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 completed to reduce public concerns about plant operations. Non-radiological data collected in 2005 are similar to data collected in previous years.

5.2 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* specifies non-radiological monitoring requirements for ambient air, local surface water, sediment, and fish. Non-radiological data are not collected for some sampling locations and some monitoring programs.

Environmental permits issued by the EPA to both the DOE and USEC specify discharge limitations, monitoring requirements, and/or reporting requirements for air emissions and water discharges. Because USEC data are important in developing a complete picture of environmental monitoring at PORTS, these data are included in this report. USEC information is provided for informational purposes only; the DOE cannot certify the accuracy of USEC data. Data from the following environmental monitoring programs are included in this chapter:

- Air,
- Surface water,
- Sediment, and
- Biota (fish).

During 2005, the Ohio EPA conducted sampling of surface water, sediment, and fish in and around PORTS for a Biological and Water Quality Study. To the extent possible, the Ohio EPA and the DOE split the samples collected for this project. Non-radiological data for samples analyzed by DOE subcontractors are discussed in this section. The Ohio EPA Biological and Water Quality Study for PORTS is available through the Ohio EPA Division of Surface Water.

The 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 DOE ambient air monitoring program measures fluoride at monitoring stations within PORTS and in the surrounding area.

5.3.1 Airborne Discharges

DOE PORTS operates several sources of conventional air pollutants such as nitrogen oxides, sulfur dioxide, and particulate matter. The boilers that provide heat for DOE facilities account for almost all of the conventional air pollutants emitted by DOE sources. The DOE reported the following emissions from the boilers for 2005 in the Ohio EPA Fee Emissions Report: 0.086 ton of particulate matter, 0.072 ton of sulfur dioxide, 2.521 tons of nitrogen oxides, 0.094 ton of carbon monoxide, and 0.225 ton of volatile organic compounds.

Other emissions sources at DOE PORTS, which include two landfill venting systems, two glove boxes (not used in 2005), two aboveground storage tanks in the X-6002A Fuel Oil Storage Facility, and four groundwater treatment facilities, emit less than 1 ton per year of conventional air pollutants (on an individual basis), and therefore do not require reporting in the Ohio EPA Fee Emissions Report.

Another potential air pollutant present at DOE PORTS is asbestos released by renovation or demolition of plant facilities. Asbestos emissions are controlled by a system of work practices. The amount of asbestos removed and disposed is reported to the Ohio EPA. In 2005, 17 tons of material contaminated with asbestos were shipped from DOE PORTS. These wastes included scrap metal, pipe insulation, and other construction debris that was contaminated with asbestos.

USEC reported the following emissions of non-radiological air pollutants for 2005 in the Ohio EPA Fee Emissions Report: 31.88 tons of particulate matter, 1.89 tons of organic compounds, 2093.88 tons of sulfur dioxide, and 258 tons of nitrogen oxides. These emissions are associated with the boilers at the X-600 Steam Plant, which provide steam for PORTS, a boiler at the X-611 Water Treatment Plant, and diesel-powered compressors for emergency use.

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) or from USEC activities associated with the former gaseous diffusion process.

In 2005, samples for fluoride were collected weekly from 15 ambient air monitoring stations in and around PORTS (see Chapter 4, Figure 4.1). A background ambient air monitoring station (A37) is located approximately 13 miles southwest of the plant. The analytical results from air sampling stations closer to the plant are compared to this background station. In 2005, the average ambient concentration of fluoride measured in samples collected at the background station was 0.034 microgram per cubic meter ($\mu g/m^3$). Ambient concentrations of fluoride measured at the other stations ranged from 0.031 $\mu g/m^3$ at Station A15, located southeast of the southeastern plant boundary, to 0.045 $\mu g/m^3$ at Station A12, located on the eastern PORTS boundary.

