COMMONWEALTH OF KENTUCKY
AGREEMENT IN PRINCIPLE

2023 ENVIRONMENTAL SAMPLING STRATEGY DOCUMENT

January12, 2023

I. INTRODUCTION

The Agreement in Principle (AIP) is an agreement between the Commonwealth of Kentucky and the Department of Energy (DOE) to provide independent oversight and assurances that environmental activities at the Paducah Gaseous Diffusion Plant (PGDP) are conducted in a scientific and sound manner. The Agreement is intended to maintain an independent, impartial, and qualified assessment of the environmental impacts into past, present, and future DOE activities at the PGDP. This AIP "Environmental Sampling Strategy Document" provides a description and rationale for all environmental sampling activities planned by the Commonwealth of Kentucky AIP staff in 2023. The goal and activities outlined in this plan are designed to facilitate coordination and transparency efforts and prevent and/or minimize negative coordination and environmental impacts as various types of site activities are carried out in and around the PGDP.

This plan is updated and revised annually or when determined necessary. A very important premise of this document is that it can be easily reviewed and modified/updated, as issues and knowledge progress. If there is a change or modification to this plan, DOE will be notified. There are no data results associated with this document; it is a plan that outlines a sampling strategy and rationale. Data results and interpretation will be transmitted to DOE (per requirements set forth in the AIP grant) and presented in the "AIP Annual Report."

The Cabinet for Health and Family Services (CHFS) Radiation Health Branch (RHB) AIP presents their own "Environmental Sampling Strategy Document" and schedule to DOE. This plan specifically covers the Energy and Environment Cabinet (EEC) AIP activities associated with the PGDP.

II. MISSION STATEMENT

The purpose of the AIP Sampling Plan is to assist in providing an independent evaluation of Quality Assurance/Quality Control (QA/QC) of DOE environmental sampling programs for the Environmental Restoration activities at the PGDP. This is accomplished by reviewing and commenting on a variety of DOE/contractor procedures, as well as observing DOE/contractor field sampling practices. The AIP is also responsible for independent and split sampling of environmental samples from a wide variety of locations (e.g. groundwater monitoring wells, residential groundwater wells, stream sediments, outfalls, surface waters, and biota). Independent sampling is performed when the AIP deems it necessary to augment current DOE sampling efforts to independently verify their results.

The Commonwealth of Kentucky's AIP Environmental Monitoring Program is designed to provide an independent assessment on the quality of the human and ecological environment in and around the PGDP.

III. MAJOR CONTAMINANTS OF CONCERN IN GROUNDWATER

Currently, two offsite groundwater contaminant plumes have been delineated: the Northeast and Northwest Plumes. Both plumes are known to be present in the Regional Gravel Aquifer (RGA) and flow from the plant, north towards the Ohio River. The primary contaminants of concern for the Northwest Plume are trichloroethylene (TCE) and technetium (Tc-99). TCE is the primary contaminant within the Northeast Plume. TCE was once widely used at the plant as a degreasing agent and is thought to exist as a dense non-aqueous phase liquid (DNAPL) within the RGA at locations within the plant fence line. It is hypothesized that DNAPL may also occur as residual pockets within the UCRS and as pockets and stringers within the RGA. As it slowly dissolves, it produces dissolved-phase plumes, which then travel offsite. Tc-99 is a product of nuclear fission and was introduced at the site when spent nuclear fuel was sent to Paducah for reprocessing.

The exact locations of sources to off-site contaminant plumes are not fully understood and multiple sources for each plume are likely. DOE believes that the C-400 area has contributed the most TCE to the dissolved phase Northwest Plume (Garner, Morti, and Smuin, 1995). The C-400 area is also believed to be responsible for much of the Northeast Plume contamination (DOE, 1997). This belief is supported by subsurface sampling and process knowledge concerning activities at the C-400 building, where as much as 23,000 gallons of TCE per month were used during peak operations in the 1970s.

The release mechanism for Tc-99 is thought to originate at the C-400 building where a recovery process occurred. Tc-99 derived from reprocessed fuel rods is also thought to have contaminated the enrichment cascade buildings. Tc-99 is a neutron absorber and was removed during the enrichment process. The disposal practices for Tc-99 were not well documented; however, there is an account of a Tc-99 spill inside the C-400 building, and it has been theorized that Tc-99 may have been placed in the C-404 landfill, the C-749 burial ground, and other on-site burial grounds.

The area of highest TCE and Tc-99 concentrations in RGA groundwater are found near the C-400 Building, the primary source for the Northwest Plume. At C-400, concentrations of TCE contamination are highest near the building's southeastern corner; whereas, Tc-99 tends to be highest at the northwest corner of the building. This understanding may change as results from ongoing C-400 Complex Operable Unit field investigative activities become available. The highest concentration of TCE within the Northeast Plume lies along the plume's southeastern edge. Several source actions have been completed around the C-400 building and now the focus has shifted to investigating and ultimately remediating the area encompassing the C-400 building.

IV. GROUNDWATER MONITORING STRATEGY IS INTENDED TO INTEGRATE SAMPLING EFFORTS TO MEET SIX BROAD GOALS:

A. Further validate DOE's sampling/analytical procedures through split sampling or observations of ~5% of the calendar year's events. Confirmation of DOE analytical results typically performed on the following analysis: Volatile Organic Compounds (VOCs), Tc-99, metals, isotopic radionuclides, and PCBs. AIP personnel will compare the results and report if observed procedures are followed and meet quality standards with findings reported in the AIP Annual Summary Report;

B. Monitor areas where contaminant plume migration is potentially occurring (e.g. fringes of the plume boundaries);

C. Monitor the effectiveness of hydraulic containment systems by monitoring wells that are located within the NW Plume and NE Plume. Monitoring any changes from the Pump and Treat systems to assess the cone of depression and the potential by-pass of higher concentration dissolved phase /areas passing around or under the extraction wells.

D. Sample a subset of residential wells to monitor for the presence of TCE and Tc-99 contamination, in order to compare results against established drinking water standards;

E. Monitor TCE concentrations upwelling from the Northwest Plume into Little Bayou Creek and walk the creek periodically searching (visually or with instrumentation) for new or migrating seeps;

F. Monitor water elevations in 16-19 monitoring wells on the Tennessee Valley Authority (TVA) property as part of a quarterly site wide synoptic groundwater elevation monitoring event.

