Department of Energy

Portsmouth/Paducah Project Office
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513
(859) 219-4000

June 24, 2025

Mr. Brian Begley
Federal Facility Agreement Manager
U.S. Environmental Protection Agency, Region 4
61 Forsyth Street
Atlanta, Georgia 30303

PPPO-02-10033219-25

Ms. April Webb
Interim Federal Facility Agreement Manager
Division of Waste Management
Kentucky Department for Environmental Protection
300 Sower Boulevard, 2nd Floor
Frankfort, Kentucky 40601

Dear Mr. Begley and Ms. Webb:

TRANSMITTAL OF THE LEASING DATA PACKAGE FOR LEASING PARCEL A, PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY DOE/LX/07-2522&D2

References:

1. Email from B. Schaffer to K. Layne, "Parcel A Lease Agreement Legal Comments," dated June 18, 2025
2. Email from B. Schaffer to K. Layne, et al., "Parcel A Lease Agreement Comment," dated June 17, 2025
3. Email from B. Schaffer to K. Layne, et al., "Leasing Parcel A Risk Assessment Comments," dated June 17, 2025
4. Email from S. Smiley to K. Layne, "Mary and Bart's Informal Comments," dated June 12, 2025
5. Email from S. Smiley to K. Layne, "Informal comments pages 1-55," dated June 11, 2025
6. Email from B. Begley to K. Layne, "DRAFT Comments on Parcel A Lease - for discussion purposes," dated June 11, 2025
7. Email from B. Begley to K. Layne, "DRAFT EPA Parcel A Data Leasing Package Comments," dated May 20, 2025
8. Email from B. Begley to K. Layne, "EPA DRAFT PARCEL A Rad Risk Comments," dated May 19, 2025

Documents transmitted contain **CUI//SP-PROCURE**. When separated from enclosures, this letter is not CUI.

The U.S. Department of Energy (DOE) Portsmouth/Paducah Project Office (PPPO) is pleased to submit the enclosed leasing data package in support of the planned lease of approximately 100 acres of real property at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky. Section 3154 of the National Defense Authorization Act of 1993, which amended Section 646 of the Department of Energy Organization Act (42 *U.S.C.* 7256), allows the Secretary of Energy to lease closed or reconfigured property at DOE facilities for economic development. This version of the leasing data package addresses comments received from the U.S. Environmental Protection Agency (EPA) on May 19 and 20, 2025, and June 11, 2025, and Kentucky Division of Waste Management (KDWM) on June 11, 12, 17, and 18, 2025. In addition, revisions have been incorporated from discussions held among the Federal Facility Agreement (FFA) parties on May 21, 2025.

The leasing data package was prepared pursuant to the requirements of 42 U.S.C. 7256(c)–(f), commonly referred to as the "Hall Amendment." The investigation included information gathering and review, visual and physical inspections, interviews with individuals familiar with past and present operations on the property, and data collection and evaluation.

DOE has determined the environmental conditions of the property are such that leasing the property, considering the terms and conditions of the lease agreement, is consistent with safety and the protection of public health and the environment. DOE is seeking EPA concurrence, as well as Commonwealth of Kentucky agreement, with the DOE determination delineated above, taking into consideration the contents and findings contained within the leasing data package.

In accordance with Section XLII of the FFA, in the event DOE determines to enter into any contract for the sale or transfer of any of the site, DOE shall notify EPA and the Kentucky Energy and Environment Cabinet of any such sale or transfer at least 90 days prior to such sale or transfer. DOE provided such notice of the potential lease on March 20, 2025 within the FFA Managers meeting.

DOE PPPO is requesting an expeditious review and concurrence with DOE's determination so that DOE PPPO can continue to advance the lease process.

The lease of DOE property for economic development is consistent with the views of Paducah Site stakeholders. We look forward to working with you on this important revitalization project for the Commonwealth of Kentucky, and in particular for western Kentucky.

If you have any questions or require additional information, please contact me at (270) 217-2029.

Sincerely,

APRIL LADD Digitally signed by APRIL LADD
Date: 2025.06.24 12:09:38 -05'00'

April Ladd
Federal Facility Agreement Manager
Portsmouth/Paducah Project Office

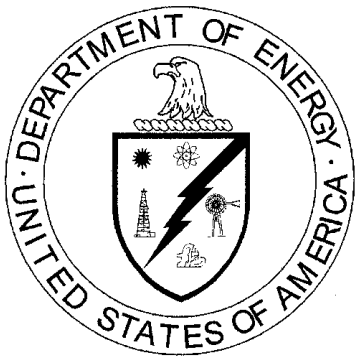
Enclosures:

1. *Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-2522&*D2*
2. Appendix B (Parts 1-5) – *Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-2522&*D2*
3. *Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-2522&*D2*—Redline
4. Comment Response Summary for EPA Comments
5. Comment Response Summary for KDWM Comments
6. Comment Response Summary for Other Changes
7. Redacted Lease Agreement
8. Redacted Lease Agreement – Edited pages based on EPA Comments
9. Comment Response Summary for EPA Comments on Lease Agreement
10. Comment Response Summary for KDWM Comments on Lease Agreement
11. Referenced Emails (Adobe Acrobat PDF)

cc w/enclosures:
abigail.parish@pppo.gov, PPPO
april.ladd@pppo.gov, PPPO
april.webb@ky.gov, KDEP
arcorrespondence@pad.pppo.gov
begley.brian@epa.gov, EPA
bruce.ford@pad.pppo.gov, FRNP
cory.hicks@pad.pppo.gov, FRNP
david.ruckstuhl@pad.pppo.gov, FRNP
frnpcorrespondence@pad.pppo.gov
joel.bradburne@pppo.gov, PPPO
kelly.layne@pppo.gov, ETAS
megan.mulry@pad.pppo.gov, FRNP
mona.dockery@pad.pppo.gov, FRNP
myrna.redfield@pad.ppo.gov, FRNP
nathan.garner@ky.gov, KYRHB
nrepcdep-dwm-hwb-pgdp@ky.gov
pad.rmc@pad.pppo.gov
reinhard.knerr@pppo.gov, PPPO
stephaniec.brock@ky.gov, KYRHB

DOE/LX/07-2522&D2

Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky



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DOE/LX/07-2522&D2

Leasing Data Package for Leasing Parcel A, Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—June 2025

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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CONTENTS

FIGURES

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TABLES

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ACRONYMS

AL	action level
AOC	area of concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	chemical or radionuclide of potential concern
COPEC	chemical or radionuclide of potential ecological concern
DAF	dilution attenuation factor
DL	detection limit
DOE	U.S. Department of Energy
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
FFA	Federal Facility Agreement
FOD	frequency of detection
FOE	frequency of exceedance
GLE	Global Laser Enrichment
HI	hazard index
HMW	high molecular weight
HQ	hazard quotient
KDEP	Kentucky Department for Environmental Protection
KDWM	Kentucky Division of Waste Management
KOW	Kentucky Ordnance Works
KPDES	Kentucky Pollutant Discharge Elimination System
LMW	low molecular weight
MCL	maximum contaminant level
MW	monitoring well
N/A	not applicable
NAL	no action level
NFA	no further action
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
OU	operable unit
PEGASIS	PPPO Environmental Geographic Analytical Spatial Information System
PGDP	Paducah Gaseous Diffusion Plant
PPPO	Portsmouth/Paducah Project Office
PR	peak risk
RCRA	Resource Conservation and Recovery Act
RGA	Regional Gravel Aquifer
RMD	risk methods document
SE	secular equilibrium
SLERA	screening-level ecological risk assessment
SVOC	semivolatile organic compound
SWMU	solid waste management unit
THI	total hazard index
UCL	upper confidence limit
UCRS	Upper Continental Recharge System
U.S.C.	*United States Code*
VOC	volatile organic compound
WKWMA	West Kentucky Wildlife Management Area
XRF	x-ray fluorescence

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CONCLUSIONS

The U.S. Department of Energy (DOE) plans to lease an approximately 100-acre parcel (hereafter referred to as "Leasing Parcel A") located on the southern end of the DOE-owned Paducah Gaseous Diffusion Plant (PGDP). Based on the DOE review of existing information, the environmental conditions of Leasing Parcel A are such that leasing the property is consistent with safety and the protection of public health and the environment. The information reviewed consisted of records searches, which included adjacent property; site history that included the Leasing Parcel A area; and environmental data from previous site/remedial investigations at PGDP. Based on a complete search of agency files, DOE is aware of no record showing the storage of the greater of 1,000 kg or a reportable quantity of any hazardous substance on the Leasehold; DOE does not know of any release of any hazardous substance on the Leasehold in excess of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) reportable quantity; and DOE is not aware of any disposal of hazardous substances on the Leasehold. The Leasehold includes two solid waste management units (SWMUs).[1] Both SWMUs (SWMU 409 and SWMU 530) have been designated for "no further action." The Leasehold has not been subject to CERCLA remedial action; however, the Leasehold is located within a Water Policy-affected area that was developed as the outer-perimeter boundary for a CERCLA non-time critical removal action. The removal action for the Water Policy continues to be effective for the purpose for which it was intended (DOE 2024f).

Based on the evaluation of the data and information gathered, there are some constituents that are present or at concentrations that exceed background (e.g., polychlorinated biphenyls in three of 28 subsurface soil samples with a maximum of 0.3 parts per million), but for future industrial land use, the levels of chemical and radiological constituents in the environmental media do not pose a threat to human health or the environment. The findings of this leasing data package, based on review of information (Sections 2–6), site data (Appendix B), and a risk evaluation (Section 7), is that Leasing Parcel A is suitable for leasing for future industrial land use, as it is protective of the environment and public health and safety.

The lease will include restrictions, covenants, and acknowledgements, including, but not limited to, the following:

- The land use of the Leasehold will be restricted to "Industrial Use" (as defined on the date of lease of the Premises in the McCracken County zoning code[2]).
    - — Examples of industries that may be permitted include heavy manufacturing, processing, and storage, including, but not limited to, the production, processing, storage, and handling of uranium and other radioactive materials, compounds, and all the related constituent parts.
- Leasehold will include limitations that prohibit groundwater extraction and use by the lessee.
    - — Groundwater underlying the Leasehold shall not be extracted, consumed, exposed, or utilized for any purpose, potable or otherwise, or permitted to be extracted, consumed, exposed, or utilized for the same; however, the lessee may install (or cause to be installed) groundwater wells necessary or appropriate to complete its environmental site assessment, to advance project development (including obtaining permits), and project operation (including obtaining permits, for monitoring,

[1] A SWMU is any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which routine and systematic releases of hazardous wastes or hazardous constituents has occurred (EPA 1998a).
[2] As of the date of this document, "industrial use" is defined as industries whose processing of products result in the emission of any atmospheric pollutant, light flashes, glare, odor, noise, or vibration, which may be heard and/or felt off the premises, and those industries that constitute a fire or explosion hazard.

and for any dewatering during shallow excavation and construction activities or subsurface utility installation or repair).

— Groundwater supply wells shall not be installed or utilized on any part of the Leasehold, nor shall the lessee undertake activities that materially adversely affect the subsurface flow direction, velocity, and other comparable hydrogeological characteristics of such groundwater beyond that contemplated for the construction and operation of the lessee's facility, including Leasehold retention pond construction, facility stability, and dewatering.

- Leasehold will include obligation and reporting requirements.

  — Lessee shall, on an annual basis, submit written documentation to DOE verifying compliance with the Groundwater Restriction and Industrial Use Restriction described herein. Groundwater testing by the lessee may require coordination with DOE.

- The Leasehold will provide assurances regarding the property through lease clauses, which includes the following:

  — Lessee shall comply with all requirements mandated by the Nuclear Regulatory Commission (NRC) for completion of the National Environmental Policy Act portion of the NRC licensing process associated with the facility's construction and will pursue all necessary and reasonable studies, permits, and agreements supporting the National Environmental Policy Act environmental review required to commence construction;

  — Services that will be offered to be provided by DOE will be delineated in the leasing agreement;

  — No change in owner or operator of the Paducah Site, or any portion thereof, or notice pursuant to Section 120(h)(3)(B) of CERCLA, 42 *U.S.C.* § 9620(h)(3)(B), relieves DOE of its obligation to perform pursuant to the executed Federal Facility Agreement; and

  — Throughout the lease term, the lessee and DOE activities at the Paducah Site will be coordinated in good faith to ensure that respective activities at the site, including on the leasehold, do not materially adversely affect the operations of the other party in terms of health and safety, environmental protection, safeguards and security, each as established in permits and applicable law.

DOE shall retain all rights of access and ownership to Leasing Parcel A necessary to conduct remedial action on Leasing Parcel A, provided that DOE coordinates such actions with lessee and such actions do not materially disrupt lessee's operations. Upon termination of the lease agreement, and unless DOE in its sole reasonable discretion has approved an alternative use for the Leasehold, the lessee shall remove and decommission all its site improvements and infrastructure located on the surface of the Leasehold in accordance with the decommissioning mandates of its NRC permit or applicable law. The lessee shall also undertake restoration activities by returning all ground cover and soil disturbance on the Leasehold to its preexisting or baseline condition as of the date the lease was executed, except for ordinary wear and tear. Lastly, the lessee shall leave the Leasehold in neat and clean order and restored to a stable ecological state that will assimilate with the surrounding undisturbed ecosystem, with a seeded mix of plants with varying blooming phenology that provides nectar to pollinators for the full blooming season in the area, to the extent those conditions prevail at the time of removal and decommissioning.

1. PROPERTY IDENTIFICATION/REAL PROPERTY SUMMARY

The U.S. Department of Energy (DOE) proposes to lease real property at the Paducah Site on the National Priorities List (NPL) under 42 *U.S.C.* 7256(c)–(f), commonly referred to as the "Hall Amendment." Under 42 *U.S.C.* 7256(e), at NPL sites, the U.S. Environmental Protection Agency (EPA) has the authority to concur in the DOE determination that the terms and conditions of the lease agreement are "consistent with safety and protection of public health and the environment." EPA requires certain information for review and evaluation before concurrence can be given. This information is submitted in the form of a leasing data package that should contain information about the environmental conditions of the property, which includes any potential environmental concerns or risks. A Joint Interim Policy that DOE and EPA entered into on June 21, 1998, provides direction for instances in which Hall Amendment authority is used by DOE to enter into leases at DOE sites that are on EPA's NPL. DOE has prepared this leasing data package to support the lease of approximately 100 acres of land (hereafter referred to as "Leasing Parcel A") (Figure 1). This leasing data package is modeled after the due diligence data gathering requirements of Section 120(h) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which can be used to determine whether leasing the property is consistent with safety and the protection of public health and the environment. In addition, an environmental assessment, the *Paducah Gaseous Diffusion Plant Final Environmental Assessment for Potential Land and Facilities Transfers, McCracken County, Kentucky*, DOE/EA-1927, evaluated the potential transfer of DOE Paducah Site real property for future uses including industrial use (DOE 2015a).

Site evaluations, which include visual and physical walkovers and historical data/risk evaluations, have been conducted for Leasing Parcel A. Based on the site evaluations, DOE does not know of any release of any hazardous substance from the Paducah Gaseous Diffusion Plant (PGDP) on Leasing Parcel A in excess of a CERCLA reportable quantity; and DOE is not aware of any disposal of hazardous substances on Leasing Parcel A. The parcel includes two solid waste management units (SWMUs).[3] Both SWMUs (SWMU 409 and SWMU 530) have been designated for "no further action." Leasing Parcel A has not been subject to CERCLA remedial action; however, it is located within a Water Policy-affected area that was developed as the outer-perimeter boundary for a CERCLA non-time critical removal action. No further investigation is warranted for Leasing Parcel A with the exception of identified SWMUs that are located adjacent to Leasing Parcel A. DOE entered into a Federal Facility Agreement (FFA) with EPA and the Kentucky Department for Environmental Protection (KDEP) on February 13, 1998 (EPA 1998a). A *Site Management Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Annual Revision—FY 2025*, DOE/LX/07-2508&D2, part of the FFA, provides DOE's remedial strategy for the Paducah Site and tracks the status of SWMUs (DOE 2024a).

The estimated 100 acres proposed for leasing includes a utility right-of-way maintained by a private utility company. Figure 1 also delineates the DOE security 229 boundary, referred to as the fenced property protection area.

When developing this leasing data package, the Portsmouth/Paducah Project Office (PPPO) followed guidance in the "Joint DOE/EPA Interim Policy Statement on Leasing Under the 'Hall Amendment'" memorandum (EPA 1998b), CERCLA 120(h), *Protocol for the Environmental Regulatory Processes for the Transfer of Real Property at the U.S. Department of Energy Portsmouth and Paducah Sites VOLUME 1: CERCLA 120(h)(4) – Uncontaminated Property*, PPPO-3329827 (DOE 2024b), and *Protocol*

[3] A SWMU is any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which routine and systematic releases of hazardous wastes or hazardous constituents have occurred (EPA 1998a).

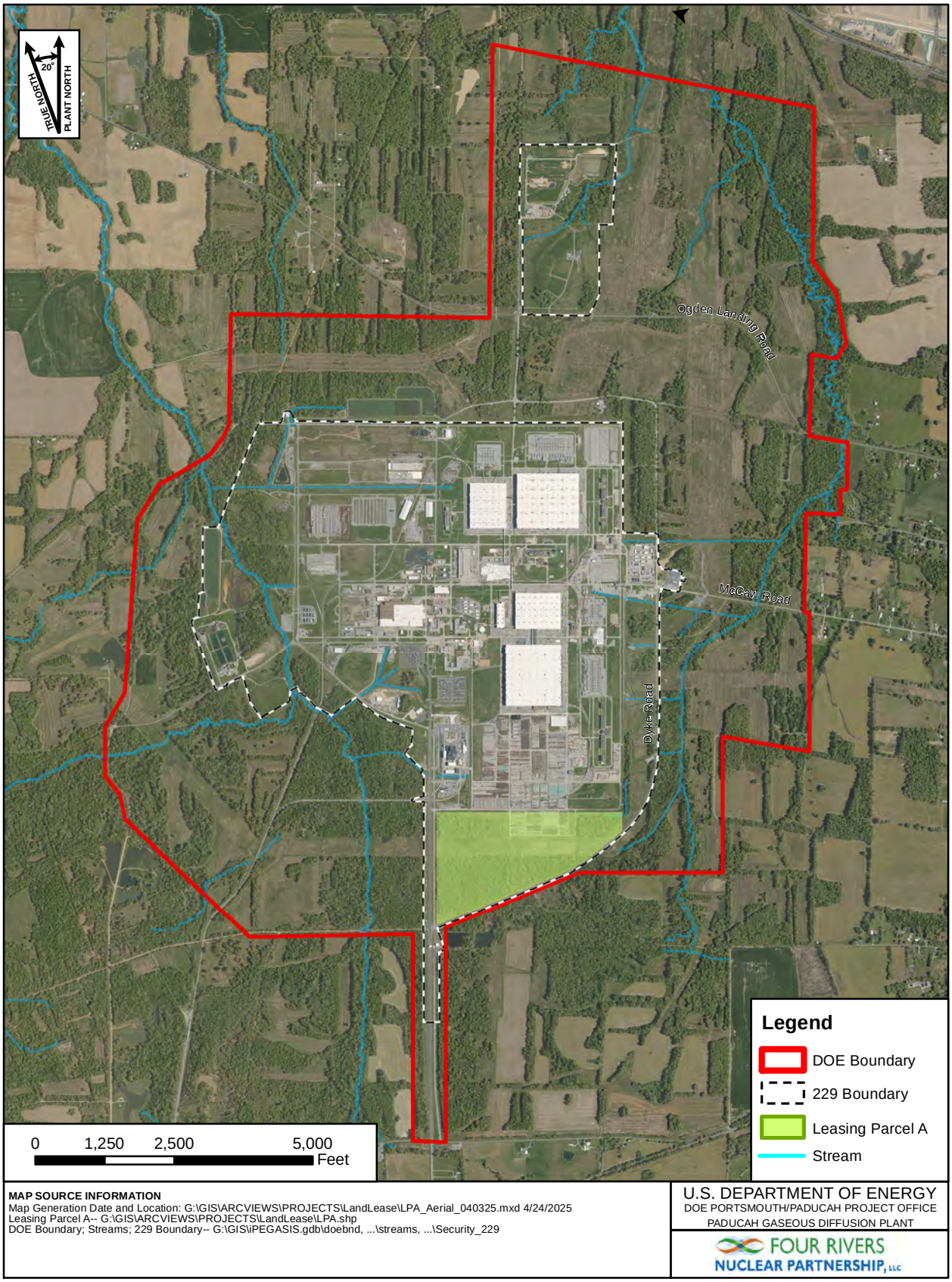


Figure 1. Location of Leasing Parcel A at the Paducah Site

for the Environmental Regulatory Processes for the Transfer of Real Property at the U.S. Department of Energy Portsmouth and Paducah Sites VOLUME 2: CERCLA 120(h)(3) – Remediated Property, PPPO-4609975 (DOE 2024c). These real property transfer protocols incorporate DOE real property transfer policy and guidance using *CERCLA Requirements Associated with Real Property Transfers* (DOE 1998), require following data gathering and reporting requirements, and include real property transfer lessons learned from PPPO and around the DOE Complex. Consistent with the guidance, the sources of information contained in this package include the following:

- Federal government records pertaining to the property (Section 2);
- The property's recorded chain of title (Section 3);
- Aerial photographs that are reasonably obtainable and may reflect prior property uses (Section 4);
- A visual inspection of the real property and any buildings, structures, equipment, pipes, pipelines, or any other improvements (Section 5.1);
- A visual inspection of adjacent properties and a physical inspection of those properties to the extent permitted by their owners/operators (Section 5.2);
- Reasonably obtainable federal, state, and local government records regarding the adjacent properties where there has been a release of hazardous substances and/or petroleum products or their derivatives that are likely to cause or contribute to such release on the property under review (Section 6); and
- Historical environmental data and a screening risk evaluation (Section 7) to evaluate the potential for adverse health effects associated with commercial/industrial use of the real property. The industrial worker, excavation worker, and outdoor worker scenarios described in the *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky Volume 1. Human Health*, DOE/LX/07-0107&D2/R15/V1, [Human Health Risk Methods Document (RMD)] were used to evaluate potential human health effects for hypothetical future workers (DOE 2024d). The residential scenario was not evaluated for this parcel, as it is not a pathway of concern for the purposes of the lease. The future use for the leased property is industrial.

The lease will include restrictions, covenants, and acknowledgements, including, but not limited to the following.

- The land use of the Leasehold will be restricted to "Industrial Use" (as defined on the date of lease of the Premises in the McCracken County zoning code[4]).
    - — Examples of industries which may be permitted include heavy manufacturing, processing, and storage, including, but not limited to, the production, processing, storage, and handling of uranium and other radioactive materials, compounds, and all the related constituent parts.
- Leasehold will include limitations to prohibit groundwater extraction and use by the lessee.
    - — Groundwater underlying the Leasehold shall not be extracted, consumed, exposed, or utilized for any purpose, potable or otherwise, or permitted to be extracted, consumed, exposed, or utilized for

[4] As of the date of this document, "industrial use" is defined as industries whose processing of products result in the emission of any atmospheric pollutant, light flashes, glare, odor, noise, or vibration, which may be heard and/or felt off the premises, and those industries that constitute a fire or explosion hazard.

the same; however, the lessee may install (or cause to be installed) groundwater wells necessary or appropriate to complete its environmental site assessment, to advance project development (including obtaining permits), and project operation (including obtaining permits, for monitoring, and for any dewatering during shallow excavation and construction activities or subsurface utility installation or repair).

— Groundwater supply wells shall not be installed or utilized on any part of the Leasehold, nor shall the lessee undertake activities that materially adversely affect the subsurface flow direction, velocity, and other comparable hydrogeological characteristics of such groundwater beyond that contemplated for the construction and operation of the lessee's facility, including Leasehold retention pond construction, facility stability, and dewatering.

- Leasehold will include obligation and reporting requirements.

  — Lessee shall, on an annual basis, submit written documentation to DOE verifying compliance with the Groundwater Restriction and Industrial Use Restriction described herein. Groundwater testing by the lessee may require coordination with DOE.

- The Leasehold will provide assurances regarding the property through lease clauses including the following:

  — Lessee shall comply with all requirements mandated by the Nuclear Regulatory Commission (NRC) for completion of the National Environmental Policy Act portion of the NRC licensing process associated with the facility's construction and will pursue all necessary and reasonable studies, permits, and agreements supporting the National Environmental Policy Act environmental review required to commence construction;

  — Services that will be offered to be provided by DOE will be delineated in the leasing agreement;

  — No change in owner or operator of the Paducah Site, or any portion thereof, or notice pursuant to Section 120(h)(3)(B) of CERCLA, 42 *U.S.C.* § 9620(h)(3)(B), relieves DOE of its obligation to perform pursuant to the executed FFA; and

  — Throughout the lease term, the lessee and DOE activities at the Paducah Site will be coordinated in good faith to ensure that respective activities at the site, including on the leasehold, do not materially adversely affect the operations of the other party in terms of health and safety, environmental protection, safeguards and security, each as established in permits and applicable law.

DOE shall retain all rights of access and ownership to Leasing Parcel A necessary to conduct remedial action on Leasing Parcel A, provided that DOE coordinates such actions with lessee and such actions do not materially disrupt lessee's operations. Upon termination of the lease agreement, and unless DOE in its sole reasonable discretion has approved an alternative use for the Leasehold, the lessee shall remove and decommission all its site improvements and infrastructure located on the surface of the Leasehold in accordance with the decommissioning mandates of its NRC permit or applicable law. The lessee shall also undertake restoration activities by returning all ground cover and soil disturbance on the Leasehold to its preexisting or baseline condition as of the date the lease was executed, except for ordinary wear and tear. Lastly, the lessee shall leave the Leasehold in neat and clean order and restored to a stable ecological state that will assimilate with the surrounding undisturbed ecosystem, with a seeded mix of plants with varying blooming phenology that provides nectar to pollinators for the full blooming season in the area, to the extent those conditions prevail at the time of removal and decommissioning.

1.1. DESCRIPTION AND HISTORY OF THE PROPERTY

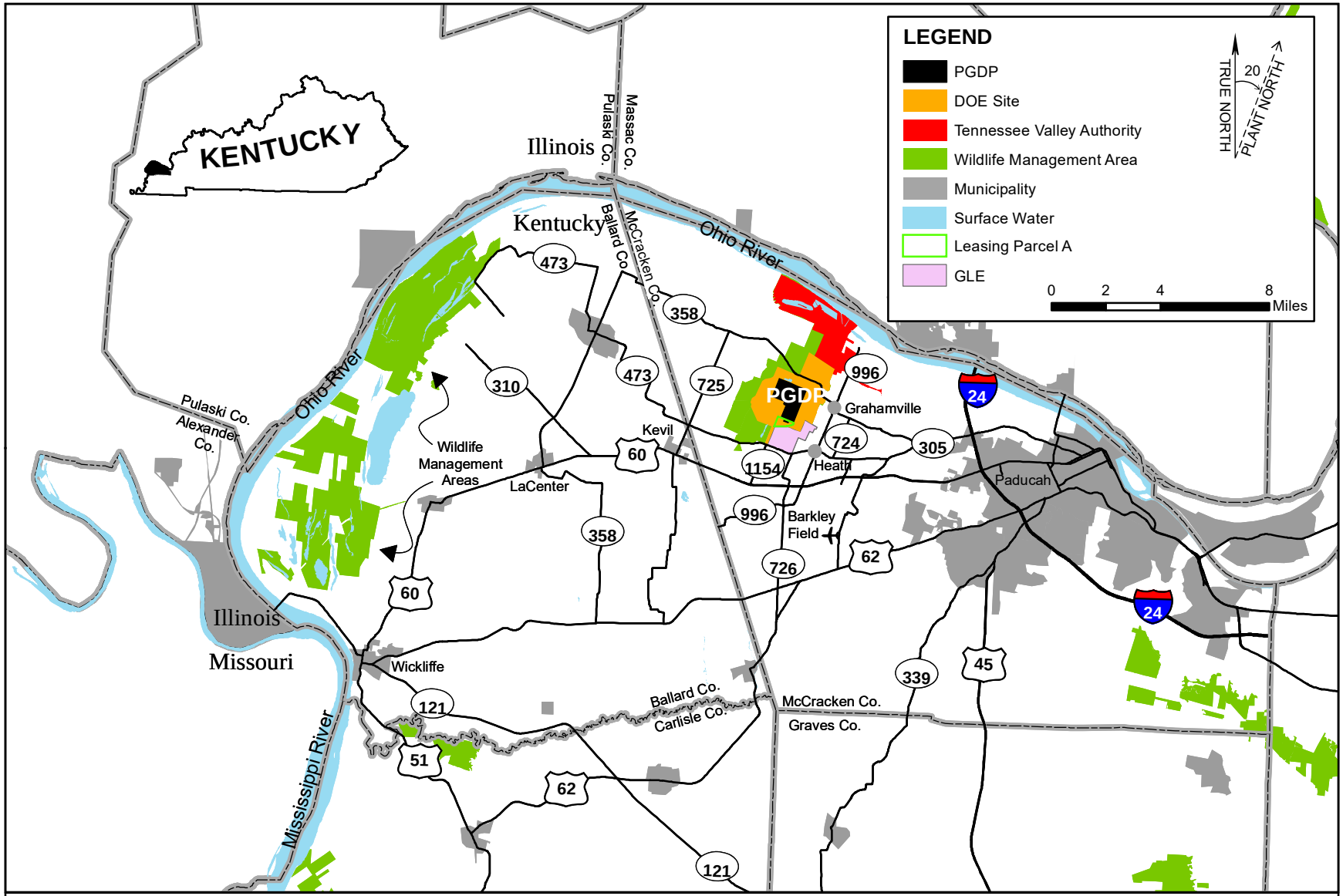
The Paducah Site includes the former PGDP, which is an inactive uranium enrichment facility owned by DOE. The Paducah Site is on a 3,556-acre federal reservation in a rural area of McCracken County, Kentucky, approximately 10 miles west of Paducah, and 3.5 miles south of the Ohio River (Figure 2). The former PGDP occupies approximately 615 acres within a fenced industrial area (referred to as the "Limited Area") at the Paducah Site. From 1952 until 2013, PGDP enriched uranium for DOE and DOE predecessor agencies, the military, and commercial customers. The Energy Policy Act of 1992 (42 *U.S.C.* § 13201) privatized uranium enrichment, and operational responsibility for PGDP was transferred to the United States Enrichment Corporation in 1993. The Paducah Site was added to the NPL in May 1994. The United States Enrichment Corporation ceased operations in May 2013 and returned the leased facilities to DOE in October 2014. With the cessation of enrichment operations, DOE is reconfiguring the site footprint, reducing the costs of maintaining the site, and facilitating beneficial reuse of DOE property by the community to support economic development. The proposed lease will be the first of such transfers/leases at the Paducah Site for beneficial reuse. Only industrial use will be allowed on the leased property.

The property proposed for lease consists of approximately 100 acres on the south/southeastern side of the Paducah Site. The property includes woodlands and uncultivated fields with a portion of the property containing an approximately 10-acre depleted uranium hexafluoride (DUF_6) cylinder storage yard (C-745-T Cylinder Storage Yard). The cylinder storage yard is constructed of concrete with a thickness of approximately 14 inches. Portions of the property were used during PGDP construction for storage of aggregate and soil. Little Bayou Creek, an intermittent to perennial stream, is located < 1,000 ft east of the property, flowing northward to its confluence with Bayou Creek near the Ohio River.

Leasing Parcel A has improved road access and includes a utility right-of-way or easement that crosses the property. Numerous transmission towers carry power lines within the right-of-way. No other structures, other than the cylinder storage yard, are present within Leasing Parcel A.

The Paducah Site's climate is humid-continental. According to the National Weather Service, for the period from 1991 to 2020, the average monthly precipitation was 4.19 inches, varying from an average of 3.11 inches in August (the monthly average low) to an average of 5.17 inches in April (the monthly average high). The mean annual temperature for the Paducah area from 1991 to 2020 was 58.8°F, with the coldest month being January with an average temperature of 36.0°F and the warmest month being July with an average temperature of 79.7°F (NWS 2021). Information on wind direction and speed was obtained from the National Weather Service office located at Barkley Regional Airport, which is less than four miles southeast of Leasing Parcel A (WRCC 2021). The prevailing wind direction during this 10-year period was from the south to southwest (33% of the time period evaluated) with mean speeds mostly ranging from 5–15 mph (the mean speed from all observations was 6.5 mph).

Prior to World War II, Leasing Parcel A was used for agricultural purposes. Numerous small farms produced various grain crops, provided pasture for livestock, and included large fruit orchards. The current Paducah Site, which includes Leasing Parcel A, was acquired by the U.S. Department of the Army in 1942 for development of the Kentucky Ordnance Works (KOW). During World War II, the former KOW plant produced trinitrotoluene (TNT) from December 1942 through August 1945 (BJC 2006). The KOW process areas were located west of the Paducah Site industrial area, outside the boundary of Leasing Parcel A. The former TNT plant was closed in 1946, at which time portions of the land were transferred to the General Services Administration or deeded to private ownership. Leasing Parcel A was deeded to private ownership



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Leasing Parcel A-- G:\GIS\ARCVIEWS\PROJECTS\LandLease\LPA.shp

Figure 2. Location of the Paducah Site

and was used for agricultural purposes. The land was acquired by the Atomic Energy Commission in 1951 for future development and operation of the former PGDP.[5] Construction of the former PGDP began in January 1951. From 1952 until 2013, the former PGDP enriched uranium in facilities located north of Leasing Parcel A. DOE licensed land east of Leasing Parcel A in September 1953 to the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA) for recreational purposes, which includes hunting and horseback trail riding.

Interviews were conducted in 2024 with eight previous and current employees associated with PGDP operations and also with the WKWMA manager regarding their knowledge of potential historical operations or activities on Leasing Parcel A. The purpose of the interviews was to potentially identify areas on and adjacent to the area where hazardous substances and petroleum products, or their derivatives, and hazardous wastes may have been released or disposed of. When interviewed, the personnel were provided with a figure that showed a larger 750-acre area that was being evaluated at that time. Leasing Parcel A is located in the southwestern portion of that larger area. In summary, interviewees were not aware of any past operations that would have released or disposed of hazardous substances and petroleum products, their derivatives, or hazardous wastes on Leasing Parcel A.

1.2. DESCRIPTION AND HISTORY OF ADJACENT PROPERTY

Leasing Parcel A lies to the south/southeast of the Limited Area. Although uranium enrichment has ceased, DOE maintains several missions at the Paducah Site. These missions include environmental monitoring and surveillance to ensure protection of site personnel, the environment, and the community; conversion of DUF_6 to an oxide; and deactivation of uranium enrichment facilities to prepare for decontamination, decommissioning, and/or demolition.

The property south of Leasing Parcel A is owned by Global Laser Enrichment (GLE). It was previously a part of WKWMA. Property (referred to as Parcel 1) to the east of Leasing Parcel A is owned by DOE and is currently planned to be transferred to the community for beneficial reuse.

The PGDP industrialized area to the north also includes several SWMUs or areas of concern (AOCs).[6] Additionally, there are several active and inactive SWMUs within and adjacent to the lease footprint. These four SWMUs and three AOCs are further discussed in Section 6.

During World War II, much of the Paducah Site property was part of KOW, which included more than 25 square miles. The KOW process areas were located south-southwest of the Limited Area, most of which now is part of WKWMA property located west and southwest of Leasing Parcel A.

Two small communities, Grahamville and Heath, lie within 2 miles east of the Paducah Site. Individual homesteads are sparsely located along rural roads in the vicinity of the property being evaluated. Historically, groundwater in the Regional Gravel Aquifer (RGA) was the primary source of drinking water for residents and businesses in the vicinity of the Paducah Site. DOE implemented a CERCLA non-time critical removal action known as the Water Policy for areas where the groundwater either is known to be contaminated or has the potential to become contaminated. Within the Water Policy area, DOE has provided water hookups to the municipal water supply and pays water bills for affected residences and businesses. An educational mailer has been mailed to residents annually since 2016 to ensure public awareness of the groundwater contamination. Residential wells have been capped and locked per license agreements between

[5] The Energy Research and Development Administration assumed the function of the Atomic Energy Commission in 1974. DOE assumed the function of the Energy Research and Development Administration in 1977.
[6] An AOC is any area having a probable or known release of a hazardous waste, hazardous constituent, or hazardous substance, which is not from a SWMU, and which poses a current or potential threat to human health or the environment (EPA 1998a).

