

ATTACHMENT A

**Environmental Baseline Survey Report
for the Proposed Transfer of the
Former Powerhouse Area, Duct Island,
and K-1007-P1 Pond Area
at the
East Tennessee Technology Park,
Oak Ridge, Tennessee**



This document is approved for public release per review
by:

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9/9/15
Date

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be considered an eligible contractor for its review.

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for the East Tennessee Technology Park Mission
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The results of this report are based on record reviews, site reconnaissance, interviews, and the radiological report reviewed and approved by UCOR. Leidos has not made, nor has it been asked to make, any independent investigation concerning the accuracy, reliability, or completeness of such information.

All sources of information on which Leidos has relied in making its conclusions are identified in Chap. 8 of this report. Any information, regardless of its source, not listed in Chap. 8 has not been evaluated or relied upon by Leidos in the context of this report.

CONTENTS

| | |
|--|------|
| FIGURES | ix |
| TABLES | xi |
| ACRONYMS | xiii |
| EXECUTIVE SUMMARY | xv |
| CONCLUSIONS..... | xxi |
| 1. PROPERTY IDENTIFICATION | 1-1 |
| 2. TITLE SEARCH..... | 2-1 |
| 3. FEDERAL RECORDS SEARCH AND COMPLIANCE SUMMARY | 3-1 |
| 3.1 FEDERAL RECORDS SEARCH..... | 3-1 |
| 3.2 COMPLIANCE SUMMARY | 3-2 |
| 3.2.1 Background | 3-2 |
| 3.2.2 The EM DVS Protocol and the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area | 3-10 |
| 3.2.3 Actions Taken Within the Former Powerhouse Area, Duct Island, and K-1007- P1 Pond Area Exposure Units | 3-11 |
| 4. PAST AND PRESENT ACTIVITIES | 4-1 |
| 4.1 PAST AND PRESENT ACTIVITIES FOR THE REAL PROPERTY PROPOSED FOR TRANSFER..... | 4-1 |
| 4.2 PAST AND PRESENT ACTIVITIES FOR THE ADJACENT PROPERTY | 4-25 |
| 4.3 HYDROGEOLOGIC ENVIRONMENT | 4-26 |
| 5. RESULTS OF VISUAL AND PHYSICAL INSPECTIONS | 5-1 |
| 5.1 VISUAL AND PHYSICAL INSPECTIONS OF THE PROPERTY FOR TRANSFER..... | 5-1 |
| 5.2 VISUAL AND PHYSICAL INSPECTION OF ADJACENT PROPERTY | 5-10 |
| 6. SAMPLING RESULTS | 6-1 |
| 7. RISK EVALUATION..... | 7-1 |
| 8. REFERENCES..... | 8-1 |
| APPENDIX A REAL ESTATE ACQUISITION LETTER | A-1 |
| APPENDIX B STUDY AREA MAP FROM RECORDS SEARCH..... | B-1 |
| APPENDIX C PCCR APPROVAL LETTERS | C-1 |

FIGURES

| | |
|---|------|
| Fig. 1.1. Location of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area Within ETTP. | 1-2 |
| Fig. 1.2. Transfer footprint for the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area. | 1-3 |
| Fig. 1.3. EU status of Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint. | 1-4 |
| Fig. 1.4. Aerial photograph of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area, circa 2013. | 1-5 |
| Fig. 3.1. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area EU Groups. | 3-7 |
| Fig. 3.2. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area adjacent property transfers and CERCLA decisions. | 3-9 |
| Fig. 3.3. Areas of restricted industrial use. | 3-13 |
| Fig. 3.4. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area property currently under lease. | 3-14 |
| Fig. 4.1. K-1007 Area, circa 1945. | 4-3 |
| Fig. 4.2. K-1007-P1 Pond area, circa 1952. | 4-4 |
| Fig. 4.3. K-1007-P1 Pond area, circa 1963. | 4-4 |
| Fig. 4.4. K-1007-P1 Pond area, circa 1974. | 4-5 |
| Fig. 4.5. K-1007-P1 Pond area, circa 2001. | 4-5 |
| Fig. 4.6. K-770 Scrap Yard Area, circa 1982. | 4-11 |
| Fig. 4.7. K-770 Scrap Yard Area, circa 1993. | 4-12 |
| Fig. 4.8. K-770 Scrap Yard Area, circa 2010. | 4-13 |
| Fig. 4.9. Former Powerhouse Area, circa 1945. | 4-16 |
| Fig. 4.10. Fercleve S-50 Liquid Thermal Diffusion Plant, circa 1945. | 4-18 |
| Fig. 4.11. Former Powerhouse Buildings, circa 1945. | 4-19 |
| Fig. 4.12. Former Powerhouse Buildings, circa 1993. | 4-20 |
| Fig. 4.13. Former Powerhouse Area from south, circa 1996. | 4-21 |
| Fig. 4.14. Aerial photograph of the K-1251 Barge Facility (circa 1998). | 4-24 |
| Fig. 4.15. Aerial photo of the K-1007-P1 Pond showing plant coverage in 2012. | 4-26 |
| Fig. 4.16. Hydrogeology of the Former Powerhouse Area. | 4-27 |
| Fig. 5.1. View of northern portion of the Former Powerhouse Area looking northwest. | 5-3 |
| Fig. 5.2. View of concrete pedestals in Former Powerhouse Area. | 5-3 |
| Fig. 5.3. View of remaining basement structure for former K-706-C building. | 5-4 |
| Fig. 5.4. View of valve vault in Former Powerhouse Area. | 5-4 |
| Fig. 5.5. View of K-901 Water Intake in Duct Island Area. | 5-5 |
| Fig. 5.6. View of Duct Island Area access roads and powerlines, looking south. | 5-5 |
| Fig. 5.7. View of western portion of Former Powerhouse Area with Oak Ridge Forest Products operation in distance. | 5-6 |
| Fig. 5.8. View of Oak Ridge Forest Products operation in Former Powerhouse Area. | 5-6 |
| Fig. 5.9. View of poles stored at Oak Ridge Forest Products on former K-723 Pad. | 5-7 |
| Fig. 5.10. Sign indicating location of former Fercleve F-29 Gasoline Station. | 5-7 |
| Fig. 5.11. View of open field with marker for the former F-05 Laboratory Burial Ground. | 5-8 |
| Fig. 5.12. View of scale house in Former Powerhouse Area. | 5-8 |
| Fig. 5.13. View of Former K-709 Switchyard. | 5-9 |
| Fig. 6.1. EUs Z1-01 and Z1-02 sample locations. | 6-2 |
| Plate 1. Soil Sample Locations. | PL-1 |

TABLES

| | |
|--|------|
| Table 3.1. Summary of CERCLA decisions for the EUs located within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area | 3-3 |
| Table 4.1. Groundwater concentrations of metals exceeding MCLs at the K-720 Fly Ash Pile, 1994–2011 | 4-32 |
| Table 7.1. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area risk evaluation results..... | 7-2 |
| Table 7.2 Land use controls for the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area | 7-6 |

ACRONYMS

| | |
|--------|---|
| ACM | asbestos-containing material |
| BEAR | Baseline Environmental Analysis Report |
| bgs | below ground surface |
| BORCE | Black Oak Ridge Conservation Easement |
| CDR | Covenant Deferral Request |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| COC | contaminant of concern |
| COE | U.S. Army Corps of Engineers |
| CPD | Clean Parcel Determination |
| CROET | Community Reuse Organization of East Tennessee |
| D&D | decontamination and decommissioning |
| DCE | dichloroethene |
| DOE | U.S. Department of Energy |
| DQO | data quality objective |
| DVS | Dynamic Verification Strategy |
| EBS | Environmental Baseline Survey |
| ELCR | excess lifetime cancer risk |
| EM | Environmental Management |
| EPA | U.S. Environmental Protection Agency |
| ETRC | East Tennessee Rail Car Services, Inc. |
| ETTP | East Tennessee Technology Park |
| EU | exposure unit |
| FFA | Federal Facility Agreement |
| FY | fiscal year |
| gpd | gallons per day |
| gpm | gallons per minute |
| HI | hazard index |
| MCL | maximum contaminant level |
| µg/L | micrograms per liter |
| mg/L | milligrams per liter |
| NCP | National Contingency Plan |
| NFA | no further action |
| NFI | no further investigation |
| NPDES | National Pollutant Discharge Elimination System |
| OREIS | Oak Ridge Environmental Information System |
| ORGDP | Oak Ridge Gaseous Diffusion Plant |
| ORNL | Oak Ridge National Laboratory |
| ORO | Oak Ridge Office |
| ORR | Oak Ridge Reservation |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PCCR | Phased Construction Completion Report |
| PCE | tetrachloroethene |
| pCi/L | picocuries per liter |
| PRG | preliminary remediation goal |
| RAO | remedial action objective |
| RCRA | Resource Conservation and Recovery Act of 1976 |

| | |
|------------------|--|
| RCW | recirculating cooling water |
| RL | remediation level |
| ROD | Record of Decision |
| SAIC | Science Applications International Corporation |
| SAP | Sampling and Analysis Plan |
| SOF | sum of fractions |
| SVOC | semivolatile organic compound |
| SWMU | solid waste management unit |
| ⁹⁹ Tc | technetium-99 |
| TCA | trichloroethane |
| TCE | trichloroethene |
| TDEC | Tennessee Department of Environment and Conservation |
| TDOT | Tennessee Department of Transportation |
| TVA | Tennessee Valley Authority |
| UCOR | URS CH2M Oak Ridge LLC |
| UF ₆ | uranium hexafluoride |
| UST | underground storage tank |
| VC | vinyl chloride |
| VOC | volatile organic compound |

EXECUTIVE SUMMARY

This environmental baseline survey (EBS) report documents the baseline environmental conditions of the U.S. Department of Energy's (DOE's) Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area at the East Tennessee Technology Park (ETTP) Heritage Center (Heritage Center). This report provides a summary of information to support the proposed transfer of this property, which is transitioning from the Federal Government to the public. The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area consists of approximately 661.7 acres of land in the southwestern portion of the Heritage Center (Fig. 1.1).

This EBS is based upon the requirements of Sect. 120(h) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). This EBS relies upon regulatory agency-approved documentation in five Phased Construction Completion Reports (PCCRs) for environmental data evaluation and human health risk evaluation and summarizes the U.S. Environmental Protection Agency (EPA) Region 4 and Tennessee Department of Environment and Conservation (TDEC)–Oak Ridge Office-approved No Further Action (NFA) determinations under an industrial land use risk scenario for the soil in approximately 458 acres of the proposed transfer land parcel. DOE has determined that the soil in approximately 192 acres of the proposed transfer footprint meets the requirements of the Zone 1 Record of Decision (ROD) pending completion of remedial actions as documented in two PCCRs (DOE 2011a and 2011b). An additional 12 acres, which is non-impacted land and lies outside the Zone 1 and Zone 2 boundaries, is located south of Highway 58. EPA approval was received on October 2, 2006; March 13, 2006; and April 4, 2008, respectively, for the three PCCRs addressing the approximately 458 acres of the proposed transfer footprint, and TDEC approval of these three PCCRs was received on September 28, 2006; March 29, 2006; and April 23, 2008. The PCCRs used for source information for this EBS are:

- *Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse Area in Zone 1 at East Tennessee Technology Park, Oak Ridge, Tennessee, (DOE/OR/01-2294&D2), August 2006 (approved) [DOE 2006a] (addresses Exposure Units (EUs) Z1-01 through Z1-10, Z1-12 through Z1-16, Z1-23 through Z1-25, Z1-34 and Z1-35);*
- *Phased Construction Completion Report for the Duct Island Area and K-901 Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee (DOE/OR/01-2261&D2), February 2006, (approved) [DOE 2006b] (addresses EUs Z1-36 through Z1-47);*
- *Fiscal Year 2008 Phased Construction Completion Report for Exposure Units Z1-01, Z1-03, Z1-38, and Z1-49 in Zone 1 at the East Tennessee Technology Park, Oak Ridge, Tennessee, (DOE/OR/01-2367&D2), March 2008 (approved) [DOE 2008];*
- *Addendum to the Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee, (DOE/OR/01-2294&D2/A1/R1), October 2011 (approved) [DOE 2011a] (addresses EUs Z1-09, Z1-11, Z1-17, Z1-18 through -22, and Z1-26); and*
- *Addendum II to the Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee, (DOE/OR/01-2294&D2/A2), June 2011 [DOE 2011b] (addresses EUs Z1-27 through Z1-33).*

The NFA determinations under an industrial land use risk scenario documented in the referenced PCCRs were reached using the Environmental Management (EM) Program's Dynamic Verification Strategy

(DVS) process (*Remedial Action Work Plan for Dynamic Verification Strategy for Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee, DOE/OR-01-2182&D4 [DOE 2007a]*), a process designed to facilitate real-time decision-making. This process is in use for remedial action decision-making across the ETTP, which has been divided into Zone 1 and Zone 2 and further subdivided into Geographic Areas, then Groups, then EUs. For consistency with the EM nomenclature, this EBS will use the EU as the basis for most discussion. The exception is discussion of the small portion of land (approximately 12 acres) on the south side of Highway 58 (K-1251 Barge Facility), which has not been assigned an EU number because it has not been developed and is not included in the areas planned for characterization and/or remediation at ETTP due to historical records indicating that no DOE-related activities have impacted this tract of land.

The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area consists of two large noncontiguous tracts separated by Poplar Creek. The areas designated as the Former Powerhouse Area and the K-1007-P1 Pond Area are contiguous and occupy the area between the Clinch River and Poplar Creek and the land surrounding the K-1007-P1 Pond (Fig. 1.2). The Former Powerhouse Area, which consists of approximately 399 acres, is where power-generating operations were conducted from 1944 to 1962. The K-1007-P1 Pond Area consists of approximately 44 acres that border the K-1007-P1 Pond and the eastern bank of Poplar Creek. This area was used for locomotive and railroad maintenance activities and for material and equipment storage during construction of the former gaseous diffusion plant. Duct Island consists of the approximately 207 acres located on the Duct Island peninsula bordered by Poplar Creek and the Clinch River. Duct Island has primarily only been used for waste disposal in limited areas of the tract. The former K-1251 Barge Facility, which occupies part of the approximately 12 acres lying south of Highway 58, was used for unloading materials shipped by barge to the ETTP.

All of the property, with the exception of the approximately 12 acres located south of Highway 58, addressed in this EBS is contained within Zone 1 and includes all, or portions of, 46 Zone 1 EUs. The proposed transfer footprint includes portions of EUs Z1-1, Z1-2, Z1-5, Z1-6, Z1-7, Z1-8A, Z1-8B, Z1-9, Z1-45, Z1-46, and all of EU Z1-10 through Z1-44, and Z1-47. The 12-acre parcel located on the south side of Highway 58 (former K-1251 Barge Facility) lies outside of Zone 1. [It should be noted that portions of EUs Z1-45 and Z1-46 on Duct Island are not included within the study area as they have been identified as part of the Blackoak Ridge Conservation Easement (BORCE)].

For purposes of the EBS, information is presented on the land proposed for transfer in its entirety, as the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is proposed for transfer in its entirety. However, in order to provide context and a tie-in with the status of the EUs, this EBS provides regulatory details for the component EUs in Chap. 3 and the results of the risk evaluation in Chap. 7. Building K-1313-F, which is included in the transfer footprint, will either be demolished or be transferred later after confirmatory sampling of the facility has been completed and the building is found to be suitable for transfer, and the slab, if remaining, and soils beneath the slab meet the requirements of the Zone 1 ROD. The K-1313-F building is currently used for storage of sodium shields and a decision on reuse or demolition of the building will be made once the disposition of the shields has been identified. Because the soil and slab underlying Bldg. K-1313-F are part of an EU that has met the requirements for an NFA determination, the land underlying these structures is included in the transfer footprint of this EBS. The soils beneath K-1313-F were not sampled under the DVS, but they were included within the scope of the PCCR that addressed EU Z1-21, which is the EU where Bldg. K-1313-F is located (DOE 2011a). DOE will not transfer the land underlying the building until a disposition determination has been made for the building and confirmatory sampling, and remedial actions, if any, are completed. Confirmatory sampling will be conducted on either the building surfaces, if the building is transferred; the building slab, if the building is demolished and the slab remains; or the underlying soils, if the building slab is removed, or the remaining slab indicates the potential for contamination of the underlying soils. If contamination

above ROD remediation levels (RLs) is discovered, it will be remediated. If the building is demolished, post-demolition confirmatory sampling of the soil and/or slab (to confirm that the prior NFA determination remains valid) will be documented in a concurrence form and/or a PCCR addendum and transmitted to EPA and TDEC for approval. If the building is determined to be suitable for transfer, the condition of the building will be documented in a concurrence form and/or a PCCR addendum, or other documentation, and submitted to EPA and TDEC for approval. Additional evaluation of the slab, if remaining, will be performed to ensure the slab meets free-release levels of DOE Order 458.1.

The K-708-E Scale House, located in the southern portion of the transfer footprint, is included in the transfer. This facility is located on the south side of the railroad spur that enters the Powerhouse Area and was used to weigh rail cars entering and leaving the Powerhouse Area. Building K-708-E is a small wood-frame structure with corrugated siding and a roof that was recently replaced. Below the building is a concrete pit that extends under the rail line and houses the scale balance mechanism. Inside the building are the scale and digital readout and printing equipment. The facility is currently under lease, and radiological surveys conducted in support of the lease found no evidence of contamination.

The approximately 12-acre parcel located south of Highway 58, which is not located within Zone 1, is the location of the former K-1251 Barge Facility with the balance of this parcel containing vacant land that has never been developed. An evaluation of the Barge Facility conducted in December 2007 indicated low likelihood of adverse health effects associated with worker exposure posed by the K-1251 Barge Facility (*Baseline Environmental Analysis Report for the K-1251 Barge Facility at the East Tennessee Technology Park, Oak Ridge, Tennessee*, BJC/OR-2885 [BJC 2007]). This conclusion was based upon soil and concrete samples collected from within the K-1251 Barge Facility. As stated within the Baseline Environmental Analysis Report (BEAR) for the K-1251 Facility (BJC 2007), there is no indication that adjacent areas are known to have been used for any activities involving hazardous substances or petroleum products or their derivatives. In addition, the adjacent property to the east of Tract B was addressed in the West Pine Ridge Study Area under DOE's Footprint Reduction Program (DOE 1997). The West Pine Ridge Study Area has an approved No Further Investigation decision based on the findings "that no public health concern should arise because of past and present federal activities within the study area" (DOE 1997).

The primary objective of the remediation measures presented in the Zone 1 ROD is to protect industrial workers from exposure to hazardous substances. The institutional controls restricting property use of the Heritage Center to a mixed-use commercial and industrial park, and the limited potential for off-site migration of contaminants, limit the potential for exposure to other individuals. Therefore, remediation criteria were designed for the protection of the future industrial worker. Accordingly, land use controls have been established to control excavations or soil penetrations below 10 ft and to restrict future land use to industrial/commercial activities.

The DVS process included a detailed records search, which included Federal Government records and title documents. That search has been relied upon for this report. The DVS process and the preparation of this report evaluated aerial photographs that may reflect prior uses, visual and physical inspections of the Property and adjacent properties, and interviews with current and former employees¹ involved in the operations on the real Property to identify any areas on the Property where hazardous substances and petroleum products, or their derivatives, and acutely hazardous wastes were stored for one year or more, known to have been released, or disposed of. The following is a summary of the findings of the evaluation that was performed:

¹ UCOR 2012a. Personal communications with Bob Kiser (formerly employed at the East Tennessee Technology Park) in August 2012.

- Data and risk evaluations of soil were conducted to allow for unrestricted industrial use to 10 ft below ground surface (bgs). Contamination anywhere within the 0- to 10-ft bgs interval had an equal weighting in the risk assessment (i.e., all soil in the interval was presumed to be equally accessible to an industrial worker).
- Groundwater data indicate the presence of volatile organic compounds (VOCs) in shallow groundwater beneath and adjacent to the K-1085 Area in the southeastern portion of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area. The groundwater contamination identified beneath the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is primarily found in the unconsolidated zone above bedrock, with significantly lower concentrations of VOCs present in the underlying bedrock. The VOCs that have been detected above the federal and state drinking water maximum contaminant level (MCL) in these plumes include *cis*-1,2-dichloroethene (DCE); trichloroethene (TCE); and vinyl chloride (VC). In addition to VOCs, the metals antimony, arsenic, cadmium, chromium, lead, selenium, and thallium have been observed historically to exceed their respective MCLs in the vicinity of the K-720 Fly Ash Pile. The presence of contaminated groundwater beneath the parcel is considered to represent a release of hazardous substances to the property.
- The maximum concentration of TCE has been detected at well UNW-135 located west of the K-1085 Area. A TCE concentration of 340 micrograms per liter ($\mu\text{g/L}$), well above the drinking water MCL of 5 $\mu\text{g/L}$, was detected in samples collected in 2011 at this location. The concentration of *cis*-1,2-DCE detected at UNW-135 was 170 $\mu\text{g/L}$ in the same sample, which exceeds the MCL of 70 $\mu\text{g/L}$. The maximum concentration of *cis*-1,2-DCE was 250 $\mu\text{g/L}$ in the sample collected from Spring 247 located north of well UNW-135. Spring 247 also contained 5 $\mu\text{g/L}$ of VC. A sample collected from a seep located approximately 250 ft east of well UNW-135 contained the maximum detected VC concentration of 9 $\mu\text{g/L}$. These results compare to the MCL of 2 $\mu\text{g/L}$ for VC. The VOCs 1,1-DCE; 1,1,1-trichloroethane; carbon tetrachloride; chloroform; and tetrachloroethene have also been detected in groundwater in the K-1085 Area but at concentrations below the drinking water MCLs for these compounds.
- Based on the results of the DVS evaluation and the remedial actions completed, all of the soil in the EUs in the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint (Z1-1, Z1-2, Z1-5 through Z1-47) either have been approved for NFA under an industrial land use risk scenario by the regulatory agencies, or have met the requirements specified in the Zone 1 ROD for an NFA determination pending completion of remedial actions in EUs Z1-29, -30, and -31 to address potential asbestos in the subsurface of these EUs.
- Until the Final Zone 1 ROD is completed and a final remedy selected for EU Z1-11(K-720 Fly Ash Pile) and EUs Z1 -29, -30 and -31 (K-770 Scrap Yard), disturbance of the soils in these areas will be prohibited unless written approval for soil disturbance is obtained from EPA and TDEC. After the final remedies are implemented for these areas, then the land use restrictions will be implemented in accordance with the Final Zone 1 ROD.
- Due to the remaining subsurface infrastructure and potential contaminants remaining in place, the land use over the underground electrical duct bank will be unrestricted industrial land use to 2 ft bgs. These requirements will be presented in the Final Zone 1 ROD scheduled for completion in December of this year.
- The EUs that are only partially included in the transfer footprint have been evaluated and a determination made that the NFA decision for the entire EU is appropriate for these partial EUs.

- The decision on groundwater remediation will be made in the ETTP Final Sitewide ROD. Because the K-720 Fly Ash Pile extends below the surface into the groundwater, separating the decisions on soils at the K-720 Fly Ash Pile as a source to groundwater and on groundwater remediation is not practical. Therefore, a decision on the K-720 Fly Ash Pile and its impact on groundwater will be deferred to the Final Sitewide ROD.
- A soil cover to reduce infiltration and erosion of the fly ash exists over the K-720 Fly Ash Pile. Maintenance of this soil cover will remain DOE's responsibility after property transfer is complete.
- Three formerly used underground storage tanks located within the transfer footprint have been closed in place in accordance with the rules of TDEC.
- Radiological walkover surveys and concrete sample results indicate that no action levels or RLs were exceeded by the remaining infrastructure within the transfer footprint.
- Evaluations of the areas adjacent to the proposed transfer footprint did not indicate a risk posed by the adjacent areas.
- Currently, ongoing operations are conducted in two parcels under lease from DOE within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint. These non-DOE operations involve the production of wood chips for use as biomass fuel and the repair and refurbishment of historical railroad equipment. Although these ongoing operations have the potential to impact the EUs included in these two parcels subsequent to the NFA determinations for the EUs, under the lease agreements, upon termination, expiration, revocation, or relinquishment of the leases, the subject properties must be returned to DOE in a state of environmental cleanliness which meets or exceeds the pre-lease conditions.

CONCLUSIONS

Based on the U.S. Department of Energy's (DOE's) review of the existing information, including discussions and interviews referenced herein, and evaluation of the data gathered in preparation of the environmental baseline survey for the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area, DOE recommends the following:

- Because of the uncertainty associated with the nature of the on-site groundwater and the need to evaluate and possibly address groundwater in the future, DOE recommends that the transfer of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area Parcel be achieved by a covenant deferral per the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Sect. 120(h)(3)(c).
- Based on the results of the Dynamic Verification Strategy (DVS) evaluation and the remedial actions completed, soils in the Exposure Units (EUs) included in the transfer footprint have either been approved by the regulatory agencies (see Appendix C), or meet the requirements for industrial use. Therefore, the soils in the Property are safe for industrial use and are suitable for transfer.
- Due to the subsurface infrastructure and waste materials remaining in-place, the underground electrical duct bank corridor will be designated for industrial use to 2 ft below ground surface (bgs).
- Building K-1313-F, which is included in the transfer footprint, will either be demolished or be transferred later after confirmatory sampling of the facility has been completed and the building is found to meet the requirements of the Zone 1 Record of Decision (ROD). Because the soil and slab underlying Bldg. K-1313-F are part of an EU that has met the requirements for a no further action (NFA) determination, the land underlying these structures is included in the transfer footprint of this environmental baseline survey. The soils beneath K-1313-F were not sampled under the DVS, but they were included within the scope of the Phased Construction Completion Report (PCCR) that addressed EU Z1-21, which is the EU where Bldg. K-1313-F is located (DOE 2011a). DOE will not transfer the land underlying the building until a disposition determination has been made for the building and confirmatory sampling, and remedial actions, if any, are completed. Confirmatory sampling will be conducted on either the building surfaces, if the building is transferred; the building slab, if the building is demolished and the slab remains; or the underlying soils, if the building slab is removed, or the remaining slab indicates the potential for contamination of the underlying soils. If contamination above ROD remediation levels is discovered, it will be remediated. If the building is demolished, post-demolition confirmatory sampling of the soil and/or slab (to confirm that the prior NFA determination remains valid) will be documented in a concurrence form and/or a PCCR addendum and transmitted to the U.S. Environmental Protection Agency (EPA) and Tennessee Department of Environment and Conservation (TDEC) for approval. If the building is determined to be suitable for transfer, the condition of the building will be documented in a concurrence form and/or a PCCR addendum, or other documentation, and submitted to EPA and TDEC for approval. Additional evaluation of the slab, if remaining, will be performed to ensure the slab meets free-release levels of DOE Order 458.1.

LAND USE RESTRICTIONS

Land use restrictions are an important component of a CERCLA covenant deferral; they help to ensure that transfer of the property is protective for the intended use. The restrictions that will apply to the

Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area Parcel are summarized below. Full details are found in Sect. 6.1 of the Covenant Deferral Request.

1. The property shall not be developed in a manner that is inconsistent with the land use assumptions of “industrial use” contained in the approved applicable ROD for Zone 1 (*Record of Decision for Interim Actions in Zone 1 of East Tennessee Technology Park, Oak Ridge, Tennessee, DOE/OR/01-1997&D2 [DOE 2002]*).
2. Development of the Property must comply with all applicable federal, state, and local laws and regulations with respect to any present or future development of the Property.
3. All structures, facilities, and improvements requiring a water supply shall be required to be connected to an approved water system for any and all usage. Extraction, consumption, exposure, or use, in any way, of the groundwater underlying the property is prohibited without the prior written approval of DOE, EPA Region 4, and TDEC.
4. Disturbance of any portion of the property deeper than 10 ft bgs without the prior authorization from DOE is prohibited. Disturbance of the property above the underground electrical ducts deeper than 2 ft bgs without the prior authorization from DOE is also prohibited.
5. Until the Final Zone 1 ROD is completed and a final remedy selected for EU Z1-11 (K-720 Fly Ash Pile) and EUs Z1 -29, -30 and -31 (K-770 Scrap Yard), disturbance of the soils in these areas will be prohibited unless written approval for soil disturbance is obtained from EPA and TDEC. After the final remedies are implemented for these areas, then the land use restrictions will be implemented in accordance with the Final Zone 1 ROD.
6. In order to ensure that the migration of volatile organic compounds (VOCs) in contaminated groundwater does not contribute to an unacceptable risk to human health, DOE will address the potential for vapor intrusion in the East Tennessee Technology Park final Sitewide ROD, which is currently scheduled to be signed in 2022, and will take interim protective measures to ensure protectiveness until the ROD is signed. Any new building or structure built on the property that is intended to be occupied by workers 8 hours or more per scheduled work day, or by public visitors, must be designed and constructed to minimize potential exposure to VOC vapors, using EPA/625/R-92/016 (June 1994), *Radon Prevention in the Design and Construction of Schools and Other Large Buildings*, as guidance.
7. DOE reserves the right of access to all portions of the property for environmental investigation, remediation, or other corrective action.

RESPONSE TO REGULATOR COMMENTS

The Covenant Deferral Request (CDR) and Environmental Baseline Survey (EBS) were issued in draft form for regulator review on September 29, 2015. Comments were received from EPA Region 4 on December 22, 2015. Additional comments from EPA Region 4 were received on January 8, 2016. Comments were received from TDEC on October 23, 2015. In general, EPA requested clarification on the approach addressing the remaining building slabs, revisions to selected figures, inclusion of additional figures showing sample locations, additional discussion of groundwater conditions, clarification of EU/Zone 1 boundaries, inclusion of the data evaluated in the PCCRs into the EBS, acknowledgement of the potential for additional remedial actions at K-1085, correction of which PCCRs have been approved, and further evaluation of the DVS data. TDEC requested efforts be taken to remove signs designating

contamination areas, clarification on what is included in the transfer, the disposition of the sodium shields be determined prior to transfer, revision of the CDR format, clarification on the impact of the transfer to the current leases occupying a portion of the property, and inclusion of additional acronyms.

Comments received from EPA and TDEC, and DOE's responses, are included in the CDR in Sect. 7.1. Comments received have been incorporated into the text of the CDR and EBS.

RESPONSE TO PUBLIC COMMENTS

This is a placeholder.

1. PROPERTY IDENTIFICATION

The area discussed in this environmental baseline survey (EBS) is designated as the Former Powerhouse Area (Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area). The U.S. Department of Energy (DOE) is proposing to transfer this property to the public. The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is located in the far southwestern portion of the East Tennessee Technology Park (ETTP) [formerly the Oak Ridge Gaseous Diffusion Plant (ORGDP) or K-25 Site] on the Oak Ridge Reservation (ORR) in Roane County, Tennessee. It is bounded by the Clinch River on the western and southwestern boundaries, Poplar Creek and the main plant area of the ETTP on the northeastern boundary, and the Oak Ridge Turnpike, also known as Highway 58, to the southeast (Fig. 1.1). A small portion of the footprint (Fig. 1.2) extends past Highway 58 to the south along the banks of the Clinch River. This portion of the footprint includes the K-1251 Barge Facility parcel, which has previously been leased, and an undeveloped portion of Pine Ridge to the east of the barge facility. The transfer footprint is surrounded by DOE property on the eastern, southern, and northern sides, and the Clinch River on the western side. The transfer footprint, which consists of two non-contiguous tracts that comprise the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area, is approximately 661.7 acres. The two tracts are separated by Poplar Creek. The community development of Rarity Ridge is located across the Clinch River to the west.

The Former Powerhouse Area and the K-1007-P1 Pond Area comprise one of the non-contiguous tracts and Duct Island comprises the remaining tract of the transfer footprint (Fig. 1.2). The Former Powerhouse Area, which consists of approximately 399 acres, includes the area of ETTP where power-generating operations were conducted. The K-1007-P1 Pond Area (the K-1007-P1 Pond is not included in the proposed property transfer), which consists of approximately 44 acres, has been used for locomotive and railroad maintenance activities and for material and equipment storage during construction of the former gaseous diffusion plant. Duct Island consists of the approximately 207 acres located on the Duct Island peninsula, which is formed by the large loop in Poplar Creek. Duct Island has primarily only been used for waste disposal in limited areas of this tract. The former K-1251 Barge Facility, which occupies part of the approximately 12 acres lying south of Highway 58, was used for unloading materials shipped by barge to the ETTP. Figure 1.3 provides the current status of the exposure units (EUs) that comprise the potential transfer footprint of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area. These EUs either have been approved for no further action (NFA) determinations or have met the Zone 1 Interim Record of Decision (ROD) requirements for NFA. The Zone 1 Interim ROD addresses human health risk from soils for 80 EUs at the ETTP. Forty-six of these EUs are included in the proposed transfer footprint. A Zone 1 Final ROD is in preparation that will address the final decision for both human health and ecological risk from soils in Zone 1.

The area south of Highway 58 (Former K-1251 Barge Facility), which lies outside of Zone 1, has previously been evaluated in the K-1251 Barge Facility Baseline Environmental Analysis Report (BEAR) and as adjacent property to the barge facility (BJC 2007). Figure 1.4 is a 2013 aerial photograph of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint.