The AIP groundwater sampling program is designed to meet these six goals while minimizing the number of samples collected through the selection of strategic sampling locations. Table 1 shows all the 2023 sampling planned as part of the AIP sampling program. Table 2 provides the sampling frequency of residential wells, monitoring wells, and seeps that will be split with DOE, or sampled independently by AIP. Table 3, 4, and 5 provide x and y coordinate sample locations. Table 6 provides the x and y coordinates of each TVA synoptic water level collection point. Figure 1 shows the locations of the residential wells to be sampled. Figure 2 shows the locations of the outfalls to be sampled. Figure 3 shows the locations of the monitoring wells and seeps to be sampled. Figure 4 shows the TVA monitoring wells used to obtain water elevations during the quarterly synoptic groundwater elevation events. All analytical and field data gathered by AIP undergoes a QA/QC review process prior to being formatted and transmitted electronically to Four Rivers Nuclear Partnership (FRNP), for entry into the PEGASIS Data Base. AIP also grants permission to FRNP and DOE for release to the public on all data.

The Cabinet for Health and Family Services (CHFS) of Frankfort, Kentucky, analyzes KDWM AIP samples collected for radiological constituents. McCoy and McCoy Laboratories, Inc. conducts analysis of Whole Effluent Toxicity (WET) testing from selected outfalls. The Kentucky Department for Environmental Protection Laboratory, Frankfort, Kentucky is utilized to analyze the vast majority of the other (non-rad) constituents.

A) Confirmatory Sampling

The AIP has an obligation to provide confirmation that sampling procedures and analytical results reported by DOE are credible, current, accurate, and being observed/followed at the Paducah Site. The AIP strategy devised to accomplish this objective involves splitting samples with DOE on a regular basis, as well as augmenting DOE's sampling program with independent AIP sampling events. Split sampling, between DOE and AIP, will occur during planned sampling events such as, routine groundwater monitoring, removal actions, technology demonstrations, and environmental investigations.

AIP staff will review DOE Contractor procedures related to sampling and look for adherence in the field. On occasion AIP will collect deionized water samples from the contractor in charge of groundwater monitoring to assure certain water quality standards are being met.

The list of routine analytes that could be collected during a confirmatory sampling event may include: 1a) volatiles encompassed in VOC 8260B; 1b) Gross Alpha, Gross Beta and gamma spectroscopy; 1c) metals 6010C; 1d) PCBs 8082A; 1e) isotopic uranium; 1f) uranium (metal); 1g) total suspended solids (TSS); 1h) Chronic Whole Effluent Toxicity (WET); 1i) Acute Whole Effluent Toxicity (WET); and 1j) Hardness. Basic geochemical parameters measured in the field include water temperature, pH, dissolved oxygen, conductivity, oxygen reduction potential (ORP) and turbidity. AIP also records air temperature, barometric pressure, and measures the water level before purging and after parameter stabilization.

B) Monitoring of Plume Growth and Migration

The AIP will augment DOE's sampling program to ensure that the spread of the contaminant plumes are adequately being monitored spatially and temporally. The Northeast plume's eastern edge is near the DOE's Water Policy Box administrative boundary. This proximity requires careful monitoring to ensure that early detection is provided for DOE and residents living near the boundary that are not currently under protection of the Water Policy Area. In addition, the AIP is monitoring areas to the west and north of the plant to monitor the impact of the Northwest and Southwest plumes. If data indicates that a plume has crossed the Water Policy boundary, DOE will be immediately notified, and steps will be taken to contact residents and sample all potentially affected residential wells. TCE is the primary analyte measured; however, Gross Alpha, Gross Beta and gamma spectroscopy may periodically be sampled due to public concern. Basic geochemical parameters will also be measured, including turbidity, temperature, pH, dissolved oxygen, conductivity and ORP.

C) Monitoring the Effectiveness of the Hydraulic Containment Systems

The AIP will continue to review results of DOE's sampling of existing wells to monitor the effectiveness of the current Northwest and Northeast plume hydraulic containment (i.e. Pump-N-Treat) systems. DOE currently monitors wells in the immediate vicinity of the extraction wells. The AIP will independently monitor and sample selected locations on a routine basis. TCE, Gross Alpha, Gross Beta and gamma spectroscopy will be the primary analytes measured in samples obtained from these wells. Basic physical and geochemical parameters will also be measured, including water level, turbidity, temperature, pH, dissolved oxygen, conductivity and ORP.

This information will be used to detect temporal changes in the groundwater elevation that may be occurring due to plant activities associated with utility optimization activities. Any observed changes will help assess impacts to the cone of depression.

D) Residential Well Monitoring Program

The AIP collects water samples from residential wells located near and outside the Water Policy Box of the PGDP. Groundwater samples may also be collected (at the request of the landowner) within an ~2.5 (two and a half) mile radius from the PGDP or if the determination has been made that the underlying aquifer could reasonably be impacted by the PGDP plumes. This will be done on a case-by-case basis, at the discretion of Kentucky. The AIP is primarily concerned about environmental contamination in residential wells and does not sample for biological or sanitary conditions. The AIP recommends for residents consuming groundwater, to have additional biological testing performed to assure their well is free from harmful bacteria and viruses. TCE, Gross Alpha, Gross Beta and gamma spectroscopy will be the primary analytes measured but samples may also be tested for metals, PFAS and PCBs. All results will be provided to the landowners and DOE. Basic physical and geochemical parameters will also be measured including water level, turbidity, temperature, pH, dissolved oxygen, conductivity and ORP.

If any of the samples collected by KY AIP are contaminated with constituents that could pose a health threat, immediate notification, both verbal and written, will be provided to the resident and DOE. A resampling event with an expedited 7-day laboratory turn around will follow to confirm the sampling results. The property owner and/or resident will be notified regardless of the results of the tests. A letter explaining the results will be sent by KDWM AIP to the resident and DOE soon after the results are compiled.

E) Monitor TCE Concentrations Upwelling from the Northwest Plume into the Little Bayou Creek.

In 2023 AIP will split two of the four scheduled DOE contractor seep-sampling events to compare results and confirm sampling procedures are being followed. AIP will also conduct transects of Little Bayou Creek periodically and sample any seeps that are present or discovered.

F) Monitoring Water Elevations at TVA During Site Wide Synoptic Water Measuring Events.