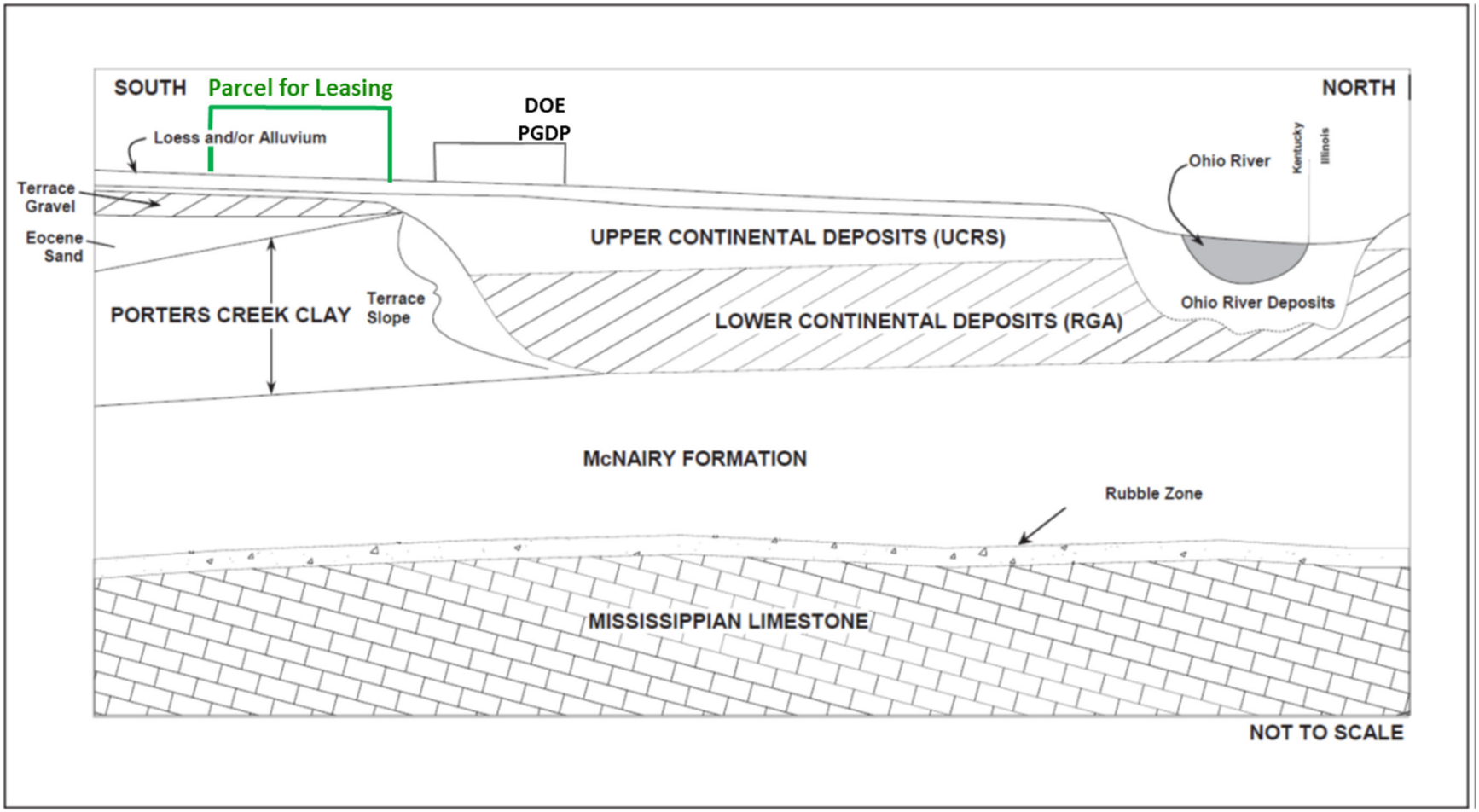
DOE and residents (renewed every five years) (DOE 2024e). The Paducah Site uses surface water from the Ohio River for potable water.

1.3. GEOLOGIC/HYDROGEOLOGIC ENVIRONMENT

Leasing Parcel A is located in the Jackson Purchase region of western Kentucky, which represents the northern tip of the Mississippi Embayment portion of the Coastal Plain. The Jackson Purchase region is an area of land that includes all of Kentucky west of the Tennessee River. The stratigraphic sequence in the region consists of Cretaceous [144 to 65 million years ago (mya)]; Tertiary (65 to 1.8 mya); and Quaternary (1.8 mya to today) sediments unconformably overlying Paleozoic (543 to 248 mya) bedrock (Paleozoic strata younger than Mississippian are not present in the Jackson Purchase region). The unconsolidated sediments above the Paleozoic limestone bedrock are grouped into four major stratigraphic units (loess, Continental Deposits, Porters Creek Clay, and the McNairy Formation) as shown in Figure 3. Some of the stratigraphic units shown in Figure 3, such as the Eocene (54.8 to 33.7 mya) sands, occur in the southwestern portions of the Paducah Site and do not underlie Leasing Parcel A. The Porters Creek Clay subcrop is formed by a buried terrace slope that extends generally east-west across the site. This subcrop is the northern limit of the Porters Creek Clay and the southern limit of the Plio-Pleistocene (2.5 mya to 11,000 years ago) Lower Continental Deposits that underlie most of the industrialized portion of the Paducah Site.

Relative to the shallow groundwater flow system in the vicinity of the Paducah Site, the Continental Deposits and the overlying loess and alluvium are of key importance. The Continental Deposits consist of an older alluvial fan gravel deposit (Terrace Gravel), underlying Leasing Parcel A; and buried river valley fill (Lower Continental Deposits), north of the parcel. The buried river valley fill locally consists of an upper silt member, with lesser sand and gravel interbeds, and a thick, basal sand and gravel member. The subcrop of the Porters Creek Clay, sometimes referred to as the Porters Creek Terrace, marks the southern extent of this buried river valley. Fine sand and clay of the McNairy Formation directly underlie the Continental Deposits. The local groundwater flow systems in the vicinity of Leasing Parcel A include the following (shallowest to deepest): (1) Terrace Gravel flow system, (2) Upper Continental Recharge System (UCRS), (3) RGA, and (4) McNairy Formation (DOE 2015a). These components are illustrated on Figure 3. The RGA is continuous from the Porters Creek Terrace northward beyond the present course of the Ohio River. The RGA is not situated beneath Leasing Parcel A as illustrated in Figure 4, while Leasing Parcel A overlies the Terrace Gravel flow system (the Eocene Sands are not present in this area). In areas north of Leasing Parcel A, groundwater flows through the UCRS, recharging the underlying RGA. Groundwater generally flows northward in the RGA toward the Ohio River, which is the local base level for the groundwater system. The Northeast Plume, a contaminant plume containing volatile organic compounds (VOCs), flows in the RGA north of Leasing Parcel A in a general northeast direction. Flow in the McNairy Formation in the vicinity of Leasing Parcel A also is northward toward the Ohio River Valley. Groundwater within the Terrace Gravel near the terrace slope in the Porters Creek Clay in the vicinity of Leasing Parcel A also recharges the RGA and discharges to local streams.

The general soil map for Ballard and McCracken counties indicates three soil associations are found within the vicinity of the Paducah Site: the Rosebloom-Wheeling-Dubbs association, the Grenada-Calloway association, and the Calloway-Henry association (USDA 1976). The predominant soil association in the vicinity of the Paducah Site is the Calloway-Henry association, which consists of nearly level, somewhat 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 70-plus years and previous agricultural practices. Activities that have disrupted the original soil classifications include filling, tilling, mixing, and grading. The soil type present in these disturbed areas is characterized as urban.



Modified from FRNP 2021

Figure 3. Cross Section Showing Geologic Relationships at the Paducah Site

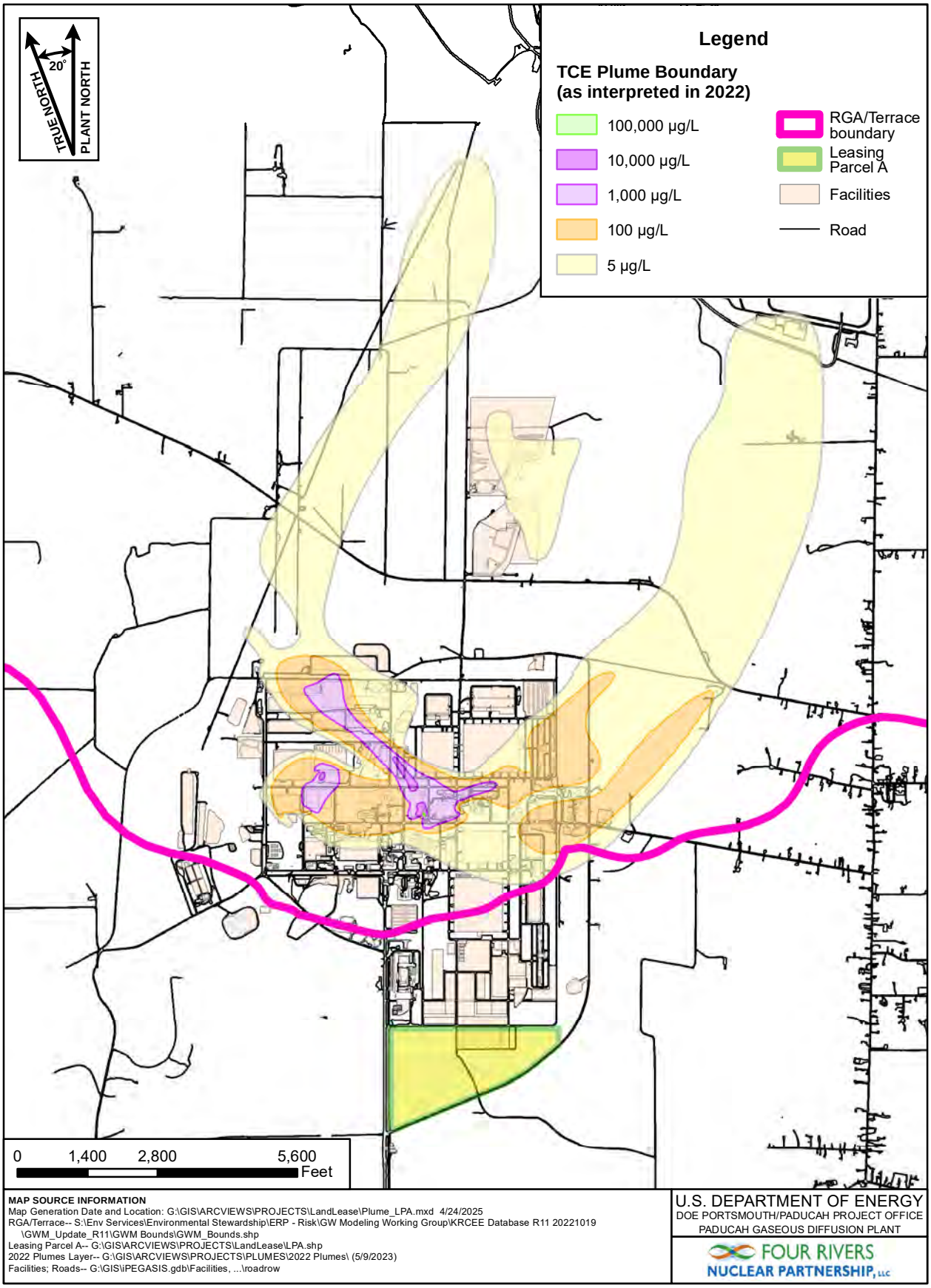


Figure 4. Location of Terrace Gravel and RGA Boundary in Relation to Leasing Parcel A

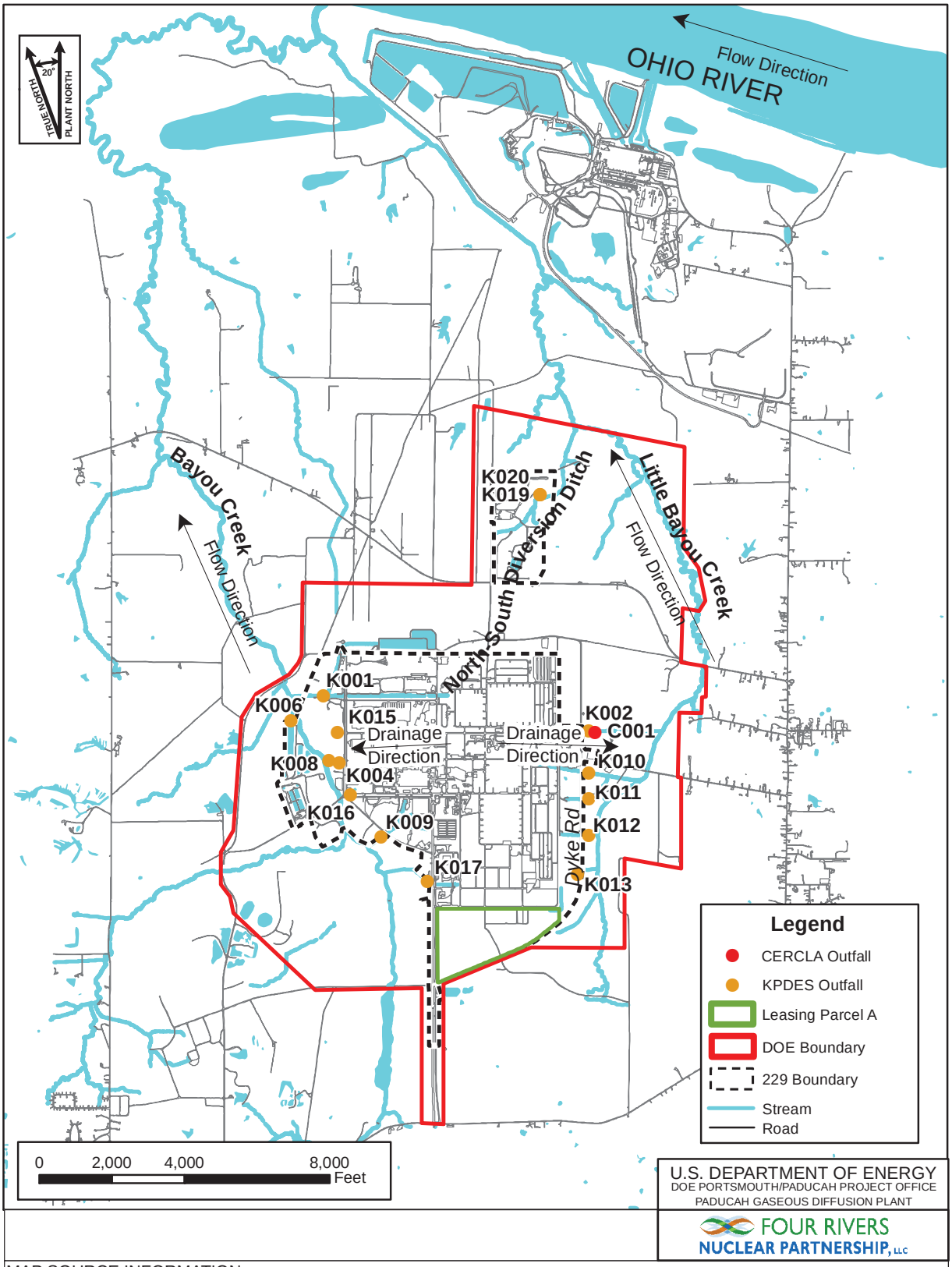
The Paducah Site is in the western portion of the Ohio River drainage basin, approximately 15 miles downstream of the confluence of the Ohio River with the Tennessee River and approximately 35 miles upstream of the confluence of the Ohio River with the Mississippi River. The Paducah Site is situated on the watershed divide between Bayou Creek and Little Bayou Creek (Figure 5). Surface flow is east-northeast toward Little Bayou Creek and west-northwest toward Bayou Creek. Locally, the eastern part of Leasing Parcel A is within the drainage area of Little Bayou Creek while the western portion of the parcel drains to Bayou Creek.

Little Bayou Creek originates approximately 0.4 miles south of PGDP within the former WKWMA property (acquired by GLE from the Commonwealth of Kentucky in 2024) and extends northward and joins Bayou Creek near the Ohio River along an approximately 7-mile course within a 6,000-acre drainage basin. Little Bayou Creek may receive surface drainage from Leasing Parcel A and the numerous swales that drain residential and industrial properties, which includes the former WKWMA property (acquired by GLE from the Commonwealth of Kentucky in 2024), the PGDP industrialized area, and the Tennessee Valley Authority Shawnee Fossil Plant. There is little flow in the headwaters south of PGDP and Little Bayou Creek becomes a perennial stream within the DOE property due to discharges from the eastern outfalls of PGDP. Little Bayou Creek has been used to discharge wastewater and storm water from PGDP to the Ohio River since operation of the plant began. Discharges to Little Bayou Creek occur through permitted Kentucky Pollutant Discharge Elimination System (KPDES) Outfalls 002, 010, 011, 012, and 013 and CERCLA Outfall C001. Subsequent to the uranium enrichment operations, the discharge of the Paducah Site Northeast Plume groundwater pump-and-treat system is a significant component of the flow in the creek.

Bayou Creek is a perennial stream on the western boundary of PGDP that flows generally northward, from approximately 2.5 miles south of the plant site to the Ohio River along a 9-mile course. Bayou Creek has a drainage basin that is approximately 11,910 acres. Water from the central and western portions of the plant drains to Bayou Creek through KPDES Outfalls 001, 006, 008, 009, 015, 016, and 017.

Any discharges to waters of the United States are regulated through the Clean Water Act. KPDES regulations require a permit for the discharge of pollutants from any point source into waters of the United States.

Figure 6 shows wetlands that were identified in 1994 by the U.S. Army Corps of Engineers. The definition of “Waters of the United States” under the Clean Water Act has changed since the 1994 survey. As such, the effort by the U.S. Army Corps of Engineers was considered a planning level delineation because wetland identification extended only to the nearest elevation contour interval; the locations do not represent definitive jurisdictional boundaries (USACE 1994).



MAP SOURCE INFORMATION
Map Generation Date and Location: 4/24/2025 G:\GIS\ARCVIEWS\PROJECTS\LandLease\SurfaceWater_LPA_20250410.mxd
229 Boundary: G:\GIS\iPEGASIS.gdb\security_229; DOE Boundary: G:\GIS\iPEGASIS.gdb\doebnd; Roads: G:\GIS\iPEGASIS.gdb\Roads;
Surface Water: G:\GIS\iPEGASIS.gdb\Streams and G:\gis\iPEGASIS.gdb\fe_2022_21145_areawater (for water bodies shown);
Outfalls: G:\gis\iPEGASIS.gdb\Locations (for those shown)
Leasing Parcel A: G:\GIS\ARCVIEWS\PROJECTS\LandLease\LPA.shp

Figure 5. Surface Water Features in the Vicinity of the Paducah Site

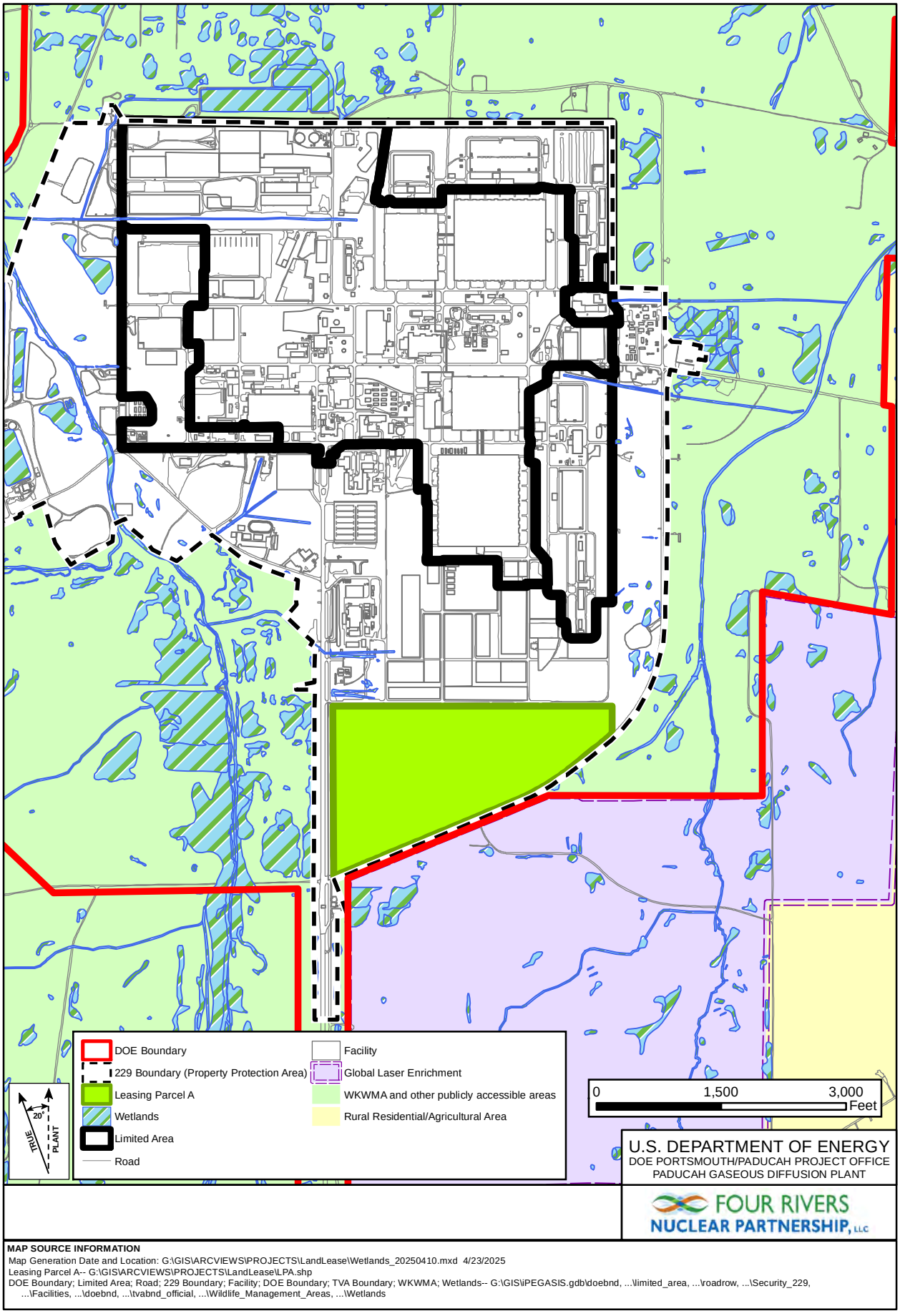


Figure 6. Wetlands Identified in the Vicinity of Leasing Parcel A

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2. FEDERAL RECORDS SEARCH

A review of reasonably obtainable records regarding past and present information about Leasing Parcel A was performed in accordance with CERCLA 120(h) and DOE guidance and protocols (DOE 2024b; DOE 2024c; DOE 1998). In addition to extensive DOE records and documentation, the following federal records and databases were queried on March 26, 2025, using the *Nationwide Environmental Title Research Online* website (https://www.netronline.com).

- Federal NPL sites
  - PGDP is an NPL site.
- Federal Delisted NPL sites
- Federal sites subject to CERCLA removal and CERCLA orders
- Federal CERCLA sites with No Further Remedial Action Planned
- Federal Resource Conservation and Recovery Act of 1976 (RCRA) facilities undergoing Corrective Action
- Federal RCRA Treatment, Storage, and Disposal facilities
- Federal RCRA Generators
- Federal institutional control/engineering control registries
- Federal Emergency Response Notification System list
- State and tribal Superfund-equivalent sites
- State and tribal hazardous waste facilities
- State and tribal landfills and solid waste disposal facilities
- State and tribal leaking storage tanks
- State and tribal registered storage tanks
- State and tribal institutional control/engineering control registries
- State and tribal voluntary cleanup sites
- State and tribal brownfields sites
- State and/or tribal lists of sites requiring further investigation/remediation
- State list of Significant Environmental Hazards

- State and tribal mine sites requiring further investigation and/or remediation
- State and/or tribal lists of spills and spill responses
- State and/or tribal lists of emergency responses
- State and/or tribal lists of dry cleaners
- State and/or tribal lists of clandestine laboratory cleanup
- State and/or tribal lists of scrap/used tire processing facilities
- State and/or tribal lists of underground injection control sites
- State and/or tribal listings of permitted drywells
- State and/or tribal lists of registered aboveground storage tanks
- State and/or tribal lists of permitted facilities
- Clean Air Act Permitted Facilities (PGDP and the DUF_6 Conversion Facility have permits issued under Title V of the Clean Air Act)
- U.S. National Pollutant Discharge Elimination System Permitted Facilities (several outfalls are included in a KPDES permit)
- On-site Wastewater Treatment sites
- EPA Underground Storage Tanks
- RCRA Information database (RCRAInfo)
- EPA Enforcement, Compliance History Online
- EPA Toxic Substances Control Act database

Records and interviews with employees or former employees address the potential for nonfederally permitted releases of hazardous substances from past operations near Leasing Parcel A (see Section 1.1).

There were no results identified for Leasing Parcel A from any of the queries other than PGDP being listed as an NPL site. Based on a search of the above records and agency files, DOE is aware of no record showing the storage of the greater of 1,000 kg or a reportable quantity of any hazardous substance on Leasing Parcel A; DOE does not know of any release of any hazardous substance on Leasing Parcel A in excess of a CERCLA reportable quantity; and DOE is not aware of any disposal of hazardous substances on the property.

In addition to DOE records, NRC inspection reports dating back to 2000 were reviewed. Based on the inspection reports reviewed, there were no releases that impacted Leasing Parcel A.

3. TITLE SEARCH

A detailed title search in accordance with CERCLA 120(h) and DOE guidance and protocols was performed (DOE 2024b; DOE 2024c; DOE 1998). DOE real estate records do not reflect that release or disposal of hazardous substances or petroleum products, or their derivatives, took place on the property prior to the time that it was owned by the U.S. government.

Various tracts that comprise Leasing Parcel A were acquired by the U.S. government between June 1942 and October 1943 for development of KOW. After KOW's closure in 1946, properties within, and adjacent to, Leasing Parcel A were returned to private ownership (provided in Appendix A) between March 1947 and January 1949. The property was acquired by the U.S. government for Atomic Energy Commission between February 1951 and May 1951 for the construction of PGDP. There were no title transfers associated with Leasing Parcel A after the acquisition of the parcels by the U.S. government in the 1950s.

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4. AERIAL AND OTHER PHOTOGRAPHS AND DRAWINGS

Aerial photographs were evaluated in accordance with CERCLA 120(h) and DOE guidance and protocols (DOE 2024b; DOE 2024c; DOE 1998). The review of aerial photographs for Leasing Parcel A focused on selected photographs from PGDP photography archives. Photographs were selected that were representative of the parcel and surrounding areas. Aerial photographs provided by PGDP from 1943, 1952, 1975, 1994, 1998, 2008, and 2009 were reviewed for this leasing data package. Other sources were also used to supplement PGDP archive photographs such as the Kentucky Division of Geographic Information website, which contained photographs as recent as 2022.

The photographs were informative in showing the evolution of Leasing Parcel A, beginning from 1943 prior to the construction of PGDP to 2022. Construction of new features, changes in existing features, and expansion of areas were observed through the evaluation of these photographs. No evidence or indications of releases of hazardous substances on Leasing Parcel A that would have negative environmental impacts were observed in the photographs.

The former KOW plant, which occupied a site southwest of what is now PGDP, produced TNT during its operations from December 1942 through August 1945 (BJC 2006). Aerial photograph 43PGD007 (Figure 7) taken June 20, 1943, shows the former KOW storage bunker area that lies northwest of Leasing Parcel A prior to construction of PGDP, which began in January 1951. The main KOW processing area was southwest of PGDP, outside of Leasing Parcel A. No unusual or unexpected features related to Leasing Parcel A are observed in this photograph.

In Figure 7, the KOW site storage bunkers appear along a series of parallel roads that run generally north-south across an area north of the current PGDP site. The lines are longer on the eastern portion of the site than on the western portion. There are structures (i.e., the KOW TNT storage bunkers) placed at equal distances along the parallel lines. There is no visual evidence of releases from the bunkers in the photographs, nor is there documentation that would indicate KOW would have had an environmental impact on Leasing Parcel A.

Leasing Parcel A appears in the 1943 photograph (Figure 7) to be farmland and forested areas. No evidence of industrial activity appears on the parcel in 1943. There appears to be a homestead/farm within Leasing Parcel A along a road that runs generally north-south across the property. This homestead/farm also appears on a 1932 U.S. Geological Survey topographic map (Figure 8).

Figure 7. 1943 Aerial Photograph Showing DOE Property Boundary and Leasing Parcel A (43PGD007)

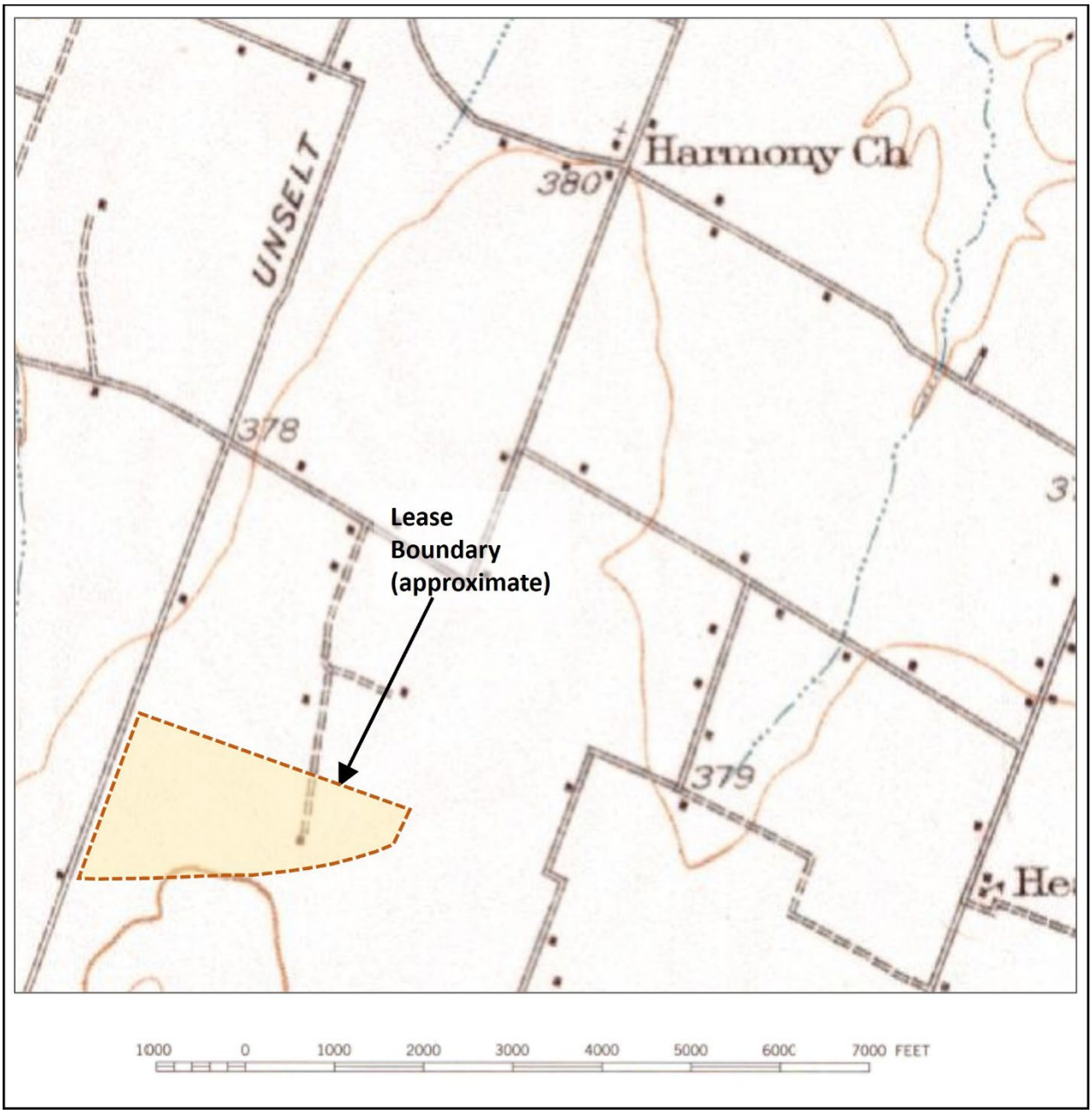


Figure 8. Portion of 1932 U.S. Geological Survey Topographic Map Showing the Proposed Lease Area

In the 1952 photograph 52PGDSBBe (Figure 9), there is significant evidence of land disturbance related to construction on the south side of the plant extending into Leasing Parcel A, going beyond the current cylinder storage yard in the south. Some of the area appears to be a staging area for soil removed during construction. A 1954 U.S. Geological Survey topographic map is shown in Figure 10.

