COMMONWEALTH OF KENTUCKY
ENERGY AND ENVIRONMENT CABINET
AGREEMENT IN PRINCIPLE

2020 ENVIRONMENTAL SAMPLING STRATEGY DOCUMENT

December 30, 2019

I. INTRODUCTION

The Agreement in Principle (AIP) "Environmental Sampling Strategy Document" provides a description and rationale for all planned environmental sampling activities undertaken by the AIP section. The AIP is an agreement between the Commonwealth of Kentucky and the Department of Energy (DOE) to provide assurances that environmental activities at the Paducah Gaseous Diffusion Plant (Paducah Site) are conducted in a scientific and sound manner. The Agreement is intended to maintain an independent, impartial, and qualified assessment of the past, present, and future environmental impacts from various activities at the Paducah Site. It is anticipated that the efforts by AIP will ultimately prevent or minimize negative environmental impacts as attempts are made at environmental restoration at the Paducah Site.

This plan will be updated and revised annually or when determined necessary. A very important premise of this document is that it can be easily reviewed and changed, as issues and knowledge progress. There will be no data results given in this document; it is merely a plan that maps out sampling strategy and rationale. Data results and interpretation will be transmitted to DOE (per requirements set forth in the AIP) and results presented in the "AIP Annual Report."

The Cabinet for Health and Family Services (CHFS) AIP transmits their own "Environmental Sampling Strategy Document" and schedule to DOE. This plan specifically covers Energy and Environmental Cabinet (EEC) activities associated with the Paducah Site.

II. MISSION STATEMENT

The purpose of the EEC 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 Paducah Site. This is accomplished by reviewing and commenting on a variety of DOE/contractor procedures as well as observing DOE/contractor field sampling practices. AIP also splits samples with DOE/contractors which are then independently analyzed at independent offsite laboratories. The AIP is also responsible for independent sampling and monitoring efforts, which include but are not limited to the monitoring of groundwater contaminant plumes, residential groundwater wells, stream sediments, surface waters, and biota. Air is also independently monitored by CHFS AIP, primarily for radiological constituents. Independent sampling is performed when the EEC AIP deems it necessary to augment current DOE sampling to safeguard human health and the environment and better understand seasonal variability.

The EEC AIP Environmental Monitoring Program is designed to provide an independent environmental assessment on the quality of the environment within and surrounding the Paducah Site.

III. MAJOR CONTAMINANTS OF CONCERN IN GROUNDWATER

Currently, two groundwater contaminant plumes have been delineated offsite; the Northeast and Northwest Plumes. Both plumes are known to occur in the Regional Gravel Aquifer (RGA) and flow from the Paducah Site north toward 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 likely resides in residual pockets and stringers within the UCRS and RGA. As TCE slowly dissolves and is transported with the groundwater flow as dissolved-phase plumes, which then travel offsite towards the Ohio River. Tc-99 is a product of nuclear fission and was introduced at the Paducah Site when reprocessing of spent nuclear fuel was occurring.

The precise locations of source areas that resulted in the dissolved phase contaminant plumes are not fully understood and multiple sources for each plume are likely. DOE believes that the C-400 Cleaning Facility has contributed the most TCE to Northwest Plume offsite contamination (Garner, Morti, and Smuin, 1995). The C-400 Complex area is also believed to be the source area for much of the Northeast Plume (DOE, 1997). This hypothesis is supported by subsurface sampling and process knowledge concerning activities surrounding the C-400 building. Initial investigations at the Paducah Site revealed that ~23,000 gallons of TCE per month were used during peak operations throughout the 1970s at C-400.

The release mechanism for Tc-99 has not been determined but is thought to originate at the C-400 building. Tc-99 derived from reprocessed fuel rods has contaminated much of the enrichment cascade buildings. Tc-99 is a neutron absorber and was removed during the enrichment process. The disposal practices for Tc-99 have not been well-documented, but it is believed that Tc-99 may have been placed in the subsurface at the C-404 landfill, the C-749 burial ground, and other burial grounds on site.

The area of highest TCE and Tc-99 concentrations in RGA groundwater are found surrounding the north, east, and southeast sides of the C-400 Building. Concentration levels of TCE are highest at C-400 near the building's southeastern corner; whereas, Tc-99 tends to be highest at the northwest corner of the building. 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 beneath the C-400 building.

