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Scoping Summary For the General Separations Area Western Groundwater Operable Unit (U)

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Key Changes to the Scoping Summary

SECTION	DESCRIPTION OF CHANGE	RATIONALE FOR CHANGE
4.1 and 4.2	Revised sections to include results from 2015 groundwater sampling.	These changes update the Scoping Summary to include results from sampling in 2015.
Figure 1	Time trend was added for tritium in the North plume.	Per Core Team discussion, include contaminant time trends as applicable.
Figures A-3, A-4, and A-5	Figures were updated based on the results of 2015 groundwater sampling.	These changes update the Scoping Summary with sampling results from 2015.
Figures A-2, A-3, A-4, and A-5	Figures were updated to include wells that are inactive (i.e., not currently being sampled).	Per Core Team discussion, inactive monitoring points were added to the figures.
Appendix C	Data table was updated with the results of 2015 groundwater sampling.	These changes update the Scoping Summary with sampling results from 2015.
Tables	Monitoring wells removed from the monitoring network were deleted from tables.	Well network was revised during the August 2013 scoping meeting based on the Monitoring Optimization White Paper, SRNS-RP-2012-00783, Rev. 1, January 2014.

Significant Core Team Agreements

Agreement	Meeting
Locations FGW-023 and FGW-024 will be sampled at least 2 more times and results will be discussed in the 2016 scoping summary. Continued monitoring of these locations will be evaluated.	September 2015
Technetium-99 will be added to the analyte list for the South plume.	September 2014
Sampling data (one event) for new locations, FGW-023 and FGW-024, will be included in the final scoping summary for 2014.	September 2014
At the South plume, the Core Team agreed to move forward with installation of one surface water sample station and one shallow seep line piezometer on a tributary to the west of the Biomass Facility. The need for additional monitoring points will be evaluated based on monitoring results.	August 2013
Sampling of established wells will be performed annually. New monitoring locations added to the OU will be sampled semi-annually until a baseline is established.	August 2013

Significant Core Team Agreements (continued)

Agreement	Meeting
As documented in the GSA Eastern and Western Groundwater OUs Groundwater Monitoring Optimization White Paper, SRNS-RP-2012-00783, Rev. 1, January 2014, the Core Team agreed to discontinue monitoring at wells FNB-3, FNB-12, FBP-13D, FBP-44D, FBP-46D, FBP-47D, BRR-5D and UTR-7.	August 2013
As documented in the GSA Eastern and Western Groundwater OUs Groundwater Monitoring Optimization White Paper, SRNS-RP-2012-00783, Rev. 1, January 2014, the Core Team agreed to add alpha and beta/gamma speciation to analyte list for well FGW005C.	August 2013
The Core Team recognized the difficulty of installing a new well down gradient of UTR-18R and agreed that a new well is not needed at this time as long as SRS continues to monitor water at the seep in well UTR-18R.	August 2013
Add one monitoring well in the lower aquifer zone down gradient of FGW-012C, if possible.	August 2012
Add one seepage and one surface water monitoring location down gradient of FGW-012C along unnamed tributary, if surface water is present.	August 2012
Data are being collected and reported for future evaluation of VOC degradation as a remedial alternative.	August 2011
The Core Team agreed to include information on wells FBP 44D, 46D, and 47D in the August 2011 scoping summary instead of submitting the February 2011 white paper that was agreed to during the June 2010 meeting.	August 2011
FBP 44D, FBP 46D, and FBP 47D can be dry during periods of lower water table. This could represent a data gap if the UTR 18R seepage piezometer is also dry (monitors the same aquifer zone). UTR 18R typically contains water. Historical data associated with the dry wells will be evaluated with respect to contaminants to determine if modifications to the well network are necessary to define plume extent. The evaluation will be reported in February 2011 as a white paper.	June 2010

1.0 PROJECT PHASE AND STATUS

The *Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI)/Remedial Investigation (RI) Phase 1 Work Plan for the General Separations Area (GSA) Western Groundwater Operable Unit (OU)*, Revision 1.1, was approved by the United States Environmental Protection Agency (USEPA) and by the South Carolina Department of Health and Environmental Control (SCDHEC) on September 9, 2004. A Field Start was achieved for the OU on September 20, 2004.

In 2007, SRS completed establishment of the groundwater monitoring network. The GSA Western Groundwater OU is currently in a groundwater monitoring program. The purpose of this Scoping Summary is to present the analytical data obtained in 2015 from groundwater monitoring to the Core Team to determine if the monitoring network and analytical suite remain appropriate for continued monitoring. In 2015, concentrations have remained consistent with results from 2014 and continued sampling of the groundwater monitoring network is recommended. Groundwater plumes remain stable with respect to concentrations and extent, and surface waters are not above MCLs.

2.0 BACKGROUND

The GSA is located on a topographic ridge near the center of the SRS. The GSA Western Groundwater OU is located in the northwest portion of the GSA on a groundwater divide. It encompasses the groundwater beneath approximately 485.6 hectares (1,200 acres) in F Area. This OU is bordered to the south by the F-Area Hazardous Waste Management Facility and to the east by the Mixed Waste Management Facility (see Figure A-1). Because the OU is located on a groundwater divide, shallow groundwater flows toward both Fourmile Branch (FMB) and Upper Three Runs Creek (UTRC) (see Figure A-2).

This OU underlies many operating facilities and waste units in and around F Area that are potential sources of contamination. Some of these facilities and units have been investigated during previous Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI)/Remedial Investigation (RI) characterization work. From these investigations and from review of the existing monitoring well networks, three distinct groundwater plumes have been identified in the Upper Three Runs Aquifer (UTRA). The plumes are identified by geographic reference as the North plume, the West plume, and the South plume.

Some of the operating facilities in the area are undergoing decontamination and decommissioning and will be brought to closure in the near term. Because other facilities will remain active into the future, in September 2005, the Core Team determined:

- It is not appropriate to achieve a Record of Decision on the GSA Western GW OU until all sources of potential contamination are brought to closure (including closure of the F-Area High Level Waste Tanks).
- The most appropriate action at this time is continued groundwater monitoring to ensure that surface water resources are adequately protected.
- If contamination in the groundwater is thought to represent a threat to surface water resources, the Core Team will reconvene to determine if early response actions are required.

SRS characterized the nature and extent of groundwater contamination. The primary groundwater contaminants are volatile organic compounds (VOCs), radionuclides, and nitrate. Tritium, iodine-129, and trichloroethylene (TCE) are sporadically above MCLs at points of groundwater discharge at the seepines. However, concentrations in adjacent surface water are consistently below MCLs.

3.0 LAND USE

The area encompassed by the GSA Western GW OU is heavily developed with many active industrial facilities. No future residential use of this area is anticipated. Land use of the entire GSA Western GW OU area will be controlled to prevent use of the groundwater that exceeds MCLs. The UTRA and Gordon Aquifer (GA) are not used as a drinking water source at SRS.

4.0 SUBUNITS

The GSA Western GW OU includes the following two subunits:

- Groundwater (i.e., North Plume, West Plume, South Plume), including shallow groundwater discharging to surface at the seep lines
- Surface water

In September 2005, the Core Team determined that soil contamination from the potential source units will be addressed during closure of the individual waste units and operating facilities.

4.1 Groundwater Subunit

The UTRA is the shallow-most aquifer beneath the GSA Western GW OU and consists of two aquifer zones; the Upper Aquifer Zone (UAZ) and the Lower Aquifer Zone (LAZ). The GA underlies the UTRA and is separated from the UTRA by the Gordon Confining Unit (GCU). Contamination is present only in the UTRA. Previous investigations have demonstrated that within the GSA Western GW OU, the GA is protected by a competent confinement unit (GCU) and contamination is not migrating into the aquifer.

In 2015, the GSA Western GW OU was under a groundwater monitoring program that consisted of sampling 33 monitoring wells, 4 shallow sampling points at the seep lines (i.e., seepage piezometers), and 4 surface water sampling stations (Table 1 and Figure A-2). Starting in 2014, sampling of the monitoring network is performed annually for established wells with the exception of the F-Area Retention Basin. The F-Area Retention Basin is sampled semi-annually according to the Record of Decision (ROD). New wells are sampled semi-annually until a baseline is established in accordance with Table 1. The results from the 2015 monitoring of the well network are discussed below for the North, West, and South plumes. The analytical data for 2015 are presented in Appendix C.