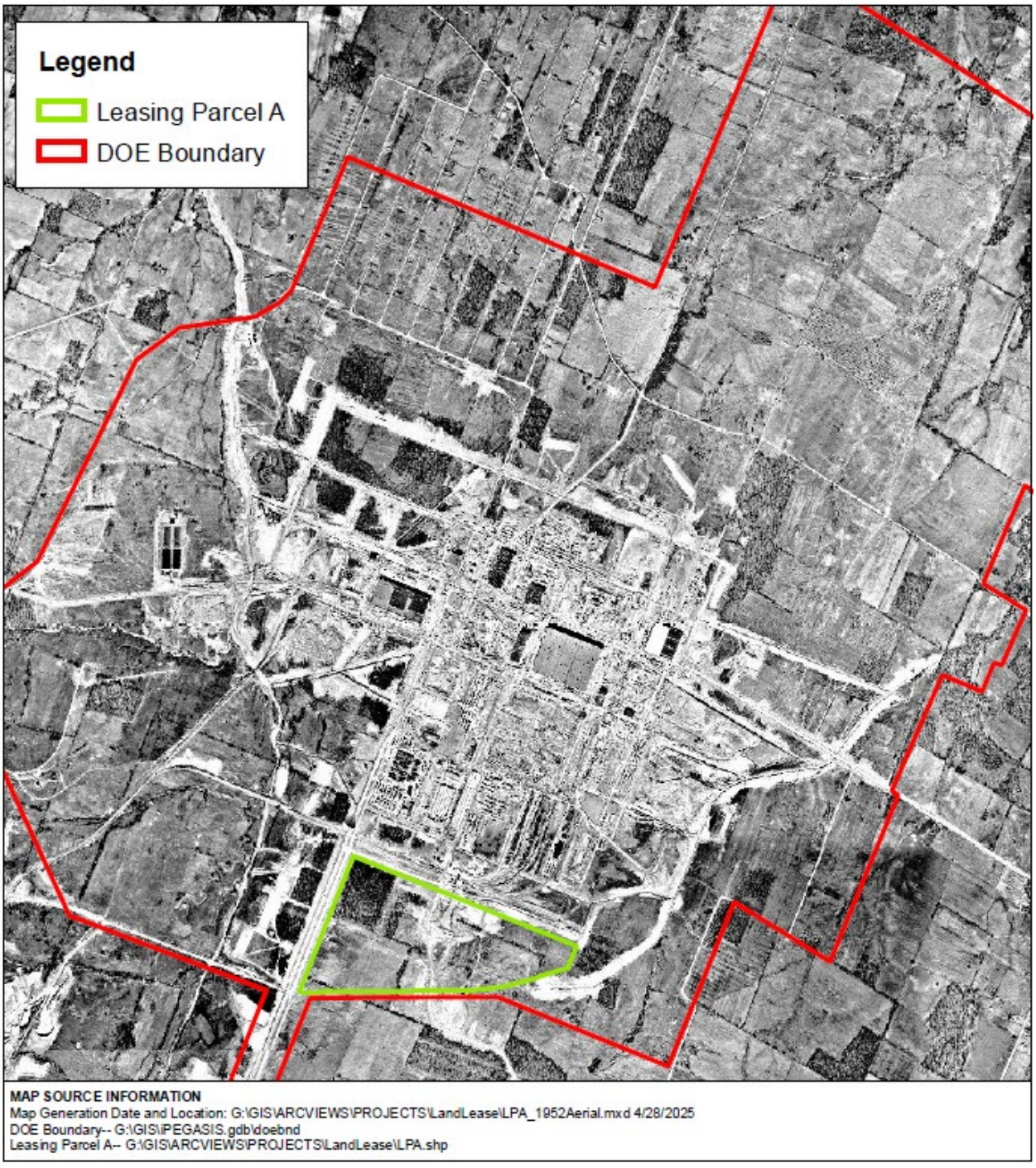


Figure 9. 1952 Aerial Photograph Showing DOE Property Boundary and Leasing Parcel A (52PGDSBBe)

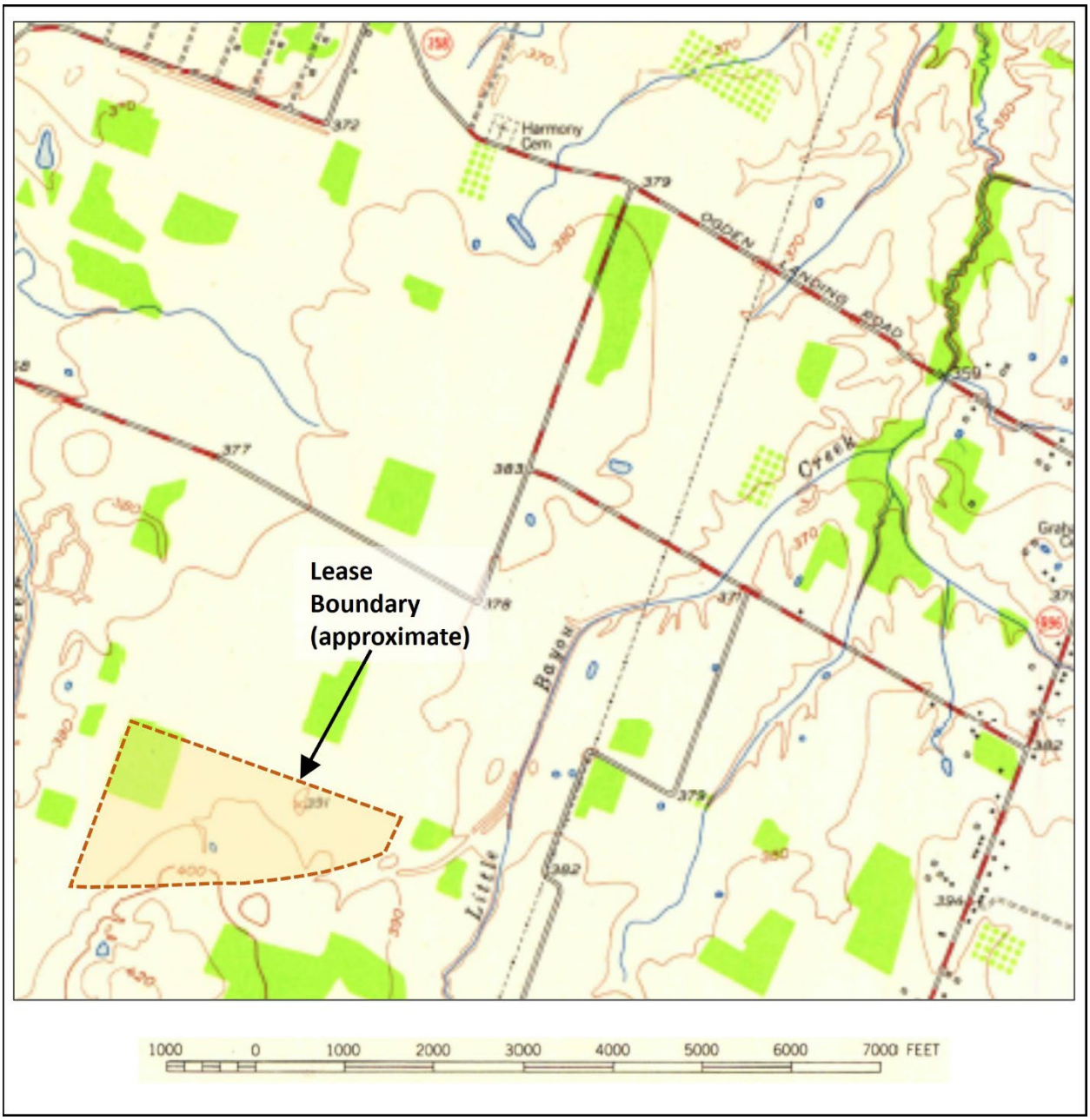


Figure 10. Portion of 1954 U.S. Geological Survey Topographic Map Showing the Proposed Lease Area

The 1975 photograph 75PGD074 (Figure 11) shows both PGDP and Leasing Parcel A in their entirety. Land disturbance related to earlier construction is still visible. An unimproved road appears to cross the property from Dyke Road to the cylinder storage yard. A 1978 U.S. Geological Survey topographic map is shown in Figure 12.

Figure 11. 1975 Aerial Photograph Showing DOE Property Boundary and Leasing Parcel A (75PGD074)

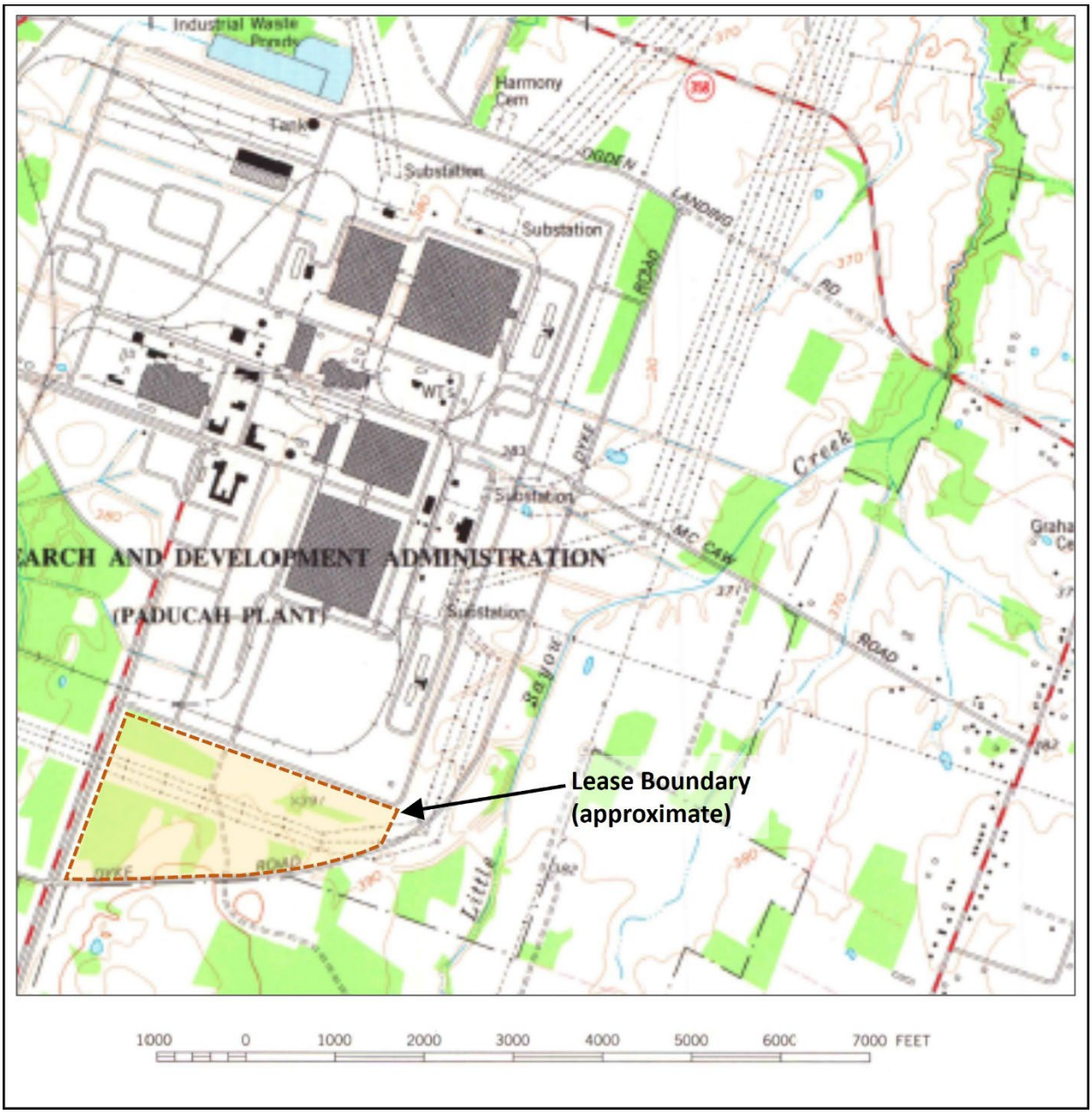


Figure 12. Portion of 1978 U.S. Geological Survey Topographic Map Showing the Proposed Lease Area

The 1994 photograph 94PGD103 (Figure 13) shows PGDP and Leasing Parcel A in their entirety. The primary land uses on Leasing Parcel A are industrial (e.g., electrical utility corridor) and unmanaged woodlands.

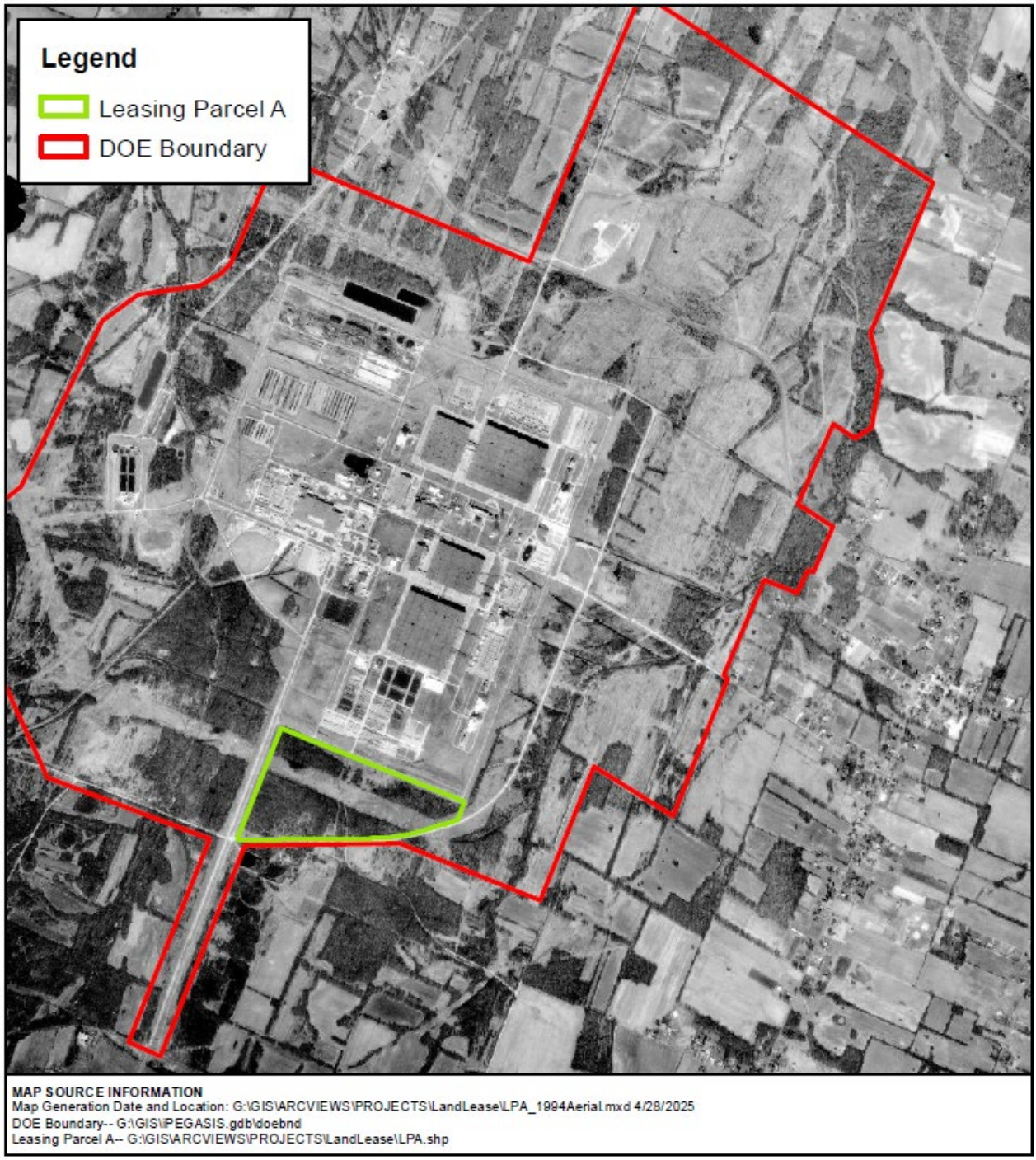


Figure 13. 1994 Aerial Photograph Showing DOE Property Boundary and Leasing Parcel A (94PGD10)

The 1998 photograph 98PGD054 (Figure 14) shows PGDP and Leasing Parcel A in their entirety. The extension of the cylinder storage yard southward into Leasing Parcel A is evident in this aerial photograph.

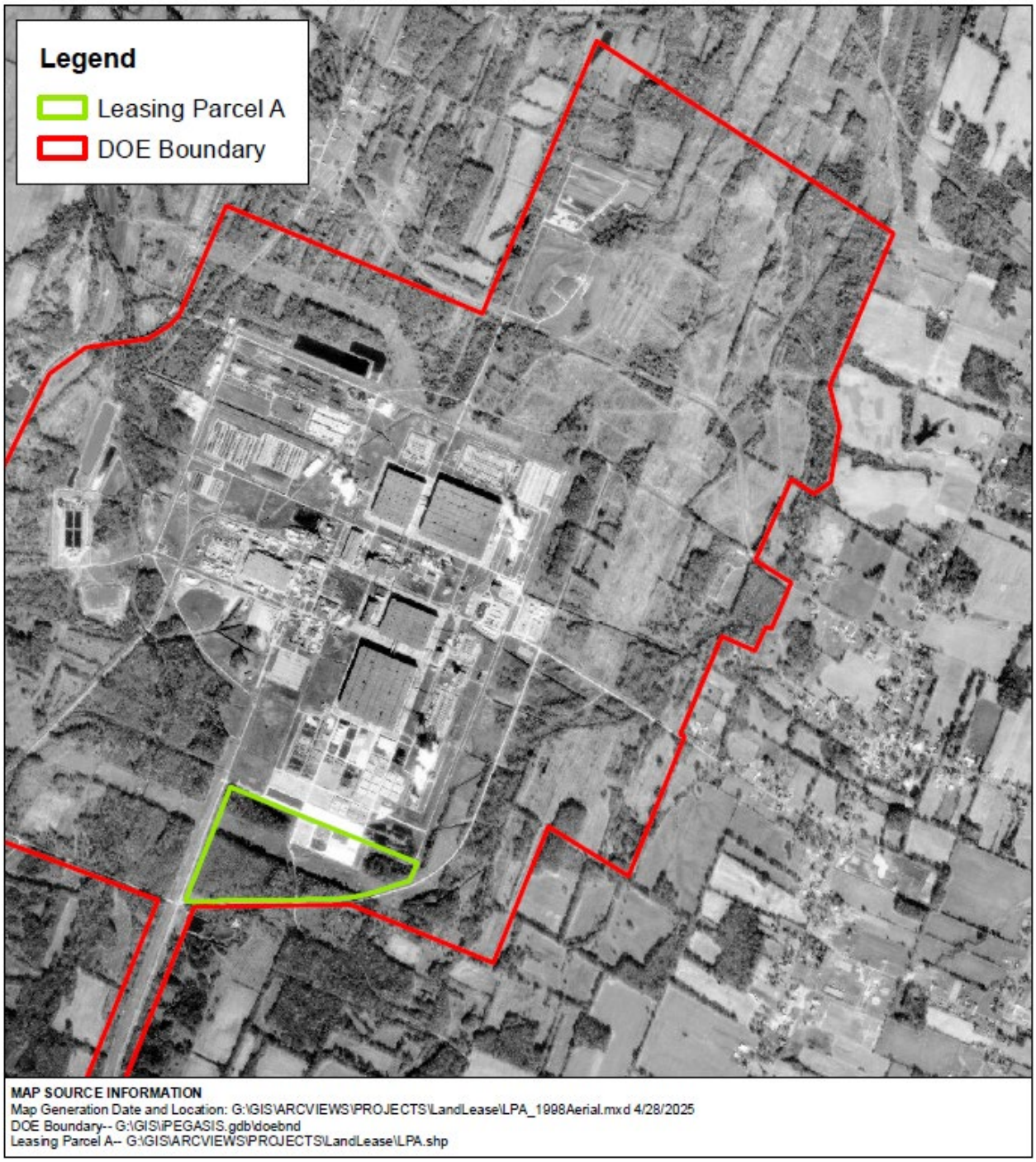


Figure 14. 1998 Aerial Photograph Showing DOE Property Boundary and Leasing Parcel A (98PGD054)

Photograph Aerial-12 from 2008 (Figure 15) and photograph 11-03-09-38 from 2009 (Figure 16), provide an oblique view of the southern portion of PGDP and shows Leasing Parcel A as mostly wooded except for the cylinder storage yard extension (i.e., the C-745-T Cylinder Storage Yard) and the power line right-of-way. No unusual activity is observed in these photographs.

Figure 15. 2008 Aerial Photograph Showing DOE Property Boundary and Leasing Parcel A (Aerial-12)

Figure 16. 2009 Aerial Photograph Showing DOE Property Boundary and Leasing Parcel A (11-03-09-38)

The 2009 photograph Half_Ft_Plant_Aerials_2009 (Figure 17) provides an aerial view of PGDP and the surrounding area, which includes Leasing Parcel A. An undeveloped road running generally north-south across the area is evident in this photograph.

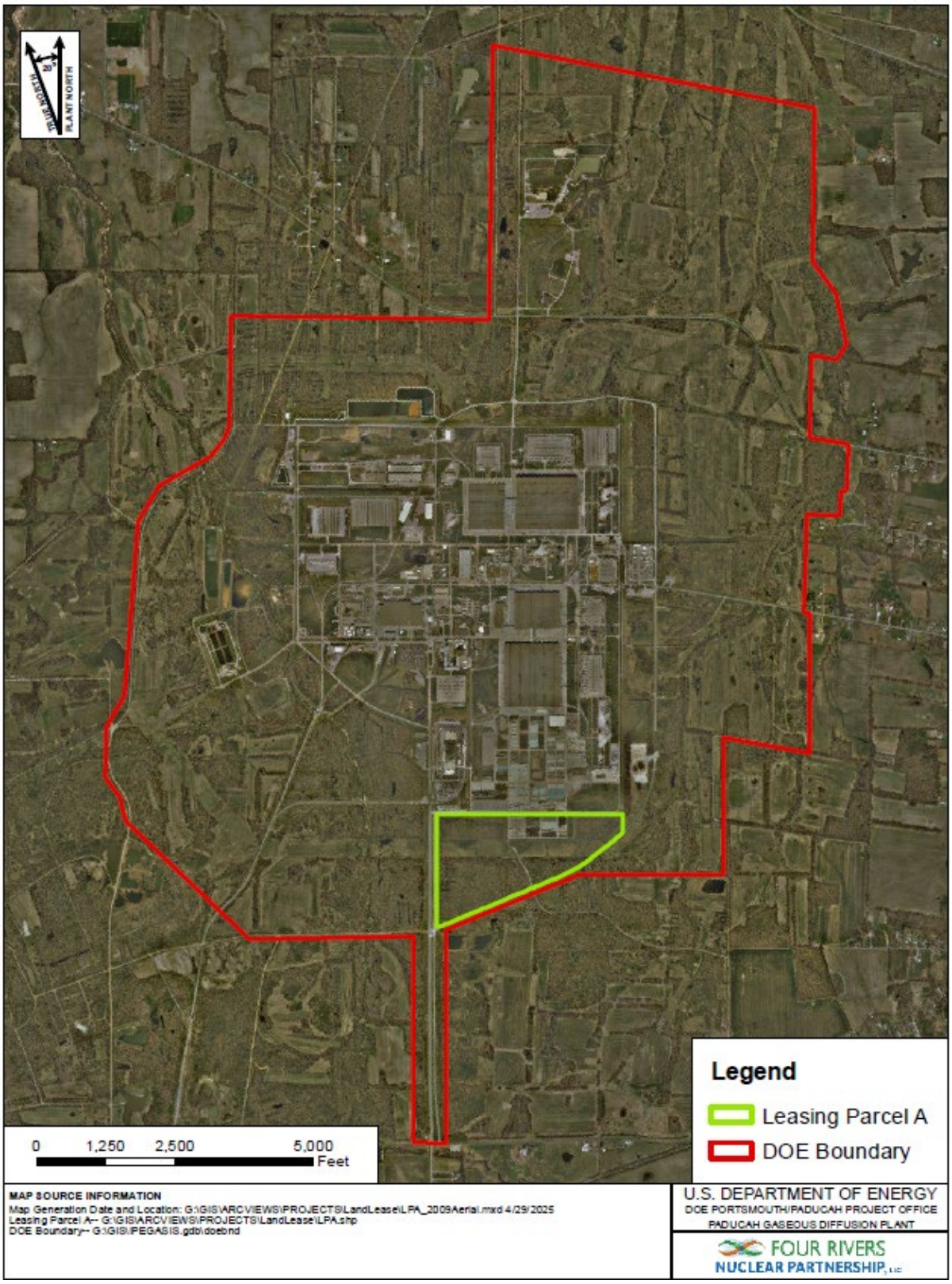


Figure 17. 2009 Aerial Photograph Showing Surrounding Area and Leasing Parcel A (Half_Ft_Plant_Aerials_2009)

Aerial photography dated 2022 from the Kentucky Division of Geographic Information[7] was also reviewed (Figure 18). Nothing unusual within Leasing Parcel A was observed in the available high-resolution imagery. A 2022 U.S. Geological Survey topographic map is shown in Figure 19.

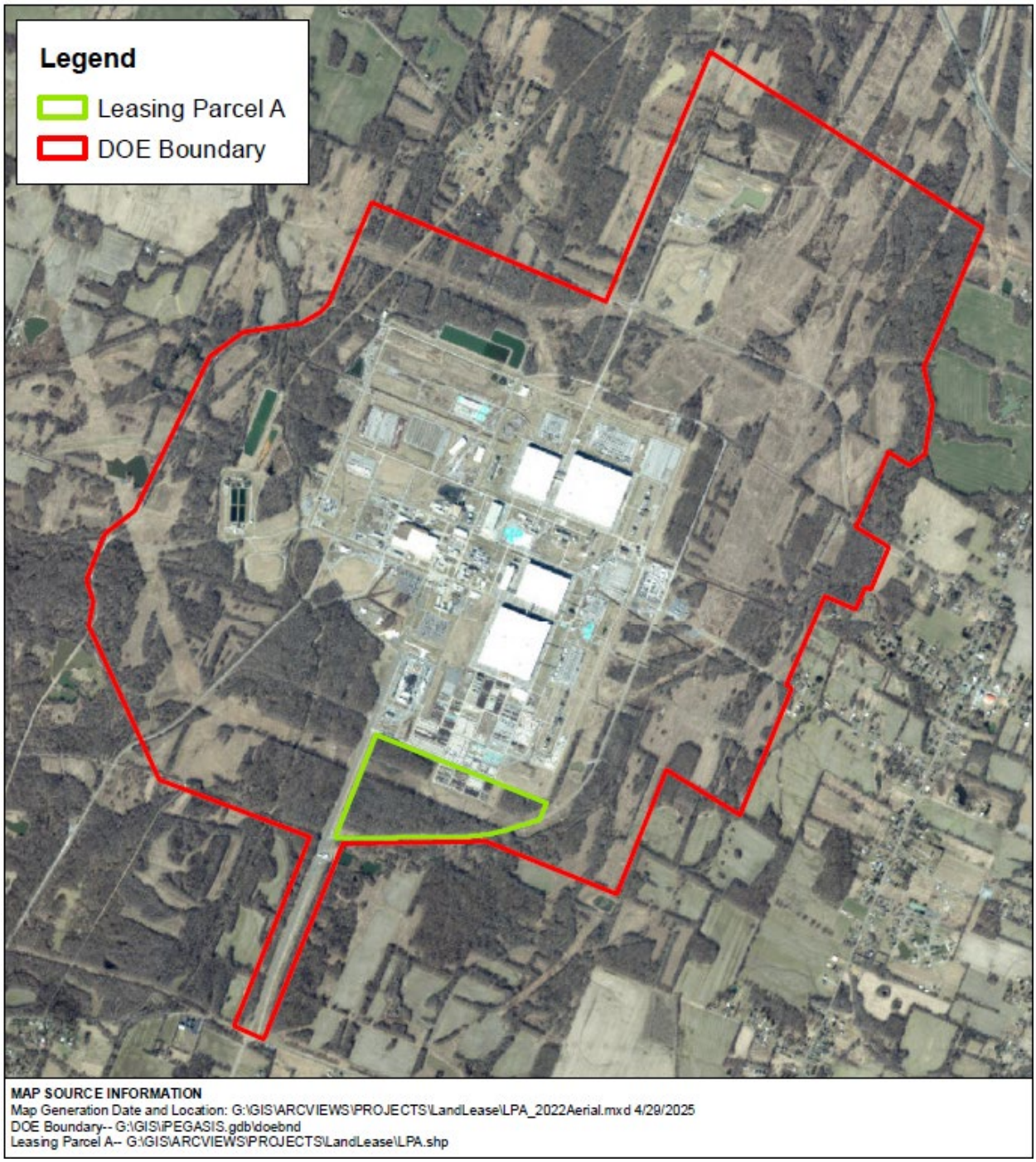


Figure 18. KY Division of Geographic Information 2022 Aerial Photograph Showing Leasing Parcel A

[7] https://kygeonet.maps.arcgis.com/apps/mapviewer/index.html?webmap=ba05e691cf3a4acd9583b12ccf09856e

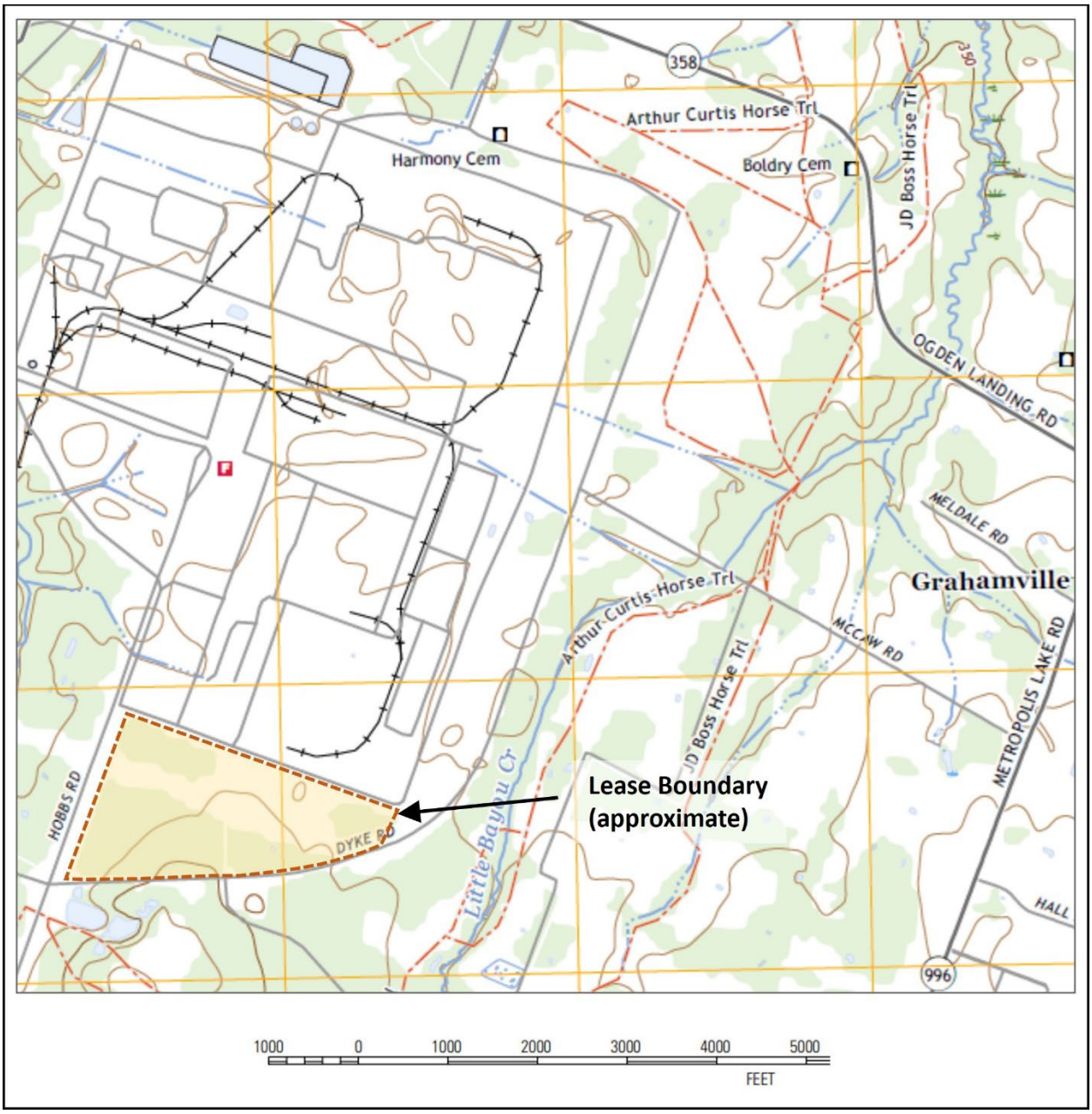


Figure 19. Portion of 2022 U.S. Geological Survey Topographic Map Showing the Proposed Lease Area

Based on the review of the historical aerial photography, there are indications of land disturbance related to construction of PGDP, electrical utility corridors, and cylinder storage yard extension within Leasing Parcel A; however, there are no indications of releases of hazardous substances.

5. RESULTS OF VISUAL AND PHYSICAL INSPECTIONS

5.1. VISUAL AND PHYSICAL INSPECTIONS OF LEASING PARCEL A

The *Sitewide Evaluation Report for the Soils Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1256&D2/R1, documents visual and physical inspections that were performed as part of the Soils Operable Unit (OU) during two field efforts (DOE 2015b). The first occurred in 2009–2010 and was conducted to identify previously unknown contaminated areas originating from PGDP. The second effort occurred in 2014–2015 and was a focused radiological survey and judgmental sampling effort planned for 25 selected anomalies to validate the conclusions from the previous 2009–2010 field effort. These visual and physical inspections included Leasing Parcel A.

This sitewide evaluation report presents the results of the comprehensive effort completed for areas outside the Limited Area and that surround PGDP on DOE-owned property, which includes property licensed to the Commonwealth of Kentucky and managed by WKWMA; and areas formerly owned by the Commonwealth of Kentucky and managed by WKWMA (DOE 2015b). The overall project objectives were to find areas impacted by PGDP hazardous substances that may require CERCLA evaluation and to develop information for determining environmental indicators used for measuring the RCRA corrective action process. These visual and radiological surveys were completed in accordance with the *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D2 (Sitewide Evaluation Work Plan) (DOE 2011).

5.1.1. 2009–2010 Field Effort

Surveys were performed during the 2009–2010 field effort to identify anomalies. Anomalies for these surveys were defined in the Sitewide Evaluation Work Plan as any area that exhibits two times instrument radiological background and/or were piles, depressions, debris, or other potential man-made disturbances (DOE 2011). On DOE-owned property outside the Limited Area (including property licensed to the Commonwealth of Kentucky), anomalies were identified by radiological and visual walkover surveys, with anomalies determined to be PGDP-related by any of the following:

1. Radiological readings,
2. A release was visually identified, or
3. Process knowledge.

In addition to the portion of WKWMA property that is licensed to the Commonwealth of Kentucky, a portion of WKWMA property formerly owned by the Commonwealth of Kentucky (some of which has been acquired by GLE) was subjected to radiological and aerial photographic flyover surveys. Based upon the evaluation of the aerial surveys of property formerly owned by the Commonwealth of Kentucky, a visual walkover survey of this area was not needed (DOE 2015b).

Descriptions of the aerial photographic and visual walkover surveys are discussed in this section.

5.1.1.1. Aerial photographic survey

The aerial photographic survey, which included aerial photography, topographic mapping, digital orthophotos, and light detection and ranging, was conducted over PGDP and the surrounding area. The purpose of the aerial photographic survey was to acquire high-resolution aerial photographs and surface contours that would aid in the identification of anomalies. A survey firm was used to provide survey data

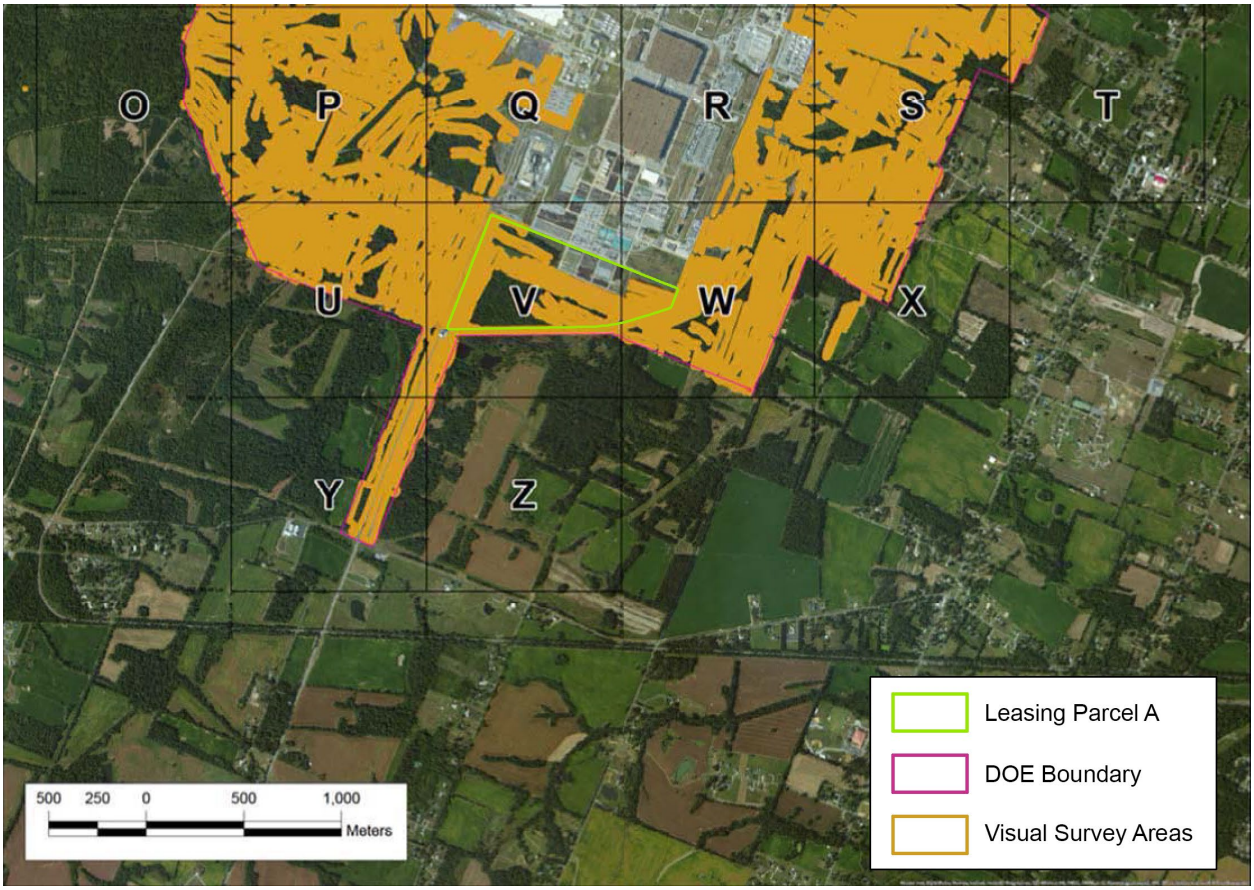
for photograph control. This included targets that did not move for the duration of the photographic survey. The aerial photographic survey was performed on April 8, 2009.

The aerial photographic survey produced a topographic map with 2 ft surface model contours and planimetric detail and a Digital Elevation Model that provided delineation of current surface features, which includes watersheds, drainage pathways, roads, and land cover. The aerial photographic survey also produced a topographic map with 2 ft surface model contours and all planimetric detail appropriate for that map scale.

