

**C-375-E4 Effluent Ditch (KPDES 011)  
Solid Waste Management Unit (SWMU) Assessment Report**

**SWMU/AOC NUMBER:** 67

**REGULATORY STATUS:** SWMU

**LOCATION:** This SWMU (Outfall 011) is located on the east side of the Paducah Gaseous Diffusion Plant (PGDP) outside the controlled access area of the plant.

**APPROXIMATE DIMENSION OR CAPACITY:** Outfall 011 receives drainage from an area of approximately 12.5 hectares (ha) (31 acres). The SWMU itself is approximately 1250 feet in length. The internal plant ditch system to Outfall 011 drains the eastern part of PGDP and is approximately 1646 meters (m) (5,400 feet [ft]) in length, unlined, and approximately 0.61 m (2 ft) deep.

**PRESENT FUNCTION:** The drainage area for Outfall 011 encompasses the C-315 Surge and Waste Building; the C-331 and C-333 Process Buildings; the C-340 Reduction and Metals Facility; the C-352 Relay House; C-532 Relay House; and the C-533-1 Switch House and Appurtenant Structures. Other areas that drain into Outfall 011 include SWMUs 56 and 80 of Waste Area Grouping (WAG) 23.

**PRESENT OPERATIONAL STATUS:** Active.

**DATES OPERATED:** 1951 to present.

**BRIEF HISTORY:** This ditch system was trenched when PGDP was built in 1951. The reported monthly average flow for Outfall 011 is 1.28 million liters per day (mlpd) (0.34 million gallons per day [mgpd]).

### **Key Actions**

There have been no previous Comprehensive Environmental Response, Compensation, and Liability Act response actions for the internal plant ditches to Outfall 011; however, DOE has implemented several remedial measures and treatability studies in areas of Outfall 011 located outside of the plant security fence.

- In the early 1980s, the Department of Energy (DOE) excavated the upper 0.46 m (1.5 ft) of sediments in the Outfall 011 ditch from the PGDP security fence to Dyke Road to remove PCB contamination. The ditch was restored with clean material.
- In 1991, DOE installed an underflow weir
- Issuance of the Interim Corrective Measures Work Plan for Institutional Control of Off-Site Contamination in Surface Water in 1992. The plan restricted casual public access to creeks, outfalls (including Outfall 011), and lagoons surrounding PGDP in 10 locations through the installation of fencing and identified the areas of contamination through the posting of warning signs.
- Subsequently, in 2000, additional warning signs that identify the ditch as a radiologically contaminated area were posted at Outfall 011.

- In 1994, DOE received two Notices of Violation from the Commonwealth of Kentucky due to PCB exceedances in surface water at Outfall 011 according to the *Sampling and Analysis Plan for Site Investigation and Risk Assessment of the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*. These exceedances were related to re-suspension of PCB-(PCB-1248, PCB-1260, and total PCBs) contaminated sediment in the ditch as water discharges flowed to Little Bayou Creek. To address this issue, the discharge of water from the C-617 Treatment Lagoon was diverted from Outfall 011 to Outfall 010 after June 8, 1994. This removed surface water flow from Outfall 011 except during high-flow rain events.
- Also during 1994, the portion of Outfall 011 between Dyke Road and the flume were ripped, and silt fences were installed around areas of known contamination to reduce sediment suspension and transport downstream.
- In 1995, DOE coated Outfall 011 with a bentonite concentrate to prevent erosion and further contaminant migration.
- In an effort to minimize/eliminate further PCB releases at PGDP, DOE performed a "Nature's Way" bioremediation technology field demonstration in the summer of 1996. A 15.24 m (50 ft) section of the Outfall 011 ditch was chosen as the demonstration site. During the demonstration, a polyvinyl chloride (PVC) distribution system was installed in the Outfall 011 ditch where the highest levels of PCB contamination (35 part per million (ppm) were found during the 1995 PCB soil characterization. The system consisted of a series of vertical PVC pipes placed in drilled holes to a depth of 30.48 centimeters (cm) (12 inches) throughout the 15.24 m (50 ft) demonstration area. The vertical pipes were connected to a horizontal manifold system and a nutrient bacteria solution was fed into the manifold system for distribution into the PCB-laden sediment. This application was performed approximately twice per week for the duration of the test from July 23 through December 15, 1996. Test results were monitored by a series of sampling events conducted during the last two quarters of 1996. For each sampling event, the 15.24 m (50 ft) section test area was divided into 3 equal sections. A single soil sample then was composited from three randomly chosen sampling locations within each section. Monitoring results indicated that the bacteria were effective for reducing PCB contamination within the 15.24 m demonstration segment to levels of approximately 10 ppm. However, test results indicating further reduction of contaminant levels below 10 ppm were inconclusive. Results are documented in the *1996 Summary of Actions to Eliminate/Minimize Polychlorinated Biphenyl (PCB) Effluent Releases at the Paducah Gaseous Diffusion Plant*.