Building K-1313-F, located in the Former Powerhouse Area of the transfer footprint, currently houses sodium shields and an appropriate disposition pathway has not yet been identified for these shields. Therefore, the building currently cannot be reused or demolished. Once the sodium shields are removed, K-1313-F will be dispositioned for either decontamination and decommissioning (D&D) or beneficial reuse.

Because the soil and slab underlying Bldg. K-1313-F are part of an EU that has met the requirements for an NFA determination, the land underlying these structures is included in the transfer footprint of this

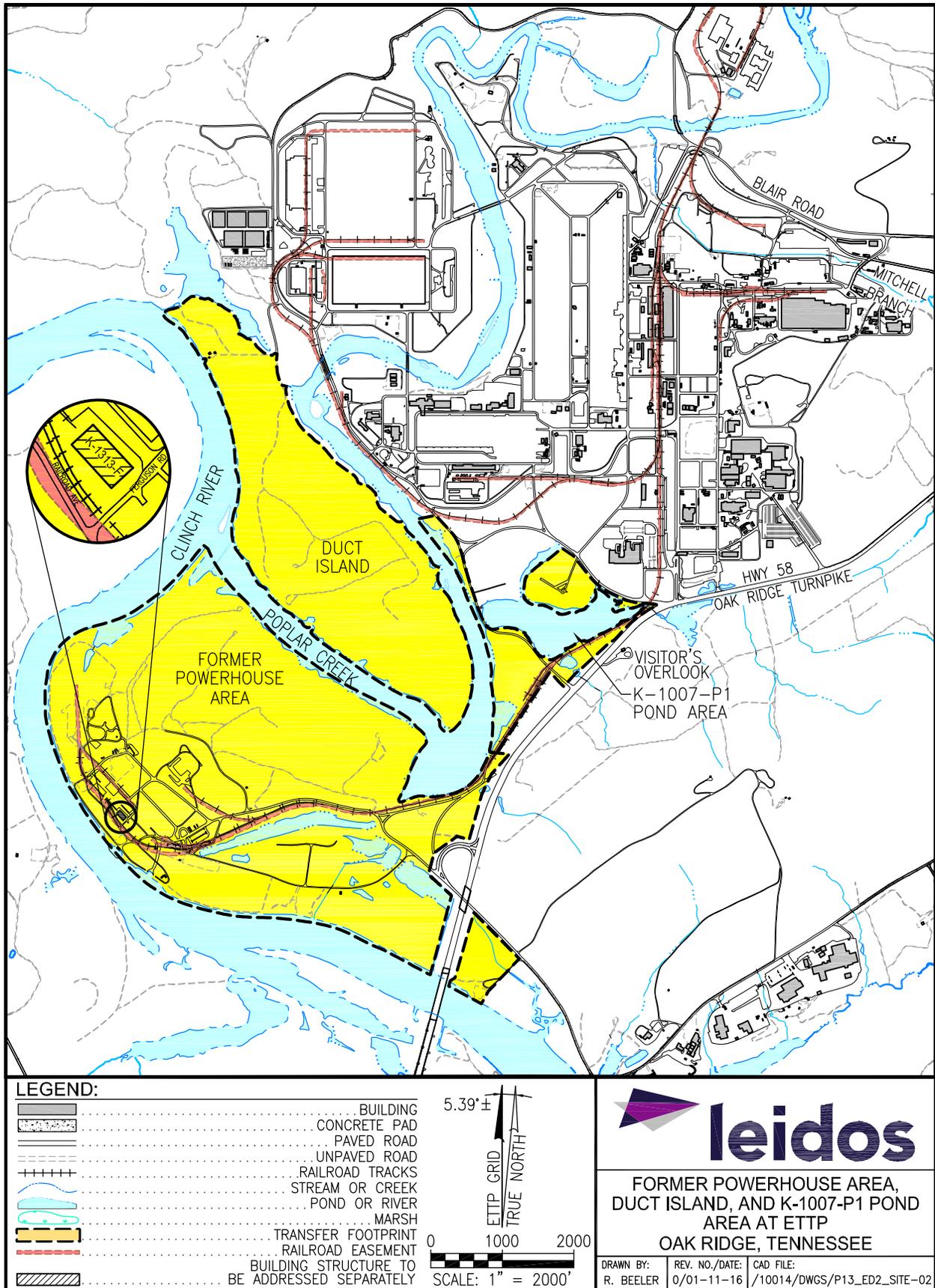


Fig. 1.1. Location of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area Within ETPP.

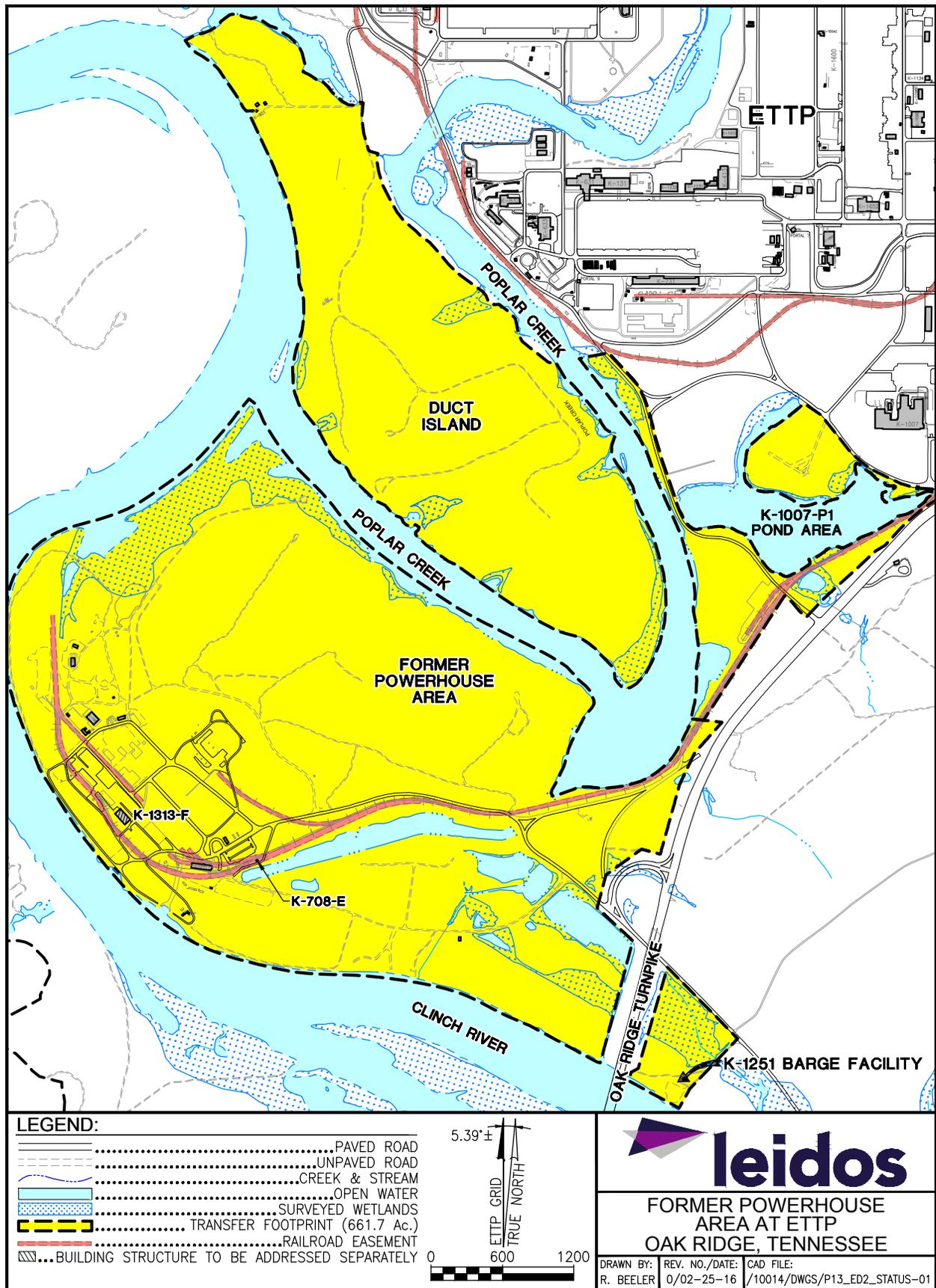


Fig. 1.2. Transfer footprint for the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area.

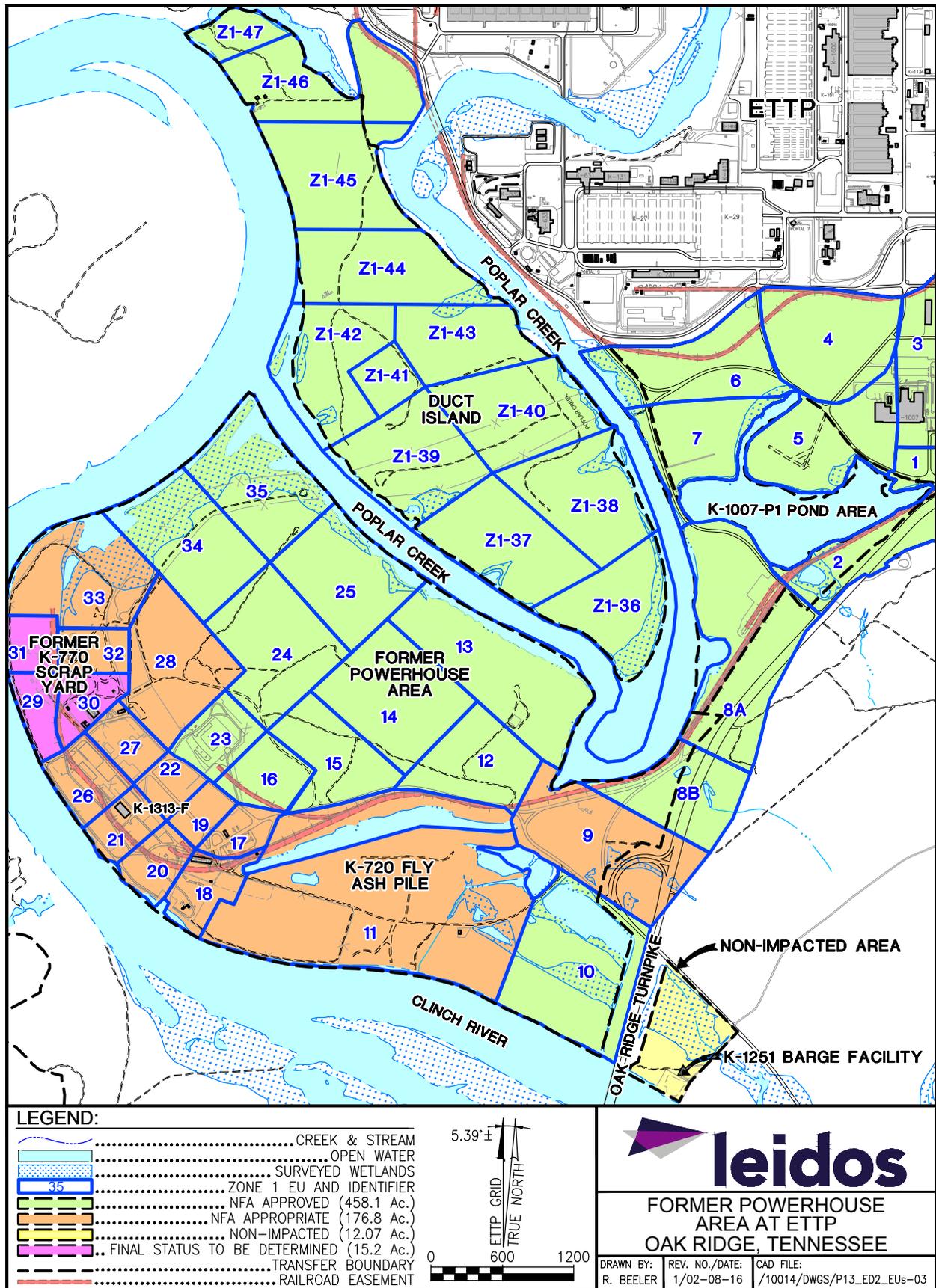


Fig. 1.3. EU status of Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint.

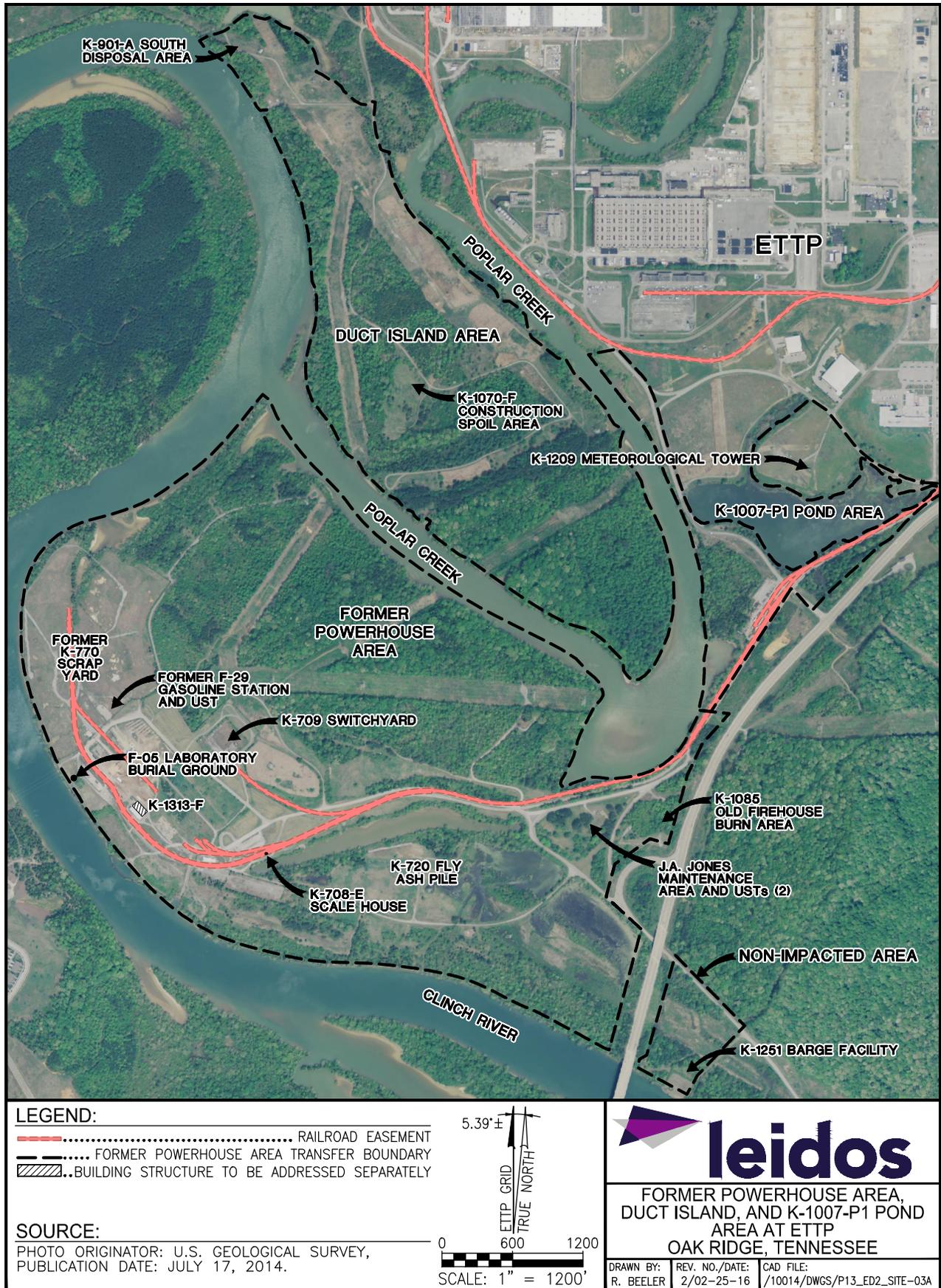


Fig. 1.4. Aerial photograph of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area, circa 2013.

EBS. The soils beneath K-1313-F were not sampled under the Dynamic Verification Strategy (DVS), but they were included within the scope of the Phased Construction Completion Report (PCCR) that addressed EU Z1-21, which is the EU where Bldg. K-1313-F is located (DOE 2011a). DOE will not transfer the land underlying the building until a disposition determination has been made for the building and confirmatory sampling, and remedial actions, if any, are completed. Confirmatory sampling will be conducted on either the building surfaces, if the building is transferred; the building slab, if the building is demolished and the slab remains; or the underlying soils, if the building slab is removed, or the remaining slab indicates the potential for contamination of the underlying soils. If contamination above ROD remedial levels (RLs) is discovered, it will be remediated. If the building is demolished, post-demolition confirmatory sampling of the soil and/or slab (to confirm that the prior NFA determination remains valid) will be documented in a concurrence form and/or a PCCR addendum and transmitted to the U.S. Environmental Protection Agency (EPA) and Tennessee Department of Environment and Conservation (TDEC) for approval. If the building is determined to be suitable for transfer, the condition of the building will be documented in a concurrence form and/or a PCCR addendum, or other documentation, and submitted to EPA and TDEC for approval. Additional evaluation of the slab, if remaining, will be performed to ensure the slab meets free-release levels of DOE Order 458.1.

2. TITLE SEARCH

On October 16, 1996, the State of Tennessee Roane County Recorder's Office was visited, and a review was conducted of the recorded deeds documenting previous ownership of the land tract where the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area and adjacent areas are located. The deeds contained no information or references to other recorded evidence that, prior to U.S. Government ownership, the property was utilized for the storage of hazardous substances and/or petroleum products or their derivatives. Additionally, no information contained in the deeds would indicate that hazardous substances and/or petroleum products or their derivatives were released from or disposed of on the property. Prior to acquisition by the government, the area was farmland and was a combination of cultivated fields and pastures with scattered wooded areas.

Because the Tennessee Valley Authority (TVA) was the previous owner of several large tracts of ORR land, the TVA Real Estate Office was contacted regarding their knowledge of any previous land uses. The U.S. Army Corp of Engineers (COE) was another source of information that has been contacted regarding previous land uses (see Sect. 3.1).

3. FEDERAL RECORDS SEARCH AND COMPLIANCE SUMMARY

3.1 FEDERAL RECORDS SEARCH

In 1997, the TVA in Knoxville, Tennessee (TVA 1998), and the COE District Office in Nashville, Tennessee (COE 1998), were contacted to determine if they maintained any records reflecting past or present land use relative to the land that is now ETPP. Neither TVA nor COE had any information regarding the history of past or present land use that would indicate if hazardous substances or petroleum products or their derivatives were stored or released on the site.

DOE real estate records documenting previous ownership of the land tracts where the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is located were examined. Page A-3 of Appendix A is a statement from the Realty Officer of the DOE Oak Ridge Office (ORO) that the real estate records contained no information or references to other recorded evidence that, prior to ownership by DOE and its U.S. Government predecessor agencies, the property had been used for the storage of hazardous substances. Additionally, no information contained in these records indicated that hazardous substances had been released from or disposed of on the property.

Aerial photographs readily available from federal, state, and local government agencies may reflect prior use of the real property. Copies of these photographs and maps are maintained on file in the U.S. Department of Energy-Oak Ridge Office (DOE-ORO) Real Estate Office.

Aerial Photographs:

| <u>Photograph Nos. and Date</u> | <u>Flight By</u> | <u>Source</u> |
|--|--|-----------------------------|
| No. 130-3-9, dated 1939 | Unknown | DOE-ORO, Real Estate Office |
| Nos. 820-2-20 through -23 and 820-3-20 through -24, dated September 25, 1942 | Aero Service Corp. for Stone and Webster | DOE-ORO, Real Estate Office |

These photographs, which were taken in 1939 and 1942, show that the land where the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is located was predominantly used for agricultural purposes. Approximately 90% of the property was used in some type of agricultural pursuit, and the remaining property was wooded. A map depicting pre-World War II structures, archeological sites, and cemeteries that were present in the area of ETPP is included on page B-3 in Appendix B.

Topographic and real estate maps:

1. A topographic map of the area, identified as Sect. A-1 of the ORR, was prepared on November 2, 1942, by Aero Services Corporation for Stone and Webster.
2. A February 19, 1945, real estate map (sheet 9 of 16) prepared by the U.S. Army shows the boundaries of all land tracts upon which facilities at the ETPP are currently located. The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is on Land Tracts H-731, H-736, H-738, and K-1007.

Neither the aforementioned photographs nor maps contained any information regarding the history of the past land use that would indicate that storage or releases of hazardous substances or petroleum

products or their derivatives have occurred on the land where the proposed transfer footprint is located. Copies of the 1942 topographic map and real estate map are maintained in the DOE-ORO Real Estate Office.

3.2 REGULATORY SUMMARY

3.2.1 Background

As mentioned previously, for the foundational information about the potential for surface and subsurface soil contamination, this EBS relies upon documentation presented in the following PCCRs:

- *Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse Area in Zone 1 at East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2294&D2, August 2006 (approved) [DOE 2006a] (addresses EUs Z1-01 through Z1-10, Z1-12 through Z1-16, Z1-23 through Z1-25, Z1-34 and Z1-35);
- *Phased Construction Completion Report for the Duct Island Area and K-901 Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee* (DOE/OR/01-2261&D2), February 2006, (approved) [DOE 2006b] (addresses EUs Z1-36 through Z1-47);
- *Fiscal Year 2008 Phased Construction Completion Report for Exposure Units Z1-01, Z1-03, Z1-38, and Z1-49 in Zone 1 at the East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2367&D2 March 2008 (approved) [DOE 2008];
- *Addendum to the Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2294&D2/A1/R1, October 2011 (approved) [DOE 2011a] (addresses EUs Z1-09, Z1-11, Z1-17, Z1-18 through -22, and Z1-26); and
- *Addendum II to the Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2294&D2/A2, June 2011 [DOE 2011b] (addresses EUs Z1-27 through Z1-33).

EPA approval was received on March 13, 2006; October 2, 2006; and April 4, 2008, for the three PCCRs addressing approximately 458 acres of the proposed transfer footprint (DOE 2006a; DOE 2006b; DOE 2008). TDEC approval of these three PCCRs was received on March 29, 2006; September 28, 2006; and April 23, 2008, respectively. DOE has determined that the soil in approximately 192 acres of the proposed transfer footprint meets the requirements of the Zone 1 ROD pending completion of remedial actions in EUs Z1-29, Z1-30, and Z1-31, as documented in two PCCRs (DOE 2011a and 2011b). The approximately 12 acres comprising the K-1251 Barge Facility lie outside of the Zone 1 and Zone 2 boundaries.

The approximately 661.7 acres of land in the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area includes portions of EU Z1-1, Z1-2, Z1-5, Z1-6, Z1-7, Z1-8A, Z1-8B, Z1-9, Z1-45, Z1-46, and all of EU Z1-10 through Z1-44, and Z1-47. The 12-acre parcel, located on the south side of Highway 58 (K-1251 Barge Facility), lies outside of Zone 1 and Zone 2. [It should be noted that portions of EUs Z1-45 and Z1-46 are not included within the study area as they have been identified as part of the

Black Oak Ridge Conservation Easement (BORCE)]. The EUs and EU Groups are shown on Fig. 3.1. Table 3.1 provides the individual acreage for each of the EUs included in the transfer footprint.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) decisions for the soils in the 46 EUs in which the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area proposed transfer footprint is located are indicated in Table 3.1. These EUs were assessed under an approved Work Plan (*Remedial Action Work Plan for Dynamic Verification Strategy for Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR-01-2182&D4 [DOE 2007a]) prepared according to the DVS process. The Work Plan was approved by EPA and TDEC on December 7 and 13, 2007, respectively. All verified and validated data used to make regulatory decisions have been placed in the Oak Ridge Environmental Information System (OREIS) database (<http://www-oreis.ettp.energy.gov/oreis/help/oreishome.html>) and are available for review. The sampling results and data evaluation can be found in Appendix A of the respective PCCRs (DOE 2006a; DOE 2006b; DOE 2008; DOE 2011a; DOE 2011b).

Table 3.1. Summary of CERCLA decisions for the EUs located within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area

| Geographic area | Group | EU (acreage) | Associated FFA sites | Decision^a |
|--------------------------|--------------------------------|-------------------------------------|--|--|
| K-1007 Ponds Area | Happy Valley Service Station | EU Z1-1 (28.3 acres) | S-21 Happy Valley Service Station | Sampling and analysis resulted in NFA concurrence ^b |
| | | EU Z1-2 (13.6 acres) | No associated FFA site | Sampling and analysis resulted in NFA concurrence ^c |
| | K-1007 Ponds | EU Z1-5 (19.3 acres) | K-1007 Gas Tank (Residual Contamination) | Sampling and analysis resulted in NFA concurrence ^c |
| | | | K-1048 Tire and Battery Shop | Sampling and analysis resulted in NFA concurrence ^c |
| | | | K-1050 Wash, Paint, and Grease Shop | Sampling and analysis resulted in NFA concurrence ^c |
| | | EU Z1-6 (19.7 acres) | 695/687 Oil Storage Operation | Sampling and analysis resulted in NFA concurrence ^c |
| | | EU Z1-7 (14.3 acres) | J. A. Jones Disposal Area | Sampling and analysis resulted in NFA concurrence ^c |
| | | | Contractor's Road Study Area (#21c) | Sampling and analysis resulted in NFA concurrence ^c |
| | 695/687 Oil Storage Operations | | Sampling and analysis resulted in NFA concurrence ^c | |
| | J. A. Jones Group | EU Z1-8A (31.5 acres) | Round House Road | Sampling and analysis resulted in NFA concurrence ^c |
| EU Z1-8B (14.6 acres) | | Demolition Materials Placement Area | Sampling and analysis resulted in NFA concurrence ^c | |

Table 3.1. Summary of CERCLA decisions for the EUs located within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area (cont.)

| Geographic area | Group | EU (acreage) | Associated FFA sites | Decision^a |
|------------------------|------------------------------|---|---|--|
| Powerhouse Area | Firehouse and Ash Pile Group | EU Z1-9 (25.4 acres) | K-1085 Old Firehouse Burn Area | NFA for soils recommended ^d |
| | | | K-1085 Old Firehouse Burn Area Burial Site | NFA for soils deferred to the Zone 1 Final ROD. ^d |
| | | | J. A. Jones Maintenance Complex | NFA for soils recommended ^d |
| | | EU Z1-10 (24.0 acres) | No FFA Sites | Sampling and analysis resulted in NFA concurrence ^c |
| | | EU Z1-11 (78.4 acres) | K-720 Fly Ash Pile ^c | NFA recommended for soils in EU Z1-11. K-720 Fly Ash Pile decision on soil as source to groundwater deferred to Zone 1 Final ROD. ^d |
| | Powerhouse North Group | EU Z1-12 through EU Z1-16 and EUs Z1-23, -24, -25, -34 and -35 (168.2 acres) | 518 Main Substation Building 523 Grease Burial Site Building 526 Heavy Equipment Shop K-709 Storage Yard K-709 Switchyard Soils Powerhouse Knoll Study Area (#21a) | Sampling and analysis resulted in NFA concurrence ^c Sampling and analysis resulted in NFA concurrence ^c |
| | K-722 Area Roads Group | EU Z1-17 through EU Z1-22 and EU Z1-26 (38.8 acres) | K-710 Sludge Beds and Imhoff Tanks 722 Area Roads | NFA for soils recommended ^d NFA for soils recommended ^d |

Table 3.1. Summary of CERCLA decisions for the EUs located within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area (cont.)

| Geographic area | Group | EU (acreage) | Associated FFA sites | Decision^a |
|---------------------------|-------------------|---|--|--|
| Powerhouse Area (cont.) | | | F-05 Laboratory Burial Ground | NFA for soils recommended ^d |
| | | | F-07 Materials Warehouse | NFA for soils recommended ^d |
| | | | F-08 Laboratory | NFA for soils recommended ^d |
| | K-770 Group | EU Z1-27, -28, -29, -30, -31, -32, and -33 (65.5 acres) | Bldg F-29 Gasoline Station | NFA for soils recommended ^e |
| | | | K-725 Beryllium Building Soils | NFA for soils recommended ^e |
| | | | K-770 Scrap Metal Yard | NFA for soils recommended ^e |
| K-770 Contaminated Debris | | | NFA for soils recommended ^e | |
| | | K-770 Cooling Tower Wood Debris | NFA for soils recommended ^e | |
| Duct Island | Duct Island South | Z1-36 (25.1 acres) | None | Sampling and analysis resulted in NFA concurrence ^f |
| | | Z1-37 (20.1 acres) | None | Sampling and analysis resulted in NFA concurrence ^f |
| | | Z1-38 (20.3 acres) | Duct Island Soil Mounds | Sampling and analysis resulted in NFA concurrence ^b |
| | K-1070-F | Z1-39 (20.0 acres) | K-1070F Construction Spoil Area; Duct Island Road | Sampling and analysis resulted in NFA concurrence ^f Land use controls to address Ducts. |
| | | Z1-40 (20.0 acres) | Duct Island Study Area; Duct Island Road | Sampling and analysis resulted in NFA concurrence ^f Land use controls to address ducts |
| | | Z1-41 (5.0 acres) | K-1070-F Construction Spoil Area; Duct Island Road | Sampling and analysis resulted in NFA concurrence ^f |
| | | Z1-42 (19.8 acres) | K-1070-F Construction Spoil Area; Duct Island Road | Sampling and analysis resulted in NFA concurrence ^f |
| | | Z1-43 (15.0 acres) | Duct Island Road | Sampling and analysis resulted in NFA concurrence ^f |
| | | Z1-44 (21.1 acres) | Duct Island Road | Sampling and analysis resulted in NFA concurrence ^f |
| | | Z1-45 (21.4 acres) | None | Sampling and analysis resulted in NFA concurrence ^f |
| | K-901 South | Z1-46 (20.4 acres) | None | Sampling and analysis resulted in NFA concurrence ^f |

Table 3.1. Summary of CERCLA decisions for the EUs located within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area (cont.)

| Geographic area | Group | EU (acreage) | Associated FFA sites | Decision^a |
|------------------------|--------------|----------------------|-----------------------------|--|
| Duct Island (cont.) | K-901 South | Z1-47 (5.1 acres) | K-901-A South Disposal Area | Sampling and analysis resulted in NFA concurrence ^f |

^a Potential impacts to ecological receptors were not addressed in the decision documents for these EUs. Potential impacts to ecological risk, both within the transfer property and the adjacent property, will be addressed in the Zone 1 Final ROD. The East Tennessee Technology Park Sitewide ROD will evaluate risk from groundwater and surface water to human health and ecological receptors. The U.S. Department of Energy will remain responsible, regardless of property ownership, for providing the necessary response actions to address any residual contamination on the property to ensure protection of human health and the environment.

^b NFA concurrence from approved *Fiscal Year 2008 Phased Construction Completion Report for Exposure Units Z1-01, Z1-02, Z1-38, and Z1-49 in Zone 1 at East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2367&D2 (DOE 2008).

^c NFA concurrence from approved *Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse Area in Zone 1 at East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2294&D2 (DOE 2006a).

^d NFA requested from the *Addendum to the Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2294&D2/A1/R1 (DOE 2011a). The decision on the impact to groundwater for the K-720 Fly Ash Pile will be deferred to the East Tennessee Technology Park Final Sitewide Record of Decision. The need for additional actions for soils at the K-1085 Burn Area Burial Site is deferred to the Zone 1 Final ROD.

^e NFA requested from the *Addendum II to the Phased Construction Completion Report for the K-1007 Ponds Area and Powerhouse North Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2294&D2/A2 (DOE 2011b).

^f NFA concurrence from approved *Phased Construction Completion Report for the Duct Island Area and K-901 Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR/01-2261&D2 (DOE 2006b).

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

EU = exposure unit.

FFA = Federal Facility Agreement.

NFA = no further action.

ROD = Record of Decision.