No new AOCs were identified within Leasing Parcel A as a result of the aerial photographic survey.

5.1.1.2. Visual survey

The visual survey of the 2,676 acres was accomplished by visually observing and physically locating an anomaly and recording the location, size, type of anomaly, and any other pertinent information. This included all DOE-owned property outside the Limited Area (including property licensed to the Commonwealth of Kentucky). Figure 20 shows the visual survey grid alignment and the extent of the visual survey conducted in 2009/2010 (yellow-orange areas) in the Leasing Parcel A area. Due to the ice storm of January 2009, portions of the wooded areas were not accessible for the visual walkover survey.



Modified from DOE 2015b

Figure 20. Visual Survey Areas

Table 1 lists and describes the anomalies that were identified within Leasing Parcel A per the grid areas shown in Figure 20. Locations of anomalies in each of the grid areas are shown in Figures 21 and 22. These visual anomalies are not related to any known KOW or PGDP activities (DOE 2015b).

Table 1. Visual Anomalies Identified within Leasing Parcel A

Anomaly Name	Description
Anomalies within Grid Area V	
PV-24-01-V-8	dirt mound
PV-29-03-V-12	dirt mound
PV-29-03-V-13	concrete
PV-29-03-V-14	concrete
PV-29-03-V-17	dirt mound
PV-29-03-V-18	dirt mound
PV-29-03-V-19	concrete
PV-29-03-V-22	depression
PV-29-03-V-23	concrete
PV-29-03-V-8	dirt mound
Anomalies within Grid Area W	
PW-17-03-V-8	dirt mound
PW-26-03-V-9	soil, limbs, tree debris
PW-26-03-V-10	soil, limbs, tree debris
PW-26-03-V-11	soil, limbs, tree debris
PW-26-03-V-12	soil, limbs, tree debris

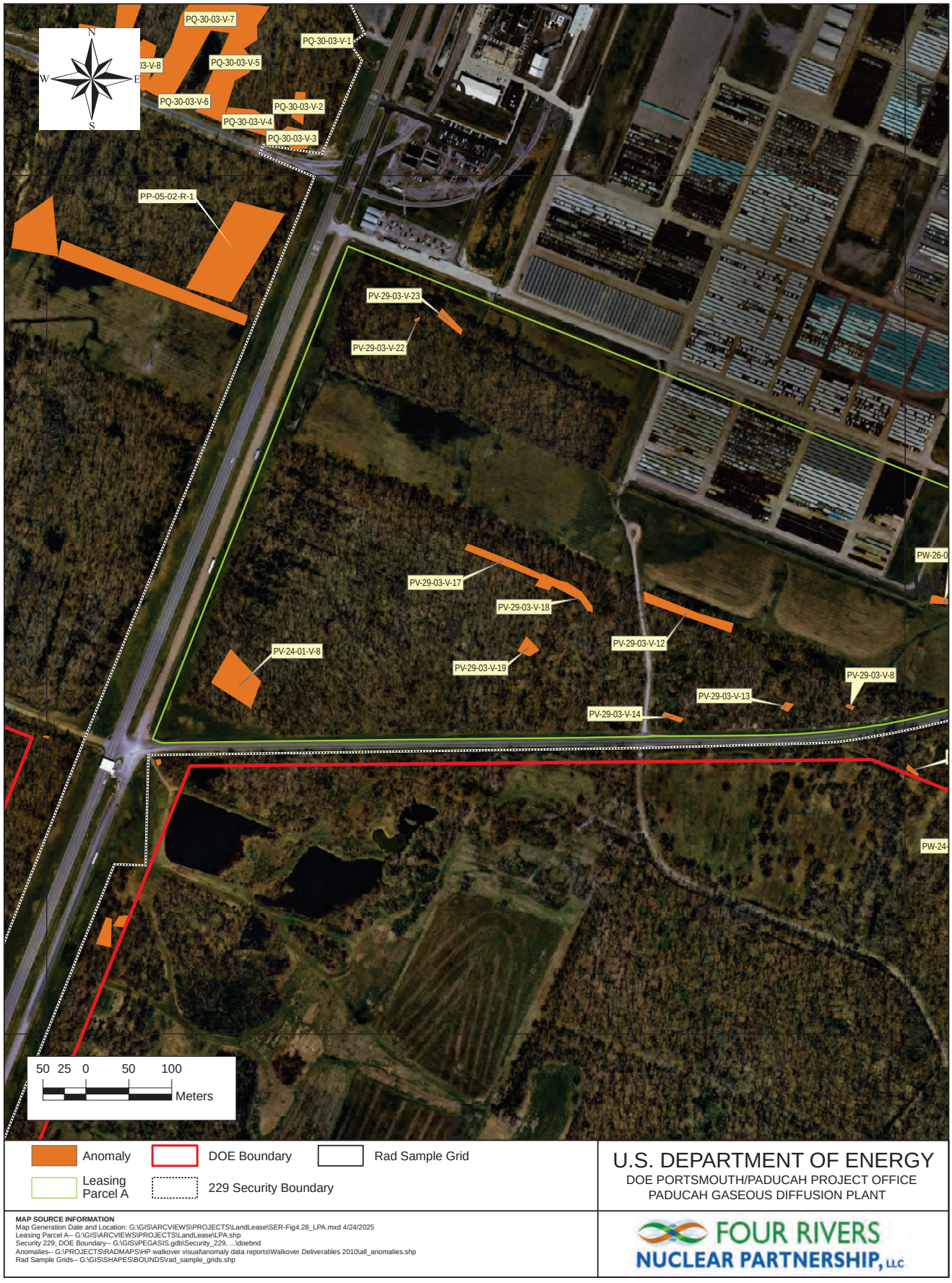


Figure 21. Visual Anomaly Grid Area V

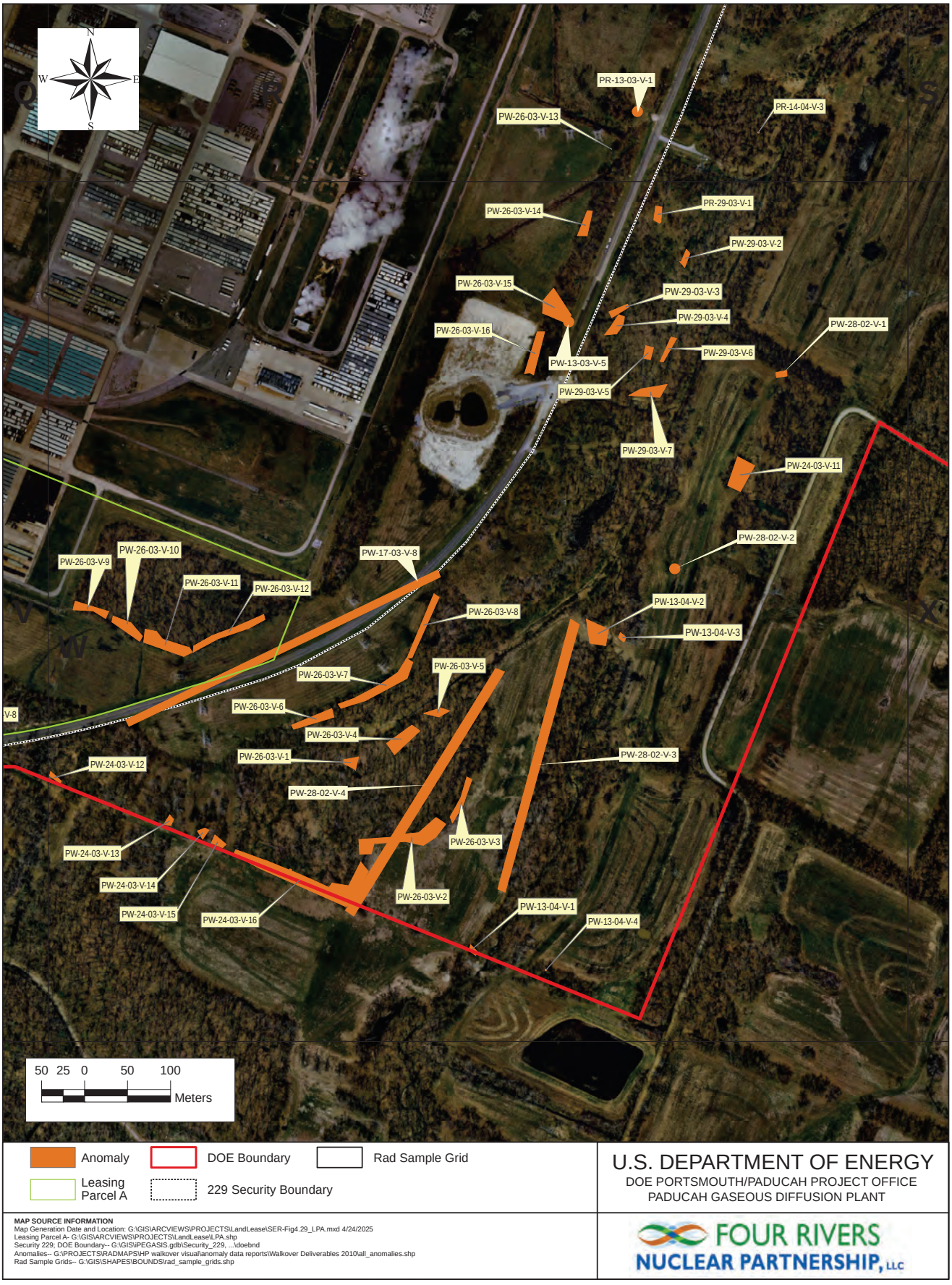


Figure 22. Visual Anomaly Grid Area W

5.1.2. 2014–2015 Field Effort

A confirmatory field effort was executed from October 2014 to January 2015 that included a focused radiological survey and judgmental sampling effort for 25 of the previously identified 534 anomalies to validate the conclusions of the previous 2009–2010 field effort. The 25 selected anomalies served as proxies for the remaining 509 identified anomalies. Soil samples were collected and analyzed using the field x-ray fluorescence (XRF) method to measure total uranium concentration associated with the selected anomalies. An evaluation of XRF data with fixed-base laboratory data was provided in a data quality assessment to the Soils OU remedial investigation report, which indicated that the use of XRF results for uranium had good correlation and, therefore, are reliable for use in determining nature, extent, and risk evaluation (DOE 2013). The 2014–2015 field effort was completed in accordance with the *Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-1288&D2 (DOE 2014). The conclusion from the evaluation of the results of the visual and radiological surveys and their associated analyses of the 25 anomalies was that no areas were identified that required either further CERCLA evaluation under the PGDP FFA or designation as SWMUs or AOCs.

One of the 25 selected anomalies evaluated, PV-24-01-V-8, described as dirt mounds with miscellaneous debris, is within the footprint of Leasing Parcel A (Figure 23). Other similar dirt mounds were identified within Leasing Parcel A.

Figure 23. Anomaly PV-24-01-V-8

5.1.3. Other Features in Leasing Parcel A

The locations of other features, in addition to the above-mentioned visual anomalies identified within Leasing Parcel A, are shown in Figure 24. Features include 161 kilovolt electrical transmission lines/towers, an undeveloped road, and SWMUs 409 and 530. A surveillance network of environmental dosimeters are established at monitoring locations at the perimeter of the Paducah Site to provide data on external radiation exposure from DOE operations to members of the public. DOE Order 458.1 Chg 4 (LtdChg), *Radiation Protection of the Public and the Environment*, has requirements in place to protect the public and environment from radiation exposure. Seven of the monitoring locations, EDL-1, EDL-2, EDL-25, EDL-35, EDL-40, EDL-53, and EDL-72, are located on, or immediately adjacent to Leasing Parcel A. Monitoring location EDL-2 also has a neutron dosimeter for collecting information. This radiation monitoring program is designed to provide exposure data on direct radiation from DOE operations to members of the public and monitoring results are reported in the annual site environmental report.

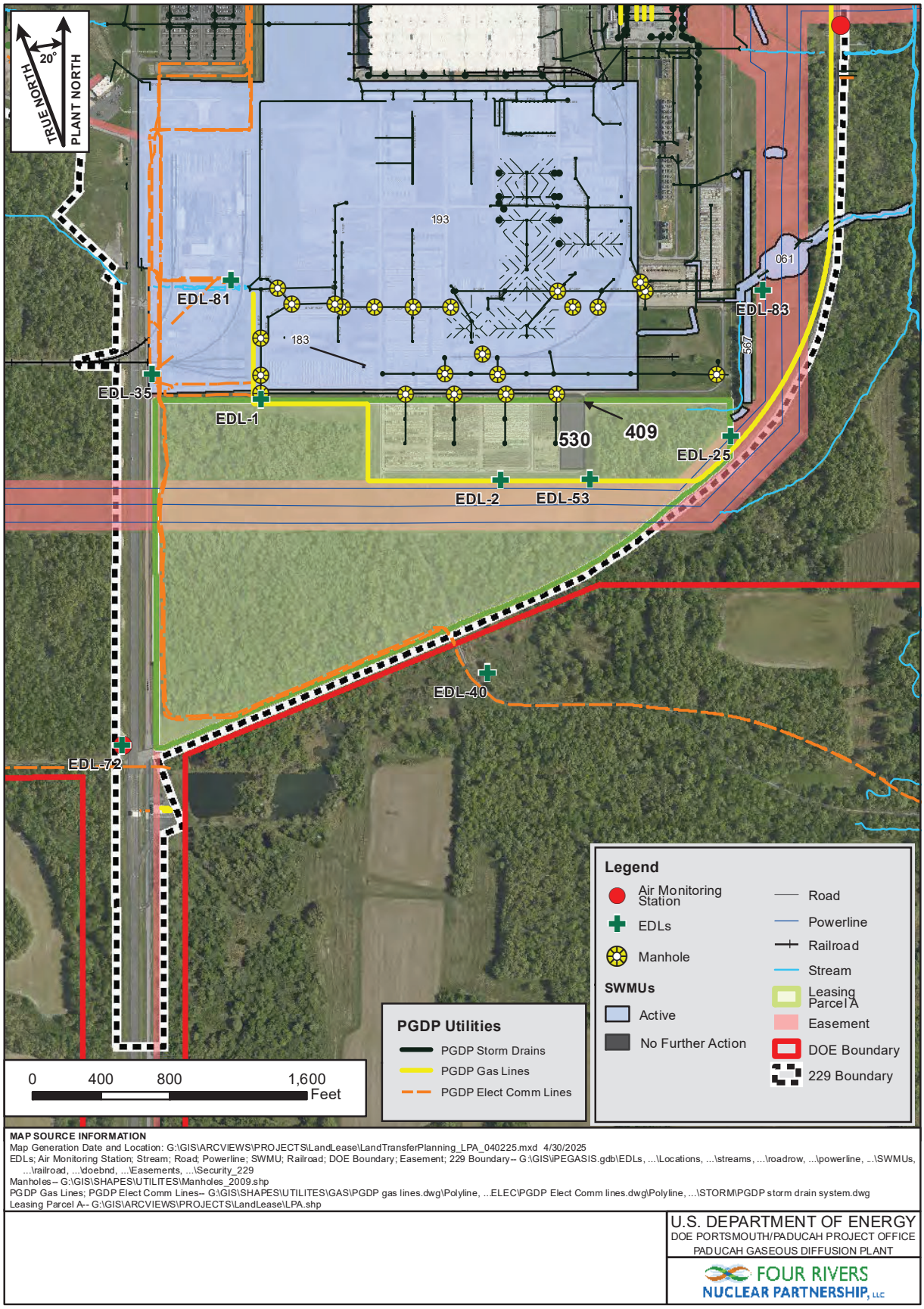
An additional visual assessment of Leasing Parcel A was performed during March 2025. Remnants of a former homestead (discussed in Section 4) were noted (e.g., bricks, concrete), but no new anomalies were identified during this assessment.

5.2. VISUAL AND PHYSICAL INSPECTIONS OF ADJACENT PROPERTY

The visual and physical inspections addressed in Section 5.1 extended beyond Leasing Parcel A into adjacent property (DOE-owned property). The associated anomalies on the adjacent property were located and investigated; based on these activities, it was determined that no additional actions were required (DOE 2015b). Leasing Parcel A is bordered to the south and southeast by former WKWMA property (acquired by GLE from the Commonwealth of Kentucky in 2024).

5.3. PARCEL SUMMARY

The conclusions of the visual and radiological walkover surveys, along with judgmental sampling of selected anomalies, were that no areas were identified that required either further CERCLA evaluation or designation as AOCs within Leasing Parcel A. The results demonstrated that identified anomalies do not represent unknown areas of contamination that pose a threat to the public or environment. There are no indications, based on visual walkover surveys, that any activity occurred within or around Leasing Parcel A, except at previously identified SWMUs/AOCs that require further investigation (see Section 6), that would impact the condition of the property or result in the release or disposal of hazardous substances or petroleum products within the property. Leasing Parcel A was disturbed during construction of PGDP and electrical transmission corridors. There has been no PGDP-related activity occurring within Leasing Parcel A since the 2009–2010 visual inspection, other than routine work in the C-745-T Cylinder Storage Yard, that would invalidate the prior conclusions.



MAP SOURCE INFORMATION

Map Generation Date and Location: G:\GIS\ARCVIEWS\PROJECTS\LandLease\LandTransferPlanning_LPA_040225.mxd 4/30/2025

EDLs; Air Monitoring Station; Stream; Road; Powerline; SWMU; Railroad; DOE Boundary; Easement; 229 Boundary-- G:\GIS\IPEGASIS.gdb\EDLs, ...\Locations, ...\streams, ...\roadrow, ...\powerline, ..\SWMUs, ...\railroad, ...\doebnd, ...\Easements, ...\Security_229

Manholes-- G:\GIS\SHAPES\UTILITES\Manholes_2009.shp

PGDP Gas Lines; PGDP Elect Comm Lines-- G:\GIS\SHAPES\UTILITES\GAS\PGDP gas lines.dwg\Polyline, ...ELEC\PGDP Elect Comm lines.dwg\Polyline, ...\STORM\PGDP storm drain system.dwg

Leasing Parcel A-- G:\GIS\ARCVIEWS\PROJECTS\LandLease\LPA.shp

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

FOUR RIVERS NUCLEAR PARTNERSHIP, LLC

Figure 24. Features in Leasing Parcel A

6. RECORDS SEARCH OF ADJACENT FACILITIES

A review of reasonably obtainable federal, state, and local records regarding past and present information about the property adjacent to Leasing Parcel A was performed in accordance with CERCLA 120(h) and DOE guidance and protocols (DOE 2024b; DOE 2024c; DOE 1998). As stated in the CERCLA regulations, the purpose of this review was to identify the following:

> …reasonably obtainable federal, state, and local government records of each adjacent facility where there has been a release of any hazardous substance or any petroleum product or its derivatives, including aviation fuel and motor oil, and which is likely to cause or contribute to a release or threatened release of any hazardous substance or any petroleum product or its derivatives, including aviation fuel and motor oil on the real property proposed for transfer.

The adjacent property north, west, and east of Leasing Parcel A is owned by DOE, while the remaining adjacent property to the south is owned by GLE. The property (referred to as Parcel 1) east of Leasing Parcel A is currently owned by DOE, but is planned to be transferred in the near-term to the local community for reindustrialization. Table 2 lists active and inactive SWMUs/AOCs that are adjacent to Leasing Parcel A as well as SWMUs that are within the property. Remedial actions for the active surface SWMUs (e.g., soil piles, effluent ditches, Little Bayou Creek) will be addressed in accordance with their respective OUs in the future.

Table 2. SWMUs and AOCs within or adjacent to Leasing Parcel A

SWMU /AOC	OU	Description	Status/Current Subproject	Within Leasing Parcel A?
61	Surface Water	C-375-E5 Effluent Ditch (KPDES 013)	Surface Water remedial/removal (currently part of the Environmental Media remedial project)	No
183	DUF_6 Footprint Underlying Soils	McGraw UST	Comprehensive Site OU	No
193	DUF_6 Footprint Underlying Soils	McGraw Construction Facilities (South Side Cylinder Yard Area, East of Hobbs Road)	Comprehensive Site OU	No
409	Not Applicable (N/A)	G-745-T-01 Generator Staging Area	No Further Action (NFA) approved by Kentucky Division of Waste Management (KDWM) on February 14, 2006; no longer in use	Yes
526	Surface Water	Internal Plant Drainage Ditches (includes KPDES 016)	Surface Water remedial/removal (currently part of the Environmental Media remedial project)	No
530	N/A	Soil and Debris Storage Area by C-745-T Yard	NFA approved by KDWM on March 8, 2007; no longer in use	Yes
567	Soils	Soil Pile K013 near Outfall 013, West of Little Bayou Creek	Soils remedial (currently part of the Environmental Media remedial project)	No

Figure 24 shows the locations of the SWMUs/AOCs. The site management plan for the Paducah Site tracks the status of the SWMUs/AOCs and whether NFA determinations have been reached (DOE 2024a).

SWMU 61 is an outfall ditch under the KPDES permit that is northeast of Leasing Parcel A. Monthly and quarterly monitoring reports are required to indicate the effects of discharges from PGDP to Little Bayou Creek. Descriptions of the outfall ditches and potential contamination are provided in *Surface Water Operable Unit (On-Site) Site Investigation and Baseline Risk Assessment Report at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-0001&D2/R1 (DOE 2008a), and *Work Plan for the Surface Water Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0361&D2/R1 (DOE 2012). KPDES Outfall 013 (SWMU 61) was evaluated during the development of the sampling and analysis plan for the Surface Water OU removal action and was determined to not require any early action. Further assessment of Outfall 013 will be addressed as part of the Surface Water OU remedial action (SWMU 61 is currently planned to be evaluated as part of the Environmental Media remedial project).

SWMU 183, the McGraw Underground Storage Tank, was a 400 gal tank used to store waste oil generated at a temporary garage used during construction of PGDP. During construction of the cylinder storage yards in the early 1980s, the tank was discovered and filled with concrete. This SWMU, located north of Leasing Parcel A, is planned to be addressed as part of the Comprehensive Site OU, after shutdown of the DUF_6 facility.

SWMU 193, the McGraw Construction Facilities area, was used in the early 1950s as infrastructure support facilities associated with the construction and early operation of PGDP. Currently, the C-745-D, -F, -G, -K, -L, -M, -N, -P, -Q, -R, -S, -U, and -V DUF_6 cylinder storage yards are located in this area (north of Leasing Parcel A). In the 1990s, various remedial investigations were conducted on this SWMU and it is planned to be addressed as part of the Comprehensive Site OU, after shutdown of the DUF_6 facility.

SWMU 409, the G-745-T-01 Generator Staging Area, was established to store rust removed from UF_6 cylinders with a wire brush. This generator staging area was in operation from December 1999 to June 2000 with the waste stored in 55 gal drums on a pallet on the ground (only one drum was used to store the rust). All waste stored in SWMU 409 has been removed and the unit is no longer in use. This unit was proposed for an NFA because it was no longer in use, had no releases to the environment, and was not a threat to human health and the environment with KDWM approving the NFA request on February 14, 2006. This NFA SWMU lies within the footprint of Leasing Parcel A.

A portion of SWMU 526, the Internal Plant Drainage Ditches associated with KPDES Outfall 013 drainage, is located in the southeastern corner of PGDP, south of the C-745-V Cylinder Storage Yard. Further assessment of KPDES Outfall 013 and this portion of SWMU 526 will be addressed as part of the Surface Water OU remedial action (which is currently planned to be evaluated as part of the Environmental Media remedial project).

SWMU 530, the Soil and Debris Storage Area by C-745-T Yard, is located east of the C-745-T Cylinder Storage Yard within Leasing Parcel A. The storage area was constructed to receive construction and demolition debris and polycyclic aromatic hydrocarbon (PAH)-contaminated soils from the C-745-K and C-745-M Cylinder Storage Yards. The construction and demolition debris consisted of concrete, soil, rock, fabric, and plastic from the demolition of existing and older utilities in the C-745-K and C-745-M Cylinder Storage Yards (debris stored in SWMU 530 was not the result of a CERCLA action). The PAH-contaminated soils are associated with the removal of underground storage tanks at the C-745-K Cylinder Storage Yard and the removal of a diesel spill that occurred in the C-745-M Cylinder Storage Yard, which may have taken place during construction of PGDP in the 1950s. The PAH-contaminated soils were underlain and covered by plastic. Landfill disposal packages U-090 and U-091 were prepared for disposal

of soil, gravel, concrete, and piping from adjacent cylinder yards; and the material was approved for disposal at the C-746-U Contained Landfill. Disposal of approximately 1,625 yd^3 of material from SWMU 530 occurred in 2003. Landfill disposal packages U-116 and U-131 were prepared for disposal of the soil that had been stored from the removal of the underground storage tanks and the diesel spill removal. This waste was removed from SWMU 530 and disposed of in the C-746-U Contained Landfill in 2004 and early 2005. All waste stored in SWMU 530 has been removed and the unit is no longer in use. SWMU 530 was proposed for NFA status after all construction debris and contaminated soil had been removed because it was no longer in use, had no releases to the environment, and was not a threat to human health and the environment with KDWM approving the NFA request on March 8, 2007.

AOC 567, Soil Pile K013, consists of five different soil piles that are about 3 ft high and cover a cumulative area of roughly 74,800 ft^2. This area was discovered in June 2008, when a sampling and analysis plan for other soil piles in the area was approved. The area contained soil piles that likely were generated as a result of past construction activities at PGDP. This area was characterized with the other soil piles in the area in October 2008. AOC 567, located east of Leasing Parcel A, will be included in the scope of the Environmental Media remedial project.

SWMU 202, Northeast Groundwater Plume, contains dissolved-phase VOC contamination such as trichloroethene (TCE) and the radionuclide technetium-99 in groundwater that flows northeastward in the RGA. SWMU 202 is located more than 2,500 ft north-northwestward of Leasing Parcel A, but is listed here as it is the nearest identified groundwater contaminant plume in relation to the property (Figure 25). The Northeast Plume is being addressed by a groundwater extraction and treatment system (i.e., "pump-and-treat") to address the higher concentration portions of the VOCs and technetium-99 emanating from source areas in PGDP (e.g., C-400 Cleaning Building). DOE established a Water Policy to mitigate exposure to groundwater by nearby residents. The Northeast Plume extraction and treatment system was installed as part of a selected interim remedy under the *Record of Decision for Interim Remedial Action at the Northeast Plume, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1356&D2 (DOE 1995). An Explanation of Significant Differences was developed to document modifications to the interim remedial action (DOE 2015c).

The Water Policy is a non-time critical removal action that originally was implemented and currently is being maintained to eliminate potential exposure to contaminated groundwater from the Paducah Site. DOE developed the Paducah Site Water Policy in accordance with the *Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1142&D3, (DOE 1993), and the *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/OR/06-1201&D2 (DOE 1994).

The Paducah Site Water Policy states, "It is the intent of the PGDP Environmental Restoration Program to offer municipal water service in accordance with this Policy to all existing private residences and businesses within the projected migration area of the contaminated groundwater originating at PGDP (affected area)." DOE is not responsible for paying water for new residents or new businesses. With the adoption of the Water Policy, DOE focused its groundwater monitoring program on the Water Policy boundary and adjacent areas that might be affected if and when the plume migrates or expands. Figure 25 shows the 5 micrograms per liter (µg/L) TCE groundwater plume boundaries and the Water Policy boundary as of 2022 (DOE 2024f).

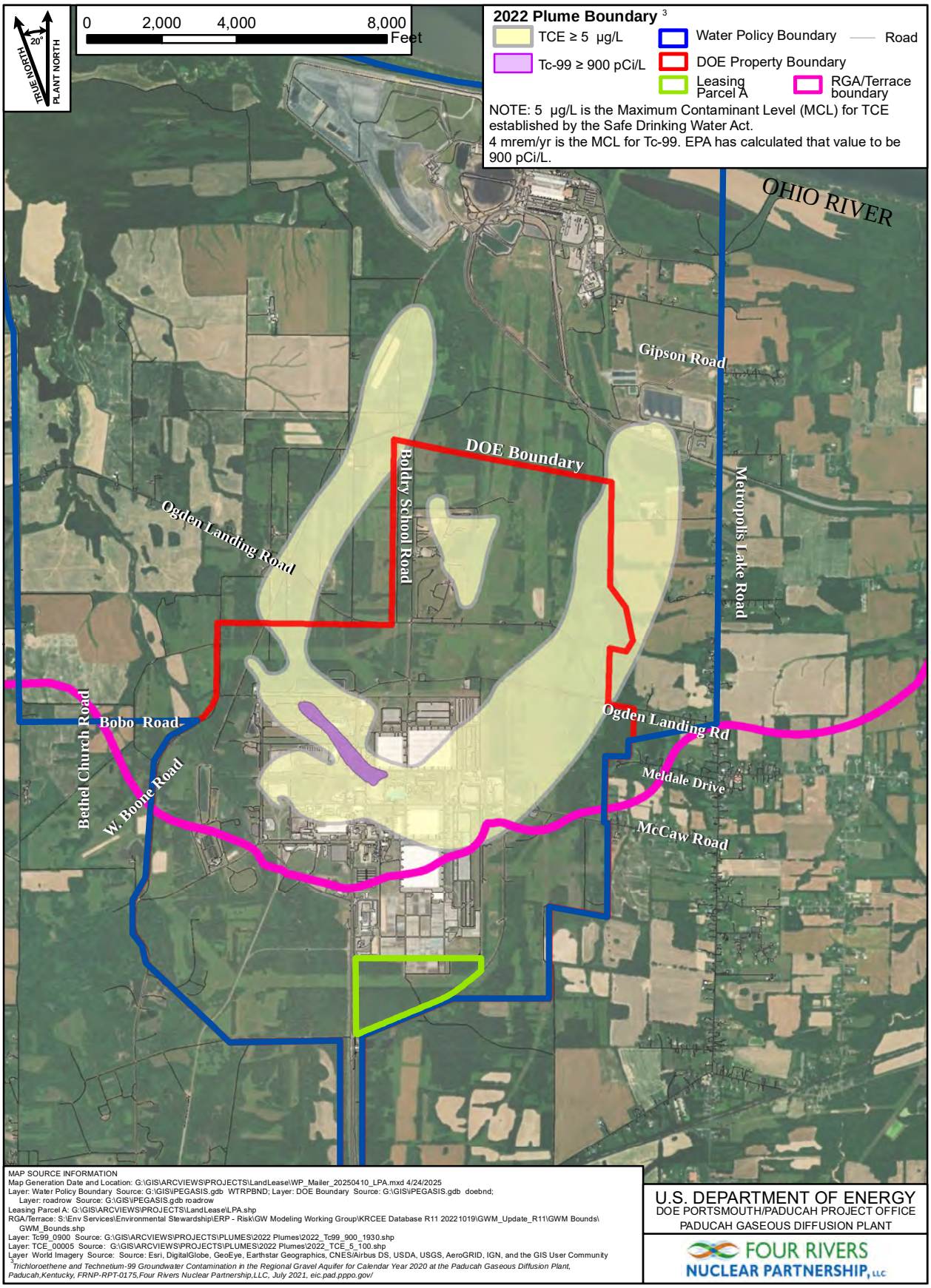


Figure 25. Location of the Water Policy Boundary and TCE/Technetium-99 Plumes

The Action Memorandum contains the following regarding the purpose of the Water Policy (DOE 1994):

> The purpose of long-term remedial action is to eliminate, reduce, or control risks to human health and the environment. Implementation of this removal action is consistent with that purpose. Potential threats to public health require attention prior to initiation of long-term remediation. This action prohibits exposure to contaminated water from residential wells until a permanent remedy has been successfully completed, or other actions have formally been deemed appropriate.

DOE samples existing residential wells and monitoring wells (MWs) to track the effectiveness of groundwater remediation efforts on reducing the size and concentration of the contaminant plumes. Additional MWs are installed as needed for other environmental programs. The monitoring of groundwater in and around the Water Policy boundary confirms that the groundwater plumes with contaminant concentrations exceeding their maximum contaminant levels (MCLs) have not migrated beyond the current Water Policy boundary. The Water Policy eliminates potential pathways of exposure to the public by providing municipal water to potentially affected residents and businesses within the Water Policy boundary. The removal action for the Water Policy currently protects human health and the environment by institutional controls, which includes administrative controls. The removal action for the Water Policy continues to be effective for the purpose for which it was intended (DOE 2024e). The continued effectiveness of the Water Policy action is evaluated by the monthly review of Water Policy-affected area water bills of licensed parcels for downward trends in water usage, the annual review of the Kentucky Geological Survey water well database to ensure that no new wells have been installed, the review of the Kentucky Division of Water well notification report for newly submitted drill logs, visual assessments of licensed parcels, and the semiannual review of the McCracken County Property Valuation Administrator website for verification of land ownership (DOE 2024g).

In establishing the affected area for the Water Policy to address contamination in the RGA, the affected area's southern boundary was made coincident with the DOE property boundary, and did not follow the southern extent of the RGA. While Leasing Parcel A is within the Water Policy boundary, as noted in Section 1.3, it overlies the Terrace Gravel flow system rather than the RGA (Figure 25); therefore, the contamination present in the RGA does not underlie Leasing Parcel A. Potential exposure to contaminated groundwater will be further minimized through a lease restriction on groundwater use.

The adjacent areas include SWMUs/AOCs that will be further evaluated in future CERCLA projects to determine if remedial actions are necessary. The identified SWMUs/AOCs are not expected to impact the planned industrial activities on Leasing Parcel A.

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7. HISTORICAL DATA AND SCREENING LEVEL RISK EVALUATION

7.1. ANALYTICAL DATA SOURCES

Soil, groundwater, and sediment data were collected from locations associated with Leasing Parcel A as part of various environmental studies and investigations conducted at PGDP. Analytical data summary tables and data collection locations are provided in this section. The data reported in this section were determined to be of sufficient quality to characterize Leasing Parcel A by following the general data quality objective process provided in DOE protocols (DOE 2024b; DOE 2024c).

The source of the analytical data is a local version of the Oak Ridge Environmental Information System on the network at the Paducah Site. Data were also viewed on DOE's PPPO Environmental Geographic Analytical Spatial Information System (PEGASIS). PEGASIS allowed a visual evaluation of environmental data located in proximity to Leasing Parcel A to determine if other sample locations should be included in the data set. The analytical data are provided in Appendix B. A summary of the analysis types performed for the soil, groundwater, and sediment is provided in Table 3.

Table 3. Matrix of Analysis Types in Samples

Analysis Type	Soil	Groundwater	Sediment
Metals	X	X (uranium)	X
Radionuclides	X	X (technetium-99)	X
Semivolatile Organic Compounds (SVOCs)	X		X
PAHs	X		X
Polychlorinated biphenyls (PCBs)	X		X
VOCs	X	X	X
Wetchem	X		

The data summary process included identification and compilation of pertinent historical chemical and radiological data collected from investigations conducted within, and immediately adjacent to, the footprint of Leasing Parcel A. Analytical data collected from 2000 through 2024 are utilized for quantitative evaluation in this leasing data package. The 2000 date was chosen based on the consideration that data from 2000 to 2024 are more relevant and better represent current conditions at the Paducah Site than data collected prior to 2000. Historical data prior to 2000 were used only qualitatively for this evaluation. For example, data from older DOE investigations at the Paducah Site were reviewed qualitatively for potential impacts within Leasing Parcel A footprint and to determine chemicals or radionuclides of potential concern (COPCs). The following are specific uses of the data by medium and analytical type.

- Soil data derived since 2000 were used quantitatively.

- Groundwater, surface water, and sediment data from samples collected since 2014 were used quantitatively, if present and applicable, to focus on current conditions. Groundwater data outside the parcel boundaries were considered qualitatively. Surface water data were not available within or near Leasing Parcel A and there were two sediment data locations sampled prior to August 2000 (which are evaluated only qualitatively in the following discussion).

All data not qualified during the verification and validation process and considered usable as reported by the laboratory were included in the data set for evaluation. Data identified as estimated and qualified with a "J" (estimated concentration) were included in the data set for evaluation. Data identified as unusable (qualified with an "R") were rejected and excluded from the evaluated data set. Data also were reviewed for the

presence of duplicate analytical results (i.e., field duplicates or replicates). Duplicate sample results were removed from the medium-specific data set so that only unique analytical sample results were included in the evaluation process. Evaluation of duplicate analytical results was performed by comparing the duplicate sample result to the original corresponding sample result on a sample-specific and analyte-specific basis. If both the original result and the duplicate result were nondetected values, then the result with the lower detection limit (DL) was retained in the data set for that sample. If both the original and duplicate sample results were detected values, then the result with the greater detected value was retained in the data set. If either the original sample result or the duplicate sample result was a detected value and the corresponding original or duplicate sample result was a nondetected value, then the detected value was retained for evaluation.