No other previous response actions have occurred at Outfall 011.

**SITE/PROCESS DESCRIPTION:** Discharges from Outfall 011 are collected in a sump and pumped to the C-617-B Treatment Lagoon for treatment of residual chlorine, pH, and excess temperature. Currently, Outfall 011 receives discharges of effluent from the C-617-B Lagoon only when maintenance is being performed on the lift station located in Outfall 010. Outfall 011 may receive additional waste streams when Lift Station 011 is bypassed due to failures, maintenance, or excessive rainfall events (i.e., rainfall events that overwhelm existing discharge controls). During such bypass events, the water discharged through Outfall 011 flows to Little Bayou Creek. Mechanical failure and maintenance activities include cleaning the underflow weir, which occur on an as-needed basis.

**WASTE DESCRIPTION:** Storm water containing PCBs and radionuclides.

**WASTE QUANTITY:** Unknown.

**SUMMARY OF ENVIRONMENTAL SAMPLING DATA:** Several previous investigations have been conducted at PGDP to characterize contaminant levels in the sediments of Outfall 011. During the Phase I Site Investigation (SI), Outfall 011 was identified as a likely route of contaminant transport due to the presence of radionuclides ( $^{99}\text{Tc}$ ,  $^{230}\text{Th}$ ,  $^{234}\text{U}$ ,  $^{235}\text{U}$ , and  $^{238}\text{U}$ ) and organic contaminants in Outfall 011 sediments. The Phase II SI confirmed these results and also identified metals contamination (chromium, copper, zinc and nickel) and PCB (PCB-1248, PCB-1254, and PCB-1260) and polyaromatic hydrocarbons contamination in the outfall sediment.

Trichloroethene (TCE) and PCBs both were identified along a limited stretch of Outfall 011 in a site evaluation of effluent ditches 010, 011, and 012 (*Final Site Evaluation Report for Outfalls 010, 011, 012 Areas, Paducah Gaseous Diffusion Plant, Paducah Kentucky*). The highest TCE concentrations in the soil and groundwater and in the ditch sediment occur within a 50-ft reach of Outfall 011 between Dyke Road and the lift station. The close association of the two contaminants suggests that the two may have a common origin. A PCB study conducted by the U.S. Army Corps of Engineers (COE) confirmed the presence of PCBs in Outfall 011 sediments. Outfall 011 was included in an extensive PCB hot-spot removal action conducted by DOE at PGDP in 1983. Approximately 1300 drums of PCB-contaminated sediments were removed during this action from locations across PGDP. Some PCB concentrations were as high as 2000 parts per million (ppm). Historical records indicate that the PCB cleanup level for the remediation was 25 ppm (*Action Memorandum for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27, PCB Sites, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*).