The AIP will augment DOE's synoptic site wide groundwater elevation measuring events by requesting access to the Tennessee Valley Authority (TVA) facility, located north of the facility. Water level elevations and associated barometer readings will be obtained during the same week as the PGDP site wide synoptic water elevation measurement event. The data will be compiled and transmitted to DOE to augment and refine the general understanding of groundwater flow conditions near the Ohio River.

REFERENCES:

Department of Energy. 1997. Integrated Remedial Investigation/ Feasibility Study Work Plan for Waste Area Grouping 6 at Paducah Gaseous Diffusion Plant Paducah, Kentucky, DOE/OR/07-1243&D4, Department of Energy, Paducah, Kentucky.

Department of Energy. 2022. Environmental Monitoring Plan Fiscal Year 2022 Paducah Gaseous Diffusion Plant, Paducah, Kentucky, CP2-ES-0006/FR7

Garner, L.K., E.E. Morti, and D.R. Smuin. 1995. *Northeast Plume Preliminary Characterization Summary Report,* DOE/OR/07-1339&D2, KY/ER-65&D2, Environmental Management and Enrichment Facilities, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, July.

Well#	Location	Screen Zone	Goals	January	February	March	April	May	June	July	August	September	October	November	December	DOE Schedule
R2	residential well	unknown	a(1a, 1b), b, d		Split											Quarterly
R10	residential well	unknown	a(1a, 1b), b, d		Split											Quarterly
R13	residential well	unknown	a(1a, 1b), b, d		Split											Quarterly
R14	residential well	unknown	a(1a, 1b), b, d		Split											Quarterly
R26	residential well	unknown	a(1a, 1b), b, d		Split											Quarterly
R40	residential well	unknown	a(1a, 1b), b, d		Split			Split			Split			Split		Quarterly
R53	residential well	unknown	a(1a, 1b), b, d		Split											Quarterly
R245	residential well	unknown	a(1a, 1b), b, d		Split											Quarterly
R9*	residential well	unknown	a(1a, 1b), b, d											AIP		Annual
R20	residential well	RGA	a(1a, 1b), b, d											AIP		Annual
R21	residential well	unknown	a(1a, 1b), b, d											AIP		Annual
R83	residential well	unknown	a(1a, 1b), b, d											AIP		Annual
R90*	residential well	unknown	a(1a, 1b), b, d											AIP		Annual
R114*	residential well	RGA	a(1a, 1b), b, d											AIP		Annual
R302	residential well	RGA	a(1a, 1b), b, d											AIP		Annual
MW84A	C-404	MRGA	a(1a, 1b, 1c, 1e), b	Split									AIP			Semiannual
MW87A	C-404	MRGA	a(1a, 1b, 1c, 1e), b	Split									AIP			Semiannual
MW90A	C-404	URGA	a(1a, 1b, 1c, 1e), b	Split									AIP			Semiannual
MW93A	C-404	MRGA	a(1a, 1b, 1c, 1e), b	Split									AIP			Semiannual
MW420	C-404	URGA	a(1a, 1b, 1c, 1e), b	Split									AIP			Semiannual
MW548	C-404	RGA	a(1a, 1b, 1c, 1e), b	Split									AIP			Semiannual
MW66	NW Plume	URGA	a(1a, 1b), b, c									Split				Semiannual
MW106A	NW Plume	MRGA	a(1a, 1b), b, c						AIP							Quarterly
MW133	NW Plume	McNairy	a(1a, 1b), b, c						AIP							Semiannual
MW134	NW Plume	LRGA	a(1a, 1b), b, c							AIP						Quarterly
MW146	NW Plume	LRGA	a(1a, 1b), b, c						AIP							Quarterly
MW194	NW Plume	MRGA	a(1a, 1b), b, c					AIP				AIP				Quarterly
MW205	NW Plume	URGA	a(1a, 1b), b, c					AIP				AIP				Biennial 2021
MW233	NW Plume	MRGA	a(1a, 1b), b, c								AIP					NS
MW247	NW Plume	McNairy	a(1a, 1b), b, c					AIP								Semiannual
MW248	NW Plume	MRGA	a(1a, 1b), b, c					AIP			AIP					Semiannual
MW249	NW Plume	MRGA	a(1a, 1b), b, c			AIP										NS
MW 250	NW Plume	MRGA	a(1a, 1b), b, c				AIP									Semiannual
MW257	NW Plume	MRGA	a(1a, 1b), b, c								AIP					Triennial 2019
MW261	NW Plume	LRGA	a(1a, 1b), b, c			AIP										Semiannual
MW262	NW Plume	LRGA	a(1a, 1b), b, c							AIP						Biennial 2021
MW339	NW Plume	LRGA	a(1a, 1b), b, c									Split				Semiannual
MW340	NW Plume	LRGA	a(1a, 1b), b, c									Split				Semiannual
MW380	NW Plume	LRGA	a(1a, 1b), b, c							AIP						NS
MW381	NW Plume	MRGA	a(1a, 1b), b, c							AIP						Triennial 2019
MW431	NW Plume	LRGA	a(1a, 1b), b, c							AIP						Quarterly
MW432	NW Plume	MRGA	a(1a, 1b), b, c			AIP										Biennial 2021
MW452	NW Plume	LRGA	a(1a, 1b), b, c				AIP									Biennial 2022
MW455	NW Plume	MRGA	a(1a, 1b), b, c			Split										Semiannual
MW456	NW Plume	LRGA	a(1a, 1b), b, c			Split										Semiannual
MW460	NW Plume	LRGA	a(1a, 1b), b, c					AIP								Semiannual
MW498	NW Plume	LRGA	a(1a, 1b), b, c			AIP										Semiannual
MW502	NW Plume	LRGA	a(1a, 1b), b, c						AIP							Semiannual
MW145	NE Plume	LRGA	a(1a, 1b), b, c				AIP									Quarterly
MW252	NE Plume	LRGA	a(1a, 1b), b, c									AIP				Semiannual