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 both the DOE and USEC NPDES-permitted outfalls. Non-radiological parameters are also monitored in the Scioto River upstream and downstream of PORTS to determine whether discharges

from PORTS affect water quality in the river. PCBs are monitored in surface water discharges and surface water downstream from the DOE depleted uranium cylinder storage yards.

In 2005, metals, volatile organic compounds, semivolatile organic compounds, and/or PCBs in surface water were monitored at locations on Big Beaver Creek, Big Run Creek, Little Beaver Creek, the Scioto River, and the West Drainage Ditch in conjunction with the Ohio EPA Biological and Water Quality Study.

5.4.1 Water Discharges (NPDES Outfalls)

Both the DOE and USEC are responsible for NPDES outfalls at PORTS. This section describes non-radiological discharges from these outfalls during 2005.

5.4.1.1 DOE NPDES outfalls

Non-radiological discharges from DOE NPDES outfalls are regulated by the DOE PORTS NPDES permit. DOE PORTS has eight discharge points, or outfalls, through which water is discharged from the site. Three outfalls discharge directly to surface water, four discharge to the USEC X-6619 Sewage Treatment Plant (USEC NPDES Outfall 003), and one discharges to the X-2230M Holding Pond (DOE Outfall 012). Outfall 612 is currently inactive because the X-625 Groundwater Treatment Facility was placed on stand-by with the approval of the Ohio EPA in July 2003. Chapter 4, Section 4.3.5.1, provides a brief description of each DOE outfall and provides a site diagram showing each DOE PORTS NPDES outfall (see Chapter 4, Figure 4.2).

The 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. For example, the DOE outfalls that discharge water from the groundwater treatment facilities (Outfalls 015, 608, 610, 611, and 612) are monitored for trichloroethene because the groundwater treatment facilities treat water contaminated with this chemical. Chemicals monitored at each DOE outfall are as follows:

- DOE NPDES Outfall 012 (X-2230M Holding Pond) – chlorine, iron, oil and grease, suspended solids, total PCBs, and trichloroethene.
- DOE NPDES Outfall 013 (X-2230N Holding Pond) – chlorine, oil and grease, suspended solids, and total PCBs.
- DOE NPDES Outfall 015 (X-624 Groundwater Treatment Facility) – total PCBs and trichloroethene.
- DOE NPDES Outfall 608 (X-622 Groundwater Treatment Facility) – trichloroethene and *trans*-1,2-dichloroethene.
- DOE NPDES Outfall 610 (X-623 Groundwater Treatment Facility) – trichloroethene and *trans*-1,2-dichloroethene.
- DOE NPDES Outfall 611 (X-627 Groundwater Treatment Facility) – trichloroethene.
- DOE NPDES Outfall 612 (X-625 Groundwater Treatment Facility) –iron and trichloroethene. This outfall is currently inactive because the X-625 Groundwater Treatment Facility was placed on stand-by with approval from the Ohio EPA on July 9, 2003.

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

In 2005, none of the discharge limitations for DOE NPDES outfalls were exceeded; therefore, the overall DOE NPDES compliance rate with the NPDES permit was 100%.

5.4.1.2 USEC NPDES outfalls

USEC is responsible for 11 NPDES outfalls through which water is discharged from the site (see Chapter 4, Figure 4.2). Eight outfalls discharge directly to surface water, and three discharge to another USEC NPDES outfall before leaving the site. Chapter 4, Section 4.3.5.2, provides a brief description of each USEC NPDES outfall.

From January through July 2005, non-radiological discharges from USEC NPDES outfalls were regulated by the USEC NPDES permit that became effective on March 1, 2000. USEC was issued a new NPDES permit in 2005, which became effective August 1, 2005. Chemicals monitored at each USEC outfall are as follows:

- USEC NPDES Outfall 001 (X-230J7 East Holding Pond) – Prior to August 2005: arsenic, copper, fluoride, manganese, nickel, oil and grease, suspended solids, zinc. The new permit adds silver, cadmium, chlorine, and dissolved solids and deletes arsenic, copper, manganese, and nickel.

