



# **Periodic Report 5 for the Upper Three Runs Integrator Operable Unit (U)**

**CERCLIS Number: 70**

**SRNS-RP-2017-00548**

**Revision 01 Redline**

**~~February~~July 2018**

that caused the Z-Area stormwater basin to discharge to the Z-01 Outfall location (SRNS 2014a). This basin does not normally discharge. The storm water runoff accumulation in the Z-Area basin included low level radiological contamination from runoff associated with Saltstone Disposal Unit (SDU) 4. Since the release, rainwater intrusion barriers have been implemented and rainwater flow paths engineered to prevent future low level contaminated runoff. In addition, contaminated soils associated with the SDU runoff have been removed. The discharge pipe and Z-01 Outfall were also grouted and closed, and a newly constructed Z-01 Outfall discharge structure is in place. The basin was also expanded to accommodate a 100-year storm event that dramatically reduces the potential for future releases from the basin. Details associated with the monitoring and mitigative efforts associated with the Z-Area basin discharge are presented in the 2012 Z-Area Special Environmental Monitoring Results report (2012a) and the Z-01 Outfall Data Report (SRNS 2015). Since the Tinker Creek cesium-137 exceedances are associated with an operational basin with an effective monitoring and reporting program, further evaluation by the IOU program is not warranted.

The sediment/soil onsite worker exceedances for cesium-137 are located in the Tinker Creek subunit. As with the sediment medium, the Tinker Creek sediment/soil exceedances, based on sediment benchmarks, are associated with the Z-Area stormwater basin Z-01 Outfall that ultimately leads to McQueen Branch. The sampling locations follow the intended water flow from the basin toward McQueen Branch and show cesium-137 activities above the onsite worker benchmark at locations in proximity to the Z-01 Outfall. The Z-01 Outfall area is part of the radiological administrative control area to protect site workers from inadvertent exposure to contaminated sediments. Since the extent of contamination has been established, and protective controls are already in place for workers, no further evaluation is warranted by the IOU program.

There were no SW benchmark exceedances the UTR PR5, therefore, further evaluation is not warranted by the IOU program at this time.

There were no new fish data for the UTR PR5, therefore, there were no exceedances for the subsistence fisherman for the fish medium.

## Ecological Benchmark Screening and Results

The purpose of the ecological evaluation is to provide an overall indicator of ecological health for the UTR IOU. The biological data is supplemented with benchmark comparisons that are used as a screening step to identify constituents that may pose a threat to ecological receptors. The ecological evaluation provides the basis for determining whether early action may need to be considered and the justification for subsequent investigations that support the ecological risk assessment process for the UTR IOU. The ecological benchmark comparisons are conducted by comparing ecological toxicological screening thresholds for sediment, sediment/soil, and SW media constituent concentrations. Tier I sediment and sediment/soil benchmarks are based on “no effect level” toxicological data, while Tier II sediment/soil benchmarks are based on “low effect level” toxicological data. For surface water screening, the Tier I benchmark is not based on “no effect” level toxicological data at the but rather “low effect” thresholds. The Tier II screening is based on acute-level thresholds. Therefore, the potential for an effect on ecological receptors could be indicated by an exceedance of either the Tier I or Tier II surface water screening benchmarks. Since the IOU database includes data from various data stewards, the IOU program assumes results for metals are representative of total metals. Constituents with SW Tier I and Tier II exceedances, or constituents with sediment and sediment/soil Tier II level exceedances are evaluated further if all criteria below are met:

1. The mean HQ > benchmark;
2. The frequency of exceedance is >5%; and
3. The mean detected value > maximum background, or if background data are non-determinant.

For the ecological evaluation, the exceedances that fail the criteria, along with biological data, are used to determine if possible early actions may need to be considered. For the ecological evaluation, early actions may include additional ecological data collection during Phase II of the IOU program (long-term monitoring and assessment) to further assess potential threats.