MW284	NE Plume	LRGA	a(1a, 1b,), b, c					AIP								NS
MW294A	NE Plume	LRGA	a(1a, 1b), b, c					AIP								NS
MW465	NE Plume	MRGA	a(1a, 1b), b, c							AIP					AIP	Biennial 2021
MW466	NE Plume	MRGA	a(1a, 1b), b, c								AIP				AIP	Biennial 2021
MW467	NE Plume	URGA	a(1a, 1b), b, c									AIP				Biennial 2021
MW533	NE Plume	LRGA	a(1a, 1b), b, c							AIP					AIP	Quarterly
MW524	NE Transect Wells	MRGA	a(1a, 1b), b, c		AIP								Split			Quarterly
MW529	NE Transect Wells	LRGA	a(1a, 1b), b, c		AIP								Split			Quarterly
MW403 Port 3	SW Plume	RGA	a(1a, 1b), b, c			AIP					AIP					Quarterly
MW404 Port 4	SW Plume	RGA	a(1a, 1b), b, c			AIP				AIP						Biennial 2021
MW428	SW Plume	LRGA	a(1a, 1b), b, c				AIP									Semiannual
MW429A	SW Plume	URGA	a(1a, 1b), b, c						AIP							NS
MW430	SW Plume	LRGA	a(1a, 1b), b, c				AIP		AIP							Semiannual
MW139	C-746 Plume	MRGA	a(1a, 1b,), b, c					AIP								Semiannual
MW366	C-746 LF	URGA	a(1a, 1b, 1c), b								AIP					Quarterly
MW575	SWMU 211a	URGA	a(1a, 1b, 1c), b				AIP									Quarterly
MW577	SWMU 211a	URGA	a(1a, 1b, 1c), b							AIP						Quarterly
MW579	SWMU 211a	URGA	a(1a, 1b, 1c), b									AIP				Quarterly
SHF-D11B	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-D17	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-D30B	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-D74B	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-201A	TVA/Synoptic	UCRS	f		WL			WL			WL			WL		NS by DOE
SHF-201B	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-201C	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-101G	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-102G	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
TVAGW-1D	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
TVAGW-2D	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
TVAGW-3D	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
TVAGW-4D	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
TVAGW-5D	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
TVAGW-6D	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
MW135	TVA	LRGA	a(1a, 1b), b, c											AIP		Semiannual
MW147	TVA	MRGA	a(1a, 1b), b, c								AIP					NS
MW433	TVA	MRGA	a(1a, 1b), b, c											AIP		Quarterly
MW439	TVA	MRGA	a(1a, 1b), b, c								AIP					Biennial 2021
MW441	TVA	LRGA	a(1a, 1b), b, c					AIP								Quarterly
MW445	TVA	MRGA	a(1a, 1b), b, c, e				AIP						AIP			Biennial 2021
MW447	TVA	LRGA	a(1a, 1b), b, c, e				AIP						AIP			Biennial 2021
MW466	TVA	MRGA	a(1a, 1b), b, c					AIP								Biennial 2021
MW168	C-400	URGA	a(1a, 1b), b, c			AIP					AIP					Biennial 2021
MW178	C-400	URGA	a(1a, 1b), b, c		AIP								AIP			Quarterly
MW343	C-400	LRGA	a(1a, 1b), b, c			AIP						AIP				Semiannual
MW421 Port 1	C-400	URGA	a(1a, 1b), b, c				AIP									Semiannual
MW421 Port 2	C-400	MRGA	a(1a, 1b), b, c				AIP									Semiannual
MW421 Port 3	C-400	LRGA	a(1a, 1b), b, c				AIP									Semiannual
MW422 Port 1	C-400	URGA	a(1a, 1b), b, c						AIP							Semiannual
MW422 Port 2	C-400	MRGA	a(1a, 1b), b, c						AIP							Semiannual
MW422 Port 3	C-400	LRGA	a(1a, 1b), b, c						AIP							Semiannual
MW423 Port 1	C-400	URGA	a(1a, 1b), b, c								AIP					Semiannual

MW423 Port 2	C-400	MRGA	a(1a, 1b), b, c								AIP					**Semiannual**
MW423 Port 3	C-400	LRGA	a(1a, 1b), b, c								AIP					**Semiannual**
MW424 Port 1	C-400	URGA	a(1a, 1b), b, c									AIP				**Semiannual**
MW424 Port 2	C-400	MRGA	a(1a, 1b), b, c									AIP				**Semiannual**
MW424 Port 3	C-400	LRGA	a(1a, 1b), b, c									AIP				**Semiannual**
MW425 Port 1	C-400	URGA	a(1a, 1b), b, c							Split						**Semiannual**
MW425 Port 2	C-400	MRGA	a(1a, 1b), b, c							Split						**Semiannual**
MW425 Port 3	C-400	LRGA	a(1a, 1b), b, c							Split						**Semiannual**
MW563	C-400	URGA	a(1a, 1b), b, c						Split							**Quarterly**
MW564	C-400	MRGA	a(1a, 1b), b, c						Split							**Quarterly**
MW565	C-400	LRGA	a(1a, 1b), b, c						Split							**Quarterly**
MW566	C-400	URGA	a(1a, 1b), b, c								Split					**Quarterly**
MW567	C-400	MRGA	a(1a, 1b), b, c								Split					**Quarterly**
MW568	C-400	LRGA	a(1a, 1b), b, c								Split					**Quarterly**
MW161	SWMU 001	LRGA	a(1a, 1b), b, c					Split								**Semiannual**
MW544	SWMU 001	URGA	a(1a, 1b), b, c					Split								**Semiannual**
MW545	SWMU 001	URGA	a(1a, 1b), b, c			AIP			AIP							**Semiannual**
K001	Outfall	SW	a(1b, 1c, 1d, 1e, 1f, 1g) b				AIP					AIP				**Weekly**
K010	Outfall	SW	a(1a, 1b, 1c, 1d,1e,1f), b				AIP									**Monthly**
K013**	Outfall	SW	a(1a, 1b, 1c,1g), b		AIP										AIP	**Monthly**
K020	Outfall	SW	a(1a, b, 1c,1e,1f), b									AIP				**Monthly**
C-613	Sediment Basin Discharge	SW	a(1b, 1c, 1e, 1f, 1g) b				AIP					AIP				**Quarterly**
L4	Bayou Creek	SW	a(1b, 1c, 1e, 1f, 1g) b				AIP					AIP				**NA**
Seep 2 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	**NS**
Seep 3 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	**NS**
Seep 4 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	**NS**
Seep 5 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	Split	AIP	AIP	Split	AIP	**Quarterly**
Seep 8 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	**NS**
Seep 9 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	**NS**
Seep 10 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	AIP	**NS**
Lab Bldg C-730, DI water	C-730	SW	a(1a)						AIP							**NA**

Event	Totals	Screen Zone	Goals	January	February	March	April	May	June	July	August	September	October	November	December	Total
Splits	**37**			**6**	**8**	**2**	**0**	**3**	**3**	**3**	**5**	**3**	**2**	**2**	**0**	**37**
AIP Independent	**187**			**7**	**11**	**16**	**22**	**17**	**18**	**16**	**18**	**20**	**16**	**15**	**11**	**187**
Water Levels	**60**			**0**	**15**	**0**	**0**	**15**	**0**	**0**	**15**	**0**	**0**	**15**	**0**	**60**

Disclaimer: This schedule is subject to change ex. - weather conditions, coordination issues, accessibility, etc.

