5. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

5.1 SUMMARY

Non-radiological environmental monitoring at PORTS includes air, water, sediment, and fish. Monitoring of non-radiological parameters is required by state and federal regulations and/or permits, but is also performed to reduce public concerns about plant operations.

Non-radiological data collected in 2019 are similar to data collected in previous years.

5.2 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INTRODUCTION

Environmental monitoring programs at PORTS usually monitor both radiological and non-radiological constituents that could be released to the environment as a result of PORTS activities. The radiological components of each monitoring program were discussed in the previous chapter. The DOE *Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* (DOE 2017b) specifies non-radiological monitoring requirements for ambient air, surface water, sediment, and fish. Non-radiological data are not collected for all sampling locations or all monitoring programs.

Environmental permits issued by Ohio EPA to FBP, MCS, or Centrus specify discharge limitations, monitoring requirements, and/or reporting requirements for air emissions and water discharges. Centrus data for NPDES water discharges are included in this section to provide a more complete picture of environmental monitoring at PORTS. Centrus data for water discharges are provided for informational purposes only; as Centrus operates independently of the DOE and is regulated by the NRC.

Data for the following environmental media are included in this chapter:

- air
- surface water
- sediment
- biota (fish).

DOE also conducts an extensive groundwater monitoring program at PORTS that includes both radiological and non-radiological constituents. Chapter 6 provides information on the groundwater monitoring program, associated surface water monitoring, and water supply monitoring.

5.3 AIR

Permitted air emission sources at PORTS emit non-radiological air pollutants. In addition, the ambient air monitoring program measures fluoride at monitoring stations within PORTS boundaries and in the surrounding area. Chapter 4, Figure 4.3 is a map of the PORTS ambient air monitoring locations.

5.3.1 Airborne Discharges

FBP is responsible for numerous air emission sources associated with the former gaseous diffusion production facilities and support facilities. These sources, which included the boilers at the X-600 Steam Plant Complex (prior to demolition in 2013), emitted more than 100 tons per year of non-radiological air pollutants specified by Ohio EPA, which caused FBP air emission sources to become a major source of air pollutants as defined in 40 CFR Part 70.

FBP is required to submit an annual report called the Ohio EPA Fee Emissions Report to report emissions of selected non-radiological air pollutants. FBP reported the following emissions of non-radiological air pollutants for 2019: 11.24 tons of particulate matter and 1.18 tons of organic compounds. Emissions for 2019 are associated with the X-627 Groundwater Treatment Facility and plant roads/parking areas.

The DUF_6 Conversion Facility emits only a small quantity of non-radiological air pollutants. Because of these small emissions, Ohio EPA requires a Fee Emissions Report only once every two years (in odd-numbered years). MCS reported less than 10 tons/year of specified non-radiological air pollutants in 2019 (the report requires reporting in increments of emissions: zero, less than 10 tons, 10-50 tons, more than 50 tons, and more than 100 tons).

U.S. EPA also requires annual reporting of greenhouse gas emissions (carbon dioxide, methane, and nitrous oxide). In 2019, FBP reported emissions of 13,470.4 metric tons of carbon dioxide, 0.26 metric ton of methane, and 0.026 metric ton of nitrous oxide. These emissions are from burning natural gas at the X-690 Boilers, which provide steam to portions of the plant.

Another potential air pollutant present at PORTS is asbestos released by D&D of plant facilities. Asbestos emissions are controlled by a system of work practices. The amount of asbestos removed and disposed is reported to Ohio EPA. In 2019, 1.1 tons of asbestos-containing materials (net weight) were shipped from PORTS.

5.3.2 Ambient Air Monitoring

In addition to the radionuclides discussed in Chapter 4, DOE ambient air monitoring stations also measure fluoride. Fluoride detected at the ambient air monitoring stations could be present due to background concentrations (fluoride occurs naturally in the environment), activities associated with the former gaseous diffusion process, and operation of the DUF_6 Conversion Facility.