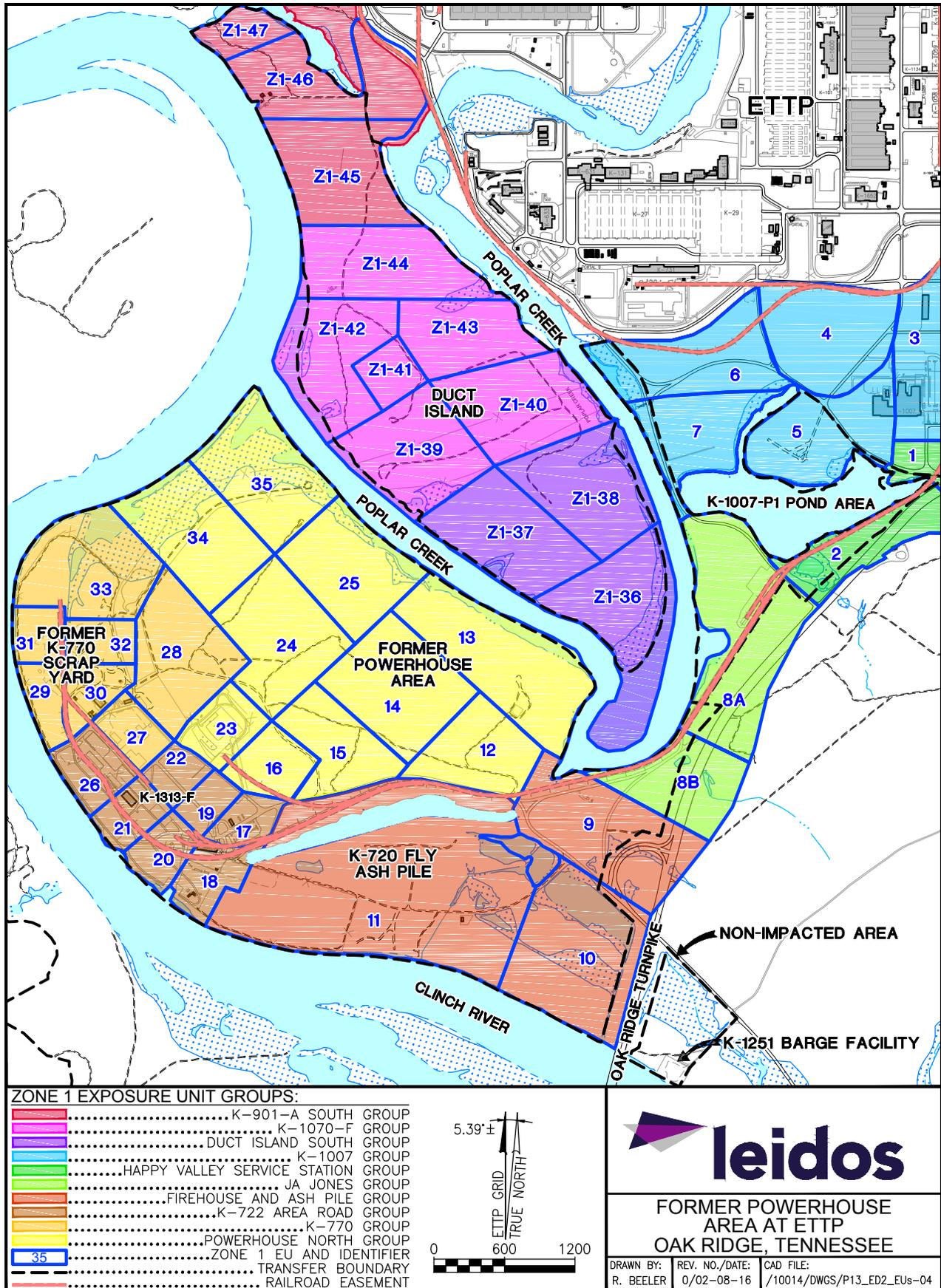


Fig. 3.1. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area EU Groups.

Soils in 30 of the 46 EUs included in the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint (EUs Z1-1, -2, -5, -6, -7, -8A, -8B, -10, -12, -13, -14, -15, -16, -23, -24, -25, and -34 through -47) have been approved by the regulatory agencies (see Appendix C) for unrestricted industrial use to a maximum of 10 ft below ground surface (bgs). Soils in the other 16 EUs (EUs Z1-9, -11, -17 through -22, and -26, through -33) have met the requirements for unrestricted industrial use to a maximum of 10 ft bgs (a decision on the K-720 Fly Ash Pile located in EU Z1-11 and its impact on groundwater will be deferred to the Zone 1 Final ROD). Exceptions to the unrestricted industrial use to a maximum of 10 ft bgs are the underground electrical duct bank corridor and the subsurface asbestos area of the K-770 Scrap Yard (EUs Z1-29, -30, and -31), which will be designated as industrial use with no digging, without DOE authorization, due to the remaining infrastructure and waste materials.

As mentioned previously, Bldg. K-1313-F, located in EU Z1-21, is currently in use and will be addressed separately from the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area. The K-1313-F building is currently used for storage of sodium shields and a decision on reuse or demolition of the building will be made once the disposition of the shields has been identified. Because the soil and slab underlying Bldg K-1313-F are part of an EU (EU Z1-21) that has met the requirements for NFA, the land underlying these structures is included in the transfer footprint of this EBS. The soils beneath K-1313-F were not sampled under the DVS, but they were included within the scope of the PCCR that addressed EU Z1-21, which is the EU where Bldg. K-1313-F is located (DOE 2011a). DOE will not transfer the land underlying the building until a disposition determination has been made for the building and confirmatory sampling, and remedial actions, if any, are completed. Confirmatory sampling will be conducted on either the building surfaces, if the building is transferred; the building slab, if the building is demolished and the slab remains; or the underlying soils, if the building slab is removed, or the remaining slab indicates the potential for contamination of the underlying soils. If contamination above ROD RLs is discovered, it will be remediated. If the building is demolished, post-demolition confirmatory sampling of the soil and/or slab (to confirm that the prior NFA determination remains valid) will be documented in a concurrence form and/or a PCCR addendum and transmitted to EPA and TDEC for approval. If the building is determined to be suitable for transfer, the condition of the building will be documented in a concurrence form and/or a PCCR addendum, or other documentation, and submitted to EPA and TDEC for approval. Additional evaluation of the slab, if remaining, will be performed to ensure the slab meets free-release levels of DOE Order 458.1.

A portion of the K-1251 Barge Facility tract, located south of Highway 58, has previously been evaluated in the BEAR for the K-1251 Barge Facility (BJC 2007). The evaluation of the Barge Facility, conducted in December 2007, indicated a low likelihood of adverse health effects associated with worker exposure posed by the facility (BJC 2007). This conclusion was based upon soil and concrete samples collected from within the K-1251 Barge Facility footprint. The K-1251 BEAR also found that there was no indication that adjacent areas, which comprise the balance of Tract B, are known to have been used for any activities involving hazardous substances or petroleum products or their derivatives. In addition, the adjacent property to the east was addressed in the West Pine Ridge Study Area under DOE's Footprint Reduction Program (Fig. 3.2). The West Pine Ridge Study Area has an approved No Further Investigation (NFI) decision based on the findings "that no public health concern should arise because of past and present federal activities within the study area" (DOE 1997).

The property adjacent to a portion of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area includes land parcels ED-3 Western Expansion Area (WEA), ED-5 East, ED-5 West, ED-7, ED-8 and ED-9 (Fig. 3.2). Parcel ED-7 has been transferred under a regulator-approved Clean Parcel Determination (CPD), and, with the exception of the ED-3 WEA, the remaining parcels have all been transferred under regulator-approved Covenant Deferral Requests (CDRs). The ED-3 WEA has received EPA concurrence for a CPD (DOE 2011c). The southeastern boundary of the Former Powerhouse Area,

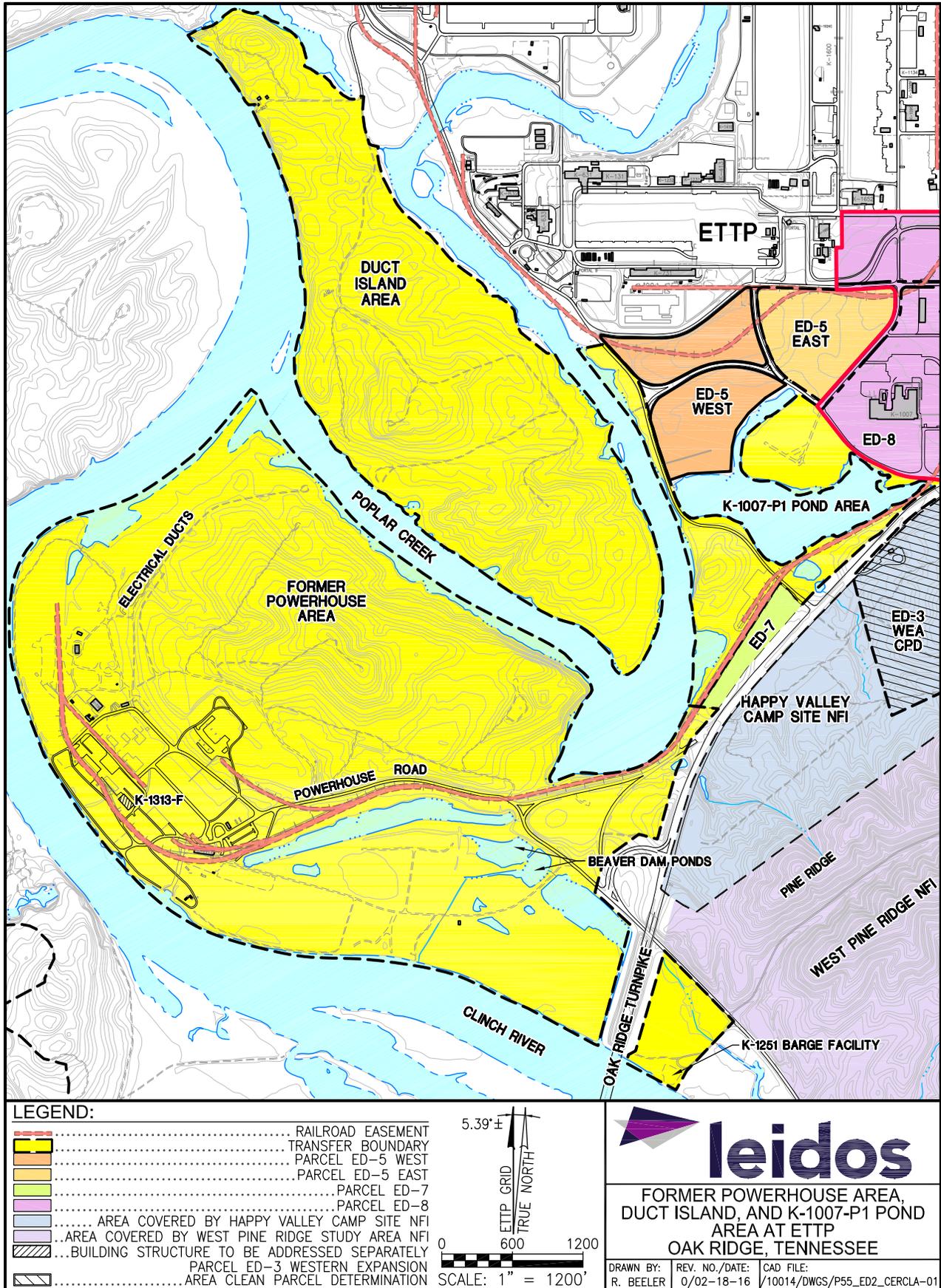


Fig. 3.2. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area adjacent property transfers and CERCLA decisions.

Duct Island, and K-1007-P1 Pond Area Parcel also adjoins the Happy Valley Campsite and the West Pine Ridge Study Area, both of which have an approved NFI.

Ecological Impacts

Potential impacts to ecological receptors can occur from either:

1. impacts that are associated with residual contamination of environmental media that result in risk to ecological receptors; or
2. impacts to ecological receptors from development and/or operational activities occurring after transfer of the property.

Potential impacts to ecological receptors, both within the transfer property and the adjacent property, from the first category will be addressed as ecological risk in the final ETPP Sitewide ROD, which will also evaluate risk from groundwater and surface water to human and ecological receptors. DOE will remain responsible, regardless of property ownership, for providing the necessary response actions to address any residual contamination on the property to ensure protection of human health and the environment.

Potential impacts to ecological receptors, both within the transfer property and the adjacent property, from development and/or operational activities resulting from property transfer were addressed in the *Environmental Assessment for Transfer of Land and Facilities within the East Tennessee Technology Park and Surrounding Area, Oak Ridge, Tennessee*, DOE/EA-1640, October 2011 (DOE 2011c), which resulted in a Finding of No Significant Impact. Exhibit B of the Quitclaim Deed, included in Sect. 6.2 of the CDR, restricts development of the property to the industrial, commercial, and recreational uses evaluated in the environmental assessment. Additionally, following transfer, the new property owner is still subject to regulatory requirements such as storm water management, wetlands protection, and Clean Air Act compliance. Finally, adverse environmental impacts to existing ecological receptors would be limited because construction activities would primarily occur within previously disturbed areas.

3.2.2 The EM DVS Protocol and the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area

Regulatory information for Zone 1, as it relates to the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area, is discussed below along with a summary of the EM DVS approach. Technical information for each of the component EUs is presented in Chap. 7.

The EM DVS process (DOE 2007a) was designed to facilitate real-time decision-making and includes five steps:

1. preparation of DQOs scoping packages,
2. classification of soil units using a graded approach,
3. preparation of DQOs scoping packages,
4. classification of soil units using a graded approach,
5. determination of additional sampling or surveying needs,
6. determination of the need for remedial action using decision rules, and
7. use of confirmation sampling to determine if remedial action is complete.

The decision rules in Step 4 were based on one or more of the following criteria:

- exceedance of a maximum RL at any location,
- exceedance of an average RL across the EU,
- unacceptable future threat to groundwater, and/or
- unacceptable cumulative excess lifetime cancer risk (ELCR) of $> 1 \times 10^{-4}$ and hazard index (HI) > 1 across the EU.

The threat to groundwater from Zone 1 soils is evaluated by reviewing historical groundwater data and, if necessary, screening soil data against established screening levels. Based on the screening, site-specific modeling may be conducted. Consideration of an action on groundwater is required if any of these steps indicate a site may be a potential source of contamination to groundwater. A Sitewide ROD will evaluate all threats to groundwater.

3.2.3 Actions Taken Within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area Exposure Units

The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is located primarily within Zone 1 of the ETTP, with the exception of approximately 12 acres, located south of Highway 58. This tract is the location of the former K-1251 Barge Facility, which has been previously evaluated in a risk screening estimate, and the results were considered indicative of a low likelihood of adverse health effects associated with worker exposure to soils and concrete at the barge facility (BJC 2007). No improvements or historical uses have been identified for the remaining portion of the barge facility tract, and the undeveloped portion is considered to be non-impacted property.

The footprint for the proposed transfer of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area includes portions of EU Z1-1, Z1-2, Z1-5, Z1-6, Z1-7, Z1-8A, Z1-8B, Z1-9, Z1-45, and Z1-46; all of EU Z1-10, Z1-12 through Z1-44 and Z1-47; and the adjacent K-1251 Barge Facility tract located south of Highway 58. Figure 1.3 shows the EUs located within the property transfer footprint and the current status of the EUs with respect to regulatory approval for NFA for soils. Located within some of the EUs are sites designated as requiring special attention because they were listed in the Federal Facility Agreement (FFA) [*Federal Facility Agreement for the Oak Ridge Reservation*, DOE/OR-1014 (DOE 1992)] as having the potential for contamination. (The FFA was entered into by DOE, the state of Tennessee, and EPA-Region 4 under the authority of CERCLA.) The FFA sites have been the focus of several remedial actions across the ETTP, and FFA sites are included within some of the EUs that compose the proposed transfer footprint. These sites are listed in Table 3.1. In addition, Table 3.1 provides the decision, based on the DVS results, for the FFA sites.

Remedial actions performed in the proposed transfer footprint have included equipment and debris removals, soil removal at the K-1085 Old Firehouse Burn Area, closure in place of three underground storage tanks (USTs) in accordance with TDEC UST rules, removal of soils at four small areas ($< 100 \text{ ft}^2$) based on walkover radiation survey results, excavation of soil hot spots associated with the underground electrical duct banks, grouting of the duct bank vaults, and removal of 66,800 yd^3 of soil from the K-770 Scrap Yard (DOE 2006a; DOE 2006b; DOE 2011a; DOE 2011b).

Four remedial actions were conducted during the summer of 2009 in EU Z1-26 in response to DVS observations of RL exceedances at six sample locations. The remedial actions addressed risk to the industrial worker by removing small surface soil areas contaminated with uranium isotopes and ^{137}Cs .

Total soil volume of 3 yd³ was excavated for disposal. Both confirmation sampling and radiation walkover surveys were conducted to verify that the contamination had been removed. A post-remedial action risk screening conducted in 2010 for EU Z1-26 showed that the EU did not pose a risk to the industrial worker.

A total of four actions were conducted in the K-770 Scrap Metal Yard, including the following:

- K-770 Scrap Yard Soils Remedial Action – DVS investigations identified 36.5 acres of contaminated soil. Excavation was conducted to a depth of up to 2 ft and approximately 66,800 yd³ of contaminated soil were excavated and removed from the site for disposition. During this remedial action, asbestos-containing materials (ACMs) were discovered. The ACMs in two locations were removed and are included in the total volume of contaminated soil that was excavated, but additional asbestos was left behind pending a decision on the appropriate actions to address these soils.
- K-725 Beryllium Building Slab Remedial Action – The K-725 Beryllium Building Slab was identified for remedial action in the Zone 1 Interim ROD. The slab and a portion of the underlying gravel were removed for disposal.
- F-29 UST Remedial Action – The F-29 UST was drained of liquids that were removed for off-site disposition and the tank was closed in place by filling with flowable fill in accordance with TDEC regulations.
- K-1093 Debris Remedial Action – The K-1093 Debris Pile was removed for disposal.

The K-770 Scrap Metal Yard remedial actions were followed by confirmation sampling and radiation walkover surveys, which demonstrated that, with the exception of the area containing asbestos in the subsurface, the area was suitable for industrial use.

EUs Z1-29, Z1-30, and Z1-31, located in the northwestern portion of the Former Powerhouse Area (Fig. 3.1), will require additional land use controls necessary to address the asbestos-containing materials (ACMs) that remain in the subsurface of these three EUs following completion of remediation efforts in 2010. The difficulty involved in removing all of the ACM from the soils precluded completion of the remedial action in these three EUs. Currently, vehicle access to these EUs is controlled through a gated fence that partially encloses these EUs. A soil cover will be placed over the potential ACM area such that it will pose no, or negligible, risk to industrial workers. Until a the Final Zone 1 ROD is completed and a final remedy selected for EUs Z1-29, -30 and -31, disturbance of the soils in these areas will be prohibited unless written approval for soil disturbance is obtained from EPA and TDEC. After the final remedies are implemented for these areas, then the land use restrictions will be implemented in accordance with the Final Zone 1 ROD.

Figure 3.3 shows areas where access to soils deeper than 2 ft bgs will be controlled.

Two parcels within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint are currently under lease from DOE (Fig. 3.4). Ongoing operations are being conducted within these parcels. These operations include the production of wood chips for biomass fuel supply (Oak Ridge Forest Products, LLC) and the repair and refurbishment of historical railroad equipment (East Tennessee Rail Car Services, Inc. [ETRC]). Although these ongoing non-DOE operations have the potential to impact the property subsequent to the NFA determinations for the EUs included in these parcels, under the lease agreements, upon termination, expiration, revocation, or relinquishment of the leases, the subject properties must be returned to DOE in a state of environmental cleanliness which meets or exceeds the pre-lease conditions.

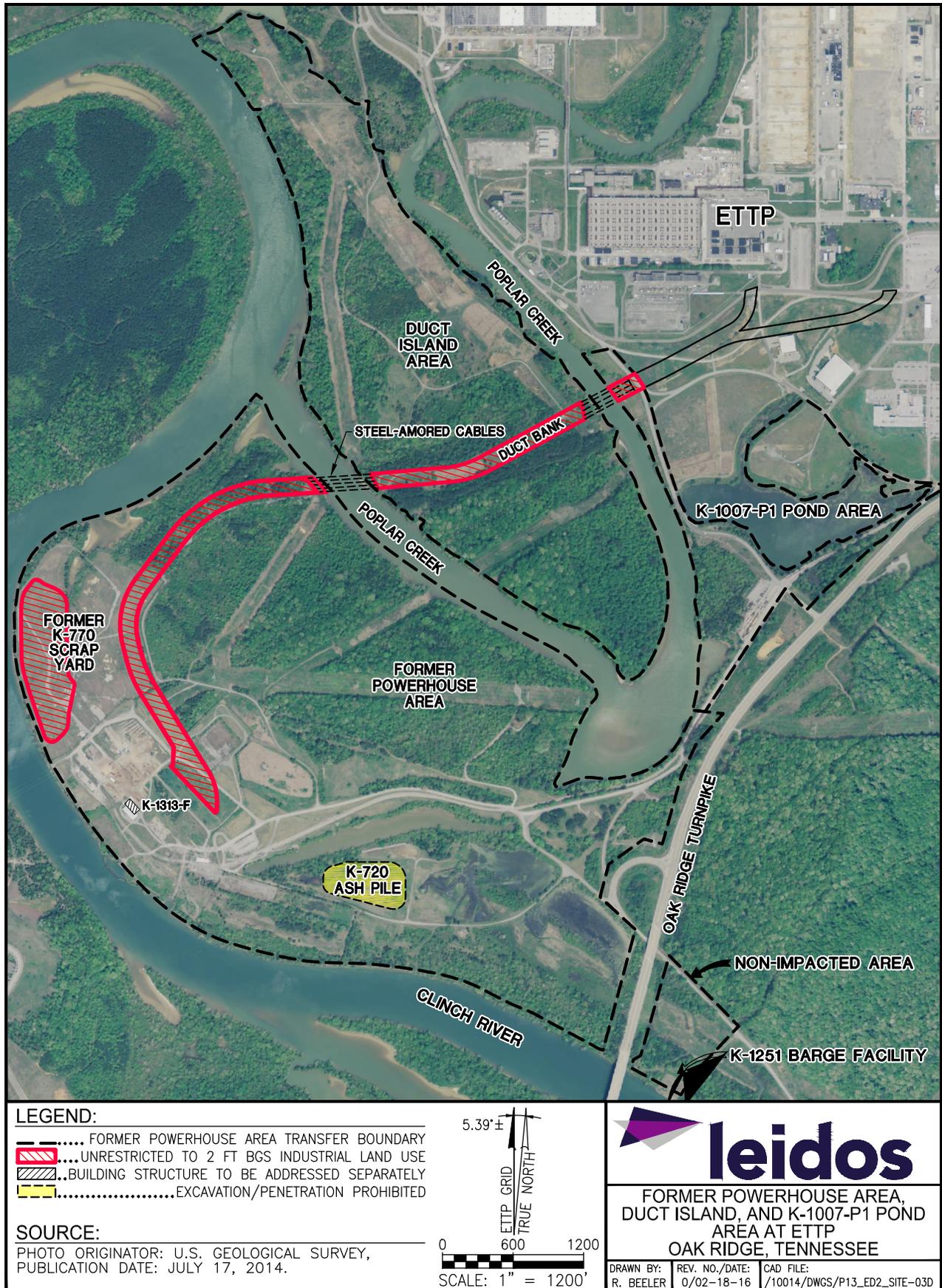


Fig. 3.3. Areas of restricted industrial use.

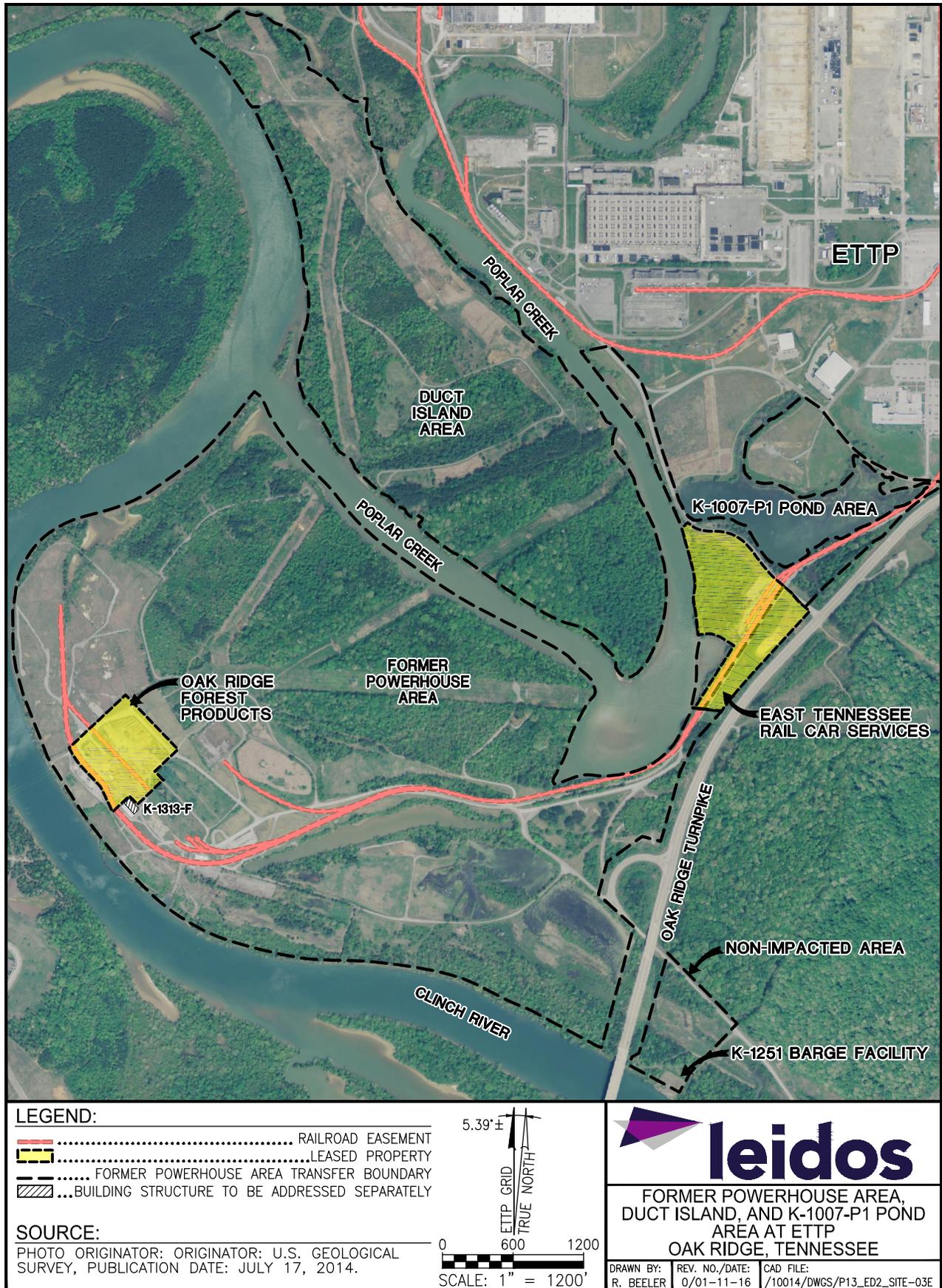


Fig. 3.4. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area property currently under lease.

4. PAST AND PRESENT ACTIVITIES

4.1 PAST AND PRESENT ACTIVITIES FOR THE REAL PROPERTY PROPOSED FOR TRANSFER

The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint is located in the southwestern section of ETTP and consists of approximately 661.7 acres bounded by the Clinch River and Poplar Creek, the Heritage Center, and Highway 58. Historically the area occupied by the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint was utilized for construction support of the former K-25 Gaseous Diffusion Plant and was the location of the Powerhouse that supplied electrical power to the plant. The eastern portion of the transfer footprint was predominately used for service buildings and temporary storage areas and has been impacted by site operations, including the construction of buildings, roads, parking lots, and sidewalks.

The Duct Island portion of the transfer footprint is also located in the southwestern portion of the ETTP, and this area was predominately used for disposal sites and storage areas. As discussed in Chap. 3, a portion of the land area in this tract is occupied by the underground electrical duct banks and the K-1070-F Construction Spoil Area.

As discussed previously the Powerhouse Area of the transfer footprint was composed of the buildings and systems needed to generate power from the fossil-fuel-fired, steam-generating facilities; to distribute power to the original ORGDP, a scrap metal storage yard, and various experimental and research facilities; and to receive power from the TVA grid. Initial activities in the Powerhouse Area began when ground was broken to begin construction of the K-25 Powerhouse on June 1, 1943, and pouring of the first concrete footers occurred later that month. Construction continued through 1943, and the first turbine was in service by April 15, 1944. The Powerhouse contained three 750,000-lb per hour steam boilers driving 14 turbine generators, for a total electrical output of approximately 270 MW. The Powerhouse complex was established so that all the necessary systems were available for the plant to be self-sufficient. Initial operation to supply power to the K-25 process equipment started in 1944 and continued until 1962. In 1962, the power-generating facilities were shut down after it was decided that TVA would supply 100% of the power used at ORGDP. The Powerhouse and two 90,000-kW TVA transmission lines supplied power for the ORGDP (BJC 2000).

The following provides a summary of the primary activities that have been conducted within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint based on the EU Groupings as defined in the associated PCCRs. The EUs and EU Groups included within the transfer footprint are shown on Fig. 3.1 and on Plate 1. Acreages for either individual EUs or EU Groups are indicated on Table 3.1.

Happy Valley EU Group (Z1-01 and Z1-02)

The Happy Valley Group Service Station of EUs is composed of EU Z1-01 and EU Z1-02. Although the S-21 Happy Valley Service Station FFA site is located in EU Z1-01, this FFA site is not included within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint. This FFA site has been addressed under the DVS and was included in the Parcel ED-8 CDR. The approved action completed at this FFA site included removal of residual fluids from four USTs and closure in-place by filling the tanks with flowable fill.

Soils and infrastructure in these two EUs have been evaluated under the DVS and have received approval for NFA under the Zone 1 Interim ROD.

K-1007 Ponds EU Group (EU Z1-05, -06, and -07)

This area was formerly used for support facilities for construction of the ORGDP (see Fig. 4.1). Some of these support facilities included a warehouse, dormitories, pumphouse buildings, recreation hall, and other small storage sheds. These facilities, and any evidence of their former existence, are no longer visible by 1963 (Fig. 4.3). Current operations and facilities located within the transfer footprint include the K-1209 Meteorological Station, the K-1209-A Thunderstorm Indicator, the K-1209-B Doppler Radar Unit, and the K-1007-B4 Pond Sample Station.

Soils and infrastructure in these two EUs have been evaluated under the DVS and have received approval for NFA under the Zone 1 Interim ROD. No CERCLA remedial actions were necessary in this EU Group.

J. A. Jones EU Group (Z1-08A, and Z1-08B)

The J. A. Jones EU group includes the area formerly occupied by the Old Southern Railway Yard, which was located on the peninsula of land between the K-1007-P1- Pond and Poplar Creek. The yard was used from 1943 to 1958 by the Southern Railway Company as a maintenance area for locomotives and a storage yard for railroad building and maintenance equipment and materials. During its operation, this area contained an asphalt plant; a 25,000-gal oil storage tank; an oil pump house; a locomotive shed; a warehouse; a cinder pit; a sand house; and other miscellaneous buildings (Figs. 4.1 and 4.2). All of the buildings and storage tank were demolished by 1960 (Fig. 4.3). Historical records indicate that there were four railroad sidings located where Round House Road is presently located. Three of the sidings were disassembled in the 1970s, and the gravel rail bed was made into Round House Road. Round House Road was paved in 1994. Figures 4.4 and 4.5 provide aerial photographs of the K-1007 Area in 1974 and 2001.

In August 2000, approximately 11 acres located near the intersection of Burchfield and Round House Roads was leased by DOE to Community Reuse Organization of East Tennessee (CROET). In January 2001, CROET subleased this parcel to ETRC for the construction of railway maintenance facilities, and the property has been used for that purpose up to the present time. An area of the parcel just to the north of the railway maintenance facility area was later enclosed with a fence and subleased to MHF, a transportation company, for the storage of Sea-Land Containers and a crane for loading them onto rail cars. In addition, a small area between Burchfield Road and Poplar Creek was used for the disposal of the fish removed from the K-1007-P1 Pond as part of the removal action conducted at the pond in 2009 (Fig. 4.5). Additional information on the removal action is provided in Sect. 4.2.

Periodically, the rail spur within EUs Z1-08A and Z1-08B is utilized for storage of empty and/or loaded railcars. An indefinite easement for the rail spur right-of-way (15 ft from centerline on either side of the rail) was granted to CROET and was subsequently assigned by CROET to EnergySolutions, Inc.

Soils and infrastructure in these two EUs have been evaluated under the DVS and have received approval for NFA under the Zone 1 Interim ROD. No CERCLA remedial actions were necessary in this EU Group.