Goals - are from the 2023 KY AIP Groundwater Strategy Sampling Plan (a - f)

Chemical Analysis Codes:

1a) VOC 8260B; 1b) Gross Alpha & Gross Beta/Tc-99; 1c) Metals; 1d) PCBs 8082A; 1e) Isotopic Uranium; 1f) Uranium (Metal);
1g) Total Suspended Solids (TSS); 1h) Chronic Whole Effluent Toxicity (WET); 1i) Acute Whole Effluent Toxicity (WET Ceriodaphnia); 1j) Hardness

WL - water level (only) - synoptic event on TVA wells
Split - with DOE
AIP - independent sampling (EEC AIP)
* - sampled from a spigot/hose
**- sampled based on availability of adequate flow
***- exact number of seep samples depends on availability

Abbreviations Used in Schedule:

UCRS - Upper Continental Recharge System
RGA - Regional Gravel Aquifer
URGA - Upper Regional Gravel Aquifer
LRGA - Lower Regional Gravel Aquifer
MRGA - Middle Regional Gravel Aquifer
PRT - Multi-Port monitoring well
NS - Not sampled by DOE during the year
NA - Not available
SW - Surface Water or Seep
KDFWR - Kentucky Department of Fish and Wildlife Kentucky Wildlife Management Area
LF - Landfill

Table 2

Sampling Frequency of RWs, MWs, and Seeps by DOE and KDWM AIP

Well#	2023 DOE sampling Frequency	Last sampled or on schedule to be sampled by DOE	2023 KDWM AIP Sampling Frequency	Last sampled or on schedule to be sampled by AIP
R2	Quarterly	2022	February/Split	2023
R9	Annual	2022	November/AIP	2023
R10	Quarterly	2022	February/Split	2023
R13	Quarterly	2022	February/Split	2023
R14	Quarterly	2022	February/Split	2023
R20	Annual	2022	November/AIP	2023
R21	Annual	2022	November/AIP	2023
R26	Quarterly	2022	February/Split	2023
R40	Quarterly	2022	Quarterly/Split	2023
R53	Quarterly	2022	February/Split	2023
R83	Annual	2022	November/AIP	2023
R90	Annual	2022	November/AIP	2023
R114	Annual	2022	November/AIP	2023
R245	Quarterly	2022	February/Split	2023
R302	Annual	2022	November/AIP	2023
MW66	Semiannual	2022	September/Split	2023
MW84A	Semiannual	2022	Jan/Split, Oct/AIP	2023
MW87A	Semiannual	2022	Jan/Split, Oct/AIP	2023
MW90A	Semiannual	2022	Jan/Split, Oct/AIP	2023
MW93A	Semiannual	2022	Jan/Split, Oct/AIP	2023
MW106A	Quarterly	2022	June/AIP	2023
MW133	Semiannual	2022	June/AIP	2023
MW134	Quarterly	2022	July/AIP	2023
MW135	Semiannual	2022	November/AIP	2023
MW139	Semiannual	2022	May/AIP	2023
MW145	Quarterly	2022	April/AIP	2023
MW146	Quarterly	2022	June/AIP	2023
MW147	NS	1994	August/AIP	2023
MW161	Semiannual	2022	May/Split	2023
MW168	Biennial	2021	Mar/AIP, Aug/AIP	2023
MW178	Quarterly	2022	Feb/AIP, Oct/AIP	2023
MW194	Quarterly	2022	May/AIP, Sep/AIP	2023
MW205	NS	2013	May/AIP, Sep/AIP	2023
MW233	NS	2019	August AIP	2023
MW247	Semiannual	2022	May/AIP	2023
MW248	Semiannual	2022	May/AIP, Aug/AIP	2023
MW249	NS	2005	May/AIP, Aug/AIP	2023
MW250	Semiannual	2022	Apr/AIP	2023
MW252	Annual	2022	Sept/AIP	2023
MW257	Triennial	2019	August/AIP	2023
MW261	Semiannual	2022	March/AIP	2023

NS – not sampled

Table 2 (Continued)

Sampling Frequency of RWs, MWs, and Seeps by DOE and KDWM AIP

Well#	2020 DOE Sampling Frequency	Last sampled or on schedule to be sampled by DOE	2020 KDWM AIP Sampling Frequency	Last sampled or on schedule to be sampled by AIP
MW262	Biennial	2021	July/AIP	2023
MW284	NS	2005	May/AIP	2023
MW294A	NS	2005	May/AIP	2023
MW339	Semiannual	2022	September/Split	2023
MW340	Semiannual	2022	September/Split	2023
MW343	Semiannual	2022	Mar/AIP, Sep/AIP	2023
MW366	Quarterly	2022	August/AIP	2023
MW380	NS	2007	July AIP	2023
MW381	Triennial	2019	July/AIP	2023
MW403 Port 3	Quarterly	2022	Mar/AIP, Aug/AIP	2023
MW404 Port 4	Biennial	2021	Mar/AIP, Jul AIP	2023
MW420	Semiannual	2022	Jan/Split, Oct/AIP	2023
MW421	Semiannual	2022	Apr/AIP	2023
MW422	Semiannual	2022	June/AIP	2023
MW423	Semiannual	2022	August/AIP	2023
MW424	Semiannual	2022	Sep/AIP	2023
MW425	Semiannual	2022	July/Split	2023
MW428	Semiannual	2022	April/AIP	2023
MW429A	NS	2022	June/AIP	2023
MW430	Semiannual	2022	April/AIP, Jun/AIP	2023
MW431	Quarterly	2022	July/AIP	2023
MW432	Biennial	2022	March/AIP	2023
MW433	Quarterly	2022	Nov/AIP	2023
MW439	Biennial	2022	Aug/AIP	2023
MW441	Quarterly	2022	May/AIP	2023
MW445	Biennial	2021	April/AIP, Oct/AIP	2023
MW447	Biennial	2021	April/AIP, Oct/AIP	2023
MW452	Biennial	2022	April/AIP	2023
MW455	Semiannual	2022	March/Split	2023
MW456	Semiannual	2022	March/Split	2023
MW460	Quarterly	2022	March/AIP	2023
MW465	Biennial	2021	July/AIP	2023
MW466	Biennial	2021	August/AIP	2023
MW467	Biennial	2021	Sep/AIP	2023
MW498	Semiannual	2022	March/AIP	2023
MW502	Semiannual	2022	June/AIP	2023
MW524	Quarterly	2022	Feb/AIP, Oct/Split	2023
MW529	Quarterly	2022	Feb/AIP, Oct/Split	2023
MW533	Quarterly	2022	July/AIP, Dec/AIP	2023
MW544	Semiannual	2022	Mar/AIP, Jun/AIP	2023