In 2019, samples for fluoride were collected weekly from 15 ambient air monitoring stations in and around PORTS (see Chapter 4, Figure 4.3), including a background ambient air monitoring station (A37) located approximately 13 miles southwest of the plant.

In 2019, fluoride was not detected in 50 percent of the samples collected for the ambient air monitoring program. The average ambient concentration of fluoride measured in samples collected at background station A37 was 0.0066 microgram per cubic meter ($\mu g/m^3$), which was calculated using the assumption that the concentration of fluoride in air was zero for samples in which fluoride was not detected. This assumption ensures that the average concentration of fluoride in ambient air at the background location is not overestimated. Concentrations of fluoride measured in samples collected at the background station ranged from zero (below the analytical detection limit) to 0.020 $\mu g/m^3$.

For the locations around PORTS, if fluoride was not detected in a sample, the ambient concentration of fluoride was calculated assuming fluoride was present at the detection limit (instead of using zero as discussed for the background location). This assumption ensures that the average concentration of fluoride in air around PORTS is not underestimated because the fluoride was actually present at a concentration less than could be detected. Average ambient concentrations of fluoride measured at the stations around PORTS ranged from 0.010 $\mu g/m^3$ at station A15 (east-southeast of PORTS on Loop Road) to 0.019 $\mu g/m^3$ at station A10 (on-site at the Don Marquis substation). These concentrations are similar to the concentrations detected in 2018 (the highest average ambient concentration in 2018 was 0.021 $\mu g/m^3$ at stations A12 and A3). Concentrations of fluoride measured in samples collected at the off-site stations near PORTS ranged from below analytical detection limits to an ambient concentration of 0.16 $\mu g/m^3$ at station A24 (north of PORTS on Shyville Road). The maximum concentration of fluoride in ambient air in 2019 (0.16 $\mu g/m^3$) is higher than the maximum concentration detected in 2018 (0.046 $\mu g/m^3$at station A3 — south of PORTS on Bailey Chapel Road). Concentrations of fluoride in ambient air around PORTS are within ambient background concentrations measured in the United States (Agency for Toxic Substances and Disease Registry 2003). There is no standard for fluoride in ambient air.

5.4 WATER

Surface water and groundwater are monitored at PORTS. Groundwater monitoring is discussed in Chapter 6, along with surface water monitoring conducted as part of the groundwater monitoring program. Non-radiological surface water monitoring primarily consists of sampling water discharges associated with the FBP, MCS, and Centrus NPDES-permitted outfalls. PCBs are monitored in on-site surface water downstream from the cylinder storage yards.

5.4.1 Water Discharges (NPDES Outfalls)

In 2019, DOE contractors (FBP and MCS) were responsible for 20 NPDES discharge points (outfalls) or sampling points at PORTS. Centrus was responsible for three outfalls. This section describes non-radiological discharges from these outfalls during 2019.

5.4.1.1 FBP NPDES outfalls

In 2019, FBP was responsible for 18 outfalls or sampling points. Nine outfalls discharge directly to surface water, and six outfalls discharge to another outfall before leaving the site. FBP also monitors three additional sampling points that are not discharge locations. Chapter 4, Section 4.3.4.1, provides a brief description of each FBP outfall or sampling point and provides a site diagram showing each FBP NPDES outfall/sampling point (see Chapter 4, Figure 4.4).