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

a. Further validate DOE's sampling/analytical procedures through split sampling or observations of ~5% of the 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. The EEC AIP will compare the results and report if observed procedures are followed and meet quality standards with findings reported in the 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 downgradient of the NW Plume and NE Plume extraction wells. Monitoring any changes from the Pump and Treat system to assess the cone of depression and potential for by-pass 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 historic results and established drinking water standards;
e. Monitor the TCE concentrations upwelling from the Northwest Plume into the Little Bayou Creek Seeps and walk the creek periodically searching (visually or with instrumentation) for new or migrating seeps;
f. Monitor the water elevations in ~19 monitoring wells on the Tennessee Valley Authority (TVA) property (contingent upon TVA permission) as part of quarterly site wide synoptic groundwater elevation monitoring events;

The EEC AIP groundwater sampling program is designed to meet these six goals, while minimizing the overall number of samples collected, through the selection of strategic locations. Table 1 shows all the planned 2020 EEC AIP sampling. Table 2 provides the sampling frequency of residential wells, monitoring wells, and seeps that will be split with DOE/contractor or sampled independently by EEC AIP. Table 3, 4, and 5 provide sample identification information with Paducah Site x and y coordinates. Table 6 provides the x and y coordinates of each TVA water level collection point. Figure 1 shows the locations of the residential wells to be sampled in 2020. Figure 2 shows the locations of the outfalls and surface water locations to be sampled in 2020. Figure 3 shows the locations of the monitoring wells and seep(s) to be sampled in 2020. Figure 4 shows the TVA monitoring wells used to obtain water elevations during the quarterly synoptic site wide water elevation monitoring project. 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, for entry into the OREIS/ PEGASIS Database.

The CHFS of Frankfort, Kentucky, analyzes KDWM AIP samples collected for radiological constituents. McCoy and McCoy Laboratories, Inc. is contracted to conduct analysis of Whole Effluent Toxicity (WET) testing from selected outfalls identified in Figure 2. Test America (Missouri) and/or Kentucky Department for Environmental Protection, Frankfort are utilized to analyze all other (non-radiological) constituents.

SPECIFIC EEC AIP SAMPLING GOALS (Table 1, Column 'Goals')

a) Confirmatory Sampling

The AIP has an obligation to provide confirmation that sampling procedures and analytical results reported by DOE/contractor are credible, accurate, and being independently observed and verified 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. 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 (reflected in Table 1, Column D 'Goals') 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) and/or Acute Whole Effluent Toxicity (WET); and 1j) Hardness. Basic geochemical parameters measured in the field include temperature, pH, dissolved oxygen, conductivity, oxygen reduction potential (ORP) and turbidity.

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 temporally. The eastern edge of the Northeast plume is near the DOE's Water Policy Box administrative boundary. This close proximity requires careful monitoring to ensure that early detection is provided to DOE and for 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 in order to monitor the impact of the Northwest and Southwest plumes. If data indicates that the Northeast plume has crossed the Water Policy boundary, DOE will immediately be notified and steps will be taken to notify 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 and recorded in the field, including turbidity, temperature, pH, dissolved oxygen, conductivity and ORP.

The monitoring frequency will be augmented in the vicinity of the C-404 landfill for 2020. In 2018 & 2019 an increase was noted with contaminates of concern in downgradient C-404 monitoring wells. The increased monitoring will supplement monitoring performed by DOE and improve the understanding of subsurface conditions at this location. During 2019 four monitoring wells were abandoned and replaced (MW84A, MW87A, MW90A, and MW93A) and all will be sampled in 2020.

Water samples will continue to be collected from MW66 and MW185 based upon temporal observations of water elevations. The data will be used to refine the understanding of how temporal conditions influence groundwater elevations and changes in TCE concentrations at this location.

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 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 changes in the groundwater elevation that may be occurring due to plant shutdown activities associated with utilities and help assess 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 Paducah Site. Groundwater samples may also be collected (at the request of the landowner) within ~2.5 (two and a half) mile radius from the center of the Paducah Site or if the determination has been made that the underlying aquifer could reasonably be impacted by the Paducah Site plumes. This will be done on a case-by-case basis, at the discretion of EEC AIP. The AIP is primarily concerned about the potential for environmental contamination in residential wells and does not sample for biological or sanitary conditions. The AIP recommends for residents consuming groundwater, to have additional sampling/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 could also be tested for metals 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 EEC 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 a 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 EEC AIP to the resident and DOE soon after the results are compiled.