To accurately reflect site subsurface conditions, soil data were reviewed further to exclude sample depths > 16 ft below ground surface (bgs). A depth of 16 ft bgs is considered as a reasonable depth of subsurface infrastructure at PGDP. Deeper soil data are provided in Appendix B.

7.1.1. Soil Sample Data Sources

Analytical data for soil samples from the following projects were collected within Leasing Parcel A.

- DUF_6 Conversion Facility siting
- Soil Pile investigations (DOE 2008b, DOE 2010)
- Soils OU remedial investigation (DOE 2013, DOE 2016a)
- Soils OU sitewide investigation (DOE 2015b)
- Waste Disposal Alternatives remedial investigation/feasibility study (DOE 2018)
- Characterization of soil/gravel in the C-745 cylinder storage yards

The data from these projects have been downloaded from the Paducah Site's environmental information system. The sampling locations are shown in Figure 26. The data from the C-745 cylinder storage yards consists of 20 surface soil samples collected in 1995 prior to construction of the C-745-T Cylinder Storage Yard. Due to the age of the samples and the samples only being analyzed for alpha activity, beta activity, and PCB compounds, data from these samples are only discussed qualitatively in following sections.

7.1.2. Groundwater Sample Data Sources

Historical groundwater data for Leasing Parcel A were collected as part of the Paducah Site's Environmental Monitoring Program. Samples collected from MW120 (a McNairy Formation MW) in eight sampling events between March 2020 and September 2024 yielded data for this evaluation.

7.1.3. Sediment Sample Data Sources

Historical sediment data are available from two locations, JP-0164 and UFSS-04. The sediment sampling locations are shown in Figure 26. Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation.

7.2. ANALYTICAL RESULTS FOR CHEMICALS

Results for chemicals found in soil, groundwater, and sediment are presented separately in the following subsections.

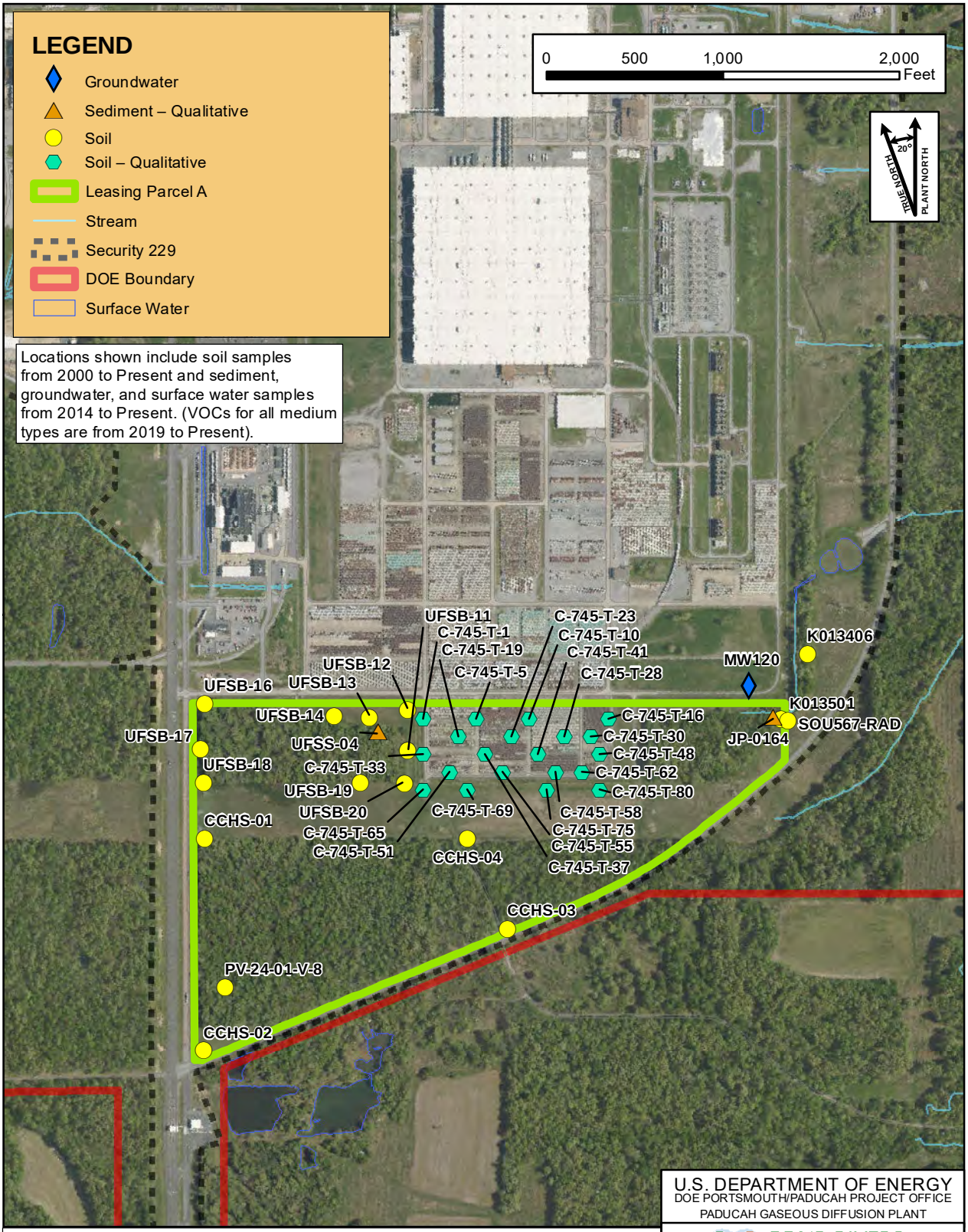

Figure 26. Historical Sample Locations by Media

7.2.1. Analytical Results for Chemical Data in Soil

Analytical results of soil samples from the historical investigations are summarized in Tables 4 and 5. These summaries provide the analytes, frequency of detections (FODs), minimum and maximum detections, frequency of exceedances (FOEs), and comparisons to provisional background values and appropriate risk screening values where available. The risk screening is discussed in Section 7.4.

The following constituents were analyzed for, but were not detected in any soil samples in the data set for Leasing Parcel A. They are not considered further in evaluating site conditions.

- Antimony
- Cyanide
- Molybdenum
- Selenium
- Thallium
- Americium-243
- Cesium-134
- Cobalt-60
- Neptunium-237
- Neptunium-239
- Plutonium-238
- Plutonium-239/240
- Protactinium-234m
- 1,2,4-Trichlorobenzene
- 1,2-Dichlorobenzene
- 4-Nitrophenol
- Acenaphthene
- 1,2-Diphenylhydrazine
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol
- Benzenemethanol
- Benzo(a)pyrene
- 2,4-Dichlorophenol
- 2,4-Dimethylphenol
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2,6-Dichlorophenol
- 2,6-Dinitrotoluene
- 2-Chloronaphthalene
- 2-Chlorophenol
- 2-Methyl-4,6-dinitrophenol
- 2-Methylnaphthalene
- 2-Methylphenol
- 2-Nitrobenzenamine
- 2-Nitrophenol
- 3,3'-Dichlorobenzidine
- 3-Nitrobenzenamine
- 4-Bromophenyl phenyl ether
- 4-Chloro-3-methylphenol
- 4-Chlorobenzenamine
- 4-Chlorophenyl phenyl ether
- 4-Methylphenol
- Acenaphthylene
- Anthracene
- Benz(a)anthracene
- Benzo(b)fluoranthene
- Benzo(ghi)perylene
- Benzo(k)fluoranthene
- Benzoic acid
- Bis(2-chloroethoxy)methane
- Bis(2-chloroethyl) ether
- Bis(2-chloroisopropyl) ether
- Butyl benzyl phthalate
- Carbazole
- Chrysene
- Dibenz(a,h)anthracene
- Dibenzofuran
- Diethyl phthalate
- Dimethyl phthalate
- Fluoranthene
- Fluorene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- Indeno(1,2,3-cd)pyrene
- Isophorone
- Naphthalene
- Nitrobenzene
- N-Nitrosodimethylamine
- N-Nitroso-di-n-propylamine
- N-Nitrosodiphenylamine
- Pentachlorophenol
- Phenanthrene
- Phenol
- p-Nitroaniline
- Pyrene
- Pyridine
- 1,1,1-Trichloroethane
- 1,1,2,2-Tetrachloroethane
- 1,1,2-Trichloroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2-Dichloroethane
- 1,2-Dichloropropane
- 1,2-Dimethylbenzene
- 2-Butanone
- 2-Hexanone
- 4-Methyl-2-pentanone
- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chloroethane
- Chloroform
- Chloromethane
- *cis*-1,2-Dichloroethene
- *cis*-1,3-Dichloropropene
- Dibromochloromethane
- Ethylbenzene
- m,p-Xylene
- Methylene chloride
- Styrene
- Tetrachloroethene
- Toluene
- Total Xylene
- *trans*-1,2-Dichloroethene
- *trans*-1,3-Dichloropropene
- Trichloroethene
- Vinyl acetate
- Vinyl chloride

7.2.2. Analytical Results for Chemical Data in Groundwater

A summary of the groundwater chemical data for the McNairy Formation MW, which includes comparisons to provisional backgrounds and MCLs, is provided in Table 6.

Table 4. Surface Soil Data Summary (0–1 ft bgs)

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		Industrial Worker		Industrial Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	
METAL	Aluminum	mg/kg	4.47E+03	1.34E+04	8.55E+03	15/15	1/15	1.30E+04	0/15	1.00E+05	0/15	1.00E+05	0/15	3.26E+04	0/15	1.00E+05	15/15	3.00E+03	0/15	5.99E+04	20 - 199
METAL	Antimony	mg/kg	--	--	--	0/15	--	2.10E-01	--	9.34E+01	--	2.80E+03	--	1.32E+01	--	3.96E+02	--	3.52E-02	--	7.04E-01	8.06 - 20
METAL	Arsenic	mg/kg	5.01E+00	7.29E+00	5.78E+00	7/15	0/15	1.20E+01	7/15	1.60E+00	0/15	1.60E+02	7/15	7.48E-01	0/15	7.48E+01	7/15	1.51E-03	7/15	3.02E-02	4.87 - 5
METAL	Barium	mg/kg	2.73E+01	1.97E+02	8.62E+01	15/15	0/15	2.00E+02	0/15	4.04E+04	0/15	1.00E+05	0/15	6.47E+03	0/15	1.00E+05	15/15	1.55E+01	0/15	3.11E+02	2.44 - 5
METAL	Beryllium	mg/kg	5.08E-01	7.65E-01	6.08E-01	4/15	1/15	6.70E-01	0/15	4.50E+02	0/15	1.35E+04	0/15	6.55E+01	0/15	1.97E+03	0/15	1.95E+00	0/15	3.89E+01	0.487 - 0.5
METAL	Cadmium	mg/kg	2.51E+00	3.15E+00	2.80E+00	4/15	4/15	2.10E-01	0/15	6.11E+00	0/15	1.83E+02	3/15	2.54E+00	0/15	7.62E+01	4/15	1.38E-02	4/15	2.77E-01	2 - 2.48
METAL	Calcium	mg/kg	3.98E+02	1.02E+05	2.06E+04	15/15	0/15	2.00E+05	N/A	N/A	N/A	N/A	0/15	N/A	0/15	N/A	N/A	N/A	N/A	N/A	97.4 - 200
METAL	Chromium[a]	mg/kg	5.73E+00	3.39E+01	1.39E+01	15/15	3/15	1.60E+01	0/15	1.00E+05	0/15	1.00E+05	0/15	4.93E+04	0/15	1.00E+05	0/15	4.04E+06	0/15	8.09E+07	2.44 - 2.5
METAL	Chromium[b]	mg/kg	5.73E+00	3.39E+01	1.39E+01	15/15	3/15	1.60E+01	9/15	1.23E+01	0/15	1.23E+03	15/15	1.83E+00	0/15	1.83E+02	15/15	6.72E-04	15/15	1.34E-02	2.44 - 2.5
METAL	Cobalt	mg/kg	5.16E+00	8.16E+00	6.12E+00	5/6	0/6	1.40E+01	0/6	6.87E+01	0/6	2.06E+03	0/6	9.84E+00	0/6	2.95E+02	5/6	2.71E-02	5/6	5.43E-01	2.5 - 4.96
METAL	Copper	mg/kg	3.42E+00	1.07E+01	6.92E+00	13/15	0/15	1.90E+01	0/15	9.34E+03	0/15	1.00E+05	0/15	1.32E+03	0/15	3.96E+04	13/15	2.81E+00	0/15	5.62E+01	2.5 - 12.4
METAL	Iron	mg/kg	9.45E+03	1.74E+04	1.24E+04	6/6	0/6	2.80E+04	0/6	1.00E+05	0/6	1.00E+05	0/6	2.30E+04	0/6	1.00E+05	6/6	3.52E+01	6/6	7.04E+02	19.5 - 20
METAL	Lead[c]	mg/kg	1.21E+01	3.84E+01	2.40E+01	8/15	1/15	3.60E+01	0/15	8.00E+02	0/15	8.00E+02	0/15	8.00E+02	0/15	8.00E+02	6/15	1.35E+01	0/15	2.70E+02	4.87 - 20
METAL	Magnesium	mg/kg	8.05E+02	2.70E+03	1.51E+03	6/6	0/6	7.70E+03	N/A	N/A	N/A	N/A	0/6	N/A	0/6	N/A	N/A	N/A	N/A	N/A	4.87 - 15
METAL	Manganese	mg/kg	3.83E+02	1.83E+03	7.24E+02	6/6	1/6	1.50E+03	0/6	4.72E+03	0/6	1.00E+05	1/6	7.74E+02	0/6	2.32E+04	6/6	2.83E+00	6/6	5.65E+01	2.44 - 10
METAL	Mercury	mg/kg	3.00E-02	3.00E-02	3.00E-02	2/15	0/15	2.00E-01	0/15	7.01E+01	0/15	2.10E+03	0/15	9.86E+00	0/15	2.96E+02	2/15	2.95E-02	0/15	5.91E-01	0.016 - 0.2
METAL	Molybdenum	mg/kg	--	--	--	0/2	N/A	N/A	--	1.17E+03	--	3.51E+04	--	1.64E+02	--	4.92E+03	--	2.02E-01	--	4.03E+00	4.87 - 4.96
METAL	Nickel	mg/kg	6.05E+00	1.31E+01	9.27E+00	15/15	0/15	2.10E+01	0/15	2.99E+03	0/15	8.98E+04	0/15	6.21E+02	0/15	1.86E+04	15/15	2.56E+00	0/15	5.12E+01	4.87 - 5
METAL	Potassium	mg/kg	4.29E+02	6.04E+02	5.09E+02	4/4	0/4	1.30E+03	N/A	N/A	N/A	N/A	0/4	N/A	0/4	N/A	N/A	N/A	N/A	N/A	200 - 200
METAL	Selenium	mg/kg	--	--	--	0/15	--	8.00E-01	--	1.17E+03	--	3.51E+04	--	1.64E+02	--	4.92E+03	--	5.19E-02	--	1.04E+00	1 - 4.96
METAL	Silver	mg/kg	4.00E+00	4.00E+00	4.00E+00	1/15	1/15	2.30E+00	0/15	1.17E+03	0/15	3.51E+04	0/15	1.64E+02	0/15	4.92E+03	1/15	7.99E-02	1/15	1.60E+00	2.01 - 4
METAL	Sodium	mg/kg	3.43E+02	3.43E+02	3.43E+02	1/6	1/6	3.20E+02	N/A	N/A	N/A	N/A	0/6	N/A	0/6	N/A	N/A	N/A	N/A	N/A	195 - 200
METAL	Thallium	mg/kg	--	--	--	0/15	--	2.10E-01	--	2.34E+00	--	7.02E+01	--	3.29E-01	--	9.87E+00	--	1.42E-03	--	2.84E-02	9.74 - 20
METAL	Uranium[d]	mg/kg	--	--	--	0/6	--	4.90E+00	--	7.00E+02	--	2.04E+04	--	9.86E+01	--	2.95E+03	--	2.70E+00	--	5.39E+01	4.87 - 200
METAL	Uranium[e]	mg/kg	--	--	--	0/6	--	4.90E+00	--	4.66E+01	--	1.40E+03	--	6.58E+00	--	1.97E+02	--	1.80E-01	--	3.60E+00	4.87 - 200
METAL	Vanadium	mg/kg	1.64E+01	3.49E+01	2.31E+01	15/15	0/15	3.80E+01	0/15	1.15E+03	0/15	3.45E+04	0/15	1.65E+02	0/15	4.95E+03	15/15	8.64E+00	0/15	1.73E+02	2.44 - 2.5
METAL	Zinc	mg/kg	2.76E+01	5.73E+01	3.62E+01	15/15	0/15	6.50E+01	0/15	7.01E+04	0/15	1.00E+05	0/15	9.86E+03	0/15	1.00E+05	4/15	3.73E+01	0/15	7.46E+02	19.5 - 20
PPCB	Total PCBs[f]	mg/kg	--	--	--	0/15	N/A	N/A	--	2.93E-01	--	2.93E+01	--	2.24E-01	--	2.24E+01	--	6.82E-03	--	1.36E-01	0.1 - 0.13
RADS	Americium-241	pCi/g	--	--	--	0/16	N/A	N/A	--	3.99E-01	--	3.99E+01	--	3.38E-01	--	3.38E+01	--	1.29E-01	--	2.57E+00	0.0156 - 0.377
RADS	Americium-243	pCi/g	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0492 - 0.159
RADS	Cesium-134	pCi/g	--	--	--	0/13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0199 - 0.0608
RADS	Cesium-137	pCi/g	5.56E-02	2.61E-01	1.38E-01	15/16	0/16	4.90E-01	0/16	3.44E-01	0/16	3.44E+01	0/16	4.52E-01	0/16	4.52E+01	0/16	4.79E-01	0/16	9.58E+00	0.0239 - 0.099
RADS	Cobalt-60	pCi/g	--	--	--	0/13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0203 - 0.0911
RADS	Neptunium-237	pCi/g	--	--	--	0/16	--	1.00E-01	--	4.09E-01	--	4.09E+01	--	3.66E-01	--	3.66E+01	--	5.50E-03	--	1.10E-01	0.024 - 0.871
RADS	Neptunium-239	pCi/g	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.237 - 1.5
RADS	Plutonium-238	pCi/g	--	--	--	0/16	--	7.30E-02	--	9.63E-02	--	9.63E+00	--	7.81E-02	--	7.81E+00	--	8.58E-03	--	1.72E-01	0.0094 - 0.235
RADS	Plutonium-239/240[g]	pCi/g	--	--	--	0/16	--	2.50E-02	--	3.44E-01	--	3.44E+01	--	2.87E-01	--	2.87E+01	--	3.32E-02	--	6.64E-01	0.0131 - 0.0874
RADS	Potassium-40	pCi/g	1.52E+00	1.19E+01	8.26E+00	9/9	0/9	1.60E+01	N/A	N/A	N/A	N/A	0/9	N/A	0/9	N/A	N/A	N/A	N/A	N/A	0.232 - 0.804
RADS	Protactinium-234m	pCi/g	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.26 - 10.7
RADS	Radium-226	pCi/g	--	--	--	0/9	--	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.2 - 0.414
RADS	Technetium-99	pCi/g	5.71E-01	5.71E-01	5.71E-01	1/16	0/16	2.50E+00	0/16	1.95E+03	0/16	1.95E+05	0/16	3.32E+02	0/16	3.32E+04	1/16	7.60E-03	1/16	1.52E-01	0.41 - 3.12
RADS	Thorium-228	pCi/g	1.01E-01	8.80E-01	4.03E-01	16/16	0/16	1.60E+00	N/A	N/A	N/A	N/A	0/16	N/A	0/16	N/A	N/A	N/A	N/A	N/A	0.02 - 0.0952
RADS	Thorium-230	pCi/g	2.51E-01	1.00E+00	4.29E-01	16/16	0/16	1.40E+00	16/16	9.69E-02	0/16	9.69E+00	16/16	8.04E-02	0/16	8.04E+00	16/16	5.31E-02	0/16	1.06E+00	0.016 - 0.138
RADS	Thorium-232	pCi/g	9.40E-02	9.50E-01	4.10E-01	16/16	0/16	1.50E+00	16/16	7.52E-02	0/16	7.52E+00	16/16	8.57E-02	0/16	8.57E+00	15/16	1.16E-01	0/16	2.32E+00	0.01 - 0.064
RADS	Uranium-234	pCi/g	2.23E-01	8.10E-01	4.88E-01	3/9	0/9	1.20E+00	3/9	9.67E-02	0/9	9.67E+00	3/9	7.97E-02	0/9	7.97E+00	3/9	1.09E-03	1/9	2.17E-02	0.02 - 0.961
RADS	Uranium-235/236[h]	pCi/g	6.70E-02	6.70E-02	6.70E-02	1/1	1/1	6.00E-02	0/1	3.49E-01	0/1	3.49E+01	0/1	3.11E-01	0/1	3.11E+01	0/1	4.78E-03	0/1	9.57E-02	0.021 - 0.021
RADS	Uranium-238	pCi/g	2.64E-01	1.57E+00	1.04E+00	5/9	3/9	1.20E+00	5/9	9.53E-02	0/9	9.53E+00	5/9	7.83E-02	0/9	7.83E+00	5/9	1.06E-03	5/9	2.12E-02	0.009 - 1.15
SVOA	1,2,4-Trichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,2-Dichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,2-Diphenylhydrazine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,3-Dichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	1,4-Dichlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4,5-Trichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4,6-Trichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dimethylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dinitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,4-Dinitrotoluene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,6-Dichlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2,6-Dinitrotoluene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Chloronaphthalene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49

Table 4. Surface Soil Data Summary (0–1 ft bgs) (Continued)

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		Industrial Worker		Industrial Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	
SVOA	2-Chlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Methyl-4,6-dinitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Methylnaphthalene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Methylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	2-Nitrobenzenamine	mg/kg	--	--	--	0/9	N/A	N/A	--	2.87E+02	--	8.61E+03	--	1.89E+02	--	5.67E+03	--	8.01E-03	--	1.60E-01	0.44 - 0.49
SVOA	2-Nitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	3,3'-Dichlorobenzidine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	3-Nitrobenzenamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Bromophenyl phenyl ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Chloro-3-methylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Chlorobenzenamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Chlorophenyl phenyl ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Methylphenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	4-Nitrophenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Acenaphthene	mg/kg	--	--	--	0/11	N/A	N/A	--	1.38E+03	--	4.14E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.44 - 0.5
SVOA	Acenaphthylene	mg/kg	--	--	--	0/11	N/A	N/A	--	1.38E+03	--	4.14E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.44 - 0.5
SVOA	Anthracene	mg/kg	--	--	--	0/11	N/A	N/A	--	6.89E+03	--	1.00E+05	--	5.05E+03	--	1.00E+05	--	5.81E+00	--	1.16E+02	0.44 - 0.5
SVOA	Benzenemethanol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Benzo(ghi)perylene	mg/kg	--	--	--	0/11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.5
SVOA	Benzoic acid	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-chloroethoxy)methane	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-chloroethyl) ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-chloroisopropyl) ether	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Bis(2-ethylhexyl)phthalate	mg/kg	6.50E-01	6.50E-01	6.50E-01	1/9	N/A	N/A	0/9	5.80E+01	0/9	5.80E+03	0/9	3.79E+01	0/9	3.79E+03	0/9	1.33E+00	0/9	2.66E+01	0.44 - 0.49
SVOA	Butyl benzyl phthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Carbazole	mg/kg	--	--	--	0/9	N/A	N/A	--	9.19E+02	--	2.76E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.44 - 0.49
SVOA	Di-n-butyl phthalate	mg/kg	9.50E-01	3.40E+01	6.73E+00	6/9	N/A	N/A	N/A	N/A	N/A	N/A	0/9	N/A	0/9	N/A	N/A	N/A	N/A	N/A	0.44 - 4.8
SVOA	Di-n-octylphthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Dibenzofuran	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Diethyl phthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Dimethyl phthalate	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Fluoranthene	mg/kg	--	--	--	0/11	N/A	N/A	--	9.19E+02	--	2.76E+04	--	6.73E+02	--	2.02E+04	--	8.91E+00	--	1.78E+02	0.44 - 0.5
SVOA	Fluorene	mg/kg	--	--	--	0/11	N/A	N/A	--	9.19E+02	--	2.76E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.44 - 0.5
SVOA	Hexachlorobenzene	mg/kg	--	--	--	0/9	N/A	N/A	--	1.26E+00	--	7.01E+01	--	3.29E-01	--	9.86E+00	--	1.23E-04	--	2.46E-03	0.44 - 0.49
SVOA	Hexachlorobutadiene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Hexachlorocyclopentadiene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Hexachloroethane	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Isophorone	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0/9	N/A	N/A	--	1.16E-01	--	1.16E+01	--	7.58E-02	--	7.58E+00	--	8.10E-06	--	1.62E-04	0.44 - 0.49
SVOA	N-Nitrosodimethylamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	N-Nitrosodiphenylamine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Naphthalene	mg/kg	--	--	--	0/11	N/A	N/A	--	4.06E+00	--	4.06E+02	--	3.34E+00	--	3.34E+02	--	3.85E-04	--	7.70E-03	0.44 - 0.5
SVOA	Nitrobenzene	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Pentachlorophenol	mg/kg	--	--	--	0/9	N/A	N/A	--	8.77E-01	--	8.77E+01	--	8.11E-01	--	8.11E+01	--	5.71E-05	--	1.14E-03	0.44 - 0.49
SVOA	Phenanthrene	mg/kg	--	--	--	0/11	N/A	N/A	--	6.89E+02	--	2.07E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.44 - 0.5
SVOA	Phenol	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Pyrene	mg/kg	--	--	--	0/11	N/A	N/A	--	6.89E+02	--	2.07E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.44 - 0.5
SVOA	Pyridine	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
SVOA	Total PAHs[1]	mg/kg	--	--	--	0/10	N/A	N/A	--	6.43E-01	--	6.43E+01	--	4.71E-01	--	4.71E+01	--	2.94E-02	--	5.89E-01	0 - 0
SVOA	p-Nitroaniline	mg/kg	--	--	--	0/9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44 - 0.49
WETCHEM	Cyanide	mg/kg	--	--	--	0/4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1 - 1

One or more samples exceed AL value
One or more samples exceed NAL value
One or more samples exceed background value
One or more samples exceed groundwater protection screening

Notes:

-- = No calculation completed, analyte not detected

[a] Chromium (III) values are shown for information purposes

[a] Chromium uses NAL/AL for Chromium (VI)

[c] Lead uses DAF screening values based on the MCL

[d] Uranium (Insoluble Compounds) values are shown for information purposes

[e] Uranium uses NAL/AL for Uranium (Soluble Salts)

Table 4. Surface Soil Data Summary (0–1 ft bgs) (Continued)

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		Industrial Worker		Industrial Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	

[f] Total PCBs calculated by laboratory

[g] Plutonium-239/240 screened against Plutonium-240 values

[h] Uranium-235/236 uses NALs/ALS for Uranium-235

[i] Total PAHs calculated using toxicity equivalence factor values in Human Health RMD (DOE 2024b)

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Table 5. Subsurface Soil Data Summary (1–16 ft bgs)

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		Excavation Worker		Excavation Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	
METAL	Aluminum	mg/kg	5.86E+03	1.43E+04	1.00E+04	28/28	4/28	1.20E+04	0/28	3.26E+04	0/28	1.00E+05	0/28	3.26E+04	0/28	1.00E+05	28/28	3.00E+03	0/28	5.99E+04	19.6 - 177
METAL	Antimony	mg/kg	--	--	--	0/28	--	2.10E-01	--	1.32E+01	--	3.96E+02	--	1.32E+01	--	3.96E+02	--	3.52E-02	--	7.04E-01	7.71 - 20
METAL	Arsenic	mg/kg	5.28E+00	1.36E+01	7.42E+00	9/28	3/28	7.90E+00	9/28	3.74E+00	0/28	3.60E+02	9/28	7.48E-01	0/28	7.48E+01	9/28	1.51E-03	9/28	3.02E-02	4.42 - 5
METAL	Barium	mg/kg	3.55E+01	1.70E+03	1.78E+02	28/28	2/28	1.70E+02	0/28	6.47E+03	0/28	1.00E+05	0/28	6.47E+03	0/28	1.00E+05	28/28	1.55E+01	2/28	3.11E+02	2.21 - 5
METAL	Beryllium	mg/kg	4.68E-01	6.60E-01	5.82E-01	7/28	0/28	6.90E-01	0/28	6.55E+01	0/28	1.97E+03	0/28	6.55E+01	0/28	1.97E+03	0/28	1.95E+00	0/28	3.89E+01	0.442 - 0.5
METAL	Cadmium	mg/kg	--	--	--	0/28	--	2.10E-01	--	2.54E+00	--	7.62E+01	--	2.54E+00	--	7.62E+01	--	1.38E-02	--	2.77E-01	2 - 2.45
METAL	Calcium	mg/kg	4.27E+02	3.78E+04	2.69E+03	28/28	1/28	6.10E+03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	88.3 - 100
METAL	Chromium[a]	mg/kg	8.60E+00	3.24E+01	1.63E+01	28/28	0/28	4.30E+01	0/28	9.86E+01	0/28	1.00E+05	0/28	4.93E+04	0/28	1.00E+05	0/28	4.04E+06	0/28	8.09E+07	2.21 - 2.5
METAL	Chromium[b]	mg/kg	8.60E+00	3.24E+01	1.63E+01	28/28	0/28	4.30E+01	27/28	9.14E+00	0/28	9.14E+02	28/28	1.83E+00	0/28	1.83E+02	28/28	6.72E-04	28/28	1.34E-02	2.21 - 2.5
METAL	Cobalt	mg/kg	7.10E+00	1.13E+01	9.20E+00	2/2	0/2	1.30E+01	1/2	9.84E+00	0/2	2.95E+02	1/2	9.84E+00	0/2	2.95E+02	2/2	2.71E-02	2/2	5.43E-01	4.42 - 4.9
METAL	Copper	mg/kg	3.77E+00	1.37E+01	8.03E+00	26/28	0/28	2.50E+01	0/28	1.32E+03	0/28	3.96E+04	0/28	1.32E+03	0/28	3.96E+04	26/28	2.81E+00	0/28	5.62E+01	2.5 - 12.3
METAL	Iron	mg/kg	1.37E+04	1.80E+04	1.59E+04	2/2	0/2	2.80E+04	0/2	2.30E+04	0/2	1.00E+05	0/2	2.30E+04	0/2	1.00E+05	2/2	3.52E+01	2/2	7.04E+02	17.7 - 19.6
METAL	Lead[c]	mg/kg	1.63E+01	3.22E+01	2.14E+01	5/28	1/28	2.30E+01	0/28	8.00E+02	0/28	8.00E+02	0/28	8.00E+02	0/28	8.00E+02	5/28	1.35E+01	0/28	2.70E+02	4.42 - 20
METAL	Magnesium	mg/kg	8.38E+02	1.18E+03	1.01E+03	2/2	0/2	2.10E+03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.42 - 4.9
METAL	Manganese	mg/kg	7.28E+02	7.39E+02	7.34E+02	2/2	0/2	8.20E+02	0/2	7.74E+02	0/2	2.32E+04	0/2	7.74E+02	0/2	2.32E+04	2/2	2.83E+00	2/2	5.65E+01	2.21 - 2.45
METAL	Mercury	mg/kg	2.70E-02	2.70E-02	2.70E-02	2/28	0/28	1.30E-01	0/28	9.86E+00	0/28	2.96E+02	0/28	9.86E+00	0/28	2.96E+02	0/28	2.95E-02	0/28	5.91E-01	0.015 - 0.2
METAL	Molybdenum	mg/kg	--	--	--	0/2	N/A	N/A	--	1.64E+02	--	4.92E+03	--	1.64E+02	--	4.92E+03	--	2.02E-01	--	4.03E+00	4.42 - 4.9
METAL	Nickel	mg/kg	6.00E+00	2.04E+01	1.10E+01	27/28	0/28	2.20E+01	0/28	6.21E+02	0/28	1.86E+04	0/28	6.21E+02	0/28	1.86E+04	27/28	2.56E+00	0/28	5.12E+01	4.42 - 5
METAL	Selenium	mg/kg	--	--	--	0/28	--	7.00E-01	--	1.64E+02	--	4.92E+03	--	1.64E+02	--	4.92E+03	--	5.19E-02	--	1.04E+00	1 - 4.9
METAL	Silver	mg/kg	--	--	--	0/28	--	2.70E+00	--	1.64E+02	--	4.92E+03	--	1.64E+02	--	4.92E+03	--	7.99E-02	--	1.60E+00	1.93 - 4
METAL	Sodium	mg/kg	--	--	--	0/2	--	3.40E+02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	177 - 196
METAL	Thallium	mg/kg	--	--	--	0/28	--	3.40E-01	--	3.29E-01	--	9.87E+00	--	3.29E-01	--	9.87E+00	--	1.42E-03	--	2.84E-02	8.83 - 20
METAL	Uranium[d]	mg/kg	--	--	--	0/2	--	4.60E+00	--	9.86E+01	--	2.95E+03	--	9.86E+01	--	2.95E+03	--	2.70E+00	--	5.39E+01	4.42 - 4.9
METAL	Uranium[e]	mg/kg	--	--	--	0/2	--	4.60E+00	--	6.58E+00	--	1.97E+02	--	6.58E+00	--	1.97E+02	--	1.80E-01	--	3.60E+00	4.42 - 4.9
METAL	Vanadium	mg/kg	8.70E+00	3.24E+01	2.32E+01	28/28	0/28	3.70E+01	0/28	1.65E+02	0/28	4.95E+03	0/28	1.65E+02	0/28	4.95E+03	28/28	8.64E+00	0/28	1.73E+02	2.21 - 2.5
METAL	Zinc	mg/kg	2.36E+01	6.05E+01	3.57E+01	24/28	1/28	6.00E+01	0/28	9.86E+03	0/28	1.00E+05	0/28	9.86E+03	0/28	1.00E+05	7/28	3.73E+01	0/28	7.46E+02	17.7 - 20
PPCB	Polychlorinated biphenyl[f]	mg/kg	1.00E-01	3.00E-01	2.00E-01	3/28	N/A	N/A	0/28	1.12E+00	0/28	1.12E+02	1/28	2.24E-01	0/28	2.24E+01	3/28	6.82E-03	2/28	1.36E-01	0.1 - 0.13
RADS	Americium-241	pCi/g	1.41E-01	1.41E-01	1.41E-01	1/29	N/A	N/A	0/29	1.69E+00	0/29	1.69E+02	0/29	3.38E-01	0/29	3.38E+01	1/29	1.29E-01	0/29	2.57E+00	0.0155 - 0.365
RADS	Americium-243	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0615 - 0.164
RADS	Cesium-134	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0302 - 0.421
RADS	Cesium-137	pCi/g	6.51E-02	1.65E-01	1.08E-01	3/29	0/29	2.80E-01	0/29	2.26E+00	0/29	2.26E+02	0/29	4.52E-01	0/29	4.52E+01	0/29	4.79E-01	0/29	9.58E+00	0.000000662 - 0.0784
RADS	Cobalt-60	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0322 - 0.0749
RADS	Neptunium-237	pCi/g	--	--	--	0/29	N/A	N/A	--	1.83E+00	--	1.83E+02	--	3.66E-01	--	3.66E+01	--	5.50E-03	--	1.10E-01	0.0469 - 0.125
RADS	Neptunium-239	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.266 - 1.33
RADS	Plutonium-238	pCi/g	--	--	--	0/29	N/A	N/A	--	3.90E-01	--	3.90E+01	--	7.81E-02	--	7.81E+00	--	8.58E-03	--	1.72E-01	0.00924 - 0.232
RADS	Plutonium-239/240[g]	pCi/g	--	--	--	0/29	N/A	N/A	--	1.44E+00	--	1.44E+02	--	2.87E-01	--	2.87E+01	--	3.32E-02	--	6.64E-01	0.0127 - 0.0862
RADS	Potassium-40	pCi/g	4.51E+00	1.33E+01	8.75E+00	26/27	0/27	1.60E+01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.286 - 0.647
RADS	Protactinium-234m	pCi/g	--	--	--	0/27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.16 - 9.74
RADS	Radium-226	pCi/g	4.58E-01	5.91E-01	5.02E-01	4/27	0/27	1.50E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.116 - 0.388
RADS	Technetium-99	pCi/g	--	--	--	0/29	--	2.80E+00	--	1.66E+03	--	1.66E+05	--	3.32E+02	--	3.32E+04	--	7.60E-03	--	1.52E-01	0.536 - 3.12
RADS	Thorium-228	pCi/g	1.18E-01	5.88E-01	4.02E-01	29/29	0/29	1.60E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0152 - 0.0125
RADS	Thorium-230	pCi/g	1.94E-01	5.17E-01	3.63E-01	28/29	0/29	1.40E+00	8/29	4.02E-01	0/29	4.02E+01	28/29	8.04E-02	0/29	8.04E+00	28/29	5.31E-02	0/29	1.06E+00	0.0177 - 0.134
RADS	Thorium-232	pCi/g	1.30E-01	5.96E-01	4.00E-01	29/29	0/29	1.50E+00	12/29	4.29E-01	0/29	4.29E+01	29/29	8.57E-02	0/29	8.57E+00	29/29	1.16E-01	0/29	2.32E+00	0.0166 - 0.0665
RADS	Uranium-234	pCi/g	2.61E-01	3.50E-01	3.06E-01	2/18	0/18	1.20E+00	0/18	3.98E-01	0/18	3.98E+01	2/18	7.97E-02	0/18	7.97E+00	2/18	1.09E-03	2/18	2.17E-02	0.117 - 3.27
RADS	Uranium-238	pCi/g	3.47E-01	6.66E-01	5.07E-01	2/18	0/18	1.20E+00	1/18	3.91E-01	0/18	3.91E+01	2/18	7.83E-02	0/18	7.83E+00	2/18	1.06E-03	2/18	2.12E-02	0.0462 - 1.96
SVOA	1,2,4-Trichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,2-Dichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,2-Diphenylhydrazine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,3-Dichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	1,4-Dichlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4,5-Trichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4,6-Trichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dimethylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dinitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,4-Dinitrotoluene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,6-Dichlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2,6-Dinitrotoluene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Chloronaphthalene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Chlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Methyl-4,6-dinitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5