Sediment: Tier I benchmark screening for UTR PR5 resulted in a benchmark exceedance for arsenic (benchmark = 7.24E+00 mg/kg) for the Tinker Creek subunit, with 1 exceedance out of 5

endosulfan II, endosulfan sulfate, endrin, iron, lead, manganese, mercury, nickel, silver, thallium, and zinc. Constituents with mean ratios >1.0, a frequency of exceedance >5%, and with a mean detected value greater than background levels (or background data are non-determinant) requiring further evaluation included copper and DDD in the Tinker Creek subunit ~~and mercury in the Tims Branch subunit.~~

Constituents based on Tier II Ambient Water Quality Criteria (AWQC) based benchmarks requiring further evaluation include copper (benchmark = 1.80E-03 mg/L) and DDD (benchmark = 6.40E-05 mg/L). Review of copper data shows two detects out of 34 analyses for UTR PR5 for the Tinker Creek subunit. Only one result is over background (0.07 mg/L). The one result (0.518 mg/L) at the S-04 Outfall representing a sample taken in 2014. This location, the S-04 outfall, is described as Defense Waste Processing Facility non-process wastewater. This outfall is part of the annual environmental monitoring and already under a monitoring and reporting program. As such, further assessment by the IOU program is not warranted. The DDD Tier II AWQC exceedance is located in Tinker Creek upgradient of SRS operational sources. There is no known SRS use of DDT (DDD is a breakdown product of DDT) and since this exceedance is located upgradient of operational discharges, no further evaluation is warranted at this time.

The Tier II evaluation also includes exceedances based on ORNL benchmarks. Mercury in the UTR Middle subunit was the only constituent to exceed ORNL benchmarks. ~~Constituents~~ However, mercury had ~~with a mean ratios less than (<) 1.0, a frequency of exceedance <5%, and with a mean detected value greater less than background level. Therefore, mercury did not require additional evaluation, and s (or if background data are non-determinant) requiring further evaluation, based on ORNL benchmarks include mercury and DDD. The DDD exceedance is located in the Tinker Creek upgradient of potential SRS operational discharges. And since there is no known SRS use of DDT or DDD, and this constituent is detected infrequently, no further evaluation by the IOU program is warranted at this time.~~

~~The mercury exceedances within the Tims Branch subunit (13 exceedances out of 68 analyses) are all 2014 data associated with National Pollutant Discharge Elimination System (NPDES) industrial outfall A-11 for Area powerhouse operations. The mercury levels are above the IOU~~

~~Tier II benchmark, but are within NPDES permitted limits. Since the mercury exceedances are data from NPDES permitted monitoring and reporting program, further evaluation by the IOU program is not warranted at this time.~~

### **Data Needs and Early Actions**

The PR5 HH evaluation lacked recent fish data (Section 2.1.1). A new approach to monitoring contaminant levels and bioaccumulation in fish for the IOU program is planned. Passive diffusive gradients in thin films (DGT) samplers have been used successfully by regulatory agencies and researchers and can be used to collect screening level contaminant data to estimate concentrations in fish tissue without catching or destroying any fish. DGT samplers will be deployed to provide additional data to support future HH subsistence fisherman scenario benchmark screening and ecological screening. DGT samplers target bioavailable fractions of contaminants to help identify contaminants of interest. The passive sampler deployment will focus on the Middle and Lower UTR subunits where edible sized game fish are more likely and higher fish diversity is supported. These data will be reported in a future PR.