**RELEASE SUSPECTED:** Uranium and PCBs have been confirmed in this SWMU.

**DESCRIPTION OF RELEASE AND MEDIA AFFECTED:**

<b>GROUNDWATER:</b>	Potentially affected due to nature of unit and contaminants present.
<b>SURFACE WATER:</b>	Potentially affected due to nature of unit and contaminants present.
<b>SOIL:</b>	Potentially affected due to nature of unit and contaminants present.
<b>ECOLOGY:</b>	Potentially affected due to nature of unit and contaminants present.

**DOCUMENTATION OF NO RELEASE:** This outfall is a likely route of contaminant transport due to the presence of radionuclides and organic contaminants in Outfall 011 sediments.

**PRG COMPARISON:** N/A.

**IMPACT ON OR BY OTHER SWMUS OR AOCS:** Other areas that drain into Outfall 011 include SWMUs 56 (C-540-A PCB Waste Staging Area) and 80 (C-540-A PCB Spill Site) of WAG 23.

**WASTE AREA GROUPING ASSIGNMENT:** N/A.

**OPERABLE UNIT ASSIGNMENT:** Surface Water Operable Unit (SWOU)

- This unit has been placed in the SWOU for further evaluation and/or remediation.

**REFERENCES:** *Results of the Site Investigation, Phase I, at the Paducah Gaseous*

*Diffusion Plant, KY/ER-4, March 1991*

*Results of the Site Investigation, Phase II, at the Paducah Gaseous Diffusion Plant, KY/SUB/13B-97777C P-03/191/14, April 1992*

*Interim Corrective Measures Work Plan for Institutional Control of Off-Site Contamination in Surface Water; Outfalls, Creeks, and Lagoons, DOE/OR-1030, 1992*

*Remedial Investigation Addendum for WAG 23 at Paducah Gaseous Diffusion Plant, Paducah, Kentucky, September 1994*

*Final Site Evaluation Report for Outfalls 010, 011, 012 Areas, Paducah Gaseous Diffusion Plant, Paducah Kentucky, DOE/OR/07-1141&D1, 1995*

*Summary of Actions to Eliminate/Minimize PCB Effluent Releases at the Paducah Gaseous Diffusion Plant, KY/EM-125 R1, January 1996*

*Paducah Gaseous Diffusion Plant Sediment Survey, Big Bayou Creek and Little Bayou Creek, Paducah Kentucky, Final Report, United States Army Corps of Engineers, Nashville, District, Nashville, TN, December 1996*

*Action Memorandum for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27, PCB Sites, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/06-1626&D1, September 1997*

*1996 Summary of Actions to Eliminate/Minimize Polychlorinated Biphenyl (PCB) Effluent Releases at the Paducah Gaseous Diffusion Plant, KY/EM-125 R1, 1997*

*Sampling and Analysis Plan for Site Investigation and Risk Assessment of the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant Paducah, Kentucky, DOE/OR/07-2137&D1, April 2004*