Firehouse and Ash Pile EU Group (EU Z1-09, Z1-10, and Z1-11)

The Firehouse and Ash Pile Group includes three EUs that have been impacted to some degree by plant activities primarily at the locations of the FFA sites. The remaining land area has been deforested, but analysis of aerial photographs spanning the 60-year history of the plant did not reveal any activities

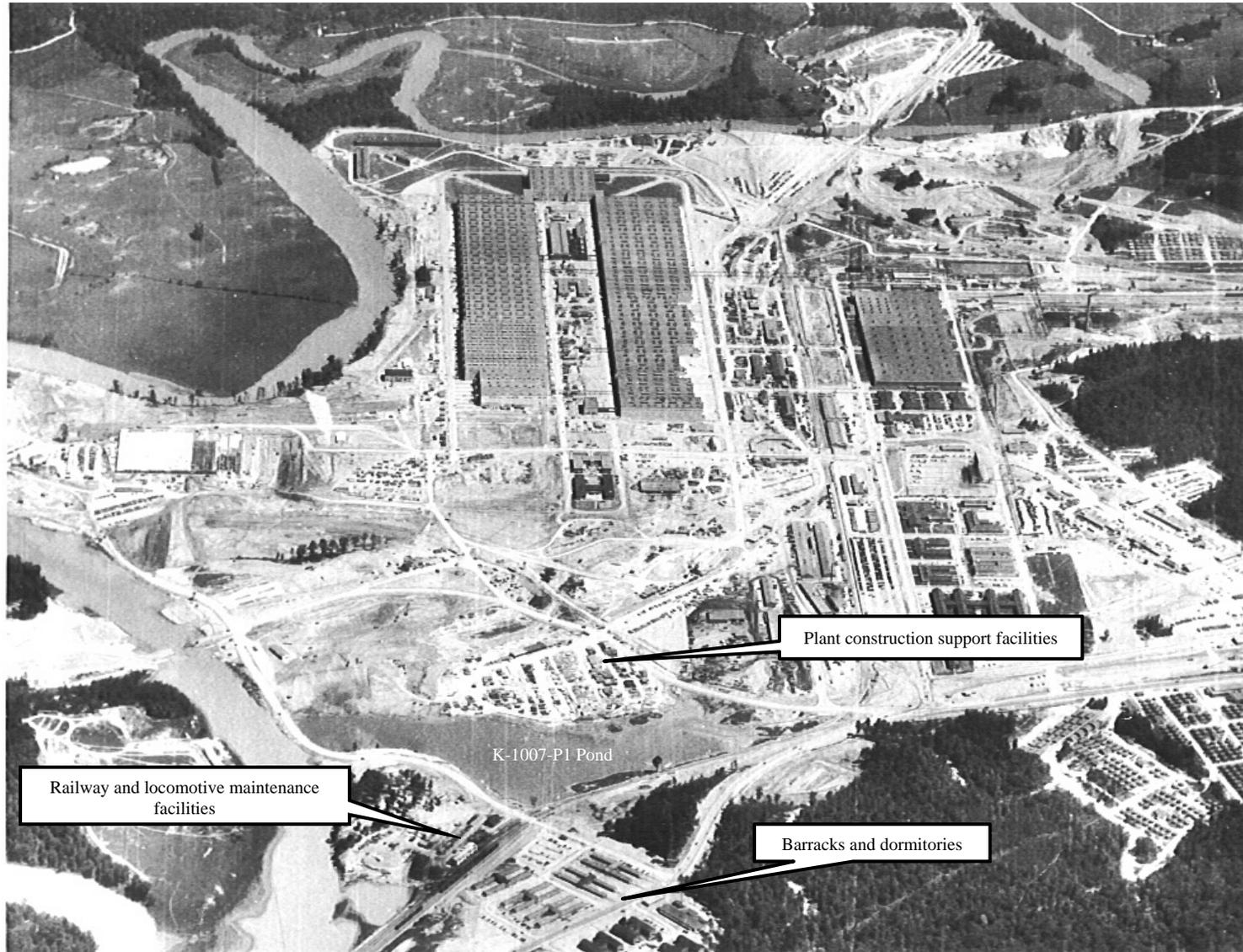


Fig. 4.1. K-1007 Area, circa 1945.



Fig. 4.2. K-1007-P1 Pond area, circa 1952.



Fig. 4.3. K-1007-P1 Pond area, circa 1963.



Fig. 4.4. K-1007-P1 Pond area, circa 1974.



Fig. 4.5. K-1007-P1 Pond area, circa 2001.

that indicate disposal operations or other activities that would lead to soils contamination (DOE 2006a). The Firehouse and Ash Pile EU Group includes the following FFA sites:

- K-1085 Old Firehouse Burn Area (EU Z1-09),
- K-1085 Old Firehouse Burn Area Burial Site (EU Z1-09),
- J. A. Jones Maintenance Complex (EU Z1-09), and
- K-720 Fly Ash Pile (EU Z1-11).

K-1085 Old Firehouse Burn Area

The burn pit is located outside the K-25 Site perimeter fence within an area bounded by State Route 58, East Gallaher Road, and Powerhouse Road. The foundation of the old firehouse itself is located just southeast of the Bear Creek Road extension at its convergence with Powerhouse Road. The pit had dimensions estimated at 20 ft × 25 ft × 15 ft. The location of the former pit was narrowed to an approximately 2-acre area. The location of the old firehouse covered an approximately 60-ft by 20-ft area. The pit area was re-graded when the Bear Creek Road extension was built in the 1960s. An existing farmhouse on-site was converted to a fire hall in 1944 and served as such until 1951. A fuel station and garage were also used on the site from 1944 to 1947.

During operation from 1944 to 1960, waste oil was burned in an unlined pit until 1951, when the pit was filled. Open burning of contaminated oil took place in large metal pans on the concrete pads of the three firehouse buildings until 1960. Exact details of the types and quantities of waste burned at this unit are unknown. Available information indicates various waste solvents, polychlorinated biphenyl (PCB)-contaminated oil, and paint wastes were burned in the open container. The waste-handling operations were not controlled. Pit burning was extinguished with water at the end of each day, and water was periodically pumped from the pit. Water was pumped with a portable gasoline-driven pump onto the ground or road, which sloped downhill from the pit.

K-1085 Old Firehouse Burn Area Burial Site

A time-critical removal action was conducted in 2002 at the K-1085 Old Firehouse Burn Area Burial Site FFA site. Buried drums and contaminated soil were excavated and removed during the 2002 action. The footprint of the action included the K-1085 Old Firehouse Burn Area FFA site.

The Tennessee Department of Transportation (TDOT) notified DOE on October 11, 2000, that one of their construction contractors had accidentally uncovered and punctured two buried drums and had encountered one additional drum approximately 10 ft east of the other two in an area immediately adjacent to the TDOT State Highway 58 construction project. A cloverleaf intersection was being constructed in the area and the Drum Burial Site area was unsecured. Upon notification of the discovery of the Drum Burial Site, DOE flagged and covered the area to minimize the potential for exposure and to minimize the possibility of surface water infiltration. In addition, radiological walkover screening and a geophysical investigation were conducted at the site.

DOE conducted a time-critical removal action at the K-1085 Firehouse Burn Area Burial Site between July and October 2001. This action included a preliminary geophysical site investigation to locate specific problem areas; five were initially identified. During the course of this removal action, a sixth area was unearthed. Although all six areas were excavated and examined, only one area held drum remains. The drum remains and the discolored soil surrounding them have been removed and packaged into 55-gal drums. Discolored soil from another area was also removed and packaged. The other four areas were examined, proved to be free of contamination, and were backfilled. DOE removed approximately 90 yd³

of soil and drum debris from the site during this project. Site restoration was completed in October 2001. Conditional approval of this action was received in February 2003, and final approval for this action was received in January 2007.

Additional soil removal under the DVS was performed in 2007, which resulted in the removal of 300 yd³ of contaminated soils from the area. Soils were excavated to a depth of 12 ft during this remedial action. The shallow soils to a depth of 8 ft, which were found to be clean, were used as backfill for the excavation. Site restoration was completed in 2008; however, the possibility for further remedial actions at this site was deferred to the Zone 1 Final ROD.

J.A. Jones Maintenance Complex

The J.A. Jones Maintenance Complex was operational from 1942 through 1946 with maintenance and refueling facilities in the central portion of EU Z1-09, which includes the site of the Bldg. 470 Gas Tank UST and a second UST northwest of the former Repair Shop. The service station building and most above-ground facilities were removed by 1955. The Complex occupied approximately 10 acres and is located in a triangular area bounded by Powerhouse Road, 1st Avenue South, and South Gallaher Road. A small portion of the facility is located on the other (west) side of South Gallaher Road.

The number of tanks and their condition was unknown prior to characterization sampling performed to support remedial action activities. Work at the site was initiated as a geophysical survey performed as part of the UST investigations conducted in the late 1990s. A magnetic anomaly was identified at the former service station site (H14 UST) and fill pipes were located in the area. Another magnetic anomaly and fill pipe also was associated with the H15 UST location. These anomalies were associated with USTs that had been left in place following demolition of the surface facilities.

Although Tank H15 was found to be empty, tank H14 was nearly full of clear liquid (water) and was sampled for disposition. Fluids were pumped from tank H14 in July 2007 and removed for off-site disposition. The tanks were closed in place on July 23 and 24, 2007, and soils from the excavation were placed back in the excavation on July 24, 2007. Closure of the site was completed July 26–27, 2007. Tank closures were performed in accordance with UST rules of the TDEC Chap. 1200-1-15-06(7)(e)(4). Results from tank H14 downgradient soil sampling did not support the need to excavate additional downgradient soils.

This EU (Z1-09), containing the K-1085 Old Firehouse Burn Area, the K-1085 Old Firehouse Burn Area Burial Site, and the J.A. Jones Maintenance Complex, has been addressed under the DVS and the soils and infrastructure have been found to meet the requirements of the Zone 1 Interim ROD. However, the potential for additional actions at the K-1085 Old Firehouse Burn Area Burial Site is deferred to the Zone 1 Final ROD.

K-720 Fly Ash Pile

The K-720 Fly Ash Pile, located in EU Z1-11, covers approximately 9 acres and was in operation from 1944 to 1962. A total of 5.97 million tons of coal were burned in the K-701 Powerhouse during its operation. The K-720 Fly Ash Pile contains bottom ash, slag, and coal fines from this powerhouse operation. Remnants of an old coal pile also exist southwest of the ash pile. Runoff and leachate resulted in low pH in surrounding surface water and storm drain effluent.

To address the water quality concerns, several corrective actions were completed in the 1990s at the K-720 Fly Ash Pile as a Clean Water Act corrective action and not as a CERCLA action. These corrective actions were conducted as an implementation step of the National Pollutant Discharge Elimination System (NPDES) permit issued in 1992 and in combination with an NPDES storm water construction permit. Starting in 1992, application of lime to control low pH in nearby surface water began and was performed on several occasions throughout the 1990s. Placement of a soil covering began in 1994, along with the addition of lime and sewage sludge to raise the pH of the runoff. In addition, the slopes were flattened to reduce erosion and the drainage pathways were modified. When completed in 1996, these actions included the establishment of a soil cover of 1.5 to 2 ft over the K-720 Fly Ash Pile, and erosion controls maintained until the vegetation was sufficient to prevent runoff concerns.

In August of 2007, additional riprap was installed in drainage ditch pathways in response to a low pH NPDES noncompliance to help neutralize the acidic pH seeps (additional modifications to the storm water discharge path were also completed in an effort to minimize storm water runoff contact time with the fly ash). Additional lime was applied to the drainage watershed in September 2010. In the spring of 2011, a field assessment was conducted that indicated the vegetative cover over the vast majority of the fly ash pile was in good shape. However, there were some areas on the north side of the fly ash pile where either the cover had eroded or the area was not completely covered during the work in the 1990s. In response to these conditions, and as a voluntary CERCLA action in anticipation of the Zone 1 Final ROD, additional corrective actions were taken in the summer of 2011. These actions included the removal of ash from the south bank of the coal ash sluice channel and spreading it onto the flat area immediately adjacent to the channel as well as placement of riprap along the south bank of the coal ash sluice channel.

Placement of additional clay and topsoil over the areas of exposed fly ash along the northern boundary of the fly ash pile was also performed as part of the voluntary CERCLA action in June 2011. This EU (Z1-11) has been evaluated under the DVS and the soils have been found to meet the requirements of the Zone 1 Interim ROD for industrial use.

EU Z1-10, which adjoins EU Z1-11 on the southeast, has been evaluated under the DVS and the soils and remaining infrastructure have received approval for NFA under the Zone 1 Interim ROD. No CERCLA remedial actions were necessary in this EU.

Powerhouse North EU Group (EU Z1-12, Z1-13, Z1-14, Z1-15, Z1-16, Z1-23, Z1-24, Z1-25, Z1-34, and Z1-35)

The Powerhouse North Group of EUs is located on the Powerhouse Peninsula in the western portion of ETPP Zone 1. The Powerhouse North Group of EUs includes the following FFA sites:

- 518 Main Substation (EU Z1-16),
- Building 523 Grease Burial Site (EU Z1-23),
- Building 526 Heavy Equipment Shop (EU Z1-23),
- K-709 Storage Yard (EU Z1-23),
- K-709 Switchyard Soils (EU Z1-23), and
- Powerhouse Knoll Study Area (#21a) (EU Z1-35).

The 518 Main Substation (EU Z1-16) is located approximately 350 ft southeast of the eastern corner of the K-709 Switchyard. This facility was approximately 100 ft by 100 ft and was in operation from 1943 to 1944. This unit was built to serve as a temporary substation for K-25 Site construction prior to building the K-709 Substation. By February 1944, the 518 unit had been removed and K-709 put in place.

Only two concrete piers from the original substation remain. PCBs were used in electrical equipment during the operational period of this unit.

The Building 523 Grease Burial Site is located in EU Z1-23, northeast of the K-709 Switchyard. The site is approximately 50 ft by 20 ft and was used from 1943 to 1946. During construction of the K-25 Powerhouse area, this building was used to store heavy and light greases and lube oils in 55- and 30-gal drums, 5-gal buckets, and other containers. Light oils, solvents, antifreeze, etc., were probably also stored there. The building had been removed by March 1946. According to a retiree who worked at the site, in 1943–45, a railroad carload of off-specification, heavy grease was delivered to the K-25 Site. Because the shipment was deemed unsalvageable, approximately one hundred 30-gal, heavy cardboard drums were buried in a shallow trench approximately 100 ft east of the oil storage building. Some cutting and filling appears to have taken place in later years, resulting in the grease being deeper than the original burial (Energy Systems 1995).

The Building 526 Heavy Equipment Shop (EU Z1-23) was located approximately 100 ft from the northwest side of the K-709 Switchyard. The shop was approximately 90 ft by 250 ft and was in operation during the 1940s. Building 526 was built and used as a heavy equipment maintenance shop during construction of the K-25 site in the early- to mid-1940s. The shop was used as a gasoline fueling station and as a base of operations for gasoline, diesel, and lube oil tankers that were dispatched to the field. Major repairs of engines, hydraulic systems, and body and frame damage were done at the shop. In the spring of 1950, the building was demolished and combustible scrap was burned. The remaining concrete pad has been used as an equipment staging area.

The K-709 Storage Yard, located in EU Z1-23, was operated from 1944 to 1962 as the Main K-25 Switchyard for the K-700 Powerhouse Complex and the K-25 Process Building. In 1962, when the Powerhouse was shut down and TVA began supplying all the power for the K-25 Plant, the K-732 Switchyard became the main switchyard and the transformers in K-709 were de-energized. The oil circuit breakers remained active and K-709 continued as a switchyard until 1978, when it was completely shut down. The yard was then stripped of most of its useful equipment and used as a storage yard for surplus electrical equipment and confiscated vehicles of the local law enforcement agencies until 1998, when it was leased to CROET for sublease.

The K-709 Switchyard Soils (EU Z1-23) are listed separately in Appendix C of the FFA. This FFA site includes the potentially PCB-contaminated soils associated with the K-709 Switchyard. The potential for PCB contamination to be present in soils beneath and surrounding the switchyard was based on historical records of transformer releases and stains on the K-709 concrete pad.

The Powerhouse Knoll Study Area is located in the southwestern portion of EU Z1-35 and extends slightly into the eastern portion of EU Z1-34. This site is described as a possible borrow pit with scattered debris.

These EUs have been evaluated under the DVS and the soils and remaining infrastructure have been found to meet the requirements of the Zone 1 Interim ROD and have received approval for NFA. No CERCLA remedial actions were necessary in this EU Group.

K-770 EU Group (EU Z1-27, Z1-28, Z1-29, Z1-30, Z1-31, Z1-32, and Z1-33)

The K-770 Group of EUs encompasses the area that was used for oil storage in the 1940s and subsequently for scrap metal and debris storage. The area includes the following FFA sites:

- Building F-29 Gasoline Station FFA site (identified as in EU Z1-27, but actually located in EU Z1-30);
- K-725 Beryllium Building Soils FFA site (EU Z1-30);
- K-770 Cooling Tower Wood Debris FFA site (EU Z1-33);
- K-770 Contaminated Debris FFA site (EU Z1-33); and
- K-770 Scrap Metal Yard FFA site (EU Z1-32).

The K-770 Scrap Metal Yard began in 1944 as a tank farm designated F-22 for storing fuel oil in thirteen 470,000-gal tanks. Each tank was individually isolated by an earthen dike and a secondary dike around each group of three tanks. Fuel oil usage at the Powerhouse extended from 1944 through the end of 1953 and the tanks remained in place until 1954, when they were demolished. Scrap metal storage in the K-770 Scrap Yard began in the 1960s with various types of metals from equipment used at the K-25 Site. Some of the scrap metal was contaminated with radioactive materials. The majority of metal at the K-770 Scrap Yard was generated during the Cascade Improvement Program/Cascade Upgrade Program. Most of the scrap metal passed through the K-1420 decontamination facility, where it was vacuumed and washed using water with dilute nitric acid or an alkaline detergent. This decontamination process removed transferable uranium prior to outside storage. From 1984 to 1986, a segregation of the metals was performed by metal type and then reduced in volume by shearing. The metal was segregated into groupings of ferrous metals, non-ferrous metals, and other metals with potential recycle value. A Resource Conservation and Recovery Act of 1976 (RCRA) assessment was performed on the K-770 Scrap Yard in fiscal year (FY) 1994 and all readily identified and accessible RCRA-regulated materials were removed. Historically, approximately 40,000 tons of metal were stored there. Figure 4.6 shows the conditions at the K-770 Scrap Yard in 1982, and Fig. 4.7 shows the K-770 Area after the metal segregation and removal activities were complete. Figure 4.8 is an aerial view of the K-770 Scrap Yard in 2010. K-770 is listed in Appendix C of the FFA and as a solid waste management unit (SWMU).

K-736 was a steel-frame building with a corrugated metal shell on an asphalt pad located adjacent to the eastern side of K-725 in EU Z1-30. The building was built in 1986 to support metal recycling and decontamination activities at the K-770 Scrap Metal Storage Yard. These activities included a technetium-99 (⁹⁹Tc) decontamination demonstration project, a negative-pressure decontamination demonstration, and surface decontamination by electrolytic separation. From the mid-1990s until it was demolished, K-736 was used to store contaminated equipment from ETTP (BJC 2000). The asphalt pad that contained the building remains.

Building K-1313-F, located in EU Z1-21, is currently used by DOE for storage of sodium shields. The shields were used in reactors at Oak Ridge National Laboratory. In 2003, there was an effort to mine the sodium out of the shields. The contractor lost control of the process and a fire resulted that initiated an emergency response. The effort to mine the sodium was stopped and the shields were put in storage following the fire.

The F-29 Gasoline Station, located in EU Z1-30, was built to support equipment used in the construction and operation of the Fercleve Thermal Diffusion Plant. It is thought that the station was used to fuel tanker trucks that, in turn, served vehicles in the field. A single UST was identified at the former station location. The UST was closed in place under the UST rules of the TDEC in September 2008. Soils excavated for closure of the tank were returned to the excavation with approval from TDEC. Downgradient soil samples did not support the need to excavate additional soils.



Fig. 4.6. K-770 Scrap Yard Area, circa 1982.



Fig. 4.7. K-770 Scrap Yard Area, circa 1993.



Fig. 4.8. K-770 Scrap Yard Area, circa 2010.

The K-725 Beryllium Building was located within EU Z1-30. The remaining concrete pad for the building is located within the K-770 Scrap Metal Yard perimeter fence. The K-725 Beryllium Building was a concrete slab on grade with concrete walls and covered an area of 21,614 ft². The K-725 Building was originally a machine shop as part of the S-50 Thermal Diffusion Plant and for beryllium machining and experimentation. The building was found to be heavily contaminated with radionuclides in 1953. A concrete “skin coat” was placed over the original floor because of high alpha counts from depleted uranium handled in the building. Subsequent to a cleaning effort that did not achieve acceptable levels, the building was defined as a contamination area and was not made available for further use. The building was demolished in 1998. The K-725 Beryllium Building slab removal remedial action was completed in 2010. Associated soils were removed during the K-770 Scrap Yard Soils Remedial Action, also completed in 2010.

The K-726 building was originally built as a boiler house to burn bunker C oil to support the Fercleve Thermal Diffusion experiments. The single-story, concrete/cinder block structure with a steel truss-supported, metal-corrugated roof is believed to have been constructed in 1944. It measured approximately 75 ft by 35 ft and had a concrete floor. Operations at this building were discontinued in 1945. Beginning in 1978, the building was used to store PCB-containing liquids and solids. The facility was diked with a sealed concrete floor and inspected weekly. The PCB materials were removed in 1994 and the building cleaned according to PCB regulations. It stood vacant from 1994 to 2006 (BJC 2000). The structure (including the concrete slab floor) was demolished in 2006 and only the subsurface portions of the foundation remain. Subsequent evaluation of the remaining subsurface concrete footers indicated that these structures and the surrounding soil met the requirements of the Zone 1 Interim ROD for industrial use (DOE 2011b).

As discussed in Sect. 3.2.3, remedial actions have been performed at several sites within this group of EUs. Subsequent to these actions, pending the decision for the final action to address asbestos in subsurface soils of EUs Z1-29, -30, and -31, these EUs have been found to meet the requirements of the Zone 1 Interim ROD under the DVS.

K-722 Area Roads EU Group (EU Z1-17, Z1-18, Z1-19, Z1-20, Z1-21, Z1-22, and Z1-26)

The K-722 Area Road Group is located in the southwestern extent of Zone 1 in the Powerhouse Area. This area historically included facilities that supported the uranium enrichment process and also the former electrical powerhouse buildings, former coal and bunker fuel handling facilities, and former shipping and receiving facilities. In addition, much of the area was used to stage both clean and contaminated scrap metal at the Toxco facility, which was formerly located in EUs Z1-19 and Z1-20.

Four FFA sites located in the K-722 Area Road Group include the following, which were all removed as early removal actions:

- K-710 Sludge Beds and Imhoff Tanks FFA site (EU Z1-18).
- F-05 Laboratory Burial Ground FFA site (EU Z1-26).
- F-07 Materials Warehouse FFA site (EU Z1-26).
- F-08 Laboratory FFA site (EU Z1-26).

The Powerhouse complex was established so that all the necessary systems were available for the power plant to be self-sufficient. Initial operation to supply power to the K-25 process equipment started in 1944 and continued until 1962. In 1962, the power-generating facilities were shut down after it was decided that TVA would supply 100% of the power used at ORGDP.

The Powerhouse contained three, 750,000-lb per hour, steam boilers driving 14 turbine generators. The steam boilers were located in the K-701 Boiler House, and steam was piped to the turbine generators located in the K-702 Turbine Room. Offices and laboratory facilities were located in the K-703 Fabrication Building. The power from the generators was routed via underground feeder cable to the K-704 Main Switch House. Here, the power was routed to many 14-kV air circuit breaker buses, where it was distributed to the underground feeders routed to the K-25 process building, ancillary buildings, and the Plant Auxiliary Power Distribution system. The auxiliary power to drive the many fans, coal pulverizers, coal conveyer belts, water pumps, intake screens, etc., was obtained from the transformers and switchgear located in the K-707 Auxiliary Switch House.

Water needed for the boilers, turbine condensers, etc., was obtained from the Clinch River via the water intake traveling screen filter in the K-705-B Crib House. This water flowed through an underground tunnel to the K-706 Pump House, where it was then pumped to the needed equipment. The discharge water was routed through an underground tunnel to the K-702-A Discharge Flume (more recently referred to as the K-720 Slough) to Poplar Creek. Ash sluice water pumps, installed in K-706, supplied high-pressure water to sluice the ashes from the boiler discharge to the ash disposal field alongside the discharge water flume.

Coal was received by rail cars, and it was weighed at the K-708 Scale House and then sent to the unloading chutes. From the K-708-F Coal Yard, the coal was transported by conveyer into the bunkers on the north side of the K-701 building structure. The K-708-E Scale House, which is included in the transfer, is a small wood-frame structure with corrugated siding and a roof that was recently replaced. Below the building is a concrete pit that extends under the rail line and houses the scale balance mechanism. Inside the building are the scale and digital readout and printing equipment. The facility is currently under lease, and radiological surveys conducted in support of the lease found no evidence of contamination.

The K-712 Fairchild Substation, K-734 Warehouse, and K-735 Warehouse were originally built as support buildings for the S-50 Liquid Thermal Diffusion Plant, which operated from 1944 to 1946. K-712 was the electrical substation and distribution point and was originally designated Bldg. F-04. It housed three 480-V breakers. K-734 was originally designated F-02 and was the pump house that supplied make-up water (to replace evaporated water) to the S-50 process. It contained five pumps with a total capacity of 75,000 gallons per minute (gpm). The K-735 Storage Warehouse was originally designated as F-03 and was the water treatment plant for the S-50 process. The structure was equipped with alum, clay, lime, and phosphate feeders to treat the water. After the termination of the S-50 process in 1946, K-734 and K-735 were used as warehouses. The K-712 substation continued to supply power to Bldgs. K-722, K-723, and K-724.

The S-50 Liquid Thermal Diffusion Plant was a wartime uranium enrichment facility constructed in 1944 adjacent to the Powerhouse buildings (Fig. 4.9) and operated by Fercleve Corporation, which was organized for the sole purpose of operating the plant. Groundbreaking for the facility took place on July 9, 1944, and construction was complete on October 31, 1944. The main process building dimensions were 522 ft long × 62 ft wide × 75 ft high; the building had a concrete floor and foundation, and steel frame sides and roof. Uranium enrichment began on September 16, 1944, before construction was complete. Thermal diffusion operations at S-50 shut down on September 9, 1945. The enrichment process utilized convective flow, whereby the lighter ^{235}U molecules tended to move upward along hot pipe walls while the heavier ^{238}U molecules moved downward along the cold pipe walls. Losses of UF_6 were common during S-50 operations, with UF_6 often escaping into the air or cooling water (MED 1947). Disassembly of the S-50 process equipment was done in the late 1940s, at which time it was removed from the main process building and transported to the K-770 Scrap Yard.

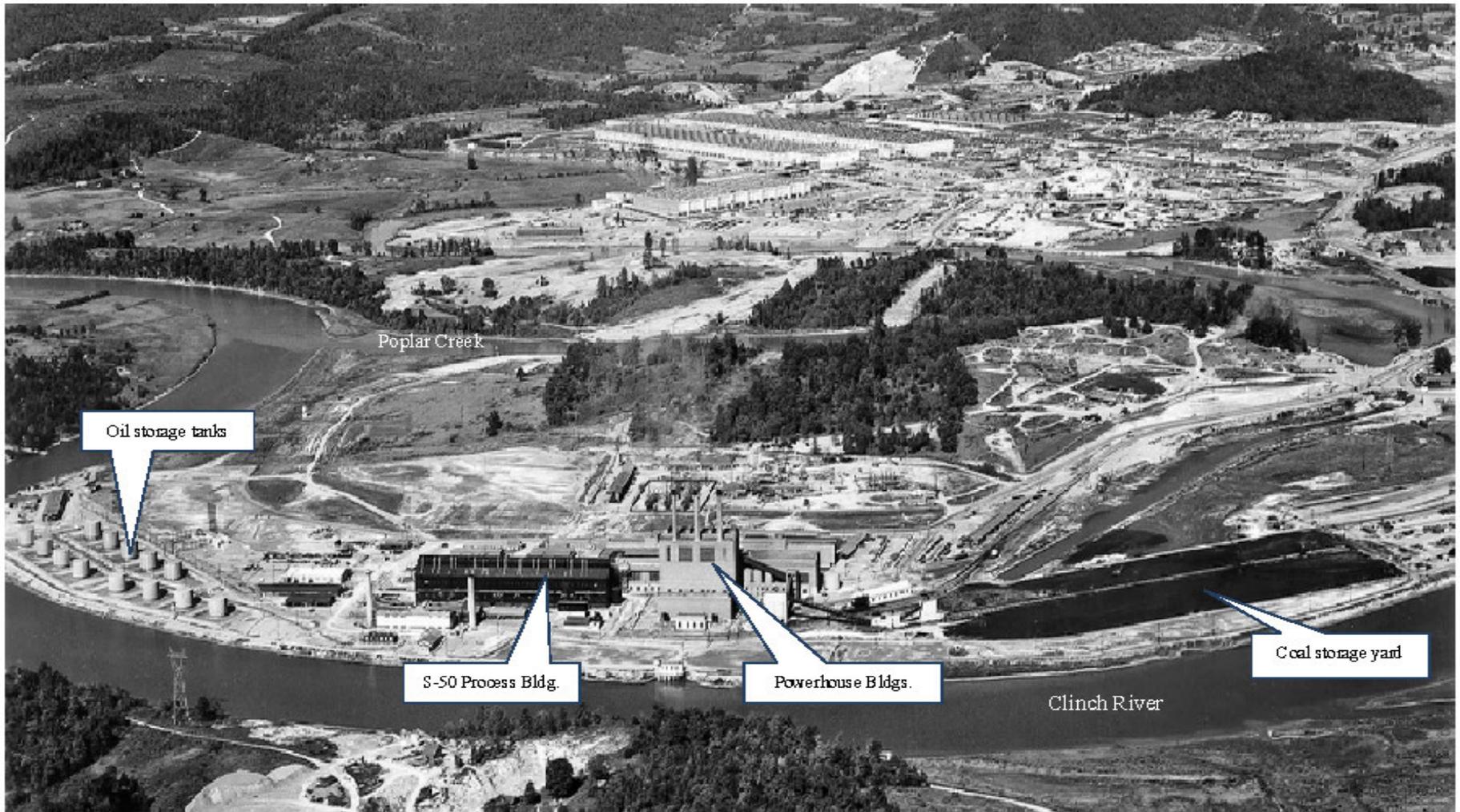


Fig. 4.9. Former Powerhouse Area, circa 1945.

Figure 4.10 shows the S-50 process building (F-01) and associated facilities as they appeared in 1945. The associated facilities included the F-05 building, also known as Laboratory #2, the F-06 Power House facility (K-723), the F-07 Warehouse, and the F-08 building, also known as Laboratory #1. The F-05 Laboratory Burial Ground is listed on the FFA.

The decommissioning of the power-generating facilities occurred in the mid-1960s, and the equipment was removed from Bldgs. K-701 and K-702 (the boiler and turbine buildings) by 1967. All of the auxiliary equipment and buildings were left intact, as were the K-701 and K-702 building skeletons. Figure 4.11 shows the Powerhouse buildings as they were in 1945, and Fig. 4.12 shows the buildings after equipment removal in 1993.

By the 1990s, the Powerhouse buildings had become deteriorated to such a degree that they presented a hazard to anyone entering the buildings. As a result, a decision was made by DOE to demolish these facilities. Before demolition in 1995, an extensive characterization was performed pursuant to agreements reached with TDEC and EPA (*K-25 Site Outdoor Radiological Characterization*, K/HS-620 [Energy Systems 1996a]). Materials that were recyclable were removed, and the structures were torn down. Much of the building material was buried at the site as part of the Powerhouse Complex Demolition Project (*Powerhouse Area Demolition Project Completion Report*, K/ER/MS-8 [Energy Systems 1996b]). TDEC approved the materials that were buried. In February 1998, an NFA determination was signed by the three FFA parties for the demolished Powerhouse structures. Figure 4.13 shows the Former Powerhouse Area after demolition of the Powerhouse buildings.

Following is a list of the major buildings formerly associated with the Powerhouse Area, all of which were demolished in 1995:

| | |
|---|---|
| K-701 Boiler House | K-702 Turbine Room |
| K-703 Fabrication Shop | K-704 Main Switch House |
| K-705-B Crib House | K-706 Pump House |
| K-707 Auxiliary Switch House | K-705-C Breaker House (for breaking coal) |
| K-712 Fairchild Substation | K-715 Water Valve House |
| K-734 Storage Warehouse | K-735 Storage Warehouse |
| K-738 Chlorinator House and Chlorine Cylinder Storage | K-740 Paint House |
| K-739 Storage Shed | |

The K-710 Sewage Treatment Facility has had three different sewage treatment systems operational during its lifetime. The original facility was built in 1943 and contained the K-710-A Lift Station; K-710-B, -F, and -G Sludge Beds; K-710-C Imhoff Tank; and a chlorination unit. In 1974–75, the second system was installed downstream from the K-710 Lift Station. It contained a sludge holding zone, aeration zone, two settling zones, and two new sludge beds. The third and current K-710 system was installed when there was a reduction in personnel at the K-25 Powerhouse Area in the late 1970s. Sewage flow was reduced from 20,000 gallons per day (gpd) to 1200 to 1800 gpd. The current system accommodates 1500 gpd and consists of a 3-in. submersible lift pump, two 900-gal septic tanks connected in series, and an area drain field. When the system was first installed, a sand filter was included between the septic tanks and the drain field. In 1997, a section of the drain field collapsed and had to be replaced. The sand filter was removed in 1998. Portions of the K-710 Area have been leased to CROET in the past.



Fig. 4.10. Fercleve S-50 Liquid Thermal Diffusion Plant, circa 1945.