Beginning in 2011, all locations in the North and West plumes have been sampled for TCE and degradation products. This is necessary to ensure that sufficient data are available to evaluate natural attenuation as a future remedial action. Currently cis-1,2-dichloroethylene is detected in the groundwater; however, concentrations are very low (0.55 ug/L) and below the laboratory analytical quantitation limit (i.e., 1 ug/L). Vinyl chloride is not detected (less than detection limit 0.3 ug/L).

Groundwater contaminants in the UTRA include VOCs, radionuclides, and nitrate. Tritium, TCE, and nonvolatile beta are recognized as the most widespread contaminants in the groundwater at the OU and thus are mapped each year. Other constituents are co-mingled with these primary contaminants. For example, TCE is the primary chlorinated solvent present yet the plume typically also contains limited quantities of tetrachloroethylene (PCE) and trichlorofluoromethane (TCFM) co-located with the TCE. Tritium and nonvolatile beta are the most widespread radioactive contaminants; however, other radionuclides such as iodine-129, strontium-90, uranium-238, etc., are also co-located within these plumes. Thus, mapping of the primary contaminants is useful to evaluate the distribution and nature of the plumes from year to year.

Beginning with the 2011 annual Core Team meeting, the TCE plume (Figure A-4) was revised. The value of the contour line was changed from 10 ug/L to the MCL of 5 ug/L. Also, the general shape of the plume was modified to reflect the absence of TCE at the wells adjacent to the Old F-Area Seepage Basin (OFASB). This change resulted in two distinct plumes being interpreted (North and West plumes) and the reassignment of well FGW 003C to the West plume monitoring network.

North Plume

The North plume covers an area of approximately 50 acres on the north side of the F-Area industrial facilities. Within this portion of the OU, the water table and the plume are located completely within the LAZ of the UTRA. Groundwater flow in this aquifer is north toward Upper Three Runs Creek and its tributaries. During 2015, groundwater samples were collected from four wells, two seepage piezometers, and two surface water locations. All locations yielded samples in 2015.

Previous investigations have shown that elevated concentrations of TCE, gross alpha, and nonvolatile beta are present to the east and north-east of the OFASB. In 2002, depth discrete samples measured TCE concentrations up to 85 ug/L. Elevated concentrations of gross alpha and nonvolatile beta were also detected. Sample locations from this investigation were shown in the November 2005 Scoping Summary. This area of the plume is likely from sources within the F-Area fence line such as facilities associated with the now decommissioned Naval Fuels and the Fabrication Shop located north of F Canyon.

During the 2015 monitoring period, TCE concentrations were the same as in 2014 and ranged between non-detect and 15.1 ug/L. Three monitoring locations detected TCE and only two locations exceeded the MCL (FNB 13 and FNB 15).

The maximum concentration detected was 15.1 ug/L at well FNB 13. At adjacent well FNB 15 TCE was 8.92 ug/L. TCE was not detected above the MCL at the seepline piezometers. The only detection at the seepline occurred at piezometer UTR-16 with a concentration of 0.53J ug/L. Both PCE and TCFM were also below the MCL in the north plume.

In addition to VOCs, nonvolatile beta, nitrate, iodine-129, strontium-90, and tritium have been present in the UTRA at levels greater than MCLs. In 2015, concentrations were similar to levels measured in 2014 and only slightly greater than respective MCLs at most locations. Near the OFASB at well FNB 2, the concentration of I-129 was 8.45J pCi/L which was slightly lower than the 2014 result. At the same well, Sr-90 was slightly higher than the previous year at 16.9 pCi/L. Tritium exceeded the MCL (20 pCi/mL) down gradient of the OFASB at wells FNB 13 and FNB 15 (25.9 and 30.2 pCi/mL, respectively). However, tritium concentrations have been decreasing over the past fifteen years and are currently barely above the MCL as shown in Figure 1. The downward concentration trend since monitoring began in year 2000 is indicative of a plume that is shrinking and a tritium source term that is depleted. Nitrate also exceeded the MCL (10 mg/L) at wells (FNB 13 and FNB 15) and the maximum concentration was 13.1 mg/L (FNB 15). Nonvolatile beta only exceeded the MCL (50 pCi/L) at one well (FNB 13) at 57 pCi/L in 2015.

In 2015, shallow groundwater discharging at the seepline was monitored by two seepline piezometers (UTR 6 and UTR 16). Historically, primarily tritium has been detected near or slightly above the MCL at location UTR 16. However, I-129 has also been sporadically measured above the MCL in the past. During the 2015 sampling at UTR 16, tritium (6.32 pCi/mL) was below the MCL and iodine-129 was 1.41J pCi/L (laboratory estimated value below the estimated quantitation limit). Levels of I-129 were about the same as measured last year and tritium concentrations were lower than 2014 results.

In accordance with the monitoring strategy, surface water samples are also collected near the points of groundwater discharge. Samples from surface water stations UTR 003 and UTR 004 were both non-detect for I-129 and had very low results for tritium, with the highest being 3.94 pCi/mL (2015).

Overall, the 2015 results were similar to last year's results. The data continue to indicate that the plume remains stable to decreasing with respect to extent and concentrations. Surface water is not being impacted above MCLs. Monitoring results for 2015 are provided in Appendix C.

West Plume

The West plume occupies approximately 65 acres on the western side of F Area. The plume is located within both the UAZ and LAZ of the UTRA. Groundwater flow in this area is generally west toward Upper Three Runs Creek. During 2015, groundwater samples were obtained from 11 of 12 wells. Well FBP 1A (LAZ) was out of service in 2015 because it was damaged beyond repair by lightning. SRS is working to replace this well. At the seepage line in 2015, piezometer (UTR 18R) was dry as well as the surface water location (UTR-005). Sampling results from the monitoring network are included in Appendix C.

Overall, the West plume is comprised primarily of VOCs (PCE, TCE, and TCFM), nitrates, and gross alpha/nonvolatile beta constituents. Based on previous sampling, the primary isotopes present include iodine-129, strontium-90, technetium-99, uranium-233/234, and uranium-238. In 2015, the data show MCL exceedances for: PCE, TCE, TCFM, nitrates, gross alpha, nonvolatile beta, radium-226, radium-228, strontium-90, tritium, uranium 233/234, and uranium-238. VOCs and nitrates are the most widespread contaminants for the West plume.

VOCs are present beneath the burning rubble pits and up gradient of the pits toward the F-Area facilities. The most prevalent VOCs are TCE and TCFM. The highest concentrations of TCE are located at the northwest edge of the F-Area facilities at wells FGW 003C, FGW 005C, FGW 022C, and FBP43DL. In 2015, the maximum TCE concentration was 29.6 ug/L at well FBP 43DL. TCE concentrations in this part of the plume (wells FGW 003C, FGW 005C, FGW 022C, and FBP 43DL) have been stable to decreasing over time (Figure 2).

In 2015 in the distal part of the plume, TCE concentrations remained steady at 14.1 ug/L (Figure 3). PCE concentrations were also similar to last year's results (2015 maximum result of 6.5 ug/L). TCFM is not present above the MCL in the distal part of the western plume.

The maximum concentrations of nitrates, gross alpha, and nonvolatile beta are also present adjacent to the F-Area facilities and the Inactive Process Sewer Line (IPSL) at LAZ wells FGW 005C and FGW 022C. In 2015, the maximum nitrate concentration was slightly lower than last year at 56.5 mg/L (FGW 005C). Gross alpha and nonvolatile beta concentrations were slightly higher than results from 2014; gross alpha 1,460 pCi/L (FGW 005C), nonvolatile beta 780 pCi/L (FGW 005C) (2015 results). At well FGW 005C, the specific isotopes associated with the elevated gross alpha are uranium-233/234 (394 pCi/L) and uranium-238 (1,250 pCi/L) and the beta emitting isotopes present are primarily strontium-90 (369 pCi/L) and technetium-99 (223J pCi/L). The results of isotopic speciation for FGW 005C are included in Appendix B.