- USEC NPDES Outfall 002 (X-230K South Holding Pond) – Prior to August 2005: fluoride, manganese, mercury, oil and grease, silver, suspended solids, thallium. The new permit adds cadmium and deletes manganese.

- USEC NPDES Outfall 003 (X-6619 Sewage Treatment Plant) – Prior to August 2005: ammonia-nitrogen, biochemical oxygen demand, chlorine, copper, fecal coliform (May-October only), mercury, nitrate-nitrogen, oil and grease, silver, suspended solids, zinc. The new permit adds nitrate + nitrite and deletes nitrate-nitrogen.

- USEC NPDES Outfall 004 (Cooling Tower Blowdown) – Prior to August 2005: copper, dissolved solids, oil and grease, suspended solids, zinc. The new permit adds chlorine and mercury.

- USEC NPDES Outfall 005 (X-611B Lime Sludge Lagoon) – suspended solids, PCBs. The new permit deletes PCBs.

- USEC NPDES Outfall 009 (X-230L North Holding Pond) – Prior to August 2005: fluoride, manganese, oil and grease, suspended solids, zinc. The new permit adds cadmium and deletes manganese.

- USEC NPDES Outfall 010 (X-230J5 Northwest Holding Pond) – Prior to August 2005: manganese, oil and grease, suspended solids, zinc. The new permit adds cadmium and mercury and deletes manganese.

- USEC NPDES Outfall 011 (X-230J6 Northeast Holding Pond) – Prior to August 2005: copper, fluoride, oil and grease, suspended solids, zinc. The new permit adds cadmium and chlorine.

- USEC NPDES Outfall 602 (X-621 Coal Pile Runoff Treatment Facility) – iron, manganese, settleable solids, suspended solids. The new permit deletes settleable solids.

- USEC NPDES Outfall 604 (X-700 Biodenitrification Facility) – copper, iron, nickel, nitrate-nitrogen, zinc. Monitoring parameters for this outfall did not change in the new permit.

- USEC NPDES Outfall 605 (X-705 Decontamination Microfiltration System) – ammonia-nitrogen, chromium, hexavalent chromium, copper, iron, Kjeldahl nitrogen, nickel, nitrate-nitrogen, nitrite-nitrogen, oil and grease, sulfate, suspended solids, trichloroethene, zinc. Monitoring parameters for this outfall did not change in the new permit.

The USEC NPDES Permit also identifies additional monitoring points that are not discharge points as described in the previous paragraphs. USEC NPDES Station Number 801 is a background monitoring location on the Scioto River upstream from USEC NPDES Outfalls 003 and 004. USEC NPDES Station Number 901 is a monitoring location on the Scioto River downstream from Outfalls 003 and 004 and located in the discharge plume from these two outfalls. Monitoring at Station Number 901 was discontinued in the new NPDES permit. Samples are collected from both of these monitoring points (only Station 801 after August 2005) to measure toxicity to minnows and another aquatic organism (Ceriodaphnia).

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

In 2005, none of the discharge limitations for USEC NPDES outfalls were exceeded; therefore, the overall USEC NPDES compliance rate with the NPDES permit was 100%.

5.4.2 Local Surface Water Monitoring

Non-radiological monitoring of local surface water locations was conducted on the Scioto River upstream and downstream of PORTS (sampling locations RW-6 and RW-1 – see Chapter 4, Figure 4.4). Samples from the Scioto River are analyzed for total phosphate – phosphorus, fluoride, 28 metals, and PCBs. Each of these measurements, with the exception of PCBs, will detect naturally-occurring constituents; therefore, measurements from the upstream location are compared to the downstream location to assess whether PORTS activities have affected the river. Natural variation and manmade activities not related to PORTS can also cause sample variation.

