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JUL 31 2018

Mr. Norm Sandlin, Prime Contract Manager
Four Rivers Nuclear Partnership, LLC
5511 Hobbs Road
Kevil, Kentucky 42053

PPPO-02-4895956-18A

Dear Mr. Sandlin:

**CONTRACT NO. DE-EM0004895: APPROVAL OF DELIVERABLE NO. 43,
GROUNDWATER PROTECTION PLAN, PAD-PROJ-0018/FR2**

Reference: Letter from M. Redfield to M. Fultz, "Four Rivers Nuclear Partnership, LLC—
Deliverable No. 43—Transmittal of the *Groundwater Protection Plan for the
Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PAD-PROJ-0018/FR2,"
(FRNP-18-1027), dated July 23, 2018

The U.S. Department of Energy approves the Four Rivers Nuclear Partnership, LLC, Deliverable
No. 43, Groundwater Protection Plan, PAD-PROJ-0018/FR2.

If you have any questions or require additional information, please contact David Dollins at
(270) 441-6819.

Sincerely,

Marcia D. Fultz
Contracting Officer
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PAD-PROJ-0018/FR2

**Groundwater Protection Plan
for the
Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**



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PAD-PROJ-0018/FR2

**Groundwater Protection Plan
for the
Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

Date Issued—July 2018

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
FOUR RIVERS NUCLEAR PARTNERSHIP, LLC,
managing the
Deactivation and Remediation Project at the
Paducah Gaseous Diffusion Plant
under Contract DE-EM0004895

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ACRONYMS

amsl	above mean sea level
AOC	area of concern
BMP	Best Management Practices Plan
CAT	Consolidated Annual Training
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
<i>CFR</i>	<i>Code of Federal Regulations</i>
D&R	deactivation and remediation
DOE	U.S. Department of Energy
EMP	Environmental Monitoring Plan
EPA	U.S. Environmental Protection Agency
ERH	electrical resistance heating
ERPP	Environmental Radiological Protection Program
FFA	Federal Facility Agreement
FRNP	Four Rivers Nuclear Partnership, LLC
GET	General Employee Training
GPP	Groundwater Protection Plan
<i>KAR</i>	<i>Kentucky Administrative Regulations</i>
KDEP	Kentucky Department for Environmental Protection
KDWM	Kentucky Division of Waste Management
KPDES	Kentucky Pollutant Discharge Elimination System
LCD	Lower Continental Deposits
MCS	Mid-America Conversion Services, LLC
MW	monitoring well
NFA	no further action
PGDP	Paducah Gaseous Diffusion Plant
RACR	remedial action completion report
RCRA	Resource Conservation and Recovery Act
RG	Regional Gravel Aquifer
ROD	record of decision
SPCC	Spill Prevention, Control, and Countermeasure Plan
SST	Swift & Staley Team
SWMU	solid waste management unit
TPD	training position description
UCD	Upper Continental Deposits
UCRS	Upper Continental Recharge System
USEC	United States Enrichment Corporation
UST	underground storage tank
VOC	volatile organic compound

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) prepared and began implementation of a Groundwater Protection Plan (GPP) in August 1995 for the Paducah Gaseous Diffusion Plant (PGDP). This document presents the revision to the 2015 version of the Groundwater Protection Plan (LATA 2015). Stated in 401 KAR 5:037 § 4(3) is the following requirement regarding the review of the GPP:

Each groundwater protection plan shall be reviewed in its entirety every three (3) years, by the persons responsible for the plan, updated if necessary, and recertified. To the extent possible, the review shall include a reevaluation of the design and operation procedures for the pollution prevention practices previously selected for the plan to ensure that they are effective.

This GPP incorporates revisions resulting from the three-year review required by 401 KAR 5:037 § 4(3). This document addresses the following specific requirements listed in 401 KAR 5:037 § 3(3) and the guidance document relating to 401 KAR 5:037 § 3(3)(a) through (g) (*Preparing a Groundwater Protection Plan*, KDEP 2018): (1) general information regarding the facility and its operation; (2) identification of activities associated with the facility as identified in Section 2(2) of the regulation; (3) identification of all practices chosen for the plan to protect groundwater from pollution; (4) implementation schedules for the protection practices; (5) description of and implementation schedule for employee training necessary to ensure implementation of the plan; (6) schedule of required inspections, as applicable to ensure that all practices established are in place and properly functioning; and (7) certification of the plan by the appropriate Paducah Site representative and that the person responsible for implementing the plan has reviewed the terms of the plan and will implement its provisions.

This revision includes changes to reflect the return and management of formerly leased facilities from the United States Enrichment Corporation to DOE, the orderly and systematic shutdown of Paducah Site operations, and transition to a new Deactivation and Remediation Contractor.

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1. GENERAL INFORMATION

This Groundwater Protection Plan (GPP) has been written in accordance with 401 KAR 5:037 to ensure protection for all current and future uses of groundwater and to prevent additional groundwater pollution at the following facility.

Name and Address of Facility

Paducah Gaseous Diffusion Plant
5600 Hobbs Road
Kevil, Kentucky 42053
McCracken County
latitude 37°6'41.95" and longitude 88°48'46.09"

Person Developing GPP

Program Manager
Four Rivers Nuclear Partnership, LLC
5511 Hobbs Road
Kevil, Kentucky 42053
Phone: (270) 441-6412

Person Responsible for Implementing GPP

Manager
Portsmouth/Paducah Project Office
U.S. Department of Energy
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513
Phone: (859) 219-4010

This plan will be implemented under the direction of the U.S. Department of Energy (DOE) Manager, Portsmouth/Paducah Project Office, and is applicable to activities performed by DOE and its contractors/representatives at the Paducah Gaseous Diffusion Plant (PGDP). In support of DOE, this plan was developed by Four Rivers Nuclear Partnership, LLC, (FRNP) and is implemented by DOE and its current contractors:

- DOE, 5501 Hobbs Road, Kevil, Kentucky 42053, (270) 441-6800
- FRNP [Deactivation and Remediation (D&R) Contractor], 5511 Hobbs Road, Kevil, Kentucky 42053, (270) 441-6412
- Swift & Staley Inc. (Infrastructure Contractor), 5505 Hobbs Road, Kevil, Kentucky 42053, (270) 441-5270
- Mid-America Conversion Services, LLC, [Depleted Uranium Hexafluoride (DUF₆) Contractor] 1020 Monarch Street, Suite 300, Lexington, Kentucky 40513, (859) 685-9268

As required by 401 KAR 5:037 § 4(3), this GPP is to be reviewed every three years. Records associated with GPP implementation [e.g., Resource Conservation and Recovery Act (RCRA) facility inspections, C-404 sump integrity tests, storm water inspections, waste inspections] will be retained for a period of at least six years after their preparation. Reference documents listed herein are available through the U.S. Department of Energy Paducah Environmental Information Center (EIC) located at 5100 Alben

Barkley Drive, Emerging Technology Center, Room 221, Paducah, Kentucky, or the website, <http://www.paducaheic.com>. Records of GPP activities are maintained under other programs, as identified in Section 4 of this Plan.

Brief Description of Facility. The Paducah Site is located in western Kentucky and includes PGDP, a former uranium enrichment facility owned by DOE. Since its initial operation in 1952, the Paducah Site's primary function was the enrichment of the fissionable isotope uranium-235 from natural assay uranium using a gaseous diffusion process with uranium hexafluoride (UF₆). Plant activities have included utility, laboratory, and maintenance support; conversion of uranium dioxide to UF₆ (to feed the diffusion process) and uranium tetrafluoride; metal production from depleted UF₆; and uranium metal processing, metals recovery, and other small operations performed for DOE and the U.S. Department of Defense such as precision machining and protective metal coating application. The Paducah Site also has an enrichment cascade housed in four large process buildings, four sets of cooling towers, phosphate reduction facility, and sanitary and potable water treatment plants.

In August 1988, volatile organic compounds (VOCs) and radionuclides were detected in private water wells north of the Paducah Site, which was placed on the National Priorities List in 1994. Since 1998, DOE, U.S. Environmental Protection Agency (EPA), and Kentucky Department for Environment Protection (KDEP) have been operating under the Federal Facility Agreement (FFA), with DOE as the lead agency and EPA and KDEP as support agencies providing oversight. The D&R Contractor works with DOE to remove/mitigate past contamination at the Paducah Site.

Appendix A contains four maps and one table that will help the reader identify facilities/areas discussed within this document. Figure A.1 is a comprehensive PGDP site map and site index. Figure A.2 is a Paducah Site map showing current solid waste management unit (SWMU) locations. Figure A.3 is a map depicting the 2016 Trichloroethene (TCE) groundwater plume. Figure A.4 is a map depicting the 2016 Technetium-99 (Tc-99) groundwater plume. Table A.1 is a SWMUs/areas of concern (AOCs) by operable unit (OU) cross-reference table. This table identifies each facility or AOC by OU, subproject, SWMU number, and gives a brief description of the facility. In addition, the table provides a list of SWMUs requiring no further action (NFA) and a list of Decontamination and Decommissioning OU facilities identifying current operational status.

2. PHYSICAL CHARACTERISTICS

The Paducah Site limited area is heavily industrialized; however, the area surrounding the plant is mostly agricultural and open land, with some forested areas. The West Kentucky Wildlife Management Area that borders the Paducah Site to the north, west, and south is an important recreational resource. Figures 1 and 2 illustrate the reasonably anticipated future land use and the current mixed industrial and recreational land use of the PGDP area, respectively. The geomorphology, geology, and hydrology of this facility and surrounding areas have undergone extensive study, review, and documentation. In-depth area descriptions may be found in numerous other DOE documents describing the DOE property at the Paducah Site.

2.1 GEOMORPHOLOGY

Located in the Jackson Purchase Region of western Kentucky, the Paducah Site lies within the northern tip of the Mississippi Embayment portion of the Gulf Coastal Plain Province (Clausen et al. 1992). The DOE property is characterized by mostly flat areas and low, gently sloped hills (< 50 ft of vertical relief). Drainage patterns are naturally dendritic, but have been modified to follow roads within the area surrounded by the PGDP security fence.

2.2 SITE GEOLOGY

The stratigraphic sequence in the region consists of Cretaceous, Tertiary, and Quaternary sediments overlying eroded Mississippian bedrock. Figure 3 shows a columnar section of the geology of the Jackson Purchase Region, and Figure 4 presents a schematic cross section that illustrates regional stratigraphic relationships near the Paducah Site.

Bedrock beneath the Paducah Site is comprised of Mississippian-age limestone. In the vicinity of the Paducah Site, the bedrock is directly overlain by interbedded and interlensing sand, silt, and clay of the Upper Cretaceous McNairy Formation. Data indicate that sand may account for 40 to 50 percent of the McNairy Formation at the Paducah Site. The Upper Cretaceous Tuscaloosa Formation, which directly overlies Paleozoic bedrock to the north, has not been encountered during drilling activities conducted at the Paducah Site.

The Paleocene Porters Creek Clay occurs in the southern portions of the site and consists of dark gray to black clay with varying amounts of silt and fine-grained micaceous, commonly glauconitic, sand. The Porters Creek Clay subcrops along a buried terrace slope that extends east-west across the site. Eocene sediments, consisting of interbedded and interlensing sand, silt, and clay, overlie the Porters Creek Clay in the extreme southern portion of the DOE Reservation.

Miocene, Pliocene, and Pleistocene continental deposits unconformably overlie Cretaceous through Eocene strata at the Paducah Site. The thicker sequence of Pleistocene continental deposits represents a valley fill that comprehensively comprises a thick, fining upward sequence. The continental deposits extend from the southern end of the plant to the Ohio River and overlay an unconformity that exhibits

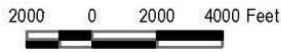
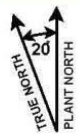
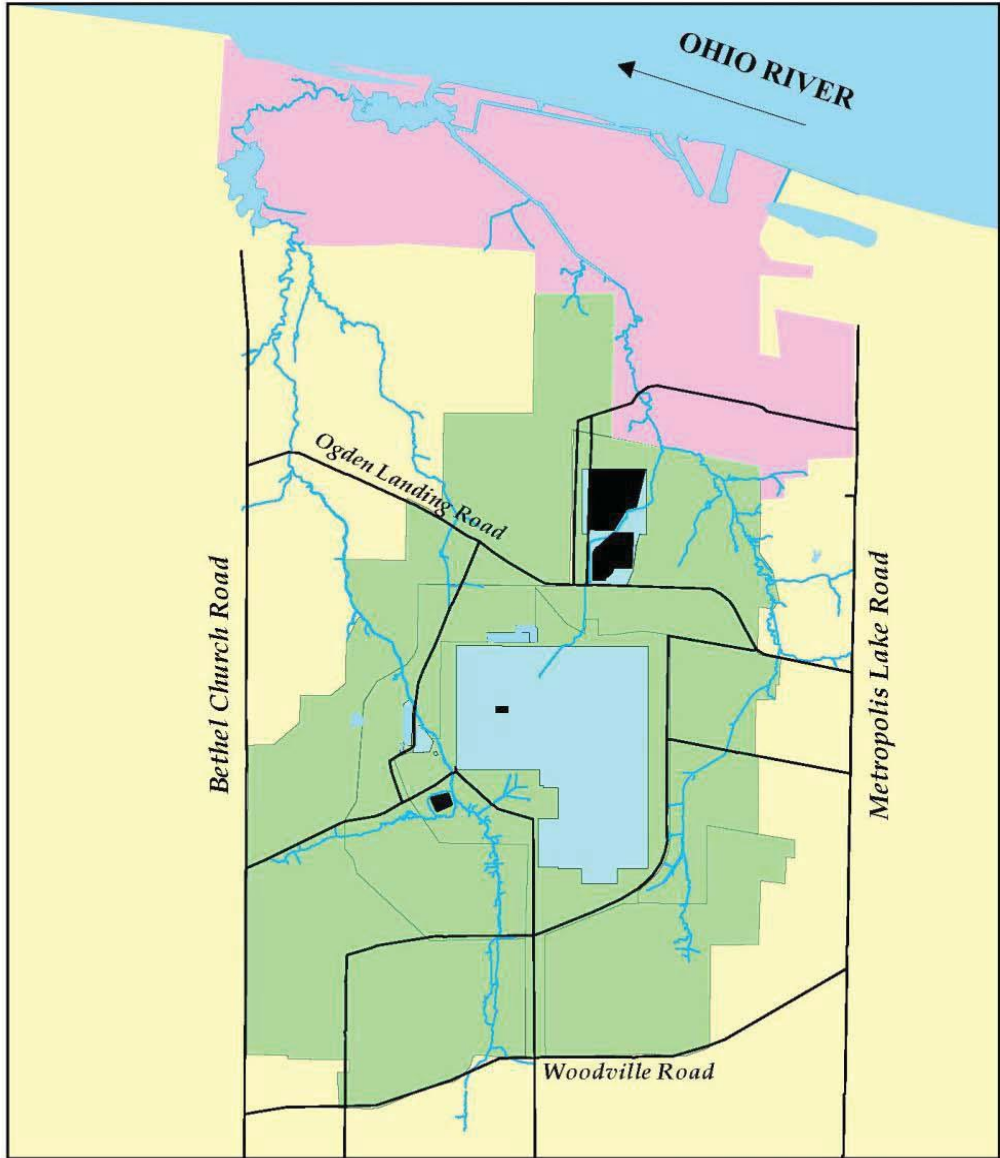


FIGURE No. SMP\LandUse_FutureR9b.mxd
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- Industrial
- Recreational
- Rural Residential
- TVA
- Waste Management Area (see note)

Note: These areas include landfills that are active or certified closed and under long-term custodial care (i.e., C-404, C-746 S&T, C-746-U), or that are under an Interim Corrective Measure (i.e., C-746-K). As such, these areas are not amenable to unrestricted future industrial use. As new CERCLA decision documents or permits are issued with deed restrictions/LUCs for waste management areas this map will be updated to include those units.

Figure 1. Reasonably Anticipated Future Land Use at PGDP

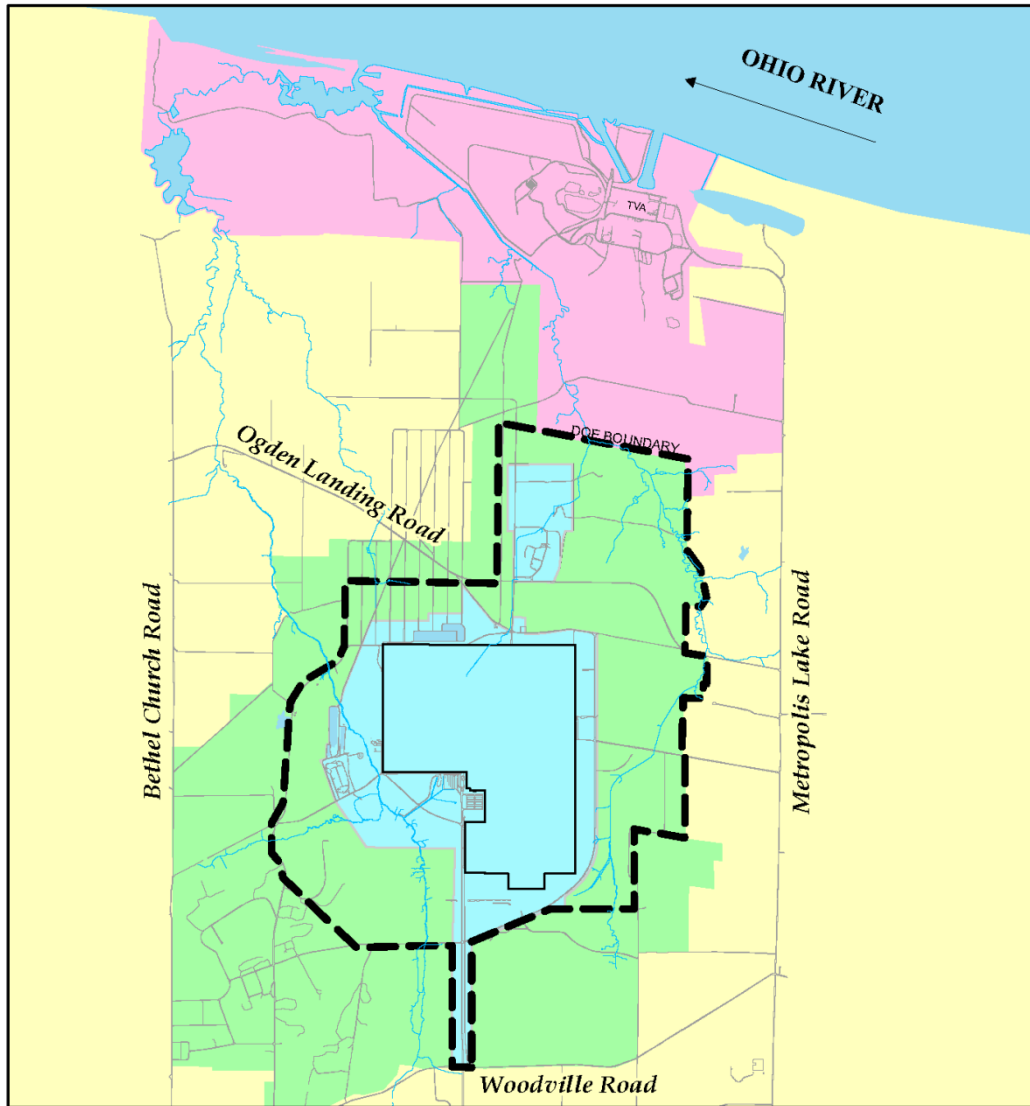


FIGURE No. SMPLandUse_MIR_Current.mxd
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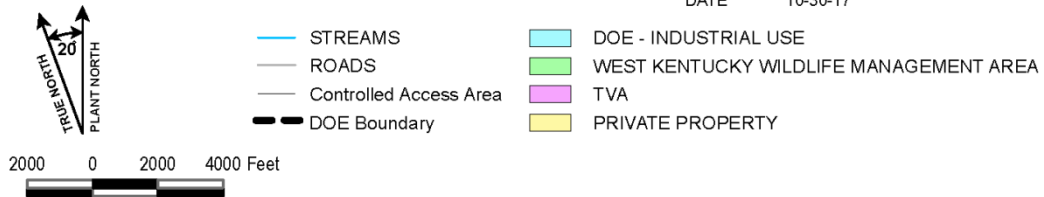


Figure 2. Current Land Use at PGDP

SYSTEM	SERIES	FORMATION	THICKNESS (IN FT)	DESCRIPTION	HYDROGEOLOGIC SYSTEMS
QUATERNARY	RECENT AND PLEISTOCENE	ALLUVIUM	0-40	Brown or gray sand and silty clay or clayey silt with streaks of sand.	Upper Continental Recharge System (UCRS)
	PLEISTOCENE	LOESS	0-43	Brown or yellowish-brown to tan unstratified silty clay	
	PLEISTOCENE	CONTINENTAL DEPOSITS	3-121	Upper Continental Deposits (Clay Facies)—mottled gray and yellowish brown to brown clayey silt and silty clay with some very fine sand. Trace of gravel. Often micaceous	Regional Gravel Aquifer (RGA)
	PLIOCENE-MIOCENE (?)			Lower Continental Deposits (Gravel Facies)—reddish-brown clayey, silty, sandy chert, gravel, and beds of gray sand.	
TERTIARY	EOCENE	JACKSON, CLAIBORNE, AND WILCOX FORMATIONS	0-200+	Red, brown, or white fine-to-coarse grained sand. Beds of white to dark gray clay are distributed at random.	McNairy Flow System
			0-100+	White to gray sandy clay, clay conglomerates and boulders, scattered clay lenses and lenses of coarse red sand. Black to dark gray lignitic clay, silt or fine-grained sand.	
	PALEOCENE	PORTERS CREEK CLAY	0-200	Dark gray, slightly to very micaceous clay. Fine-grained clayey sand, commonly glauconitic in the upper part. Glauconitic sand and clay at the base.	
		CLAYTON FORMATION	Undetermined	Lithologically similar to the underlying McNairy Formation.	
UPPER CRETACEOUS		McNAIRY FORMATION	200-300	Grayish-white to dark gray micaceous clay, often silty, interbedded with light gray to yellowish-brown very fine-to-medium grained sand with lignite and pyrite. The upper part is interbedded clay and sand, and the lower part is sand.	
		TUSCALOOSA FORMATION	Undetermined	White, well rounded, or broken chert gravel with clay.	
MISSISSIPPIAN		MISSISSIPPIAN CARBONATES	500+	Dark gray limestone and interbedded chert with some shale.	