At the West plume, the concentrations of gross alpha and nonvolatile beta attenuate rapidly with distance away from the F-Area facilities. As shown in Figure A-5, the nonvolatile beta plume terminates approximately half-way between the F-Area fence line and the wetlands of Upper Three Runs Creek, and poses no threat to surface water.

In the past, TCE has been detected at piezometer UTR 18R, however, surface water samples collected down gradient from UTR 18R have historically been non-detect for VOCs. In 2014, small amounts of PCE, TCE and TCFM were detected in groundwater at UTR 18R. The maximum concentration was 8.5 ug/L for TCE and was above the MCL. PCE was also above the MCL in 2014 at 5.43 ug/L. UTR 018R is located at the base of a slope in an area of localized groundwater seeps. At this area, the rate of groundwater discharge is so low that standing water is not present year round. Also, the seepage sample point is approximately 600 feet from Upper Three Runs Creek and groundwater discharged to the surface seeps back into the ground or evaporates before reaching the creek. Downgradient of the seep piezometer, the concentration of all constituents have been below the MCL at surface water location UTR 005. UTR 18R and UTR 005 were not sampled in 2015 due to unusually dry conditions. However, samples were collected from UTR 18R in 2016; PCE, TCE, TCFM, and tritium were detected but all results were below MCLs.

Overall, 2015 data continue to indicate that the plumes remain stable with respect to extent and concentrations. Both the VOC and nonvolatile beta plumes terminate prior to discharging at seeps to Upper Three Runs Creek. Surface water is not being impacted above MCLs. Monitoring results for 2015 are provided in Appendix C.

South Plume

The South plume covers an area of approximately 55 acres on the south west corner of F Area. The plume is located within the UAZ and LAZ of the UTRA. Groundwater flow in this portion of the OU is generally south west toward Upper Three Runs Creek. During 2015, groundwater samples were collected from 13 wells. The analyte list for monitoring includes nitrates, gross alpha, nonvolatile

beta, tritium, iodine-129, radium- 226, radium-228, strontium-90, uranium-233/234, uranium-238, and technetium-99. Technetium-99 is being analyzed for the first time this year (2015). Analytical results are presented in Appendix C.

The South plume consists primarily of tritium and nonvolatile beta constituents. VOCs are not present at the South plume. Specific radionuclides that have been present above MCLs include iodine-129, strontium-90, and radium-226. SRS believes these constituents are sourced from the RCRA permitted F-Area Inactive Process Sewer Line (FIPSL). Potential sources of contamination include historic releases along sections of the FIPSL. A collapsed section of the vitrified clay FIPSL is known to exist down gradient of the Tank Farm. The collapsed section is shown in Figure A-2. Sampling locations near the collapsed section of the FIPSL are not accessible at this time due to interferences with power lines and active steam lines.

In 2015, nonvolatile beta was the most widespread contaminant detected. It was present at levels exceeding 50 pCi/L in five of the thirteen wells with concentrations ranging from 67.4 pCi/L (BRR 6C) to 418 pCi/L (FTF 28). Historically the elevated concentrations have been detected in the area of wells FTF 28 and FSL 5D near the IPSL collapsed section, and also at down gradient well FGW 12C.

In addition to nonvolatile beta activity, a few wells near the IPSL have exceeded the MCL for iodine-129, strontium-90, radium-226, technetium-99, and tritium. In 2015, all of these analytes exceeded the MCL in at least one well. The maximum concentrations were: iodine-129 (17.1 pCi/L), radium-226 (6.03 pCi/L), strontium-90 (17.9 pCi/L), technetium-99 (1040J pCi/L), and tritium (75.6 pCi/mL). All of these maximum concentrations occurred in wells along or near the FIPSL. Historically, radium-228 and nitrate have also exceeded in at least one

well. However, concentrations of radium-228 and nitrate were below MCLs at all sampled locations in the South plume.

Overall, the 2015 data indicate that the plume remains stable with respect to extent and concentrations. Monitoring results are provided in Appendix C.

During the August 2012 Core Team meeting, uncertainties associated with the extent of the South plume in the LAZ and the possibility of the South plume discharging to surface water were discussed. The Core Team recommended investigating a tributary to Upper Three Runs Creek that is located down gradient of well FGW 012C for potential sampling locations. The potential locations investigated included one surface water sample station, one seepage piezometer location, and a location for one new groundwater monitoring well, if needed. A field walk-down was held on April 16, 2013 with representatives from EPA, SCDHEC, and SRS. Based on the walk-down, groundwater discharge to the tributary was determined to begin approximately half-way down its length with the tributary being discharged to the floodplain swamp of Upper Three Runs Creek. The upper reaches of the tributary were dry.

In September 2014, SRS installed a surface water sample station (FGW 024) near the discharge point to the swamp and in August 2014, a shallow piezometer (FGW 023) to sample groundwater discharging to the surface. Four rounds of samples have been collected for the South plume constituents in 2014 and 2015. Nitrate-nitrite, radium-226, radium-228, nonvolatile beta, technetium-99 and tritium were detected, but all concentrations were very low and below MCLs. Based on the sampling results, the South plume is not impacting this tributary to Upper Three Runs Creek. The results are presented in Appendix C.

Four sets of samples have been collected over the past two years and only a few contaminants have been detected. As agreed to in the 2015 Core Team meeting,

SRS has evaluated the sample results and proposes to reduce the sampling frequency from semi-annual to annual for FGW 23 and FGW 24. The analyte suite will remain the same as for the rest of the South plume.

F-Area Retention Basin

Previously the Core Team decided to incorporate the monitoring and reporting for the F-Area Retention Basin in this report. The GSA Western Groundwater OU monitoring network includes sampling at four wells for the F-Area Retention Basin (FRB 1 through FRB 4). The monitoring network is shown on Figure A-2 and details are provided in Table 1. Samples were collected from all of the wells. All results were below MCLs at the F-Area Retention Basin. The analytical data are presented in Appendix C.

4.1.1 Problem Warranting Action

- Volatile organic compounds (VOCs), nitrate, and radionuclides in the UTRA are present at levels that exceed the respective MCLs.
- VOCs and radionuclides have been present in groundwater at the seepline at levels above the MCLs.

4.1.2 Remedial Action Objectives

- Ensure that contaminants in groundwater do not impact surface water at levels that exceed MCLs.
 - Prevent human exposure to contaminants in groundwater at levels that exceed MCLs.
-

4.1.3 Scope of Problem

Groundwater contaminants in the UTRA include VOCs, radionuclides, and nitrate. Tritium, TCE, and nonvolatile beta are recognized as the most widespread contaminants in the groundwater at the OU. Figures A-3, A-4, and A-5 show the distribution of these contaminants in the UTRA during 2015.

4.1.4 Likely Response Actions

- Continued monitoring of groundwater in the UTRA and at the seepline on an annual frequency.

4.1.5 Uncertainties

- There is some uncertainty regarding the potential sources of shallow groundwater contamination due to the number of operating facilities and waste units within the boundaries of the GSA Western GW OU. Individually and collectively, these facilities and waste sites have contaminated the shallow aquifer that underlies this groundwater OU. The closure of the F-Area facilities will manage the uncertainties associated with residual sources. The uncertainty regarding source areas will ultimately be addressed by the F-Area OU remedial investigation (prior to Area Closure). Until then, the impact of the combined sources on groundwater will be tracked by continued groundwater monitoring in the GSA Western GW OU. The well network for each plume area, sampling frequency, and specific analyte lists are summarized in Table 1.

4.2 Surface Water

Shallow groundwater within the OU discharges to surface water at the seeplines of Upper Three Runs Creek and Fourmile Branch. The Phase 1 Work Plan specified that if groundwater contamination was detected at the seeplines above the MCLs, then surface water quality in the stream(s) would be evaluated. Four surface water sample locations are used to monitor water quality in the groundwater monitoring plan (see Figure A-2). In

June 2010, the core team agreed to sample the surface water at the same frequency as the groundwater.

Characterization and monitoring well data show that groundwater contamination exists above MCLs beneath the seepline at a few locations within the OU. At the North and West plumes groundwater at the seepline has exceeded MCLs for tritium, strontium-90, iodine-129, and VOCs in the past. However, confirmation sampling of the surface water in the streams has demonstrated that contaminant levels are below MCLs in the tributaries to Upper Three Runs Creek.