Semiannual samples were collected for fluoride and total phosphate – phosphorus. In 2005, the concentrations of fluoride were slightly higher at the upstream Scioto River sampling location (0.3 and 0.4 milligram per liter [mg/L] or ppm) than the downstream sampling location (0.2 and 0.4 mg/L). Concentrations of total phosphate – phosphorus were not appreciably different in upstream and downstream samples collected in 2005: 0.19 and 0.2 mg/L in upstream samples and 0.2 and 0.2 mg/L in downstream samples.

Quarterly samples were collected for PCBs and 28 metals from the upstream and downstream Scioto River sampling locations. PCBs were not detected in any of the samples collected in 2005. No significant differences in the concentrations of metals were noted at the upstream and downstream Scioto River sampling locations. Discharges of non-radiological constituents from PORTS do not appear to affect surface water quality in the Scioto River downstream from PORTS.

5.4.3 Surface Water Monitoring Associated with DOE Cylinder Storage Yards

In the third quarter of 2005, the DOE initiated U.S. EPA-required monitoring of surface water and sediment in drainage basins downstream from the DOE cylinder storage yards. Samples are collected quarterly from four locations (UDS X01, RM-8, UDS X02, and RM-10 - see Chapter 4, Figure 4.2) and analyzed for PCBs. No PCBs were detected in surface water samples collected in the third and fourth quarters of 2005. Section 5.5.2 presents the results for sediment samples collected as part of this program.

5.4.4 Surface Water Monitoring in Conjunction with the Ohio EPA Biological and Water Quality Study

Surface water samples were collected during August and October from locations on Big Beaver Creek, Big Run Creek, Little Beaver Creek, the Scioto River, and the West Drainage Ditch as part of the Ohio EPA Biological and Water Quality Study. Chapter 4, Figure 4.4, includes these sampling locations. All samples were analyzed for 25 metals. Samples from selected locations on Big Run Creek (BRC 4.3), Little Beaver Creek (LBC 1.4), and the West Drainage Ditch (WDD 1.2) were also analyzed for semivolatile organic compounds, PCBs, and volatile organic compounds. Radiological parameters are discussed in Chapter 4.

Metals occur naturally in soil and water; therefore, results for metals detected in surface water downstream from PORTS are compared to upstream monitoring data, although variations can occur for reasons unrelated to PORTS activities. In addition, concentrations of metals are compared to the non-drinking water quality criteria for the Ohio River drainage basin in the Ohio Administrative Code, Chapter 3745-1-34. At PORTS, variations occur in the concentrations of metals detected in upstream and downstream sampling locations, but none of the metals were detected at levels that exceeded the non-drinking water quality criteria.

PCBs were not detected at any of the locations sampled for PCBs. Several volatile organic compounds were detected at the sampling location on the West Drainage Ditch (WDD 1.2). These detections were toluene at 0.55 μg/L, 1,2,4-trichlorobenzene at 0.59 μg/L, and 1,2-dichlorobenzene at 0.24 μg/L. These detections are significantly less than the non-drinking water quality standards of 200,000 μg/L (toluene), 9400 μg/L (1,2,4-trichlorobenzene), and 17,000 μg/L (1,2-dichlorobenzene). One semivolatile organic compound, di-n-butyl phthalate, was also detected at sampling locations on West Drainage Ditch (WDD 1.2) and Little Beaver Creek (LBC 1.4). The detections were 6.1 and 7 μg/L, respectively; the non-drinking water quality standard for di-n-butyl phthalate is 12,000 μg/L.

5.5 SEDIMENT

In 2005, sediment monitoring at PORTS included local streams and the Scioto River upstream and downstream from PORTS, drainage basins downstream from the DOE depleted uranium cylinder storage yards, and sampling conducted in conjunction with the Ohio EPA Biological and Water Quality Study.

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 and at the NPDES outfalls on the east and west sides of PORTS (see Chapter 4, Figure 4.4). In 2005, samples were analyzed for 30 metals and PCBs, in addition to the radiological parameters discussed in Chapter 4.