Adapted from USGS 1980

Figure 3. Lithostratigraphic Column of the Jackson Purchase Region*

*Historically, the geologic section used at the Paducah Site reflects the stratigraphy, as mapped by Wilds W. Olive in the United States Geological Survey publication, *Geologic Maps of the Jackson Purchase Region, Kentucky* (USGS 1980). This document was published in 1980 in cooperation with the Kentucky Geologic Society. At the Paducah Site, the probable age of the Terrace Gravel is considered to be of Miocene or Pliocene age.

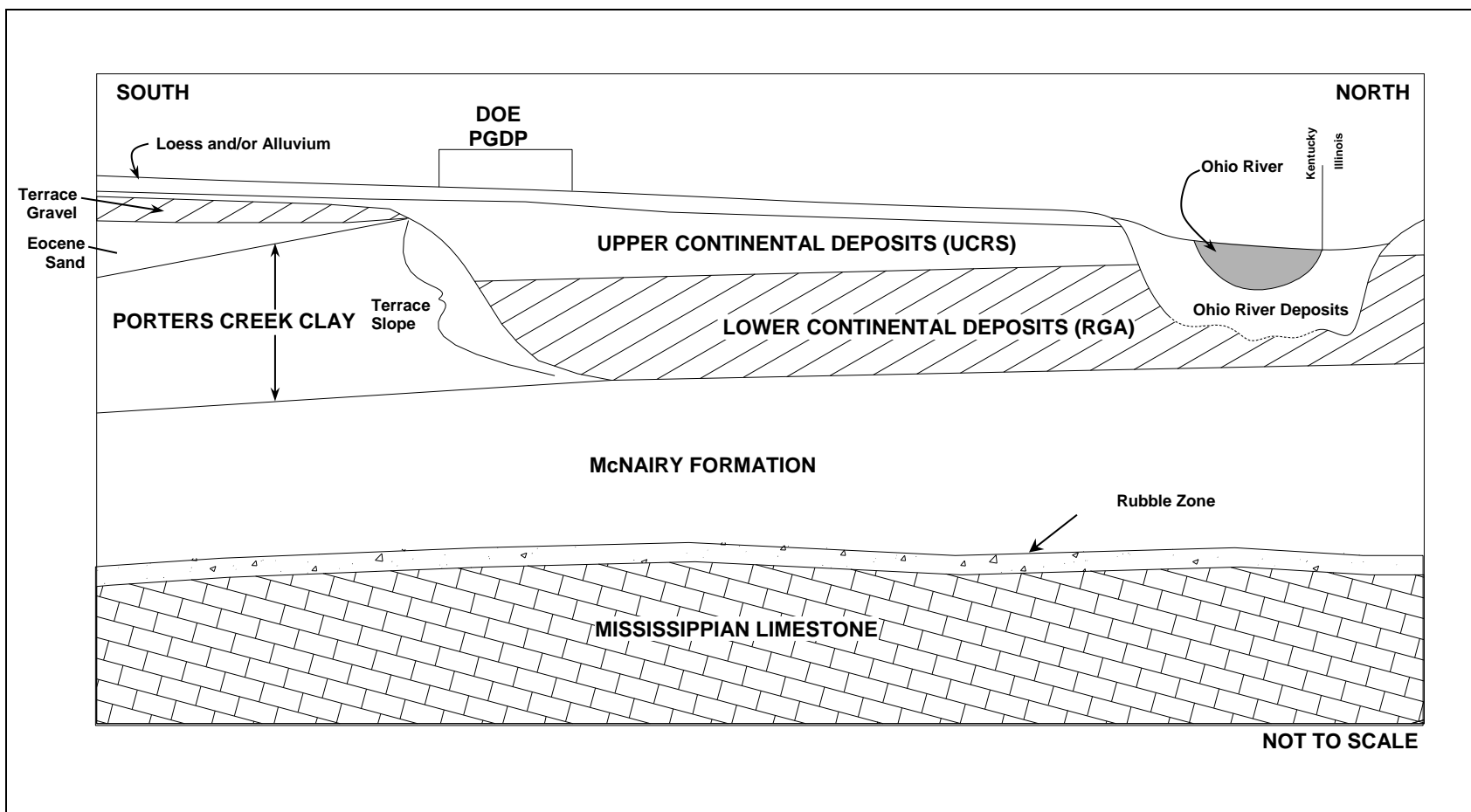


Figure 4. Schematic of Stratigraphic and Structural Relationships near PGDP

steps, or terraces. These continental deposits have been divided into a basal gravel facies [Lower Continental Deposits (LCD)] and an upper, fine-grained clastic facies [Upper Continental Deposits (UCDs)].

The LCD consists of chert gravel in a matrix of poorly sorted sand and silt. This basal gravel facies has been identified at three horizons at the Paducah Site. A Miocene-to-Pliocene-aged facies, ranging in thickness from 1 to 30 ft and averaging less than 10 ft, exists in the southern portions of the site, occurring on the upper surfaces of a buried terrace at elevations greater than 350 ft above mean sea level (amsl). A second gravel facies, ranging in thickness from 15 to 20 ft, exists in southeastern and eastern portions of the site occurring on an erosional surface at approximately 320 to 345 ft amsl. The third and most prominent of the three gravel facies beneath the site consists of Pleistocene deposits that overlie an erosional surface north of the buried Porters Creek Clay Terrace. Elevations of this facies vary from approximately 245 to 310 ft amsl. Overall the LCD has an average thickness of approximately 30 ft, but thicker deposits, up to 70 ft, exist in deeper scour channels that trend east-west across the site.

The UCD is primarily a fine-grained, clastic facies varying in thickness from 15 to 55 ft and consisting of clayey silt with lenses of sand and occasional gravel. The UCD represents fluvial and lacustrine environments (Finch 1967; Frye et al. 1972). Lacustrine sediments were deposited along the present Ohio and Tennessee River Valleys when the Mississippi River Valley and ancestral Ohio River Valley became choked from draining glaciated areas. These sediments dammed valleys of tributaries, creating slackwater lakes, and resulting in deposition of fine-grained sediments. Depending on stages of glaciation, periods of lacustrine deposition were followed by periods of erosion. As aggradation of the fluvial system continued, stream gradients in the ancestral Tennessee River and tributaries lessened. Lower gradients likely favored a transition from a braided environment to a meandering environment. A very gravelly lower sequence that becomes sandier upward identifies the transition in the Pleistocene continental deposits.

Loess, consisting of yellowish-brown silt and clayey silt, overlies the continental deposits at the site, and varies in thickness from approximately 5 to 25 ft with an average of approximately 15 ft. Holocene alluvial deposits are found at lower elevations within the Ohio River floodplain north of the plant site.

The general soil map for Ballard and McCracken counties indicates three soil associations are found in the vicinity of the Paducah Site (USDA 1976): the Rosebloom-Wheeling-Dubbs association, the Grenada-Calloway association, and the Calloway-Henry association. The predominant soil association in the vicinity of the Paducah Site is the Calloway-Henry association, which consists of nearly level, somewhat poorly drained to poorly drained, medium-textured soils on upland positions. Many of the characteristics of the original soil have been lost due to industrial activity that has occurred over the past 67 years.

2.3 SITE HYDROLOGY

Local groundwater near the Paducah Site occurs in the unconsolidated sediments of the Cretaceous McNairy Formation, Miocene-Pliocene Terrace Gravel, and Pleistocene LCD and UCD. Terms describing the hydrogeologic-flow systems that generally correspond to these lithostratigraphic units are the McNairy Flow System, Terrace Gravel, Regional Gravel Aquifer (RGA), and Upper Continental Recharge System (UCRS). The following are brief descriptions of the four components of the groundwater flow system:

- (1) **McNairy Flow System:** Formerly termed “the deep groundwater system,” this component consists of the interbedded and interlensing sand, silt, and clay of the McNairy Formation. Sand facies account for 40 to 50 percent of the total formation thickness of approximately 225 ft.

- (2) **Terrace Gravel:** This component consists of Miocene-to-Pliocene-aged gravel deposits found at elevations higher than 350 ft amsl in the southern portion of the plant site. These deposits usually lack sufficient thickness and saturation to constitute an aquifer and typically are characterized by an unsorted mix of sand to cobble-sized materials.
- (3) **RGA:** This component consists of the Pleistocene sand and gravel facies of the LCD and Holocene alluvium found adjacent to the Ohio River. In addition, the RGA includes contiguous sands of the UCD and the McNairy Formation. The RGA is commonly thicker than the Pliocene gravel deposits, with an average thickness of 30 ft, and ranges up to 70 ft in thickness along an axis that trends east to west through the plant site. The RGA, which extends well beyond the site boundary, is the primary aquifer used locally and serves as the main conduit for groundwater flow to the north where it discharges to the Ohio River. Some of the RGA groundwater discharges in springs/boils in tributaries to the Ohio River.
- (4) **UCRS:** Formerly termed “the shallow groundwater system,” this component consists of the UCD, excluding sand adjacent to the LCD. The sand and gravel lithofacies are relatively discontinuous. The most prevalent sand and gravel deposits occur at an elevation of approximately 345 to 351 ft amsl, with less prevalent deposits occurring at an elevation of 337 to 341 ft amsl. Groundwater flows downward into the RGA from the UCRS in the vicinity of the Paducah Site.

The local groundwater flow system at the Paducah Site is bound by topographically controlled recharge and discharge areas to the south and north, respectively. Recharge within the Pliocene Terrace Gravel and Eocene sands has resulted in a groundwater divide located southwest of the Paducah Site. Locally, groundwater within the Terrace Gravel and Eocene sands either discharges to streams or flows northward into the RGA, which eventually discharges to the Ohio River, the regional base level for the system. The main recharge for the RGA is through flow from the UCRS.

Toward the southern part of the Paducah Site, the RGA either is truncated or thins and grades laterally into the Terrace Gravel; high hydraulic potential causes groundwater to discharge into adjoining streams. In the north-central portion of the plant site, the lower gradients are a result of the thicker LCD. The hydraulic gradient increases closer to the Ohio River as a result of a thinner section of the RGA or the low permeability of bottom sediments in the Ohio River. The primary pathway of groundwater flow at the Paducah Site is within the RGA, which dominates the flow regime.

The discontinuous nature of sands and gravels in the UCRS and the large vertical gradient within the UCRS require groundwater flow in the UCRS to be oriented predominantly downward into the RGA. Some horizontal flow in the UCRS likely occurs; however, it is insignificant near the Paducah Site due to the lateral discontinuity of shallow sand and gravel lenses. Groundwater flow in the RGA is to the north and discharges into the Ohio River and into Little Bayou Creek in the vicinity of the Tennessee Valley Authority plant. Hydraulic conductivities of the RGA range from 100 to 1,000 ft per day. Existing regional maps and borehole logs indicate the RGA is thin or absent beneath the Ohio River, suggesting that flow under the Ohio River is unlikely.

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3. ACTIVITIES THAT HAVE THE POTENTIAL TO POLLUTE GROUNDWATER

Activities for which groundwater protection plans shall be prepared and implemented are listed in 401 KAR 5:037 § 2(2). The following activities, relevant to these requirements, are performed by DOE and its contractors/subcontractors at the Paducah Site:

- (a) *Storing or related handling of bulk quantities of pesticides or fertilizers for commercial purposes.* This primarily is performed by the Infrastructure Contractor. Examples include the following:
- Storage of concentrated herbicides is in a secure, weatherproof “clamshell” structure north of C-755-A and at C-725. Only personnel with current state certifications for herbicide application are allowed to access the chemicals, mix, and apply the chemicals.
 - Fertilizers are used by the D&R Contractor to aid in sowing down landfill vegetation. Fertilizers are stored in a Poly-Overpack[®], which is stored inside a wooden storage facility (C-746-U-11).
 - The Infrastructure Contractor uses spike type fertilizers for targeted application to trees and ornamentals; spikes are stored at C-755-T27.
- (b) *Storing or related handling of bulk quantities of pesticides or fertilizers for the purpose of distribution to a retail sales outlet.* (Not Applicable)
- (c) *Applying of pesticides or fertilizers for commercial purposes.* (Not Applicable)
- (d) *Applying of fertilizers or pesticides for public right-of-way maintenance or institutional lawn care.* This primarily is performed by the Infrastructure Contractor.
- (e) *Land treatment or land disposal of a pollutant.* (Not Applicable)
- (f) *Storing, treating, disposing, or related handling of hazardous waste, solid waste, or special waste in landfills, incinerators, surface impoundments, tanks, drums or other containers, or in piles.* This primarily is performed by the D&R Contractor.
- C-733, C-746-Q, and C-752-A are permitted hazardous waste storage and treatment units in accordance with the Hazardous Waste Facility Permit, KY8-890-008-982, issued by Kentucky Division of Waste Management (KDWM).
 - C-746-U receives and disposes of solid wastes in accordance with Solid Waste Permit SW07300015, SW07300014, SW07300045 issued by KDWM. The C-746-U Landfill also has six large capacity storage tanks (two 31,000-gal, two 13,100-gal, one 16,000-gal, and one 2,500-gal) to facilitate the collection and treatment of leachate generated at the landfill and also from the C-746-S Landfill.
 - C-404 Landfill is a closed landfill listed on the Hazardous Waste Facility Permit, KY8-890-008-982.
 - C-746-S and C-746-T are Subtitle D RCRA-closed landfills listed on the Solid Waste Permit SW07300014, SW07300015, SW07300045.

- Various projects/facilities are used for the temporary staging/storage of hazardous/solid waste per applicable regulations. These areas may include Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waste staging areas managed in accordance with an approved CERCLA decision document.
 - Solid wastes are staged in covered roll-offs, trucks, and/or intermodals prior to transfer to the C-746-U Landfill for disposal to prevent accumulation of precipitation or condensation in the waste containers. Receipt/processing of waste at the landfill is performed in accordance with the solid waste landfill permit, which prohibits receipt of free liquids in the waste. Waste is disposed of within 2 hours of receipt at the landfill and covered with daily cover by the end of each day. Interim and long-term covers are used at areas of the landfill that are not used for extended periods, per the permit, to minimize infiltration of water into the waste.
 - Twenty-two intermodal containers in C-746-Q are holding uranium compounds pending disposition and disposal as waste.
- (g) *Commercial or industrial storing or related handling in bulk quantities of raw materials, intermediate substances or products, finished products, substances held for recycling, or other pollutants held in tanks, drums or other containers, or in piles.* This is performed by each contractor in differing amounts and purposes.

The *Spill Prevention, Control, and Countermeasure Plan for the U.S. Department of Energy Paducah Site, McCracken County, Kentucky*, PAD-REG-1005, (SPCC) identifies the petroleum-based materials stored on-site (FRNP 2018a). Select examples of bulk storage sites are discussed below.

- A 1,000-gal stationary tank used to store diesel fuel for heavy equipment and a 500-gal stationary tank that stores gasoline for vehicles are located at the C-746-U Landfill.
- Two 420,000-gal tanks (C-601-A and C-601-B) are located at the facility. Both tanks are located within a 675,000-gal capacity containment structure consisting of an earthen dike lined with a synthetic material impervious to oil.
- C-601-A currently is empty and no longer is used for oil storage, but serves as emergency containment for the C-601-B tank in the event of a leak.
- C-601-B tank is used to charge a 500-gal day tank, which is used to store fuel oil for backup operations associated with two of the five newly-installed, portable steam generator units.
- A historical bulk coal storage area exists near the “out of service” C-600 Steam Plant. The bulk of the coal has been removed (facility currently is out of service).
- A 150-gal tank containing used oil is at C-755-Y.
- Six 10,000-gal aboveground, polymer-lined, carbon steel bulk storage tanks outside the DUF₆ Conversion Building (tanks C-0-HFS-550 to 555) are for the storage of aqueous hydrogen fluoride (HF).
- DUF₆ is stored in the site’s cylinder storage yards east of the DUF₆ Conversion Plant in approximately 36,000 steel cylinders.

- UF₆ is stored in facilities and cylinders located in the site's cylinder storage yards and processing facilities (e.g., C-310, C-315, C-331, C-333, C-335, C-337, and C-360).
 - Posi-Shell[®] is a clay and polymer-based alternative daily cover material that is stored in metal Sealand containers at the C-746-U Landfill.
 - Flocculants are used for the treatment of suspended solids in the sedimentation pond and are stored in a metal Sealand container at the C-746-U Landfill.
- (h) *Transmission in pipelines of raw materials, intermediate substances or products, finished products, or other pollutants.* This is performed by each contractor in different amounts and for different purposes. Examples include the following:
- UF₆ piping between process buildings
 - C-600 No. 2 fuel oil piping
 - Transformer oil piping
 - Piping for C-611, C-616, C-752-B aboveground storage tanks
 - Piping associated with C-765 and C-765-A Northeast Plume Treatment systems
 - Piping associated with C-612 Northwest Plume Treatment system
 - Piping associated with former C-614 Northeast Plume Treatment system (maintained in standby status)
- (i) *Installation or operation of on-site sewage disposal systems.* This is performed by the D&R Contractor. Examples include the following:
- C-615 Sewage Treatment Plant
 - C-333-A and C-337-A Extended Aeration Systems
 - C-611, C-612, and C-746-A Septic Systems
- (j) *Storing or related handling of road oils, dust suppressants, or deicing agents at a central location.* This primarily is performed by the infrastructure contractor.
- Road deicer is stored at the C-732 storage building and in two locations in C-755 Area: C-755-U and C-755-V. Each structure is an approximately 20 ft tall, covered metal storage buildings with an open front for loading/unloading. The floor at C-732 storage building is concrete to minimize moisture intrusion and loss of salt material to the environment. The C-755-U and C-755-V storage facilities have rubber, barrier-pad covers on gravel surface to minimize moisture intrusion and loss of salt material into the environment.
- (k) *Application or related handling of road oils, dust suppressants or deicing materials.* This primarily is performed by the infrastructure contractor, although each of the contractors applies small amounts of deicing materials around facility entryways/walkways for safety when needed. This activity typically is performed around each facility.
- (l) *Mining and associated activities.* (Not Applicable)

(m) *Installation, construction, operation, or abandonment of wells, bore holes, or core holes.* The Paducah Site was placed on the National Priorities List in 1994. As a result, wells and bore holes are installed in accordance with CERCLA and as such would be exempt from administrative requirements in this plan. Rather, they are conducted in accordance with the substantive requirements of an approved CERCLA decision document. Wells installed under other programs (e.g., hazardous waste landfill, solid waste landfill) would be completed in accordance with this plan and applicable permits and subsequent regulations under 401 KAR.

(n) *Collection or disposal of pollutants in an industrial or commercial facility through the use of floor drains which are not connected to on-site sewage disposal systems, closed-loop collection or recovery systems, or a waste treatment system permitted under the Kentucky Pollutant Discharge Elimination System.*

Liquids from plant operations are discharged through plant effluent ditches. Groundwater protection from effluents in these discharges is under the purview of the Kentucky Pollutant Discharge Elimination System (KPDES); therefore, it is not addressed further in this GPP. Compliance with the KPDES program ensures protection of the groundwater from plant effluent discharges.