Table 5. Subsurface Soil Data Summary (1–16 ft bgs) (Continued)

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		Excavation Worker		Excavation Worker		Outdoor Worker		Outdoor Worker		GW Protection Screen				DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	NAL	FOE	AL	FOE	NAL	FOE	AL	FOE	DAF 1	FOE	DAF 20	
SVOA	2-Methylnaphthalene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Methylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	2-Nitrobenzenamine	mg/kg	--	--	--	0/26	N/A	N/A	--	1.89E+02	--	5.67E+03	--	1.89E+02	--	5.67E+03	--	8.01E-03	--	1.60E-01	0.43 - 0.5
SVOA	2-Nitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	3,3'-Dichlorobenzidine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	3-Nitrobenzenamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Bromophenyl phenyl ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Chloro-3-methylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Chlorobenzenamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Chlorophenyl phenyl ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Methylphenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	4-Nitrophenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Acenaphthene	mg/kg	--	--	--	0/28	N/A	N/A	--	1.01E+03	--	3.03E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.43 - 0.5
SVOA	Acenaphthylene	mg/kg	--	--	--	0/28	N/A	N/A	--	1.01E+03	--	3.03E+04	--	1.01E+03	--	3.03E+04	--	5.49E-01	--	1.10E+01	0.43 - 0.5
SVOA	Anthracene	mg/kg	--	--	--	0/28	N/A	N/A	--	5.05E+03	--	1.00E+05	--	5.05E+03	--	1.00E+05	--	5.81E+00	--	1.16E+02	0.43 - 0.5
SVOA	Benzenemethanol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Benzo(ghi)perylene	mg/kg	--	--	--	0/28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Benzoic acid	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-chloroethoxy)methane	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-chloroethyl) ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-chloroisopropyl) ether	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Bis(2-ethylhexyl)phthalate	mg/kg	--	--	--	0/26	N/A	N/A	--	1.90E+02	--	1.14E+04	--	3.79E+01	--	3.79E+03	--	1.33E+00	--	2.66E+01	0.43 - 0.5
SVOA	Butyl benzyl phthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Carbazole	mg/kg	--	--	--	0/26	N/A	N/A	--	6.73E+02	--	2.02E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.43 - 0.5
SVOA	Di-n-butyl phthalate	mg/kg	5.00E-01	7.00E+00	1.56E+00	13/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Di-n-octylphthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Dibenzofuran	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Diethyl phthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Dimethyl phthalate	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Fluoranthene	mg/kg	--	--	--	0/28	N/A	N/A	--	6.73E+02	--	2.02E+04	--	6.73E+02	--	2.02E+04	--	8.91E+00	--	1.78E+02	0.43 - 0.5
SVOA	Fluorene	mg/kg	--	--	--	0/28	N/A	N/A	--	6.73E+02	--	2.02E+04	--	6.73E+02	--	2.02E+04	--	5.45E-01	--	1.09E+01	0.43 - 0.5
SVOA	Hexachlorobenzene	mg/kg	--	--	--	0/26	N/A	N/A	--	3.29E-01	--	9.86E+00	--	3.29E-01	--	9.86E+00	--	1.23E-04	--	2.46E-03	0.43 - 0.5
SVOA	Hexachlorobutadiene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Hexachlorocyclopentadiene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Hexachloroethane	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Isophorone	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0/26	N/A	N/A	--	3.79E-01	--	3.79E+01	--	7.58E-02	--	7.58E+00	--	8.10E-06	--	1.62E-04	0.43 - 0.5
SVOA	N-Nitrosodimethylamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	N-Nitrosodiphenylamine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Naphthalene	mg/kg	--	--	--	0/28	N/A	N/A	--	1.67E+01	--	1.67E+03	--	3.34E+00	--	3.34E+02	--	3.85E-04	--	7.70E-03	0.43 - 0.5
SVOA	Nitrobenzene	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Pentachlorophenol	mg/kg	--	--	--	0/26	N/A	N/A	--	4.06E+00	--	4.06E+02	--	8.11E-01	--	8.11E+01	--	5.71E-05	--	1.14E-03	0.43 - 0.5
SVOA	Phenanthrene	mg/kg	--	--	--	0/28	N/A	N/A	--	5.05E+02	--	1.52E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.43 - 0.5
SVOA	Phenol	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Pyrene	mg/kg	--	--	--	0/28	N/A	N/A	--	5.05E+02	--	1.52E+04	--	5.05E+02	--	1.52E+04	--	1.32E+00	--	2.63E+01	0.43 - 0.5
SVOA	Pyridine	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5
SVOA	Total PAHs[h]	mg/kg	--	--	--	0/28	N/A	N/A	--	2.35E+00	--	1.51E+02	--	4.71E-01	--	4.71E+01	--	2.94E-02	--	5.89E-01	0 - 0
SVOA	p-Nitroaniline	mg/kg	--	--	--	0/26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.43 - 0.5

One or more samples exceed AL value
One or more samples exceed NAL value
One or more samples exceed background value
One or more samples exceed groundwater protection screening

Notes:
-- = No calculation completed, analyte not detected
[a] Chromium (III) values are shown for information purposes
[a] Chromium uses NAL/AL for Chromium (VI)
[c] Lead uses DAF screening values based on the MCL
[d] Uranium (Insoluble Compounds) values are shown for information purposes
[e] Uranium uses NAL/AL for Uranium (Soluble Salts)
[f] Total PCBs calculated by laboratory
[g] Plutonium-239/240 screened against Plutonium-240 values
[h] Total PAHs calculated using toxicity equivalence factor values in Human Health RMD (DOE 2024b)

Table 6. Groundwater Data Summary—McNairy Formation

Type	Analysis	Unit	Detected Results			FOD	Provisional Background		MCL		DL Range
			Min	Max	Avg		FOE	Bkgd	FOE	MCL	
METAL	Uranium[a]	mg/L	9.10E-05	9.10E-05	9.10E-05	1/7	0/7	1.00E-03	0/7	3.00E-02	0.0002 - 0.0002
METAL	Uranium[b]	mg/L	9.10E-05	9.10E-05	9.10E-05	1/7	0/7	1.00E-03	0/7	3.00E-02	0.0002 - 0.0002
RADS	Technetium-99	pCI/L	--	--	--	0/7	--	7.80E+00	--	9.00E+02	13.9 - 20.2
VOA	1,1,1-Trichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	2.00E-01	0.001 - 0.001
VOA	1,1,2-Trichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	1,1-Dichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	N/A	0.001 - 0.001
VOA	1,1-Dichloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	7.00E-03	0.001 - 0.001
VOA	1,2-Dichloroethane	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Benzene	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Bromodichloromethane	mg/L	--	--	--	0/7	N/A	N/A	--	8.00E-02	0.001 - 0.001
VOA	Carbon tetrachloride	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Chloroform	mg/L	--	--	--	0/7	N/A	N/A	--	8.00E-02	0.001 - 0.001
VOA	*cis* -1,2-Dichloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	7.00E-02	0.001 - 0.001
VOA	Ethylbenzene	mg/L	--	--	--	0/7	N/A	N/A	--	7.00E-01	0.001 - 0.001
VOA	Tetrachloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	5.00E-03	0.001 - 0.001
VOA	Toluene	mg/L	--	--	--	0/7	N/A	N/A	--	1.00E+00	0.001 - 0.001
VOA	Total Xylene	mg/L	--	--	--	0/7	N/A	N/A	--	1.00E+01	0.003 - 0.003
VOA	*trans* -1,2-Dichloroethene	mg/L	--	--	--	0/7	N/A	N/A	--	1.00E-01	0.001 - 0.001
VOA	Trichloroethene	mg/L	4.00E-04	1.26E-03	9.03E-04	3/7	N/A	N/A	0/7	5.00E-03	0.001 - 0.001
VOA	Vinyl chloride	mg/L	--	--	--	0/7	N/A	N/A	--	2.00E-03	0.001 - 0.001

One or more samples exceed Background value

One or more samples exceed MCL

Notes:

-- = No calculation completed, analyte not detected

[a] Uranium (Insoluble Compounds) values are shown for information purposes

[b] Uranium uses NAL/AL for Uranium (Soluble Salts)

7.2.3. Analytical Results for Chemical Data in Sediment

Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation. Metals that were detected (aluminum, barium, beryllium, calcium, chromium, copper, nickel, uranium, vanadium, and zinc) were all less than the respective background values for surface soil (there is no site-specific background established for sediment). There were no detections of PCBs, SVOCs, or VOCs in the two sediment samples.

7.2.4. Evaluation of Chemical Results

7.2.4.1 Soil—Surface and Subsurface

For the surface and subsurface soil sample results shown in Tables 4 and 5, there were detections of 12 metals (aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, lead, manganese, silver, sodium, and zinc) that exceed the associated Paducah Site provisional background values. The metals that most frequently exceeded provisional background (exceeded in > 5% of the sample analyses) were aluminum, arsenic, cadmium, chromium, manganese, and sodium. Barium, beryllium, calcium, lead, silver, and zinc results in surface and subsurface soil samples combined exceeded their respective provisional background values in < 5% of the samples. The ranges of detected values of the metals that exceed provisional background values (refer to Tables 4 and 5) are compared to metal concentrations reported for Kentucky soils, as presented in the *Kentucky Guidance for Ambient Background Assessment*, in Table 7 (KDEP 2004). The criteria for applying KDEP ambient background values, used previously at PGDP for soil piles, are as follows: (1) the mean site concentration of the analytes (based on detections) for Leasing Parcel A is below the 95% upper confidence limit (UCL) of the mean concentrations for KDEP background; (2) at least half of the data points are less than the 60th percentile value; and (3) no data points exceed the 95th percentile value. For chemicals and radionuclides that exceed background to the extent that contamination is suspected, as well as for organic chemicals that have been detected, the data are further evaluated in the risk screening in Section 7.4.

Table 7. Constituents Exceeding Background Compared to Kentucky Soils Range

Constituent	Horizon with Exceedance (ft bgs)	Property Soil Data Range (mg/kg)	Kentucky Soils*	
			Data Range (mg/kg)	95th Percentile (mg/kg)
Aluminum	0–1; 1–16	4,470–14,300	1,290–38,100	21,000
Arsenic	1–16	5.01–13.6	0.059–55.5	21.2
Barium	1–16	27.3–1,700	6.14–1,160	241
Beryllium	0–1	0.468–0.765	0.061–3.57	1.8
Cadmium	0–1	2.51–3.15	0.004–9.46	3.9
Calcium	1–16	398–102,000	N/A	N/A
Chromium	0–1	5.73–33.9	2.83–168	40
Lead	0–1; 1–16	12.1–38.4	0.03–284	84.6
Manganese	0–1	383–1,828	8.43–5,100	2,620
Silver	0–1	4.0 (1 detect)	0.006–5.2	1.2
Sodium	0–1	343 (1 detect)	N/A	N/A
Zinc	1–16	23.6–60.5	6–470	115

**Kentucky Guidance for Ambient Background Assessment* (KDEP 2004).

For the 12 metals exceeding Paducah Site provisional background, as indicated in Tables 4 and 5, seven of the metals (aluminum, arsenic, beryllium, chromium, lead, manganese, and zinc) meet all three KDEP ambient background criteria and, therefore, are not considered COPCs for Leasing Parcel A. Note that some of these metals are still considered in the risk evaluation (Section 7.4) to assess overall protectiveness.

Calcium and sodium are not listed with a generic statewide ambient background value, nor do these chemicals have risk-based action levels (ALs) or no action levels (NALs) because they are essential elements/nutrients (DOE 2024d); therefore, though calcium and sodium are present in Leasing Parcel A soil above background, they are not considered COPCs.

Barium. Barium results in surface soil samples did not exceed the Paducah Site provisional background value of 200 mg/kg in any of the 15 samples. Barium results in subsurface soil samples exceeded the provisional background value of 170 mg/kg (found in Table 5) in two of the 28 samples. The sample at location UFSB-13 (1,700 mg/kg) was collected from a depth of 6 to 8 ft bgs and the sample at location UFSB-14 (1,040 mg/kg) was collected from a depth of 11 to 15 ft bgs. The criteria for applying ambient background values established by KDEP for barium are as follows: (1) the mean site concentration for detects (178 mg/kg for subsurface) is above the 95% UCL of the mean concentrations of KDEP background (116.9 mg/kg) (the mean for surface soil is less than 116.9 mg/kg); (2) at least half of the data points for surface soil and for subsurface soil are less than the 60th percentile value (100 mg/kg); and, (3) two data points in subsurface soil are above the upper bound value (241 mg/kg). Because barium results exceeded the provisional background value and also exceeded two of the three KDEP ambient background criteria, barium is considered a COPC and is further evaluated in Section 7.4.

Cadmium. Cadmium was detected in four of the 15 surface soil samples and exceeded the Paducah Site provisional background value of 0.21 mg/kg in all four samples. Cadmium was not detected in the 28 subsurface samples collected from the 1 to 16 ft bgs horizon. The maximum detected value in the samples was 3.15 mg/kg. The criteria for applying ambient background values established by KDEP for cadmium are as follows: (1) the mean site concentration (for detects) (2.8 mg/kg) is above the 95% UCL of the mean concentrations of KDEP background (0.78 mg/kg); (2) at least half of the data points are greater than the 60th percentile (0.27 mg/kg); but (3) no data points were above the upper bound value (3.9 mg/kg). Cadmium failed the first two criteria and is considered a COPC for Leasing Parcel A. With regard to the second criteria, the DLs (or practical quantitation limits in this case) ranged from 2 to 2.48 mg/kg, substantially above the 60th percentile of 0.27 mg/kg.

Silver. Silver was detected only once out of 43 samples with the surface soil sample result of 4 mg/kg exceeding the Paducah Site provisional background value of 2.3 mg/kg. The criteria for ambient background values established by KDEP for silver are as follows: (1) the mean site concentration for detects (4 mg/kg with only one detect) is > the 95% UCL of the mean concentrations of KDEP background (0.45 mg/kg); (2) at least half of the data points are greater than the 60th percentile (0.257 mg/kg); and, (3) the one detection exceeded the 95th percentile value (1.2 mg/kg). Because silver results exceeded the provisional background value and also failed the KDEP ambient background criteria, silver is considered a COPC and is further evaluated in Section 7.4. With regard to the second criteria, the practical quantitation limits for silver ranged from 1.93 to 4 mg/kg, substantially above the 60th percentile of 0.257 mg/kg.

PCBs and Other Organics. PCBs were detected in three of 28 subsurface soil samples but were not detected in the 15 surface soil samples. The maximum result in the subsurface soil was 0.3 mg/kg. The detections occurred at location UFSB-11 (at depth intervals of 1 to 5 ft bgs and 6 to 10 ft bgs) and location UFSB-12 (at a depth interval of 11 to 15 ft bgs). PCBs were detected at deeper intervals (in a sample collected from 21 to 25 ft bgs) in boring UFSB-11 at 0.1 mg/kg. PCBs were also detected in one of the 20 cylinder storage yard characterization samples of surface soil collected in 1995. Sample location C-745-T-65 had a PCB result of 0.2 mg/kg (the detection was from Aroclor-1254). Total PAHs were not detected in 10 surface soil samples or 28 subsurface samples in Leasing Parcel A soil. As a result, PAHs are not considered COPCs for this evaluation. The only other organic compounds detected in soil were low levels of phthalate compounds [bis(2-ethylhexyl)phthalate and di-n-butyl phthalate were detected] and acetone. Phthalates and acetone are often considered potential laboratory contaminants.

Soil data from depths greater than 16 ft bgs were qualitatively evaluated for this data package. There were four metals that exceeded Paducah Site provisional background in the deeper soil zone. Arsenic was detected in two out of 12 samples with one detection at 10.1 mg/kg exceeding the subsurface background value. Beryllium was detected in six of 12 samples with one detection at 1.33 mg/kg exceeding the subsurface background value. Chromium was detected in all 12 deep soil samples with two results, 61.4 mg/kg at location UFSB-14 and 55 mg/kg at location UFSB-20, exceeding the subsurface background value of 43 mg/kg. The fourth metal, vanadium, was also detected in all 12 deep soil samples with four detections exceeding the subsurface background value of 37 mg/kg. These detections occurred at locations UFSB-13 (49.1 mg/kg), UFSB-14 (63.8 mg/kg), UFSB-17 (41.7 mg/kg), and UFSB-20 (48.7mg/kg). In addition, as noted in the paragraph above, PCBs were detected in one deep soil sample at location UFSB-11 (0.1 mg/kg Total PCBs from a sample collected from 21 to 25 ft bgs).

7.2.4.2 Groundwater

Groundwater samples from MW120, a McNairy Formation MW located adjacent to Leasing Parcel A, were screened against provisional groundwater background values (using the "Over Wells" value) and primary MCLs provided in the Human Health RMD, where applicable (DOE 2024d). For MW120, there were eight sampling events between March 2020 and September 2024, which are summarized in Table 6. Samples are analyzed for uranium, technetium-99, and VOCs. There was one detection of uranium of 0.000091 mg/L (in March 2020), which is less than the provisional background value and the MCL. There were three detections of TCE with a maximum detection of 0.00126 mg/L, which is less than the MCL of 0.005 mg/L.

Leasing Parcel A is located within the Water Policy boundary (Figure 25), which mitigates exposure to contaminated groundwater. Any lease of Leasing Parcel A will contain a groundwater restriction that prohibits extraction and use.

7.2.4.3 Sediment

As noted previously, metals that were detected in samples from the two sediment locations (aluminum, barium, beryllium, calcium, chromium, copper, nickel, uranium, vanadium, and zinc) were below the respective background values for surface soil. There were no detections of PCBs, SVOCs, or VOCs in the two sediment samples.

7.3. RADIOLOGICAL SURVEY AND DATA RESULTS

7.3.1. Data Sources for Radiological Surveys

Data are available from several radiological surveys. Radiological survey results were available from the sources discussed below.

Aerial Radiological Surveys

Radiological surveys of PGDP were conducted in 1976 and 1990. The purpose of those aerial radiological surveys was to determine the extent to which plant operations may have impacted the radiological signature of the plant surroundings. Another aerial radiological survey was conducted over PGDP and the surrounding area from October 28, 2009, to November 2, 2009. The purpose of the last aerial radiological survey was to measure the terrestrial radiological environment within and around PGDP in order to update previous aerial radiological survey data from 1976. The aerial radiological survey used a large array of helicopter-mounted sodium iodide gamma ray detectors. The aerial survey was flown at an altitude of approximately 150 ft along a series of parallel lines spaced 250 ft apart and encompassing an area of approximately 25 square miles bordered on the north by the Ohio River (DOE 2015b).

The areas covered by the aerial radiological surveys completed in 1976 and 1990 were consistent with the 2009 aerial radiological survey. A comparison of the 2009 aerial radiological survey and the 1990 aerial radiological survey is shown in Figure 27 (DOE 2015). This figure indicates changes to the configuration of the depleted uranium cylinder yards since the 1990 aerial radiological survey. In particular, the footprint of the elevated terrestrial exposure rate region at the southern cylinder yard, near Leasing Parcel A, has increased since 1990, while that of the western cylinder yard has decreased.

No significant man-made gamma activity was detected outside the Limited Area boundary during the aerial radiological survey. The areas with the greatest activity at PGDP are cylinder storage yards located near the southern portion of PGDP (radiation emissions near the cylinder storage yards are informally referred to as "shine") along the north-central portion of Leasing Parcel A.

Sitewide Evaluation for the Soils OU

Radiological and visual walkover surveys were conducted over DOE-owned property (including property licensed to the Commonwealth of Kentucky), encompassing an area of approximately 2,676 acres. The purpose of these visual and radiological walkover surveys was to visually identify anomalies and to complete a radiological scoping survey of the entire area with a targeted radiological survey of identified anomalies (DOE 2011). These surveys were completed between January 5, 2009, and April 23, 2010.

DOE completed the 2009–2010 visual and radiological walkover surveys, and no new contaminated areas were identified, no areas were found to have radiological readings greater than twice instrument background, and no areas required action based on criteria established in the Sitewide Evaluation Work Plan (DOE 2011). Consistent with the FFA (EPA 1998a) and the approaches set forth in the National Contingency Plan, the results of the sitewide evaluation determined that no removal or remedial actions were required for the 534 anomalies identified within DOE property (outside of the Limited Area), and there was no need to establish SWMU assessment reports (DOE 2015b).

Figure 28 provides the results of the radiological walkover survey within Leasing Parcel A. The radiological walkover survey for Leasing Parcel A started on January 22, 2009, and was completed on March 17, 2009. Due to the ice storm of January 2009, portions of the wooded areas were not accessible for the radiological walkover survey. For the data shown in Figure 28, there were 25,287 measurements with the net gamma counts per minute (cpm) ranging from 91 to 17,358 cpm. The highest measurements, represented in the figure by measurements greater than the 95th percentile of the data set, reflects the interference from the cylinder storage yard shine, which prevents an accurate measurement of surficial soil levels near the cylinder storage yards.

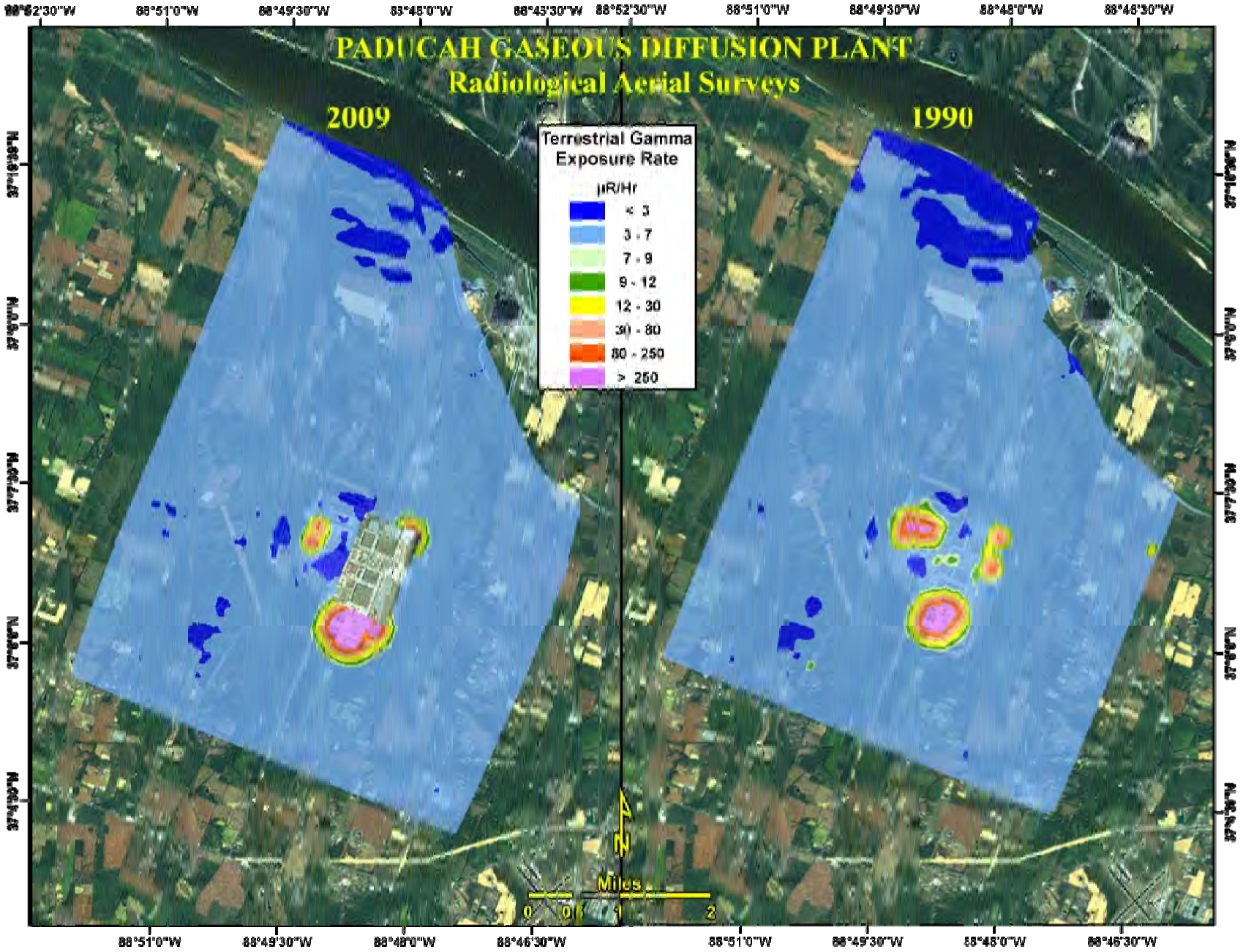
The conclusion from the evaluation of the results of the visual and radiological walkover surveys and their associated analyses is that no areas were identified that required either further CERCLA evaluation under the FFA or designation as SWMUs or AOCs (DOE 2015b). The results demonstrate that these anomalies do not represent unknown areas of contamination that pose a threat to the public or environment.

7.3.2. Analytical Results for Radiological Data in Soil

A summary of the analytical radiological data for surface and subsurface soil, which includes comparisons to background values and risk screening values, is provided in Tables 4 and 5, respectively.

7.3.3. Analytical Results for Radiological Data in Groundwater

A summary of the groundwater detections of radionuclides in the McNairy Formation MW, which includes comparisons to background and MCLs, is provided in Table 6. Technetium-99 is the only radionuclide analyzed for the evaluated data set, and it was not detected.



From DOE 2015b

Figure 27. Comparison of 1990 and 2009 Terrestrial Gamma Exposure Rate Results

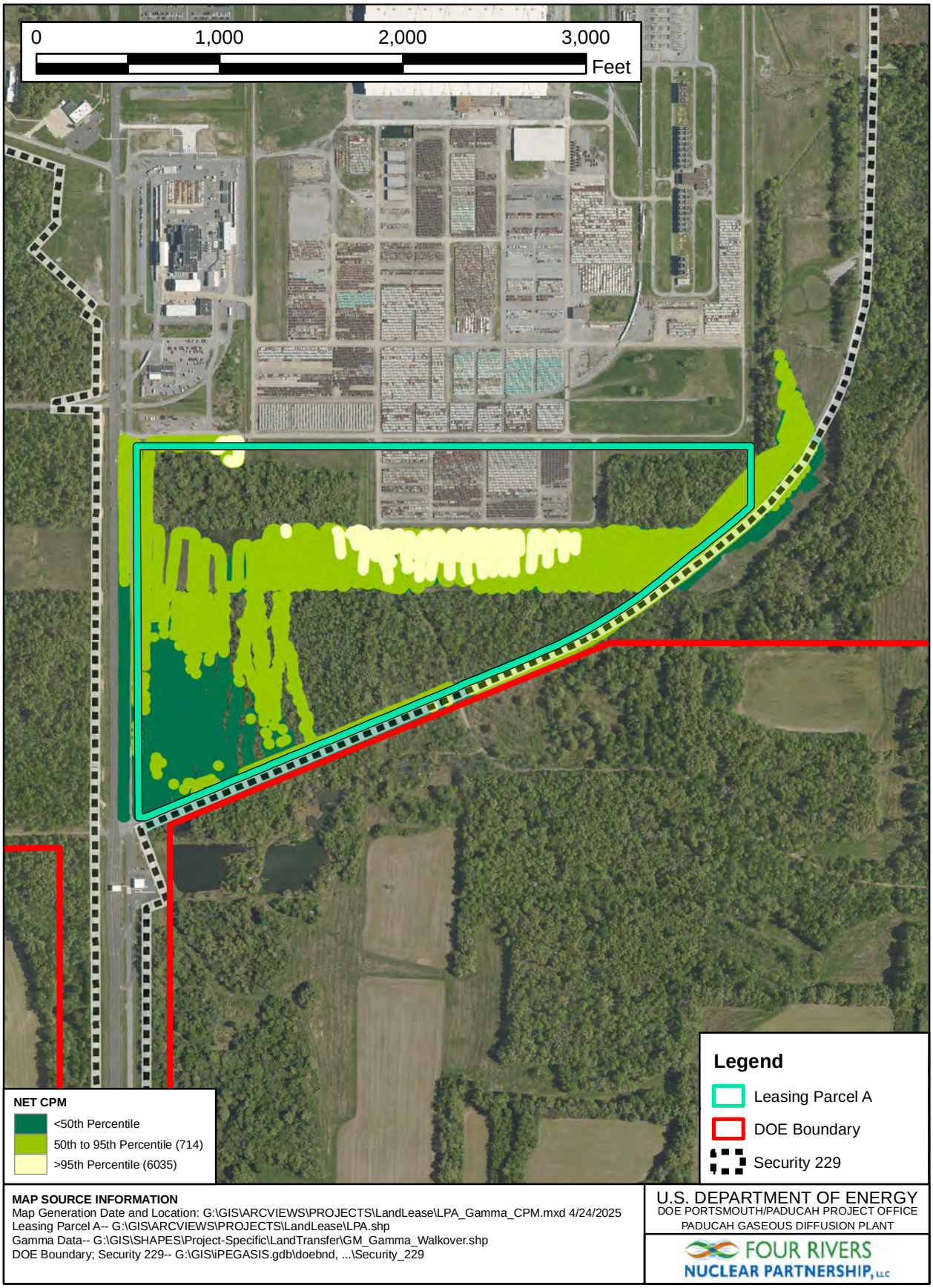


Figure 28. Historical Gamma Walkover Survey Results for Leasing Parcel A

7.3.4. Analytical Results for Radiological Data in Sediment

Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation. All radionuclides were less than their respective site background values, where applicable, with the exception of uranium-234 and uranium-238 at location JP-0164. At this location, the activity-based concentration of uranium-234 [1.37 picocuries per gram (pCi/g)] and uranium-238 (1.84 pCi/g) were less than two times their respective background values.

7.3.5. Evaluation of Radiological Data

7.3.5.1. Soil—Surface and Subsurface

For the surface and subsurface soil sample results shown in Tables 4 and 5, there were detections of two radionuclides (uranium-235/236 and uranium-238) that exceeded the associated Paducah Site provisional background values. There are several other radionuclides with site provisional background values that were detected, but they did not exceed background.

Uranium-235/236. Uranium-235/236 was analyzed in only one surface soil sample. The sample, collected from AOC 567, adjacent to Leasing Parcel A, during the Soils OU remedial investigation had a uranium-235/236 result (0.067 pCi/g) slightly exceeding the background value of 0.06 pCi/g. There were no subsurface samples analyzed for uranium-235/236. Uranium-235/236 is considered a site COPC and is further evaluated in Section 7.4.

Uranium-238. Uranium-238 values in surface soil samples exceeded the background value of 1.2 pCi/g in three of the nine samples from the Leasing Parcel A area with a maximum result of 1.57 pCi/g (the maximum detection was from a sample collected at AOC 567 east of Leasing Parcel A). Uranium-238 was detected in two of 18 subsurface soil samples (1 to 16 ft bgs) with no results exceeding the provisional background of 1.20 pCi/g. The maximum subsurface soil result was 0.666 pCi/g. Uranium-238 is considered a site COPC and is further evaluated in Section 7.4.

7.3.5.2. Groundwater

As shown in Table 6, the only radionuclide analyzed for in groundwater was technetium-99. Technetium-99 was analyzed in seven samples collected from MW120 between March 2020 and September 2024, and all were nondetect.

7.3.5.3. Sediment

Due to the sediment sampling being collected prior to 2014, the data are considered only qualitatively in this evaluation. All radionuclide results for sediment were less than their respective site surface soil background values, where applicable, with the exception of uranium-234 and uranium-238 at location JP-0164. At this location, the activity-based concentration of uranium-234 (1.37 pCi/g) and uranium-238 (1.84 pCi/g) were less than two times their respective surface soil background values.

7.4. SCREENING RISK EVALUATION

The goal of this screening risk evaluation is to determine if Leasing Parcel A proposed for leasing is protective of human health and the environment. Specifically, the objectives of this evaluation are the following:

1. Determine exposure to constituents based on available data for the surface and subsurface soils;

2. Use these data to provide an estimate of the potential for adverse effects to human health in a screening human health risk evaluation; and

3. Evaluate whether existing data justify a decision that site contaminants do not pose a risk to ecological receptors.

The screening human health risk methods utilized in this evaluation are taken from the Human Health RMD (DOE 2024d), which was developed based upon EPA's *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)* (EPA 1989), and the EPA *Region 4 Human Health Risk Assessment Supplemental Guidance* (EPA 2018a). The screening-level ecological risk assessment (SLERA) was performed consistent with the *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky, Volume 2, Ecological,* DOE/LX/07-0107&D2/R3/V2, (Ecological RMD) (DOE 2019), which was developed consistent with EPA ecological risk assessment guidance including *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997) and *Region 4 Ecological Risk Assessment Supplemental Guidance* (EPA 2018b). The following sections describe the background information and data used for the risk evaluation.

This section presents an overview of the approaches used, a summary of the screening human health and ecological risk evaluation results, and the conclusions of the human health and ecological evaluations. The data available for Leasing Parcel A screening human health risk evaluation and SLERA consist of surface soil (human health and ecological) and subsurface soil (human health only) analytical results. The evaluation of human exposure to chemicals in soil includes the ingestion, dermal contact, and inhalation pathways (via airborne soil as dust and volatilization), and the evaluation of human exposure to radionuclides in soil includes the ingestion, external radiation, and dust inhalation pathways. Because the on-site workers would receive the highest levels of dust/volatile inhalation based on activities and proximity, on-site workers are conservative surrogates for off-site receptors who may inhale dust and volatiles originating from on-site soils. Groundwater is excluded from risk evaluation because there are no complete exposure pathways. The human exposure pathway for groundwater is incomplete because Leasing Parcel A is within the Water Policy Area. Ecological exposure pathways are incomplete because the underlying McNairy Formation groundwater does not discharge to the surface. Surface water is not evaluated, as there are no perennial surface water features on or adjacent to the property.