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

In 2020 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 attempt to conduct monthly transects of Little Bayou Creek and sample any seeps that are discovered. If new seeps are discovered, AIP will collect GPS coordinates.

f) Monitoring water elevations at TVA during site wide synoptic water measuring event.

The AIP will augment DOE's synoptic site wide groundwater measuring events by acquiring water levels from ~19 monitoring wells located on TVA property (with permission). Water level elevations and associated barometric readings will be obtained during the site wide synoptic water elevation measurements. The data collected will be shared with DOE/contractor and used to refine the understanding of the groundwater flow conditions at the Paducah Site (near the Ohio River) and in support of future groundwater models.

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. 2019. Environmental Monitoring Plan Fiscal Year 2020 Paducah Gaseous Diffusion Plant, Paducah, Kentucky, CP2-ES-0006/FR2

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.

Table 1
2020 Sampling and Water Level Measurements

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
R39	Residential Well	unknown	a(1a, 1b), b, d								split					Quarterly
R53	Residential Well	unknown	a(1a, 1b), b, d								split					Quarterly
R245	Residential Well	unknown	a(1a, 1b), b, d								split					Quarterly
R5	Residential Well	unknown	a(1a, 1b), b, d		AIP											NS
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
R387	Residential Well	unknown	a(1a, 1b), b, d		AIP											NS
R713	Residential Well	unknown	a(1a, 1b), b, d		AIP											NS
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			Biennial 2019
MW66	NW Plume	RGA	a(1a, 1b), b, c	AIP					AIP							Semiannual
MW185	NW Plume	RGA	a(1a, 1b), b, c								AIP					NS
MW98	NW Plume	RGA	a(1a, 1b), b, c						AIP							Semiannual
MW146	NW Plume	RGA	a(1a, 1b), b, c			AIP			AIP							Quarterly
MW233	NW Plume	MRGA	a(1a, 1b), b, c			AIP							AIP			NS
MW236	NW Plume	RGA	a(1a, 1b), b, c			AIP										Semiannual
MW257	NW Plume	RGA	a(1a, 1b), b, c										AIP			Triennial 2019
MW261	NW Plume	LRGA	a(1a, 1b), b, c			AIP										Semiannual
MW339	NW Plume	LRGA	a(1a, 1b), b, c			AIP										Semiannual
MW381	NW Plume	RGA	a(1a, 1b), b, c										AIP			Triennial 2019
MW340	NW Plume	LRGA	a(1a, 1b), b, c			AIP										Semiannual
MW427	NW Plume	RGA	a(1a, 1b), b, c									AIP				Quarterly
MW442	NW Plume	LRGA	a(1a, 1b), b, c	AIP												Biennial 2019
MW460	NW Plume	LRGA	a(1a, 1b), b, c			AIP										Quarterly
MW455	NW Plume	RGA	a(1a, 1b), b, c			split										Semiannual
MW456	NW Plume	RGA	a(1a, 1b), b, c			split										Semiannual
MW498	NW Plume	LRGA	a(1a, 1b), b, c			AIP										Semiannual
MW502	NW Plume	LRGA	a(1a, 1b), b, c					AIP						AIP		Semiannual
MW133	NW Plume	McNairy	a(1a, 1b), b, c				AIP									Semiannual
MW247	NW Plume	McNairy	a(1a, 1b), b, c				AIP									Semiannual
MW356	NE Plume	RGA/McNairy	a(1a, 1b), b, c				AIP									Semiannual