Ohio EPA selects the chemical parameters that must be monitored at each outfall based on the chemical characteristics of the water that flows into the outfall and sets discharge limitations for some of these parameters. For example, some of the FBP outfalls discharge water from the groundwater treatment facilities; therefore, the outfalls are monitored for selected VOCs (*trans*-1,2-dichloroethene and/or TCE) because the groundwater treatment facilities treat water contaminated with VOCs. Chemicals and water quality parameters monitored at each FBP outfall in 2019 are as follows:

- FBP NPDES Outfall 001 (X-230J7 East Holding Pond) – cadmium, chlorine, copper, total filterable residue (dissolved solids), fluoride, mercury, oil and grease, pH, silver, total suspended solids, and zinc.
- FBP NPDES Outfall 002 (X-230K South Holding Pond) – cadmium, fluoride, mercury, ammonia-nitrogen, oil and grease, pH, selenium, silver, total suspended solids, and thallium.
- FBP NPDES Outfall 003 (X-6619 Sewage Treatment Plant) – acute toxicity, ammonia-nitrogen, carbonaceous biochemical oxygen demand, copper, E. coli (May-October only), mercury, nitrite + nitrate, oil and grease, pH, silver, thallium, total suspended solids, and zinc.
- FBP NPDES Outfall 004 (Cooling Tower Blowdown) – acute toxicity, chlorine, copper, total filterable residue (dissolved solids), mercury, oil and grease, pH, total suspended solids, and zinc.
- FBP NPDES Outfall 005 (X-611B Lime Sludge Lagoon) – lead, mercury, pH, selenium, and total suspended solids.
- FBP NPDES Outfall 009 (X-230L North Holding Pond) – bis(2-ethylhexyl)phthalate, copper, fluoride, mercury, oil and grease, pH, silver, total suspended solids, and zinc.
- FBP NPDES Outfall 010 (X-230J5 Northwest Holding Pond) – lead, mercury, oil and grease, pH, selenium, total suspended solids, and zinc.
- FBP NPDES Outfall 011 (X-230J6 Northeast Holding Pond) – cadmium, chlorine, copper, fluoride, oil and grease, pH, selenium, total suspended solids, thallium, and zinc.

- FBP NPDES Outfall 015 (X-624 Groundwater Treatment Facility) – arsenic, barium, total PCBs, pH, silver, and TCE.

- FBP NPDES Outfall 602 (X-621 Coal Pile Runoff Treatment Facility) – iron, manganese, pH, and total suspended solids.

- FBP NPDES Outfall 604 (X-700 Biodenitrification Facility) – copper, iron, nickel, nitrate-nitrogen, pH, and zinc.

- FBP NPDES Outfall 605 (X-705 Decontamination Microfiltration System) – ammonia-nitrogen, chromium, hexavalent chromium, copper, Kjeldahl nitrogen, nickel, nitrate-nitrogen, nitrite-nitrogen, oil and grease, pH, sulfate, total suspended solids, TCE, and zinc.

- FBP NPDES Outfall 608 (X-622 Groundwater Treatment Facility) – TCE, pH, and *trans*-1,2-dichloroethene.

- FBP NPDES Outfall 610 (X-623 Groundwater Treatment Facility) – TCE, pH, and *trans*-1,2-dichloroethene.

- FBP NPDES Outfall 611 (X-627 Groundwater Treatment Facility) – pH and TCE.

The FBP NPDES Permit also identifies additional monitoring points that are not discharge points as described in the previous paragraphs. FBP NPDES Station Number 801 is a surface water background monitoring location on the Scioto River upstream from FBP NPDES Outfalls 003 and 004. Samples are collected from this monitoring point to measure toxicity to minnows and another aquatic organism, *Ceriodaphnia*.

FBP NPDES Station Number 902 is a monitoring location on Little Beaver Creek downstream from FBP NPDES Outfall 001. FBP NPDES Station Number 903 is a monitoring location on Big Run Creek downstream from FBP NPDES Outfall 002. Water temperature is the only parameter measured at each of these monitoring points.

The monitoring data detailed in the previous paragraphs are submitted to Ohio EPA in a monthly discharge monitoring report. In 2019, discharge limitations at the FBP NPDES monitoring locations were exceeded on 30 occasions (see Table 5.1).