7.4.1. Screening Human Health Risk Evaluation Methodology

The screening human health risk evaluation methodology uses a stepwise process to determine if Leasing Parcel A under consideration is suitable (from a health perspective) for leasing. As detailed below, the site data are screened against Paducah Site background concentrations and risk-based, receptor-specific NAL concentrations found in the Human Health RMD at or below which no action is required. If the maximum detected concentration of an analyte exceeds the background and NAL during an initial screen, then the chemical or radiological constituent is retained as a COPC for further evaluation. The risk-based NALs were developed as screening levels based on an excess lifetime cancer risk (ELCR) of 1E-6 and a hazard quotient (HQ) of 0.1. Because the NALs are derived from PGDP-specific exposure parameter values for each receptor, NALs also can be used in the derivation of cumulative risk estimates as described in Appendix A of the Human Health RMD (see Appendix F, Section F.5.5.3) (DOE 2024d). PGDP-specific exposure parameters are provided in Table B.5 of the Human Health RMD.

For analytes retained after the initial screening step, representative exposure point concentrations (EPCs) are used for the cumulative risk estimate rather than maximum detected concentrations. The 95% UCL on

the arithmetic mean concentration is used as the EPC because the 95% UCL represents a protective estimate of the average concentration to which an individual would be exposed over time (EPA 1989). ProUCL software is used to calculate 95% UCL values, employing various statistical methods and providing recommended 95% UCL values based on the specific data set characteristics.[8]

The anticipated future land use for Leasing Parcel A is industrial; therefore, surface soil NALs were selected based on the industrial worker scenario and outdoor worker scenario (e.g., maintenance work, groundskeeping). Subsurface soil NALs are based on the outdoor worker scenario and excavation worker scenario, consistent with the Human Health RMD. The residential and recreational scenarios were not evaluated for purposes of the lease (restrictions will prohibit any residential or recreational uses of Leasing Parcel A).

The industrial receptor is a long-term, full-time indoor worker who works at the site under the expectation that Leasing Parcel A will be developed for industrial use. The outdoor worker receptor is a long-term, full-time indoor worker who works at the site and performs outdoor maintenance and groundskeeping tasks that may require digging into the subsurface. The excavation worker scenario is for a shorter-term worker who digs into the subsurface soil (e.g., utility work).

The ELCR for a single COPC in soil is calculated as follows:

$$ELCR_1 = (EPC_1/NAL_{1c}) \times TR_{NAL} \qquad \text{Eq. 1}$$

Where:

$ELCR_1$ = ELCR associated with COPC "1."

EPC_1 = EPC of chemical "1" (mg/kg for chemicals; pCi/g for radionuclides).

NAL_{1c} = Carcinogenic NAL for COPC "1" (mg/kg for chemicals; pCi/g for radionuclides). Note that NAL values are receptor-specific as well as analyte-specific.

TR_{NAL} = Target risk used to calculate the NAL (1E-6).

The cumulative ELCR is simply the sum of individual COPC-specific ELCR values calculated as follows:

$$ELCR_{cum} = \sum (ELCR_1 + ELCR_2 + \ldots ELCR_n) \qquad \text{Eq. 2}$$

Where:

$ELCR_{cum}$ = Cumulative ELCR associated with all COPCs combined.
$ELCR_x$ = ELCR associated with each COPC.

It is noted that cancer risks associated with chemical COPCs and radiological COPCs are evaluated separately.

Analogous to calculation of the ELCR, the calculation of the noncancer hazard index (HI) for Paducah Site COPCs is calculated based on the noncancer NAL values, which are provided in Appendix A of the Human Health RMD. The noncancer-based NAL is the calculated exposure concentration for an HI of 0.1, using the chronic reference dose and the appropriate exposure values for the receptor and medium of interest

[8] ProUCL (version 5.2) software is available at www.epa.gov/land-research/proucl-software.

(Human Health RMD). The HI for noncancer effects of a single COPC in an environmental medium is calculated as follows:

$$HI_1 = (EPC_1/NAL_{1n}) \times TH_{NAL} \quad \text{Eq. 3}$$

Where:

HI_1 = HI associated with COPC "1."
EPC_1 = EPC of chemical "1" (mg/kg).
TH_{NAL} = Target HI used to calculate the NAL (0.1).
NAL_{1n} = Noncancer NAL for COPC "1" (mg/kg).

The total hazard index (THI) is the sum of individual COPC-specific HI values calculated as follows:

$$THI_{cum} = \sum (HI_1 + HI_2 + \ldots HI_n) \quad \text{Eq. 4}$$

Where:

THI_{cum} = THI associated with all COPCs combined.
HI_x = HI associated with each COPC.

The THI, which represents the cumulative noncancer hazard associated with the COPCs, is compared to a value of 1. EPA considers only those analytes that affect the same target organ to have additive effects (EPA 2018a, EPA 1989, ATSDR 2001); therefore, if the THI exceeds a value of 1, cumulative HI values may be segregated by the target organ and then compared to a value of 1. The target organ-specific approach was not performed for Leasing Parcel A because the site-related THI values did not exceed a value of 1.

Additionally, separate NALs were developed in the Human Health RMD for radiological COPCs depending on the assumed site conditions and time intervals. The Human Health RMD recommends the secular equilibrium (SE) NALs for the initial screening. The SE is the most protective scenario and assumes that the parent and all progeny are in equilibrium and that the parent COPC is continually being renewed (no source decay). Another protective option provided by the Human Health RMD is the infinite time source peak risk (PR). This scenario assumes that every radionuclide COPC present at the site is within its PR period.

For the uranium isotope COPCs, the period of PR occurs from between 185,000 to more than 3,500,000 million years into the future. Given that topsoil may form at the rate of a few inches per millennium, the contaminated soil would presumably be covered with tens or hundreds of feet of soil at the time of PR given an infinite time frame (Scalenghe et al. 2016). Such a soil covering would effectively eliminate exposure to currently uranium-contaminated surface soil.

As a more realistic alternative for the uranium isotope COPCs, NALs based on the 1,000-year PR are used in this evaluation and are regarded as most appropriate for uranium isotopes in soil. The SE NALs are also used to provide a range of values from which to calculate the ELCRs for radiological COPCs. The 1,000-year time frame of the 1,000-year PR NALs is consistent with DOE's requirements for disposal facilities for uranium and thorium wastes, which must be designed to remain effective for 1,000 years, to the extent reasonably achievable [DOE Order 458.1 Chg 4 (LtdChg), *Radiation Protection of the Public and the Environment*]. To accommodate the calculation of multiple radiological ELCR values, separate tables were used to evaluate radiological COPCs and chemical ELCRs. The cumulative ELCR for COPCs is the sum of the site-related chemical ELCR and radiological ELCR values based on the more realistic 1,000-year PR ELCR values for the latter.

The NALs were selected to be protective concentrations and meet the definition under CERCLA 120(h) in that concentrations of contaminants below these levels would not pose a threat to human health. These screening levels also are consistent with KDEP risk assessment guidance (KDEP 2002). If there are constituents with concentrations in excess of the background soil concentrations and the NALs, further evaluation is conducted to ensure cumulative risks/hazards do not exceed acceptable risk/hazard ranges, consistent with land use. The specific exposure scenarios and corresponding NALs for this evaluation were selected based on site surveys and anticipated industrial use of Leasing Parcel A.

7.4.2. Screening Human Health Risk Evaluation Results

Risk screening was performed using the detected concentrations, PGDP background values, and the NAL values for each medium and human receptor evaluated. The initial screen uses the maximum detected concentration. Analytes with maximum concentrations that exceed the NAL and background screening are identified as COPCs and are subject to an additional screening step whereby the 95% UCL on the mean concentration is compared to the cancer-based or noncancer-based NALs for the purpose of estimating the human health risk of that constituent from the additional cumulative risk evaluation. The risks of all other constituents evaluated in this second step are summed to determine whether the resulting cumulative ELCRs exceed the 1E-6 to 1E-4 cancer risk range and noncancer HIs exceed a value of 1. Additionally, constituents shown to be consistent with KDEP background soil levels (Sections 7.2.4 and 7.3.5) are identified as background-related. Separate total ELCR values and noncancer THI values are calculated that exclude the COPCs identified as background-related based on KDEP background soil levels.

7.4.2.1. Surface Soil Risks—Industrial Worker and Outdoor Worker

Table 4 presents the results for Leasing Parcel A initial surface soil risk screening evaluation based on industrial worker and outdoor worker exposure. The risk evaluation methods and results are summarized in the following paragraphs.

Industrial Worker Surface Soil Risks. Table 4 shows two metals and four radionuclides with one or more analytical laboratory detections that exceed their respective NAL for the industrial worker. None of the organics were detected at a concentration that exceeds an NAL. Of the analytes with an NAL exceedance, only one metal [chromium as Cr(VI)] and one radionuclide (uranium-238) were not attributable to background soil conditions during the initial screening of the maximum detected concentrations to provisional background values; therefore, these two analytes were evaluated for cumulative cancer risk, and chromium was evaluated for noncancer hazard. These analytes were identified as COPCs and their ELCR and noncancer HI estimated using the 95% UCL concentration as the EPC and equations 1 through 4 presented in Section 7.4.1. Chromium was subsequently identified as background-related in the Section 7.2.4 comparison to Kentucky background soils.

Chemical cancer risks, radionuclide cancer risks, and noncancer hazards were evaluated for the industrial worker exposed to Leasing Parcel A surface soil using equations 1 through 4 presented above. The industrial worker total ELCR of the chemical COPCs in surface soil is 1.37E-6 (Table 8), which is at the low end of the CERCLA acceptable risk range. This total ELCR is based entirely on chromium, which is identified in Section 7.2.4 as background-related. Also, chromium is assumed to be present as 100% chromium VI [Cr(VI)], which is not a likely realistic assumption. Typically, Cr(VI) is a minor component of chromium in soil. The ELCR of chromium, with rounding as recommended by EPA (EPA 1989), equals the Kentucky target risk of 1E-6. The site-related total ELCR of chemicals in Leasing Parcel A surface soil is regarded as negligible (i.e., ELCR < 1E-6) for the industrial worker.

Table 8. Cancer Risk Evaluation of Surface Soil Chemical COPCs to the Industrial Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Chromium as Cr(VI)[d]	mg/kg	16.79	1.23E+01	Yes	1.37E-06
Chromium as Cr(III)[e]	mg/kg	16.79	N/A	Yes	N/A
				Total ELCR	1.37E-06
				Total ELCR excluding background	[f]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.
[d] NALs for Cr(VI) are used in Total ELCR calculations.
[e] NALs for Chromium III [Cr(III)] are presented for additional information.
[f] Chromium, the only chemical COPC, was identified in Section 7.2.4 as background-related.

The industrial worker radiological ELCR values based on the SE assumption and the 1,000-year PR assumption are 1.35E-5 and 2.01E-7, respectively (Table 9). The SE value is within the CERCLA acceptable risk range and exceeds the Kentucky target risk of 1E-6. As described in Section 7.4.1, the SE-based values are regarded as unrealistic with respect to future soil exposure.

Table 9. Cancer Risk Evaluation of Surface Soil Radiological COPCs to the Industrial Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL—SE[b]	Industrial Cancer NAL—1,000-year PR[b]	Background related?[c]	ELCR—SE	ELCR—1,000-year PR
Uranium-238	pCi/g	1.29	9.53E-02	6.42E+00	No	1.35E-05	2.01E-07
					Total ELCR	1.35E-05	2.01E-07

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.

The 1,000-year PR industrial worker ELCR for the uranium isotopes is less than both the CERCLA acceptable risk range and the Kentucky target risk of 1E-6. Because the site-related ELCR to chemical COPCs is negligible, the combined ELCR of chemical and radiological COPCs is less than the CERCLA acceptable risk range and the Kentucky target risk of 1E-6.

The noncancer THI for the industrial worker was 0.002 based on background-related chromium (Table 10). Because this value is < 1, adverse noncancer health effects are regarded as unlikely.

Table 10. Noncancer Risk Evaluation of Surface Soil COPCs to the Industrial Worker

COPC	Units	95% UCL[a]	Industrial Noncancer NAL[b]	Background Related?[c]	HI
Chromium as Cr(VI)[d]	mg/kg	16.79	6.93E+02	Yes	2.42E-03
Chromium as Cr(III)[e]	mg/kg	16.79	1.00E+05	Yes	1.68E-05
Uranium-238	pCi/g	1.29	N/A	No	N/A
				THI	0.002
				THI excluding background	[f]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Sections 7.2.4 and 7.3.5.
[d] NALs for Cr(VI) are used in THI calculations.
[e] NALs for Cr(III) are presented for additional information.
[f] Chromium, the only COPC with a noncancer NAL, was identified in Section 7.2.4 as background-related.

In addition to comparisons of human health receptor scenarios, and consistent with implementing requirements of DOE Authorized Limits at the Paducah Site, radiological soil samples were compared to

Authorized Limits for unrestricted release of the property to ensure protectiveness under DOE Order 458.1 Chg 4 (LtdChg) (DOE 2016b). The maximum detected concentration 1.57 pCi/g and the 95% UCL concentration (1.29 pCi/g) of uranium-238 were approximately two orders of magnitude less than the Paducah Authorized Limit for unrestricted use (135 pCi/g).

The basic concept upon which the Authorized Limits are developed is that (subject to an "as low as reasonably achievable" assessment) the concentration of any specific radionuclide in the residual radioactivity in the soil would not result in a dose in excess of 25 mrem/year to any member of the public under the assumed future uses of the property. The uranium-238 Authorized Limit (135 pCi/g) is less than the soil/sediment AL based on the 1,000-year PR scenario (709 pCi/g for resident receptor scenario) and is approximately two orders of magnitude greater than the soil/sediment AL based on the secular equilibrium scenario (1.09 pCi/g for an industrial worker receptor scenario). The soil/sediment ALs are from Table A.1b of the Human Health RMD (DOE 2024d).

Outdoor Worker Surface Soil Risks. Table 4 shows that the maximum detected laboratory concentrations of four metals, four radionuclides, and zero organics in surface soil exceed the outdoor worker NALs. Of these, three metals (cadmium, chromium, and manganese) and one radionuclide (uranium-238) could not be attributed to background soil conditions based on the initial screening of maximum detected concentrations to provisional background values and were further evaluated for potential surface soil risk to the outdoor worker. Chromium and manganese were subsequently identified as background-related in the Section 7.2.4 comparison to Kentucky background soils.

The outdoor worker total ELCR of the chemical COPCs in surface soil is 9.18E-6 (Table 11), which is within the CERCLA acceptable risk range but exceeds the Kentucky target risk of 1E-6. Virtually all of this ELCR is associated with chromium, which is identified in Section 7.2.4 as background-related. If background contributions of chromium are excluded, the resulting total ELCR of chemical contaminants is 1.97E-10, which is less than the CERCLA acceptable risk range and the Kentucky target risk of 1E-6. It is also noted that the chromium ELCR assumes that chromium is present as 100% Cr(VI), an overly protective assumption because Cr(VI) is typically a minor component of chromium in soils.

Table 11. Cancer Risk Evaluation of Surface Soil Chemical COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Cadmium	mg/kg	2.46	1.25E+04	No	1.97E-10
Chromium as Cr(VI)[d]	mg/kg	16.8	1.83E+00	Yes	9.17E-06
Chromium as Cr(III)[e]	mg/kg	16.8	N/A	Yes	N/A
Manganese	mg/kg	1694	N/A	Yes	N/A
				Total ELCR	9.18E-06
				Total ELCR excluding background	1.97E-10

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.
[d] NALs for Cr(VI) are used in Total ELCR calculations.
[e] NALs for Cr(III) are presented for additional information.

The radiological ELCR values for the outdoor worker exposed to surface soil, based on the SE assumption and the 1,000-year PR assumption are 1.65E-5 and 2.93E-7, respectively (Table 12). The SE value for the outdoor worker is within the CERCLA acceptable risk range and exceeds the Kentucky target risk of 1E-6. As described above, the SE-based values are regarded as unrealistic with respect to future soil exposure of uranium-238.

Table 12. Cancer Risk Evaluation of Surface Soil Radiological COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL—SE[b]	Industrial Cancer NAL—1,000-year PR[b]	Background Related?[c]	ELCR—SE	ELCR—1,000-year PR
Uranium-238	pCi/g	1.29	7.83E-02	4.40E+00	No	1.65E-05	2.93E-07
					Total ELCR	1.65E-05	2.93E-07

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.

The 1,000-year PR ELCR for the uranium isotopes is less than both the CERCLA acceptable risk range and the Kentucky target risk of 1E-6. When combined with the site-related chemical ELCR (1.97E-10), the resulting ELCR of 2.93E-7 is unchanged and is within the CERCLA acceptable risk range.

The noncancer THI for the outdoor worker exposed to surface soil was 0.3, assuming 100% of chromium is present as Cr(VI) (Table 13). When rounded, as recommended by EPA (EPA 1989), this THI is less than the target HI of 1, indicating that adverse noncancer health effects are unlikely for an outdoor worker exposed to surface soil. Note that the assumption of chromium as 100% Cr(VI) is unrealistic, because Cr(VI) is generally a minor component of chromium in soils. Further, chromium and manganese are identified as background-related in Section 7.2.4. If the background-related contributions of chromium and manganese are excluded, the site-related THI of 0.1 indicates likewise that exposure by an outdoor worker to site surface soil is unlikely to result adverse noncancer site-related health effects.

Table 13. Noncancer Risk Evaluation of Surface Soil COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Noncancer NAL[b]	Background Related?[c]	HI
Cadmium	mg/kg	2.46	2.54E+00	No	9.68E-02
Chromium as Cr(VI)[d]	mg/kg	16.79	9.85E+01	Yes	1.70E-02
Chromium as Cr(III)[e]	mg/kg	16.79	4.93E+04	Yes	3.41E-05
Manganese	mg/kg	1,694.00	7.74E+02	Yes	2.19E-01
Uranium-238	pCi/g	1.29	N/A	No	N/A
				THI [assuming all chromium is Cr(VI)]	0.3
				THI [assuming all chromium is Cr(III)]	0.3
				THI excluding background	0.10

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.
[d] NALs for Cr(VI) are used in THI calculations.
[e] NALs for Cr(III) are presented for additional information.

Evaluation of Surface Soil Protection of Groundwater. Detected surface soil concentrations were compared to soil screening concentrations with a dilution attenuation factor (DAF) of 1 (DAF 1) and of 20 (DAF 20) to evaluate protectiveness of soil concentrations to groundwater, assuming it to be a hypothetical drinking water source (Leasing Parcel A lies within the Water Policy Area). Two sets of DAF-based soil concentrations that are protective of groundwater are presented in the Human Health RMD—one DAF 1/DAF 20 set that was derived from the risk-based NAL and a second set that is based on the groundwater MCL, where available. Only the values derived from the NAL were used in the soil risk screen for protectiveness of groundwater (except in the case of lead, which are based on the MCL because lead has no risk-based groundwater NAL provided in the RMD). The DAF 1/DAF 20 values derived from the MCLs, which are generally higher than the corresponding NAL-based DAF 1/DAF 20 values presented in this evaluation, are included in the Human Health RMD as supplemental information. DAF 1 values are

identified in the Human Health RMD as NALs. DAF 20 values are included as additional information. No soil-to-groundwater ALs are included in the Human Health RMD.

As shown in Table 4, numerous analytes detected in surface soil laboratory analytical samples have at least one exceedance of the DAF 1 value, and several of these also exceed the corresponding DAF 20 value. Three analytes (cadmium, silver, and uranium-238) were detected in surface soil with a DAF 1 exceedance and were not shown to be related to background soil conditions in Section 7.2.4 or Section 7.3.5. Each of these three analytes also have one or more DAF 20 exceedances. Neither cadmium nor silver, which was detected in only one of 15 samples, is an analyte of concern for McNairy Formation groundwater. Also, the only detection of uranium in McNairy Formation groundwater is an order of magnitude less than the provisional background level (Table 6), which indicates that uranium-238 is not of concern with respect to McNairy Formation groundwater.

The exceedance of a DAF 1 or DAF 20 value may indicate the potential for soil to adversely affect groundwater, and analytes with exceedances should be evaluated in conjunction with concentrations of these analytes observed in groundwater; however, an exceedance is not necessarily an indication that soil has adversely affected or may adversely affect the underlying groundwater. It is emphasized that the DAF 1 and DAF 20 values are not ALs and do not connote a specific risk level with respect to groundwater. Because Leasing Parcel A is in the Water Policy Area and because the analytes with DAF 1 and DAF 20 exceedances are not of concern with respect to McNairy Formation groundwater, further evaluation of surface soil with respect to groundwater protection is not warranted.

7.4.2.2. Subsurface Soil Risks—Outdoor Worker and Excavation Worker

Table 5 presents the results for Leasing Parcel A subsurface soil risk screening evaluation based on industrial worker and outdoor worker exposure. These results are summarized in the following paragraphs.

Outdoor Worker Subsurface Soil Risks. Table 5 shows that the maximum detected laboratory concentrations of four metals, one organic analyte, and four radionuclides in subsurface soil exceed the outdoor worker NALs. Of these, one metal (arsenic) and one organic (PCBs) could not be attributed to background soil conditions during the initial screening of the maximum detected concentrations to provisional background values; therefore, these two analytes were further evaluated for potential surface soil risk to the outdoor worker. The four radionuclides that exceeded an NAL were each attributed to background soil conditions during the initial screening of maximum concentrations to provisional background values. Arsenic was subsequently identified as background-related in the Section 7.2.4 comparison to Kentucky background soils.

The outdoor worker total ELCR of the chemical COPCs in subsurface soil is 9.13E-6 (Table 14). Because arsenic was identified as background-related in Section 7.2.4, the site-related total ELCR of 5.76 E-7 was calculated by excluding arsenic.

Table 14. Cancer Risk Evaluation of Subsurface Soil COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Arsenic	mg/kg	6.395	7.48E-01	Yes	8.55E-06
PCBs	mg/kg	0.129	2.24E-01	No	5.76E-07
				Total ELCR	9.13E-06
				Total ELCR excluding background	5.76E-07

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.

The noncancer THI for the outdoor worker exposed to subsurface soil was 0.09 including arsenic, which was identified as background-related in Section 7.2.4, and 0.04 excluding arsenic (Table 15). Both values are less than the target HI value of 1, indicating that adverse noncancer effects are unlikely for the outdoor worker exposed to Leasing Parcel A subsurface soil.

Table 15. Noncancer Risk Evaluation of Subsurface Soil COPCs to the Outdoor Worker

COPC	Units	95% UCL[a]	Outdoor Worker Noncancer NAL[b]	Background Related?[c]	HI
Arsenic	mg/kg	6.395	1.20E+01	Yes	5.33E-02
PCBs[d]	mg/kg	0.129	3.24E-01	No	3.98E-02
				THI	0.09
				THI excluding background	0.04

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.
[d] Noncancer NAL for PCB-1254 was used for PCBs.

Excavation Worker Subsurface Soil Risks. Table 5 shows that the maximum detected laboratory concentrations of three metals, three radionuclides, and no organics in subsurface soil exceed the excavation worker NALs. Of these, only arsenic could not be attributed to background soil conditions during the initial screening and was further evaluated for potential subsurface soil risk to the excavation worker.

The excavation worker total ELCR of the chemical COPC arsenic in subsurface soil is 1.71E-6 (Table 16). This value is within the CERCLA acceptable risk range and exceeds the Kentucky target risk of 1E-6. Because arsenic was identified as background-related in Section 7.2.4, the site-related total ELCR is regarded as negligible.

Table 16. Cancer Risk Evaluation of Subsurface Soil COPCs to the Excavation Worker

COPC	Units	95% UCL[a]	Industrial Cancer NAL[b]	Background Related?[c]	ELCR
Arsenic	mg/kg	6.395	3.74E+00	Yes	1.71E-06
				Total ELCR	1.71E-06
				Total ELCR excluding background	[d]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.2.4.
[d] Arsenic, the only chemical COPC, was identified in Section 7.2.4 as background-related.

The noncancer THI for the outdoor worker exposed to subsurface soil was 0.05 including only arsenic (Table 17), which was identified as background-related in Section 7.2.4. This THI value is less than the target HI value of 1, indicating that adverse noncancer effects are unlikely for the excavation worker exposed to Leasing Parcel A subsurface soil.

Table 17. Noncancer Risk Evaluation of Subsurface Soil COPCs to the Excavation Worker

COPC	Units	95% UCL[a]	Industrial Noncancer NAL[b]	Background Related?[c]	HI
Arsenic	mg/kg	6.395	1.20E+01	Yes	5.33E-02
				THI	0.05
				THI excluding background	[d]

[a] Calculated using ProUCL Version 5.2.
[b] NAL from the Human Health RMD (DOE 2024d).
[c] Based on evaluation presented in Section 7.3.5.
[d] Arsenic, the only chemical COPC, was identified in Section 7.2.4 as background-related.

Evaluation of Subsurface Soil Protection of Groundwater. Detected subsurface soil concentrations were compared to DAF 1 and DAF 20 soil screening concentrations to evaluate protectiveness of soil concentrations to groundwater, assuming that it is a hypothetical drinking water source. Leasing Parcel A lies within the Water Policy boundary and groundwater use in this area currently is restricted. Two sets of DAF-based soil concentrations that are protective of groundwater are presented in the Human Health RMD—one DAF 1/DAF 20 set that was derived from the risk-based NAL and a second set that is based on the groundwater MCL, where available. Only the values derived from the NAL were used in the soil risk screen for protectiveness of groundwater (except in the case of lead, which are based on the MCL because lead has no risk-based groundwater NAL provided in the RMD). The DAF 1/DAF 20 values derived from the MCLs, which are generally higher than the corresponding NAL-based DAF 1/DAF 20 values presented in this evaluation, are included in the Human Health RMD as supplemental information. DAF 1 values are identified in the Human Health RMD as NALs. DAF 20 values are included as additional information. No soil-to-groundwater ALs are included in the Human Health RMD.

As shown in Table 5, numerous analytes detected in subsurface soil laboratory analytical samples have at least one exceedance of the DAF 1 value, and most of these also exceed the corresponding DAF 20 value. The only analyte detected in subsurface soil with a DAF 1 exceedance and that was not shown to be related to background soil conditions in previous sections is barium. Barium also has two exceedances of the DAF 20 value. No organics or radionuclides were detected at a maximum concentration that exceeds a DAF 1 or DAF 20 value.

A qualitative evaluation of deep soil data (i.e., samples collected from > 16 ft bgs) indicated that arsenic and chromium, assuming all chromium is Cr(VI), exceeded both DAF 1 and DAF 20 values. Vanadium and Total PCBs in the deep soil exceeded the DAF 1 value.

The exceedance of a DAF 1 or DAF 20 value may indicate the potential for soil to adversely affect groundwater, and analytes with exceedances should be evaluated in conjunction with concentrations of these analytes observed in groundwater; however, an exceedance is not necessarily an indication that soil has adversely affected or may adversely affect the underlying groundwater. It is emphasized that the DAF 1 and DAF 20 values are not ALs and do not connote a specific risk level with respect to groundwater. Because Leasing Parcel A is in the Water Policy Area that restricts groundwater use and because barium has not been an analyte of concern with respect to McNairy Formation groundwater, further evaluation of subsurface soil with respect to protection of groundwater is not warranted.

7.4.3. Screening Level Ecological Risk Assessment Methodology

The SLERA was performed for Leasing Parcel A to evaluate whether existing data justify a decision that site contaminants do not pose a risk to ecological receptors or whether additional evaluation is necessary; therefore, the SLERA is conservative, erring on the side of environmental protection. The SLERA was conducted using the methods presented in the Ecological RMD (DOE 2019), consistent with the eight-step process developed by EPA for ecological risk assessment at Superfund sites (EPA 1997).

Leasing Parcel A SLERA includes the following elements of Steps 1 and 2 of the eight-step process.

- Screening-level problem formulation
- Screening-level effects evaluation
- Screening-level exposure estimate
- Screening-level risk calculation

7.4.3.1. Screening-Level Problem Formulation

Leasing Parcel A currently is approximately 100 acres and consists of approximately 55 acres of mature woodlands bisected generally east-to-west by a 23-acre power line right-of-way that is regularly maintained. A 10-acre portion of the cylinder storage yard is in the north-central part of the site. Aside from the cylinder storage yard, the property has no known uses. Some wetland areas are present in the western part of the parcel (Figure 6). Most of the wetland areas were characterized as including forested wetlands, ponds, wet meadows, vernal pools, and wetlands converted to agriculture (ANL 2004).

Wildlife commonly found at the Paducah Site consists of species indigenous to open grassland, thicket, and forest habitats. Small mammals found in the vicinity of the site include the southern short-tailed shrew, prairie vole, house mouse, rice rat, and deer mouse (KSNPC 1991). Large mammals commonly present in the area include coyote, eastern cottontail, opossum, groundhog, beaver, whitetail deer, raccoon, and gray squirrel. Mist netting activities in the area have captured red bats, little brown bats, Indiana bats, northern long-eared bats, evening bats, and eastern pipistrelles (KSNPC 1991). Typical birds of the area include European starling, cardinal, red-winged blackbird, mourning dove, bobwhite quail, turkey, killdeer, American robin, eastern meadowlark, eastern bluebird, blue jay, red-tail hawk, and great horned owl. Examples of a few amphibians and reptile species present include the cricket frog, Fowler's toad, common snapping turtle, green tree frog, chorus frog, southern leopard frog, eastern fence lizard, and red-eared slider (KSNPC 1991).

The following are the threatened and endangered species known, or potentially present, in the general vicinity of the Paducah Site (DOI 2013).

- Mammals—Indiana bat (*Myotis sodalis)*
- Birds—interior least tern (*Sterna antillarum*)
- Clams—fat pocketbook (Potamilus capax), orangefoot pimpleback (Plethobasus cooperanmus), pink mucket (Lampsilis abrupta), ring pink (Obovaria retusa), sheepnose (Plethobasus cyphyus), clubshell (Pleurobema clava), fanshell (Cyprogenia stegaria), rough pigtoe (Pleurobema plenum), spectaclecase (Cumberlandia monodonta), and rabbitsfoot (Quadrula c. cylindrica)

7.4.3.2. Screening-Level Effects Evaluation

The screening-level effects evaluation identifies the chemical-specific toxicity threshold benchmarks for each environmental medium evaluated. These are PGDP NFA screening values presented in Appendix A of the Ecological RMD. An NFA represents a threshold concentration that, if exceeded, may represent a dose to one or more species that may result in an adverse ecological effect to an individual receptor.

7.4.3.3. Screening-Level Exposure Estimates

The SLERA is protective intentionally because its purpose is to evaluate whether existing data justify a decision that site contaminants do not pose a risk to ecological receptors. Consistent with this objective, the maximum detected concentrations are used to evaluate exposure.

7.4.3.4. Screening-Level Risk Calculation

The screening-level risk is calculated by dividing the maximum detected concentration by the NFA to derive the ecological HQ. Analytes that have maximum detected concentrations that exceed the respective NFAs and have resulting HQ values that exceed a value of 1.0 are identified as a chemicals or radionuclides

of potential ecological concern (COPECs). Analytes that are not detected are screened against the NFAs to determine whether they are COPECs. A value of one-half the maximum DL is used as the concentration to screen against the NFA. Also, a value of one-half the maximum DL is used for screening detected analytes if this value exceeds the maximum detected concentration. The identification of a COPEC does not necessarily mean that the constituent represents an ecological threat, but rather that the COPEC requires further evaluation.

7.4.3.5. Screening Level Ecological Risk Assessment Results

A total of 20 metals, three SVOCs, and eight radionuclides were detected in Leasing Parcel A surface soil (Table 18).

The following seven metals and two organics had maximum detected concentrations in site surface soil that were greater than the NFA values and thus resulted in an HQ > 1.0. These nine analytes are identified as COPECs.

- Cadmium (HQ = 8.75)
- Chromium (HQ = 1.47)
- Lead (HQ = 3.49)
- Manganese (HQ = 8.31)
- Mercury (HQ=7.69)
- Vanadium (HQ = 4.47)
- Zinc (HQ = 1.25)
- Bis(2-ethylhexl)phthalate (HQ = 32.5)
- Di-n-butyl phthalate (HQ = 3091)

Of the seven metals listed above, chromium, lead, manganese, and zinc were identified in Section 7.2.4 as being representative of background conditions. Note that for mercury, the HQ value shown is based on one-half the maximum DL because this value was greater than the maximum detected concentration. Bis(2-ethylhexy)phthalate and di-n-butyl phthalate are common laboratory contaminants. None of the radionuclides had maximum detected concentrations that exceed the NFAs; thus, none of these were identified as COPECs. In addition, Table 18 lists five metals and 14 organic analytes that were not detected in surface soil, but are identified as surface soil COPECs because one-half their respective maximum DLs exceeded the NFA.

Numerous detected and nondetected COPECs were identified as described in the preceding paragraphs based on exceedances of NFAs, which are intentionally selected as conservative values for an initial screening for the protection of ecological communities. The intended use of Leasing Parcel A is for industrial development and is not intended as habitat for wildlife; therefore, further evaluation of Leasing Parcel A for the protection of ecological communities is not necessary or appropriate.

7.4.3.6. Radiation and Dose

DOE Order 458.1, Chg 4 (LtdChg), has requirements in place to protect the public and environment from radiation exposure. DOE's external radiation monitoring program is designed to provide exposure data on direct radiation from DOE operations to members of the public. Figure 24 shows environmental dosimeter locations within, and adjacent to, Leasing Parcel A. The primary sources for radiation exposure in the parcel are the DUF_6 cylinder storage yards on the north side of the parcel. These environmental dosimeters are also useful in assessing potential radiation exposure to site employees.