Table 1
2020 Sampling and Water Level Measurements

Well#	Location	Screen Zone	Goals	January	February	March	April	May	June	July	August	September	October	November	December	DOE Schedule
MW252	NE Plume	LRGA	a(1a, 1b), b, c									AIP				Annual
MW284	NE Plume	RGA	a(1a, 1b), b, c						AIP							NS
MW469	NE Plume	MRGA	a(1a, 1b), b, c							AIP						Annual
MW470	NE Plume	LRGA	a(1a, 1b), b, c					AIP			AIP			AIP		Annual
MW472	NE Plume	LRGA	a(1a, 1b), b, c									AIP				Annual
MW529	NE Transect Wells	RGA	a(1a, 1b), b, c		AIP			AIP			AIP			AIP		Quarterly
MW139	LF Plume	RGA	a(1a, 1b,), b, c						AIP							Semiannual
MW366	C-746 LF	URGA	a(1a, 1b, 1c), b									AIP				Quarterly
MW575 (proposed)	SWMU 211a	URGA	a(1a, 1b, 1c), b											AIP		Quarterly
MW577 (proposed)	SWMU 211a	URGA	a(1a, 1b, 1c), b											AIP		Quarterly
MW579 (proposed)	SWMU 211a	URGA	a(1a, 1b, 1c), b											AIP		Quarterly
MW581 (proposed)	SWMU 211a	URGA	a(1a, 1b, 1c), b											AIP		Quarterly
SHF-D10	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
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-D27	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-D75B	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-D8A	TVA/Synoptic	URGA	f		WL			WL			WL			WL		NS by DOE
SHF-D8R	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-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			AIP				Semiannual
MW433	TVA	RGA	a(1a, 1b), b, c						AIP							Quarterly
MW439	TVA	RGA	a(1a, 1b), b, c						AIP							Biennial 2019
MW440	TVA	RGA	a(1a, 1b), b, c						AIP							NS
MW441	TVA	RGA	a(1a, 1b), b, c						AIP							Quarterly
MW447	TVA	RGA	a(1a, 1b), b, c									AIP				Biennial 2019
MW168	C-400	URGA	a(1a, 1b), b, c								AIP				AIP	Biennial 2019
MW421 PRT 1	C-400	URGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW421 PRT 2	C-400	MRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW421 Port 3	C-400	LRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW422 Port 1	C-400	URGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW422 Port 2	C-400	MRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW422 Port 3	C-400	LRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW423 Port 1	C-400	URGA	a(1a, 1b), b, c								AIP				AIP	Semiannual

Table 1
2020 Sampling and Water Level Measurements

Well#	Location	Screen Zone	Goals	January	February	March	April	May	June	July	August	September	October	November	December	DOE Schedule
MW423 Port 2	C-400	MRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW423 Port 3	C-400	LRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW424 Port 1	C-400	URGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW424 Port 2	C-400	MRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW424 Port 3	C-400	LRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW425 Port 1	C-400	URGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW425 Port 2	C-400	MRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW425 Port 3	C-400	LRGA	a(1a, 1b), b, c								AIP				AIP	Semiannual
MW506	C-400	URGA	a(1a, 1b), b, c						split		AIP				AIP	Semiannual
MW507	C-400	URGA	a(1a, 1b), b, c						split		AIP				AIP	Quarterly
MW542	SWMU 001	RGA	a(1a, 1b), b, c						split							Semiannual
MW543	SWMU 001	RGA	a(1a, 1b), b, c						split							Semiannual
MW546	SWMU 001	RGA	a(1a, 1b), b, c			AIP				AIP						Semiannual
MW547	SWMU 001	RGA	a(1a, 1b), b, c						split							Semiannual
K001	Outfall	SW	a(1b, 1c, 1e, 1f, 1g) b				AIP					AIP				Weekly
K008	Outfall	SW	a(1a, 1b, 1c, 1h, 1j), b				AIP									Monthly
K011	Outfall	SW	a(1a, 1b, 1c, 1d, 1i, 1j), b			AIP										Monthly
K012**	Outfall	SW	a(1a, 1b, 1c, 1d, 1i, 1j), b			AIP										Monthly
K013**	Outfall	SW	a(1a, 1b, 1c, 1d, 1i, 1j), b		AIP									AIP		Monthly
K020	Outfall	SW	a(1a, b, 1c, 1i, 1j), b		AIP									AIP		Monthly
C-613	Sediment Basin	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
Seeps 2, 5, 6 and 7 ***	Little Bayou Creek	SW	a(1a, 1b), b, c, e	AIP	AIP	AIP	AIP	AIP	AIP	AIP	split	AIP	AIP	split	AIP	Quarterly
FFS/GEO Lab Bldg C-730, DI	C-730	SW	a(1a)							AIP						NA
Event	**Totals**			**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	
Splits	**23**			**6**	**0**	**2**	**0**	**0**	**5**	**0**	**9**	**0**	**0**	**1**	**0**	
AIP Independent	**125**			**3**	**14**	**12**	**8**	**4**	**11**	**4**	**21**	**10**	**10**	**9**	**19**	
Water Levels	**76**			**0**	**19**	**0**	**0**	**19**	**0**	**0**	**19**	**0**	**0**	**19**	**0**	