NS – not sampled
NA – not available

Table 2 (Continued)

Sampling Frequency of RWs, MWs, and Seeps by DOE and KDWM AIP

Well#	2020 DOE sampling Frequency	Last sampled or on schedule to be sampled by DOE	2020 KDWM AIP sampling Frequency	Last sampled or on schedule to be sampled by AIP
MW545	Semiannual	2022	May/Split	2023
MW548	Biennial	2021	Jan/Split, Oct/AIP	2023
MW563	Quarterly	2022	June/Split	2023
MW564	Quarterly	2022	June/Split	2023
MW565	Quarterly	2022	June/Split	2023
MW566	Quarterly	2022	August/Split	2023
MW567	Quarterly	2022	August/Split	2023
MW568	Quarterly	2022	August/Split	2023
MW575	Semiannual	2023	April/AIP	2023
MW577	Semiannual	2023	July/AIP	2023
MW579	Semiannual	2023	September/AIP	2023
Seep* 2, 5, 6, & 7	Quarterly	2022	Jan thru July/AIP, Aug/Split, Nov/Split, Sept/AIP, Oct/AIP, Dec/AIP	2022

NS – not sampled
* - Seep sampling locations depend on presence and water level in the creek

Table 3
Residential Well X and Y Coordinates

Well #	X	Y
R2	-7253.69	4111.992
R9	1986.83	-2251.3
R10	-130970	6895.25
R13	-9977.50	7018.31
R14	-10638	8353.58
R20	4775.28	6106.22
R21	2856.60	11723.4
R26	-13579.20	2945.639
R40	-13636	6599.79
R53	-11855.00	714.84
R83	3460.44	12290.50
R90	9107.89	3986.56
R114	8510.00	9157.00
R245	-6973.80	11182.90
R302	5200.00	2400.00
X and Y Coordinates are plant specific		

Table 4
Outfall X and Y Coordinates

Outfall	X	Y
K001	-7806.25	-146.875
K010	-612.50	-2,231.25
K013	-1009.38	-5056.25
K020	-1925.87	5424.411
C-613	-7558.77	-11.31
L4	-8951.71	319.68
X and Y Coordinates are plant specific		

Table 5

Monitoring Well X and Y Coordinates

Well #	X	Y
MW66	-6872.62	978.57
MW84A	-5975.23	-804.20
MW87A	-5825.09	-804.98
MW90A	-5688.64	-793.68
MW93A	-5994.81	-1028.57
MW106A	-8438.9	990.93
MW133	-1715.66	9124.70
MW134	-8335	3568.95
MW135	-1520.05	9137.28
MW139	-576.59	6189.67
MW145	-768.84	383.32
MW146	-5684.18	13549.15
MW147	-5669.28	13548.69
MW161	-6916.9	-1666.7
MW168	-4822.50	-924.80
MW178	-4073.6	-1216.2
MW194	-10177.5	1865.6
MW205	-4360.3	-364.1
MW233	-5530.15	7300.335
MW247	-7445.70	1360.147
MW248	-7376.72	1385.422
MW249	-7432.4541	1357.752
MW250	-7431.78	1396.341
MW252	4228.397	5717.894
MW257	-5972.21	442.3827
MW261	-5979.20	442.1934
MW262	-5379.8	-292.32
MW284	1589.999	913.4824
MW294A	1801.8	839.09
MW326	-6185.001	-2430.1134
MW328	-7337.476	-1962.3084
MW329	-7347.443	-1419.371
MW339	-6468.50	663.20
MW343	-4404.16	-1083.87
MW356	-1466.38	863.45
MW366	-2246.10	6121.18
MW380	-5190.31	7205.26
MW381	-4892.90	7745.84
MW403	-7370	-1237.4
MW404	-7370	-1267.4
MW420	-5793.53	-1041.57
MW421	-4335.43	-1084.18
X and Y Coordinates are plant specific		

Table 5 Continued

Monitoring Well X and Y Coordinates

Well #	X	Y
MW422	-4365.74	-1083.80
MW423	-4389.45	-1084.00
MW424	-4405.68	-1148.44
MW425	-4407.35	-1226.18
MW428	-8438.4	-419.3
MW429A	-7778.16	-449.45
MW430	-7776.05	-464.51
MW431	-8413.94	61.49
MW432	-8229.44	492.4
MW433	-4526.72	12219.07
MW439	-2679.36	12575.82
MW440	-2688.23	12564.90
MW441	-2696.03	12552.96
MW445	-2412.85	11307.21
MW447	-2424.29	11310.49
MW452	-8033.79	4194.86
MW455	-7557.43	1963.20
MW456	-7560.77	1953.78
MW460	-6616.28	1944.07
MW465	2652.88	8312.1
MW466	2638.93	8317.04
MW467	3143.53	8217.52
MW498	-6767.51	1106.62
MW502	-7927.08	1981.00
MW524	-3314.745	-876.476
MW529	-3362.39	-1675.23
MW533	-2,312.70	-1,024.64
MW544	-6817.935	-1813.548
MW545	-6904.303	-1690.196
MW548	-6168.19	-1061.78
MW563	-4218.27	-1566.37
MW564	-4218.19	-1571.49
MW565	-4218.19	-1576.58
MW566	-4068.83	-1444.62
MW567	-4068.65	-1449.60
MW568	-4,069.89	-1,454.98
MW575	-5263.00	-1974.93
MW577	-5037.94	-1987.93
MW579	-5168.40	-2116.39
X and Y Coordinates are plant specific		