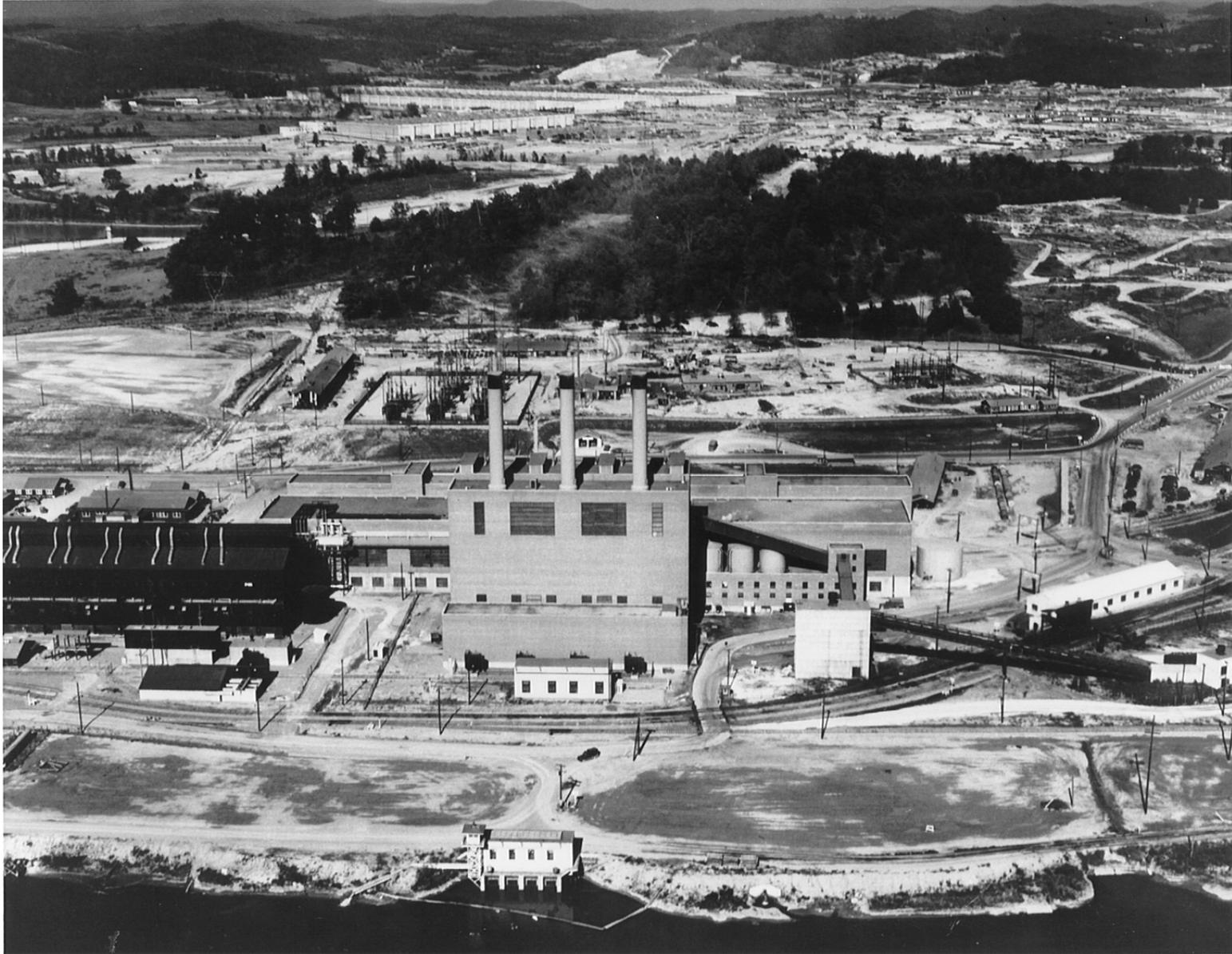


Fig. 4.11. Former Powerhouse Buildings, circa 1945.



Fig. 4.12. Former Powerhouse Buildings, circa 1993.



Fig. 4.13. Former Powerhouse Area from south, circa 1996.

The K-711 Storage Warehouse has been used as a Resource Conservation and Recovery Act of 1976 (RCRA)-permitted storage unit since 1992. It also houses a PCBs storage area. K-711 is listed in Appendix C of the FFA and as a SWMU. On April 10, 1991, a spill was discovered in K-711 due to the rupture of a drum containing perchloroethylene and PCBs. The spill was in a diked storage area and was contained. Empty B-25 boxes were stored outside in a fenced radiological material storage area south of K-711. All waste materials were disposed prior to building demolition, which was completed in 2006.

The EUs in this EU Group have been evaluated under the DVS and the soils and remaining infrastructure have been found to meet the requirements of the Zone 1 Interim ROD.

Duct Island

The Duct Island Tract is located in the western portion of the ETTP. This area of the plant was predominately used for service buildings, disposal sites, and storage areas. As discussed in Chap. 3, a portion of the land area in this geographic area has been impacted by site operations, including the construction of buildings, roads, parking lots, and sidewalks. Following is a discussion of the EUs that comprise the Duct Island Parcel.

Duct Island South EU Group (Z1-36, Z1-37, and Z1-38)

EUs Z1-36, Z1-37, and Z1-38 are located in the southern most area of the Duct Island tract. These EUs are comprised predominately of undeveloped wooded areas and grassland. A utility easement exists through the central portion of EUs Z1-37 and Z1-38 where power lines occur trending west–southwest to east–northeast across the tract. No other improvements within the EU have been identified based upon available documentation. There are no FFA sites located within these EUs.

Although available documentation does not identify any other development, contaminated soils were identified during the DVS investigation phase in EU Z1-38. The contaminated soils were removed under a remedial action. Approximately 130 yd³ of soils that were found in piles within the EU were removed and disposed.

These EUs have been evaluated under the DVS and the soils have been found to meet the requirements of the Zone 1 Interim ROD and have received approval for NFA. No CERCLA remedial actions were necessary in this EU Group.

K-1070-F EU Group (Z1-39, Z1-40, Z1-41, Z1-42, Z1-43, and Z1-44)

EUs Z1-39, Z1-40, Z1-41, Z1-42, Z1-43, and Z1-44 are located in the central portion of the Duct Island Tract. EUs Z1-39 and Z1-40 consist of primarily undeveloped wooded and grassy areas. Underground utility ducts, which trend roughly east/west, are located within the southern portion of these EUs. Surface improvements include a road for access and the K-716 Poplar Creek Water Sample Pier. The FFA sites located within these EUs include:

- K-1070-F Construction Spoil Area (EUs Z1-39, Z1-41, and Z1-42);
- K-900 Bottle Smasher (EU Z1-41);
- Duct Island Road (EUs Z1-39 to Z1-44); and
- Duct Island Study Area (EUs Z1-43 and Z1-44).

Two separate areas totaling about 0.55 acre in EU Z1-40 were covered with 2 ft of soil as part of a voluntary action to protect terrestrial species from minor areas of elevated levels of contamination. Subsequent evaluation has determined that a potential threat to ecological resources is possible if the soil

covers erode, and additional soil removal is planned under the Zone 1 Final ROD to address these two areas.

EU Z1-41 consists of primarily wooded and grassy areas. The K-1070-F Construction Spoil Area, where historical disposal of construction debris and wastes occurred in the 1970s (MMES 1988), is located within this EU. Excess spoil dirt from construction of the K-1066-K Cylinder Yard was utilized in 1984 and landscaped with grass and trees. The K-900 Bottle Smasher, a former RCRA interim status treatment unit, used in the thermal treatment of certain wastes was located within the EU along the border of the K-1070-F site. The bottle smasher was closed in 1993 under an approved closure plan (MMES 1994). Soils beneath the unit were deferred to CERCLA as part of the closure efforts. Additional surface improvements include an access road.

EUs Z1-42 and Z1-43 also consist of primarily wooded and grassy areas. A portion of the K-1070-F Construction Spoil Area is located within these EUs. K-1070-F was used from the early 1970s to 1978 and received a variety of construction debris including concrete, roofing scrap, soil, asphalt, building materials, transite panels, cross ties, skids and pallets, glass, paper, and Fuller's Earth filter compound. Excess spoil dirt from construction of the K-1066-K Cylinder Yard was utilized in 1984 as cover material and landscaped with grass and trees. Additional surface improvements include an access road and power line easements that trend generally north/south across the EUs.

EU Z1-44 extends the width of the tract to the banks of Poplar Creek on the east and Clinch River on the west of Duct Island. The EU consists primarily of undeveloped wooded and grassy areas. Large portions of this EU were deforested and exhibit several areas where test pits have been dug for a soil borrow site. Surface improvements include an access road and power line easement that extends across the EU in a north/south configuration.

Duct Island Road was designated an FFA site based on the spraying of mineral oil on the road for dust suppression in 1982. However, subsequent evaluation of the mineral oil used indicated that the road posed no risk to human health or the environment (Energy Systems 1995). The Duct Island Study Area appears to have been strictly a borrow area for soils, and historical records reviews indicate that there is no evidence of backfilling or disposal at this site located in EUs Z1-43 and Z1-44.

These EUs have been evaluated under the DVS and the soils have been found to meet the requirements of the Zone 1 Interim ROD and have received approval for NFA. However, additional soil actions to address potential ecological risk from soils are planned in two small areas of EU Z1-40.

K-901-A South EU Group (Z1-45, Z1-46, and Z1-47)

EU Z1-45, Z1-46, and Z1-47 are located in the northern portion of the Duct Island tract. These EUs consist primarily of undeveloped wooded and grassy areas. Surface improvements include an access road and power line easements that extend across the EUs in a north/south configuration. There is one FFA site located within this EU Group: the K-901-A South Disposal Area (EU Z1-47).

EU Z1-46 also consists primarily of undeveloped wooded and grassy areas. Two areas have been developed within the EU and include the K-901 Recirculating Cooling Water (RCW) intake located on the western boundary of the EU on the banks of the Clinch River, and the K-700-A-45 Substation located in the central portion of the EU. Additional surface improvements include an access road known as Gilliam Road.

EU Z1-47 consists primarily of undeveloped wooded and grassy areas, but is also the location of the K-901 South disposal area where waste disposal operations were conducted. Surface improvements

include an access road. The K-901 South Disposal Area was used from the 1950s to the mid-1970s for disposal of materials from building demolition and trash from general plant cleanup activities.

In addition to the above activities, two cemeteries (Gallaher and Welcker) are located in the southeastern portion of EU Z1-13 (see Appendix B). Access to the cemeteries is by gravel road turning northeast from Powerhouse Road. Although the cemeteries are included in the transfer, they are protected under the laws of the state of Tennessee.

These EUs have been evaluated under the DVS and the soils have been found to meet the requirements of the Zone 1 Interim ROD and have received approval for NFA. No CERCLA remedial actions were necessary in this EU Group.

Non-Impacted Land

K-1251 Barge Facility

The K-1251 Barge Unloading Facility, located south of Highway 58, was constructed in 1952 and began operations in 1953. The barge facility was used to unload barges carrying uranium hexafluoride (UF₆) cylinders on the Clinch River. The cylinders were stored in an area adjacent to the riverbank. Although UF₆ cylinders were transferred at the facility, historical information does not indicate that any releases occurred. Included as part of the facilities were a 383-ft² metal building and a large crane. The facility was removed from operation in the early 1990s. The equipment was removed and the 383-ft² metal building was dismantled in 1995. This tract of land is currently vacant (Fig. 4.14).



Fig. 4.14. Aerial photograph of the K-1251 Barge Facility (circa 1998).

4.2 PAST AND PRESENT ACTIVITIES FOR THE ADJACENT PROPERTY

The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint and adjacent areas are located within the bounds of ETTP. The nearest non-DOE property is the Clinch River, which bounds the transfer footprint to the south and west, Poplar Creek, which bounds Duct Island and the eastern portion of the Powerhouse Area, and Highway 58 on the southern side of the transfer footprint. There is no indication that activities from these non-DOE areas would have contributed any contamination to the area to be transferred.

To the north of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is an area commonly referred to as the K-901 Area. The primary activities known to have occurred in the K-901 area are discharges to the K-901 Pond from water treatment facilities and disposal of waste materials at the K-901 North Disposal Area, the K-1070-A Landfarm, and the K-1070-A Burial Ground).

As previously stated, the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area footprint is bounded to the west and southwest by the Clinch River. The area immediately across the river from the transfer footprint includes the Rarity Ridge development, which consists of single-family housing with parks and walking trails, swimming pools, and a town center for shops.

The K-1007-P1 Pond, which is located within the transfer footprint, but is not included in the transfer, was formed in the 1944–1945 time frame by the construction of Burchfield Road and a weir across a backwater of Poplar Creek. The pond received a mix of natural runoff and effluent from laboratory drains through the storm drain system. Although various organic compounds, metals, and radionuclides are detected in sediment and fish in the pond, the greatest threat to human health and the environment was determined to be due to the presence of PCBs in fish. A non-time critical removal action to enhance the ecological conditions of the pond began in 2009. The removal action consisted of draining the pond, modifying the weir, removing the fish, backfilling and contouring the bank of the pond, establishing vegetation within the riparian zone, and stocking the pond with desirable fish. Completion of the removal action is documented in the *Removal Action Report for the Ponds at the East Tennessee Technology Park* [DOE/OR/01-2456&D1/R1 (DOE 2011e)].

Monitoring is conducted at the K-1007-P1 Pond to ensure that the ecological enhancement measures have been implemented as intended. The ecological information obtained is used to evaluate whether modifications are needed to attain the desired end state—i.e., a heavily vegetated, clear water pond dominated by sunfish with significantly diminished, or at least downwardly trending, PCB levels. So far, data suggest that the desired water quality, plant community, and wildlife manipulations are progressing well toward the desired end state (Fig. 4.15). It may take a number of years for the pond conditions to stabilize such that the success or failure of the remedy is fully determined. Land use restrictions associated with the pond, including mowing, stocking with fish, and other related restrictions, will remain the responsibility of DOE.

Land parcels ED-5 East and ED-5 West, which have both been transferred under CDR, are located adjacent to the eastern portion of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area (see Fig. 3.1). ED-5 East is bounded by South Perimeter Road to the north, Europia Avenue to the west and south, and Meritus Avenue to the east. The ED-5 East and West areas were used to house construction and maintenance facilities that supported construction of the process buildings until construction was completed, at which time the support buildings, construction-related materials, and salvage materials were removed and the areas were graded and seeded. ED-5 West has remained a grassy field since the late 1950s, and ED-5 East is occupied by two speculative buildings, one of which is occupied by an engineering and consulting business.



Fig. 4.15. Aerial photo of the K-1007-P1 Pond showing plant coverage in 2012.

Land parcel ED-7, which has been transferred under a regulator-approved CPD, is located adjacent to the southern side of the ETRC lease area (see Fig. 3.1). The CPD was approved based on the fact that no evidence was found that hazardous substances were released or disposed of on the property that would preclude its identification as an uncontaminated parcel.

Land parcel ED-8 is located adjacent to the eastern boundary of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint. This parcel received regulator approval for transfer under a CDR in August 2009 and has been transferred. In addition, a portion of Europa Avenue located between Parcels ED-5 East and ED-5 West (see Fig. 3.1) received regulator approval for transfer under CDR in August 2010 and has been transferred.

The land immediately south of Highway 58 consists of undeveloped woodlands occupying Pine Ridge and the ETPP Visitor's Overlook. The adjacent property to the east of the K-1251 Barge Facility was addressed in the West Pine Ridge Study Area under DOE's Footprint Reduction Program (DOE 1997). The West Pine Ridge Study Area has an approved No Further Investigation determination based on the findings that no public health concern should arise because of past and present federal activities within the West Pine Ridge Study Area. Historical ETPP site maps dating back to the 1940s show no other development in this area of Pine Ridge.

4.3 HYDROGEOLOGIC ENVIRONMENT

The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is underlain by bedrock of the Rome Formation and the Chickamauga Group (Lemiski 1994) [see Fig. 4.16]. The Rome Formation has been placed over rocks of the Chickamauga Group by the Whiteoak Mountain Fault. This regional thrust fault transects the southern portion of the area (Fig. 4.16). The lower part of the Rome Formation, which is poorly exposed in the ETPP area, generally consists of thin-bedded shale and siltstone with interbedded sandstones in variegated colors of maroon, green, and yellow-brown. The upper Rome

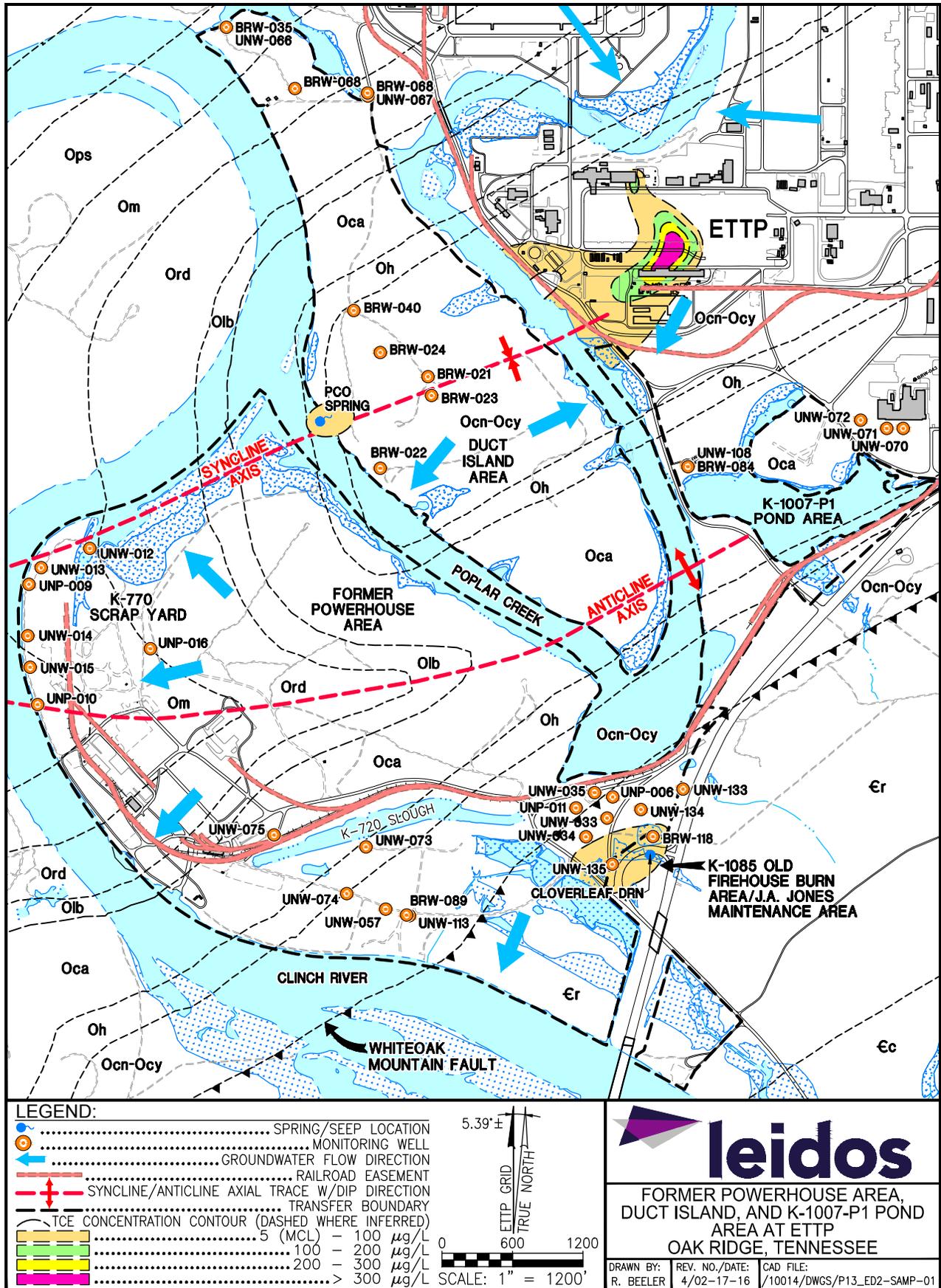


Fig. 4.16. Hydrogeology of the Former Powerhouse Area.

consists of maroon sandstone, siltstone, and shale. The shales are thin bedded and may be olive-green, light-brown, green-gray, or maroon in color. Greenish-gray, yellowish-gray, light-brown, and olive-gray siltstones and sandstones are interbedded with the maroon sandstones. In situ weathering of the Rome Formation yields saprolite consisting of weathered shale or siltstone, which commonly becomes more competent with depth. Available exposures of the weathered Rome Formation in the bank of Poplar Creek reveal highly fractured, folded, and contorted bedding with widely ranging orientations.

The Chickamauga Group formations underlying the northern two-thirds of the transfer footprint include, from oldest to youngest, the Pond Spring Formation, the Murfreesboro Limestone, the Ridley Limestone, the Lebanon Limestone, the Carters Limestone, the Hermitage Formation, the Cannon Limestone, and the Catheys Formation. These units comprise a sequence of interbedded shale and limestone with an average thickness of over 2000 ft in the ETPP area. The following description of the Chickamauga Group formations is taken from Lemiszki (1994).

The Pond Spring Formation (Fig. 4.16 symbol Ops) consists of calcareous shales and argillaceous limestones. The lower and upper parts of the formation consist of maroon, green, and gray argillaceous limestone. Bedding ranges from thin to medium, even, regular beds to mottled, uneven beds. Interbedded with the limestones are thick, irregularly bedded, calcareous shales that are grayish-green and red. Within the middle part of the Pond Spring is a thick- to massive-bedded, dark-gray, micritic limestone with bed-parallel gray chert pods.

The lower part of the Murfreesboro Limestone (Fig. 4.16 symbol Om) consists primarily of micritic and fine-grained crystalline limestone. The limestones are usually thin bedded, although very thick to massive beds do occur in the section. Minor amounts of calcareous shale and argillaceous limestone also exist in the lower part. The middle part of the Murfreesboro consists of similar micritic and fine-grained limestones, but beds are commonly thin to medium, regular, and even. Bryozoans are the only fossils that have been observed in the middle part, and bed-parallel, ropy, black chert zones increase in abundance. Thick to massive beds interbedded with even, thin to medium beds become more common in the upper part of the Murfreesboro, but they are not as abundant as in the overlying Ridley Limestone.

Thick- to massively bedded, fucoidal-textured limestone is characteristic of the Ridley Limestone (Fig. 4.16 symbol Ord). “Fucoidal texture” is a term used to describe the presence of tan-brown, irregularly shaped, fine- to coarse-grained dolomitic patches within the limestone. The limestones are generally dark-gray micrite that are commonly devoid of fossils. Within the middle part of the Ridley is a yellowish-red, mud-cracked, calcareous shale, and in the upper part, minor amounts of gray-black chert are present, and fossils are very abundant in some coarse-grained limestone beds.

A distinctive characteristic of the Lebanon Limestone (Fig. 4.16 symbol Olb) is the abundance of fossils. Bedding in the Lebanon ranges from regular and even, thin to medium beds, to irregular, cobbly beds. Cobbles are more pronounced after the beds have been extensively weathered and are elongated, micritic- to coarse-grained limestone lenses, parallel to bedding, that are surrounded by thin laminae of calcareous mud. Some thick to massive limestone beds also occur in the Lebanon. Fucoidal texture is common. Chert is rare.

The lower part of the Carters Limestone (Fig. 4.16 symbol Oca) consists of thick to massive beds of interbedded micritic- and coarse-grained limestone. Chert in the lower part consists of gray-black pods and lenses. Where outcrops are absent, chert blocks are relatively abundant in the residuum. The top of the lower part consists of olive-gray, argillaceous limestone that is mud-cracked and devoid of fossils and weathers into thin chips. The middle part of the Carters Limestone consists of medium to thick, regular- and even-bedded, blue-gray limestone. Fossil hash beds commonly have *Tetradium* coral.

Fucoidal texture and gray chert pods are also common. At the top of the middle part are two apple green, sometimes partly maroon, metabentonite beds that range from 1ft to 3 ft in thickness. Although exposures of the metabentonites were not found in the ETTP area, they have been observed along strike toward the southwest and northeast. The upper part of the Carters is poorly exposed but consists of micritic, greenish-gray and yellowish-gray, poorly bedded, mud-cracked limestone.

The Hermitage Formation (Fig. 4.16 symbol Oh) limestones consist of thin to medium, irregular, uneven, cobbly beds that are abundantly fossiliferous. Fossils are commonly silicified and include crinoids, brachiopods, and bryozoans. Limestones range from light-gray to slightly reddish-gray, coarse-grained spar and micrite that can be partly argillaceous. A maroon, olive-tan, calcareous shale has been observed near the base of the unit.

The Cannon Limestone (Fig. 4.16 symbol Ocn) is poorly exposed and may exist only within the minor syncline in the middle of the ETTP. Limestones in the Cannon are commonly dark-gray, thick to massive beds, but thin and medium beds also occur. Fossils range from rare to a coquina consisting of crinoids, bryozoans, and brachiopods. Chert and fucoidal texture is rare, but stylolites are common and produce ridges on weathered outcrops.

The Catheys Formation (Fig. 4.16 symbol Ocy) is also poorly exposed, but commonly consists of medium to dark-gray, thin- to thick-bedded, micrite and occasionally coarse-grained limestone with shale seams and partings. Some beds are very fossiliferous. Near the upper part are interbedded calcareous, green and red shales. Chert and siltstone fragments are common in soil. Due to the poor exposures, Lemiszki (1994) mapped the Cannon and Catheys Formations as a single unit.

Solutionally enlarged fractures, joints, and bedding planes are common in exposures of Chickamauga rocks in the vicinity of ETTP. Pre-construction topographic maps indicate the presence of several sinkholes throughout the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area (DOE 1996).

Structurally, these formations have been folded into a syncline (convex downward fold)/anticline (convex upward fold) pair with the axis of the syncline trending east to west across the northern end of the Powerhouse Area and the middle portion of Duct Island. The axis of the anticline trends northeast to northwest across the middle portion of the Powerhouse Area and the southern end of Duct Island. Bedding in the Chickamauga generally dips to the north on the south side of the syncline axis and to the south on the north side of the syncline axis. Bedding generally dips northeastward on the north side of the anticline axis and southwestward on the south side of the anticline axis (see Fig. 4.16).

Hydrogeologic characterization data for the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area are based on unconsolidated zone and bedrock monitoring wells that have been installed within the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area footprint. These wells include UNP-006, UNP-009, UNP-010, UNP-011, UNP-016, UNW-012, UNW-013, UNW-014, UNW-15, UNW-033, UNW-034, UNW-035, UNW-057, UNW-066, UNW-067, UNW-073, UNW-074, UNW-075, UNW-113, UNW-133, UNW-134, UNW-135, BRW-021, BRW-022, BRW-023, BRW-024, BRW-034, BRW-035, BRW-040, BRW-066, BRW-089, and BRW-118. Five of these monitoring wells (UNP-016, UNW-014, UNW-075, UNW-113, and BRW-089) were plugged and abandoned in 2011 under the Zone 1 ROD remedial activities due to questionable well construction integrity, or the long-term absence of contamination. In addition, five wells including one bedrock monitoring well and four unconsolidated zone monitoring wells (UNW-070, UNW-071, UNW-072, UNW-108, and BRW-084) have been located adjacent to and upgradient of the eastern portion of the footprint in the vicinity of the K-1007-P1 Pond (Fig. 4.16). Of these wells, UNW-071 and UNW-072 have been plugged and abandoned due to the general absence of contamination in these wells.

Although some wells in these areas have been plugged and abandoned, additional wells exist to provide sufficient groundwater monitoring data for these areas. The general depth to bedrock is expected to be from 25 ft to 50 ft bgs based on the drilling logs for the wells within the transfer footprint. The depth to groundwater is expected to range from 4 ft bgs near the banks of the Clinch River and Poplar Creek, to as much as 40 ft bgs in the higher topographic areas.

The water table at ETPP generally mimics topography with shallow groundwater flowing from higher topographic areas to the surrounding surface water bodies. Groundwater flow through bedrock is primarily controlled by fractures, bedding planes, and hydraulic gradient, and specific flowpaths are difficult to discern. A groundwater divide runs generally north to south along the ridgecrest located near the center of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area. This divide directs shallow groundwater flow in a general radial pattern toward the Clinch River and Poplar Creek. Because these water bodies represent local base level for groundwater, constituents transported by shallow groundwater are discharged to Poplar Creek or the Clinch River after following relatively short flow paths.

A groundwater plume has been mapped within the portion of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area underlain by Rome Formation bedrock (K-1085 Old Firehouse Burn/J. A. Jones Maintenance Areas) and north of the K-1007-P1 Pond (Fig. 4.16). Potential groundwater problems have also been identified in other areas within the transfer footprint including the western side of Duct Island, the K-720 Fly Ash Pile area, and the K-770 Scrap Yard Area. These areas are discussed separately below.

Groundwater data indicate the presence of volatile organic compounds (VOCs) in shallow groundwater beneath the K-1085 Old Firehouse Burn/J. A. Jones Maintenance Areas in the southeastern portion of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area (Fig. 4.16). The groundwater contamination identified beneath the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is primarily found in the unconsolidated zone above bedrock, with significantly lower concentrations of VOCs present in the underlying bedrock. The VOCs that have been detected above the federal and state drinking water maximum contaminant level (MCL) in this plume include *cis*-1,2-dichloroethene (DCE); trichloroethene (TCE); and vinyl chloride (VC).

VOCs have consistently been detected at Spring 247 located in the K-1085 Old Firehouse Burn/J. A. Jones Maintenance Areas (Fig. 4.16). These former facilities were located upgradient of the spring and are suspected sources of the VOCs. Spring 247 has been sampled periodically since 1998 (Fig. 4.16). The maximum concentration of TCE has been detected at well UNW-135 located west of the K-1085 Area. A TCE concentration of 340 micrograms per liter ($\mu\text{g/L}$), well above the drinking water MCL of 5 $\mu\text{g/L}$, was detected in samples collected in 2011 at this location. The concentration of *cis*-1,2-DCE detected at UNW-135 was 170 $\mu\text{g/L}$ in the same sample, which exceeds the MCL of 70 $\mu\text{g/L}$. The maximum concentration of *cis*-1,2-DCE was 250 $\mu\text{g/L}$ in the sample collected from Spring 247 located north of well UNW-135. Spring 247 also contained 5 $\mu\text{g/L}$ of VC. A sample collected from a seep (Cloverleaf Dm) located approximately 250 ft east of well UNW-135 (Fig. 4.16) contained the maximum detected VC concentration of 9 $\mu\text{g/L}$. These results compare to the MCL of 2 $\mu\text{g/L}$ for VC. The VOCs 1,1-DCE; 1,1,1-trichloroethane (TCA); carbon tetrachloride; chloroform; and tetrachloroethene (PCE) have also been detected in groundwater in the K-1085 Area at concentrations below the drinking water MCLs for these compounds. The presence of the degradation daughter products may indicate that biodegradation of the parent compounds (PCE and TCE) is occurring in groundwater in this area. TCE concentrations at Spring 247 have decreased from 30 $\mu\text{g/L}$ to 9.1 $\mu\text{g/L}$ in 2011. Concentrations of *cis*-1,2-DCE have increased from 147 $\mu\text{g/L}$ in 2003 to 250 $\mu\text{g/L}$ in 2011. These concentrations of

cis-1,2-DCE exceed the federal and state drinking water MCL of 70 µg/L. VC was detected at a concentration of 4.8 µg/L in 2011, which is slightly above the MCL of 2 µg/L. Other VOC compounds detected in 1998 (PCE and carbon tetrachloride) have been non-detects in subsequent samples collected from the spring.

VOCs have also been detected in shallow groundwater in the vicinity of the K-1007-P1 Pond. This plume primarily consists of TCE with concentrations exceeding the MCL extending from Bldg. K-27 to Poplar Creek (Fig. 4.16). Historical concentrations of TCE greater than 1000 µg/L have been detected beneath Bldg. K-27 (*Final Sitewide Remedial Investigation and Feasibility Study for East Tennessee Technology Park, Oak Ridge, Tennessee*, DOE/OR-01-2279&D3 [DOE 2007b]). The source for the TCE plume in the K-27 area of the Heritage Center is uncertain. The potential southern extent of the plume into the transfer footprint is also uncertain due to the absence of monitoring wells in that area. The southern extent of the plume has been inferred based on available data from wells located north of the transfer footprint boundary.

Releases of ⁹⁹Tc during demolition of the K-25 Building resulted in ⁹⁹Tc contamination reaching groundwater in the vicinity of the former building. Although ⁹⁹Tc contamination has migrated to the south, this movement is largely related to migration along the abandoned electrical duct banks, and the primary movement within groundwater is generally to the north. Concentrations of ⁹⁹Tc in groundwater exceeding the MCL of 900 picocuries per liter (pCi/L) have not been detected in the vicinity of the transfer footprint.

A groundwater plume has not been mapped within the Duct Island study area; however, TCE has consistently been detected at the PCO Spring located on the southwest bank of Poplar Creek (Fig. 4.16). The K-1070-F Old Contractor's Burial Ground, located upgradient of the spring, is a suspected source of the TCE. In addition, liquid wastes were handled at the K-900 Bottle Smasher, which was co-located with the burial ground. TCE is the only VOC that has been detected above the federal and state drinking water MCL in the Duct Island study area. However, historically *cis*-1,2-DCE; 1,1,1-TCA; and PCE have been reported on rare occasions at low estimated concentrations, ranging from 0.1 to 12 µg/L. TCE concentrations at the PCO Spring have ranged from 9 to 43 µg/L from 2000 to 2010.

The K-720 Fly Ash Pile is located adjacent to the southern portion of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area between the K-720 Slough and the Clinch River (Fig. 4.16). Based on the groundwater sampling results from six groundwater monitoring wells, antimony, arsenic, cadmium, chromium, lead, selenium, and thallium have been observed historically to exceed their respective MCLs (Table 4.1). Groundwater samples collected in 2011 indicate that only chromium in an unfiltered sample exceeded the MCL of 0.1 milligram per liter (mg/L) in well UNW-075. However, although this well is included with the K-720 Fly Ash Pile monitoring network, based on the anticipated groundwater flow conditions, it appears likely that this well is located upgradient, or at least side-gradient, to the fly ash pile and would not be representative of groundwater quality impacts originating from the fly ash pile. The MCL exceedance for lead in 2009 at well UNW-057 (the most recent sample for this well) also occurred in an unfiltered sample, and in the corresponding filtered sample, lead was not detected. Therefore, based on the most recent data for filtered groundwater samples in the K-720 Fly Ash Pile area, there are currently no impacts to groundwater from metals in this area.