This schedule is subject to change ex. - weather conditions/DOE coordination issues

Goals - are from the 2020 Groundwater Stategy Sampling Plan (a - f)
Chemical Analysis
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 - synoptic water level event
split - with DOE
AIP - independent sampling
***** - sampled from a spigot/hose
**- sampled based on availability of adequate flow
***- Exact number of seep samples depends on availability of water in the creek

UCRS - Upper Continental Recharge System
RGA - Regional Gravel Aquifer
URGA - Upper Regional Gravel Aquifer
MRGA - Middle Regional Gravel Aquifer
LRGA - Lower Regional Gravel Aquifer
PRT - Multi-Port monitoring well
NS - not sampled by DOE during calendar year 2020
NA - not available
SW - Surface Water or Seep
LF - Landfill

Table 2
Sampling Frequency of RWs, MWs, and Seeps by DOE/contractor and EEC 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
R2	Quarterly	2020	August/Split	2020
R5	NS	2001	Feb/AIP	2020
R9	Annual	2020	Feb/AIP	2020
R10	Quarterly	2020	August/Split	2020
R13	Quarterly	2020	August/Split	2020
R14	Quarterly	2020	August/Split	2020
R20	Annual	2020	Feb/AIP	2020
R21	Annual	2020	Feb/AIP	2020
R26	Quarterly	2020	August/Split	2020
R39	Quarterly	2020	August/Split	2020
R53	Quarterly	2020	August/Split	2020
R83	Annual	2020	Feb/AIP	2020
R90	Annual	2020	Feb/AIP	2020
R114	Annual	2020	Feb/AIP	2020
R245	Quarterly	2020	August/Split	2020
R302	Annual	2020	Feb/AIP	2020
R387	NS	2015	Feb/AIP	2020
R713	NS	2003	Feb/AIP	2020
MW66	Semiannual	2020	Jan/AIP, June/AIP	2020
MW84A	Semiannual	2020	Jan/Split, Oct/AIP	2020
MW87A	Semiannual	2020	Jan/Split, Oct/AIP	2020
MW90A	Semiannual	2020	Jan/Split, Oct/AIP	2020
MW93A	Semiannual	2020	Jan/Split, Oct/AIP	2020
MW98	Semiannual	2020	June/AIP	2020
MW133	Semiannual	2020	April/AIP	2020
MW135	Semiannual	2020	June/AIP, Sept/AIP	2020
MW139	Semiannual	2020	June/AIP	2020
MW146	Quarterly	2020	March/AIP, June/AIP	2020
MW168	Biennial	2019	Aug/AIP, Dec/AIP	2020
MW185	NS	2012	August/AIP	2020
MW233	NS	2018	March/AIP, Oct/AIP	2020
MW236	Semiannual	2020	March/AIP	2020
MW247	Semiannual	2020	April/AIP	2020
MW252	Annual	2020	Sept/AIP	2020
MW257	Triennial	2019	Oct/AIP	2020
MW261	Semiannual	2020	March/AIP	2020