The PR5 ecological assessment showed Tier II sediment/soil and Tier I and II SW exceedances based on review of UTR PR5. Field studies have indicated that mercury in the Lower subunit, and uranium, nickel and mercury in the Tims Branch subunit may pose a threat to ecological receptors within the UTR IOU. As Phase II continues, data will continue to be compiled and assessed for the UTR IOU and reported in upcoming PRs. To support the ongoing Phase II data screening, several biological studies are planned or on-going for the UTR IOU. The passive sampler deployment in Middle and Lower UTR identified as a data need for this PR will assist in identifying bioavailable constituents that may pose a threat to ecological receptors. Other biological sampling efforts include fish and macroinvertebrate assemblages. It is anticipated that macroinvertebrate surveys will be conducted in Crouch Branch in 2018 as part of the National Pollution Discharge Elimination System surveillance program. Also, the SREL has recently conducted macroinvertebrate surveys in McQueen Branch. Additionally, an SRS-wide IOU bioassessment field effort was conducted in 2017 to assess fish communities and macroinvertebrate assemblages within all the IOUs except the Savannah River and Floodplain Swamp (SRFS) IOU. The SRFS IOU was not included since the bioassessment data collection

assemblages of aquatic insects in North America, if not the world. More than 575 species of aquatic insects have been documented to inhabit UTR including several rare and unusual species, some of which are found nowhere else in the world (SREL 1997).

For data evaluation purposes, the UTR IOU is divided into subunits that are based on sub-watersheds. The following subunits make up the UTR IOU: Upper, Middle, Lower, Tinker Creek, and Tims Branch (Figure 1-2).