The principal mechanism of contaminant transport at the adjacent K-720 Fly Ash Pile is infiltration through the fly ash and unsaturated soils that causes contaminants to leach from these materials into the groundwater, or by direct contact of the water table with the contaminated soil mass, thereby leaching contaminants from the soils to groundwater. Low pH levels in groundwater in this area, produced from

Table 4.1. Groundwater concentrations of metals exceeding MCLs at the K-720 Fly Ash Pile, 1994–2011

| Analyte | Location | Maximum concentration (mg/L) | Maximum concentration sample date | Latest concentration (mg/L) | Last sample date | MCL ^a (mg/L) | Last sample exceeds MCL? ^b |
|----------|----------|------------------------------|-----------------------------------|-----------------------------|------------------|-------------------------|---------------------------------------|
| Antimony | UNW-073 | 0.0887 | 9/29/1994 | 0.003 U | 9/09/2009 | 0.006 | No |
| Arsenic | UNW-057 | 0.0423/0.005 U ^c | 9/08/2009 | 0.0423/0.005 U ^c | 9/08/2009 | 0.01 | Yes/No ^c |
| | UNW-073 | 0.159 | 9/29/1994 | 0.005 U | 9/09/2009 | | No |
| Cadmium | UNW-057 | 0.0067 | 9/28/1994 | 0.000252 | 9/08/2009 | 0.005 | No |
| | UNW-073 | 0.0102 | 9/29/1994 | 0.000636 | 9/09/2009 | | No |
| | UNW-074 | 0.0176 | 9/29/1994 | 0.00048 | 1/25/2011 | | No |
| Chromium | UNW-075 | 0.18/0.013 ^c | 1/24/2011 | 0.18/0.013 ^c | 1/24/2011 | 0.1 | Yes/No ^c |
| Lead | UNW-057 | 0.0549/0.002 U ^c | 9/08/2009 | 0.0549/0.002 U ^c | 9/08/2009 | 0.015 | Yes/No ^c |
| Selenium | UNW-057 | 0.0739 | 9/28/1994 | 0.0025 U | 9/09/2009 | 0.05 | No |
| Selenium | UNW-074 | 0.076 | 9/29/1994 | 0.0038 | 1/25/2011 | | No |
| Thallium | BRW-089 | 0.0044 | 5/20/1998 | 0.001 U | 1/25/2011 | 0.002 | No |
| Thallium | UNW-057 | 0.0623 | 6/2/1998 | 0.001 U | 9/09/2009 | | No |
| Thallium | UNW-074 | 0.0207 | 9/21/1995 | 0.001 U | 1/25/2011 | | No |
| Thallium | UNW-113 | 0.0075 | 9/21/1995 | 0.001 U | 1/25/2011 | | No |

^a Value represents EPA or state of Tennessee drinking water MCL.

^b Based on most recent sampling event at each well.

^c Represents filtered sample result.

EPA = U.S. Environmental Protection Agency.

MCL = maximum contaminant level.

U = analyte not detected above the indicated quantitation level.

reaction with the fly ash and residual coal materials, serve to increase the leachability of metals from the surrounding soil. Groundwater modeling performed for the fly ash pile (DOE 2011a) indicated that none of these metals that are leaching to the water table would migrate to the downgradient receptor location (Clinch River). The contaminants are expected to naturally attenuate in the groundwater system through chemical immobilization, advection, adsorption, and dispersion.

The K-770 Scrap Yard is located adjacent to the transfer footprint in the northwestern portion of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area. Groundwater monitoring is conducted at wells UNW-013 and UNW-015 to assess radiological groundwater contamination adjacent to the Clinch River (Fig. 4.16). Historical analytical results indicate that the gross alpha activity at well UNW-015 has periodically exceeded the MCL of 15 pCi/L. However, the results for the semiannual sampling events in 2013 and 2014 have all been below the MCL with results ranging from 3.7 to 11.3 pCi/L. Well UNW-013 historically contained ⁹⁹Tc, which is a strong beta-emitting radionuclide and is likely responsible for the elevated gross beta activity in that well. Beta activity fluctuates in well UNW-013 and was detected at 21 and 57 pCi/L in FY 2014. This compares to the EPA guidance level of 50 pCi/L for beta activity in drinking water supplies. It is suspected that the scrap materials historically stored in this area are the source of the ⁹⁹Tc in groundwater. An evaluation of ⁹⁹Tc and groundwater chemistry at ETTP indicates that this radionuclide is very mobile in ETTP groundwater. The high ⁹⁹Tc mobility coupled with the low hydraulic gradient and tidal-like effects of river fluctuations in this area likely contribute to the long-lived occurrence of the elevated beta activity in groundwater.

The presence of VOCs, metals, and radioactivity in groundwater beneath the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area footprint is considered to represent a release of hazardous substances to the proposed transfer footprint. A decision on groundwater remediation will be made in the ETPP Final Sitewide ROD.

It is possible for groundwater to serve as a secondary source of contamination to soils depending on the chemical conditions in the subsurface. VOCs have been detected sporadically in soil samples from the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area at low concentrations. Additionally, there is uncertainty concerning groundwater flow paths due to the karst conditions in the Chickamauga Group bedrock underlying the majority of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area footprint. Since the remedial investigation for groundwater and soil gas at the Heritage Center is incomplete, and since there are uncertainties associated with the available data, further evaluation is necessary to confirm that a vapor intrusion threat does not exist in the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area footprint.

5. RESULTS OF VISUAL AND PHYSICAL INSPECTIONS

5.1 VISUAL AND PHYSICAL INSPECTIONS OF THE PROPERTY FOR TRANSFER

A visual and physical inspection of the property was conducted on March 25, 2015, by URS | CH2M Oak Ridge LLC (UCOR) and Leidos. The Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area was generally either grass-covered or forested with a mix of deciduous and evergreen trees. The Powerhouse Area also contains numerous roads, concrete pads, and paved surfaces (see Figs. 5.1 through 5.4). Forested areas are primarily located along the eastern portion of the Powerhouse peninsula area. The Duct Island tract is mostly forested except for areas that have been cleared for roads and power line corridors, which are generally grass- and scrub-covered. Due to its location between the former Powerhouse Area and the electrical switchyards for the former gaseous diffusion operations at the Heritage Center, the study area is crisscrossed with multiple overhead and underground electrical power transmission lines. A large portion of the transmission line corridor that parallels Poplar Creek along the eastern portion of Duct Island is used for the cultivation of switchgrass for use as a biofuel. Switchgrass is also being cultivated over the western portion of the underground duct bank corridor.

The Former Powerhouse Area peninsula is accessed from the east by Highway 58 and Powerhouse Road. Bear Creek Road provides access to the barge facility in the southern undeveloped tract. A portion of the facility fence still exists at what was Portal 10 that controlled entry into the Powerhouse Area proper. Both improved (paved) and unimproved (gravel) roads crisscross the area. Due to its historical use for electrical power operations, several high-voltage (13.8-kV and 161-kV) overhead electric transmission lines traverse the area. As mentioned above, numerous concrete pads, support pedestals, and building remnants remain scattered throughout the area (see Figs. 5.2 and 5.3). Valve vaults for various water supply and sewer lines are also present in some areas (Fig. 5.4). Storm drains traverse some areas of the Property and discharge storm water runoff to the Clinch River. These storm drain outfalls are maintained and monitored under the ETTP NPDES permit (TN0002950).

The Duct Island tract of the transfer footprint can only be accessed by road from the northeast corner via Gilliam Road, which turns west off of Perimeter Road. Access to Gilliam Road is controlled through a locked bar gate. Gilliam Road is a paved road that leads to the K-901 Pumphouse water intake located on the eastern bank of the Clinch River (Fig. 5.5). The Duct Island Patrol Road, a gravel road (Fig. 5.6), turns south off of Gilliam Road near the southern terminus of the K-901-A Pond. The Duct Island study area is primarily a peninsula of land bounded by a large bend made by Poplar Creek. The northern portion of the study area is bounded by the Clinch River on the west and the K-901-A Pond and Poplar Creek on the east. Due to the isolated and remote nature caused by the surrounding water, little activity related to historical operations at the Heritage Center has occurred in the study area. The exceptions are the K-901 South Waste Disposal Area and the K-1070-F Construction Spoil Area. Both of these facilities are clearly designated by signs along the existing roads. Both of these facilities were primarily used for disposal of construction debris. With the exception of a raised grass-covered area at K-1070-F, there is little visual indication of these facilities at the surface.

The Oak Ridge Forest Products is the only active operation working within the Powerhouse Area peninsula currently (see Figs. 5.7 through 5.9). DOE currently uses Bldg. K-1313-F to store water-reactive materials. As mentioned previously, Bldg. K-1313-F is within the transfer footprint but is not included as part of the property transfer; K-1313-F will not be transferred until the stored materials have been removed and the building determined to be appropriate for transfer. This building is visible in the background of Fig. 5.7. Railcars are stored on segments of the railroad easement that is excluded from

the transfer footprint at various times, and some were present on the southern rail during the site visit. No operations or equipment were observed outside the fenced areas of the Powerhouse Area.

A sign located near the fence delineating the northern boundary of EU Z1-27 (see Fig. 1.3) marks the location of the former Fercleve F-29 Gas Station (Fig. 5.10). Although the sign and possibly partial remnants of the former gas station are in EU Z1-27, the PCCR addressing this FFA site (DOE 2011b) indicates this inactive waste site and the associated UST, which has been closed in place, is actually located in EU Z1-30. A similar sign designates the location of the former F-05 Laboratory Burial Ground FFA site in the grassy field adjacent to the Clinch River in EU Z1-26 (Fig. 5.11). The DVS has determined that the soils in EU Z1-26 meet the requirements for NFA for industrial use to 10 ft bgs. The railroad scale house (K-708-E), which is located in the railroad easement, is the lone building structure in the southern half of the Powerhouse Area (Fig. 5.12). The K-708-E Scale House, included in the proposed transfer, is a small wood-frame structure with corrugated siding and a roof, which has been replaced since the photograph of Fig. 5.12. Below the building is a concrete pit that extends under the rail line and houses the scale balance mechanism. Inside the building are the scale and digital readout and printing equipment. The facility is currently under lease, and radiological surveys conducted in support of the lease found no evidence of contamination.

Two shallow ponds, located south of the K-720 Fly Ash Pile and north of the Oak Ridge Turnpike (see Fig. 3.1), were formed as much as 30 years ago as the result of beaver dam-building activities across an existing drainage swale in the area. Over the years the size of the ponds has increased, and beavers continue to be active in the area and the size of the inundated area continues to gradually increase in recent years. These beaver dam ponds consist of two separate ponds bisected by a gravel access road to the K-720 Area. A culvert beneath the access road connects the two ponds.

The pad remaining from the former K-709 Storage Yard (EU Z1-23) is shown in Fig. 5.13. The area, formerly used as a switchyard and subsequently as a storage yard, is completely fenced with a locked gate. The pad was evaluated under the DVS and the EU was approved for NFA.

No operations or equipment were observed throughout the Duct Island tract. The K-901 RCW intake and associated electrical substation are located at the west end of Gilliam Road. An air monitoring station is located on the gravel road that turns north from Gilliam Road and leads to the K-901-A Pond outfall to the Clinch River, but no other facilities were observed.

The former K-1251 Barge Facility is enclosed by a chain-link fence and is mostly covered by grass except for the remains of the concrete pad located in the northern portion of the fenced area. A barge-docking shelf borders the Clinch River.

The southeastern portion of the transfer footprint contains the ETRC operations where maintenance on railroad locomotives and cars has been performed. A portion of that area is also fenced in and much of the ETRC area is covered by gravel. A small shed with a concrete floor and a small amount of other concrete slab are present. Some equipment associated with the former gaseous diffusion plant operations was observed in scrap piles. The wooded area between Poplar Creek and the K-1007-P1 Pond contains piles of concrete rubble that may be from the old locomotive shed concrete pad.



Fig. 5.1. View of northern portion of the Former Powerhouse Area looking northwest.



Fig. 5.2. View of concrete pedestals in Former Powerhouse Area



Fig. 5.3. View of remaining basement structure for former K-706-C building.



Fig. 5.4. View of valve vault in Former Powerhouse Area.



Fig. 5.5. View of K-901 Water Intake in Duct Island Area.



Fig. 5.6. View of Duct Island Area access roads and powerlines, looking south.



Fig. 5.7. View of western portion of Former Powerhouse Area with Oak Ridge Forest Products operation in distance.



Fig. 5.8. View of Oak Ridge Forest Products operation in Former Powerhouse Area.



Fig. 5.9. View of poles stored at Oak Ridge Forest Products on former K-723 Pad.



Fig. 5.10. Sign indicating location of former Fercleve F-29 Gasoline Station.



Fig. 5.11. View of open field with marker for the former F-05 Laboratory Burial Ground.



Fig. 5.12. View of scale house in Former Powerhouse Area.



Fig. 5.13. View of Former K-709 Switchyard.

5.2 VISUAL AND PHYSICAL INSPECTION OF ADJACENT PROPERTY

The area to the south of the transfer footprint across Highway 58 is predominantly an undeveloped, wooded area with the exception of the ETPP Visitor's Overlook. The area to the west across the Clinch River also was noted to consist of a tree-lined ridge where the Rarity Ridge development is located. The area to the northwest was also primarily forested and the location of the K-901-A Holding Pond. Adjacent facilities were observed from Perimeter Road, Patrol Road, Duct Island Road, and the Powerhouse Road.

The adjacent property to the northeast contains two speculative buildings, of which the larger one is occupied, and Bldg. K-1007, which also is occupied, a solar panel farm, and vacant land of the Heritage Center. The Heritage Center also occupies the adjacent areas to the east. These adjacent areas of the Heritage Center are primarily the site of D&D activities as removal of the former gaseous diffusion buildings is ongoing.

The adjacent area to the north and east is the main plant area of the Heritage Center (e.g., K-27 Building and support facilities), Parcel ED-5 West (previously transferred), and the K-1007-P1 Pond. The northern border also includes the Bldg. K-1065 RCRA storage unit (designated as a Foreign Trade Zone), the K-895 Cylinder Destruct Facility, and the K-1066-K Cylinder Yard. The K-1065 Area consists of five separate metal-siding buildings and various other walk-in containers placed on a concrete pad. The location of the K-895 Cylinder Destruct Facility can be identified by the gravel-covered and disturbed areas marking the location that soil remediation has been performed. The K-1066-K Cylinder Yard was an empty concrete pad.

Based on the results of the site visit, there are no physical or visual indications of potential impacts to Duct Island from adjacent properties.

6. SAMPLING RESULTS

The soil in the 31 EUs associated with the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area were assessed under an approved Work Plan (DOE 2007a) prepared according to the DVS process. The Work Plan was approved by EPA and TDEC on December 7 and 13, 2007, respectively. All verified and validated data used to make regulatory decisions have been placed in the OREIS database (<http://www-oreis.ettp.energy.gov/oreis/help/oreishome.html>) and are available for review. The sampling results and data evaluation can be found in Appendix A of the respective PCCRs (DOE 2006; DOE 2010; DOE 2011). These data were deemed sufficient to reach NFA decisions for soil in all of the EUs where remedial action has been completed or were not needed. EPA and TDEC approved these NFA decisions for EUs Z1-1, -2, -5, -6, -7, -8A, -8B, -10, -12, -13, -14, -15, -16, -23, -24, -25, and -34 through -47 and DOE has determined that NFA for soils is appropriate for EUs Z1-9, -11, -17, -18, -19, -20, -21, -22, -26, -27, -28, -32, and -33. These EUs were all addressed in one PCCR (DOE 2011b) but have not received regulatory approval due to the pending decision on the final action to address the asbestos remaining in the subsurface soil in EUs Z1-29, -30, and -31. Otherwise, the soils and infrastructure in these EUs meet the requirements of the Zone 1 Interim ROD for industrial use. The Property containing soils with asbestos remaining (EUs Z1-29, -30, and -31), will not be transferred until the final action has been implemented and appropriate land use controls have been established.

In August 2007, eight surface and subsurface soil samples were collected from three locations at the K-1251 Barge Facility and in accordance with the approved K-1251 Barge Facility Sampling and Analysis Plan (SAP). All samples collected from the three soil sampling locations were quantified for VOCs, semivolatile organic compounds, metals, PCBs, and radionuclides. Two samples of the concrete pad were collected from the top 3 in. of the concrete surface and these samples were analyzed for PCBs. In addition, radiological surveys were also conducted. The results of these samples and radiological surveys are documented in the K-1251 BEAR (BJC 2007). The sample results indicated that no individual results were greater than the Zone 1 maximum RLs and no averages were above average RLs. Therefore, no residual contamination in excess of the Zone 1 remediation goals was found. (Although K-1251 is not in Zone 1, the Zone 1 remedial goals were used for comparison purposes.) All DVS and the K-1251 Barge Facility sample locations are shown on Plate 1.

EU Z1-01

EU Z1-01 is only partially included in the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint. Only the small peninsula of land south of Contractor's Road is included in the footprint. The balance of EU Z1-01 has already been transferred under the CDR addressing Parcel ED-8. Eight soil samples were collected under the DVS within EU Z1-01. Based on both the historical and DVS sampling results, the results of the Class 3 walkover assessment, and evaluation of all available data, the following were determined:

- There were no contaminant of concern (COC) concentration exceedances of the RL maximum in EU Z1-01.
- No average COC concentration exceeded its RL average value across EU Z1-01.
- There are no sources for groundwater contamination in EU Z1-01.

Eight DVS soil samples and two historical samples were used in the DVS evaluation of this EU (Fig. 6.11). Although no soil samples were collected from the small peninsula of land included in the proposed transfer footprint, the walkover assessment found no indications that this area had been

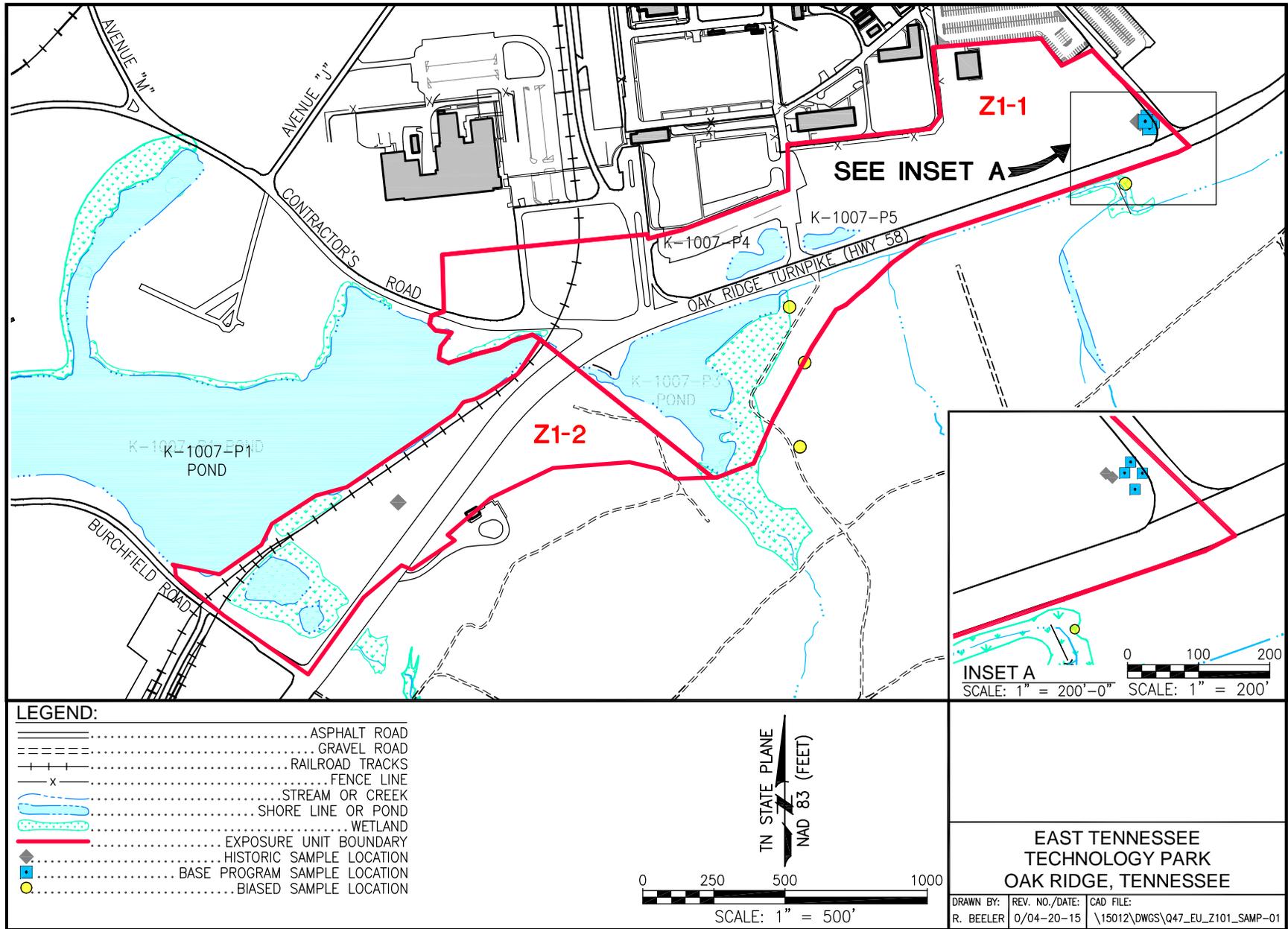


Fig. 6.1. EUs Z1-01 and Z1-02 sample locations.

impacted by plant operations. Thus, as documented in the approved PCCR (DOE 2006a), NFA is necessary to meet industrial land use in this EU.

EU Z1-02

EU Z1-02 is only partially included in the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area transfer footprint. A portion of the EU extends south of Highway 58, and this portion of the EU is not included in the transfer footprint. Two historical soil samples were used by the DVS in addition to a walkover assessment to determine the status of this EU. There were no radiological screening level exceedances in EU Z1-02 and it was determined, based on visual and radiological evaluation, that the observed anthropogenic features in the EU, which consisted of dirt mounds, metal cable, and abandoned roads, were not potential sources of contamination. Therefore, no DVS biased sampling was performed in EU Z1-02. Based on both the historical sampling results, the results of the walkover assessment, and evaluation of all available data, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-02.
- No average COC concentration exceeded its RL average value across EU Z1-02.
- There are no sources for groundwater contamination in EU Z1-02.

The two samples used to determine NFA for this EU were collected from the portion of the EU included in the proposed footprint (Fig. 6.1) and no exceedances of maximum or average RLs were observed in these samples. Thus, as documented in the approved PCCR (DOE 2006a), NFA is necessary to meet industrial land use in this EU.

EU Z1-05

A little over half of EU Z1-05 is included in the transfer footprint. The transfer footprint includes the peninsula of land bound by the K-1007-P1 Pond and Contractor's Road. The remaining portion of the EU not included in the transfer footprint lies on the east side of Contractor's Road. There were a total of 8 DVS sample locations in EU Z1-5, with another 18 historical samples collected from the EU (Plate 1). The samples were analyzed for metals, PCBs, radionuclides, semivolatile organic compounds (SVOCs), and VOCs. Although cesium-137 results exceeded the 1×10^{-5} industrial preliminary remediation goal (PRG) in four samples and the Zone 1 soils average RL in one sample, the average ^{137}Cs concentration across EU Z1-5 is less than either evaluation criterion. No other 1×10^{-5} industrial PRGs or average RLs were exceeded and no maximum RLs or groundwater screening levels were exceeded.

Based on the historical sampling results, the results of the walkover assessment, and evaluation of all available data, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-05.
- No average COC concentration exceeded its RL average value across EU Z1-05.
- There are no sources for groundwater contamination in EU Z1-05.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-05 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-06

Only the westernmost portion of EU Z1-06 is included in the transfer footprint. The balance of the EU has already been transferred by DOE. A total of 26 DVS and historical soil samples were collected within

EU Z1-06 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Although the ^{137}Cs average RL was exceeded in two samples, the average concentration of ^{137}Cs across EU Z1-06 is 1.5 pCi/g, which is less than the average RL of 2 pCi/g. No other Zone 1 soils average RLs were exceeded. Based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-06.
- No average COC concentration exceeded its RL average value across EU Z1-05.
- There are no sources for groundwater contamination in EU Z1-06.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-06 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU. Although no soil samples were collected from the partial EU addressed under this EBS, the transfer footprint consists primarily of mapped wetlands (Plate 1) that, with the exception of Perimeter Road, represent non-impacted areas.

EU Z1-07

A total of 28 DVS and historical soil samples have been collected within EU Z1-07 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. The 1×10^{-5} industrial PRG for ^{237}Np was exceeded in one sample. However, the average detected concentration of ^{237}Np across the EU is 0.32 pCi/g, which is less than the 1×10^{-5} industrial PRG (2.7 pCi/g). Therefore, the established risk limits will not be exceeded. No other 1×10^{-5} industrial PRGs were exceeded. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-07.
- No average COC concentration exceeded its RL average value across EU Z1-07.
- There are no sources for groundwater contamination in EU Z1-07.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-07 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-08A

A total of 68 DVS and historical soil samples have been collected within EU Z1-08A (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. The results of the walkover assessment showed that the land area has been impacted but the impacts do not constitute sources of contamination. EU Z1-8A has metal concentrations that exceed background values. Several organic compounds (PCBs, SVOCs, and VOCs) were detected in the EU Z1-8A soil samples. Only the SVOC benzo(*a*)pyrene exceeds its 1×10^{-5} industrial PRG; however, the average detected concentration of benzo(*a*)pyrene in EU Z1-8A is less than the 1×10^{-5} industrial PRG. Thus, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-08A.
- No average COC concentration exceeded its RL average across EU Z1-08A.
- There are no sources for groundwater contamination in EU Z1-08A.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-08A meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-08B

Only the northwestern portion of EU Z1-08B is included in the proposed transfer footprint. A total of four DVS and historical samples were collected within EU Z1-8B (Plate 1). All four samples were collected from within the transfer footprint portion of the EU. As with EU Z1-8A, the walkover assessment in EU Z1-8B demonstrated that the EU has been impacted, but there is a low probability that the impacts caused soil or groundwater contamination. One anthropogenic feature was selected for biased sampling. The DVS sample results showed metal concentrations elevated above background, and PCB and SVOC detects. However, there were no 1×10^{-5} industrial PRG or Zone 1 soils RL exceedances. The historical samples show similar results, with the addition of an exceedance of the 1×10^{-5} industrial PRG by benzo(a)pyrene; however, the average concentration of benzo(a)pyrene in EU Z1-8B does not exceed the 1×10^{-5} industrial PRG. Thus, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-08B.
- No average COC concentration exceeded its RL average across EU Z1-08B.
- There are no sources for groundwater contamination in EU Z1-08B.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-08B meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-09

A total of 77 DVS and historical soil samples were collected from within EU Z1-09 (Plate 1). All but one of these samples were collected from within the transfer footprint. Samples were analyzed for metals, PCBs, radionuclides, SVOCs, and VOCs. PCBs were found to exceed both the maximum and average Zone 1 RLs. In addition, individual concentrations of several chemicals and radionuclides exceeded their respective 1×10^{-5} industrial PRGs. However, further evaluation found that only the average PCE and TCE concentrations exceeded the industrial PRG and no other average chemical or radionuclide concentrations exceeded their PRGs. Remedial actions were recommended to address the remaining USTs and contaminated soils at the K-1085 Old Firehouse Burn Area.

Remedial actions in EU Z1-09 were completed in 2007 for the USTs and in 2008 for the K-1085 soils. The USTs were closed in accordance with the rules of TDEC, and post-remedial action sampling conducted at the K-1085 Old Firehouse Burn Area indicated that the Zone 1 ROD requirements were met. Based on the DVS sampling information, historical sampling results, the walkover assessment, and the results of the post-remedial action confirmatory sampling, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-09.
- No average COC concentration exceeded its RL average value across EU Z1-09.
- There are no sources for groundwater contamination in EU Z1-09.

As documented in the approved PCCR (DOE 2011a), all of EU Z1-09 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU, pending determination of the need for a final remedial action at the K-1085 Firehouse Burn Area Burial Site. The need for additional RA is deferred to the Zone 1 Final ROD. The need for potential groundwater actions will be addressed in the ETPP Sitewide ROD.

EU Z1-10

A total of two DVS and historical soil samples were collected from within EU Z1-10 (Plate 1). Samples were analyzed for metals, PCBs, radionuclides, SVOCs, and VOCs. The two DVS biased sample locations were identified to document soil compositions at locations that exceeded the radiological screening level during the walkover assessment. Other than the radionuclides excluded from PRG evaluations due to the PRGs being less than, or similar to, background concentrations (^{226}Ra , ^{228}Th , and ^{232}Th), no 1×10^{-5} industrial PRGs were exceeded and no Zone 1 soils RLs or groundwater screening levels for radionuclides were exceeded. Based on the DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-10.
- No average COC concentration exceeded its RL average across EU Z1-10.
- There are no sources for groundwater contamination in EU Z1-10.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-10 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-11

All the land area in this EU has been impacted to some degree by plant activities, primarily at the K-720 Fly Ash Pile FFA site and at a former material storage area at the western end of the EU. The remaining land area has been deforested but analysis of aerial photographs spanning the 60-year history of the plant did not reveal any activities that indicate disposal operations or other activities that could lead to soils contamination (DOE 2011). A total of 30 DVS and historical soil samples have been collected from within EU Z1-11 (Plate 1). The results indicated that there were two analytes with 10^{-5} industrial PRG exceedances that were evaluated for their impact on risk to the industrial worker – arsenic (12 exceedances) and benzo(*a*)pyrene (two exceedances). Other analytes with PRG exceedances were not evaluated for their impact on risk because their concentrations did not exceed background concentrations (^{40}K) or because their impact to risk is evaluated through RLs only according to the Zone 1 ROD (radium and thorium isotopes). The arsenic PRG exceedances ranged in concentration from 20.6 to 84 mg/kg and the benzo(*a*)pyrene exceedances ranged in concentration from 2200 to 2500 $\mu\text{g}/\text{kg}$. The combined impact of all industrial PRG exceedances would not cause EU Z1-11 to fail the 1×10^{-4} risk limit of the Zone 1 ROD (DOE 2011). Thus, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-11.
- No average COC concentration exceeded its RL average value across EU Z1-11.
- The decision on the threat to groundwater will be made in the Zone 1 Final ROD. Since the K-720 Fly Ash Pile is within the local groundwater, a decision on the K-720 Fly Ash Pile and its impact on groundwater will be deferred to the Zone 1 Final ROD.

As documented in the approved PCCR (DOE 2011a), soils in EU Z1-11 meet the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for soils in this EU, pending a decision on the impact of the K-720 Fly Ash Pile to groundwater. The potential need for groundwater actions will be addressed in the ETPP Sitewide ROD.

EU Z1-12

The walkover assessment resulted in no observations of anthropogenic impacts indicative of waste burial and observed no materials or debris that indicate the possibility of chemical contamination. One sediment accumulation area was identified for sample collection. One DVS biased sample was collected at the sediment accumulation area and there is also one historical sample location in EU Z1-12 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. The analytical results from the sediment accumulation area samples are consistent with the positive evaluation of EU Z1-12 by the walkover assessment. The analytical results from the historical samples in EU Z1-12 show some elevated metal and radionuclide concentrations above background as well as the presence of organic chemicals. The only 1×10^{-5} industrial PRGs that were exceeded were by those radionuclides for which there are secondary comparison limits for risk evaluation and none of these secondary limits were exceeded. Methylene chloride, a common laboratory contaminant, was the only VOC detected at a concentration that exceeds its groundwater screening level. Groundwater monitoring from a downgradient well pair has not detected methylene chloride in any samples. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-12.
- No average COC concentration exceeded its R average value across EU Z1-12.
- There are no sources for groundwater contamination in EU Z1-12.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-12 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-13

A total of 25 DVS and historical soil samples have been collected within EU Z1-13 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Analytical results showed elevated metals and radionuclides above background and the presence of several SVOCs [benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*a*)fluoranthene, and dibenz(*a,h*)anthracene] in concentrations that exceeded 1×10^{-5} industrial PRGs, but average concentrations for these compounds for EU Z1-13 using area weighting were all less than the 1×10^{-5} industrial PRGs. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-13.
- No average COC concentration exceeded its RL average value across EU Z1-13.
- There are no sources for groundwater contamination in EU Z1-13.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-13 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-14

A total of eight DVS soil samples have been collected within EU Z1-14 (Plate 1). No historical soil samples were available for this EU. The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Analytical results from the samples show that EU Z1-14 has some elevated metal and radionuclide concentrations above background and infrequent detections of organic chemicals. The 1×10^{-5} industrial PRGs were exceeded only by the group of radionuclides with secondary comparison limits for risk evaluation under the Zone 1 ROD and none of these secondary limits were exceeded.