NS – not sampled

Table 2 (Continued)
Sampling Frequency of RWs, MWs, and Seeps by DOE/contractor and EEC 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
MW284	NS	2005	June/AIP	2020
MW339	Semiannual	2020	March/AIP	2020
MW340	Semiannual	2020	March/AIP	2020
MW356	Semiannual	2020	April/AIP	2020
MW366	Semiannual	2020	April/AIP	2020
MW381	Semiannual	2020	Oct/AIP	2020
MW420	Semiannual	2020	Jan/Split, Oct/AIP	2020
MW421	Semiannual	2020	Aug/AIP, Dec/AIP	2020
MW422	Semiannual	2020	Aug/AIP, Dec/AIP	2020
MW423	Semiannual	2020	Aug/AIP, Dec/AIP	2020
MW424	Semiannual	2020	Aug/AIP, Dec/AIP	2020
MW425	Semiannual	2020	Aug/AIP, Dec/AIP	2020
MW427	Quarterly	2020	Sep/AIP	2020
MW433	Quarterly	2020	June/AIP	2020
MW439	Biennial	2019	June/AIP	2020
MW440	NS	2015	June/AIP	2020
MW441	Quarterly	2020	June/AIP	2020
MW442	Biennial	2019	Jan/AIP	2020
MW447	Biennial	2019	Sept/AIP	2020
MW455	Semiannual	2020	March/Split	2020
MW456	Semiannual	2020	March/Split	2020
MW460	Quarterly	2020	March/AIP	2020
MW469	Annual	2020	July/AIP	2020
MW470	Annual	2020	May/AIP, Aug/AIP	2020
MW472	Annual	2020	Sept/AIP	2020
MW498	Semiannual	2020	March/AIP	2020
MW502	Semiannual	2020	May/AIP, Nov/AIP	2020
MW506	Semiannual	2020	June/Split, Aug/AIP, Dec/AIP	2020
MW507	Quarterly	2020	June/Split, Aug/AIP, Dec/AIP	2020
MW529	Quarterly	2020	Feb/AIP, May/AIP, Aug/AIP, Nov/AIP	2020
MW542	Semiannual	2020	June/Split	2020
MW543	Semiannual	2020	June/Split	2020
MW546	Semiannual	2020	March/AIP, July/AIP	2020
MW547	Semiannual	2020	June/Split	2020
MW548	Biennial	2019	Jan/Split, Oct/AIP	2020
Seep 2, 5, 6, & 7	Quarterly	2020	Jan thru July/AIP, Aug/Split, Nov/Split, Sept/AIP, Oct/AIP, Dec/AIP	2020

NS – not sampled

Table 3
Residential Well X and Y Coordinates

Well #	X	Y
R2	-7253.69	4111.992
R5	-8109.40	5527.07
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
R39	-11081.00	6400.00
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
R387	6787.00	3652.00
R713	4509.18	-4553.36
X and Y Coordinates are plant specific		

Table 4
Surface Water X and Y Coordinates

Outfall	X	Y
K001	-7806.25	-146.875
K008	-7721.88	-1843.75
K011	-621.875	-2953.13
K012	-574.364	-3930.21
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
MW98	-3281.31	7397.46
MW133	-1715.66	9124.70
MW135	-1520.05	9137.28
MW139	-576.59	6189.67
MW146	-5684.18	13549.15
MW168	-4822.50	-924.80
MW185	-6601.90	952.90
MW233	-5530.15	7300.335
MW236	-5087.79	7919.994
MW247	-7445.70	1360.147
MW252	4228.397	5717.894
MW257	-5972.21	442.3827
MW261	-5979.20	442.1934
MW284	1589.999	913.4824
MW339	-6468.50	663.20
MW340	-6165.40	665.50
MW356	-1466.38	863.45
MW366	-2246.10	6121.18
MW381	-4892.90	7745.84
MW420	-5793.53	-1041.57
MW421	-4335.43	-1084.18
MW422	-4365.74	-1083.80
MW423	-4389.45	-1084.00
MW424	-4405.68	-1148.44
MW425	-4407.35	-1226.18
MW427	-9390.18	9.54
MW433	-4526.72	12219.07
MW439	-2679.36	12575.82
MW440	-2688.23	12564.90
MW441	-2696.03	12552.96
MW442	-2827.07	11896.27
MW447	-2424.29	11310.49
MW455	-7557.43	1963.20
MW456	-7560.77	1953.78
X and Y Coordinates are plant specific		