(o) *Impoundment or containment of pollutants in surface impoundments, lagoons, pits, or ditches.* This is performed by the D&R Contractor and the DUF₆ Conversion Project contractor. Examples include these:

- C-611-V, C-611-Y, C-611-H, and C-611-U are containment basins used for the backwash from the treatment of Ohio River water for potable uses on-site.
- C-616 is a series of settling basins constructed to hold recirculating cooling water for phosphate reduction prior to discharge.
- C-617 lagoons collect storm water and various industrial wastewaters. Sodium thiosulfate and carbon dioxide are fed into the lagoon to dechlorinate the effluent and control pH before discharge.
- Fifteen outfall ditches convey storm water and treated industrial waste waters off-site in accordance with the KPDES permit. Each of these ditches contains devices with the potential to impound or contain wastewaters during transport off-site (e.g., inverted pipe dams, culverts).
- C-745-G1 is a large concrete basin to collect storm water runoff from the C-746-G Cylinder Yard prior to lifting runoff to Outfall 017.

(p) *Commercial or industrial transfer, including loading and unloading, in bulk quantities of raw materials, intermediate substances or products, finished products, substances held for recycling, or other pollutants.* This is performed by each contractor in differing amounts and for different purposes. Examples include the following.

- C-760, C-759, rail lines, and the staging/receiving area along Hobbs Road (C-761-A) are used to stage wastes being shipped off-site for treatment and/or disposal.
- C-720 Shipping and Receiving Area is used to stage incoming bulk materials for use at the site.
- Aqueous HF is pumped from the storage tanks (tanks C-0-HFS-TK-550 to 555) into a railcar or tank truck for off-site shipment.

- Historically, C-333-A Autoclave Feed Facility, C-337-A Autoclave Feed Facility, C-360 Transfer and Sampling Facility, C-310 Product Removal Facility, and C-315 Tails Removal Facility were used to transfer UF₆ from process lines/equipment to cylinders; however, this facility currently is out of service.
- Used oil is pumped directly from the 150-gal tank at C-755-Y for off-site shipment.

Additionally, 401 KAR 5:037 § 2(4) lists several activities that are excluded from the provisions of this administrative regulation.

- Normal use or consumption of products sized and packaged for personal use by individuals.* This is performed by each contractor in differing amounts and for different purposes.
- Retail marketing of products sized and packaged for personal use or consumption by individuals.* (Not Applicable)
- Activities that are conducted entirely inside enclosed buildings.* Several facilities used by contractors/subcontractors qualify for this exclusion; these uses include, but are not limited to, employee training, business conferences, meetings, and general office work.
- Storing, related handling, or transmission in pipelines of pollutants that are gases at standard temperature and pressure.* This exclusion applies to the storage and transfer of gases in cylinders and process piping, such as fluorine, chlorine, Freon™, and chlorine trifluoride.
- Storing municipal solid waste in a container located on property where the municipal solid waste is generated and which is used solely for the purpose of collection and temporary storage of that municipal solid waste prior to off-site disposal.* This is performed by each contractor in differing amounts throughout the facility.
- Installing and operating sewer lines or water lines approved by the cabinet.* This exclusion applies to the septic water lines that run from the process and operating buildings to the on-site sewage treatment plant.
- Storing water in ponds, lakes, or reservoirs.* This exclusion applies to Ohio River water storage at the C-611 Water Treatment Plant.
- Impounding stormwater, silt, or sediment in surface impoundments.* Several facilities used by contractors/subcontractors qualify for this exclusion, including the DUF₆ detention basin, C-613 basin, C-617 basin, etc.
- Application of chloride-based deicing materials used on roads or parking lots.* This primarily is performed by the infrastructure contractor, although each of the contractors will keep small amounts of deicing materials near facility entryways/walkways for use in clearing ice on walkways.
- Emergency response activities conducted in accordance with local, state, and federal law.* These are performed by each contractor in differing amounts and for different purposes.
- Fire fighting activities.* This will be performed by contractors/subcontractors.
- Conveyance or related handling by motor vehicle, rolling stock, vessel, or aircraft.* These are performed by each contractor in differing amounts and for different purposes.

(m) *Agricultural activities at agriculture operations.* (Not Applicable)

(n) *Application by commercial applicators of fertilizers or pesticides on lands used for agriculture operations.* (Not Applicable)

Operations at the Paducah Site are conducted in numerous facilities and areas across the Paducah Site. Contractors/subcontractors control these facilities and areas to ensure established waste management practices that result in groundwater protection practices are in place and properly functioning.

4. PRACTICES SELECTED TO PROTECT GROUNDWATER FROM POLLUTION

DOE uses contractors at the Paducah Site under the Environmental Management (EM) cleanup mission. The D&R Contractor is responsible for the deactivation of the uranium enrichment facilities and the implementation of environmental restoration activities (cleanup and closure of facilities and cleanup of soil, groundwater, burial grounds, and disposal of legacy waste) at the Paducah Site. The Infrastructure Contractor is responsible for infrastructure services such as surveillance and maintenance of selected facilities, property and records management, janitorial services, and grounds and roadway maintenance. The DUF₆ Contractor is responsible for the operation of a DUF₆ Conversion Plant. To ensure groundwater at the Paducah Site is protected from site-based pollution, DOE, and their contractors use standardized plans and procedures to assure quality and consistency in the implementation of groundwater protection practices. The following general programs at the Paducah Site are maintained by DOE contractors:

- Environment, Safety, and Health
- Integrated Safety and Environmental Management Systems
- Spill Prevention, Control, and Countermeasure Plan
- Best Management Practices Plan (BMP)
- Emergency Response Action Plan
- Facility Response Plan
- Uranium Programs
- Waste Management
- Transportation
- Radiological Controls
- Environmental Monitoring
- Data and Sampling
- Well Maintenance
- D&R

A list of relevant plans and procedures are in Appendix B.

The following sections provide brief descriptions of the groundwater protection practices that have been implemented at the Paducah Site.

4.1 INTEGRATED SAFETY MANAGEMENT SYSTEM AND ENVIRONMENTAL MANAGEMENT SYSTEMS

The Paducah Site is committed to performing work safely and ensuring the protection of its workforce, the public and the environment. In order to meet these goals DOE has embraced the Integrated Safety Management System (ISMS) and expects its contractor/subcontractor to adhere to the five Safety Management core functions and the eight guiding principles of ISMS. In addition, DOE sites must use Environmental Management System (EMS) as a platform for Site Sustainability Plan implementation and programs with objectives and measurable targets that contribute to DOE's meeting its sustainability goals. EMS enables more effective use of natural resources, provides better protection of the environment, and achieves environmental sustainability. The EMS helps to insure consistency and rigor in existing environmental activities and drives continual improvements in environmental performance. In addition to

ISMS/EMS, several other environmental based programs have been established to help foster and ensure environmental due diligence.

The Environmental Monitoring Plan (EMP) is intended to document the rationale, sampling frequency, parameters, and analytical methods for EM activities at the Paducah Site and provide information on site characteristics, environmental methodologies, and quality assurance management pathways, dose assessment methodologies, and quality assurance management (FRNP 2018b). EM at the Paducah Site consists of effluent monitoring and environmental surveillance activities and supports evaluation and assessment if an unplanned release occurs. Monitoring is conducted for a variety of media, including air, surface water, groundwater, and sediment.

The *Best Management Practices Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PAD-REG-1006, (FRNP 2018c) is required per Section 3 of Kentucky Pollutant Discharge Elimination System Permit for the Paducah Site. The plan is required for “all permittees who use, manufacture, store, handle, or discharge any pollutant listed as: (1) toxic under Section 307(a)(1) of the Clean Water Act; (2) oil, as defined in Section 311(a)(1) of the Act; (3) any pollutant listed as hazardous under Section 311 of the Act; or (4) is defined as a pollutant pursuant to *KRS 224.1-010(35)* and who have operations which could result in (1) the release of a hazardous substance, pollutant, or contaminant, or (2) an environmental emergency, as defined in *KRS 224.1-400*, as amended, or any regulation promulgated pursuant thereto (hereinafter, the ‘BMP pollutants’). These operations include material storage areas; plant site runoff; in-plant transfer, process and material handling areas; loading and unloading operations, and sludge and waste disposal areas.”

The BMP must be maintained consistent with 401 *KAR 5:065 § 2(4)* pursuant to *KRS 224.70-110*, which prevents or minimizes the potential for the release of “BMP pollutants” from ancillary activities through site runoff; spillage or leaks, sludge or waste disposal; or drainage from raw material storage at the Paducah Site. The BMP has general requirements for all operations and specific requirements for individual operations. The plan discusses a required BMP committee, the reporting of BMP incidents, and risk identification and assessment. The plan also discusses employee training, inspection records, preventative maintenance, housekeeping requirements, materials inventory, and security.

4.2 GROUNDWATER MONITORING

To ensure groundwater at the Paducah Site is protected from site-based pollution, DOE and their contractors integrate principals from the ISMS/EMS, the EMP, and BMP plans into the overall groundwater strategy.

4.2.1 RCRA Subtitle C Monitoring

Currently, the only RCRA Subtitle C permitted facility at the Paducah Site that requires groundwater monitoring is the C-404 Low-Level Radioactive Waste Burial Ground. The C-404 unit was used as a low-level waste lagoon/burial ground from the early 1950s until 1986. At that time, routine testing determined that, of the wastes disposed of there, gold-dissolver precipitate was considered a hazardous waste under RCRA. The landfill was covered with a RCRA-compliant clay cap (final cover) and was certified “closed” in 1991 as a hazardous waste landfill. The postclosure permit for this facility was incorporated into the Hazardous Waste Management Permit, KY8-890-008-982, in 1992.

Monitoring wells (MWs) were installed to monitor groundwater quality during the postclosure care period. The MWs were installed in the UCRS and the underlying RGA, which is considered to be the uppermost regulatory aquifer. A statistical evaluation of the indicator parameters was conducted using

quarterly sample results from the initial year of monitoring. As a result, the Commonwealth of Kentucky determined that additional information was needed to support the postclosure permit application, and subsequent MWs were installed to provide upgradient monitoring of the Lower RGA and the Upper RGA (refer to Appendix B to the EMP).

The MW network at C-404 is sampled and monitored in accordance with the requirements associated with the Hazardous Waste Facility Permit (KY8-890-008-982). The data resulting from sampling is statistically analyzed to determine if the landfill is impacting the groundwater. This analysis is supplied in semiannual reports to KDEP.

4.2.2 Underground Storage Tank Monitoring

Hazardous and Solid Waste Amendments under Subtitle I of RCRA regulation (40 *CFR* Part 280), established a comprehensive regulatory program for underground storage tanks (USTs). The Subtitle I regulations generally pertain to all USTs used to store “regulated substances.” Regulated substance means (a) any substance defined in section 101(14) of CERCLA (but not including any substance regulated as a hazardous waste under subtitle C); and (b) petroleum, including crude oil or any fraction thereof that is liquid at standard conditions of temperature and pressure (60°F and 14.7 pounds per square inch absolute). The term “regulated substance” includes, but is not limited to, petroleum and petroleum-based substances comprised of a complex blend of hydrocarbons derived from crude oil through processes of separation, conversion, upgrading, and finishing, such as motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils. RCRA-regulated wastes are specifically exempt from the Subtitle I (UST) regulations, and releases from USTs that contain RCRA wastes are addressed under the regulations governing corrective action. In addition to these federal regulations, USTs at the Paducah Site also are subject to 401 *KAR* Chapter 42.

DOE is responsible for 18 site USTs that have been reported to KDEP in accordance with regulatory notification requirements. All 18 of these USTs and associated piping runs have been closed in place permanently or physically removed and properly disposed of in accordance with KDEP regulations and KDEP NFA letters are on file for each former UST facility. Table 1 provides summary information on the former USTs at the Paducah Site. Visit the following webpage for additional information: <https://pegasis.ffspaducah.com/>.

4.2.3 RCRA 3004 (u/v) and CERCLA Monitoring

Additional groundwater monitoring performed relates to RCRA 3004 (u/v) and CERCLA requirements for characterization of areas of contamination at a facility that has had releases with the potential to contaminate groundwater. Groundwater contamination currently present at the Paducah Site has been labeled as the TCE Plume and the Tc-99 Plume (see Figures A.3 and A.4). The TCE Plume is subdivided further into the Northeast Plume, Northwest Plume, and Southwest Plume. Results of monitoring are used to determine and implement remedial actions, as necessary, to protect human health and the environment. Specific actions/procedures to protect groundwater during MW installation and groundwater remediation are identified in the CERCLA response work plans. Annual, semiannual, and quarterly analytical data collected in conjunction with groundwater monitoring sampling events are posted to the Environmental Information System PEGASIS data repository.

Table 1. Summary Information on USTs

State Identification Number	PGDP Identification Number	SWMU Designation/ Status	Regulatory Status
0001	C-750-A	142	Removed 3/91; closure complete per KDWM letter of 3/25/99.
0002	C-750-B	143	Removed 3/91; closure complete per KDWM letter of 3/25/99.
0003	C-750-C	25	Removed 10/93; not Subtitle I—clean closed under RCRA Subtitle C.
0004	C-750-D	24	Rinsed with TCE and emptied 6/79; filled with cement 10/97; closure complete per KDWM letter of 11/23/99.
0005	C-746-A1	139	Emptied 9/88; filled with cement 10/97; revised closure assessment report submitted 07/15/03; additional information requested from KDWM on 03/18/04; closure complete per KDWM letter.
0006	C-710-B	73	EXEMPT—emptied 7/85; filled with cement 10/97; closure complete per KDWM letter of 02/19/02.
0007	C-200-A	72	EXEMPT—grouted in 1977; closure complete per KDWM letter of 11/23/99.
0008	C-746-A2	140	During the Waste Area Group 15 Site Investigation, this UST was determined (and documented) to be nonexistent.
0009	C-751-W	186	Removed 2/27/2015; closure complete per KDWM NFA letter dated 10/21/2015.
0010	C-751-E	186	Removed 2/27/2015; closure complete per KDWM NFA letter dated 10/21/2015.
0011	C-611-1	130	Last used before 1975; clean closed per KDWM letter of 12/6/96.
0012	C-611-3	134	Last used before 1975; filled with cement 9/97; clean closed per KDWM letter of 12/6/96.
0013	C-611-2	131	This UST was determined to be nonexistent—NFA required per state correspondence of 12/6/96.
0014	C-611-4	132	Last used before 1975; filled with sand; clean closed per KDWM letter of 12/6/96.
0015	C-611-5	133	Filled with grout before 1975; clean closed per KDWM letter of 12/6/96.
0016	C-200-B	72	Filled with concrete around 1981; closure complete per KDWM letter of 02/19/02.
0017	C-745-K	490	UST discovered 08/16/01; tank and soils removed 02/02, clean closed per KDWM letter of 12/4/02.
0018	C-745-K2	534	UST discovered 04/10/02; tank removed 04/02; clean closed per KDWM letter of 12/4/02.

4.2.4 RCRA Subtitle D Landfill Groundwater Monitoring

Both C-746-S and C-746-T Landfills are closed landfills in postclosure care under the Solid Waste Permit (SW07300014, SW07300015, SW07300045) issued by KDWM on September 28, 2017. The C-746-S Residential Landfill stopped receiving solid waste and was certified “closed” in 1995. The groundwater monitoring system for the C-746-S Residential Landfill also encompasses the C-746-T Inert Landfill, which was certified “closed” in 1992.

A solid waste landfill, C-746-U, was constructed in 1996 north of C-746-S and C-746-T Landfills. The C-746-U Landfill currently operates and receives wastes as a contained landfill under Solid Waste Permit (SW07300014, SW07300015, SW07300045). MWs for the C-746-S, C-746-T, and C-746-U Landfills are sampled quarterly for analytes dictated by the current, approved Solid Waste Permit.

The data resulting from groundwater sampling at C-746-U and C-746-S&T Landfills are statistically analyzed to determine if the landfills are impacting the groundwater. This analysis is supplied in quarterly reports to KDEP.

4.2.5 Monitoring Well Preventive Maintenance

To protect and maintain the integrity of the MW network at the Paducah Site, a preventive monitoring well maintenance plan was implemented in 2002. A complete description of this program can be found in the current approved CP2-ES-0024, *Monitoring Well Maintenance Implementation Plan for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. This program combines regular monitoring of each well's physical condition and performance during routine sampling activities. If problems requiring attention are identified, a schedule to repair or rehabilitate wells is developed. The maintenance monitoring program also includes, as needed, visual inspection of downhole equipment, downhole video inspection, evaluation of water quality data, microbial sampling and analysis, and assessment of well performance indicators. Typical efforts to rehabilitate MWs involve the use of physical treatment methods, such as brushing and surging.

4.2.6 Evaluation of Floor Drains

An evaluation of floor drains before groundwater protection practices are selected is required by 401 KAR 5:037 § 3(5)(c). Floor drains must be connected to an on-site sewage disposal system, to a closed-loop collection or recovery system, a waste treatment system permitted under KPDES, or be terminated.

Liquid discharges from plant operations are discharged through the plant effluent ditches, and groundwater protection from effluents in these discharges are under purview of the KPDES program and, therefore, are not addressed further in this GPP. Compliance with the KPDES program provides protection of the groundwater from plant effluent discharges.

4.2.7 Evaluation of Loading and Unloading Areas

401 KAR 5:037 § 3(5)(a) states:

Loading and unloading areas shall have spill prevention and control procedures and operation procedures designed to prevent groundwater pollution. Spill containment and cleanup equipment shall be readily accessible.

Loading and unloading areas have emergency response procedures, spill containment, and cleanup equipment. The plant emergency squad provides continuous emergency response to spills, 24 hours per day.

4.3 ENVIRONMENTAL SURVEILLANCE MONITORING

Groundwater surveillance monitoring, as required by DOE Order 436.1, *Departmental Sustainability*, is implemented at the Paducah Site. The approved EMP discusses this program and its components including MWs, sample parameters, and sampling frequencies. The plan is maintained as a living document that will be modified to meet new requirements and needs. Any changes in MW status, locations, or sampling frequency will be documented in the annual EMP. The EMP also describes other environmental monitoring activities, such as surface water monitoring at the C-746-S/T/U Landfills, KPDES outfall monitoring, and in-stream monitoring of Bayou and Little Bayou Creeks.

4.4 KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM OUTFALLS

The KPDES permit (KY0004049) requires the Paducah Site to monitor effluent discharges through permitted Outfalls 001, 002, 004, 006, 008, 009, 010, 011, 012, 013, 015, 016, 017, 019, and 020 (Figure 5).

Sample parameters include both physical and chemical constituents. Results are assessed and submitted to the proper regulatory agencies. Activities include field testing (pH, conductivity, and temperature), field measurements (flow measurements), and laboratory analysis for pollutants identified in the KPDES permit. If data indicate increasing contaminant levels, information pertaining to upstream operations is reviewed to identify the potential cause and implement appropriate best management practices to minimize pollutants per Section 3 of the KPDES permit. General conditions and general requirements of Section 3 of the KPDES Permit are discussed in the FRNP BMP as they pertain to the remediation, deactivation, and infrastructure contractors and in *Paducah Storm Water Pollution Prevention and Best Management Practices Plan*, DUF6-PLN-079, (MCS 2017) for the DUF₆ Conversion Project contractor.

4.5 SAMPLE COLLECTION

Surface water bodies (streams, the Ohio River, lagoons, and ponds), surface and subsurface soil, and groundwater (from MWs) are sampled as part of environmental assessment and possible remediation efforts conducted at the Paducah Site. To provide protection of groundwater during the performance of these activities, task-specific procedures are utilized that allow quantification of site conditions without degradation of the sampling site. These procedures, maintained and implemented by DOE contractors, are specified and described in project-specific sampling and analysis plans that are reviewed and approved prior to sampling. In addition, the procedures utilized during sample-collection tasks are documented in the associated investigation or evaluation report published following completion of the assessment. The following sections in this report provide generic information on the types of procedures that are applicable to sampling surface water, surface and subsurface soil, and groundwater at the Paducah Site.

Appendix B provides a partial list of the most current version of procedures that are implemented for specific tasks at the Paducah Site.

4.5.1 Surface Water [401 KAR 5:037 § 2(2)(o)]

Surface water sampling activities can be divided into two types: observation and water sampling. Observations include presampling visual assessment and determination of flow rates or volumes using flow meters and calibrated flumes. The sampling protocol is designed to allow representative samples to be taken from a location and protect sampling personnel, while preventing the spread of contamination. Collected samples then are tested for specific constituents using either field measurement methods or laboratory analysis. Hydrogeologic evidence has demonstrated that Bayou Creek and Little Bayou Creek are losing streams over some intervals; therefore, sampling and protecting surface water aid in ensuring groundwater protection.