4.2.1 Problem Warranting Action

- No problems warranting action have been identified for surface water at the OU.

4.2.2 Remedial Action Objectives

- To date there were no MCL exceedances in surface water; therefore remedial action objectives are not applicable at this time.

4.2.3 Surface Water Scope of Problem Warranting Action

The GSA Western GW OU contains three distinct areas of groundwater contamination. Since routine monitoring started in 2005, two of these plumes, the North plume and the West plume, have been above MCLs in groundwater near the discharge zone to the seeplines. In 2015, the North plume groundwater at the seepline was slightly above MCLs for iodine-129 and strontium-90 at concentrations of 1.41J pCi/L and 8.51J pCi/L, respectively. The West plume groundwater at the seepline was unable to be sampled in 2015 due to dry conditions. However, samples were collected in 2016 and all results were below MCLs. Historically, confirmation sampling of the surface water has demonstrated that contaminant levels have been and continue to be below MCLs in the tributaries to Upper Three Runs Creek.

4.2.4 *Surface Water Likely Response Actions*

- Monitoring of surface water per the schedule in Table 1.

4.2.5 *Uncertainties*

- It is uncertain if surface water of Upper Three Runs Creek and tributaries will be impacted by groundwater discharging from the North and West plumes. At some of the seepage locations contaminants have been detected above the MCL in groundwater. However, the associated streams continue to remain below MCLs for all contaminants. As more data is obtained, trends will be developed as necessary. This uncertainty is managed by monitoring surface water in the tributaries to Upper Three Runs Creek. Sample locations and analytes are summarized in Table 1.

5.0 OPERABLE UNIT STRATEGY

- SRS will sample the monitoring network annually for contaminants of concern until there is a decision to modify the frequency. New monitoring locations added to the OU will be sampled semi-annually until a baseline is established. Evaluation will be based on data trends. This information is reported in an annual update to this scoping summary.
 - SRS will convene the Core Team annually (or as necessary) to review data, re-evaluate the well network, sampling frequency, and analyte list, assess the effectiveness of the OU logic, and decide if the monitoring strategy is still appropriate or if changes are required (including the need for immediate action).
 - SRS will notify the Core Team promptly if monitoring data indicate a problem that requires immediate action.
-

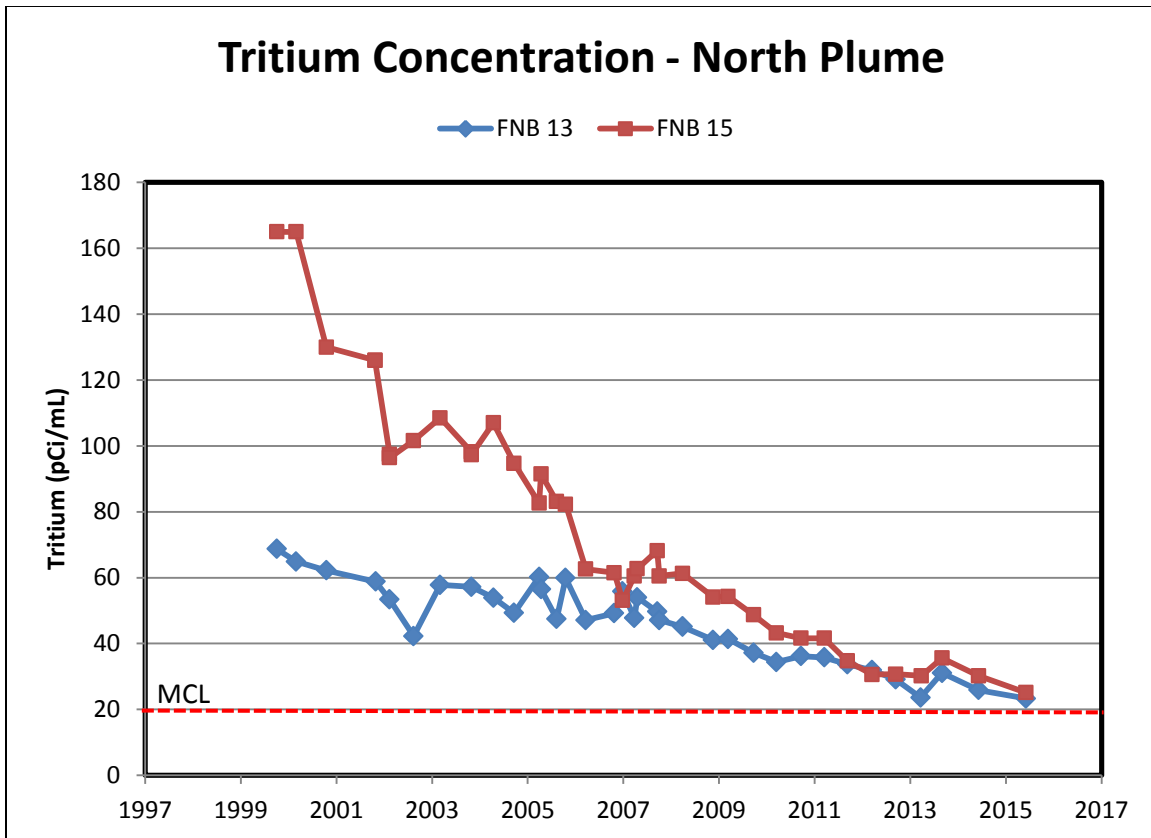


Figure 1. Tritium Concentration in the North Plume.

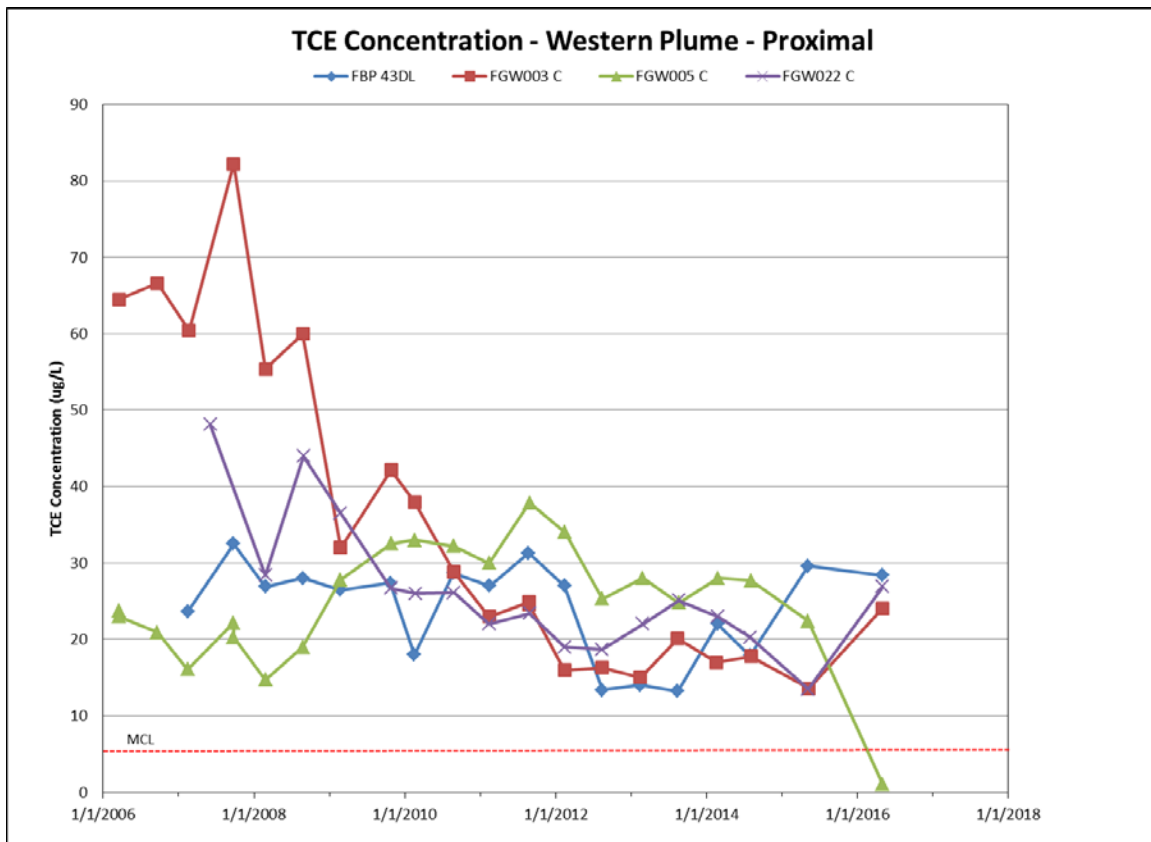


Figure 2. TCE Concentration Near the Source in the West Plume.