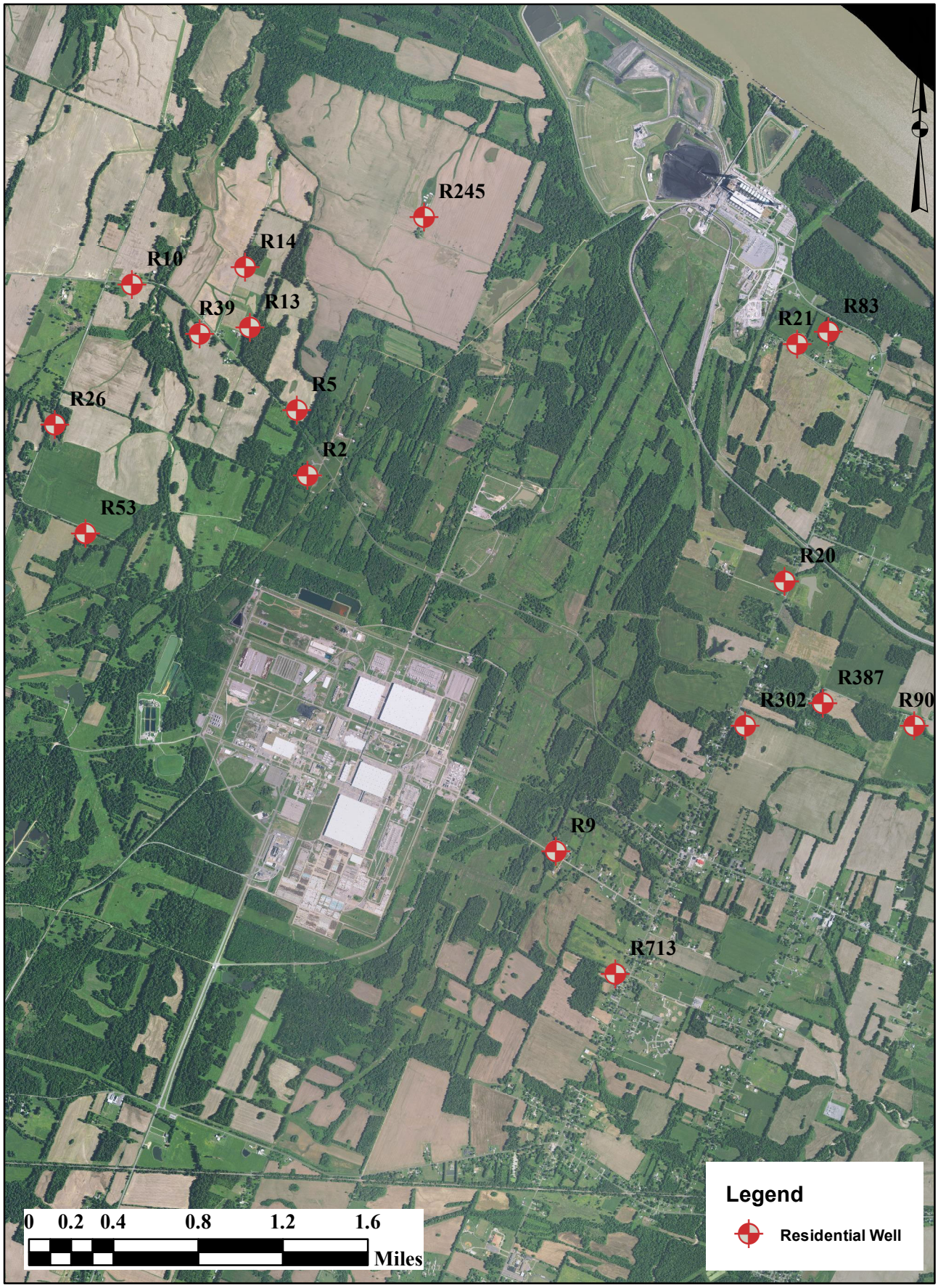
Table 5 (Continued)
Monitoring Well X and Y Coordinates

Well #	X	Y
MW460	-6616.28	1944.07
MW469	4049.53	8037.38
MW470	4066.18	8033.74
MW472	4904.89	7822.45
MW498	-6767.51	1106.62
MW502	-7927.08	1981.00
MW506	-4013.04	-1939.93
MW507	-4013.00	-1939.89
MW529	-3362.39	-1675.23
MW542	-6807.55	-1704.10
MW543	-6761.36	-1729.40
MW546	-6964.33	-1743.20
MW547	-6940.44	-1702.99
MW548	-6168.19	-1061.78
X and Y Coordinates are plant specific		

Table 6
TVA Water Level X and Y Coordinates

Well #	X	Y
SHF-D10	-6130.60	16359.20
SHF-D11B	-6385.92	18190.06
SHF-D17	1782.156	12391.45
SHF-D27	-535.942	13306.34
SHF-D30B	-1414.04	17085.19
SHF-D74B	-3124.52	17402.59
SHF-D75B	-5553.68	15864.71
SHF-D8A	-3860.94	13981.72
SHF-201A	-12888.49	17297.87
SHF-201B	-13266.91	17195.91
SHF-201C	-13114.97	17242.01
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