PCBs were not detected in sediment samples collected in 2005. The results of metals sampling conducted in 2005 indicate that no appreciable differences are evident in the concentrations of metals present in sediment samples taken upstream from PORTS, at background sampling locations, 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 the DOE Cylinder Storage Yards

In the third quarter of 2005, the DOE initiated U.S. EPA-required monitoring of surface water and sediment in drainage basins downstream from the DOE cylinder storage yards. Samples are collected quarterly from four locations (UDS X01, RM-8, UDS X02, and RM-10) and analyzed for PCBs.

No PCBs were detected in sediment samples collected in the third quarter of 2005. In the fourth quarter of 2005, PCBs were detected at both monitoring locations associated with the X-745C Cylinder Storage Yard (the Western Drainage Ditch) at 71 micrograms per kilogram (μg/kg) or part per billion (ppb) at location UDS X02 and 37 μg/kg at location RM-10. These concentrations are below the 1 ppm (1000 ppb) reference value set forth in the U.S. EPA Region 5 *TSCA Approval for Storage for Disposal of PCB Bulk Product (Mixed) Waste* associated with paint containing greater than 50 ppm PCBs on the exterior of a portion of the depleted uranium cylinders in storage at PORTS.

Section 5.4.3 presents the results for surface water samples collected as part of this program.

5.5.3 Sediment Monitoring in Conjunction with the Ohio EPA Biological and Water Quality Study

Sediment samples were collected from locations on Big Beaver Creek, Big Run Creek, Little Beaver Creek, the Scioto River, and the West Drainage Ditch as part of the Ohio EPA Biological and Water Quality Study. Chapter 4, Figure 4.4 shows these sampling locations. All samples were analyzed for 24 metals, semivolatile organic compounds, and PCBs. Samples from selected locations on Big Run Creek, Little Beaver Creek, and the West Drainage Ditch were also analyzed for volatile organic compounds. Radiological parameters are discussed in Chapter 4.

Metals occur naturally in soil and water; therefore, results for metals detected in sediment are compared to upstream data, background monitoring data, and screening values based on the potential risk to human health. The Ohio EPA has published sediment reference values in the *Ohio EPA DERR Ecological Risk Assessment Guidance* (Ohio EPA 2003), which are representative background sediment concentrations for flowing water bodies. The sediment reference values are developed for the five ecological regions in the State of Ohio; PORTS is in the Western Allegheny Plateau. The Ohio EPA also uses preliminary remediation goals developed by U.S. EPA Region 9 as a basis for screening values to assess whether concentrations of contaminants detected in the environment could pose a threat to human health. Concentrations of contaminants below these screening values are not considered a threat to human health.

Concentrations of metals detected at most locations were less than background (i.e., the applicable Ohio EPA sediment reference values). Detections of arsenic, beryllium, cobalt, and zinc exceeded Ohio EPA background values at one or more of the sampling locations on Big Run Creek (BRC 4.0, BRC 4.3, and BRC 4.8) and Little Beaver Creek (2.4).

The Ohio EPA background value for arsenic is 19 milligrams per kilogram (mg/kg); the concentrations detected that exceeded the Ohio EPA background level were 34 mg/kg (BRC 4.3), and 19.2 mg/kg (BRC 4.8). DOE routinely analyzes sediment samples for arsenic collected as part of the local sediment monitoring program (see Section 5.5.1). The concentrations of arsenic in sediment around

PORTS are similar to levels detected in streams in the local area that are not influenced by PORTS activities.

The Ohio EPA background value for beryllium is 0.8 mg/kg; the detection that exceeded this value was 1.1 mg/kg (BRC 4.3). The Ohio EPA background value for cobalt is 12 mg/kg; the detections that exceeded background were 13.1 mg/kg (LBC 2.4), 13.6 mg/kg (BRC 4.0) and 17.6 mg/kg (BRC 4.3). The Ohio EPA background value for zinc (170 mg/kg) was exceeded at Little Beaver Creek sampling location LBC 2.4 (175 mg/kg). By way of reference, these detections are considerably less than the Ohio EPA screening levels for beryllium (15 mg/kg), cobalt (900 mg/kg), and zinc (2300 mg/kg) and are not considered a potential threat to human health.