Various discharge limits for total suspended solids were exceeded at five outfalls a total of 27 times in 2019 (see Table 5.1). These exceedances were generally caused by a combination of excessive rainfall and operational issues at the outfall. Operational issues that contributed to the exceedances were corrected immediately. In many cases, a single high daily measurement resulted in more than one permit exceedance. Permit limitations can be set for the maximum daily limit, maximum daily loading limit, maximum average monthly limit, and/or maximum average monthly loading limit (each of these limits are not set for every parameter at every outfall). The maximum daily limit and maximum average monthly limit are concentration limits in mass per volume: for example milligram per liter. Samples collected at the outfall are measured in these units, generally milligrams or micrograms per liter. The loading limits (daily and monthly) are limits set for total mass per day (or month). These limits are calculated using the measured concentration of the sample multiplied by the total daily amount of water released through the outfall.

Table 5.1 FBP NPDES exceedances in 2019

Outfall	Parameter	Limit	Number of Exceedances	Date and Result[a]
002	Total suspended solids	20 mg/L (monthly average)	1	February: 25 mg/L
003	Total suspended solids	18 mg/L (maximum daily)	1	February 27: 29 mg/L
		27.3 kg/day (maximum daily loading)	2	February 6: 36.59 kg/day February 27: 35.78 kg/day
		12 mg/L (monthly average)	1	February: 17 mg/L
		18.2 kg/day (monthly average loading)	1	February: 28.43 mg/L
005	Total suspended solids	15 mg/L (maximum daily)	9	March 27: 36 mg/L May 7: 16 mg/L May 14: 30 mg/L June 14: 47.4 mg/L July 25: 29 mg/L October 15: 35 mg/L November 11: 22 mg/L November 14: 25.2mg/L December 22: 17.6 mg/L
		10 mg/L (monthly average)	6	March: 16 mg/L May: 20 mg/L June: 24 mg/L October: 12.65 mg/L November: 16 mg/L December: 13.7 mg/L
009	Total suspended solids	45 mg/L (maximum daily)	2	February 27: 120 mg/L March 13: 138 mg/L
		30 mg/L (monthly average)	2	February: 120 mg/L March: 50 mg/L
010	Total suspended solids	45 mg/L (maximum daily)	1	July 16: 46 mg/L
		30 mg/L (monthly average)	1	July: 46 mg/L
611	TCE	10 µg/L (maximum daily)	2	December 9: 14.1 µg/L December 16: 14.1 µg/L
		10 µg/L (monthly average)	1	December: 14.1 µg/L

[a]Units: kilogram per day (kg/day). microgram per liter (µg/L). milligram per liter (mg/L).

Discharge limitations for TCE at Outfall 611 (the X-627 Groundwater Treatment Facility) were exceeded in December 2019. Two samples collected on December 9 and 16 exceeded the daily discharge limitation, which also resulted in an exceedance of the monthly average discharge limitation (see Table 5.1). The air stripping unit at the treatment facility, which removes TCE from the water, was cleaned and compliance was restored. Water from this outfall is treated further at the X-6619 Sewage Treatment Plant (FBP NPDES Outfall 003) prior to discharge from PORTS. No further actions were required.

In 2019, the overall FBP NPDES compliance rate with the NPDES permit was 98%.

5.4.1.2 MCS NPDES outfalls

MCS is responsible for the NPDES permit for the discharge of process wastewaters from the DUF_6 Conversion Facility. The MCS NPDES permit provides monitoring requirements for two outfalls: MCS Outfall 001 and MCS Outfall 602. Chapter 4, Figure 4.4 shows the location of the MCS NPDES outfalls. Monitoring requirements for MCS Outfall 001 are only effective when process wastewater is being discharged through the outfall. No process waste water was discharged through Outfall 001 in 2019; therefore, no monitoring was required.

MCS Outfall 602 monitors the discharge of MCS process wastewater to the sanitary sewer, which flows to the X-6619 Sewage Treatment Plant that discharges through FBP NPDES Outfall 003. Process wastewater discharged from MCS Outfall 602 was monitored for pH and total flow.