12/16/19

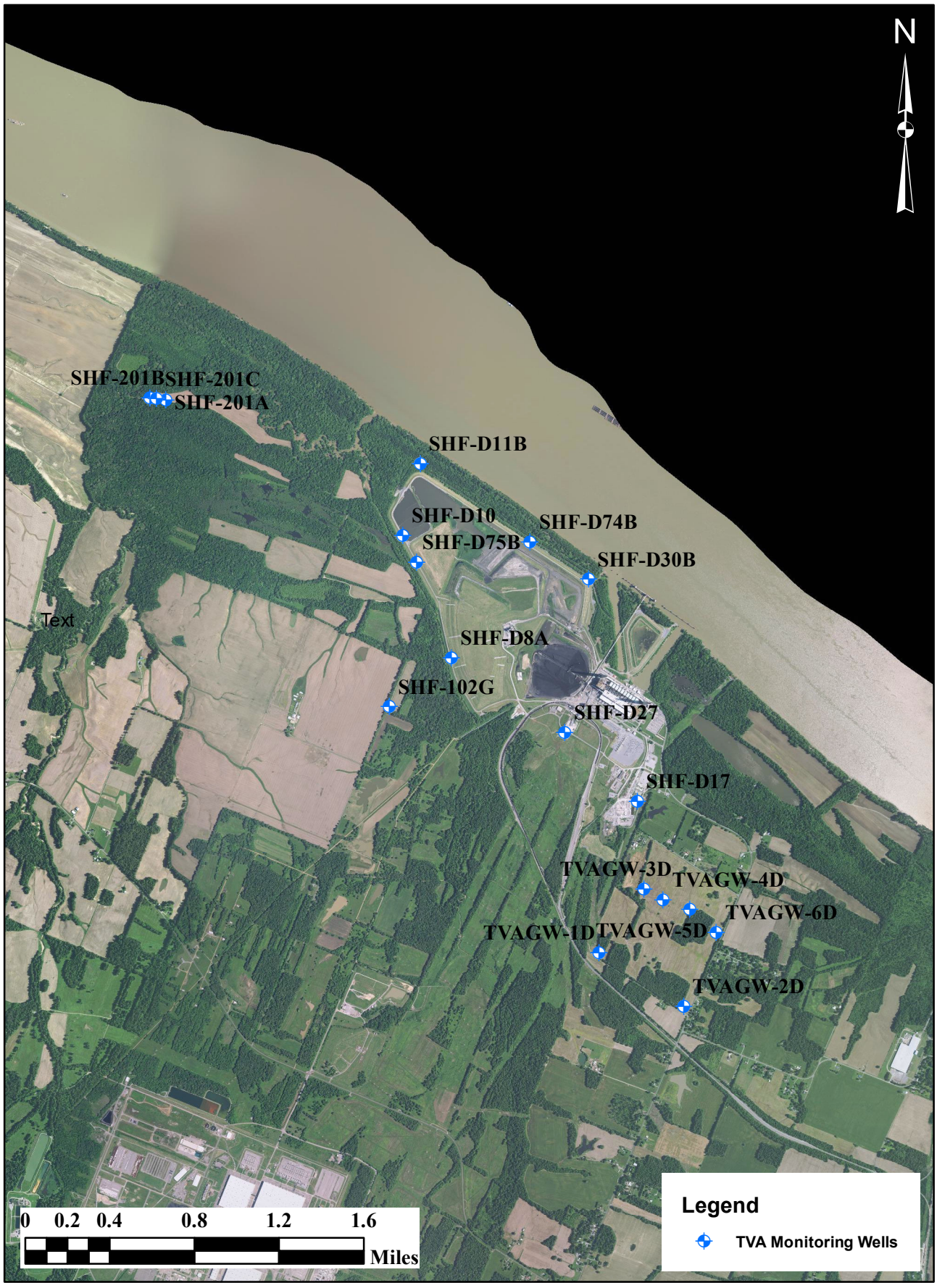
Figure 2. Outfall Sampling Locations

12/16/19

Figure 3. Groundwater Sampling Locations

12/16/19

Figure 4. TVA Synoptic Water Elevation Points



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