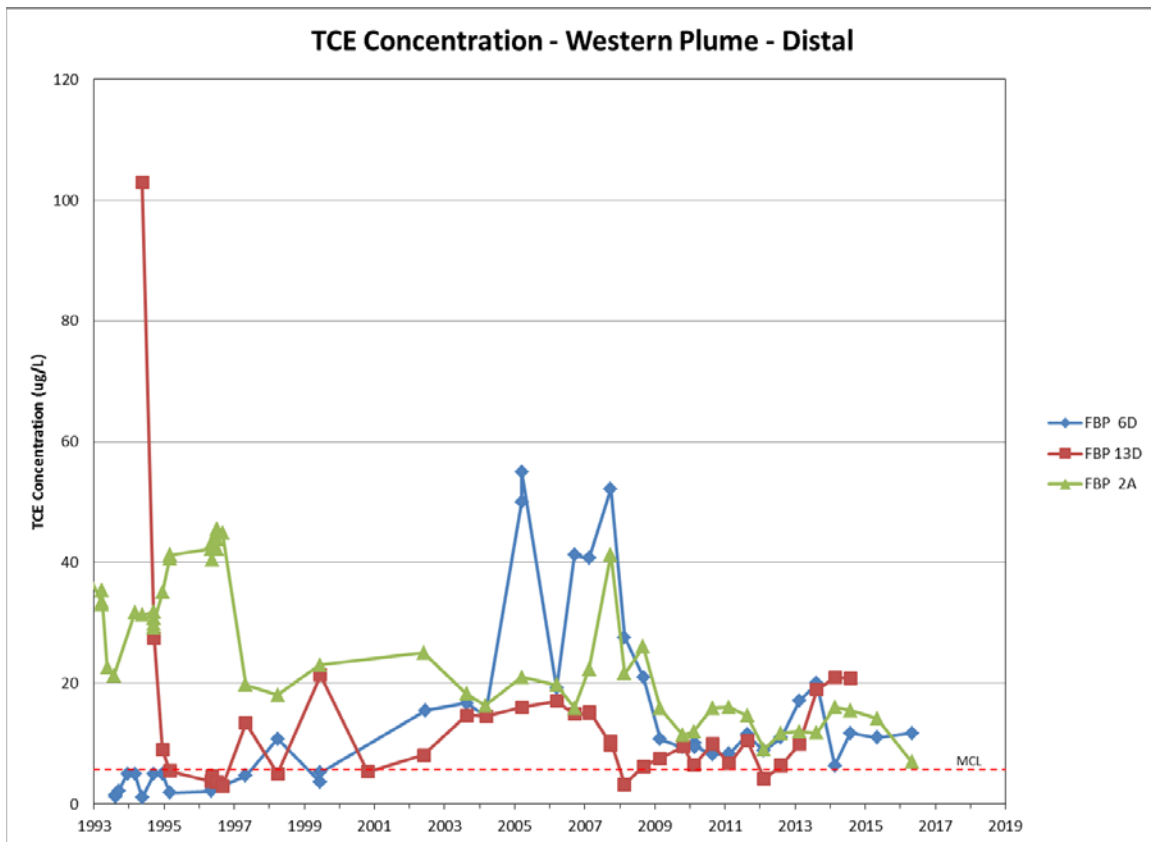


Figure 3. TCE Concentrations in the Distal Part of the West Plume.