Therefore, based on the DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-14.
- No average COC concentration exceeded its RL average value across EU Z1-14.
- There are no sources for groundwater contamination in EU Z1-14.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-14 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-15

A total of 19 DVS soil samples have been collected within EU Z1-15 (Plate 1). No historical soil samples were available for this EU. The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Analytical results from the sampling show that there are elevated metal concentrations above background in the soils of EU Z1-15. Arsenic exceeds its 1×10^{-5} industrial PRG in two samples, but does not exceed the Zone 1 soils average RL; nor does its average concentration for EU Z1-15 exceed the 1×10^{-5} industrial PRG. Radionuclides are also elevated in soils and 1×10^{-5} industrial PRGs are exceeded by ^{40}K , ^{226}Ra , ^{228}Th , and ^{232}Th . However, none of these radionuclides exceeds its risk evaluation criterion under the Zone 1 ROD. PCBs, SVOCs, and VOCs were detected in the EU Z1-15 soil samples and 1×10^{-5} industrial PRGs were exceeded in individual samples by three SVOCs. The average concentration of benzo(a)pyrene for all of EU Z1-15 is greater than the 1×10^{-5} industrial PRG (2100 $\mu\text{g}/\text{kg}$). However, there are no other chemicals or radionuclides with average concentrations that contribute significantly to risk associated with EU Z1-15 and the total risk in the EU is less than the 1×10^{-5} risk limit. Therefore, based on the DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-15.
- No average COC concentration exceeded its RL average value across EU Z1-15.
- There are no sources for groundwater contamination in EU Z1-15.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-15 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-16

A total of 40 DVS soil samples have been collected within EU Z1-16 (Plate 1). There were no historical samples available for this EU. The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. The analytical results show elevated metals and radionuclides above background including 1×10^{-5} industrial PRG exceedances by arsenic and ^{238}U , each in a single sample. The concentration of the arsenic 1×10^{-5} industrial PRG exceedance does not exceed the arsenic Zone 1 soils average RL and neither the average concentration of arsenic nor that of ^{238}U exceeds the 1×10^{-5} industrial PRG across EU Z1-16. SVOCs were detected frequently in the EU Z1-16 samples. Benzo(a)pyrene exceeded its 1×10^{-5} industrial PRG in one sample, but its average detected concentration across the EU is less than the industrial PRG. Therefore, based on the DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-16.
- No average COC concentration exceeded its RL average value across EU Z1-16.
- There are no sources for groundwater contamination in EU Z1-16.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-16 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-17

A total of 10 DVS and historical soil samples have been collected within EU Z1-17 (Plate 1). These samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. There was one analyte with one 10^{-5} PRG exceedance that was evaluated for its impact on risk to the industrial worker – benzo(a)pyrene (3300 $\mu\text{g}/\text{kg}$). Other analytes with PRG exceedances did not need to be evaluated for their impact on risk because their concentrations did not exceed background concentrations (^{40}K) or because their impact to risk is evaluated through RLs according to the Zone 1 ROD (radium and thorium isotopes). The combined impact of the benzo(a)pyrene PRG exceedance does not cause EU Z1-17 to fail the 1×10^{-4} risk limit of the Zone 1 ROD.

Thus, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-17.
- No average COC concentration exceeded its RL average value across EU Z1-17.
- There are no sources for groundwater contamination in EU Z1-17.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-17 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-18

A total of 49 DVS and historical soil samples have been collected within EU Z1-18 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. There were two PCB average RL exceedances at one location; however, the average concentration did not exceed the average RL across the EU. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-18.
- No average COC concentration exceeded its RL average value across EU Z1-18.
- There are no sources for groundwater contamination in EU Z1-18.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-18 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

The K-708-E Scale House, which is included in the proposed transfer, is a small wood-frame structure with corrugated siding and a roof that was recently replaced. K-708-E is currently under lease, and radiological surveys conducted in support of the lease found no evidence of contamination.

EU Z1-19

A total of 19 DVS and historical soil samples have been collected within EU Z1-19 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. There were six analytes, including one metal, one radionuclide, and four polycyclic aromatic hydrocarbons (PAHs), with 1×10^{-5}

PRG exceedances that were further evaluated under the DVS. A quantitative risk assessment of EU Z1-19 showed that the combined impact of all chemicals and radionuclides does not cause this EU to fail the 1×10^{-4} risk limit of the Zone 1 ROD. However, no maximum or average RLs were exceeded by Zone 1 COCs in this EU. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-19.
- No average COC concentration exceeded its RL average value across EU Z1-19.
- There are no sources for groundwater contamination in EU Z1-12.

As documented in the approved PCCR (DOE 2011a), all of EU Z1-19 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-20

A total of 39 DVS and historical soil samples have been collected within EU Z1-20 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. In addition, one sample of the remaining concrete pad was obtained and analyzed for metals, radionuclides, and PCBs. Although there were some arsenic and radionuclide PRG exceedances, further evaluation of the historical and DVS sampling information and the results of the walkover assessment, indicated the following:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-20.
- No average COC concentration exceeded its RL average value across EU Z1-20.
- There are no sources for groundwater contamination in EU Z1-20.

As documented in the approved PCCR (DOE 2011a), all of EU Z1-20 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-21

A total of 50 DVS and historical soil samples have been collected within EU Z1-21 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Although there was one ^{137}Cs and one Ra/Th decay series average RL exceedance, the average concentrations for these radionuclides were less than the average Zone 1 average RL. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-21.
- No average COC concentration exceeded its RL average value across EU Z1-21.
- There are no sources for groundwater contamination in EU Z1-21.

As documented in the approved PCCR (DOE 2011a), all of EU Z1-21 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-22

A total of 24 DVS and historical soil samples have been collected within EU Z1-22 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. No Zone 1 COCs exceeded the maximum or average RLs. Although there were several arsenic and radionuclide PRG exceedances, a quantitative risk assessment showed that the risk is below the 1×10^{-4} risk limit of the Zone 1 ROD. Thus,

based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-22.
- No average COC concentration exceeded its RL average value across EU Z1-22.
- There are no sources for groundwater contamination in EU Z1-22.

As documented in the approved PCCR (DOE 2011a), all of EU Z1-22 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-23

A total of 67 DVS and historical soil samples have been collected within EU Z1-23 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. The analytical results showed arsenic and ^{137}Cs both exceeded the 1×10^{-5} industrial PRG in one sample each, but the average concentrations were less than the Zone 1 soils average RLs and the average concentrations across EU Z1-23 were less than the 1×10^{-5} industrial PRG. SVOCs were also detected in several samples and five SVOCs exceed the 1×10^{-5} industrial PRGs in individual samples. Only the average concentration of benzo(a)pyrene across EU Z1-23 exceeds the 1×10^{-5} industrial PRG. Because the average concentration of no other chemical or radionuclide exceeds its 1×10^{-5} industrial PRG across this EU, the DVS determined that the benzo(a)pyrene industrial PRG exceedance will not cause EU Z1-23 to exceed the 1×10^{-4} risk limit (DOE 2006a). Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-23.
- No average COC concentration exceeded its RL average value across EU Z1-23.
- There are no sources for groundwater contamination in EU Z1-23.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-23 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-24

A total of 13 DVS and historical soil samples have been collected within EU Z1-24 (Plate 1). No historical soil samples were available for this EU. The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Although there are SVOC industrial 1×10^{-5} PRG exceedances in individual samples, no average SVOC concentration exceeds the PRG across EU Z1-24. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-24.
- No average COC concentration exceeded its RL average value across EU Z1-24.
- There are no sources for groundwater contamination in EU Z1-24.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-24 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-25

Based on the data quality objective (DQO) process and the walkover assessment for EU Z1-25, there were no DVS soil samples collected (Plate 1). Based on results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-25.
- No average COC concentration exceeded its RL average value across EU Z1-25.
- There are no sources for groundwater contamination in EU Z1-25.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-25 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-26

A total of 124 DVS and historical soil samples have been collected within EU Z1-26 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Although there were initially radionuclide maximum RL exceedances, remedial actions were performed which removed all of the exceedances. In addition, following the remedial actions there were three radionuclide average RL exceedances at two locations, but the average across the EU does not exceed the average RL. The post-remedial action quantitative risk assessment showed that the combined impact of all chemicals and radionuclides does not cause the EU to fail the 1×10^{-4} risk limit of the Zone 1 ROD. Confirmation radiological walkover surveys of the remaining concrete pads indicated that no action levels were exceeded. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-26.
- No average COC concentration exceeded its RL average value across EU Z1-26.
- There are no sources for groundwater contamination in EU Z1-26.

As documented in the approved PCCR (DOE 2011a), all of EU Z1-26 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-27

A total of 32 DVS soil samples have been collected within EU Z1-27 (Plate 1). No historical soil samples were available for this EU. The DVS soil samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. No Zone 1 COCs exceeded the maximum or average RLs. Although arsenic exceeded the 1×10^{-5} industrial PRG, based on further evaluation, it was concluded that the combined impact of all PRG exceedances would not cause EU Z1-27 to fail the 1×10^{-4} risk limit of the Zone 1 ROD. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-27.
- No average COC concentration exceeded its RL average value across EU Z1-27.
- There are no sources for groundwater contamination in EU Z1-27.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-27 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-28

A total of 31 DVS soil samples have been collected within EU Z1-28 (Plate 1). No historical soil samples were available for this EU. The DVS soil samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Based on the DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-28.
- No average COC concentration exceeded its RL average value across EU Z1-28.
- There are no sources for groundwater contamination in EU Z1-28.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-28 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-29

EU Z1-29 was addressed in the K-770 Scrap Yard soil RA completed in 2010 (see Sect. 3.2.3), which removed approximately 6,800 yds³ of contaminated soil from the former scrap yard. A total of 17 post-remediation DVS confirmatory soil samples have been collected within EU Z1-29 (Plate 1). No historical soil samples were available for this EU. The DVS soil samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Based on the DVS sampling information, the results of the walkover assessment, and the completion of remedial actions, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-29.
- No average COC concentration exceeded its RL average value across EU Z1-29.
- There are no sources for groundwater contamination in EU Z1-29.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-29 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU, pending a decision on the final action to address the asbestos remaining in soils of this EU. Although meeting the Zone 1 ROD criteria for NFA, DOE proposes an additional land use control for EU Z1-29 due to the potential for asbestos in the subsurface (see Sect. 3.2.1).

EU Z1-30

EU Z1-30 was addressed in the K-770 Scrap Yard soil RA completed in 2010 (see Sect. 3.2.3), which removed approximately 6,800 yds³ of contaminated soil from the former scrap yard. A total of 17 post-remediation DVS confirmatory soil samples have been collected within EU Z1-30 (Plate 1). The DVS soil samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Although one PAH exceeded the 1×10^{-5} industrial PRG, further evaluation under the DVS indicates that the combined impact of the industrial PRG exceedances will not cause EU Z1-30 to fail the 1×10^{-4} risk limit of the Zone 1 ROD. Therefore, based on the DVS sampling information, the results of the walkover assessment, and the completion of remedial actions, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-30.
- No average COC concentration exceeded its RL average value across EU Z1-30.
- There are no sources for groundwater contamination in EU Z1-30.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-30 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU, pending a decision on the final action to address the asbestos remaining in soils of this EU. Although meeting the Zone 1 ROD criteria for NFA, DOE proposes an additional land use control for EU Z1-30 due to the potential for asbestos in the subsurface (see Sect. 3.2.1).

EU Z1-31

EU Z1-30 was addressed in the K-770 Scrap Yard soil removal action completed in 2010 (see Sect. 3.2.3), which removed approximately 6,800 yds³ of contaminated soil from the former scrap yard. A total of 16 post-remedial action DVS confirmatory soil samples have been collected within EU Z1-31 (Plate 1). The DVS samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Based on the DVS sampling information, the results of the walkover assessment, and the completion of remedial actions, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-31.
- No average COC concentration exceeded its RL average value across EU Z1-31.
- There are no sources for groundwater contamination in EU Z1-31.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-31 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU, pending a decision on the final action to address the asbestos remaining in soils of this EU. Although meeting the Zone 1 ROD criteria for NFA, DOE proposes an additional land use control for EU Z1-31 due to the potential for asbestos in the subsurface (see Sect. 3.2.1).

EU Z1-32

A total of 14 post-remedial action DVS confirmatory soil samples have been collected within EU Z1-32 (Plate 1). All of the EU was included in the remedial action, so there are no pre-remedial action sample locations remaining. The post-remedial action DVS samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. There were no Zone 1 COC exceedances of the maximum RL. Although one sample location had a concentration of ²³⁸U that exceeded the average RL, the average ²³⁸U concentration across the EU did not exceed the average RL. In addition, there was one exceedance of the 1×10^{-5} industrial PRG each for ²³⁸U and ²³⁵U; however, the average concentrations did not exceed the PRG. Further evaluation of the PRG exceedances shows that the combined impact of all industrial PRG exceedances will not cause EU Z1-32 to fail the 1×10^{-4} risk limit of the Zone 1 ROD (DOE 2011b). Thus, based on the DVS sampling information, the results of the walkover assessment, and completion of the remedial actions, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-32.
- No average COC concentration exceeded its RL average value across EU Z1-32.
- There are no sources for groundwater contamination in EU Z1-32.

Based on the results of the DVS, as documented in Addendum II of the PCCR, (DOE 2011b), all of EU Z1-32 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-33

A total of 43 DVS soil samples have been collected within EU Z1-33 (Plate 1). No historical soil samples were available for this EU. The DVS samples were analyzed for metals, radionuclides, PCBs, SVOCs,

and VOCs. There were no Zone 1 COCs with concentrations exceeding either the maximum or average RLs. There was one exceedance of the 1×10^{-5} industrial PRG for ^{238}U . Further evaluation of this PRG exceedance shows that the combined impact of all industrial PRG exceedances will not cause EU Z1-33 to fail the 1×10^{-4} risk limit of the Zone 1 ROD (DOE 2011b). Thus, based on the DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-33.
- No average COC concentration exceeded its RL average value across EU Z1-33.
- There are no sources for groundwater contamination in EU Z1-33.

Based on the results of the DVS, as documented in Addendum II of the PCCR (DOE 2011b), all of EU Z1-33 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-34

Based on the DQO process and the walkover assessment for EU Z1-34 (Plate 1), there were no DVS soil samples collected within this EU. Based on results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-34.
- No average COC concentration exceeded its RL average value across EU Z1-34.
- There are no sources for groundwater contamination in EU Z1-34.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-34 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-35

A total of two DVS soil samples have been collected within EU Z1-35 (Plate 1). No historical soil samples were available for this EU. The DVS samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Based on the DVS sample results and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-35.
- No average COC concentration exceeded its RL average value across EU Z1-35.
- There are no sources for groundwater contamination in EU Z1-35.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-35 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-36

Based on the DQO process and the walkover assessment for EU Z1-36 (Plate 1), there were no DVS soil samples collected within this EU. Based on results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-36.
- No average COC concentration exceeded its RL average value across EU Z1-36.
- There are no sources for groundwater contamination in EU Z1-36.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-36 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-37

Based on the DQO process and the walkover assessment for EU Z1-37, there were no DVS soil samples collected within this EU (Plate 1). Based on results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-37.
- No average COC concentration exceeded its RL average value across EU Z1-37.
- There are no sources for groundwater contamination in EU Z1-37.

As documented in the approved PCCR (DOE 2006a), all of EU Z1-37 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-38

A total of 2 DVS soil samples were collected within EU Z1-38 prior to remedial action (Plate 1). No historical soil samples were available for this EU. The DVS soil samples were analyzed for metals, radionuclides, PCBs, and SVOCs. An area of soil disposal was identified in the EU during the walkover assessment. This area was found to contain elevated radioactivity during the walkover. Based on the walkover assessment and the DVS sampling, it was concluded that the small earthen mounds contained PCB contamination above the maximum RL. The soil mounds were excavated to a nominal depth of 1 ft and approximately 130 yd³ of soil were removed from this EU. Following remedial actions, six confirmatory soil samples were collected and also analyzed for metals, radionuclides, PCBs, and SVOCs. Based on the DVS sampling results, the results of the walkover assessment, and the results of confirmatory sampling, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-38.
- No average COC concentration exceeded its RL average value across EU Z1-38.
- There are no sources for groundwater contamination in EU Z1-38.

As documented in the approved PCCR (DOE 2008), all of EU Z1-38 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-39

A total of 38 DVS and historical soil samples have been collected within EU Z1-39 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Two average RLs were exceeded by ¹³⁷Cs and ²³⁸U, but the average concentrations of these radionuclides do not exceed their average RLs. Also, the 1×10^{-5} industrial PRGs were exceeded by arsenic, three radionuclides and one PAH, but the average concentrations of these chemicals and radionuclides do not exceed their respective PRGs. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-39.
- No average COC concentration exceeded its RL average value across EU Z1-39.
- There are no sources for groundwater contamination in EU Z1-39.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-39 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-40

A total of 16 DVS and historical soil samples have been collected within EU Z1-40 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. The average RL was exceeded by ^{137}Cs in one sample, but the average ^{137}Cs concentration for the EU does not exceed the average RL. Several exceedances of the 1×10^{-5} industrial PRG occurred for arsenic and ^{137}Cs , but the average concentrations did not exceed the PRGs. Therefore, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-40.
- No average COC concentration exceeded its RL average value across EU Z1-40.
- There are no sources for groundwater contamination in EU Z1-40.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-40 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-41

A total of 31 DVS and historical soil samples have been collected within EU Z1-41 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Several chemical and radionuclide concentrations exceeded their industrial PRG in samples collected from the main burial area of the K-1070-F Construction Spoil Area. There were no Zone 1 COCs with concentrations exceeding either the maximum or average RLs. A risk screen was performed and found that the combined risk of all chemicals and radionuclides did not exceed the 1×10^{-4} risk limit of the Zone 1 ROD. Thus, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-41.
- No average COC concentration exceeded its RL average value across EU Z1-41.
- There are no sources for groundwater contamination in EU Z1-41.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-41 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-42

A total of 13 DVS and historical soil samples have been collected within EU Z1-42 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Arsenic exceeded the industrial PRG in several samples, but the average arsenic concentration across the EU did not exceed the PRG. Thus, based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-42.
- No average COC concentration exceeded its a RL average value across EU Z1-42.
- There are no sources for groundwater contamination in EU Z1-42.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-42 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-43

A total of 15 DVS and historical soil samples have been collected within EU Z1-43 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. The average detected results for PCBs and ^{238}U exceeded the average RL, but when all results (including non-detects) and the area-weighted averaging were factored in, there were no average RL exceedances (DOE 2006b). Additionally, several metals, PCBs, and radionuclides exceeded their respective industrial PRG. A risk screen was performed and it was concluded that EU Z1-43 meets the risk protection goal of the Zone 1 ROD. Based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-43.
- No average COC concentration exceeded its RL average value across EU Z1-43.
- There are no sources for groundwater contamination in EU Z1-43.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-43 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-44

A total of five DVS and historical soil samples have been collected within EU Z1-44 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-44.
- No average COC concentration exceeded its RL average value across EU Z1-44.
- There are no sources for groundwater contamination in EU Z1-44.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-44 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

EU Z1-45

EU Z1-45, which is only partially included in the proposed transfer footprint, included a walkover assessment and evaluation of historical soil samples for the NFA decision for this EU. A total of three historical soil samples have been collected within the EU (Plate 1). The DQO process did not identify the collection of additional DVS soil samples for this EU. The historical samples were analyzed for radionuclides only. Based on the historical sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-45.
- No average COC concentration exceeded its RL average value across EU Z1-45.
- There are no sources for groundwater contamination in EU Z1-45.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-45 meets the protection goals of the Zone 1 ROD for industrial land use.

EU Z1-46

EU Z1-46, which is only partially included in the transfer footprint, included walkover assessments, evaluation of historical soil samples, and sampling of soils under the DVS to determine NFA for this EU. A total of 9 DVS and historical soil samples have been collected within EU Z1-46 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-46.
- No average COC concentration exceeded its RL average value across EU Z1-46.
- There are no sources for groundwater contamination in EU Z1-46.

In addition, it was determined that no soil sample results exceeded industrial use PRGs. As documented in the approved PCCR (DOE 2006b), all of EU Z1-46 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate.

EU Z1-47

A total of 20 DVS and historical soil samples have been collected within EU Z1-47 (Plate 1). The samples were analyzed for metals, radionuclides, PCBs, SVOCs, and VOCs. Based on historical and DVS sampling information and the results of the walkover assessment, the following were determined:

- There were no COC concentration exceedances of the RL maximum value in EU Z1-47.
- No average COC concentration exceeded its RL average value across EU Z1-47.
- There are no sources for groundwater contamination in EU Z1-47.

As documented in the approved PCCR (DOE 2006b), all of EU Z1-47 meets the protection goals of the Zone 1 ROD for industrial land use and NFA is appropriate for this EU.

K-1251 Barge Facility

In August 2007, eight surface and subsurface soil samples were collected from three locations (Plate 1) at the K-1251 Barge Facility. Samples were collected in accordance with the approved K-1251 Barge Facility SAP. One sample was collected at each of the following depths: 0.0 to 0.5 ft bgs, 0.5 to 2.0 ft bgs, and 2.0 to 10 ft bgs, with the exception of the 02 location where only the 0.0 to 0.5 ft bgs and 0.5 to 2.0 ft bgs depths were sampled. All samples collected from the three soil sampling locations were analyzed for VOCs, SVOCs, metals, radionuclides, and PCBs. Two samples of the concrete pad were also collected at the K-1251 Barge Facility. These samples, collected from the top 3 inches of the concrete surface, were analyzed for PCBs.

A total of 3 PCB results were detected out of 72 sample results. The concentration of the detected PCBs ranged from 2.4 to 7.3 µg/kg for Aroclor-1260. A total of 11 VOC results were detected out of 384 sample results. The concentrations of the VOC results ranged from 0.297 µg/kg for toluene to 8.59 µg/kg for acetone. A total of 49 SVOC results were detected out of 561 sample results. The concentrations of the SVOC results ranged from 0.26 µg/kg for 1,4-dichlorobenzene to 283 µg/kg for fluoranthene. A total of 121 metals results were detected out of 200 metal sample results. The concentrations of the metal results ranged from 0.0129 mg/kg for mercury to 237,000 mg/kg for calcium. No individual results were greater than the Zone 1 maximum RLs and no averages were above the Zone 1 average RLs. In addition, no results exceeded their respective PRGs.

Two samples of the concrete pad were collected in August 2007 at the K-1251 Barge Facility. These samples, collected from the top 3 inches of the concrete surface, were analyzed for PCBs. The results indicate that the PCBs Aroclor-1254 and Aroclor-1260 were detected at concentrations ranging from 0.002 to 0.0067 mg/kg. These concentrations are below the Zone 1 maximum RLs and no averages were above average RLs.

Results of the radiological surveys performed at the K-1251 Barge Facility indicated that all surveyed surfaces were below the free release criteria of DOE Order 458.1.

7. RISK EVALUATION

The Zone 1 remedial action objectives (RAOs) were developed by the DVS process to support the future use of ETTP as a mixed-use commercial and industrial park. Therefore, remediation criteria were designed for the protection of the future industrial worker under the assumption the worker normally would not have the potential for exposure to soils at depths below 10 ft bgs.

Within that constraint, the decision rules established in the DVS were based on one or more of the following criteria:

- exceedance of a maximum RL at any location,
- exceedance of an average RL across the EU,
- unacceptable future threat to groundwater, or
- unacceptable cumulative ELCR of $> 1 \times 10^{-4}$ and HI > 1 across the EU.

The National Contingency Plan (NCP) preamble (55 *Federal Register* 8716, March 8, 1990) describes the process used to establish the remediation goal for environmental media as consisting of a two-step approach. First, an individual lifetime excess cancer risk of 10^{-6} is used as a starting point for establishing remediation goals for the risks from contaminants at specific sites. The second step involves consideration of a variety of site-specific or remedy-specific factors, which enter into the determination of where, within the risk range, the cleanup standard for a given contaminant will be established. The factors considered in the development of the Zone 1 Interim ROD and subsequent steps in the implementation of the ROD, such as the DVS, included an acceptable *cumulative* risk level of 10^{-4} , which is the upper bound of the EPA acceptable risk range. From the Zone 1 Interim ROD (Sect. 1.4): “The remedial action objective (RAO) for Zone 1 is to ‘*Protect human health under an industrial land use to an excess cancer risk at or below 10^{-4} .*’” A comparable statement is included in the Zone 1 Interim ROD. Zone 1 RAOs were developed by the DVS to support the future use of 10^{-4} cumulative ELCR across a given EU as one of the decision criteria. To achieve the RAO, constituent-specific cleanup goals were developed. Per the NCP preamble, these cleanup goals are to be based on a risk level of 10^{-6} for individual constituents unless site-specific or remedy-specific factors exist to suggest modifications are appropriate. For the Zone 1 Interim ROD, these factors include the following:

- Site-Specific Exposure Factors
 - Exposure of the industrial worker is limited to soil-related pathways only (multiple media exposures are not applicable to this scenario).
 - The limited COC list indicates that the potential for a large number of remedial goal exceedances was considered unlikely in the ROD, allowing for a higher risk level for each COC considered, while still achieving a cumulative risk $< 10^{-4}$. However, the ROD indicates that additional COCs were identified in four EUs within Zone 2, and additional COCs may be identified from the characterization sampling to be conducted for a wide range of potential contaminants.
- Remedy-Specific Technical Factors
 - Remedial goals for particular COCs were generated at a risk level $> 10^{-5}$ due to cost prohibitiveness and impracticality of remediation to a lower concentration.

- Remedial goals for particular COCs were revised to reflect consideration of elevated background levels.
- Control leaching and migration from contaminated soil to help minimize further impacts to groundwater.

Incorporation of the factors above provided RLs that reflect the RAO of achieving a cumulative human health risk that will not exceed 10^{-4} for a given EU or FFA site. Table 7.1 summarizes the decisions for the EU components of the Former Powerhouse and/or the decisions for the FFA sites located within the EUs. For purposes of risk evaluation, the entire EU is considered because there are no barriers or impediments preventing access to the balance of the EU.

Table 7.1 summarizes the decisions for the component EUs within which the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is located, and the decisions for the FFA sites located within the EUs. As noted in the table, the decision on potential groundwater remedial actions will be made in the ETPP Sitewide ROD. A decision on the K-720 Fly Ash Pile and its potential impact on groundwater will also be deferred to the ETPP Final Sitewide ROD. The need for additional remediation of soils at the K-1085 Burn Area Burial Site is deferred to the Zone 1 Final ROD. Soil removal for the protection of ecological resources in EU Z1-38 will be conducted under the Zone 1 Final ROD, as well as placement of a soil cover over the potential subsurface asbestos in EUs Z1-29, Z1-30, Z1-31, and Z1-33.

Table 7.1. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area risk evaluation results

| EU | Associated FFA sites | Decision rule evaluation | | | | Risk evaluation |
|--------------------|--|--------------------------|--------|------|------|-----------------|
| | | Max RL | Avg RL | Risk | GW | |
| Z1-1 ^a | S-21 Happy Valley Service Station | NFA | NFA | NFA | NFA | Passes |
| Z1-2 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-5 ^b | K-1007 Gas Tank (Residual Contamination) | NFA | NFA | NFA | NFA | Passes |
| | K-1048 Tire and Battery Shop | NFA | NFA | NFA | NFA | Passes |
| | K-1050 Wash, Paint, and Grease Shop | NFA | NFA | NFA | NFA | Passes |
| Z1-6 ^b | 695/687 oil Storage Operations | NFA | NFA | NFA | NFA | Passes |
| Z1-7 ^b | J. A. Jones Disposal Area | NFA | NFA | NFA | NFA | Passes |
| | Contractor's Road Study Area (#21c) | NFA | NFA | NFA | NFA | Passes |
| | 695/687 Oil Storage Operations | NFA | NFA | NFA | NFA | Passes |
| Z1-8A ^b | Roundhouse Road | NFA | NFA | NFA | NFA | Passes |
| Z1-8B ^b | Demolition Materials Placement Area | NFA | NFA | NFA | NFA | Passes |
| Z1-9 ^c | K-1085 Old Firehouse Burn Area | NFA | NFA | NFA | NFA | Passes |
| | K-1085 Old Firehouse Burn Area Burial Site | NFA* | NFA* | NFA* | NFA* | Passes* |
| | J.A. Jones Maintenance Complex | NFA | NFA | NFA | NFA | Passes |
| Z1-10 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-11 ^c | K-720 Fly Ash Pile | NFA | NFA | NFA | TBD* | Passes |
| Z1-12 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-13 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-14 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-15 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-16 ^b | 518 Main Substation | NFA | NFA | NFA | NFA | Passes |
| Z1-17 ^c | 722 Area Roads | NFA | NFA | NFA | NFA | Passes |
| Z1-18 ^c | K-710 Sludge Beds and Imhoff Tanks | NFA | NFA | NFA | NFA | Passes |
| | 722 Area Roads | NFA | NFA | NFA | NFA | Passes |

Table 7.1. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area risk evaluation results (cont.)

| EU | Associated FFA sites | Decision rule evaluation | | | | Risk evaluation |
|--------------------|--|--------------------------|--------|------|------|--|
| | | Max RL | Avg RL | Risk | GW | |
| Z1-19 ^c | 722 Area Roads | NFA | NFA | NFA | NFA | Passes |
| Z1-20 ^c | 722 Area Roads | NFA | NFA | NFA | NFA | Passes |
| Z1-21 ^c | 722 Area Roads | NFA | NFA | NFA | NFA | Passes |
| Z1-22 ^c | 722 Area Roads | NFA | NFA | NFA | NFA | Passes |
| Z1-23 ^b | Building 523 Grease Burial Site | NFA | NFA | NFA | NFA | Passes |
| | Building 526 Heavy Equipment Shop | NFA | NFA | NFA | NFA | Passes |
| | K-709 Storage Yard | NFA | NFA | NFA | NFA | Passes |
| | 709 Switchyard Soils | NFA | NFA | NFA | NFA | Passes |
| Z1-24 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-25 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-26 ^c | F-05 Laboratory Burial Ground | NFA | NFA | NFA | NFA | Passes |
| | F-07 Material Warehouse | NFA | NFA | NFA | NFA | Passes |
| | F-08 Laboratory | NFA | NFA | NFA | NFA | Passes |
| | 722 Area Roads | NFA | NFA | NFA | NFA | Passes |
| Z1-27 ^d | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-28 ^d | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-29 ^d | No FFA site associated with EU | NFA* | NFA* | NFA* | NFA* | Passes* |
| Z1-30 ^d | Bldg. F-29 Gasoline Station | NFA* | NFA* | NFA* | NFA* | Passes* |
| | K-725 Beryllium Building Soils | NFA* | NFA* | NFA* | NFA* | Passes* |
| Z1-31 ^d | | NFA* | NFA* | NFA* | NFA* | Passes* |
| Z1-32 ^d | K-770 Scrap Metal Yard | NFA | NFA | NFA | NFA | Passes |
| Z1-33 ^d | K-770 Cooling Tower Wood Debris | NFA* | NFA* | NFA* | NFA* | Passes* |
| | K-770 Contaminated Debris | NFA* | NFA* | NFA* | NFA* | Passes* |
| Z1-34 ^b | No FFA site associated with EU | NFA | NFA | NFA | NFA | Passes |
| Z1-35 ^b | Powerhouse Knoll Study Area (#21a) | NFA | NFA | NFA | NFA | Passes |
| Z1-36 ^e | None | NFA | NFA | NFA | NFA | Passes |
| Z1-37 ^e | None | NFA | NFA | NFA | NFA | Passes |
| Z1-38 ^f | Duct Island Soil Mounds | NFA* | NFA* | NFA* | NFA* | Passes* |
| Z1-39 ^e | K-1070-F Construction Spoil Area Duct Island Road | NFA | NFA | NFA | NFA | Passes Ducts to be addressed through land use controls. |
| Z1-40 ^e | Duct Island Study Area Duct Island Road | NFA | NFA | NFA | NFA | Passes Ducts to be addressed through land use controls. |
| Z1-41 ^e | K-1070-F Construction Spoil Area K-900 Bottle Smasher Duct Island Road | NFA | NFA | NFA | NFA | Passes |
| Z1-42 ^e | K-1070-F Construction Spoil Area Duct Island Road | NFA | NFA | NFA | NFA | Passes |

Table 7.1. Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area risk evaluation results (cont.)

| EU | Associated FFA sites | Decision rule evaluation | | | | Risk evaluation |
|--------------------|-----------------------------|--------------------------|--------|------|-----|--------------------------------------|
| | | Max RL | Avg RL | Risk | GW | |
| Z1-43 ^e | Duct Island Road | NFA | NFA | NFA | NFA | Passes Area Weighted Risk Assessment |
| Z1-44 ^e | Duct Island Road | NFA | NFA | NFA | NFA | Passes |
| Z1-45 ^e | None | NFA | NFA | NFA | NFA | Passes |
| Z1-46 ^e | None | NFA | NFA | NFA | NFA | Passes |
| Z1-47 ^e | K-901-A South Disposal Area | NFA | NFA | NFA | NFA | Passes |

^a Decision rule and risk evaluation information are from DOE/OR/01-2367&D2.

^b Decision rule and risk evaluation information are from DOE/OR/01-2294&D2.

^c Decision rule and risk evaluation information are from DOE/OR/01-2294&D2/A1/R1.

^d Decision rule and risk evaluation information are from DOE/OR/01-2294&D2/A2.