The monitoring data collected in accordance with the MCS permit are submitted to Ohio EPA in a monthly discharge monitoring report. No exceedances of permit limitations at MCS Outfall 602 occurred during 2019; therefore, the overall MCS compliance rate with the NPDES permit was 100%.

5.4.1.3 Centrus NPDES outfalls

Centrus is responsible for three NPDES outfalls through which water is discharged from the site (see Chapter 4, Figure 4.4). Two outfalls discharge directly to surface water, and one outfall discharges to FBP NPDES Outfall 003 before leaving the site. Chapter 4, Section 4.3.4.2, provides a brief description of each Centrus NPDES outfall. Chemicals and water quality parameters monitored at each Centrus outfall are as follows:

- Centrus NPDES Outfall 012 (X-2230M Southwest Holding Pond) – cadmium, chlorine, copper, iron, mercury, oil and grease, pH, selenium, silver, suspended solids, total PCBs, thallium, and TCE.

- Centrus NPDES Outfall 013 (X-2230N West Holding Pond) – antimony, arsenic, barium, cadmium, chlorine, copper, mercury, oil and grease, pH, suspended solids, thallium, total PCBs, and zinc.

- Centrus NPDES Outfall 613 (X-6002A Recirculating Hot Water Plant particle separator) – chlorine and suspended solids.

The monitoring data are submitted to Ohio EPA in a monthly discharge monitoring report. No exceedances of permit limitations at Centrus Outfalls 012, 013, and 613 occurred during 2019; therefore, the overall Centrus compliance rate with the NPDES permit was 100%.

5.4.2 Surface Water Monitoring Associated with MCS Cylinder Storage Yards

Surface water samples (filtered and unfiltered) are collected quarterly from four locations in the drainage basins downstream from the MCS X-745C, X-745E, and X-745G Cylinder Storage Yards (UDS X01, RM-8, UDS X02, and RM-10 – see Chapter 4, Figure 4.4). These locations are on site at PORTS and not accessible to the public. Samples are analyzed for PCBs.

PCBs were detected at 0.34 µg/L in the unfiltered surface water sample collected in the second quarter at UDS X01, but were not detected in the sample collected at RM-8, which is downstream from UDS X01. PCBs were not detected in any of the other surface water samples (filtered or unfiltered) collected during 2019. Section 5.5.2 presents the results for sediment samples collected as part of this program.

5.5 SEDIMENT

In 2019, sediment monitoring at PORTS included local streams and the Scioto River upstream and downstream from PORTS and drainage basins downstream from the MCS cylinder storage yards.

5.5.1 Local Sediment Monitoring

Sediment samples are collected annually at the same locations upstream and downstream from PORTS where local surface water samples are collected, at the NPDES outfalls on the east and west sides of PORTS, and at a location on Big Beaver Creek upstream from the confluence with Little Beaver Creek (see Chapter 4, Figure 4.6). In 2019, samples were analyzed for 20 metals and PCBs, in addition to the radiological parameters discussed in Chapter 4.

PCBs were detected at three on-site and one off-site sampling locations. Samples collected on site from Little Beaver Creek (RM-8 and RM-11) and West Drainage Ditch (RM-10) contained PCBs at concentrations ranging from 71.6 to 380 micrograms per kilogram (µg/kg) or parts per billion (ppb). PCBs were also detected at the off-site sampling location on Little Beaver Creek (RM-7) at 33.1 µg/kg. The concentration of PCBs detected in the off-site sample from Little Beaver Creek (33.1 µg/kg) is less than the risk-based regional screening level for PCB-1254/1260 developed by U.S. EPA and utilized by Ohio EPA: 240 µg/kg (U.S. EPA 2020).

The results of metals sampling conducted in 2019 indicate that no appreciable differences are evident in the concentrations of metals present in sediment samples taken upstream from PORTS and downstream from PORTS. Metals occur naturally in the environment. Accordingly, the metals detected in the samples most likely did not result from activities at PORTS.