The concentration of calcium detected at Scioto River sampling location SR 23.4, 27,100 mg/kg, slightly exceeded the background value of 27,000 mg/kg; however, this result was qualified by the laboratory as estimated because the results for a quality control sample associated with the sample collected at SR 23.4 were not within specified limits. It is most likely that the concentration of calcium at Scioto River sampling location SR 23.4 is within background levels. Calcium is one of the most common elements in the earth's crust and a necessary nutrient for humans; no screening values are available for this element.

Several semivolatile organic compounds were also detected in the sediment samples. Most of the detections were compounds called polycyclic aromatic hydrocarbons (PAHs). These compounds result from burning materials that contain carbon, such as wood, oil, or coal, and are frequently detected in the environment. PAHs were detected most frequently in the upstream Scioto River sample (SR 30.0). PAHs were also detected at each Scioto River downstream sampling location (SR 27.0 and SR 23.4), and all the Little Beaver Creek sampling locations. PAHs were not detected in any Big Run Creek sediment samples and at only one Big Beaver Creek sampling location (BBC 2.1). PCBs were not detected in any of the sediment samples.

Volatile organic compounds were detected at low concentrations in samples collected from each of the selected locations on Big Run Creek, Little Beaver Creek, and the West Drainage Ditch. Chlorobenzenes (a component of pesticides, room deodorizers, and moth repellant) were most frequently detected; other chemicals detected include naphthalene (moth repellant), and carbon disulfide (which can occur naturally in sediment). The highest concentrations of chlorobenzenes, naphthalene, and carbon disulfide detected in the sediment samples were 1.4 μg/kg, 4.2 μg/kg, and 0.47 μg/kg, respectively. By way of reference, these concentrations are below the Ohio EPA screening levels for chlorobenzenes (3400 μg/kg), naphthalene (5600 μg/kg), and carbon disulfide (36,000 μg/kg). Concentrations of volatile organic compounds detected in sediment samples are considerably less than the Ohio EPA screening levels and are not considered a potential threat to human health.

5.6 BIOLOGICAL MONITORING - FISH

In 2005, fish were collected from downstream sampling locations on Little Beaver Creek (RW-8) and the Scioto River (RW-1) as part of the routine fish monitoring program at PORTS. Chapter 4, Figure 4.4, shows the surface water monitoring locations where the fish were caught. Fish samples were analyzed for chromium and PCBs, in addition to the radiological parameters discussed in Chapter 4. Fish samples collected for this program were prepared by removing the head from each fish and pureeing the remainder of the fish. This method of sample preparation means that portions of the fish that are not usually eaten, such as the internal organs, are included in the sample analyzed by the laboratory.

In 2005, PCBs were not detected in any of the five fish samples collected from Little Beaver Creek or the Scioto River at detection limits of 2 or 2.5 μg/g (or ppm).

Chromium was detected in each of the fish samples collected during 2005 at estimated concentrations ranging from 0.208 to 0.5 mg/kg (or ppm). No upstream (or background) fish were collected in 2005. These concentrations of chromium detected in downstream fish in 2005 are less than concentrations of chromium detected in downstream fish caught in 2004 (2.79 to 8.18 mg/kg).

The chromium detected in these fish in 2005 is most likely due to naturally-occurring chromium. Chromium occurs naturally in soil and is often present in stream sediment and surface water. For example, chromium is usually detected in samples of surface water collected at the upstream Scioto River sampling location (RW-6) and in the sediment sample collected from this location.