^e Decision rule and risk evaluation information are from DOE/OR/01-2261&D2.

^f Decision rule and risk evaluation information are from DOE/OR/01-2367&D2.

* The decision on groundwater remediation will be made in the East Tennessee Technology Park (ETTP) Sitewide Final Record of Decision (ROD). Since the K-720 Fly Ash Pile is in the groundwater, separating the decisions on source to groundwater and groundwater remediation is not practical. Therefore, a decision on the K-720 Fly Ash Pile and its impact on groundwater will be deferred to the ETTP Final Sitewide ROD. The need for additional remediation of soils at the K-1085 Burn Area Burial Site is also deferred to the Zone 1 Final ROD. Soil removal for the protection of ecological resources in exposure unit (EU) Z1-38 will be conducted under the Zone 1 Final ROD. A soil cover will be placed over the potential subsurface asbestos in EUs Z1-29, Z1-30, Z1-31, and Z1-33 under the Zone 1 Final ROD.

FFA = Federal Facilities Agreement.

GW = groundwater.

NFA = no further action.

RL = remediation level.

TBD = to be determined.

Although the K-1251 Barge Facility tract of the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area is not included within Table 7.1, a screening-level risk estimate for soils was prepared for the K-1251 Barge Facility, located within Tract B, and the results were presented in the BEAR for K-1251 (BJC 2007). The screening-level risk results indicated that the cumulative risks did not exceed the acceptable target risk range of 10^{-4} to 10^{-6} , or an HI above 1. Therefore, a full risk calculation was not conducted, and the risk screening was considered indicative of the low likelihood of adverse health effects associated with worker exposure to soils at the barge facility. The remaining portion of Tract B is considered to be non-impacted based on historical knowledge. The BEAR for the K-1251 Barge Facility did not identify any development or industrial activities involving hazardous substances or petroleum products or their derivatives that took place on this parcel. In addition, this portion of the property footprint is not included within either Zone 1 or Zone 2 areas requiring investigation and/or cleanup. Because no development or industrial activities have been identified for this portion of the footprint, this area is considered to be non-impacted and available for transfer.

In addition to the individual EU evaluations, a roving worker scenario was also evaluated in the risk assessment to evaluate exposure to a worker from adjacent property. The roving worker evaluation was based on certain assumptions, including: (1) the worker will not be exposed to areas that are inaccessible due to radiological or other controls, such as fences or other barriers, or postings that prevent casual entry by a worker at a nearby building; and (2) there are no “hotspots” of contamination at the Heritage Center

that are accessible to these workers. The results of the roving worker risk screen, which used all available data, show that risks/hazards are within EPA's acceptable risk range.

As a part of the ongoing Heritage Center cleanup, soil data and confirmatory sampling continue to be collected and have been used to support numerous NFA decisions in Zone 1 and Zone 2 under an industrial land use risk scenario. All of the EU components within which the proposed transfer footprint is located have either obtained NFA concurrence from the regulators or have met the requirements for NFA. Based on these NFA determinations, which address soil and subsurface structures under an industrial worker exposure scenario, and based on consideration of potential impacts to surface water, groundwater, and ecological receptors, the proposed transfer footprint is suitable for the intended industrial use.

As a part of the ongoing Heritage Center cleanup, soil data and confirmatory sampling continue to be collected and have been used to support numerous NFA decisions in Zone 1 and Zone 2 under an industrial land use risk scenario. All of the EU components within which the proposed transfer footprint is located have either obtained NFA concurrence from the regulators or have met the requirements for NFA and regulator concurrence is pending. Based on these NFA determinations, which address soil and subsurface structures under an industrial worker exposure scenario, and based on consideration of potential impacts to surface water, groundwater, and ecological receptors, the proposed transfer footprint is suitable for the intended industrial use. Table 7.2 summarizes the land use controls to be implemented in affected areas of the transfer footprint.

Table 7.2 Land use controls for the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area

| Type of control | Purpose of control | Duration | Implementation | Affected area^a |
|---|---|--|---|---|
| 1. Property Record A. Land Use B. Groundwater | Restrict uses of certain property by imposing limitations, protect soil covers Prohibits use of groundwater | Until the concentrations of hazardous substances are at such levels to allow for unrestricted use and exposure; groundwater use prohibitions are in place until the final groundwater decision is made | Drafted and implemented by DOE upon transfer of affected areas; recorded by DOE in accordance with state law at Roane County Register of Deeds office | <ul style="list-style-type: none"> • Use compatible with inspecting and maintaining soil cover at K-720 Fly Ash Pile; no industrial use allowed. • Controlled industrial or recreational use at K-770 and Duct Bank corridor (controls needed to excavate beneath 2 ft); • Unrestricted industrial or recreational use in rest of Zone 1 where residual contamination prohibits unrestricted use • Prohibits groundwater use throughout all of Zone 1 |
| 2. Property Record and Other Notices ^c | Provide information to the public about the existence and location of contaminated areas and media and limitations on their use | Until the concentrations of hazardous substances are at such levels to allow for unrestricted use and exposure | Notice of Land Use Restrictions recorded in Roane County Register of Deeds office upon transfer of affected areas | <ul style="list-style-type: none"> • Use compatible with inspecting and maintaining soil cover at K-720 • Controlled industrial or recreational use at K-770 and Duct Bank corridor (controls needed to excavate beneath 2 ft) • Unrestricted industrial or recreational use in rest of Zone 1 where residual contamination prohibits unrestricted use |
| 3. Zoning Notices ^d | Provide notice to city and county about the existence and location of waste disposal and residual contamination areas and limitations on their use for zoning/planning purposes | Until the concentrations of hazardous substances are at such levels to allow for unrestricted use and exposure | Zoning notice and survey plat filed with City and County Planning Commissions upon transfer of affected area | <ul style="list-style-type: none"> • Use compatible with inspecting and maintaining soil cover at K-720 • Controlled industrial or recreational use at K-770 and Duct Bank corridor (controls needed to excavate beneath 2 ft) • Unrestricted industrial or recreational use in rest of Zone 1 where residual contamination prohibits unrestricted use |

Table 7.2 Land use controls for the Former Powerhouse Area, Duct Island, and K-1007-P1 Pond Area (cont.)

| Type of control | Purpose of control | Duration | Implementation | Affected area^a |
|--|--|--|---|--|
| 4. Excavation/Penetration Permit Program | Provide notice to worker/developer (i.e., permit requestor) on extent of contamination and prohibit or limit excavation/penetration activity | Until the concentrations of hazardous substances are at such levels to allow for unrestricted use and exposure | Implemented by DOE and its contractors; initiated by permit request | <ul style="list-style-type: none"> • K-720, K-770, and Duct Bank (notice of potential contamination below 2 ft) • Excavation/Penetration activities at K-720 Fly Ash Pile prohibited • Elsewhere in Zone 1 where residual contamination remains below 10 ft (notice of potential contamination) |
| 5. Signs | Provide notice or warning to prevent unauthorized access | As long as waste remains | Signage maintained by DOE | <ul style="list-style-type: none"> • At K-720 Fly Ash Pile where residual waste is covered • At the K-1007-P1 Pond where a restriction on mowing to maintain a buffer is required |

Note: Modified from *Proposed Plan for Final ROD for Soils in Zone 1 at East Tennessee Technology Park, Oak Ridge, Tennessee* (DOE/OR/01-2648&D4).

^a Affected Areas – Specific locations identified as part of a remedial design report/remedial action work plan.

^b Property Record Restrictions – Includes conditions and/or covenants that restrict or prohibit certain uses of real property and are recorded along with original property acquisition records of DOE and its predecessor agencies.

^c Property Record Notices – Refers to any non-enforceable, purely informational document recorded along with the original property acquisition records of DOE and its predecessor agencies that alert anyone searching property records to important information about residual contamination/waste disposal areas on the property.

^d Zoning Notices – Includes information on the location of waste disposal areas and residual contamination depicted on a survey plat, which is provided to a zoning authority (i.e., City Planning Commission) for consideration in appropriate zoning decisions for non-DOE property.

^e Excavation/Penetration Permit Program – Refers to the internal DOE/DOE contractor administrative program(s) that require the permit requestor to obtain authorization, usually in the form of a permit, before beginning any excavation/penetration activity for the purpose of ensuring that the proposed activity will not affect underground utilities/structures or will not disturb the affected area without the appropriate precautions and safeguards.

DOE = U.S. Department of Energy.

8. REFERENCES

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Plate 1. Soil Sample Locations

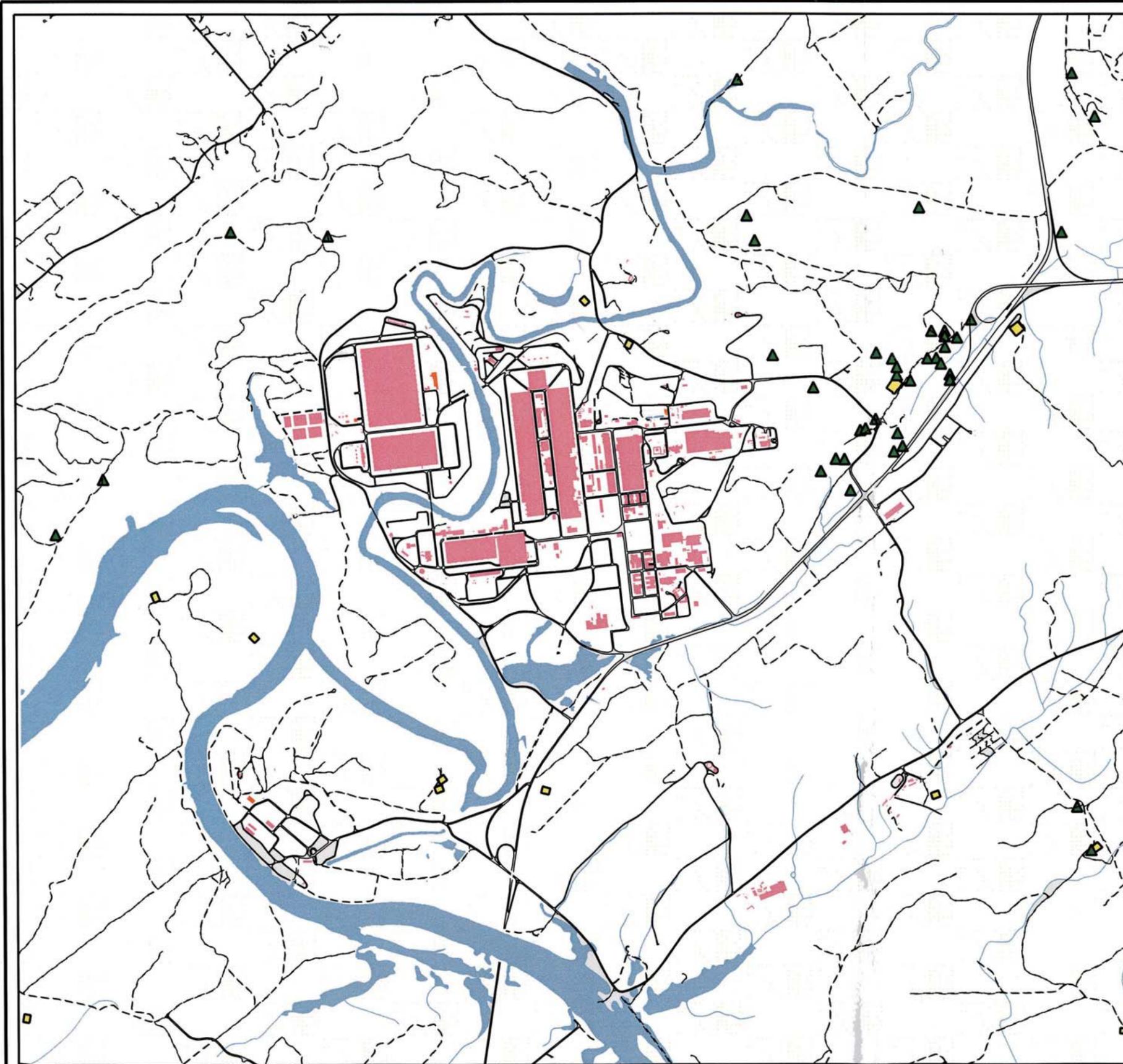
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APPENDIX A
REAL ESTATE ACQUISITION LETTER

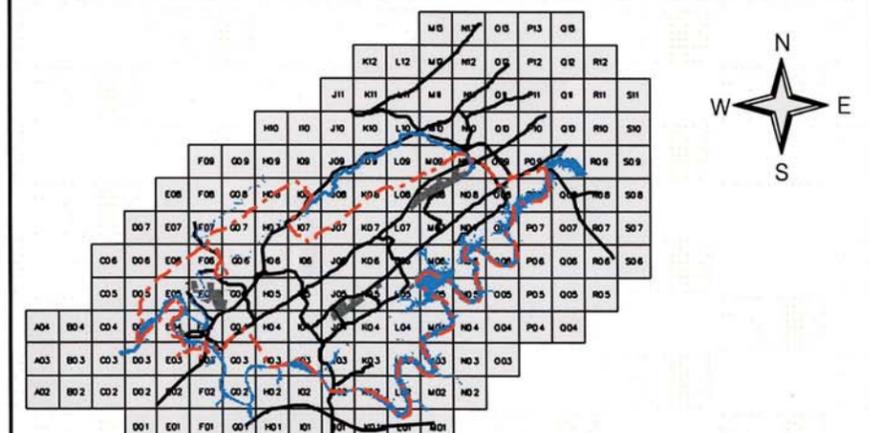
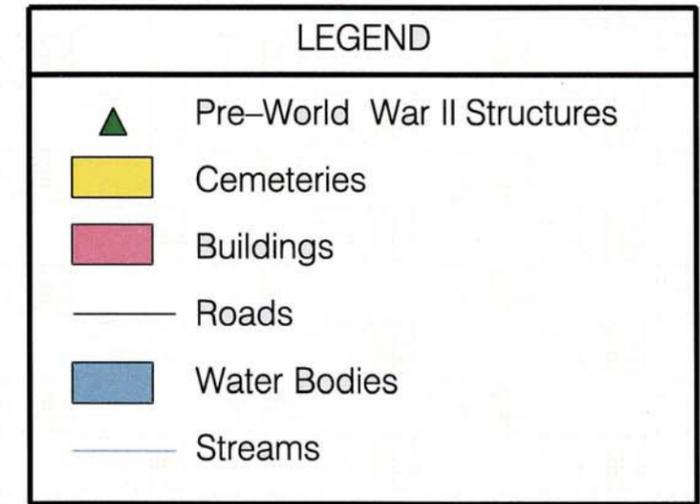
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APPENDIX B

STUDY AREA MAP FROM RECORDS SEARCH



Location of Pre-World War II Structures and Cemeteries in or near the East Tennessee Technology Park



DATA COMPILED BY: GRID IS NAD 83 FEET
 ER REMOTE SENSING PROGRAM
 ENVIRONMENTAL INFORMATION MANAGEMENT PROGRAM
 GEOGRAPHIC INFORMATION SCIENCES AND TECHNOLOGY GROUP
 ORIGINAL BY: BARGE, WAGGONER, SUMNER AND CANNON, INC.
 REVISED BY: TETRA TECH, INC. 2/10/01

APPENDIX C
PCCR APPROVAL LETTERS

DOE-06-0250

I-10033-0208



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

March 13, 2006

Certified Mail
Return Receipt Requested

4WD-FFB

Mr. David G. Adler, Project Manager
Federal Facilities Agreement
Oak Ridge Reservation Management Group
Department of Energy
P.O. Box 2001
Oak Ridge, TN 37831

SUBJ: Phased Construction Completion Report for the Duct Island Area and K-901 Area
in Zone I, East Tennessee Park, Oak Ridge, Tennessee (DOE/OR/-01-2261&D2)

Dear Mr. Adler:

This letter serves to notify you that the Environmental Protection Agency has completed its review of the above referenced document. There is one typographical error on page J-7, second paragraph second to the last sentence: The reference to U-234 should actually be U-235. Please make this page correction and submit as a replacement. Upon receipt, I will recommend to the Chief, Federal Facilities Branch to approve the document as submitted.

If you have questions regarding this matter, please contact me at (404) 562-8551.

Sincerely,

Constance Allison Jones, Senior RPM
KY/TN Oversight Section
Federal Facilities Branch
Waste Management Division

cc: R. Doug McCoy, TDEC
Patricia Halsey, DOE
James Kopotic, DOE
Thomas Gebhart, TDEC
SSAB

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DOE-06-0308



I-10033-0211

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
761 EMORY VALLEY ROAD
OAK RIDGE, TENNESSEE 37830-7072

March 29, 2006

David Adler
DOE FFA Project Manager
PO Box 2001
Oak Ridge, TN 37830

Dear Mr. Adler

TDEC Approval Letter
Phased Construction Completion Report, Duct Island Area and K-901 Area in Zone 1, East Tennessee Technology Park, Oak Ridge, Tennessee
DOE/OR/01-2261&D2
February 2006

The Tennessee Department of Environment and Conservation, DOE Oversight Division has reviewed the above referenced document pursuant to the Federal Facility Agreement for the Oak Ridge Reservation. The State is in receipt of the errata page transmitted by DOE in a letter dated March 20, 2006, correcting a typographical error on page J-7 of the document. The State has no comments of significance and approves the document as it is presented.

Questions or comments concerning the contents of this letter should be directed to Erin Dixon or Thomas Gebhart at the above address or by phone at (865) 481-0995.

Sincerely


Doug McCoy, FFA Manager
Environmental Restoration Program

cc Jeff Crane, EPA
Pat Halsey, DOE
Donna Perez, DOE

Er712.05

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RECEIVED APR 19 2006



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

OCT - 2 2006

Certified Mail
Return Receipt Requested

4WD-FFB

Mr. David G. Adler, Project Manager
Federal Facilities Agreement
Oak Ridge Reservation Management Group
Department of Energy
P.O. Box 2001
Oak Ridge, TN 37831

SUBJ: EPA Approval of the Phased Construction Completion Report for the K-1007 Ponds Area and the Powerhouse North Area in Zone 1 at East Tennessee Technology Park, Oak Ridge, Tennessee (DOE/OR/01-2994&D2)

Dear Mr. Adler:

The Environmental Protection Agency (EPA) has reviewed the document which was submitted on August 29, 2006. The Phased Construction Completion Report (PCCR) for the K-1007 Ponds Area and the Powerhouse North Area in Zone 1 documents:

- the characterization results of the Dynamic Verification Strategy (DVS) for 21 of the accessible 36 Exposure Units (EU) in the K-1007 Ponds and Powerhouse Area addressing 404.1 acres;
- the risk evaluation for each EU evaluated under the DVS and the determination of whether the EU met the Zone 1 Record of Decision (ROD) requirements for unrestricted industrial use to 10 feet below ground surface;
- evaluated 25 Federal Facility Agreement (FFA) sites and recommends no further action for 16 of these sites;
- final status assessments of nine FFA sites which are contingent on completion of remedial action at the site or in the associated EU;
- recommends 326 acres for unrestricted industrial use to 10 feet below ground surface;
- 9.2 acres of water bodies that will be addressed by the Site-wide Remedial Investigation and ROD;

06 OCT 4 PM 2:47

- four of the remaining 15 EUs await removal of the K-770 Scrap prior to completion of the characterization and associated remedial action; and
- eleven of the remaining 15 EUs await completion of decontamination and decommissioning actions prior to final sampling activity.

The EPA has no further comments on this document and is approving the PCCR as submitted. Although, this interim remedial action is approved, the Department of Energy should ensure that the Zone 1 Remedial Action Report (RAR) clearly specifies all land use controls implemented for all acreage within Zone 1 including all changes to the dig restrictions below 10 feet. Revising the industrial land use restrictions may require further specification of the remaining land use controls (e.g., restrictions on digging into contaminated aquifers). The current discussions to remove these controls need to conclude with an agreement between the FFA Parties regarding the specific conditions to apply prior to submitting the D1 RAR.

The EPA commends the efforts of the Remedial Action Core Team to achieve this major milestone. If you have any questions regarding this matter, please feel free to contact Constance Jones of my staff at (404) 562-8551.

Sincerely,


Earl L. Bozeman, Jr., Acting Chief
Federal Facilities Branch
Waste Management Division

cc: R. Doug McCoy, TDEC
Patricia Halsey, DOE
James Kopotic, DOE
Thomas Gebhart, TDEC
SSAB
LOC



STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
761 EMORY VALLEY ROAD
OAK RIDGE, TENNESSEE 37830-7072

September 28, 2006

Mr. David Adler
DOE FFA Project Manager
PO Box 2001
Oak Ridge, TN 37830

Dear Mr. Adler

**TDEC Approval Letter
Phased Construction Completion Report for the
K-1007 Ponds Area and Powerhouse North Area in Zone 1
East Tennessee Technology Park
Oak Ridge, Tennessee
DOE/OR/01-2294&D2
August, 2006**

The Tennessee Department of Environment and Conservation, DOE Oversight Division has reviewed the above referenced document pursuant to the Federal Facility Agreement for the Oak Ridge Reservation and approves the document as presented.

Questions or comments concerning the contents of this letter should be directed to Erin Dixon or Thomas Gebhart at the above address or by phone at (865) 481-0995.

Sincerely

R. Doug McCoy
FFA Project Manager

cc: Jeff Crane – EPA
Pat Halsey – DOE
Donna Perez – DOE

er757.10

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bcc: Martha Brock, OEA
Reading File
ETTP Site File
Constance Jones, FFB

C.Jones/caj:4WD-FFB/404-562-8551/9-21-2006/My Documents\Backup\ORR\Zone
1\PCCRs\Approval of PCCR for the K-1007 Ponds Area and Powerhouse North
Area.doc

Jones caj 9/21/06 Crane JK Taylor _____
9/21/06



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

April 4, 2008

Certified Mail
Return Receipt Requested

4SF-FFB

Mr. David G. Adler, Project Manager
Federal Facilities Agreement
Oak Ridge Remediation Group
Department of Energy
P.O. Box 2001
Oak Ridge, TN 37831

SUBJ: Review and Approval of the FY 2008 Construction Completion Report for
Exposure Units Z1-01, Z1-03, Z1-38 and Z1-49 in Zone 1 at East Tennessee
Technology Park, Oak Ridge, Tennessee (DOE/OR/01-2367&D2)

Dear Mr. Adler:

The Environmental Protection Agency (EPA) has reviewed the Phased Construction Completion Report (PCCR) which was submitted March 26, 2008. The PCCR addresses exposure units (EU) in the Dust Island, K-901, and K-1007 Ponds Areas and presents information on:

- the characterization and remediation results for the K-895 Cylinder Destruct Facility in the K-901 Area (EU Z1-49) which covers 0.8 acres. Remediation for the site was identified in the Zone 1 ROD, which was approved November 2002. Remediation activities occurred in September 2007 and clears the 4.3 acres contained in this EU;
- the remediation of six (6) earthen mounds in EU Z1-38, which was identified in the K-901/Duct Island PCCR and approved by EPA on September 21, 2006. The remedial action occurred September 2007 and clears the 20.3 acres contained in this EU;
- EU Z1-1 at the Happy Valley Service Station Group of the K-1007 Ponds Area. The EPA approved the PCCR for the K-1007 Ponds Area and Powerhouse North Area in Zone 1 on April 26, 2006. The Happy Valley Service Station site was identified as needing additional characterization. Based on the results of the subsequent characterization activities, four (4) underground storage tanks were closed in placed in accordance with the Tennessee Department of Environment and Conservation (TDEC) UST

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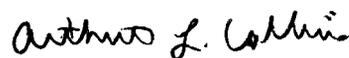
regulations. The remedial action was completed on August 28, 2007. The remedial action clears the 28.0 acres in EU Z1-1;

- the characterization activities at EU Z1-03 in the K-1055 Gasoline/Diesel Station Tanks of the K-1007 Ponds Group. The remedial action removed five tanks. Although the tanks met the criteria for closure in place under the TDEC UST regulations, they were removed in support of the Re-industrialization Program at ETTP. The remedial action clears the 24.4 acres contained in EU Z1-03;
- the total of 81.1 acres that have been evaluated under the Dynamic Verification System and determined that each EU meets the Zone 1 Record of Decision (ROD) requirements for unrestricted industrial use to 10 feet below ground surface; and
- recommends no further action on four (4) additional Federal Facility Agreement (FFA) sites in Z1 UE-03 that were referenced in an earlier PCCR.

The EPA has no further comments on this document and is approving the PCCR as submitted. Although this interim remedial action is approved, the Department of Energy should ensure that the Zone 1 Remedial Action Report (RAR) clearly specifies all land use controls implemented for all acreage within Zone 1, including all changes to the dig restrictions below 10 feet. Revising the industrial land use restrictions may require further specification of the remaining land use controls (e.g., restrictions on digging into contaminated aquifers). Discussions to remove these controls need to conclude with an agreement between the FFA Parties regarding the specific conditions to apply prior to submitting the D1 RAR.

If you have any questions, please feel free to contact Constance Jones of my staff at (404) 562-8551 or electronically at: Jones.Constance@epa.gov.

Sincerely,



Arthur L. Collins, Chief
Federal Facility Branch
Superfund Division

cc: Roger Petrie, TDEC
Patricia Halsey, DOE
Jack Howard, DOE
Thomas Gebhart, TDEC
SSAB
LOC



**STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
761 EMORY VALLEY ROAD
OAK RIDGE, TENNESSEE 37830-7072**

April 23, 2008

Mr. David Adler
DOE FFA Project Manager
PO Box 2001
Oak Ridge, TN 37830

Dear Mr. Adler

**TDEC Approval Letter
FY2008 Phased Construction Completion Report for Exposure Units Z1-01, Z1-03,
Z1-38, and Z1-49
East Tennessee Technology Park
Oak Ridge, Tennessee
DOE/OR/01-2367-D2
March, 2008**

The Tennessee Department of Environment and Conservation, DOE Oversight Division has reviewed the above referenced document pursuant to the Federal Facility Agreement for the Oak Ridge Reservation and approves the document as presented.

Questions or comments concerning the contents of this letter should be directed to Thomas Gebhart at the above address or by phone at (865) 481-0995.

Respectfully

A handwritten signature in black ink, appearing to read "Roger Petrie".

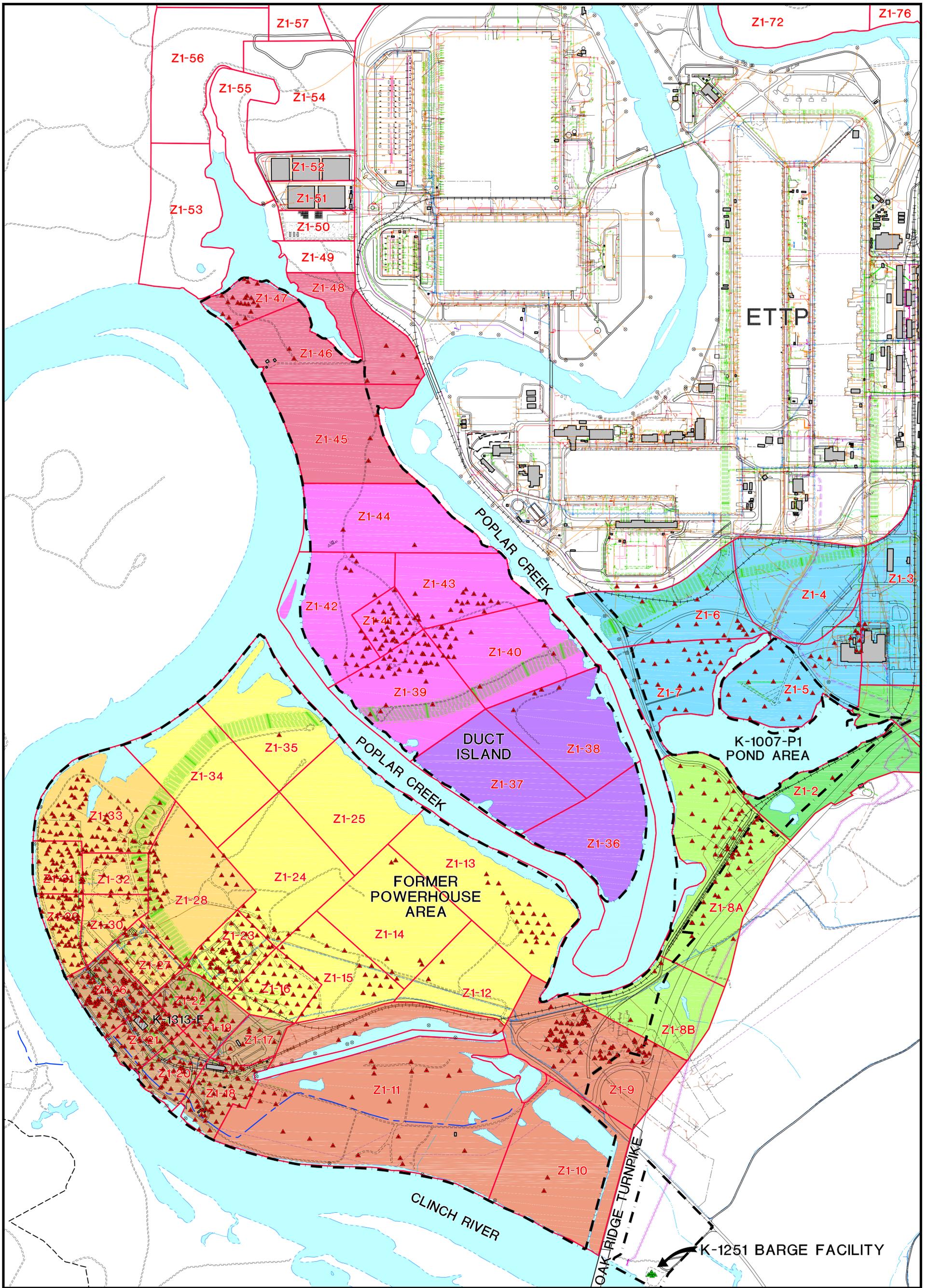
Roger Petrie
FFA Project Manager

cc Jeff Crane – EPA
Pat Halsey – DOE
Jack Howard – DOE

er880

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LEGEND:

| | |
|--|---|
| | BUILDING |
| | PAVED ROAD |
| | UNPAVED ROAD |
| | CREEK OR STREAM |
| | OPEN WATER |
| | SURVEYED WETLANDS |
| | TRANSFER FOOTPRINT (661.7 Ac.) |
| | BUILDING STRUCTURE TO BE ADDRESSED SEPARATELY |
| | DVS SOIL SAMPLE |
| | REINDUSTRIALIZATION SOIL SAMPLE |

ONE EXPOSURE UNIT GROUPS:

| | |
|--|------------------------------------|
| | K-901-A SOUTH GROUP |
| | K-1070-F GROUP |
| | DUCT ISLAND SOUTH GROUP |
| | K-1007 GROUP |
| | HAPPY VALLEY SERVICE STATION GROUP |
| | JONES GROUP |
| | FIREHOUSE AND ASH PILE GROUP |
| | K-722 AREA ROAD GROUP |
| | K-770 GROUP |
| | POWERHOUSE NORTH GROUP |

UTILITIES LEGEND:

FIRE WATER

| | |
|--|-----------------------------------|
| | FIRE WATER LINE |
| | ABANDONED FIRE WATER LINE |
| | CITY OF OAK RIDGE FIRE WATER LINE |

SANITARY WATER

| | |
|--|--------------------------------|
| | SANITARY WATER LINE |
| | ABANDONED SANITARY WATER LINE |
| | WATER SPRINKLER SYSTEM LINE |
| | SANITARY RAW WATER RETURN LINE |

SANITARY SEWER

| | |
|--|-------------------------------|
| | SANITARY SEWER LINE |
| | SANITARY SEWER FORCE MAIN |
| | ABANDONED SANITARY SEWER LINE |
| | SANITARY SEWER ACID LINE |
| | SANITARY SEWER BACKWASH LINE |

NATURAL GAS

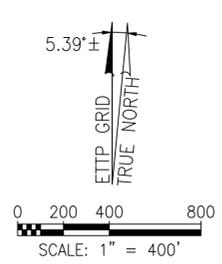
| | |
|--|---|
| | NATURAL GAS LINE |
| | EAST TENNESSEE NATURAL GAS LINE |
| | OAK RIDGE UTILITY DISTRICT NATURAL GAS LINE |
| | PROPOSED NATURAL GAS LINE |
| | ABANDONED NATURAL GAS LINE |
| | PROPANE GAS LINE |

UNDERGROUND ELECTRICAL

| | |
|--|---------------------------|
| | COMMUNICATION LINE |
| | FIRE ALARM LINE |
| | UNDERGROUND ELECTRIC LINE |
| | ELECTRICAL GROUNDING LINE |

STORM SEWER

| | |
|--|---------------------|
| | STORM SEWER LINE |
| | STORM SEWER OUTFALL |



**FORMER POWERHOUSE AREA
DUCT ISLAND, AND K-1007-P1 POND
AREA AT ETPP
OAK RIDGE, TENNESSEE**

SOIL SAMPLE LOCATIONS

| | | |
|------------------------|------------------------------|---|
| DRAWN BY: R. BEELER | REV. NO./DATE: 0/02-17-16 | CAD FILE: /16002/DWGS/Q89_PH_SAMPUTIL-01 |
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