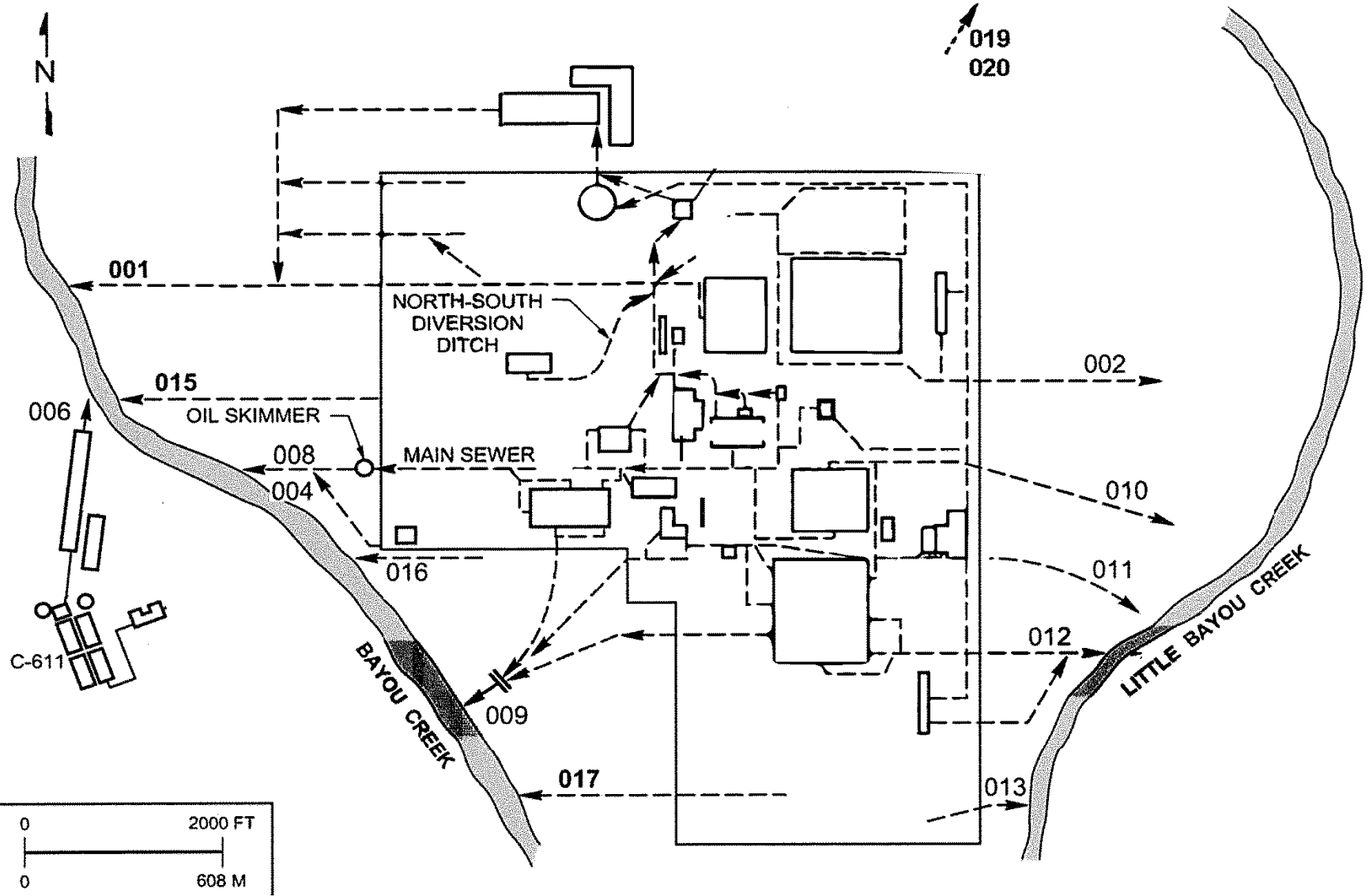


Figure 5. KPDES Outfall Locations at PGDP

Several SWMUs at the Paducah Site are located in areas without an outfall and are grass covered and under normal conditions would not have discharges. The BMP states that during extreme rainfall events these areas may become saturated, which may allow storm water to flow over or through the SWMU increasing the potential for surface water discharge. If the soils covering the SWMU become saturated, the SWMUs will be checked for signs of erosion and releases. Storm water runoff periodically will be inspected visually to look for signs of contamination (e.g., an oily sheen, cloudy or discolored water, etc.) and, if necessary, sampled.

The following types of activities are used during surface water sampling as appropriate to the specific task:

- Collection of surface water samples
- Field measurement of water temperature
- Field measurement of pH
- Field measurement of dissolved oxygen
- Field measurement of residual chlorine
- Field measurement of specific conductance
- Field measurement of alkalinity

4.5.2 Surface and Subsurface Soil [401 KAR 5:037 § 2(2)(m)]

Surface and subsurface soil samples may be taken prior to or during construction, excavation, and remediation activities or as part of environmental characterization activities. Procedures for soil sampling enable characterization while protecting sampling personnel and reducing the risk of increasing contaminant migration and are identified in project specific work instructions and/or CERCLA work plans.

The following activities may be used during surface and subsurface soil sampling as appropriate to the requirement of the specific task:

- Surface soil sampling
- Subsurface soil sampling
- Soil gas sampling
- Lithologic logging

4.5.3 Well Sampling [401 KAR 5:037 § 2(2)(m)]

Numerous MWs and residential wells are sampled on a regular basis (Appendix B of the EMP). This sampling is conducted to monitor the existing groundwater contamination plumes and to detect any additional releases of contamination into the RGA. The procedures that guide these activities help ensure that analytical results are representative of aquifer conditions. In addition to chemical and physical conditions, aquifer parameters such as transmissivity and conductivity are determined as needed. Additional information on the well sampling program at the Paducah Site is available in the current approved EMP.

The following types of activities may be used during well sampling, as appropriate to the specific task:

- Groundwater sampling
- Water level measurements
- Monitoring well purging

4.6 SUBSURFACE PENETRATIONS [401 KAR 5:037 § 2(2)(m)]

To characterize subsurface conditions, numerous subsoil penetrations have been made under various investigation and remedial activities. These penetrations have been in the form of MWs, production/extraction wells, piezometers, and sample borings (including shallow direct push holes and drilled borings to the McNairy Formation and deeper). Installation/drilling techniques are selected specifically to prevent undesirable alteration of contaminant migration while providing the maximum information required for characterization of the geological and hydrogeological conditions. Excavation permits are required by facility procedures [CP3-EN-0227 *Trenching, Excavation and Penetration Permit* (FRNP 2017)] prior to any installation/drilling activity anywhere on-site in order to satisfy ISMS/EMS principles. Completed sample borings and MWs no longer required for sampling are properly abandoned per 401 KAR 6:350 § 11 (as appropriate) to prevent downward migration of contaminants.

4.7 STORAGE OF BULK QUANTITIES OF MATERIALS, RECYCLABLES, AND WASTES [401 KAR 5:037 § 2(2)(a), (g), & (j)]

4.7.1 Fuel Storage Tanks

Fuel storage tanks located at the Paducah Site, including C-600, C-746-U, and C-752-B, are subject to the SPCC Plan. Each of the tanks is equipped with appropriate containment (secondary or double-walled) and is inspected at least monthly. Collected storm water is inspected for sheen prior to discharge. For a comprehensive overview of the Paducah Site aboveground storage tanks, refer to Appendix A to the SPCC Plan (FRNP 2018a). Additionally, spill control and cleanup equipment is located near each facility to allow for prompt cleanup of spills.

4.7.2 Used Oil

Used oil is collected for recycle in a 150-gal tank at C-755-Y. This tank is single-wall tank, but located within secondary containment. This tank is inspected every other week for evidence of leaks/drips. Once the waste oil tank is full, the infrastructure contractor schedules pick up of the used oil. Generally, a tanker truck is used for off-site shipment of used oil.

4.7.3 Intermodals with Cold Traps

Sealand-type containers with cold traps containing uranium compounds are stored inside C-746-Q, pending recovery of the uranium. C-746-Q is permitted under the hazardous waste facility permit and is a warehouse structure with a concrete base with curbs. The facility/containers are inspected weekly per the permit for signs of leaks. Spill containment and cleanup supplies are available in the facility.

4.7.4 Storage of UF₆

Bulk UF₆ is stored in on-site cylinders and various facilities around the Paducah Site.

DUF₆ cylinders are stored on concrete pads in the cylinder yards. Storm water runoff from the cylinder yards is channeled to Outfalls 001, 002, 008, 010, 012, 013, 015, and 017 for discharge/monitoring under the KPDES permit (KY0004049).

4.7.5 Storage of Aqueous Hydrogen Fluoride

HF is stored in six aboveground, outdoor, carbon steel 10,000-gal tanks (tanks C-0-HFS-TK-550 to 555) and each tank has the following:

- Polymer lining;
- Remote level monitoring;
- High-level and high-high level alarms to warn operators of potential overflow; and
- Concrete secondary containment (21,166 ft² × 3.5-ft high, 11,729-gal capacity).

4.7.6 Storage of Posi-Shell[®] Chemicals

Posi-Shell[®] is an alternative daily cover material that is stored at the C-746-U Landfill in metal Sealand containers.

4.7.7 Storage of Flocculants

Flocculants are used for the treatment of suspended solids in the sedimentation pond and are stored in a metal Sealand container at C-746-U Landfill.

4.7.8 Storage of Road Oils and Deicing Materials

The infrastructure contractor is responsible for road maintenance. As such, road salt is stored at the C-732 storage building and in two locations in C-755 Area; C-755-U and C-755-V. Each structure is an approximately 20-ft tall, fully covered, metal storage building with an open front for loading/unloading. The floor of the C-732 storage building is concrete to minimize moisture intrusion and loss of salt material to the environment. The C-755-U and C-755-V storage facilities have rubber barrier pad covers on gravel surface to minimize moisture intrusion and loss of salt material into the environment. Road salt is used during winter months on sidewalks, decks, and steps to improve personal safety. Salt is dissolved in water into a high salinity solution (brine) suitable for road and parking lot pretreatment. If weather is severe enough to defeat the pretreatment, the road salt would be applied directly to road and parking lot surfaces. By using pretreatment, the infrastructure contractor minimizes the amount of salt used and therefore salt runoff to the site's ditches and outfalls.

4.7.9 Storage of Herbicides and Pesticides

The infrastructure contractor utilizes herbicide as one form of weed control and plant management. A minimum amount of concentrate is purchased for use in a one year period. Storage of concentrate is outside in a dedicated "clamshell" weatherproof structure north of C-755-A and C-725. Access to the chemical is restricted by use of a lock and key. Only personnel with current state certifications for herbicide application are allowed to access the chemicals, mix, and apply the chemicals. The herbicide is stored, applied and the container disposed of in accordance with the manufacturer's instructions and Commonwealth of Kentucky law.

4.8 WASTE MANAGEMENT [401 KAR 5:037 § 2(2)(f)]

DOE and its contractors/subcontractors generate, handle, and store a significant quantity of waste materials. Activities that deal with waste are addressed in procedures established to ensure proper storage, maintain accountability, and eliminate the possibility of a release to the environment. At each area of generation, facilities are provided for the proper containerization of waste materials.

Waste handling activities include segregation, transportation, sampling, storage, and treatment and/or disposal. Beginning at generation, wastes are segregated (i.e., liquid from solid) and similar materials are consolidated in containers. To the extent practical, waste is containerized in accordance with 49 *CFR* § 172.101, “Hazardous Material Table,” and 49 *CFR* § 173 at the point of generation. This step ensures proper storage and handling until treatment and/or disposal. After wastes are containerized and secured, they are transported to a waste staging or storage area for further processing, transfer to another container, or storage pending treatment and/or disposal. Temporary storage of wastes at the generating project is conducted in accordance with applicable regulations based upon the type of waste [e.g., 40 *CFR* § 262.34 for hazardous wastes, DOE Order 435.1, Chapter 4, for radioactive wastes, and/or 40 *CFR* § 761.65 for wastes containing polychlorinated biphenyls (PCBs)]. Long-term storage of hazardous waste is done in accordance with the hazardous waste facility permit in a facility constructed with concrete secondary containment basins and structures to prevent rain from contacting waste. Long-term storage of other industrial wastes (e.g., radioactive, PCBs) is conducted in the same facilities to the extent practical.

4.8.1 Release Prevention and Control

One of the first steps in preventing groundwater contamination is release prevention. To this end, DOE operates under DOE Order 435.1, Change 1, *Radioactive Waste Management* (DOE 1999), and DOE Order 458.1, Change 3 *Radiation Protection of the Public and the Environment* (DOE 2013), which direct the acceptable conditions for treatment, storage, and disposal of DOE-generated waste. In addition, each project task is required to have a Waste Management Plan, which specifically relates to the expected waste stream, the quantities of waste generated, and also includes, but is not limited to, information on required container inspection, diking, repackaging of waste, and transferring of liquid wastes.

The Environmental Radiological Protection Program (ERPP) is designed to meet the requirements in the DOE Order 458.1, *Radiation Protection of the Public and the Environment*. The purpose of the order is to minimize radiation exposure to the public, control the radiological clearance of property, ensure that any exposure to the public is as low as reasonably possible, monitor routine and nonroutine radiological releases, and to provide protection of the environment from effects of radiation. The ERPP provides an overview of the measures implemented by DOE and its contractors/subcontractors at the Paducah Site.

4.8.2 Release Control

Because the potential for release to the environment exists at all facilities that handle hazardous waste, DOE has developed and continues to update the SPCC Plan. This “living” document stipulates the procedures to be followed and the equipment to be used in the event of a liquid release. It also maintains a record of these releases.

4.9 MATERIAL TRANSFERS [401 KAR 5:037 § 2(2)(p)]

Loading of wastes and/or materials into containers is performed inside of structures to the extent practical. Any spills are promptly cleaned up. Containers are loaded in a manner to avoid/prevent damage to containers during loading/transfer.

Transportation Security Plan for the Transport of Hazardous Materials in Commerce, CP2-WM-0025, has been prepared for waste to be shipped off-site from the D&R Contractor. Procedure DUF6-U-WMP-2001, *Shipping*, has been prepared for off-site shipments of U.S. Department of Transportation (DOT)-regulated hazardous materials except HF. Procedure DUF6-U-WMP-2003, *Hydrogen Fluoride (HF) Shipping*, has been prepared for off-site shipments of HF. These plans/procedures describe the process to ensure

compliance with applicable DOT Hazardous Material Regulations. A hazard classification is assigned to waste/material being shipped in accordance with 49 *CFR* § 172.101 and 49 *CFR* § 173.2a. Waste/material is containerized in accordance with 49 *CFR* § 172.101, *Hazardous Material Table*, and 49 *CFR* § 173. Radiation levels are not allowed to exceed the threshold values provided in 49 *CFR* § 173.441, *Radiation Level*, and 49 *CFR* § 173.443, *Contamination Controls*. Shipping papers are prepared for each shipment in accordance with 49 *CFR* § 172.200 and/or 40 *CFR* § 262. Additional information/shipping papers are provided to comply with applicable requirements of the Nuclear Regulatory Commission, National Emission Standards for Hazardous Air Pollutants, and Toxic Substances Control Act. All marking, labeling, and placarding of waste materials and waste containers are completed in accordance with 40 *CFR* § 172.300, 49 *CFR* § 172.400, and 49 *CFR* § 172.500, respectively. An Emergency Response Plan is completed and provided for the carrier to use to comply with 49 *CFR* § 171.15, 49 *CFR* § 171.16, and 49 *CFR* § 390.15.

4.10 TREATMENT

4.10.1 Groundwater [401 KAR 5:037 § 2(2)(n)]

The Paducah Site currently operates two groundwater pump-and-treat systems. The Northwest Plume Pump-and-Treat System involves the use of an air stripper, ion exchange units, and a vapor-phase activated carbon exchange unit. The Northeast Plume Containment System uses air strippers. Additionally, projects have been started and/or completed to remediate source contamination at SWMU 1, SWMU 91, C-400, and the Southwest Plume.

4.10.1.1 Northwest Plume Pump-and-Treat System and Northeast Plume Containment System

The groundwater pump-and-treat systems were constructed and are operated in accordance with two separate CERCLA interim records of decision (RODs) approved by EPA. These RODs are the *Record of Decision for Interim Remedial Action of the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1993) and the *Record of Decision for Interim Remedial Action at the Northeast Plume, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1995). The purpose of these facilities is to retard further migration of the northwest and northeast groundwater contaminant plumes. Prior to the implementation of the interim RODs, a water policy was implemented for residences located within the affected areas. This policy was established in an Administrative Consent Order between DOE and EPA, pursuant to Sections 104 and 106 of CERCLA.

Beginning in August 2010, the Northwest Plume Pump-and-Treat System switched from withdrawal from the original four extraction wells to withdrawal from two new extraction wells located at the north boundary of the industrial area of the Paducah Site (in the vicinity of the original south wellfield). The location of these extraction wells was optimized to capture the core and the lateral extent of the Northwest Plume in the area of the north plant boundary. DOE issued an *Explanation of Significant Differences to the Record of Decision for the Interim Remedial Action of the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (DOE 2010) for this action in December 2010.

In 2011, the FFA managers identified optimization of the Northeast Plume Containment System as a priority, consistent with the sitewide strategy that includes a series of sequenced activities consisting of source actions and control of off-site groundwater migration followed by a final action for the overall dissolved-phased plume. Subsequently, a resolution to significant differences was finalized in 2016, and a Remedial Action Work Plan was prepared (DOE 2016). Northeast Plume Optimization construction activities commenced in July 2016, and the optimized system was operational in October 2017. The optimized system consists of two new extraction wells moved closer to the known VOC source zones

near the east PGDP security fence in the two centroids of the Northeast Plume. Two new modular air stripper treatment units were installed to treat extracted groundwater from the Northeast Plume.

4.10.1.2 SWMU 91 source remediation

In July 1998, DOE issued the CERCLA *Record of Decision for Remedial Action at Solid Waste Management Unit 91 of Waste Area Group 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1998). This ROD designated Lasagna™ as the selected remedial alternative for reducing the concentration of TCE in SWMU 91 to levels that would decrease the potential groundwater risk to human health and the environment at the point of exposure. Installed on the south side of the C-745-B cylinder yard in 1999, the electroosmosis system was operated for two years and reduced the concentration of TCE in SWMU 91 soil from an average of 84 mg/kg to an average of less than 5.6 mg/kg. This was verified in sample results taken in the spring of 2002 and 2003. Additional information about the Lasagna™ technology and its development can be found in the *Final Soil Characterization Work Plan for the Paducah Gaseous Diffusion Plant Lasagna Pilot Test in the Cylinder Drop Test Area*, (MMES 1994), and the *DNAPL Site Characterization and Lasagna™ Technology Demonstration at Solid Waste Management Unit 91 of the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (MMES 1996).

4.10.1.3 C-400 source remediation

DOE issued the *Record of Decision for Interim Remedial Action for the Groundwater Operable Unit for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2005), in August 2005. This interim remedial action included the design, installation, operation, and subsequent decommissioning of an electrical resistance heating (ERH) system to heat discrete intervals of the subsurface TCE source zone resulting in volatilization, removal, and recovery of volatile organic compounds from the southern end of the C-400 Cleaning Building. The system became operational in 2010.

The first phase of the ERH was completed in December 2010. Based on the evaluation and the lessons learned from Phase I, it was determined that the ERH base design was successful in reaching target temperatures in the subsurface and removing contaminants in the UCRS and upper RGA. The evaluation of Phase I also indicated that target temperatures were not achieved in the lower RGA (DOE 2011a), which resulted in the split of the Phase II interim remedial action for the southeast source areas into two separate actions: (1) UCRS and Upper RGA action (Phase IIa) and (2) Lower RGA action (Phase IIb). The *Remedial Action Completion Report for the Interim Remedial Action for the Groundwater Operable Unit for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (RACR) reported a 95.0% reduction in VOCs in the Phase I east treatment area soils and a 76.0% reduction in VOCs in groundwater within the boundaries of the Phase I east treatment area (DOE 2018). The RACR reported a 99.0% reduction in VOCs in the Phase I southwest treatment area soils and a 99.0% reduction in VOCs in groundwater within the boundaries of the Phase I southwest treatment area.

Construction of the Phase IIa ERH system was completed in April 2013; remedial ERH operations were initiated in July 2013; and ERH electrodes were turned off in October 2014 to allow the subsurface to cool down, after the FFA parties agreed that asymptosis had been achieved. The soil vapor groundwater treatment system continued to operate through November 2014, at which time operations were ceased, and the remedial action portion of Phase IIa was considered complete. The RACR reported a 99.8% reduction in VOCs in the Phase IIa treatment area soils and a 99.3% reduction in VOCs in groundwater within the boundaries of the Phase IIa treatment area.

The FFA parties signed the *Memorandum of Agreement on the C-400 Complex under the Federal Facility Agreement for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2017a), in August 2017. The memorandum accelerates the investigation and cleanup of the C-400 Cleaning Building area for all sources of contamination associated with and underlying the C-400 Cleaning Building and integrating the Phase IIb source area into the final action for the C-400 Complex Operable Unit.

4.10.1.4 Southwest Plume source remediation

DOE conducted a site investigation of the Southwest Plume and four potential source areas in 2004, *Site Investigation Report for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2007). As a result, a Focused Feasibility Study for the Southwest Groundwater Plume VOC Sources (Oil Landfarm and C-720 Northeast and Southeast Sites) was conducted (DOE 2011b). Sources to the Southwest Plume included in this action were the SWMU 1 Oil Landfarm, SWMU 211-A C-720 Building TCE Northeast Spill Site, and the SWMU 211-B C-720 Building Southeast Spill Site.