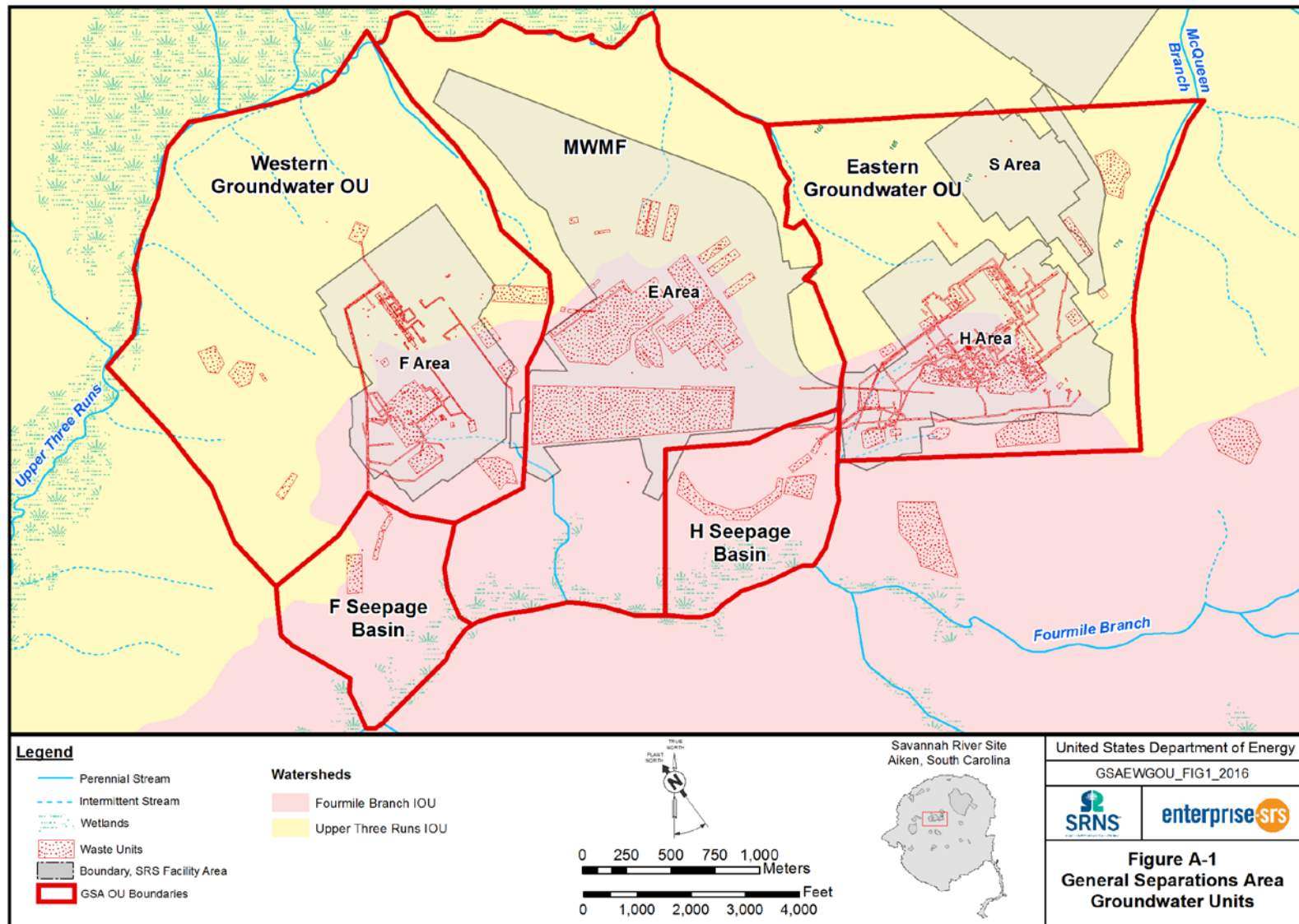
Table 1. Groundwater Monitoring Network

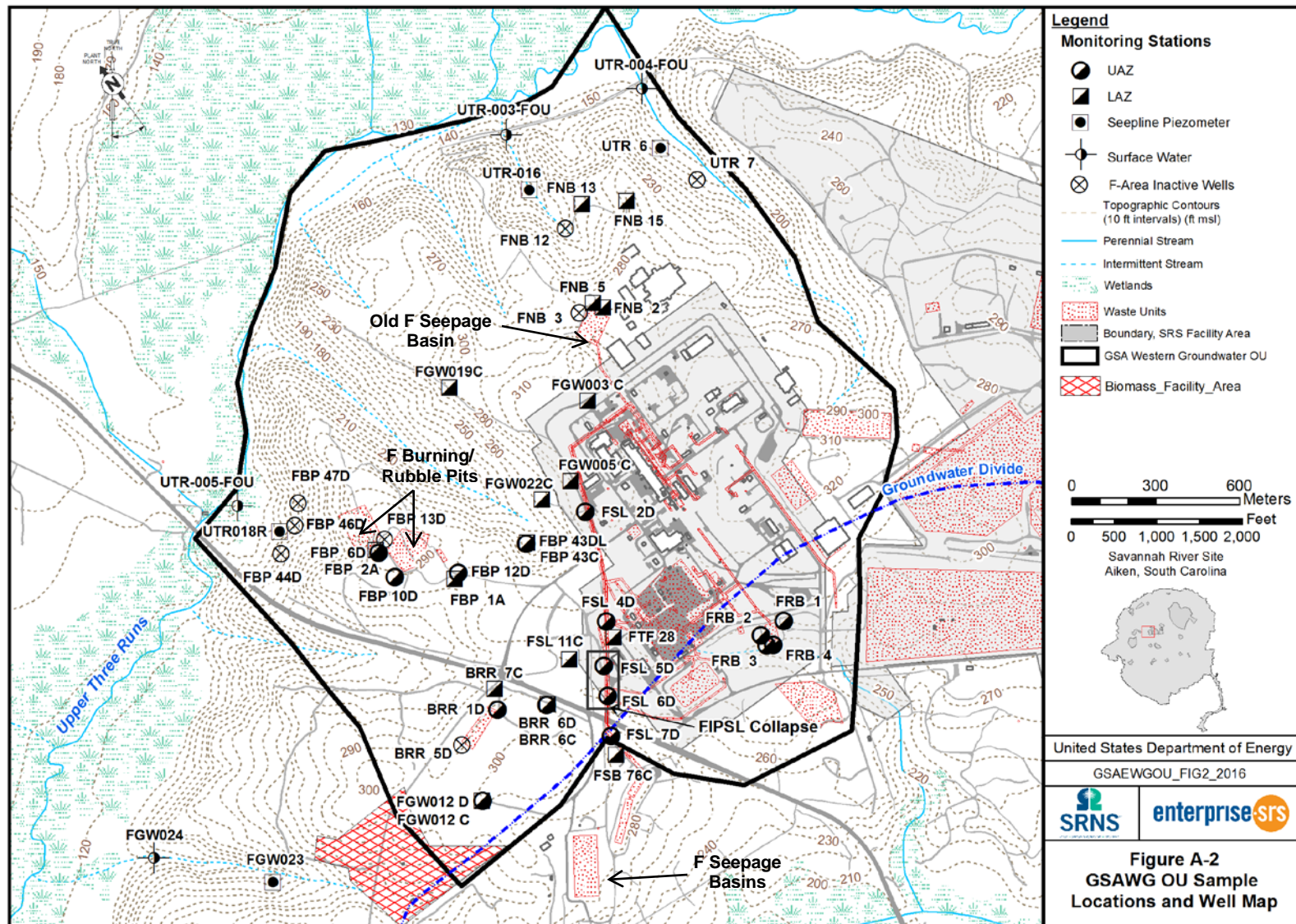
Plume Description	Aquifer Zone	Well ID	Analyte List
West Plume	UAZ of UTRA	FBP10D, FBP6D, FBP12D, FBP43DL, FSL2D	Nitrate, gross alpha, nonvolatile beta, tritium, and TCL VOCs
	LAZ of UTRA	FBP1A, FBP2A, FBP43C, FGW003C, FGW005C, FGW019C, FGW022C	Alpha and beta/gamma speciation for FGW005C
	Seepage/Surface Water	UTR18R, UTR005	At surface water locations: field parameters for VOC degradation and degradation products
North Plume	LAZ of UTRA	FNB2, FNB5, FNB13, FNB15	Nitrate, gross alpha, nonvolatile beta, tritium, iodine-129, strontium-90, and TCL VOCs
	Seepage/Surface Water	UTR16, UTR6, UTR003, UTR004	
South Plume	UAZ of UTRA	BRR1D, BRR6D, FSL4D, FSL5D, FSL6D, FSL7D, FSB76C, FGW012D	Nitrate, gross alpha, nonvolatile beta, tritium, iodine-129, radium-226, 228, strontium-90, technetium-99, uranium- 233/234, 238
	LAZ of UTRA	BRR6C, BRR7C, FTF28, FSL11C, FGW012C	
	Seepage/Surface Water	One new surface water location (FGW024) and one new seepage piezometer (FGW023)	
F Area Retention Basin	UAZ of UTRA	FRB1, FRB2, FRB3, FRB4	Gross alpha, nonvolatile beta, cesium-137, strontium-90, radium-226, TCE

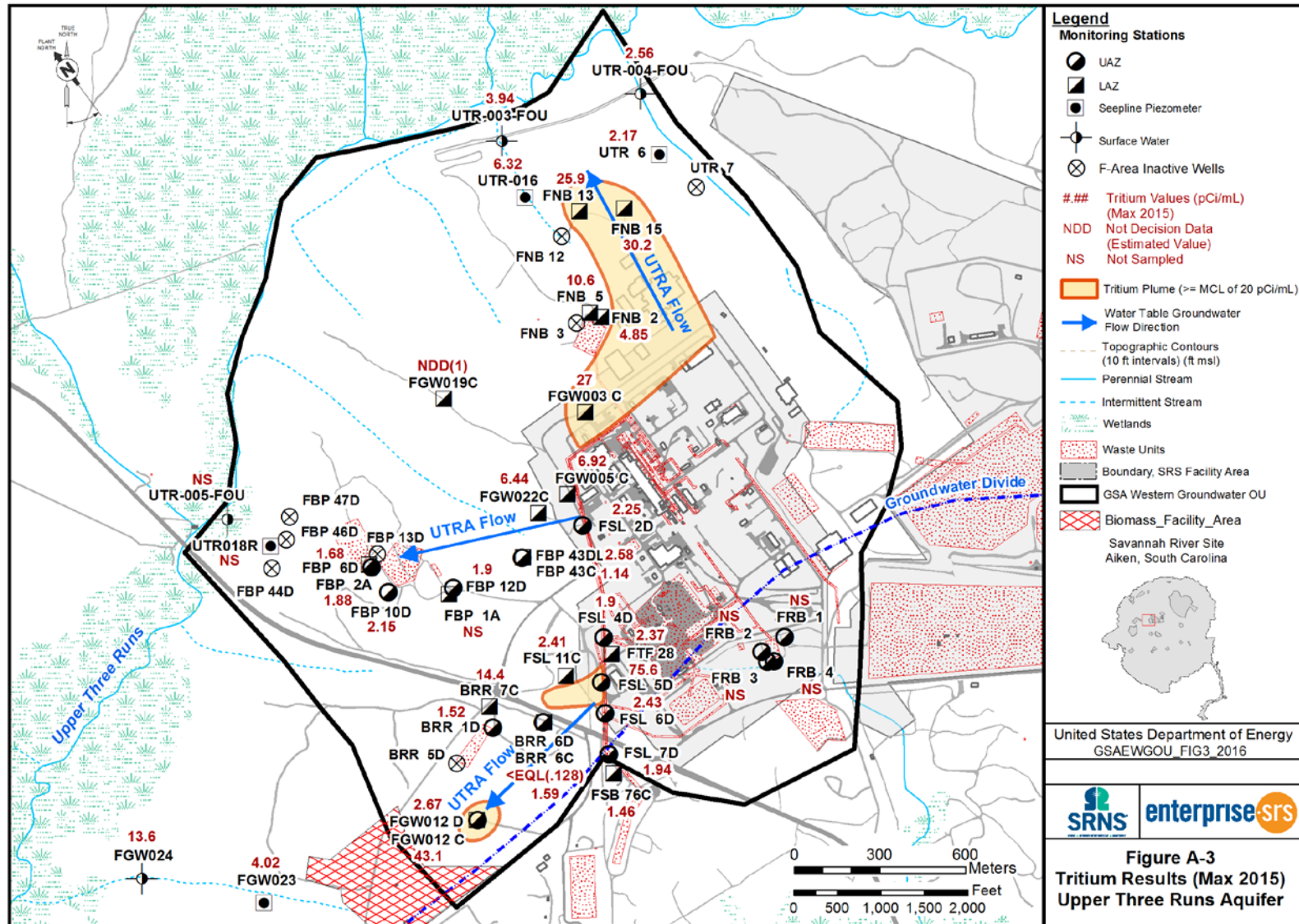
- Sampling of the well network is performed annually for existing wells starting in 2014 with the exception of the F Area Retention Basin. The FRB wells are sampled semi-annually according to the ROD. New monitoring locations added to the OU will be sampled semi-annually until a baseline is established. The monitoring network was revised during the August 2013 scoping meeting based on the Monitoring Optimization White Paper, SRNS-RP-2012-00783, Rev. 1, January 2014.
- Sample locations are shown on Figure A-2. FBP-45D was abandoned in 2009.