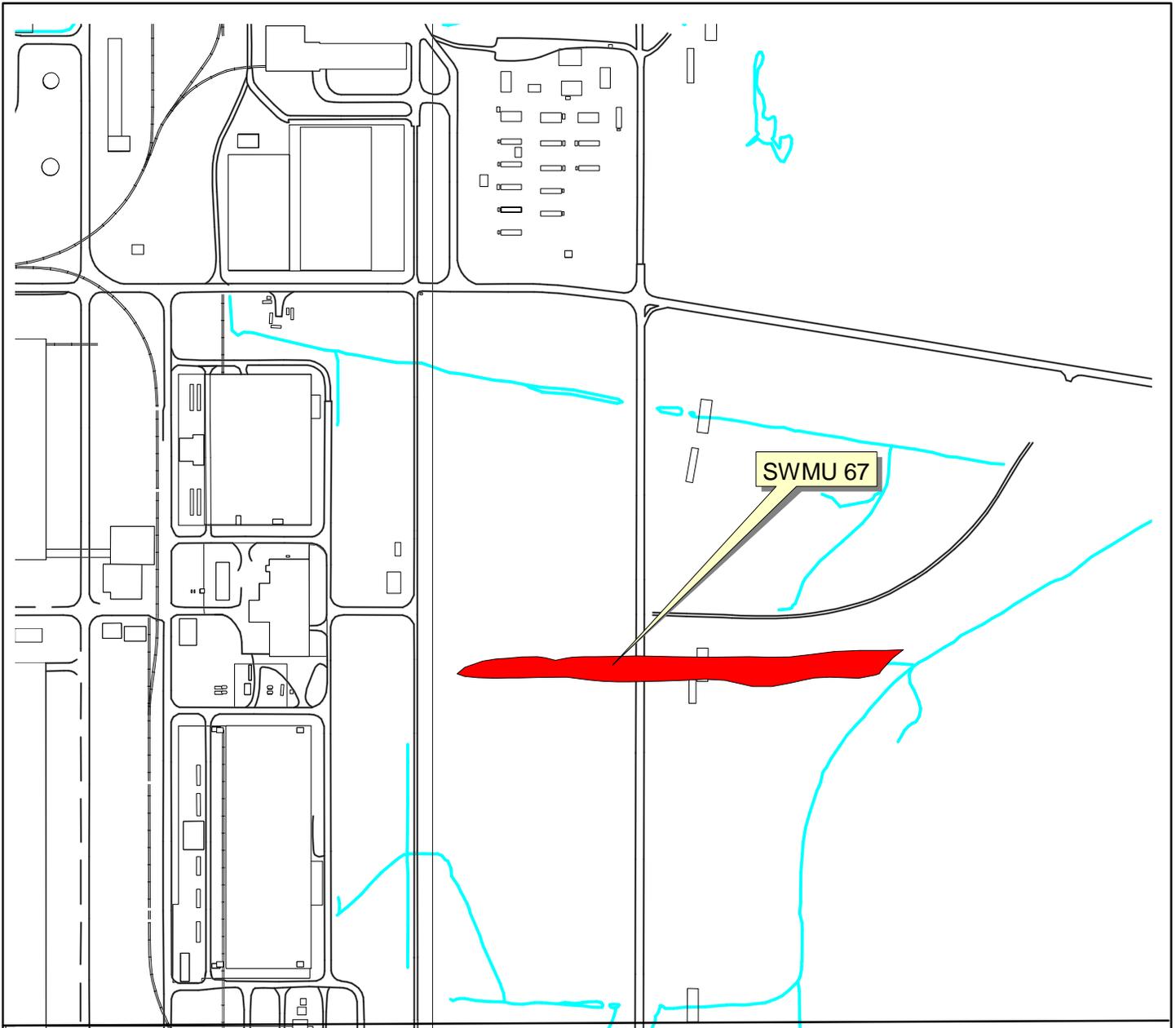
**DATE OF ORIGINAL SAR:** Unknown.

**DATE OF SAR REVISION:** 1/4/05.

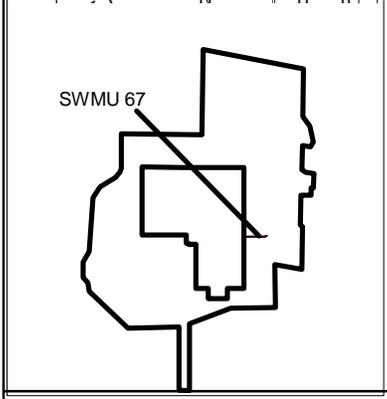


June 2004

**C-375-E4 Effluent Ditch (KPDES 011)  
SWMU 67**



SWMU 67



LEGEND:

-  SWMU 67 Area
-  Buildings

0 300 600 Feet



U.S. DEPARTMENT OF ENERGY  
DOE OAK RIDGE OPERATIONS  
PADUCAH GASEOUS DIFFUSION PLANT



BECHTEL JACOBS COMPANY LLC  
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER  
US GOVERNMENT CONTRACT DE-AC-05-03OR22980  
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

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