DOE completed a ROD for these Southwest Plume sources in March 2012 (DOE 2012). The ROD for these SWMUs implements deep soil mixing to treat the VOC source zone at SWMU 1. Deep soil mixing at SWMU 1 commenced in March 2015 and concluded in April 2016. The *Remedial Action Completion Report for In Situ Source Treatment by Deep Soil Mixing of the Southwest Groundwater Plume Volatile Organic Source at the C-747-C Oil Landfarm (Solid Waste Management Unit 1), at Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (SWMU 1 RACR) reported a 99.0% reduction in VOCs in the treatment area soils (DOE 2017b). The SWMU 1 RACR was approved by EPA and Kentucky in February 2017. The Final Characterization Report Addendum and Letter Notification proposing remedy for 211-A and 211-B were evaluated by the FFA parties. The FFA parties agreed to move forward with 211-A and will determine an appropriate remedial action for 211-B, based on a revised conceptual site model consistent with the data in the Final Characterization Report.

4.10.2 Decontamination, Well Development, and Well Purge Wastewater [401 KAR 5:037 § 2(2)(n)]

C-752-C is a large concrete containment pad covered by a roof. This facility is used to decontaminate equipment and to treat wastewaters to remove suspended solids in accordance with the KPDES permit. This treatment usually serves as pretreatment for water that is further treated in the C-612 facility.

4.10.3 C-746-S and C-746-U Landfill Leachate [401 KAR 5:037 § 2(2)(n)]

The C-746-U-15 leachate treatment system has a large concrete secondary containment pad covered by a permanent structure. Wet wells in this facility are designed to automatically pump any releases back into the influent tank. This facility treats C-746-S and C-746-U Landfill leachate using treatment media prior to discharge in accordance with the solid waste landfill permit. The leachate discharge is regulated under the KPDES permit.

4.10.4 Miscellaneous Wastewater [401 KAR 5:037 § 2(2)(n)]

The C-752-A permitted hazardous waste treatment facility has a large concrete secondary containment pad covered by a permanent structure. This facility also is used to treat miscellaneous wastewaters generated at the Paducah Site such as decontamination solutions, contamination storm waters, leachate from C-404 or C-746-U, etc., in accordance with the KPDES permit. Treatment in this facility includes chemical precipitation, photocatalytic reaction, particulate filtration, and/or carbon filtration.

4.10.5 Noncontact Cooling Water [401 KAR 5:037 § 2(2)(n)]

The DUF₆ Conversion Facility cooling tower blowdown contains a biocide and deposit control agent and is discharged through the effluent treatment system in accordance with the KPDES permit.

4.10.6 C-613 Storm Water Control Basin [401 KAR 5:037 § 2(2)(o)]

C-613 collects storm water from the northeast part of the PGDP limited area. This facility originally was constructed to contain contaminated runoff from the scrap metal yards under CERCLA. The basin is lined to minimize migration of contaminants to groundwater. The basin is approved under the KPDES permit (KY0004049) to treat wastewater with high levels of suspended contaminants prior to discharge through Outfall 001.

4.10.7 Use of Surface Impoundments, Lagoons, Ditches in CERCLA Projects [401 KAR 5:037 § 2(2)(o)]

Many of the remediation projects require the holding/collecting of storm waters to prevent/minimize contaminated runoff. Specific control measures and technologies are addressed in the project specific CERCLA work plan.

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5. IMPLEMENTATION SCHEDULE

The controls and measures described in this plan have been established in accordance with regulatory requirements and, as a result, already have been implemented.

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6. EMPLOYEE TRAINING

DOE ensures that contractor personnel are trained and qualified for their functional positions. Each contractor employee has an individualized Training Position Description (TPD). Each contractor employee is required to complete his/her assigned training prior to implementing any work associated with their respective TPD. This training complies with state and federal regulations, DOE orders, contractor policies and procedures, and the Paducah Site, site-specific requirements, as applicable. This training ensures that all employees implement proper practices for protection of the environment, including groundwater protection. Applicable training courses include the following:

- **General Employee Training (GET):** This training session covers general topics for performing work at a DOE facility, including the Quality Assurance Program, classification security, the Industrial Hygiene Program, emergency preparedness, fire protection, Radiological Program, criticality safety, and hazard communication. Training includes elements on storage and use of hazardous materials. Many of these topics incorporate the requirements for groundwater protection measures required for work conducted at the Paducah Site. Personnel who require access to the Paducah Site, except escorted visitors, must complete this course. Testing is required to complete the course and it must be renewed every two years. GET consists of Web-based training.
- **Consolidated Annual Training (CAT):** This training session covers general topics for performing work at a DOE facility, including the ISMS/EMS, Quality Assurance Program, use of fire extinguishers, and waste minimization/management. These are key components for the overall environmental management activities conducted at the Paducah Site in support of groundwater and other environmental protection programs. Testing is required to complete the course, and it must be renewed every year. CAT consists of Web-based training.
- **Radiological Worker Training I and II:** Radiological Worker Training is required for all unescorted personnel who work in, or require access to, radiological areas. Radiological areas, as defined by the site Radiological Control Program procedures, include contamination areas, high contamination areas, radiation areas, high radiation areas, very high radiation areas, airborne radioactivity areas, radioactive material areas, fixed contamination areas, underground radioactive material areas, and radiological buffer areas. Training focuses on spread of contaminants, which prevents potential for discharge to groundwater. This training is designed to be accomplished in approximately 16 hours; however, the core material may be reviewed as self-study followed by a Web-based examination. This training must be recertified every two years.
- **Waste Generator Training:** The following training is required for personnel who generate, package, and handle RCRA-hazardous waste, including personnel who work in areas that generate hazardous waste and who manage satellite or 90-day accumulation areas: Fissile/Potentially Fissile Waste Handling and Storage Requirements; PCB Awareness training; DOT General Awareness Training, Nevada National Security Site Waste Acceptance, Hazardous Waste Training, Transportation Security Plan, DOT Identification of Hazardous Waste, RCRA Permit B, DOT Packaging Operator, DOE O.435.1 Implementation, HAZMAT Transportation Security Awareness, and Suspect/Counterfeit Item Awareness. This training gives instruction on the proper identification, management, and temporary storage of wastes generated during the performance of hazardous waste activities at the Paducah Site. In addition, the following required reading documents are assigned to personnel handling and managing waste: FRNP Waste Management Plan; NNSS Specific Waste Characterization, Profiling, Packaging, and Shipping; Safe Handling and Opening of Sealed Containers; Generation and Temporary Storage of Waste Materials; Waste Container Handling, Overpacking, and Transportation; Waste Packaging; and PCB Spill Management-Waste

Management. Proper waste management minimizes the risk of a release of contaminants to groundwater at the Paducah Site.

- **Hazard Communication Training:** Hazard Communication Training is required for personnel who use or might come in contact with hazardous materials defined under the Occupational Safety and Health Act. The course covers appropriate identification, storage, use, and labeling. This is a one-time course with refresher training required annually, with additional requirements for supervisory personnel. Proper hazardous materials management minimizes the risk of a release of hazardous materials to groundwater at the Paducah Site.

7. INSPECTION SCHEDULE

Inspections of each system for control of groundwater pollution are unique to each type of activity. Inspection forms are driven by the SPCC Plan; the Hazardous Waste Facility Permit; and the Solid Waste Permit. Pursuant to each of those requirements, the checklists include the date, name of operator and supervisor, what the inspection pertains to, observations, and any actions taken. An example inspection form for oil-containing tanks, containers, and equipment is shown on the following page.

EXAMPLE FORM

CP4-OP-1124-F01 – Chemical Operations Operator Rounds and Equipment Status Sheet

Date:	Time:		
LOCATION			OK
C-400 BUILDING [Including breakrooms/changehouses/process areas/basement, etc.]			
Water Leaks			
Air Leaks			
Lighting			
Energized 480 Volt heater cord connections checked <110°F. (Note heater locations where connections are >110°F in Remarks section and notify Supervisor.)			
C-400 CAAS AIR BOOSTER COMPRESSOR			
Check air pressure on PI-136. If pressure ≥ 158.0 psig and compressor is running, then notify Supervisor.			
*Oil is at top of circle within bull's eye when compressor is shut down			
CAAS Compressor hour meter reading			
C-409 BUILDING (Including breakrooms/change houses/process area, etc.)			
Water leaks			
Air leaks			
***Lighting			
C-409 CAAS AIR BOOSTER COMPRESSOR			
Check air pressure on PI-136. If pressure ≥ 158.0 psig and compressor is running, then notify Supervisor.			
*Oil is at top of circle within bull's eye when compressor is shut down			
CAAS Compressor hour meter reading			
C-410-D /C-410-K			
No evidence of fluorine leakage in area or equipment			
C-410-K alarm check performed			
C-410-D CAAS AIR BOOSTER COMPRESSOR			
Check air pressure on PI-136. If pressure ≥ 158.0 psig and compressor is running, then notify Supervisor.			
*Oil is at top of circle within bull's eye when compressor is shut down			
CAAS Compressor hour meter reading			
C-410-D AND C-410-K FLUORINE AREAS			
P R E S S U R E S	Tank A (Max. 148 psia Min. 16 psia)		
	Tank B (Max. 148 psia Min. 16 psia)		
	Tank C (Max. 148 psia Min. 16 psia)		
	Header (Max. 22.7 psia Min. 15 psia)		
No evidence of leakage from tube truck			
C-742-B ClF₃ Cylinder Storage Yard			
No combustible waste or excessive vegetation within 10 feet of cylinders			
Cylinder labels, barricades and postings are free from damage and are legible			
C-745-A-1 F₂ Tube Truck			
No evidence of leakage from tube truck			
No evidence of damage to tubing or valves			
Truck labels and posting are free from damage and legible			

CP4-OP-1124-F01 – Chemical Operations Operator Rounds and Equipment Status Sheet

LOCATION	OK
C-410 L SPILL RESPONSE AREA	<input checked="" type="checkbox"/>
Sliding door is sealed with TID and locked	<input type="checkbox"/>
Comments: _____ _____ _____ _____ _____	
Operator signature: _____ Badge # _____ Date _____ Supervisor signature: _____ Badge # _____ Date _____	

* If oil below circle inside bull's eye, **then** add oil according to CP3-OP-0301. If above inside bull's eye, **then** notify Supervisor.

** Not required when truck is in winter storage.

*** Excludes lighting above C-409 Uranium Recovery Area

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8. CERTIFICATION STATEMENT

DOCUMENTATION IDENTIFICATION: *Groundwater Protection Plan for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,*
PAD-PROJ-0018/FR2

I, Myrna E. Redfield, Four Rivers Nuclear Partnership, LLC, Acting Program Manager, certify that this Groundwater Protection Plan complies with the requirements of 401 KAR 5:037. I have read the terms of the plan and will implement its provisions.

Signature: _____

Date: _____

Myrna E. Redfield
7/23/18

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9. REVIEW LOCATION FOR GROUNDWATER PROTECTION PLAN

Public inspection of GPPs is a provision of 401 KAR 5:037 § 4(7). This plan is made available for access at the following website: <https://fourriversnuclear.com/public-documents/all>. Hard copies may be requested through the Paducah Environmental Information Center at the address listed below.

5100 Alben Barkley Drive
Emerging Technology Center, Room 221,
Paducah, Kentucky 42001
Phone: (270) 554-3004
Hours: Monday through Friday from 8 a.m. to 12 p.m.

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10. REFERENCES

- DOE (U.S. Department of Energy) 1993. *Record of Decision for Interim Remedial Action of the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1143&D4, U.S. Department of Energy, Paducah, KY, July.
- DOE 1995. *Record of Decision for Interim Remedial Action at the Northeast Plume, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1356&D2, U.S. Department of Energy, Paducah, KY, June.
- DOE 1998. *Record of Decision for Remedial Action at Solid Waste Management Unit 91 of Waste Area Group 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1527&D2, U.S. Department of Energy, Paducah, KY, July.
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APPENDIX A

DOE PADUCAH SITE FIGURES AND TABLE

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FIGURES

A.1. Paducah Gaseous Diffusion Plant Site Map.....	A-5
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TABLE

A.1. Solid Waste Management Units/Areas of Concern by Operable Unit	A-9
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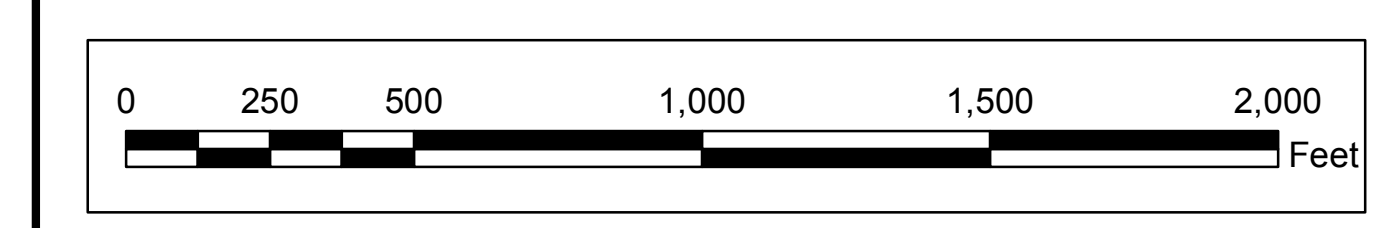
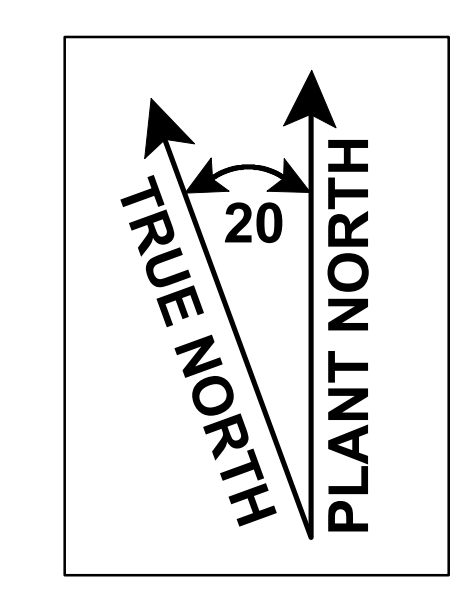
Paducah Site Map Showing Current SWMU Locations

- ▭ Completed Actions
- ▭ Addressed in Future
- ▭ Ongoing Actions
- ▭ No Further Action

SWMUs - 515,516,524,529, 497-506, and 509-513 (not labeled)

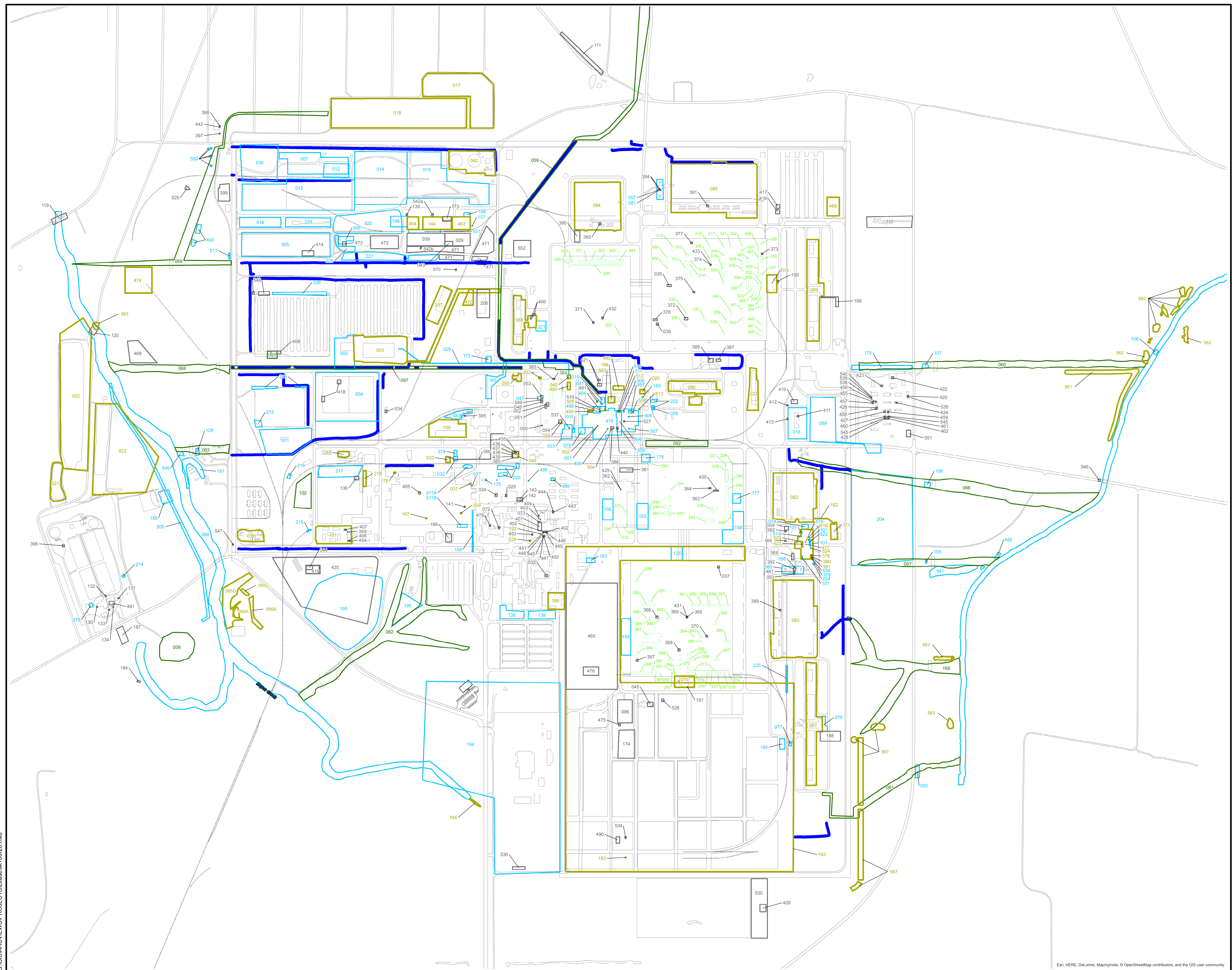
Inside DMSAs,GSAs/SAAs:
▭ SWMUs - 230-359,386,389, 394,397,398,402,404-407, 411,422,424,425,429-440, 442-457,527,535,545, and 553-560

~ SWMU 526 - Internal Plant Drainage Ditches
 SWMUs not shown:
 009,010,103,104,109, 112-118,121-128,145-152, 157,197,199,208,415,466, 467, and 484-487,564 (outside of map boundary)
 201,202 and 210 (plumes not shown)
 179 Sanitary Sewer System
 102 Underground Storm Sewer System



U.S. DEPARTMENT OF ENERGY
 DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
 PADUCAH GASEOUS DIFFUSION PLANT

FIGURE No. sk100r26.mxd
 DATE 03-30-16



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Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit*

C-400 COMPLEX				
Operable Unit	Subproject	SWMU No.	Description	
C-400 Complex OU	C-400 D&D	Other	C-400 Building [building foundation (i.e., slab) will remain in place]	
	C-400 Final Remedial Action	11	C-400 TCE Leak Site	
		40	C-403 Neutralization Tank slab and underlying soils	
		47	C-400 Technetium Storage Tank Area	
		98	C-400 Basement Sump	
		203	C-400 Discard Waste System slab and underlying soils	
		480	C-402 Lime House building slab and underlying soils	
		533	TCE Spill Site from TCE Unloading Operations at C-400	
GROUNDWATER				
GWOU	C-400 Interim Remedial Action	11	C-400 TCE Leak Site	
		533	TCE Spill Site from TCE Unloading Operations at C-400	
	Southwest Plume Sources	1	C-747-C Oil Land Farm	
		211 A	C-720 TCE Spill Site Northeast	
		211 B	C-720 TCE Spill Site Southeast	
	Dissolved-Phase Plumes	201	Northwest Groundwater Plume	
		202	Northeast Groundwater Plume	
		210	Southwest Groundwater Plume	
	Potential Additional Groundwater Sources	NA	This operable unit is being reserved for remaining sources to groundwater contamination that may be identified in the future	
	SURFACE WATER			
SWOU	SWOU Remedial Action	Removal Action	58	NSDD (Outside) (includes KPDES 003)
			60	C-375-E2 Effluent Ditch (KPDES 002) ¹
			61	C-375-E5 Effluent Ditch (KPDES 013) ¹
			62	C-375-S6 SW Ditch (KPDES 009) ¹
			63	C-375-W7 Oil Skimmer Ditch (KPDES 008 and KPDES 004)
			66	C-375-E3 Effluent Ditch (KPDES 010)
			67	C-375-E4 Effluent Ditch (C-340 Ditch) (KPDES 011)
			68	C-375-W8 Effluent Ditch (KPDES 015)
			69	C-375-W9 Effluent Ditch (KPDES 001)
			92	Fill Area for Dirt from the C-420 PCB Spill Site
			97	C-601 Diesel Spill
			102B	Plant Storm Sewer associated with C-333-A, C-337-A, C-340, C-535, and C-537 ¹
			168	KPDES Outfall Ditch 012 ¹
526	Internal Plant Drainage Ditches (includes KPDES 016) ²			

¹ The results of the Surface Water Operable Unit (SWOU) (On-Site) Site Investigation determined that there were no unacceptable levels of risk to current and anticipated future receptors that warranted inclusion of Solid Waste Management Unit (SWMU) 60 (Outfall 002), SWMU 168 (Outfall 012), or SWMU 102 [Paducah Gaseous Diffusion Plant (PGDP) storm sewer systems associated with C-333-A, C-337-A, C-340, C-535, and C-537]. As a result, no action will be taken for these SWMUs as originally planned under the SWOU removal action. These SWMUs will be evaluated further as part of the SWOU remedial action. It also should be noted that during development of the Sampling and Analysis Plan (SAP) for SWOU (On-Site) Removal Action, Outfall 009 and Outfall 013 were evaluated. This assessment of the outfalls, which included a review of historical data, indicated that Outfall 009 and Outfall 013 did not require an early action, and further assessment of Outfall 009 and Outfall 013 would be addressed during the Comprehensive Site Operable Unit (CSOU). Based upon current site strategy, Outfall 009 and Outfall 013 also will be addressed as part of the SWOU remedial action.