5.5.2 Sediment Monitoring Associated with MCS Cylinder Storage Yards

Sediment samples are collected quarterly from four locations in the drainage basins downstream from the MCS X-745C, X-745E, and X-745G Cylinder Storage Yards (UDS X01, RM-8, UDS X02, and RM-10) and analyzed for PCBs. These locations are on site at PORTS and not accessible to the public (see Chapter 4, Figure 4.4).

In 2019, PCBs were detected in at least one of the sediment samples collected at each location. The maximum concentration of PCBs (230 µg/kg) was detected in the second quarter sample collected at sampling location RM-8. The concentrations of PCBs detected in 2019 are below the 1 ppm (1000 µg/kg) reference value set forth in the U.S. EPA Region 5 *TSCA Approval for Storage for Disposal of PCB Bulk Product (Mixed) Waste,* which applies to the storage of DUF_6 cylinders at PORTS that may have paint on the exterior of the cylinders that contains more than 50 ppm PCBs. None of the samples contained PCBs above the risk-based regional screening level for PCB-1254/1260 developed by U.S. EPA and utilized by Ohio EPA: 240 µg/kg (ppb) (U.S. EPA 2020).

Section 5.4.2 presents the results for surface water samples collected as part of this program.

5.6 BIOLOGICAL MONITORING - FISH

Fish samples are collected annually (if available) from the following locations:

- Little Beaver Creek (RW-8): on site at PORTS
- Big Beaver Creek (RW-15): off site upstream from the confluence with Little Beaver Creek
- Big Beaver Creek (RW-13): off site downstream from the confluence with Little Beaver Creek
- Scioto River (RW-1A): off site downstream from PORTS water discharges
- Scioto River (RW-6): off site upstream from PORTS water discharges (Piketon).

In 2019, fish, all bass, were caught in Big Beaver Creek and Little Beaver Creek. No fish were caught in the Scioto River. Chapter 4, Figure 4.6, shows the surface water monitoring locations where the fish were caught.

Fish samples were analyzed for PCBs, in addition to the radiological parameters discussed in Chapter 4. Fish samples collected for this program included only the fish fillet, that is, only the portion of the fish that would be eaten by a person. Both regular and duplicate samples were collected from the fish caught at RW-15.

Table 5.2 summarizes the results of the PCB sampling in fish for 2019 and compares the results to suggested consumption limits from the State of Ohio.

Table 5.2. PCB results in fish and Ohio advisory consumption limits

	Ohio advisory consumption limits for PCBs in fish[a]		
	Unrestricted Less than 50 µg/kg	1 meal/week 50-220 µg/kg	1 meal/month 220-1000 µg/kg
PORTS 2019 fish samples	RW-13 PCBs: not detected RW-15 (regular sample) PCBs: 41.7 µg/kg	RW-8 PCBs:130 µg/kg	RW-15 (duplicate sample) PCBs: 412 µg/kg

[a]Source: *State of Ohio Cooperative Fish Tissue Monitoring Program Sport Fish Tissue Consumption Advisory Program* (Ohio EPA 2010).

PCBs were detected at 41.7 µg/kg in the regular sample collected at RW-15 and at 412 µg/kg in the duplicate sample. These samples consisted of several fish, which indicates that concentrations of contaminants in fish can vary even among similar fish.

The Ohio Sport Fish Consumption Advisory, available from the Ohio Department of Health, advises the public on consumption limits for sport fish caught from all water bodies in Ohio and should be consulted before eating any fish caught in Ohio waters (Ohio Department of Health 2020). The advisory recommends a limit of one meal per month for white bass (12 inches and over), common carp, and channel or flathead catfish caught in the Scioto River in Pike and Scioto Counties due to mercury and/or PCB contamination. The Ohio Department of Health advises that everyone limit consumption of sport fish caught from all waterbodies in Ohio to one meal per week, unless there is a more or less restrictive advisory.