In addition, fish samples were collected from locations on Big Beaver Creek, Big Run Creek, Little Beaver Creek, the Scioto River, and the West Drainage Ditch as part of the Ohio EPA Biological and Water Quality Study. The DOE split 37 samples with the Ohio EPA (some samples could not be divided because of the small sample size). Fish samples were analyzed for selected metals (arsenic, cadmium, lead, mercury, and selenium) and PCBs, in addition to the radiological parameters discussed in Chapter 4.

Concentrations of metals and PCBs in fish were compared to the Ohio Fish Consumption Advisory Chemical Limits provided in the *State of Ohio Cooperative Fish Tissue Monitoring Program Sport Fish Tissue Consumption Advisory Program* (Ohio EPA 2005). These limits are set for the following consumption rates: unrestricted, 1/week, 1/month, 6/year, and do not eat. However, these limits are based on concentrations of metals and PCBs detected only in the portion of the fish that would be eaten (the fillet of the fish). PCBs and other contaminants tend to accumulate in the fatty portions of the fish and in the organs such as the liver, intestines, and kidneys. Most of the fish samples collected at PORTS were whole body composite samples; therefore, it is unknown whether metals and PCBs were present above the given limits in only the fillet portion of the fish. Concentrations of metals and PCBs detected in the whole body composite fish samples collected at PORTS are compared to Ohio Fish Consumption Advisory limits as a conservative measure.

Cadmium was not detected in any of the fish samples. Selenium was detected in each fish sample, but all detections were less than the Ohio Fish Consumption Advisory Limit of 2.5 mg/kg for unrestricted consumption. Arsenic was detected in 31 of the 37 samples. Seven samples (one fillet sample and six whole body samples) contained arsenic in concentrations less than the unrestricted limit (0.15 mg/kg). Twenty-three samples (six fillet samples and 17 whole body samples) contained arsenic at concentrations equal to or above the unrestricted limit but below the 1/week limit (0.656 mg/kg), and one whole body sample was above the 1/week limit but below the 1/month limit (2.838 mg/kg).

Lead was detected in three fish samples (one fillet sample and two whole body samples) at concentrations between the unrestricted consumption level (0.086 mg/kg) and the 1/week consumption level (0.375 mg/kg). Mercury was detected in all of the samples with 11 whole body samples less than the unrestricted limit (0.050 mg/kg), 23 samples (five fillet samples and 18 whole body samples) with concentrations above the unrestricted limit but below the 1/week limit (0.22 mg/kg), and three fillet samples above the 1/week limit but less than the 1/month limit (1 mg/kg).

PCBs were detected in 26 of 37 fish samples (four fillet samples and 22 whole body samples). The detections of PCBs in fish fillet samples were compared to the Ohio Fish Consumption Advisory limits. One fillet sample (a channel catfish from the Scioto River upstream from PORTS) was less than the unrestricted consumption level (0.050 mg/kg). Two fillet samples were between the unrestricted limit and the 1/week limit (0.220 mg/kg). One fillet sample was between the 1/week limit and the 1/month limit

(1 mg/kg). Please note that PCBs were detected in more fish collected during the Ohio EPA Biological and Water Quality Study than in the routine sampling conducted by the DOE because the detection limits for the routine sampling (2 or 2.5 ppm) are much higher than the detections of PCBs present in fish collected during the Ohio EPA Biological and Water Quality Study (highest detection 0.820 mg/kg or ppm).

In addition to the Ohio Fish Consumption Advisory limits, Ohio EPA also sets a limit of 0.640 mg/kg of PCBs in a whole body sample of a representative aquatic organism in order to protect against adverse reproductive effects on wildlife. Only one whole body sample of 28 whole body samples collected by DOE, a yellow bullhead collected from Little Beaver Creek at river mile 2.4, contained PCBs that exceeded the Ohio EPA Water Quality Standard for whole body samples (0.640 mg/kg). The concentration of PCBs measured in the yellow bullhead sample was 0.820 mg/kg.

The Ohio Sport Fish Consumption Advisory, available from the Ohio EPA, Division of Surface Water, 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.