Table 6

Little Bayou Creek Seeps

Seep	X	Y
LBCSP2	-2534.83	12638.64
LBCSP3	-2413.12	12489.25
LBCSP4	-2259.53	12422.55
LBCSP5	-2082.48	12093.12
LBCSP8	-1829.64	11297.52
LBCSP9	-2024.88	12036.35
LBCSP10	-2408.77	12450.50
X and Y Coordinates are plant specific		

Table 7
TVA Water Level X and Y Coordinates

Well #	X	Y
SHF-D11B	-6385.92	18190.06
SHF-D17	1782.156	12391.45
SHF-D30B	-1414.04	17085.19
SHF-D74B	-3124.52	17402.59
SHF-D75B	-5553.68	15864.71
SHF-201A	-12888.49	17297.87
SHF-201B	-13266.91	17195.91
SHF-201C	-13114.97	17242.01
SHF-101G	-4870.21	17913.25
SHF-102G	-4839.182	12273.117
TVAGW-1D	2305.382	8519.814
TVAGW-2D	4770.208	8073.758
TVAGW-3D	2759.29	10423.70
TVAGW-4D	3294.697	10357.20
TVAGW-5D	4012.515	10380.98
TVAGW-6D	4839.378	10083.34
X and Y Coordinates are plant specific		