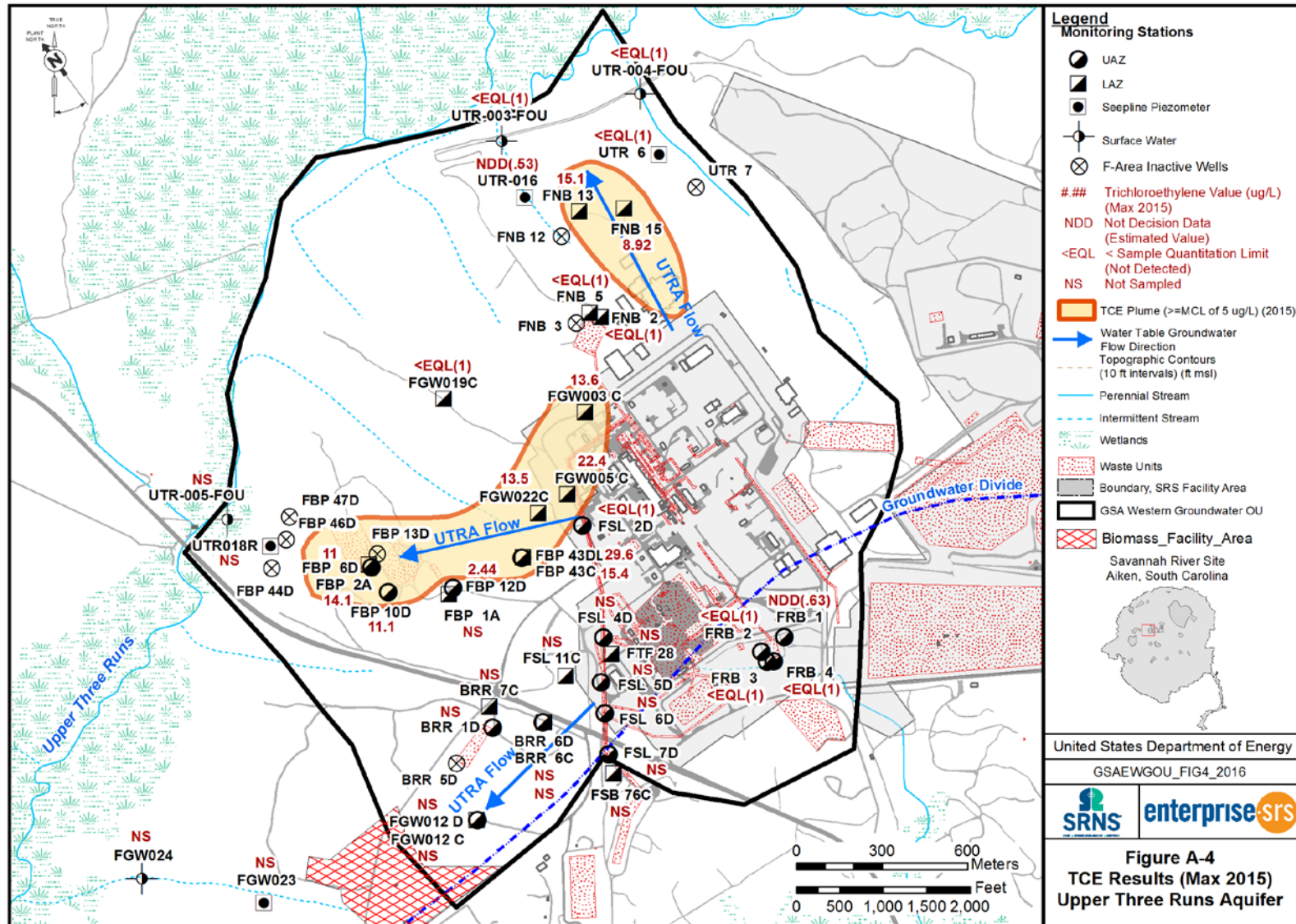
Appendix A

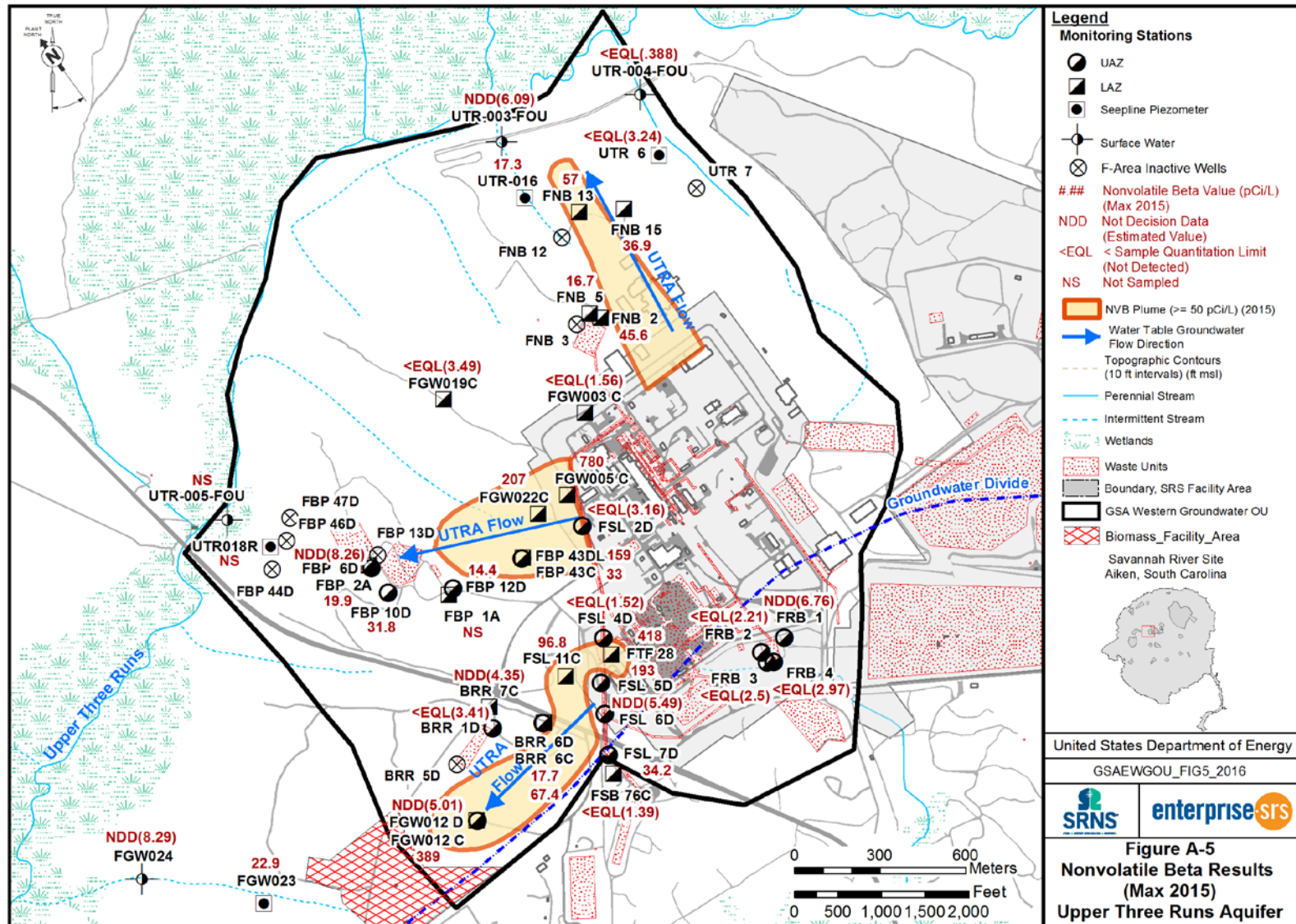
- Figure A-1 Groundwater Operable Units at the General Separations Area
- Figure A-2 GSA Western Groundwater OU Sample Locations and Well Map
- Figure A-3 Tritium Results (2015) Upper Three Runs Aquifer
- Figure A-4 Trichloroethylene Results (2015) Upper Three Runs Aquifer
- Figure A-5 Nonvolatile Beta Results (2015) Upper Three Runs Aquifer