² Kentucky Pollutant Discharge Elimination System (KPDES) Outfall 016, in its entirety, will be addressed as part of the SWOU Remedial Investigation.

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

SURFACE WATER (CONTINUED)			
Operable Unit	Subproject	SWMU No.	Description
SWOU	SWOU Remedial Action	64	Little Bayou Creek
		65	Bayou Creek
		93	Concrete Disposal Area East of Plant Security Area
		105	Concrete Rubble Pile (3)
		106	Concrete Rubble Pile (4)
		107	Concrete Rubble Pile (5)
		108	Concrete Rubble Pile (6)
		109	Concrete Rubble Pile (7)
		113	Concrete Rubble Pile (11)
		129	Concrete Rubble Pile (27)
		175	Concrete Rubble Pile (28)
		185	C-611-4 Horseshoe Lagoon (includes KPDES 014)
		199	Bayou Creek Monitoring Station
		205	Eastern Portion of Yellow Water Line
		549	Dirt/Concrete Rubble Pile near Outfall 008
550	Concrete Culvert Sections Located on the West Bank of the Ditch Leading to Outfall 001		
	Others	Outfalls 017, 018, 019/020, and 526 and associated ditches	
LAGOONS			
Lagoons OU	Process Lagoons	17	C-616-E Sludge Lagoon
		18	C-616-F Full-Flow Lagoon
		171	C-617-B Lagoon (formerly identified as C-617-A)
	Water Treatment System Lagoons	21	C-611-W Sludge Lagoon
		22	C-611-Y Overflow Lagoon (includes KPDES 006)
		23	C-611-V Lagoon (includes KPDES 005)
BURIAL GROUNDS			
BGOU	BGOU Remedial (10 SWMUs)	2	C-749 Uranium Burial Ground
		3	C-404 Low-Level Radioactive Waste Burial Ground
		4	C-747 Contaminated Burial Ground
		5	C-746-F Classified Burial Ground
		6	C-747-B Burial Area
		7	C-747-A Burial Ground
		9	C-746-S Residential Landfill
		10	C-746-T Inert Landfill
		30	C-747-A Burn Area
		145	Residential/Inert Landfill Borrow Area (P-Landfill)
	Additional Burial Grounds	472	C-746-B Pad
		520	Scrap Material West of C-746-A

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

SOILS			
Operable Unit	Subproject	SWMU No.	Description
Soils OU	Soils Remedial	1	C-747-C Oil Land Farm
		13	C-746-P Clean Scrap Yard ³
		14	C-746-E Contaminated Scrap Yard
		15	C-746-C Scrap Yard ³
		19	C-410-B HF Neutralization Lagoon
		26	C-400 to C-404 Underground Transfer Line ³
		56	C-540-A PCB Waste Staging Area ^{3,4}
		57	C-541-A PCB Waste Staging Area ⁴
		76	C-632-B Sulfuric Acid Storage Tank
		77	C-634-B Sulfuric Acid Storage Tank ^{3,5}
		80	C-540-A PCB Spill Site ³
		81	C-541-A PCB Spill Site
		99 B	C-745 Kellogg Bldg. Site—Septic Tank/Leach Field
		138	C-100 Southside Berm
		153	C-331 PCB Soil Contamination (West)
		156	C-310 PCB Soil Contamination (West Side)
		158	Chilled-Water System Leak Site
		160	C-745 Cylinder Yard Spoils (PCB Soils)
		163	C-304 Bldg./HVAC Piping System (Soil Backfill)
		165	C-616-L Pipeline & Vault Soil Contamination
		169	C-410-E HF Vent Surge Protection Tank
		170	C-729 Acetylene Bldg. Drain Pits
		180	Outdoor Firing Range (WKWMA)
		181	Outdoor Firing Range (PGDP)
		194	McGraw Construction Facilities (Southside)
		195	Curlee Road Contaminated Soil Mounds
		196	C-746-A Septic System
		200	Soil Contamination South of TSCA Waste Storage Facility
		204	Dykes Road Historical Staging Area ³
		211 A	C-720 TCE Spill Site Northeast ³
		212	C-745-A Radiological Contamination Area
		213	OS-02
		214	OS-03
215	OS-04		
216	OS-05		
217	OS-06		
219	OS-08		
221	OS-10		
222	OS-11		
224	OS-13 ³		
225A	OS-14 ³		

³ These SWMUs/areas of concern (AOCs) will be evaluated further under a Soils OU RI 2 and addressed by a subsequent Soils OU feasibility study.

⁴ SWMUs 56 and 57 are located within, and will be addressed as part of, SWMUs 80 and 81, respectively.

⁵ This SWMU was evaluated as part of the Soils Operable Unit. The soils and underlying slabs associated with this SWMU will be addressed under the Soils and Slabs OU as part of post-GDP shutdown activities.

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

SOILS (CONTINUED)			
Operable Unit	Subproject	SWMU No.	Description
Soils OU (Continued)	Soils Remedial (Continued)	225 B	Contaminated Soil Area near C-533-1 DMSA OS-14 ³
		227	OS-16
		228	OS-17
		229	OS-18 ³
		486	Rubble Pile WKWMA (approximately 116 ft off roadside)
		487	Rubble Pile WKWMA (approximately 483 ft off roadside)
		488	PCB Contamination Area by the C-410 Trailer Complex
		489	Septic Tank North of C-710 Laboratory
		492	Contaminated Soil Area Near Outfall 010
		493	Concrete Rubble Piles Near Outfall 001
		517	Rubble and Debris Erosion Control Fill Area
		518	Field South of C-746-P1 Clean Scrap Yard
		520	Scrap Material West of C-746-A
		531	Aluminum Slag Reacting Area (C-746-H4) near the C-746-A Facility
		541	Contaminated Soil Area South of Outfall 011
		561	Soil Pile I
		562	Soil Piles C, D, E, F, G, H, J, K, and P in subunit 1 north of Soil Pile I on the west bank of Little Bayou Creek
563	Soil Piles 20, CC, and BW in subunit 4 north of outfall 012 west of Little Bayou Creek		
564	Soil Pile AT in subunit 5 that consists of three soil areas on the east side of the North-South Diversion Ditch north of the P-, S-, and T-Landfills		
565	Rubble Area KY-19 (along Bayou Creek north of C-611 Water Treatment Plant) ³		
567	Soil Pile K013 near Outfall 013, West of Little Bayou Creek		
SOILS AND SLABS			
Soils and Slabs OU (Continued)		16	C-746-D Classified Scrap Yard
		20	C-410-E Emergency Holding Pond slab and underlying soils
		27	C-722 Acid Neutralization Tank
		28	C-712 Laboratory Equalization Tank slab and underlying soils
		31	C-720 Compressor Pit Water Storage Tank slab and underlying soils
		32	C-728 Clean Waste Oil Tanks slab and underlying soils
		33	C-728 Motor Cleaning Facility slab and underlying soils
		38	C-615 Sewage Treatment Plant slab and underlying soils
		41	C-410-C Neutralization Tank slab and underlying soils
		42	C-616 Chromate Reduction Facility slab and underlying soils
		55	C-405 Incinerator building slab and underlying soils
		70	C-333-A Vaporizer slab and underlying soils
		71	C-337-A Vaporizer slab and underlying soils
		74	C-340 PCB Transformer Spill Site
75	C-633 PCB Spill Site		

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

SOILS AND SLABS (CONTINUED)			
Operable Unit	Subproject	SWMU No.	Description
Soils and Slabs OU (Continued)		77	C-634-B-Sulfuric Acid Storage Tank slab and underlying soils
		78	C-420 PCB Spill Site
		79	C-611 PCB Spill Site
		82	C-531 Electric Switchyard slab and underlying soils
		83	C-533 Electric Switchyard slab and underlying soils
		84	C-535 Electric Switchyard slab and underlying soils
		85	C-537 Electric Switchyard slab and underlying soils
		86	C-631 Pumphouse and Cooling Tower slab and underlying soils
		87	C-633 Pumphouse and Cooling Tower slab and underlying soils
		88	C-635 Pumphouse and Cooling Tower slab and underlying soils
		89	C-637 Pumphouse and Cooling Tower slab and underlying soils
		99 A	C-745 Kellogg Bldg. Site-Cylinder Yard
		135	C-333 PCB Soil Contamination (North Side)
		137	C-746-A Inactive PCB Transformer Sump Area ⁶
		154	C-331 PCB Soil Contamination (Southeast)
		155	C-333 PCB Soil Contamination (West)
		159	C-746-H3 Storage Pad slab and underlying soils
		161	C-743-T-01 Trailer Site (Soil Backfill)
		162	C-617-A Sanitary Water Line (Soil Backfill)
		166	C-100 Trailer Complex Soil Contamination (East Side)
		167	C-720 White Room Sump slab and underlying soils
		172	C-726 Sandblasting Facility slab and underlying soils
		176	C-331 RCW Leak Northwest Side
		177	C-331 RCW Leak East Side
		178	C-724-A Paint Spray Booth slab and underlying soils
		179	Plant Sanitary Sewer System
		192	C-710 Acid Interceptor Pit slab and underlying soils
		198	C-410-D Area Soil Contamination slab and underlying soils
		209	C-720 Compressor Shop Pit Sump slab and underlying soils
		211 B	C-720 TCE Spill Site Southeast
		218	OS-07 slab and underlying soils
		220	OS-09 slab and underlying soils
		223	OS-12 slab and underlying soils
		226	OS-15
		463	C-746-A East End Smelter slab and underlying soils
		464	C-746-A West End Smelter building slab and underlying soils
		469	C-745-J Yard
		470	C-746-V Yard
		474	West of Vortec Site
		477	C-340 Metals Plant building slab and underlying soils
		478	C-410/420 Feed Plant building slab and underlying soils
		482	C-415 Feed Plant Storage Building slab and underlying soils
		483	Nitrogen Generating Facilities slab and underlying soils

⁶ SWMU 137 was evaluated as part of the American Recovery and Reinvestment Act and the Soils OU. SWMU 137 will be addressed as part of Soils and Slabs OU.

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

SOILS AND SLABS (CONTINUED)			
Operable Unit	Subproject	SWMU No.	Description
Soils and Slabs OU (Continued)		498	C-410/420 Sump at Column D & E-1&2 slab and underlying soils
		499	C-410/420 Sump at Column H-9&10 slab and underlying soils
		500	C-410/420 Sump at Column U-10&11 slab and underlying soils
		501	C-410/420 UF ₆ Scale Pit Sumps A&B slab and underlying soils
		502	C-410/420 Sump at Column U-9 slab and underlying soils
		503	C-410/420 Sump at Column G-1 slab and underlying soils
		504	C-410/420 Sump at Column L-10 slab and underlying soils
		505	C-410/420 Sump at Column A-3N slab and underlying soils
		506	C-410/420 Sump at Column Wa-9 slab and underlying soils
		507	C-410/420 Condensate Tank Pit slab and underlying soils
		508	C-410/420 Settling Basin slab and underlying soils
		509	C-410/420 Drain pit slab and underlying soils
		510	C-410/420 Sump at Column P&Q-2 slab and underlying soils
		511	C-410/420 Sump at Column Q&R-2 slab and underlying soils
		512	C-410/420 Sump at Column R-2 slab and underlying soils
		513	C-411 Cell Maintenance Room Sump slab and underlying soils
		522	C-340 Work Pit at Ground Floor Level (B-7—B-9) slab and underlying soils
523	C-340 Metals Plant Pit at Ground Floor (F-6 to F-11) slab and underlying soils		
524	C-340 Pickling System Sump (B-10 to B-11) slab and underlying soils		
529	C-340 Powder Plant Sump at Ground Floor Level slab and underlying soils		
DECONTAMINATION AND DECOMMISSIONING			
Facility D&D OU	Remaining D&D	The following SWMUs/AOCs or facilities may include multiple smaller facilities. A more detailed listing is included in the following table entitled D&D OU Facilities.	
		33	C-728 Motor Cleaning Facility
		38	C-615 Sewage Treatment Plant
		42	C-616 Chromate Reduction Facility
		70	C-333-A Vaporizer
		71	C-337-A Vaporizer
		82	C-531 Electric Switchyard
		83	C-533 Electric Switchyard
		84	C-535 Electric Switchyard
		85	C-537 Electric Switchyard
		86	C-631 Pumphouse and Cooling Tower
		87	C-633 Pumphouse and Cooling Tower
		88	C-635 Pumphouse and Cooling Tower
		89	C-637 Pumphouse and Cooling Tower
		172	C-726 Sandblasting Facility
		178	C-724-A Paint Spray Booth
		482	C-415 Feed Plant Storage Building
		Other Buildings	C-310, C-310-A, C-315, C-331, C-333, C-333-A, C-335, C-337, C-337-A, C-409, C-600, C-709, C-710, C-720 Process Building tie-lines and bridges will be included with the appropriate process building.

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

DUF₆ FOOTPRINT UNDERLYING SOILS			
DUF ₆ Footprint Underlying Soils OU		164	KPDES Outfall Ditch 017 Flume - Soil Backfill
		183	McGraw UST
		193	McGraw Construction Facilities (Southside Cylinder Yards)
		194	McGraw Construction Facilities (Southside)
FINAL COMPREHENSIVE SITE OPERABLE UNIT			
CSOU ^{7,8}	SWMU No.	Description	
	8	C-746-K Inactive Sanitary Landfill	
	59	NSDD (Inside)	
	91	UF ₆ Cylinder Drop Test Area	
	100	Fire Training Area	

⁷ The FFA, as currently written, contemplates multiple CSOUs, consisting of those associated with integrator units (i.e., groundwater, surface water), and a final CSOU completed after issuance of all final RODs for the site. The FFA parties acknowledge that the scope description is intended to reflect a single CSOU to address all media, and a future FFA modification will be conducted to resolve any inconsistencies between the FFA and Site Management Plan strategy.

⁸ Historically, once an action has been completed for a particular SWMU whereby no additional active response actions are expected, such SWMUs have been placed in the CSOU for further evaluation; however, the FFA parties recognized the need to reach consensus on the criteria for assigning units to the CSOU. As a result, placement of SWMUs 8, 59, 91, and 100 in the CSOU is provisional pending the FFA parties reaching consensus on such criteria.

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

PERMITTED		
	SWMU No.	Description
Permitted	3	C-404 Low-Level Radioactive Waste Burial Ground ⁹
	9	C-746-S Residential Landfill
	10	C-746-T Inert Landfill
	44	C-733 Hazardous Waste Storage Area
	46A	C-746-Q Hazardous and Low-Level Mixed Waste Storage Facility
	207	C-752-A ER Waste Storage Bldg.
	208	C-746-U Solid Waste Contained Landfill

⁹ SWMU 3 was issued only a post-closure permit, was not permitted for construction and operation, and was not an engineered hazardous waste landfill.

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

NO FURTHER ACTION		
SWMU No.	Description	NFA Approval By
12	C-747-A UF ₄ Drum Yard	FFA Managers Agreement– November 17, 2011; FFA Managers Meeting, 4/12/2012
24	C-750-D UST	KDWM (UST Branch) 11/23/1999
25	C-750 1,000-gal Waste Oil Tank (UST)	EPA HSWA Class 1 Permit Mod 3/17/1993—Regulated by RCRA Permit; KDWM (UST Branch) 6/20/1994
29	C-746-B TRU Storage Area	EPA HSWA Class 1 Permit Mod 3/17/1993
34	C-746-M PCB Waste Storage Area	EPA HSWA Class 1 Permit Mod 3/17/1993
35	C-337 PCB Waste Storage Area	EPA HSWA Class 1 Permit Mod 3/17/1993
36	C-337 PCB Waste Staging Area	EPA HSWA Class 1 Permit Mod 3/17/1993
37	C-333 PCB Waste Staging Area	EPA HSWA Class 1 Permit Mod 3/17/1993
39	C-746-B PCB Waste Storage Area	EPA HSWA Class 1 Permit Mod 3/17/1993
43	C-746-B Waste Chemical Storage Area	EPA HSWA Class 1 Permit Mod 3/17/1993; Closed after 1993
45	C-746-R Waste Solvent Storage Area	EPA HSWA Class 1 Permit Mod 3/17/1993; Closed after 1993
46	C-409 Hazardous Waste Pilot Plant ¹⁰	EPA HSWA Class 1 Permit Mod 3/17/1993—Regulated by RCRA Permit; KDWM (Mod #13) 9/26/1997
48	Gold Dissolver Storage Tank (DMSA C400-03)	EPA HSWA Class 1 Permit Mod 3/17/1993; KDWM 7/8/2010
49	C-400-B Waste Solution Storage Tank	EPA HSWA Class 1 Permit Mod 3/17/1993—Regulated by RCRA Permit; KDWM 9/26/1997
50	C-400-C Nickel Stripper Evaporation Tank	EPA HSWA Class 1 Permit Mod 3/17/1993—Regulated by RCRA Permit; KDWM (Mod #13) 9/26/1997
51	C-400-D Lime Precipitation Tank	EPA HSWA Class 1 Permit Mod 3/17/1993—Regulated by RCRA Permit; KDWM (ROC) 8/8/1994
52	C-400 Waste Decontamination Solution Storage Tanks	EPA HSWA Class 1 Permit Mod 3/17/1993
53	C-400 NaOH Precipitation Unit	EPA HSWA Class 1 Permit Mod 3/17/1993
54	C-400 Degreaser Solvent Recovery Unit	EPA HSWA Class 1 Permit Mod 3/17/1993; KDWM 7/8/2010
72	C-200 Underground Gasoline Tanks	EPA HSWA Class 1 Permit Mod 3/17/1993; KDWM (UST C-200A; UST Branch) 11/23/1999

¹⁰ Radiological contamination associated with the sump in this unit will be addressed under the D&D program for the C-409 Stabilization Building.