Table 18. Ecological Risk Initial Screening and Data Summary of Surface Soil

Analysis	Units	Detected Results		FOD	Location of Max Detected Conc.	Ecological PGDP		DL Range	½ Max DL	Max Site Concentration[a]	Maximum HQ[b]	COPEC?[c]
		Min	Max			FOE	NFA					
Aluminum	mg/kg	4.47E+03	1.34E+04	15/15	K013406	N/A	N/A	20 - 199	9.95E+01	1.34E+04	N/A	NO
Antimony	mg/kg	--	--	0/15	N/A	N/A	0.27	8.06 - 20	1.00E+01	1.00E+01	**37.04**	YES
Arsenic	mg/kg	5.01E+00	7.29E+00	7/15	UFSB-18	N/A	18.00	4.87 - 5	2.50E+00	7.29E+00	0.41	NO
Barium	mg/kg	2.73E+01	1.97E+02	15/15	CCHS-03	N/A	330.00	2.44 - 5	2.50E+00	1.97E+02	0.60	NO
Beryllium	mg/kg	5.08E-01	7.65E-01	4/15	CCHS-03	N/A	2.50	0.487 - 0.5	2.50E-01	7.65E-01	0.31	NO
Cadmium	mg/kg	2.51E+00	3.15E+00	4/15	CCHS-03	4/15	0.36	2 - 2.48	1.24E+00	3.15E+00	**8.75**	YES
Calcium	mg/kg	3.98E+02	1.02E+05	15/15	UFSB-12	N/A	N/A	97.4 - 200	1.00E+02	1.02E+05	N/A	NO
Chromium	mg/kg	5.73E+00	3.39E+01	15/15	UFSB-13	1/15	23.00	2.44 - 2.5	1.25E+00	3.39E+01	**1.47**	YES
Cobalt	mg/kg	5.16E+00	8.16E+00	5/6	CCHS-03	N/A	13.00	2.5 - 4.96	2.48E+00	8.16E+00	0.63	NO
Copper	mg/kg	3.42E+00	1.07E+01	13/15	UFSB-20	N/A	28.00	2.5 - 12.4	6.20E+00	1.07E+01	0.38	NO
Iron	mg/kg	9.45E+03	1.74E+04	6/6	CCHS-03	N/A	N/A	19.5 - 20	1.00E+01	1.74E+04	N/A	NO
Lead	mg/kg	1.21E+01	3.84E+01	8/15	UFSB-12	8/15	11.00	4.87 - 20	1.00E+01	3.84E+01	**3.49**	YES
Magnesium	mg/kg	8.05E+02	2.70E+03	6/6	CCHS-04	N/A	N/A	4.87 - 15	7.50E+00	2.70E+03	N/A	NO
Manganese	mg/kg	3.83E+02	1.83E+03	6/6	CCHS-03	6/6	220.00	2.44 - 10	5.00E+00	1.83E+03	**8.31**	YES
Mercury	mg/kg	3.00E-02	3.00E-02	2/15	K013406	2/15	0.013	0.016 - 0.2	1.00E-01	1.00E-01	**7.69**	YES
Molybdenum	mg/kg	--	--	0/2	N/A	N/A	2.00	4.87 - 4.96	2.48E+00	2.48E+00	**1.24**	YES
Nickel	mg/kg	6.05E+00	1.31E+01	15/15	CCHS-03	0/15	38.00	4.87 - 5	2.50E+00	1.31E+01	0.34	NO
Potassium	mg/kg	4.29E+02	6.04E+02	4/4	CCHS-04	N/A	N/A	200 - 200	1.00E+02	6.04E+02	N/A	NO
Selenium	mg/kg	--	--	0/15	N/A	N/A	0.52	1 - 4.96	2.48E+00	2.48E+00	**4.77**	YES
Silver	mg/kg	4.00E+00	4.00E+00	1/15	CCHS-04	N/A	4.20	2.01 - 4	2.00E+00	4.00E+00	0.95	NO
Sodium	mg/kg	3.43E+02	3.43E+02	1/6	CCHS-03	N/A	N/A	195 - 200	1.00E+02	3.43E+02	N/A	NO
Thallium	mg/kg	--	--	0/15	N/A	N/A	0.05	9.74 - 20	1.00E+01	1.00E+01	**200.00**	YES
Uranium	mg/kg	--	--	0/6	N/A	N/A	25.00	4.87 - 200	1.00E+02	1.00E+02	**4.00**	YES
Vanadium	mg/kg	1.64E+01	3.49E+01	15/15	UFSB-20	15/15	7.80	2.44 - 2.5	1.25E+00	3.49E+01	**4.47**	YES
Zinc	mg/kg	2.76E+01	5.73E+01	15/15	UFSB-18	3/15	46.00	19.5 - 20	1.00E+01	5.73E+01	**1.25**	YES
Polychlorinated biphenyl	mg/kg	--	--	0/15	N/A	N/A	0.04	0.1 - 0.13	6.50E-02	6.50E-02	**1.59**	YES
Americium-241	pCi/g	--	--	0/16	N/A	N/A	2160.00	0.0156 - 0.377	1.89E-01	1.89E-01	0.00	NO
Americium-243	pCi/g	--	--	0/9	N/A	N/A	N/A	0.0492 - 0.159	7.95E-02	7.95E-02	N/A	NO
Cesium-134	pCi/g	--	--	0/13	N/A	N/A	N/A	0.0199 - 0.0608	3.04E-02	3.04E-02	N/A	NO
Cesium-137	pCi/g	5.56E-02	2.61E-01	15/16	UFSB-13	N/A	20.80	0.0239 - 0.099	4.95E-02	2.61E-01	0.01	NO
Cobalt-60	pCi/g	--	--	0/13	N/A	N/A	N/A	0.0203 - 0.0911	4.56E-02	4.56E-02	N/A	NO
Neptunium-237	pCi/g	--	--	0/16	N/A	N/A	814.00	0.024 - 0.871	4.36E-01	4.36E-01	0.00	NO
Neptunium-239	pCi/g	--	--	0/9	N/A	N/A	N/A	0.237 - 1.5	7.35E-01	7.35E-01	N/A	NO
Plutonium-238	pCi/g	--	--	0/16	N/A	N/A	1750.00	0.0094 - 0.235	1.18E-01	1.18E-01	0.00	NO
Plutonium-239/240[d]	pCi/g	--	--	0/16	N/A	N/A	1270.00	0.0131 - 0.0874	4.37E-02	4.37E-02	0.00	NO
Potassium-40	pCi/g	1.52E+00	1.19E+01	9/9	UFSB-16	N/A	N/A	0.232 - 0.804	4.02E-01	1.19E+01	N/A	NO
Protactinium-234m	pCi/g	--	--	0/9	N/A	N/A	N/A	4.26 - 10.7	5.35E+00	5.35E+00	N/A	NO
Radium-226	pCi/g	--	--	0/9	N/A	N/A	N/A	0.2 - 0.414	2.07E-01	2.07E-01	N/A	NO
Technetium-99	pCi/g	5.71E-01	5.71E-01	1/16	K013406	0/16	2190.00	0.41 - 3.12	1.56E+00	1.56E+00	0.00	NO
Thorium-228	pCi/g	1.01E-01	8.80E-01	16/16	SOU567-RAD	N/A	N/A	0.02 - 0.0952	4.76E-02	8.80E-01	N/A	NO
Thorium-230	pCi/g	2.51E-01	1.00E+00	16/16	SOU567-RAD	0/16	9980.00	0.016 - 0.138	6.90E-02	1.00E+00	0.00	NO
Thorium-232	pCi/g	9.40E-02	9.50E-01	16/16	SOU567-RAD	0/16	N/A	0.01 - 0.064	3.20E-02	9.50E-01	N/A	NO
Uranium-234	pCi/g	8.10E-01	8.10E-01	3/9	SOU567-RAD	0/9	5140.00	0.02 - 0.961	4.81E-01	8.10E-01	0.00	NO
Uranium-235/236[e]	pCi/g	6.70E-02	6.70E-02	1/1	SOU567-RAD	0/1	2750.00	0.021 - 0.021	1.05E-02	6.70E-02	0.00	NO
Uranium-238	pCi/g	1.22E+00	1.57E+00	5/9	SOU567-RAD	0/9	1570.00	0.009 - 1.15	5.75E-01	1.57E+00	0.00	NO
1,2,4-Trichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.27	0.44 - 0.49	2.45E-01	2.45E-01	0.91	NO
1,2-Dichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.09	0.44 - 0.49	2.45E-01	2.45E-01	**2.72**	YES
1,2-Diphenylhydrazine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO

Table 18. Ecological Risk Initial Screening and Data Summary of Surface Soil (Continued)

Analysis	Units	Detected Results		FOD	Location of Max Detected Conc.	Ecological PGDP		DL Range	½ Max DL	Max Site Concentration[a]	Maximum HQ[b]	COPEC?[c]
		Min	Max			FOE	NFA					
1,3-Dichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.08	0.44 - 0.49	2.45E-01	2.45E-01	**3.06**	YES
1,4-Dichlorobenzene	mg/kg	--	--	0/9	N/A	N/A	0.88	0.44 - 0.49	2.45E-01	2.45E-01	0.28	NO
2,4,5-Trichlorophenol	mg/kg	--	--	0/9	N/A	N/A	4.00	0.44 - 0.49	2.45E-01	2.45E-01	0.06	NO
2,4,6-Trichlorophenol	mg/kg	--	--	0/9	N/A	N/A	9.94	0.44 - 0.49	2.45E-01	2.45E-01	0.02	NO
2,4-Dichlorophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2,4-Dimethylphenol	mg/kg	--	--	0/9	N/A	N/A	0.04	0.44 - 0.49	2.45E-01	2.45E-01	**6.13**	YES
2,4-Dinitrophenol	mg/kg	--	--	0/9	N/A	N/A	0.06	0.44 - 0.49	2.45E-01	2.45E-01	**4.02**	YES
2,4-Dinitrotoluene	mg/kg	--	--	0/9	N/A	N/A	6.00	0.44 - 0.49	2.45E-01	2.45E-01	0.04	NO
2,6-Dichlorophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2,6-Dinitrotoluene	mg/kg	--	--	0/9	N/A	N/A	4.00	0.44 - 0.49	2.45E-01	2.45E-01	0.06	NO
2-Chloronaphthalene	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Chlorophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Methyl-4,6-dinitrophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Methylnaphthalene	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Methylphenol	mg/kg	--	--	0/9	N/A	N/A	0.10	0.44 - 0.49	2.45E-01	2.45E-01	**2.45**	YES
2-Nitrobenzenamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
2-Nitrophenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
3,3'-Dichlorobenzidine	mg/kg	--	--	0/9	N/A	N/A	0.03	0.44 - 0.49	2.45E-01	2.45E-01	**8.17**	YES
3-Nitrobenzenamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Bromophenyl phenyl ether	mg/kg	--	--	0/9	N/A	N/A	47.00	0.44 - 0.49	2.45E-01	2.45E-01	0.01	NO
4-Chloro-3-methylphenol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Chlorobenzenamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Chlorophenyl phenyl ether	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
4-Methylphenol	mg/kg	--	--	0/9	N/A	N/A	0.08	0.44 - 0.49	2.45E-01	2.45E-01	**3.06**	YES
4-Nitrophenol	mg/kg	--	--	0/9	N/A	N/A	5.12	0.44 - 0.49	2.45E-01	2.45E-01	0.05	NO
Acenaphthene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Acenaphthylene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Anthracene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benz(a)anthracene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzenemethanol	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Benzo(a)pyrene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzo(b)fluoranthene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzo(ghi)perylene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzo(k)fluoranthene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Benzoic acid	mg/kg	--	--	0/9	N/A	N/A	0.01	0.44 - 0.49	2.45E-01	2.45E-01	**24.50**	YES
Bis(2-chloroethoxy)methane	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Bis(2-chloroethyl) ether	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Bis(2-chloroisopropyl) ether	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Bis(2-ethylhexyl)phthalate	mg/kg	6.50E-01	6.50E-01	1/9	UFSB-19	1/9	0.02	0.44 - 0.49	2.45E-01	6.50E-01	**32.50**	YES
Butyl benzyl phthalate	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Carbazole	mg/kg	--	--	0/9	N/A	N/A	0.07	0.44 - 0.49	2.45E-01	2.45E-01	**3.50**	YES
Chrysene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Dibenz(a,h)anthracene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Dibenzofuran	mg/kg	--	--	0/9	N/A	N/A	0.15	0.44 - 0.49	2.45E-01	2.45E-01	**1.63**	YES
Diethyl phthalate	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Dimethyl phthalate	mg/kg	--	--	0/60	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Di-n-butyl phthalate	mg/kg	9.50E-01	3.40E+01	6/9	UFSB-13	6/9	0.01	0.44 - 4.8	2.40E+00	3.40E+01	**3090.91**	YES
Di-n-octylphthalate	mg/kg	--	--	0/9	N/A	N/A	0.91	0.44 - 0.49	2.45E-01	2.45E-01	0.27	NO

Table 18. Ecological Risk Initial Screening and Data Summary of Surface Soil (Continued)

Analysis	Units	Detected Results		FOD	Location of Max Detected Conc.	Ecological PGDP		DL Range	½ Max DL	Max Site Concentration[a]	Maximum HQ[b]	COPEC?[c]
		Min	Max			FOE	NFA					
Fluoranthene	mg/kg	--	--	7/81	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Fluorene	mg/kg	--	--	0/106	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Hexachlorobenzene	mg/kg	--	--	0/9	N/A	N/A	20.00	0.44 - 0.49	2.45E-01	2.45E-01	0.01	NO
Hexachlorobutadiene	mg/kg	--	--	0/9	N/A	N/A	0.01	0.44 - 0.49	2.45E-01	2.45E-01	***27.22***	YES
Hexachlorocyclopentadiene	mg/kg	--	--	0/9	N/A	N/A	0.00	0.44 - 0.49	2.45E-01	2.45E-01	***245.00***	YES
Hexachloroethane	mg/kg	--	--	0/9	N/A	N/A	0.02	0.44 - 0.49	2.45E-01	2.45E-01	***10.21***	YES
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Isophorone	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
N-Nitroso-di-n-propylamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
N-Nitrosodimethylamine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
N-Nitrosodiphenylamine	mg/kg	--	--	0/9	N/A	N/A	0.55	0.44 - 0.49	2.45E-01	2.45E-01	0.45	NO
Naphthalene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Nitrobenzene	mg/kg	--	--	0/9	N/A	N/A	2.20	0.44 - 0.49	2.45E-01	2.45E-01	0.11	NO
Pentachlorophenol	mg/kg	--	--	0/9	N/A	N/A	2.10	0.44 - 0.49	2.45E-01	2.45E-01	0.12	NO
Phenanthrene	mg/kg	--	--	0/11	N/A	N/A	see LMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Phenol	mg/kg	--	--	0/9	N/A	N/A	0.79	0.44 - 0.49	2.45E-01	2.45E-01	0.31	NO
Pyrene	mg/kg	--	--	0/11	N/A	N/A	see HMW PAHs	0.44 - 0.5	2.50E-01	2.50E-01	N/A	NO
Pyridine	mg/kg	--	--	0/9	N/A	N/A	N/A	0.44 - 0.49	2.45E-01	2.45E-01	N/A	NO
Total Low Molecular Weight (LMW) PAHs[f]	mg/kg	--	--	0/11	N/A	N/A	29.00	0.44 - 0.5	2.50E-01	2.50E-01	0.01	NO
PAHs[g]	mg/kg	--	--	0/11	N/A	N/A	1.10	0.44 - 0.5	2.50E-01	2.50E-01	0.23	NO

Shading indicates exceedances:

One or more samples exceeded NFA value

[a] Max Site Concentration is the greater of the maximum detected result and one-half the maximum detection limit.

[b] HQs that exceed a value of 1.0 are shown in bold italics and are identified as COPECs for further evaluation.

[c] COPEC? explanation:

"NO" indicates that the maximum site concentration does not exceed the NFA.

"YES" indicates that the NFA is exceeded.

[d] Plutonium-239/240 uses NFAs for plutonium-239.

[e] Uranium-235/236 uses NFAs for uranium-235.

[f] LMW PAHs are the sum of the detected results for acenaphthene; acenaphthylene; anthracene; fluorene; 1-methyl naphthalene; 2-methyl naphthalene; 2,6-dimethyl naphthalene; 2,3,5-trimethylnaphthalene; naphthalene; 1-methyl phenanthrene; and phenanthrene; if available.

[g] HMW PAHs are the sum of the detected results for benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; benzo(ghi)perylene; benzo(a)pyrene; benzo(e)pyrene; chrysene; dibenzo(a,h)anthracene; fluoranthene; indeno(1,2,3-cd)pyrene; perylene; and pyrene; if available.

The NRC will seek to enforce worker safety requirements with respect to radiation, which includes those set forth in 10 *CFR* Part 20, through its licensing application review process, its permitting process, and ongoing inspections during facility operations. Because the lease area is inside the DOE fenced property protection area, applicable dose limits for occupational workers would be those defined in 10 *CFR* Part 20, *Subpart C – Occupational Dose Limits*, for the NRC or 10 *CFR* Part 835, *Subpart C – Standards for Internal and Exposure Monitoring*, for DOE. The annual radiation dose limit for general employees in these regulations is 5,000 mrem. These occupational limits will be captured in the Lessee's radiation protection program, which is required by both the NRC and DOE for site operations. The radiation protection program will require employee dose monitoring and will take into account doses from adjacent areas in addition to doses related to the Lessee's operations. Also, if the potential Lessee uses the property to construct and operate a radiological facility, that facility will require all necessary permits and authorizations from the requisite regulatory body to cover construction and operation (e.g., NRC license).

DOE uses LANDAUER® InLight® EX-type environmental dosimeters to measure external gamma radiation at the monitoring locations, while location EDL-2 also uses a LANDAUER® Neutrak® Type E dosimeter to measure external neutron radiation (note that neutron results were reported as "M" in 2024 meaning the dose equivalents were below the minimum measurable quantity). Environmental dosimeters are collected and analyzed quarterly. When the environmental dosimeters are collected, the following quarter's dosimeters are placed at the same locations.

Table 19 shows facility-related doses at each of the monitoring locations based on the 2024 environmental dosimeter measurements. The quarterly facility-related dose (F_Q) is the dose received during a quarter (91 days for 24 hour/day) at the monitoring location due to radiation from the facility, while the annual facility-related dose (F_A) is the dose received during a year (365 days for 24 hour/day) at the monitoring location due to radiation. F_Q and F_A are represented as follows:

$$F_Q = M_Q - \sigma B_Q$$
$$F_A = M_A - \sigma B_A$$

Where:

M_Q = normalized quarterly field dose (measured field dose that is normalized to a standard 91-day quarter)

σB_Q = representative baseline quarterly background dose

M_A = normalized annual dose (sum of the normalized quarterly field doses; represents the measured dose over a 365 day/24 hour per day period)

σB_A = representative baseline annual background dose

The facility-related doses in Table 19 exclude the background annual radiation dose of 91.5 millirem (mrem) (the background radiation dose is determined from 11 monitoring locations that are unaffected by Paducah Site operations).

Table 19. Facility-Related Dose at Monitoring Locations

Dosimeter Location	σB_Q (mrem)	M_Q (mrem)				$F_Q = M_Q - \sigma B_Q$ (mrem)				σBA (mrem)	M_A (mrem)	$F_A = M_A - \sigma B_A$ (mrem)	Maximum Effective Dose to the Industrial Worker (based on 2,000 hour/ year) (mrem)
2024 Quarters →		1	2	3	4	1	2	3	4				
1	22.9	189.6	229.8	224.2	205.4	166.7	206.9	201.3	182.5	91.5	848.9	757.4	172.9
2		293.3	303.6	279.4	314.6	270.4	280.7	256.5	291.7		1,190.9	1,099.4	251.0
25		29.6	25.5	30.0	24.3	*	*	*	*		109.4	17.9	4.1
35		27.0	26.1	27.9	25.6	*	*	*	*		106.6	15.1	3.4
40		24.4	25.0	26.9	24.6	*	*	*	*		100.9	9.4	2.1
53		107.3	111.1	112.6	108.3	84.4	88.2	89.7	85.4		439.3	347.8	79.4
72		25.3	22.4	21.8	22.3	*	*	*	*		91.8	*	*
81		97.2	100.9	103.3	76.9	74.3	78.0	80.4	54.0		378.2	286.7	65.5
83		48.7	46.6	50.8	51.1	25.8	23.7	27.9	28.2		197.2	105.7	24.1

*Not detected, where M_Q or M_A is approximate to baseline/background.

From Table 19, locations 1, 2, 25, and 53, which are situated on Leasing Parcel A, indicated a facility-related dose during the monitoring period [the annual facility-related dose (F_A) is the dose received during a year by a field dosimeter at a monitoring location due to radiation from the monitored facility and excludes the background annual radiation dose plus the annual minimum differential, which is the smallest facility-related dose that can be detected during a year above the baseline annual background]. These locations are closer to the perimeter of the DUF_6 facility and the cylinder storage yards (refer to Figure 24). Historically, these locations have shown a facility-related dose. Locations 35, 40, and 72 did not indicate a facility-related dose.

The annual facility-related doses in Table 19 do not represent doses to an individual, but the results can be used to determine an estimate of the maximum radiation dose to a general employee at the site based on the time an individual would be in the area working. For instance, assuming an employee works at the site 2,000 hour/year (40 hour/week for 50 weeks), and using the highest facility-related dose from EDL-2 (1,099.4 mrem), provides an estimated maximum external radiation dose to the employee of 251 mrem/year (approximately 5% of the annual dose limit for a general employee):

At EDL-2, 1,099.4 mrem × (200 day/year × 10 hour/day) ÷ (365 day/year × 24 hour/day) = 251 mrem

This would be a conservative, or protective, estimate as it is not realistic that the employee would be positioned in the vicinity of EDL-2 the entire time, but the employee would move around the leased area while performing work. The last column in Table 19 shows the maximum effective dose to the industrial worker may vary from near background level (at EDL-72 location) to 251 mrem/year (at EDL-2 location). This indicates that an employee that works in the lease area will not receive an external radiation dose that exceeds the regulatory limit of 5,000 mrem.

EPA has recommended 12 mrem/year as a dose-based limit that was estimated to achieve protection at a 3×10^{-4} cancer risk for a standard 30-year residential exposure scenario (EPA 2014). This dose-to-risk relationship of 12 mrem/year to a 3×10^{-4} lifetime cancer risk for a 30-year resident can be used to estimate the external radiation dose to a Paducah worker that would result in a lifetime cancer risk of a 3×10^{-4}. This is done by calculating the ratio of hours of total exposure for the outdoor worker to the external radiation source as compared to the total hours of exposure for the 30-year resident used in the 2014 EPA guidance. The outdoor worker is used to represent the Paducah worker because it is the receptor receiving the exposure with the highest risk in the screening risk evaluation for soil (Section 7.4.2). Based on a ratio of the outdoor worker total hours (37,000 hours) to 30-year resident total hours (252,000 hours), the estimated dose at

which a worker would incur a lifetime cancer risk of 3×10^{-4} is 81.7 mrem/year. This indicates, depending on the worker's activities with respect to time spent at various locations within the parcel and the resulting dose of external radiation, that risks to workers may exceed 3×10^{-4} lifetime cancer risk. These risks would be mitigated through implementation of a radiation protection program using "as low as reasonably achievable" protective measures including time, distance, and shielding.

The above estimates are based on dose measurements collected during the 2024 calendar year. The cylinder yards are regularly used by DOE contractors and cylinders are transient as they are moved into and out of storage yards during current operations. Also note that relocation of cylinders farther from the parcel in the future, if needed, would result in lower radiation doses within Leasing Parcel A.

Historical monitoring has shown that the potential annual dose to a maximally exposed individual member of the public from DOE operations at the Paducah Site has been < 10 mrem/year due to limited exposure time and distance from access points of the public to DOE cylinder yards. Location EDL-40 is south of Dyke Road (Figure 24). While Leasing Parcel A is not readily accessible to the public, a member of the public at location EDL-40 near the DOE property boundary would have received an external radiation effective dose of 1.1 mrem in 2024. In the 2023 Annual Site Environmental Report, the calculated radiation dose from DOE activities at the Paducah Site that could be received by a maximally exposed individual of the public, assuming exposure from all relevant pathways, was 5.8 mrem/year (DOE 2024f). The largest contributor to this calculated dose was the direct radiation pathway, or external radiation, which contributed 5.6 mrem to this total. Atmospheric releases, incidental ingestion of surface water, and incidental ingestion of sediment contributed the remainder of this calculated dose to the maximally exposed individual.

7.5. DATA AND RISK SUMMARY

Based on the evaluation of the analytical data for Leasing Parcel A, there are indications that there have been releases of hazardous substances within Leasing Parcel A. Low concentrations of PCBs (three of twenty-eight subsurface soil samples with a maximum detection of 0.3 mg/kg) were detected in Leasing Parcel A soil. There also are active SWMUs/AOCs that are adjacent to the parcel that are to be further evaluated in future CERCLA projects to determine the extent of releases and whether remedial action is warranted.[9]

Future industrial use was evaluated for human health cancer risks and noncancer hazards. Surface soil was evaluated based on exposure to the long-term industrial worker and long-term outdoor worker. Subsurface soil was evaluated based on exposure to surface soil to the long-term outdoor worker and the shorter-term excavation worker. The results of the human health evaluation indicate that ELCRs are within or below the CERCLA acceptable risk range for surface soil and subsurface soil exposure under all exposure scenarios. Similarly, the evaluation of noncancer hazards indicate that exposure to surface and subsurface soil is unlikely to result in adverse noncancer health effects for all receptors under future industrial use. Exposure to groundwater is an incomplete pathway because Leasing Parcel A is within the Water Policy Area boundary.

The SLERA evaluated detected and nondetected analytes in surface soil against conservative NFA screening values. These values are selected for the protection of sensitive ecological receptors to ensure that impact to actual or potential wildlife habitat does not adversely affect ecological communities. The SLERA identified three detected site-related metals and two organics as COPECs. These two organics are recognized as common laboratory contaminants. Several nondetected analytes were also identified as

[9] The 2025 Site Management Plan proposes an Environmental Media OU that will combine cleanup actions for multiple environmental media areas (e.g., soils, surface water, groundwater, slabs, lagoons) into a single final decision (DOE 2024a).

COPECs. Because the entire land area of Leasing Parcel A is intended to be cleared in the near term for industrial development and will not represent wildlife habitat, further evaluation of the COPECs was regarded as unnecessary. The findings of this leasing data package risk evaluation is that Leasing Parcel A is protective of human health and the environment for its intended future industrial land use.

Historical monitoring has shown that the potential annual dose from DOE operations at the Paducah Site to the public for the direct radiation pathway has been < 10 mrem/year due to limited exposure time and distance from access points of the public to DOE cylinder yards. Leasing Parcel A is not readily accessible to the public.

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8. REFERENCES

ANL (Argonne National Laboratory) 2004. *Floodplain/Wetland Assessment of the Effects of Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky, Site*, ANL-04/37, Argonne National Laboratory, Argonne, IL, April.

ATSDR (Agency for Toxic Substances and Disease Registry) 2001. *Toxicological Profile for Di-n-Butyl Phthalate*, U.S. Department of Health and Human Services, Atlanta, GA, September.

BJC (Bechtel Jacobs Company, LLC) 2006. *Cultural Resources Management Plan for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, BJC/PAD-691/R1, Bechtel Jacobs Company, LLC, Kevil, KY, March.

DOE (U.S. Department of Energy) 1993. *Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1142&D3, U.S. Department of Energy, Paducah, KY, July.

DOE 1994. *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/OR/06-1201&D2, U.S. Department of Energy, Paducah, KY, June.

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. *CERCLA Requirements Associated with Real Property Transfers*, EH-413-9808, CERCLA Information Brief, U.S. Department of Energy, Washington, DC, April.

DOE 2008a. *Surface Water Operable Unit (On-Site) Site Investigation and Baseline Risk Assessment Report at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-0001&D2/R1, U.S. Department of Energy, Paducah, KY, February.

DOE 2008b. *Site Evaluation Report for Soil Pile I at Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0108&D2, U.S. Department of Energy, Paducah, KY, November.

DOE 2010. *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D2/R2, U.S. Department of Energy, Paducah, KY, September.

DOE 2011. *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-0228&D2, U.S. Department of Energy, Paducah, KY, May.

DOE 2012. *Work Plan for the Surface Water Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0361&D2/R1, U.S. Department of Energy, Paducah, KY, June.

DOE 2013. *Soils Operable Unit Remedial Investigation Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0358&D2/R1, U.S. Department of Energy, Paducah, KY, February.

DOE 2014. *Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-1288&D2, U.S. Department of Energy, Paducah, KY, August.

DOE 2015a. *Paducah Gaseous Diffusion Plant Final Environmental Assessment for Potential Land and Facilities Transfers, McCracken County, Kentucky*, DOE/EA-1927, U.S. Department of Energy, December.

DOE 2015b. *Sitewide Evaluation Report for the Soils Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1256&D2/R1, U.S. Department of Energy, Paducah, KY, July.

DOE 2015c. *Explanation of Significant Differences to the Record of Decision for the Interim Remedial Action of the Northeast Plume at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-1291&D2/R2, U.S. Department of Energy, Paducah, KY, November.

DOE 2016a. *Soils Operable Unit Remedial Investigation 2 Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-2306&D2, U.S. Department of Energy, Paducah, KY, March.

DOE 2016b. Letter from J. Woodard, U.S. Department of Energy, to B. Smith, Fluor Federal Services, Inc., "Authorized Limits for the U.S. Department of Energy Owned Property Outside the Limited Area in Paducah, Kentucky Approval and Implementation Requirements," PPPO-02-3652503-16, July 13.

DOE 2018. *Remedial Investigation/Feasibility Study Report for CERCLA Waste Disposal Alternatives Evaluation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0244&D2/R2, U.S. Department of Energy, Paducah, KY, July.

DOE 2019. *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky Volume 2. Ecological*, DOE/LX/07-0107&D2/R3/V2, U.S. Department of Energy, Paducah, KY, April.

DOE 2024a. *Site Management Plan Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Annual Revision—FY 2025*, DOE/LX/07-2508&D2, U.S. Department of Energy, Paducah, KY, December.

DOE 2024b. *Protocol for the Environmental Regulatory Processes for the Transfer of Real Property at the U.S. Department of Energy Portsmouth and Paducah Sites VOLUME 1: CERCLA 120(h)(4) – Uncontaminated Property;* PPPO-REG-PRO-1, Revision 6, U.S. Department of Energy, Lexington, KY, September.

DOE 2024c. *Protocol for the Environmental Regulatory Processes for the Transfer of Real Property at the U.S. Department of Energy Portsmouth and Paducah Sites VOLUME 2: CERCLA 120(h)(3) – Remediated Property;* PPPO-REG-PRO-1, Revision 4, U.S. Department of Energy, Lexington, KY, September.

DOE 2024d. *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky Volume 1. Human Health*, DOE/LX/07-0107&D2/R15/V1, U.S. Department of Energy, Paducah, KY, June.

DOE 2024e. *CY 2023 Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (Fifth Synchronized Five-Year Review)*, DOE/LX/07-2492&D2/R1, U.S. Department of Energy, Paducah, KY, February.

DOE 2024f. *2023 Paducah Site Annual Site Environmental Report*, FRNP-RPT-0337, U.S. Department of Energy, Paducah, KY, September.

DOE 2024g. *U.S. Department of Energy Paducah Gaseous Diffusion Plant Federal Facility Agreement Semiannual Progress Report for the Second Half of Fiscal Year 2024 Paducah, Kentucky*, DOE/LX/07-2500/V2, U.S. Department of Energy, Paducah, KY, October.

DOI (U.S. Department of the Interior) 2013. Letter from V. Andrews, Fish and Wildlife Service, U.S. Department of the Interior, to W. Murphie, U.S. Department of Energy, "Re: FWS 2013-B-0579; Paducah Gaseous Diffusion Plant property transfer; located in McCracken County, Kentucky," June 21.

EPA (U.S. Environmental Protection Agency) 1989. *Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A)*, EPA/540/1-89/002, Interim Final, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, DC, December.

EPA 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*, EPA 540-R-97-006, Interim Final, Environmental Response Team, U.S. Environmental Protection Agency, Edison, NJ, June.

EPA 1998a. *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant*, DOE/OR/07-1707, U.S. Environmental Protection Agency, Atlanta, GA, February.

EPA 1998b. Memorandum from Timothy Fields, Jr., et al., U.S. Environmental Protection Agency, to Distribution, "Joint DOE/EPA Interim Policy Statement on Leasing Under the 'Hall Amendment,'" June 23.

EPA 2014. Memorandum from R.H. Richardson to Superfund National Policy Managers, Regions 1–10, "Distribution of the 'Radiation Risk Assessment at CERCLA Sites Q & A,' " June 13.

EPA 2018a. *Region 4 Human Health Risk Assessment Supplemental Guidance*, Scientific Support Section, Superfund Division, U.S. Environmental Protection Agency Region 4, March.

EPA 2018b. *Region 4 Ecological Risk Assessment Supplemental Guidance*, Scientific Support Section, Superfund Division, U.S. Environmental Protection Agency Region 4, March.

FRNP (Four Rivers Nuclear Partnership, LLC) 2021. *Groundwater Protection Plan for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, CP2-ES-1000/FR0, Four Rivers Nuclear Partnership, LLC, Paducah, KY, August.

KDEP (Kentucky Department for Environmental Protection) 2002. *Kentucky Risk Assessment Guidance*, Kentucky Department for Environmental Protection, Frankfort, KY, June 8.

KDEP 2004. *Kentucky Guidance for Ambient Background Assessment*, Kentucky Department for Environmental Protection, Frankfort, KY, January 8.

KSNPC (Kentucky State Nature Preserves Commission) 1991. *Biological Inventory of the Jackson Purchase Region of Kentucky*, Kentucky State Nature Preserves Commission, Frankfort, KY, April.

NWS (National Weather Services) 2021. Climatology – Monthly Normals. National Oceanic and Atmospheric Administration, National Weather Service, accessed September 20, 2021, https://www.weather.gov/pah/monthlynormals.

Scalenghe, R. et al. 2016. "The Role of Pedogenic Overprinting in the Obliteration of Parent Material in some Polygenetic Landscapes of Sicily (Italy)." *Geoderma Regional* Volume 7(1) March: 49–58.

USACE 1994. *Environmental Investigations at the Paducah Gaseous Diffusion Plant and Surrounding Area McCracken County, Kentucky, Volume II, Wetlands Investigation*, Final Report, Waterways Experiment Station, Vicksburg, MS, and Engineer District Nashville, Nashville, TN, May.

USDA (U.S. Department of Agriculture) 1976. *Soil Survey of Ballard and McCracken Counties, Kentucky*, Soil Conservation Service, U.S. Department of Agriculture, Washington, DC, February.

WRCC (Western Regional Climate Center) 2021. Station Wind Rose for Paducah, Kentucky, National Centers for Environmental Information, accessed September 20, 2021, https://wrcc.dri.edu/cgi-bin/wea_windrose.pl?laKPAH.

APPENDIX A

ORIGINAL ACQUISITION TRACTS

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Lands affected by the leasing of the Leasing Parcel A are identified as portions of the original acquisition tracts to which the United States of America acquired the title (having been acquired for the Atomic Energy Commission as a forerunner of the U.S. Department of Energy) (Table A.1 and Figure A.1).

Table A.1. Original Acquisition Tracts in the Leasing Parcel A

TRACT	DEED BOOK	PAGE NUMBER	DATE
A-16	296	412	February 27, 1951
A-24	297	499	March 28, 1951
A-25	296	215	February 19, 1951
A-26	296	404	February 27, 1951
A-34	301	50	May 15, 1951

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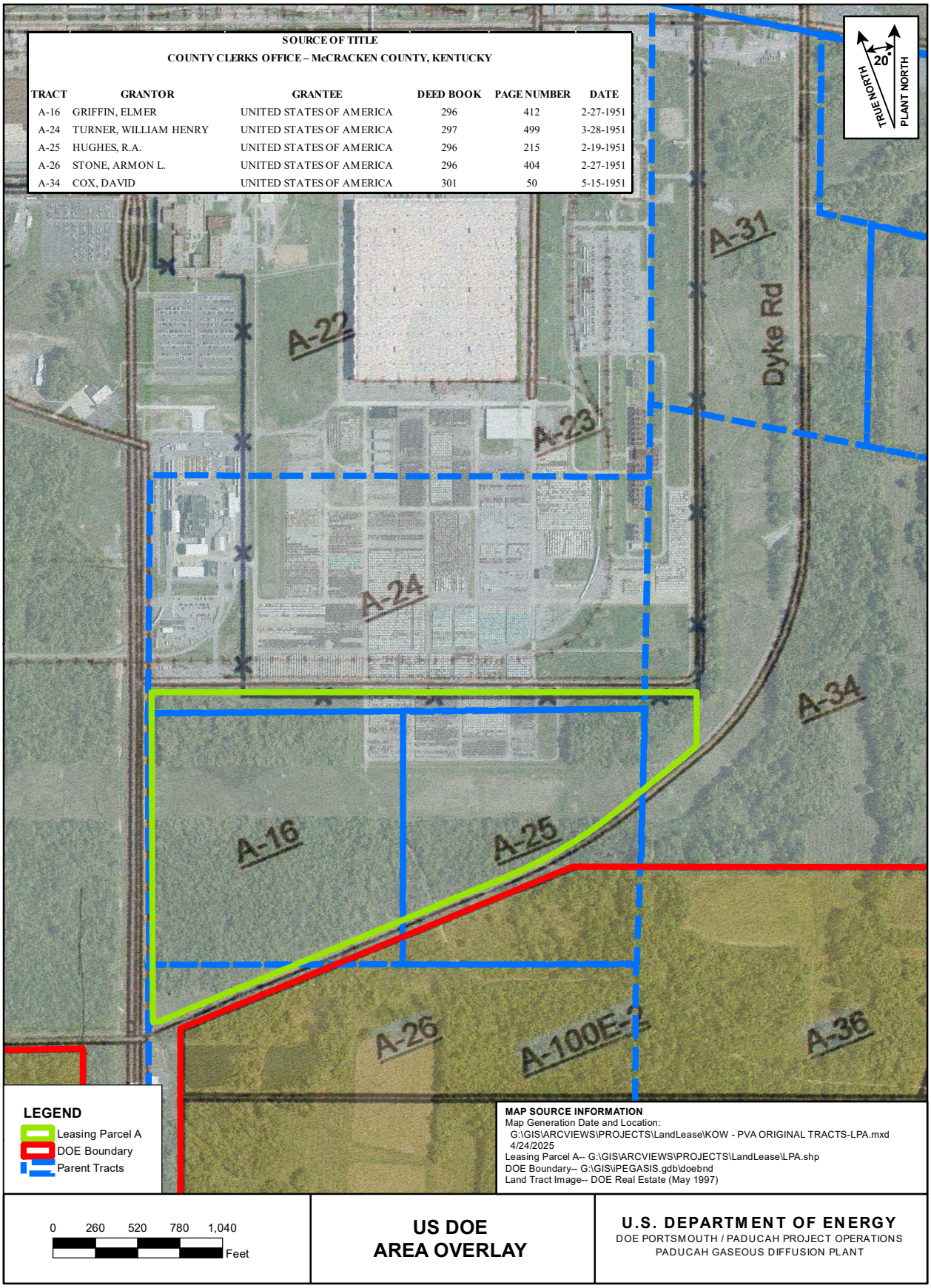

Figure A.1. Original Acquisition Tracts for the Lease Parcel

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APPENDIX B

HISTORICAL DATA (DATA)

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Historical Data (Data)

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