Appendix B

**Isotopic Speciation Results
For FGW 005C**

**Scoping Summary for the GSA
Western Groundwater Operable Unit (U)
October 2016**

ERD-EN-2005-0127

Final

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Well ID	Date	Analyte	Detection Limit	Quantitation Limit	Lab Qualifier	Review Qualifier	Result	Units
FGW005 C	5/7/2015	ACTINIUM-228	40	89.1	U	U	19.8	pCi/L
FGW005 C	5/7/2015	AMERICIUM-241	0.0391	0.0925	J	U	0.0188	pCi/L
FGW005 C	5/7/2015	ANTIMONY-125	25.8	55.7	U	U	1.74	pCi/L
FGW005 C	5/7/2015	BARIUM-133	10.6	24.9	U	U	-0.894	pCi/L
FGW005 C	5/7/2015	BISMUTH-214	16	57.5		J	59.6	pCi/L
FGW005 C	5/7/2015	CARBON-14	7.37	16.6	J	J	9.98	pCi/L
FGW005 C	5/7/2015	CARBON-14	7.39	16.6	J	J	8.29	pCi/L
FGW005 C	5/7/2015	CESIUM-134	7.17	17.9	U	U	-5.75	pCi/L
FGW005 C	5/7/2015	CESIUM-137	8.42	18.3	U	U	-2.58	pCi/L
FGW005 C	5/7/2015	COBALT-60	7.03	14.7	U	U	-1.07	pCi/L
FGW005 C	5/7/2015	CURIUM-242	0.0486	0.169	J	J	0.0835	pCi/L
FGW005 C	5/7/2015	CURIUM-243/244	0.0419	0.12	U	U	0.0309	pCi/L
FGW005 C	5/7/2015	CURIUM-245/246	0.0392	0.151	J	U	0.0764	pCi/L
FGW005 C	5/7/2015	EUROPIUM-152	99.6	229	U	U	19.8	pCi/L
FGW005 C	5/7/2015	EUROPIUM-154	18	39	U	U	-5.87	pCi/L
FGW005 C	5/7/2015	EUROPIUM-155	27.1	60.6	U	U	-5.45	pCi/L
FGW005 C	5/7/2015	GROSS ALPHA	3.88	106			1460	pCi/L
FGW005 C	5/7/2015	IODINE-129	1.05	4.46	J	J	5.3	pCi/L
FGW005 C	5/7/2015	LEAD-212	18.6	42.5	U	U	-1.54	pCi/L
FGW005 C	5/7/2015	LEAD-214	20.2	59	J	J	54.8	pCi/L
FGW005 C	5/7/2015	NEPTUNIUM-237	0.0672	0.511			0.818	pCi/L
FGW005 C	5/7/2015	NONVOLATILE BETA	37	108			780	pCi/L
FGW005 C	5/7/2015	PLUTONIUM-238	0.0418	0.11	U	U	0.0214	pCi/L
FGW005 C	5/7/2015	PLUTONIUM-239/240	0.0548	0.112	U	U	0.0122	pCi/L
FGW005 C	5/7/2015	POTASSIUM-40	178	342	U	U	-60.2	pCi/L
FGW005 C	5/7/2015	PROMETHIUM-146	11.5	24.9	U	U	0.573	pCi/L
FGW005 C	5/7/2015	RADIUM-226	0.406	3.07			17.9	pCi/L
FGW005 C	5/7/2015	RADIUM-228	0.554	2.87			13.7	pCi/L
FGW005 C	5/7/2015	SODIUM-22	7.84	17.2	U	U	-3.3	pCi/L
FGW005 C	5/7/2015	STRONTIUM-90	2.52	80			369	pCi/L
FGW005 C	5/7/2015	TECHNETIUM-99	4.03	16.7		J	223	pCi/L
FGW005 C	5/7/2015	THALLIUM-208	11.2	23.6	U	U	0.833	pCi/L
FGW005 C	5/7/2015	THORIUM-228	0.187	0.42	U	U	0.103	pCi/L
FGW005 C	5/7/2015	THORIUM-228	0.172	0.477	U	U	0.19	pCi/L
FGW005 C	5/7/2015	THORIUM-230	0.0691	0.365	U	U	0.204	pCi/L
FGW005 C	5/7/2015	THORIUM-230	0.15	0.31	U	U	0.0501	pCi/L
FGW005 C	5/7/2015	THORIUM-232	0.069	0.069	U	U	0	pCi/L
FGW005 C	5/7/2015	THORIUM-232	0.0603	0.0603	U	U	0	pCi/L
FGW005 C	5/7/2015	TRITIUM	0.459	1.58			6.92	pCi/mL
FGW005 C	5/7/2015	URANIUM-233/234	0.518	214		R	484	pCi/L
FGW005 C	5/7/2015	URANIUM-233/234	0.692	106			394	pCi/L
FGW005 C	5/7/2015	URANIUM-235	0.5	33.4		R	68.3	pCi/L
FGW005 C	5/7/2015	URANIUM-235	0.286	17.5			50.5	pCi/L
FGW005 C	5/7/2015	URANIUM-238	0.54	649		R	1500	pCi/L
FGW005 C	5/7/2015	URANIUM-238	0.793	313			1250	pCi/L

Appendix C

**2015 Monitoring Well Results
Data Matrix Table**

Key to Field Conditions Codes for Data Matrix Tables

<u>Field Code</u>	<u>Explanation</u>
A	Pump is surging excessively; aerated
B	Blank sample was collected
C	Well is continuously pumping
D	Well is dry-no sample or field data collected
E	Equipment blank was collected
I	Well went dry during sampling; field data collected but insufficient water to collect all samples
L	Well went dry before sampling began; only depth to water can be determined
N	Well was not stabilized before sampling began
P	Inaccessibility or mechanical failure prevented sample collection and field analysis of the water
S	No water in standpipe; for water level events only
T	Samples were collected, but some samples were not sent to the laboratory due to high turbidity
W	Unable to sample well because of stabilization or sampling equipment failure; water-level measurements were obtained
X	Well went dry during purging; samples collected after well recovered measurements obtained
0	OK
1	Pump Dry
2	Sampled after recovery
3	Gallons purged through sample port
4	DI water obtained from 772-7B
5	High turbidity
6	Flow meter leaking
7	Pump failure
8	Flow meter not operating
9	# gallons added
10	Well is inaccessible, well cannot be Sampled
11	Well abandoned
12	No water to surface
13	Field measurements only
14	Not all samples were collected
15	Equipment failure
16	No water in standpipe
17	Bailed well
18	Water level tape not long enough
19	Well not sampled, maintenance required
20	Well sampled, maintenance required
21	Measurement Exceeded Criteria

Regulation	
100%	IPAFunctional Guideline Code of 7 was applied to the results, indicating an estimated quantity.
75%	Constraint was below detection. Sample-specific Estimated Quantitation Limit is in parentheses.
50%	Results exceeds applicable limits.
25%	Results Rejected
NS	Results is less than the applicable limits and without IPAFunctional Guideline qualifiers.
Blue line	Expected to be sampled but was not. See comments as to why not.
Green	Not a required sample analysis.
FL	Dry
SL	Will wet dry during paving, samples collected after well recovery