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

NO FURTHER ACTION (CONTINUED)		
SWMU No.	Description	NFA Approval By
73	C-710 Underground Gasoline Tanks	EPA HSWA Class 1 Permit Mod 3/17/1993; KDWM (UST C-200A; UST C-710; UST Branch) 2/19/2002
90	C-720 Petroleum Naphtha Pipe	KDWM 1/14/2015
96	C-333 Cooling Tower Scrap Wood Pile	EPA HSWA Class 1 Permit Mod 3/17/1993
101	C-340 Hydraulic System	EPA and KDWM 4/2/2015
102A	Plant Storm Sewer—between the south side of the C-400 Building and Outfall 008	EPA and KY via SW Plume ROD 3/16/2012; KDWM 1/14/2015
103	Concrete Rubble Pile (1)	EPA and KY via WAG 17 ROD 9/29/1997
104	Concrete Rubble Pile (2)	EPA and KY via WAG 17 ROD 9/29/1997
110	Concrete Rubble Pile (8)	EPA and KY via WAG 17 ROD 9/29/1997
111	Concrete Rubble Pile (9)	EPA and KY via WAG 17 ROD 9/29/1997
112	Concrete Rubble Pile (10)	EPA and KY via WAG 17 ROD 9/29/1997
114	Concrete Rubble Pile (12)	EPA and KY via WAG 17 ROD 9/29/1997
115	Concrete Rubble Pile (13)	EPA and KY via WAG 17 ROD 9/29/1997
116	Concrete Rubble Pile (14)	EPA and KY via WAG 17 ROD 9/29/1997
117	Concrete Rubble Pile (15)	EPA and KY via WAG 17 ROD 9/29/1997
118	Concrete Rubble Pile (16)	EPA and KY via WAG 17 ROD 9/29/1997
119	Concrete Rubble Pile (17)	EPA and KY via WAG 17 ROD 9/29/1997
120	Concrete Rubble Pile (18)	EPA and KY via WAG 17 ROD 9/29/1997
121	Concrete Rubble Pile (19)	EPA and KY via WAG 17 ROD 9/29/1997
122	Concrete Rubble Pile (20)	WAG 17 RI Work Plan
123	Concrete Rubble Pile (21)	EPA and KY via WAG 17 ROD 9/29/1997
124	Concrete Rubble Pile (22)	EPA and KY via WAG 17 ROD 9/29/1997
125	Concrete Rubble Pile (23)	EPA and KY via WAG 17 ROD 9/29/1997
126	Concrete Rubble Pile (24)	EPA and KY via WAG 17 ROD 9/29/1997
127	Concrete Rubble Pile (25)	EPA and KY via WAG 17 ROD 9/29/1997
128	Concrete Rubble Pile (26)	EPA and KY via WAG 17 ROD 9/29/1997
130	C-611 550-gal Gasoline UST	KDWM 12/6/1996 EPA and KY via WAG 1&7 ROD

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

NO FURTHER ACTION (CONTINUED)		
SWMU No.	Description	NFA Approval By
131	C-611 50-gal Gasoline UST	KDWM 12/6/1996 EPA and KY via WAG 1&7 ROD 8/10/1998
132	C-611 2,000-gal Oil UST	KDWM 12/6/1996 EPA and KY via WAG 1&7 ROD 8/10/1998
133	C-611 (unknown size) Grouted UST	KDWM 12/6/1996 EPA and KY via WAG 1&7 ROD 8/10/1998
134	C-611 1,000-gal Diesel/Gasoline Tank	KDWM 12/6/1996 EPA and KY via WAG 1&7 ROD 8/10/1998
136	C-740 TCE Spill Site	EPA and KY via WAG 1&7 ROD 8/10/1998
139	C-746-A1 UST	KDWM 12/9/2005
140	C-746-A2 UST	KDWM 12/19/1996
141	C-720 Inactive TCE Degreaser	KDWM 8/11/1992; EPA HSWA Class 1 Permit Mod 3/17/1993— Regulated by RCRA Permit;
142	C-750-A 10,000-gal Gasoline Tank (UST)	EPA HSWA Class 1 Permit Mod 3/17/1993—Regulated by RCRA Permit; KDWM 3/25/1999
143	C-750-B 10,000-gal Diesel Tank (UST)	EPA HSWA Class 1 Permit Mod 3/17/1993; KDWM 3/25/1999
144	C-746-A Hazardous and Mixed Waste Storage Facility	KDWM 10/10/2011
146	Concrete Rubble Pile (40)	EPA and KY via WAG 17 ROD 9/29/1997
147	Concrete Rubble Pile (41)	EPA and KY via WAG 17 ROD 9/29/1997
148	Concrete Rubble Pile (42)	EPA and KY via WAG 17 ROD 9/29/1997
149	Concrete Rubble Pile (43)	EPA and KY via WAG 17 ROD 9/29/1997
150	Concrete Rubble Pile (44)	EPA and KY via WAG 17 ROD 9/29/1997
151	Concrete Rubble Pile (45)	EPA and KY via WAG 17 ROD 9/29/1997
152	Concrete Rubble Pile (46)	EPA and KY via WAG 17 ROD 9/29/1997
173	C-746-A Trash-Sorting Facility	EPA HSWA Class 1 Permit Mod 3/17/1993; KDWM 12/18/1992
174	C-745-K Low-Level Storage Area	EPA HSWA Class 1 Permit Mod 3/17/1993; KDWM 2/22/1993
184	Concrete Rubble Pile (29)	EPA and KY via WAG 17 ROD 9/29/1997
186	C-751 Fuel Facility	KDWM 10/20/1993
187	C-611 Septic System	KDWM 10/20/1993
188	C-633 Septic System	KDWM 10/20/1993
189	C-637 Septic System	KDWM 10/20/1993
190	C-337A Sewage Treatment Aeration Tank	KDWM 10/20/1993
191	C-333-A Sewage Treatment Aeration Tank	KDWM 10/20/1993

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

NO FURTHER ACTION (CONTINUED)		
SWMU No.	Description	NFA Approval By
197	Concrete Rubble Pile (30)	EPA and KY via WAG 17 ROD 9/29/1997
206	C-753-A Toxic Substances Control Act Waste Storage Bldg.	KDWM 3/7/1997
208	C-746-U Solid Waste Contained Landfill	KDWM 3/7/1997
360	C-535	KDWM 1/4/2006
361	C-727-90 day	KDWM 8/28/2007
362	G-310-04	KDWM 8/28/2007
363	G-331-03	KDWM 6/29/2004
364	G-331-05	KDWM 6/29/2004
365	G-333-02	KDWM 5/12/2003
366	G-333-03	KDWM 5/12/2003
367	G-333-04	KDWM 5/12/2003
368	G-333-08	KDWM 6/29/2004
369	G-333-10	KDWM 5/12/2003
370	G-333-20	KDWM 5/12/2003
371	G-335-01	KDWM 1/4/2006
372	G-337-02	KDWM 9/11/2003
373	G-337-03	KDWM 9/11/2003
374	G-337-13	KDWM 9/11/2003
375	G-337-14	KDWM 9/11/2003
376	G-337-15	KDWM 9/11/2003
377	C-337-22	KDWM 1/4/2006
378	G-340-01	EPA and KDWM 4/02/2015
379	G-340-03	EPA and KDWM 4/02/2015
380	G-340-04	EPA and KDWM 4/02/2015
381	G-340-05	EPA and KDWM 4/02/2015
382	G-340-06	KDWM 8/28/2007
383	G-400-01	KDWM 5/12/2003
384	G-400-02	KDWM 5/12/2003
385	G-409-25	KDWM 5/12/2003
386	G-410-01	KDWM 8/28/2007
387	C-416-01	KDWM 8/28/2007
388	C-416 Decontamination Pad	KDWM 4/12/2004
389	G-533-01	KDWM 6/29/2004
390	G-535-02	KDWM 6/29/2004
391	G-537-01	KDWM 1/4/2006
392	G-540-A-01	KDWM 2/14/2006
393	G-540-A-1-02	KDWM 2/14/2006
394	G-541-A-01	KDWM 4/12/2004
395	G-600-01	KDWM 3/8/2007
396	C-611-U-01	KDWM 3/8/2007
397	G-612-01	KDWM 3/8/2007
398	G-612-02	KDWM 3/8/2007
399	G-612-A-01	KDWM 3/8/2007
400	G-635-01	KDWM 3/8/2007
401	G-710	KDWM 1/4/2006
402	G-710-04	KDWM 9/11/2003
403	G-710-20	KDWM 1/4/2006
404	G-710-24	KDWM 9/11/2003
405	G-720-22	KDWM 2/14/2003
406	G-743-T-17-01	KDWM 6/29/2004
407	G-743-T-17-02	KDWM 3/8/2007

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

NO FURTHER ACTION (CONTINUED)		
SWMU No.	Description	NFA Approval By
408	G-745-B-01	KDWM 3/8/2007
409	G-745-T-01	KDWM 2/14/2006
410	G-746-G-01	KDWM 6/29/2004
411	G-746-G-1-01	KDWM 3/8/2007
412	G-746-G-2-01	KDWM 11/1/2004
413	G-746-G-3-01	KDWM 11/1/2004
414	G-746-F-01	KDWM 1/4/2006
415	G-746-S-01	KDWM 8/28/2007
416	G-746-X-01 (PCBs)	KDWM 3/8/2007
417	G-746-X-01 (Asbestos)	KDWM 3/8/2007
418	G-748-B-01	KDWM 6/29/2004
419	G-752-C-01	KDWM 8/28/2007
420	G-752-C-02	KDWM 3/8/2007
421	G-754-01	KDWM 1/4/2006
422	G-755-A-01	KDWM 1/28/2004
423	G-755-C-01	KDWM 1/28/2004
424	G-755-T-07-01	KDWM 1/28/2004
425	G-755-T-08	KDWM 1/28/2004
426	G-755-T-2-3-01	KDWM 1/28/2004
427	G-755-T-3-1-01	KDWM 1/28/2004
428	G-755-T-3-2-01	KDWM 1/28/2004
429	S-310-04	KDWM 8/28/2007
430	S-331-02	KDWM 1/4/2006
431	S-333-12	KDWM 5/12/2003
432	S-335-09	KDWM 11/23/2004
433	S-337-11	KDWM 9/11/2003
434	S-340-01	EPA and KY 4/2/2015
435	S-409-100	KDWM 5/12/2003
436	S-409-20	KDWM 5/12/2003
437	S-409-40	KDWM 5/12/2003
438	S-409-60	KDWM 5/12/2003
439	S-409-80	KDWM 5/12/2003
440	S-410-05	KDWM 8/28/2007
441	S-540-A-2-01	KDWM 6/29/2004
442	S-612-01	KDWM 2/14/2006
443	S-709-01	KDWM 6/29/2004
444	S-709-02	KDWM 6/29/2004
445	S-710-05	KDWM 2/14/2006
446	S-710-06	KDWM 9/11/2003
447	S-710-09	KDWM 1/4/2006
448	S-710-16	KDWM 9/11/2003
449	S-710-18	KDWM 9/11/2003
450	S-710-32	KDWM 1/4/2006
451	S-710-41	KDWM 9/11/2003
452	S-710-44	KDWM 1/4/2006
453	S-710-46	KDWM 9/11/2003
454	S-743-T-17-01	KDWM 2/14/2006
455	S-755-T-16-01	KDWM 1/28/2004
456	S-755-T-16-02	KDWM 1/28/2004
457	S-755-T-16-03	KDWM 1/28/2004
458	S-755-T-2-3-01	KDWM 1/28/2004
459	S-755-T-3-1-01	KDWM 1/28/2004

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

NO FURTHER ACTION (CONTINUED)		
SWMU No.	Description	NFA Approval By
460	S-755-T-3-2-01	KDWM 1/28/2004
461	S-755-T-3-2-02	KDWM 1/28/2004
462	S-755-T-3-2-03	KDWM 1/28/2004
465	Yard Rubble Pile and Crushate Storage Area (G-Yard)	KDWM 10/13/2009
466	South of Dyke Road, Pond Area	KDWM 8/17/2009
467	Concrete Cylinder Holders Storage Area on Western Kentucky Wildlife Management Area	KDWM 8/17/2009
468	Area Northwest of Outfall 015	KDWM 2/14/2006
471	Outside C-746-B South Storage Area	KDWM 8/17/2009
473	C-746-B Pad, West	KDWM 8/28/2007
475	C-745-G5-01 (Paint Enclosure)	KDWM 2/14/2006
476	Concrete Crusher	KDWM 2/14/2006
479	C-204 Disintegrator Building	KDWM 6/3/2002
481	C-410-A Hydrogen Holder	KDWM 4/2/2002
484	C-611-M Storage Tank	KDWM 8/30/2002
485	C-611-N Sanitary Water Storage	KDWM 2/18/2002
490	McGraw Fuel Facility Waste Oil Storage Tank	KDWM 12/21/2001
491	Mercury Spill at the C-611 Water Treatment Plant Vault	KDWM 3/22/2004
494	Ash Receiver Area in C-410/420	KDWM 6/3/2016; EPA 6/9/2016
495	C-410-I Ash Receiver Shed	KDWM 6/3/2016; EPA 6/9/2016
496	C-410 Fluorine/Hydrogen Filters (Northeast Mezzanine)	KDWM 6/3/2016; EPA 6/9/2016
497	C-410/420 F ₂ Cell Neutralization Room Vats	KDWM 6/3/2016; EPA 6/9/2016
514	C-340 Magnesium Fluoride Reject Silo	EPA and KY 4/2/2015
515	C-340 "Dirty" Dust Collection System	EPA and KY 4/2/2015
516	C-340 Derby Preparation Area Sludge Collection System	EPA and KY 4/2/2015
519	C-410 Sulfuric Acid Tank (C-634-B)	KDWM 1/10/2003
521	C-340 Saw System Degreaser	EPA and KY 4/2/2015
525	Concrete Water Tower Supports (KOW)	KDWM 8/28/2007
527	C-410 GSA/SAA at Column J-6	KDWM 8/28/2007
528	GSA/SAA at the Northwest corner of C-745-G3 Paint Enclosure	KDWM 2/14/2006
530	Soil and Debris Storage Area by C-745-T Yard	KDWM 3/8/2007
532	Photographic Solution Treatment Area in the C-102 Building	KDWM 5/21/2003
534	UST #18, within SWMU 193	KDWM (UST Branch) 12/4/2007
535	S-755-T08-01 (Satellite Accumulation Area at C-755, Trailer 8)	KDWM 2/14/2006
536	Concrete Truck Washout Area	KDWM 6/27/2002
537	S-400-001 (SAA Located Outside at the Southeast Corner of the C-400 Building)	KDWM 2/14/2006
538	S-MST-01-01 & S-MST-01-02 (Mobile Trailer 01)	KDWM 2/14/2006
539	S-MST-02-01 & S-MST-02-02 (Mobile Trailer 02)	KDWM 2/14/2006
540	S-MST-03-01 & S-MST-03-02 (Mobile Trailer 03)	KDWM 2/14/2006
542 A	G-746-B-01; S-746-B-01; S-746-B-02 (GSA/SAA's located outside C-746-A)	KDWM 1/28/2004
542 B	G-746-A-01; S-746-A-01; S-746-A-02 (GSA/SAA's located outside C-746-A)	KDWM 1/28/2004
543	T-746-S-01 (90-Day Storage Area)	KDWM 1/28/2004
544	T-752-C-01 (90-Day Storage Area)	KDWM 1/28/2004
545	C-755-T-22-01 and G-755-T-22	KDWM 1/28/2004
546	PGDP Post 67 Diesel Fuel Spill Area	KDWM 2/14/2006
547	PGDP Post 38 Diesel Spill Area	KDWM 2/14/2006
548	Staging Area for Concrete Piers, Wood and Rubble North Side of C-745-B Cylinder Yard	KDWM 8/28/2007

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

NO FURTHER ACTION (CONTINUED)		
SWMU No.	Description	NFA Approval By
551	C-755-GSA-23 Located at C-755 near the East Fence Line	KDWM 8/28/2007
552	C-760 90-Day Accumulation Area	KDWM 3/28/2007
566	H-340-01	KDWM 12/02/2010
568	C-340 ST-90 Boxes	KDWM 12/02/2010
569	C-743-T-17 Sample Return Refrigerator	KDWM 5/24/2012
570	Sample Return Sealand	KDWM 5/24/2012

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

PENDING NO FURTHER ACTION DECISION	
SWMU No.	Description
	TBD
SWMUs THAT WILL BE INVESTIGATED AND REMEDIATED BY THE U.S. ARMY CORPS OF ENGINEERS¹¹	
94	KOW Trickling Filter and Leach Field
95	KOW Burn Area
157	KOW Toluene Spill Area
182	Western Portion of Yellow Water Line

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

CSOU = Comprehensive Site Operable Unit

D&D = decontamination and decommissioning

EPA = U.S. Environmental Protection Agency

ER = environmental remediation

FFA = Federal Facility Agreement

FY = fiscal year

GDP = gaseous diffusion plant

GSA = generator staging area

HSWA = Hazardous and Solid Waste Amendments

HVAC = heating, ventilating, and air-conditioning

KDWM = Kentucky Division of Waste Management

KOW = Kentucky Ordinance Works

KPDES = Kentucky Pollutant Discharge Elimination System

KY = Kentucky

NFA = no further action

NSDD = North-South Diversion Ditch

OU = operable unit

PCB = polychlorinated biphenyl

PGDP = Paducah Gaseous Diffusion Plant

RCW = recirculating cooling water

ROD = record of decision

SAA = satellite accumulation area

SAP = Sampling and Analysis Plan

SWMU = solid waste management unit

SWOU = Surface Water Operable Unit

TBD = to be determined

TCE = trichloroethene

TSCA = Toxic Substances Control Act

UST = underground storage tank

WAG = waste area group

WKWMA = West Kentucky Wildlife Management Area

¹¹ The Corps of Engineers accepted responsibility for the investigation/remediation of these SWMUs in a letter dated March 13, 1996. EPA review/approval of the CERCLA documentation (not yet available) associated with these SWMUs has not occurred.

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

D&D OU FACILITIES					
Facility Number	Description	SWMU/AOC Number	Facility Status	Integrated Site Evaluation (SE) Complete	CERCLA NTCRA Required
Gaseous Diffusion Process Facilities and Process Building Tie Lines and Bridges					
C-310	Purge and Product Building	--	Deactivating	No	Pending SE
C-310-A	Product Withdrawal Building	--	Deactivating	No	Pending SE
C-315	Surge and Waste Building	--	Deactivating	No	Pending SE
C-331	Process Building	--	Deactivating	No	Pending SE
C-333	Process Building	--	Deactivating	No	Pending SE
C-333-A	Feed Vaporization Facility	70	Deactivating	8/24/1987	Yes
C-335	Process Building	--	Deactivating	No	Pending SE
C-337	Process Building	--	Deactivating	No	Pending SE
C-337-A	Feed Vaporization Facility	71	Deactivating	8/24/1987	Yes
C-310-331	Tie-Line	--	Deactivating	No	Pending SE
C-310-331-A	Bridge (Enclosed)	--	Deactivating	No	Pending SE
C-310-331-B	Tie-Line	--	Deactivating	No	Pending SE
C-315-331	Tie-Line	--	Deactivating	No	Pending SE
C-331-333-A	Bridge (Enclosed—300 ft)	--	Deactivating	No	Pending SE
C-331-333-B	Tie-Line (West)	--	Deactivating	No	Pending SE
C-331-333-C	Tie-Line (East)	--	Deactivating	No	Pending SE
C-331-335	Tie-Line	--	Deactivating	No	Pending SE
C-335-337-A	Bridge (Enclosed)	--	Deactivating	No	Pending SE
C-335-337-B	Tie-Line (North)	--	Deactivating	No	Pending SE
C-335-337-C	Tie-Line (South)	--	Deactivating	No	Pending SE
Process Support Facilities					
C-409	Stabilization Building	--	Deactivating	No	Pending SE
C-415	Feed Plant Storage	482	Shutdown	7/18/2001	Yes
C-600	Steam Plant	--	Shutdown	No	Pending SE
Switchyards					
C-531-1	Switch House	82	Operating	8/24/1987	Yes
C-531-2	Switchyard	82	Operating	8/24/1987	Yes
C-531-3A	Fire Valve House No. 1	82	Operating	8/24/1987	Yes
C-531-3B	Fire Valve House No. 2	82	Operating	8/24/1987	Yes
C-532	Relay House	82	Operating	8/24/1987	Yes
C-533-1	Switch House	83	Operating	8/24/1987	Yes
C-533-2	Switchyard	83	Operating	8/24/1987	Yes

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

D&D OU FACILITIES					
Facility Number	Description	SWMU/AOC Number	Facility Status	Integrated Site Evaluation (SE) Complete	CERCLA NTCRA Required
Switchyards (Continued)					
C-533-3A	Fire Valve House No. 1	83	Operating	8/24/1987	Yes
C-533-3B	Fire Valve House No. 2	83	Operating	8/24/1987	Yes
C-533-3C	Fire Valve House No. 3	83	Operating	8/24/1987	Yes
C-533-3D	Fire Valve House No. 4	83	Operating	8/24/1987	Yes
C-535-1	Switch House	84	Operating	8/24/1987	Yes
C-535-2	Switchyard	84	Operating	8/24/1987	Yes
C-535-3A	Fire Valve House No. 1	84	Operating	8/24/1987	Yes
C-535-3B	Fire Valve House No. 2	84	Operating	8/24/1987	Yes
C-535-4	Test Shop (Maintenance Office)	84	Operating	8/24/1987	Yes
C-536	Relay House	84	Operating	8/24/1987	Yes
C-537-1	Switch House	85	Operating	8/24/1987	Yes
C-537-2	Switchyard	85	Operating	8/24/1987	Yes
C-537-3A	Fire Valve House No. 1	85	Operating	8/24/1987	Yes
C-537-3B	Fire Valve House No. 2	85	Operating	8/24/1987	Yes
C-537-3C	Fire Valve House No. 3	85	Operating	8/24/1987	Yes
C-537-3D	Fire Valve House No. 4	85	Operating	8/24/1987	Yes
C-537-4	Test Shop	85	Operating	8/24/1987	Yes
C-540-A	Oil Pump House	83	Operating	8/24/1987	Yes
C-541-A	Oil Pump House	84	Operating	8/24/1987	Yes
Cooling Towers					
C-631-1	Pump House	86	Operating	8/24/1987	Yes
C-631-2	Cooling Tower	86	Operating	8/24/1987	Yes
C-631-3	Fire Water Pump House	86	Operating	8/24/1987	Yes
C-631-4	Blending Pump House	86	Operating	8/24/1987	Yes
C-631-5	Blending Cooling Tower (West)	86	Operating	8/24/1987	Yes
C-631-6	Blending Cooling Tower (East)	86	Operating	8/24/1987	Yes
C-633-1	Pump House	87	Deactivating	8/24/1987	Yes
C-633-2A	Cooling Tower (South)	87	Deactivating	8/24/1987	Yes
C-633-2B	Cooling Tower (North)	87	Deactivating	8/24/1987	Yes
C-633-3	Blending Pump House	87	Deactivating	8/24/1987	Yes
C-633-4	Blending Cooling Tower (North)	87	Deactivating	8/24/1987	Yes
C-633-5	Blending Cooling Tower (South)	87	Deactivating	8/24/1987	Yes