Figure 1. Residential Well Sampling Locations

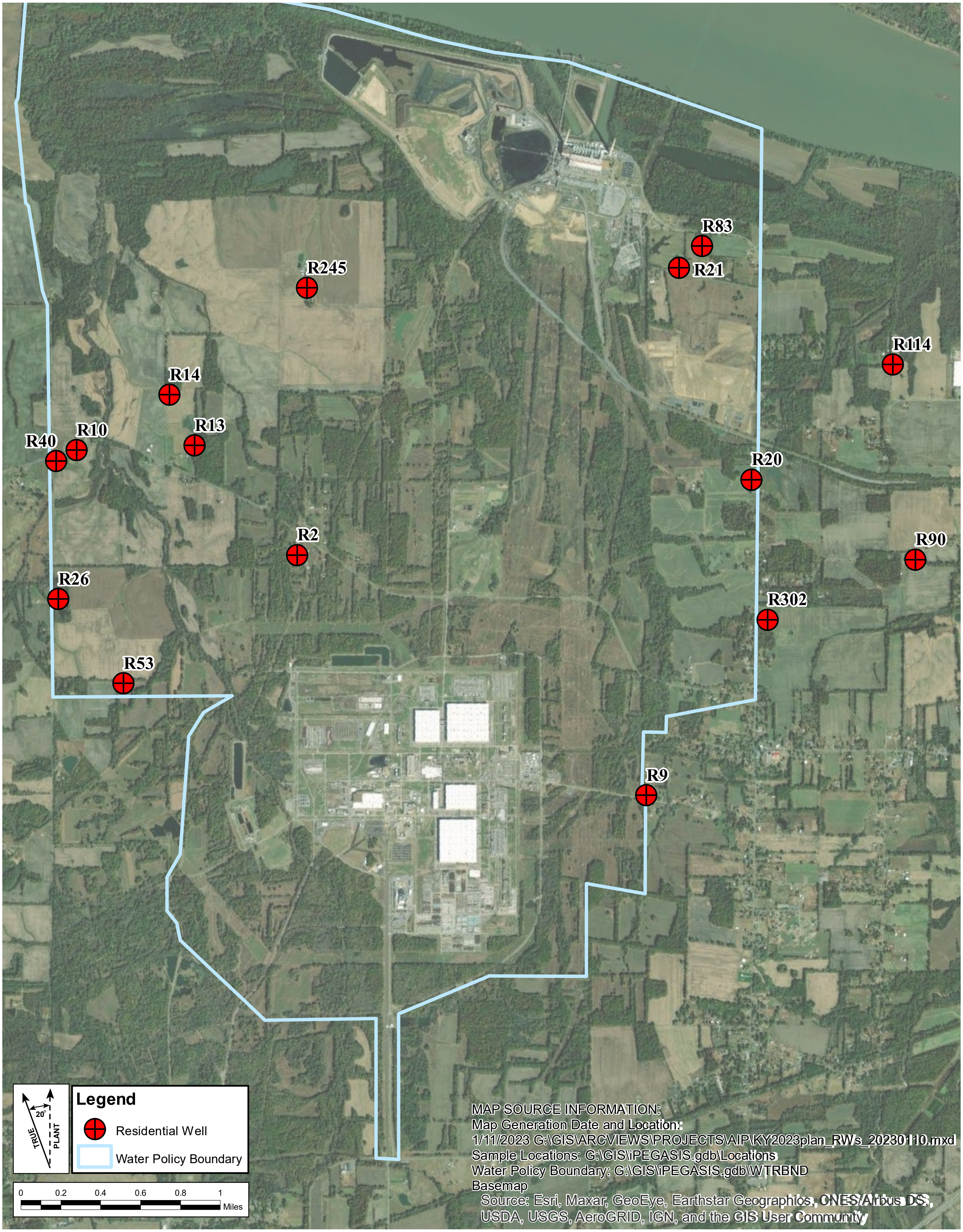

Figure 2. Outfall Sampling Locations

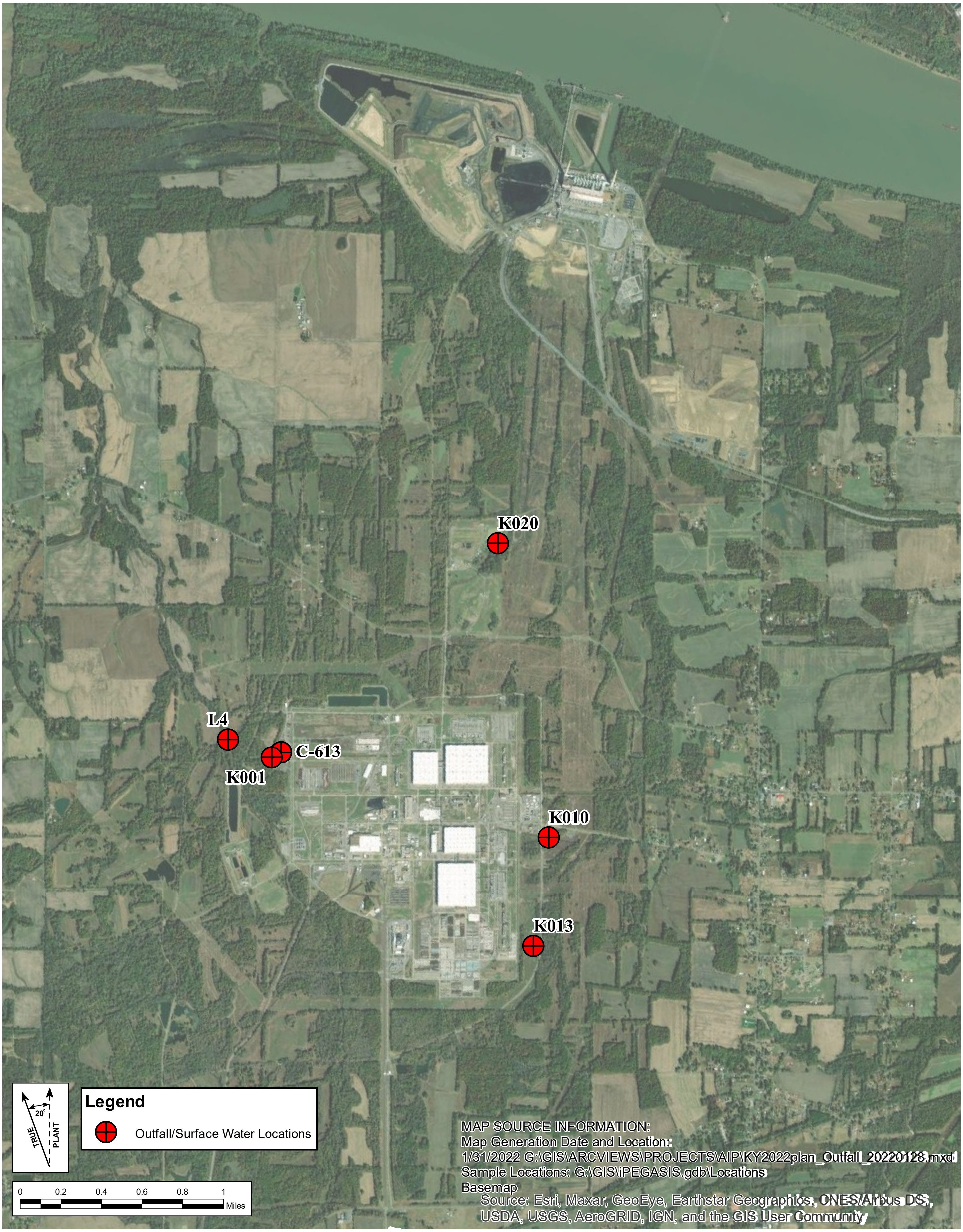

Figure 3. Groundwater Sampling Locations

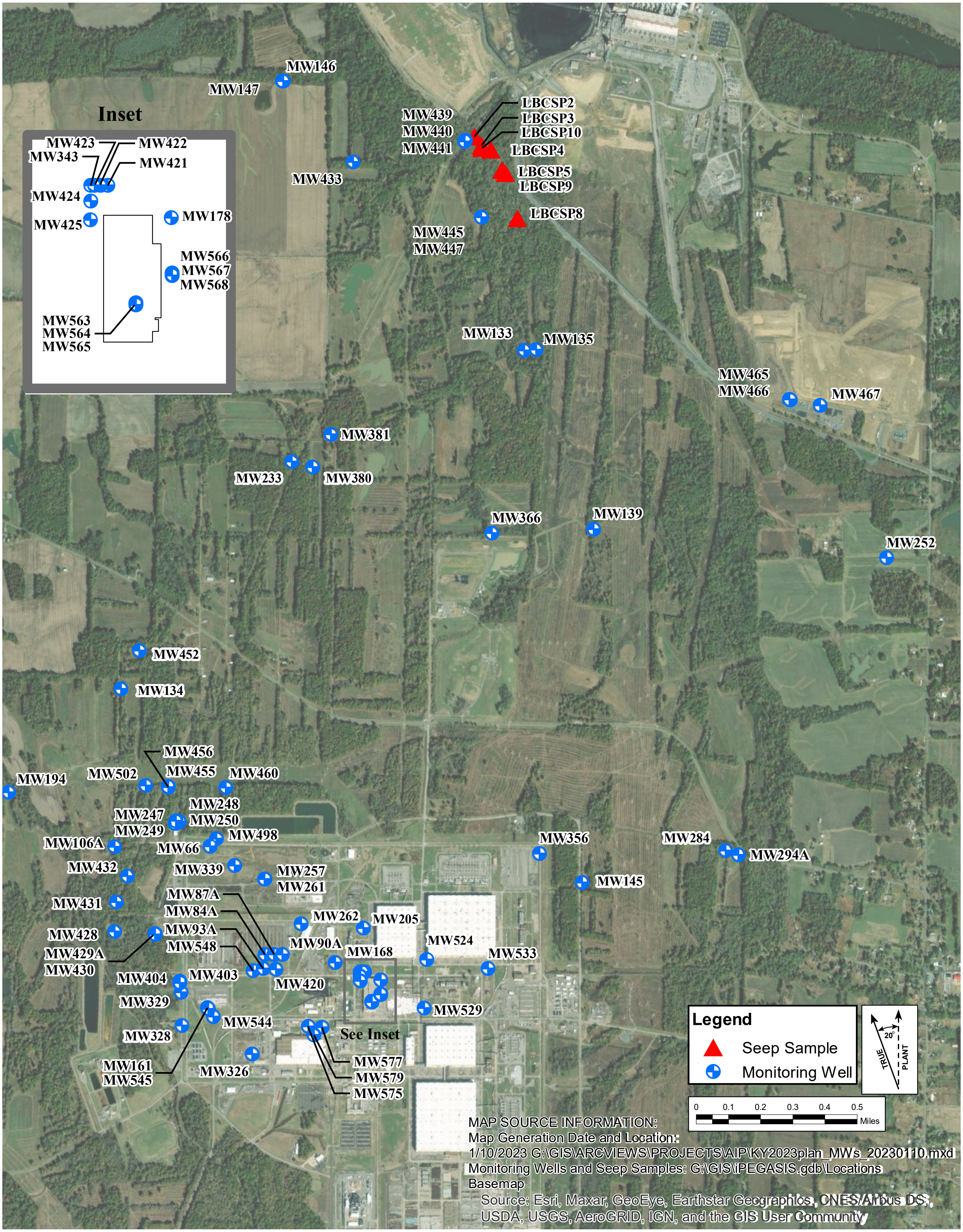

Figure 4. TVA Synoptic Water Elevation Points