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

D&D OU FACILITIES					
Facility Number	Description	SWMU/AOC Number	Facility Status	Integrated Site Evaluation (SE) Complete	CERCLA NTCRA Required
Cooling Towers (Continued)					
C-633-6	Sand Filter Building	87	Deactivating	8/24/1987	Yes
C-635-1	Pump House	88	Deactivating	8/24/1987	Yes
C-635-2	Cooling Tower	88	Deactivating	8/24/1987	Yes
C-635-3	Blending Pump House	88	Deactivating	8/24/1987	Yes
C-635-4	Blending Cooling Tower (North)	88	Deactivating	8/24/1987	Yes
C-635-5	Blending Cooling Tower (South)	88	Deactivating	8/24/1987	Yes
C-637-1	Pump House	89	Deactivating	8/24/1987	Yes
C-637-2A	Cooling Tower (South)	89	Deactivating	8/24/1987	Yes
C-637-2B	Cooling Tower (North)	89	Deactivating	8/24/1987	Yes
C-637-3	Blending Pump House	89	Deactivating	8/24/1987	Yes
C-637-4	Blending Cooling Tower (North)	89	Deactivating	8/24/1987	Yes
C-637-5	Blending Cooling Tower (South)	89	Deactivating	8/24/1987	Yes
C-637-6	Sand Filter Building	89	Deactivating	8/24/1987	Yes
Phosphate (Former Chromate) Reduction System Facilities					
C-616-A	Chemical Feed Building	42	Operating	12/18/91	Yes
C-616-B	Clarifier-East	42	Operating	12/18/91	Yes
C-616-C	Effluent Control Vault	42	Operating	12/18/91	Yes
C-616-D	Sludge Vault and Valve Pit	42	Operating	12/18/91	Yes
C-616-H1	Ferrous Sulfate Storage Tank (East)	42	Operating	12/18/91	Yes
C-616-H2	Ferrous Sulfate Storage Tank (West)	42	Operating	12/18/91	Yes
C-616-J	Reduction Tank (East)	42	Operating	12/18/91	Yes
C-616-K	Service Building	42	Operating	12/18/91	Yes
C-616-L	Lift Station	42	Operating	12/18/91	Yes
C-616-M	Clarifier (West)	42	Operating	12/18/91	Yes
C-616-N	Reduction Tank (West)	42	Operating	12/18/91	Yes
C-616-P	Sludge Vault and Valve Pit	42	Operating	12/18/91	Yes
Sewage System Facilities					
C-615-A	Primary Settling Tank/Catch Basin	38	Operating	8/24/87	Yes
C-615-B	Final Settling Tank/Catch Basin	38	Operating	8/24/87	Yes
C-615-C	Sewage Plant Monitoring Building	38	Operating	8/24/87	Yes
C-615-D	Digester	38	Operating	8/24/87	Yes
C-615-E	Trickling Filter	38	Operating	8/24/87	Yes
C-615-F	Dry Bed for Trickling Filter	38	Operating	8/24/87	Yes

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Table A.1. Solid Waste Management Units/Areas of Concern by Operable Unit* (Continued)

D&D OU FACILITIES					
Facility Number	Description	SWMU/AOC Number	Facility Status	Integrated Site Evaluation (SE) Complete	CERCLA NTCRA Required
Process Laboratory and Maintenance Facilities					
C-709	Plant Laboratory Annex	--	Operating	No	Pending SE
C-710	Technical Services Building/Lab	--	Operating	No	Pending SE
C-720	Maintenance and Storage Building	--	Operating	No	Pending SE
C-724-A	Carpenter Shop Annex	178	Operating	01/25/93	Yes
C-726	Sandblast Building	172	Standby	10/29/92	Yes
C-728	Motor Cleaning Facility	33	Operating	6/2/15	Yes

AOC = area of concern

D&D = Decontamination and Decommissioning

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

NTCRA = non-time-critical removal action

SE = site evaluation

SWMU = solid waste management unit

Operating—Facility is currently in use supporting U.S. Department of Energy mission activities.

Standby—Facility is currently not in use but may be utilized to support future U.S. Department of Energy mission activities.

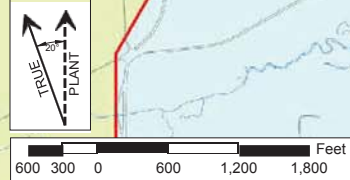
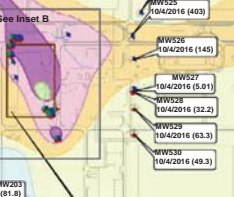
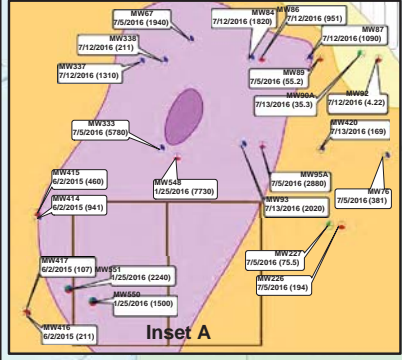
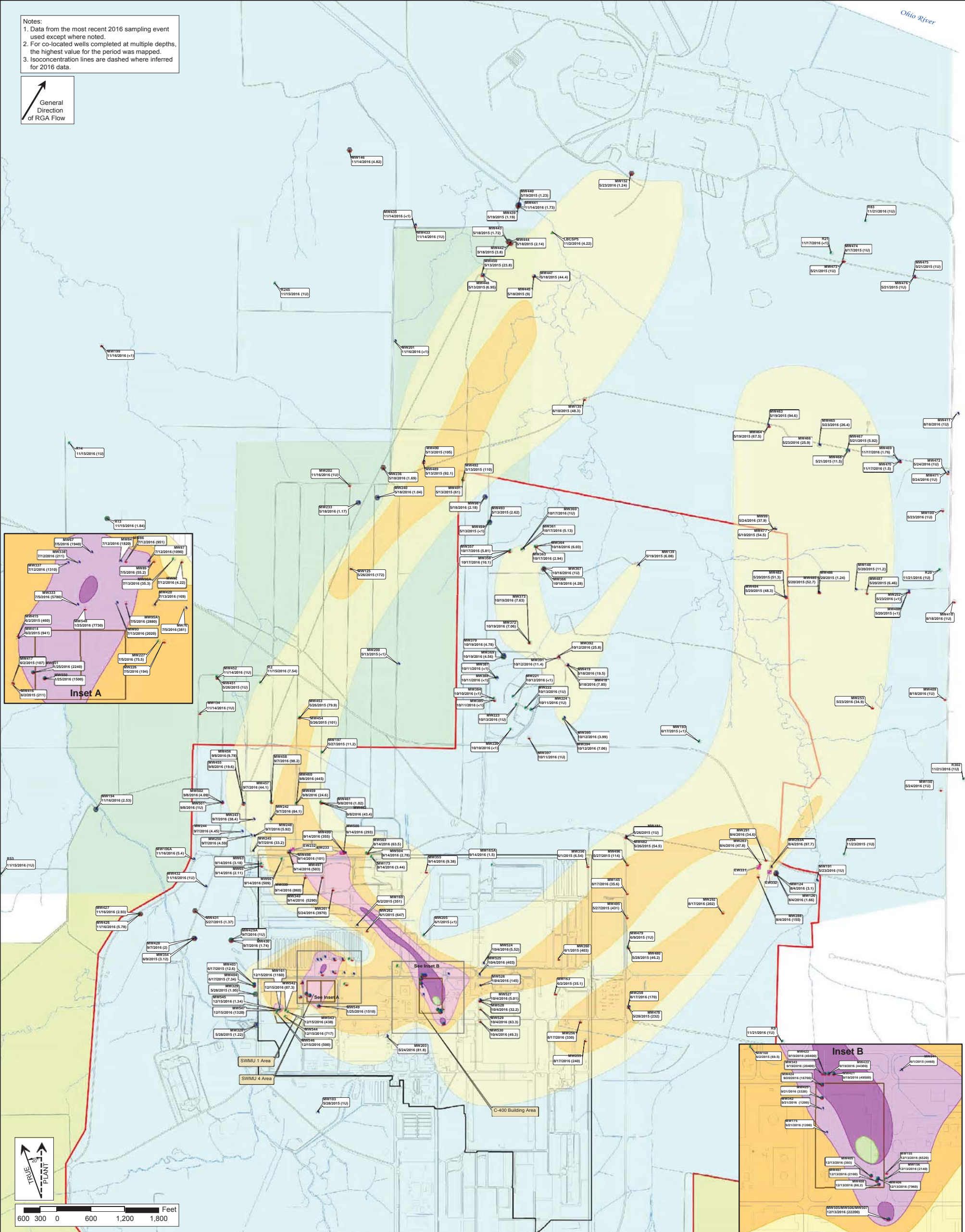
Shutdown—Facility is not being maintained for future use but has not yet begun deactivation activities.

Deactivating—Deactivation activities have been initiated.

Deactivation Complete—Awaiting decommissioning.

* Information is taken from the Site Management Plan, DOE/LX/07-2418&D2, April 2018

Notes:
 1. Data from the most recent 2016 sampling event used except where noted.
 2. For co-located wells completed at multiple depths, the highest value for the period was mapped.
 3. Isoconcentration lines are dashed where inferred for 2016 data.



LEGEND

- MW101 01/12/2016 (1U)
- Monitoring Well Identification, Date of Sample, and Sample Value (in µg/L)
- 1U = not detected at a reporting limit of 1 µg/L
- <1 indicates detected at a value less than the reporting limit.
- Lower RGA Well
- Middle RGA Well
- Upper RGA Well
- Multizone RGA Well
- Extraction Well
- RGA Well outside Plume Concentration Field showing TCE > 1 µg/L
- Water Policy Area
- West Kentucky Wildlife Management Area
- DOE Property Boundary
- Roadways
- Streams
- PGDP Boundary

- 2016 TCE Plume Concentration Fields**
- 5 - 100 µg/L
 - 100 - 1,000 µg/L
 - 1,000 - 10,000 µg/L
 - 10,000 - 100,000 µg/L
 - ≥ 100,000 µg/L



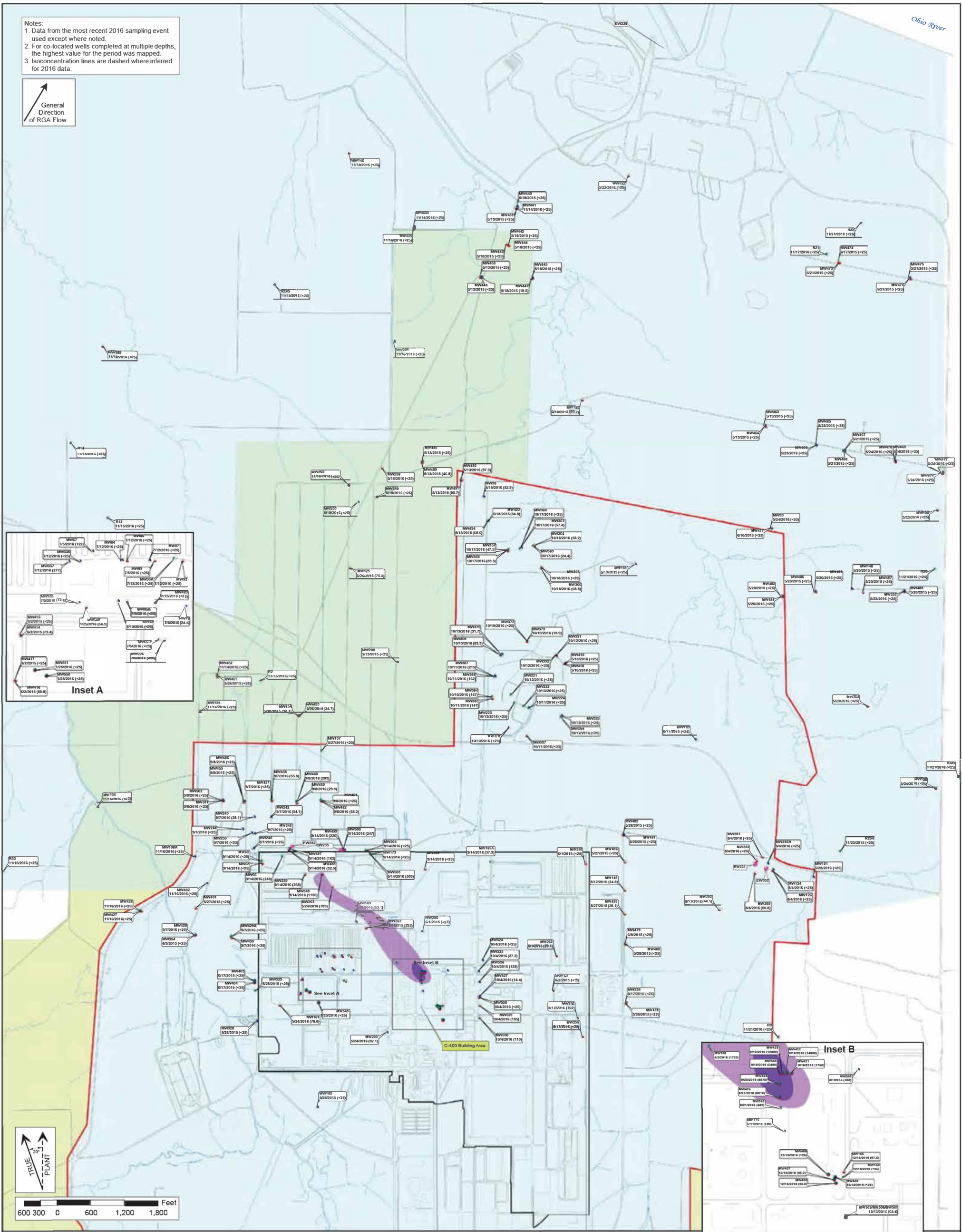
U.S. DEPARTMENT OF ENERGY
 PORTSMOUTH / PADUCAH PROJECT OFFICE
 PADUCAH GASEOUS DIFFUSION PLANT

Figure A.3. 2016 TCE Plume—Regional Gravel Aquifer

FILE NAME:	PROJECT #:	SCALE:	DATE:
Fig_C01_2016PlumesTCE	EM	AS NOTED	4/28/2017

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- Notes:
1. Data from the most recent 2016 sampling event used except where noted.
 2. For co-located wells completed at multiple depths, the highest value for the period was mapped.
 3. Isoconcentration lines are dashed where inferred for 2016 data.



LEGEND

2016 Tc-99 Plume Concentration Fields

- 900 - 3,790 pCi/L
- ≥ 3,790 pCi/L

- Monitoring Well Identification, Date of Sample, and Sample Value
- Lower RGA Well
- Middle RGA Well
- Upper RGA Well
- Multizone RGA Well
- Extraction Well

- Water Policy Area
- West Kentucky Wildlife Management Area
- DOE Property Boundary
- Roadways
- Streams
- PGDP Boundary



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PORTSMOUTH / PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

Figure A.4. 2016 Tc-99 Plume—Regional Gravel Aquifer

FILE NAME: Fig_C02_2016PlumesTc99	PROJECT #: EM	SCALE: AS NOTED	DATE: 4/28/2017
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A-31

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APPENDIX B

U.S. DEPARTMENT OF ENERGY CONTRACTOR PROCEDURES

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Table B.1. U.S. Department of Energy Contractor Procedures

Project-Wide Procedures		
Procedure Number	Procedure Title	Comments
PAD-REG-1005	<i>Spill Prevention, Control, and Countermeasure Plan for the U.S. Department of Energy Paducah Site, McCracken County, Kentucky</i>	D&R Contractor Program
CP2-RA-0014	<i>Environmental Compliance and Protection Program Description at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
CP2-RA-0015	<i>Paducah Gaseous Diffusion Plant Facility Response Plan in Accordance with the Oil Pollution Act of 1990</i>	D&R Contractor Plan
CP2-ES-0005	<i>Pollution Prevention/Waste Minimization Plan for the Deactivation and Remediation Project, Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
CP2-HS-2000	<i>Worker Safety and Health Program for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Plan
CP2-QA-1000	<i>Quality Assurance Program Description for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Plan
CP2-SM-1000	<i>Activity Level Work Planning and Control Program for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
SST-06.01.01	<i>Paducah Work Control Process</i>	SST Procedure
CP2-EN-0201	<i>Configuration Management Program Description at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
CP3-OP-1118	<i>Facility Management</i>	D&R Contractor Procedure
CP3-QA-1006	<i>Suspect/Counterfeit Items</i>	D&R Contractor Procedure
Environment, Safety, and Health Procedures		
Procedure Number	Procedure Title	Comments
CP1-HS-1000	<i>Integrated Safety Management System Description for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Policy
CP2-HS-2000	<i>Worker Safety and Health Program for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
CP3-EN-0227	<i>Trenching, Excavation, and Penetration Permit</i>	D&R Contractor Procedure
CP3-HS-2003	<i>Hazard Communication</i>	D&R Contractor Procedure
CP3-FR-2006	<i>Fire Hazard Analysis and Facility Assessment</i>	D&R Contractor Procedure
CP3-FP-2005	<i>Welding, Burning, and Hotwork</i>	D&R Contractor Procedure
SST-03.02.06	<i>Welding, Burning, and Hotwork</i>	SST Procedure
SST-03.02.11	<i>Defective Equipment Tags</i>	SST Procedure
SST-03.02.12	<i>Confined Space Program</i>	SST Procedure
SST-11.02.03	<i>Excavation-Penetration Activities</i>	SST Procedure
CP3-HS-2010	<i>Instructions for Lockout/Tagout</i>	D&R Contractor Procedure
CP3-HS-2008	<i>Accident Prevention Equipment Control Tags</i>	D&R Contractor Procedure
Uranium Program Procedures		
Procedure Number	Procedure Title	Comments
DUF6-BWCS-PLN-117	<i>Paducah Groundwater Protection Plan</i>	MCS/DUF6 Plan
DUF6-PLN-079	<i>Paducah Storm Water Pollution Prevention and Best Management Practices Plan</i>	MCS/DUF6 Plan

Table B.1. U.S. Department of Energy Contractor Procedures (Continued)

Transportation Procedures		
Procedure Number	Procedure Title	Comments
DUF6-U-WMP-2001	<i>Shipping</i>	MCS/DUF6 Procedure
DUF6-U-WMP-2003	<i>Hydrogen Fluoride (HF) Shipping</i>	MCS/DUF6 Procedure
CP2-WM-0025	<i>Four Rivers Nuclear Partnership, LLC, Paducah Deactivation and Remediation Project Transportation Security Plan for the Transport of Hazardous Materials in Commerce</i>	D&R Contractor Program
CP2-WM-0661	<i>Four Rivers Nuclear Partnership, LLC, Paducah Deactivation and Remediation Project Transportation Safety Document for On-Site Transport</i>	D&R Contractor Plan
Waste Management Procedures		
Procedure Number	Procedure Title	Comments
CP2-WM-0001	<i>Four Rivers Nuclear Partnership, LLC Paducah Deactivation and Remediation Project Waste Management Plan</i>	D&R Contractor Plan
CP3-WM-1017	<i>Safe Handling and Opening of Sealed Containers</i>	D&R Contractor Procedure
CP3-WM-1037	<i>Generation and Temporary Storage of Waste Materials</i>	D&R Contractor Procedure
CP3-QA-2501	<i>Waste Certification</i>	D&R Contractor Procedure
CP3-QA-2500	<i>Procurement, Inspection, and Management of Items Critical for Paducah Off-Site Waste Shipments</i>	D&R Contractor Procedure
SST-03.06.01	<i>Storage and Disposition of Spent Materials</i>	SST Procedure
CP3-WM-3015	<i>Waste Packaging</i>	D&R Contractor Procedure
Data and Sampling Procedures		
Procedure Number	Procedure Title	Comments
CP2-ES-0811	<i>Pesticide and PCB Analyses Data Verification and Validation, Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
CP4-ES-2708	<i>Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals</i>	D&R Contractor Procedure
CP3-ES-5003	<i>Quality Assured Data</i>	D&R Contractor Procedure
CP4-ES-5004	<i>Sample Tracking, Lab Coordination, and Sample Handling</i>	D&R Contractor Procedure
CP4-ES-5007	<i>Data Management Coordination</i>	D&R Contractor Procedure
CP2-ES-5102	<i>Radiochemical Analysis Data Verification and Validation, Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program

Table B.1. U.S. Department of Energy Contractor Procedures (Continued)

Data and Sampling Procedures (Continued)		
Procedure Number	Procedure Title	Comments
CP2-ES-5103	<i>Polychlorinated Dibenzodioxins/Polychlorinated Dibenzofurans Analyses Data Verification and Validation, Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
CP2-ES-5105	<i>Volatile and Semivolatile Analyses Data Verification and Validation, Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program
CP2-ES-5107	<i>Inorganic Analyses Data Verification and Validation, Paducah Gaseous Diffusion Plant, Paducah, Kentucky</i>	D&R Contractor Program

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