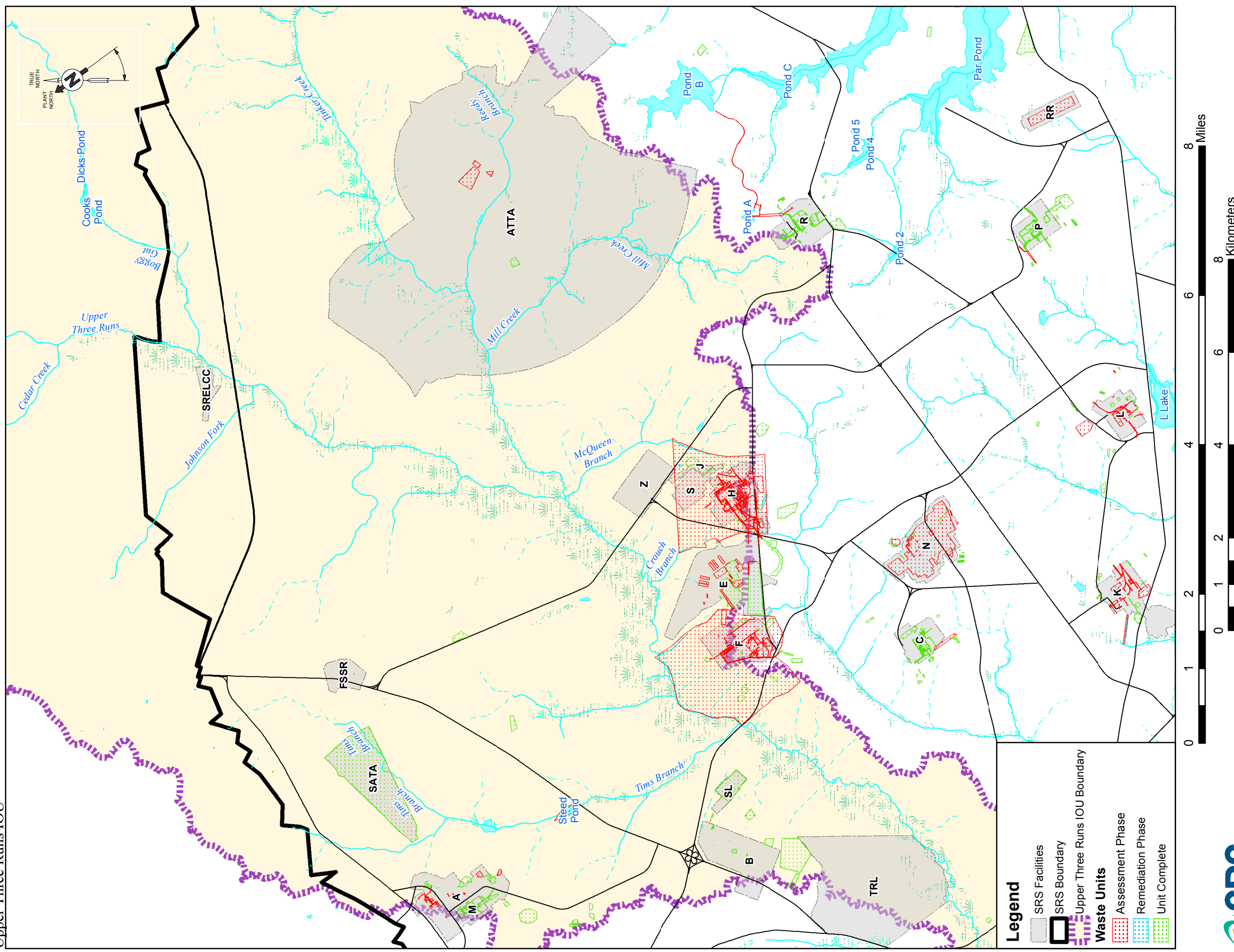
The potential for contaminant impacts to the IOU are assessed based on knowledge of the OUs or inferred from contaminant migration analysis. Figure 1-3 provides an overview of the OUs within UTR watershed (and adjacent watersheds) and identifies whether the unit is in the Assessment Phase, Remediation Phase, or Complete. For Assessment and Remediation Phase units, ~~the~~ potential SW flow paths for land surfaces are based on Light Detection and Ranging (LiDAR) elevation data from the U.S. Forest Service (USFS 2009). The LiDAR data were acquired for the SRS in 2009 to produce detailed, high resolution bare ground surface models. Data were acquired with an average of 10 pulses/square meter, and the entire point data set includes over 18 billion points. The total area covered by the acquisition is ~119,000 ha (294,054 ac) which is used to approximate SW flow directions from the OUs (listed by unit identification number, "ID", as described in Table 1-1) to receiving water bodies. The LiDAR data-generated surface contours are shown in Figures 1-3a-4a through 1-3f4d. Figures 1-45a through 1-4f5d) show the OUs in relation to GW plumes and GW potentiometric contours for the water table surface based on a 2003 regional scale interpretation utilizing 1,324 wells (Westinghouse Savannah River Company [WSRC] 2003a). The potentiometric lines assist in the visualization and interpretation of GW flow directions of OUs that potentially impact the UTR IOU. The SRS watershed boundaries have also been revised based on interpretation of the 2009 LiDAR data. OUs that are included in the UTR PR5 evaluation are presented in Table 1-1. These units are included because potential GW and/or SW transport pathways lead to the UTR IOU providing a possible route of exposure to HH and/or ecological receptors. The Unit Status column on Table 1-1 includes ROD and no further action determinations, and projected FFA scheduled Field Starts for OUs with future FFA commitments. Table 1-1 also describes OUs with GW components that are currently being addressed by an OU monitoring/assessment program. The Potential GW and SW Transport

Pathway column in Table 1-1 describes where GW or SW pathways from a particular OU would ultimately discharge based on potentiometric or LiDAR surface contours. OUs that have not been closed, or units that have a GW component with ongoing monitoring requirements, have the potential to impact the IOU and are considered a potential contaminant source to the UTR IOU. Whether impact to the IOU may need to be considered during Phase II of the IOU program is summarized in the Potential Impact to GW or SW columns. Units that no longer represent a potential threat to the IOU due to implementation of remedial actions or issuance of regulatory decisions are noted as a “No” and are no longer considered a source to the IOU requiring action during Phase II evaluations. The CSMs have been developed to illustrate the relationship between potential contaminant sources (listed in Table 1-1) and their potential to impact various exposure media (SW, sediment, and/or sediment/soil) within the IOU and, consequently, human and/or ecological receptors.

The UTR CSM is presented in Figure 1-~~56~~ and reflects the current understanding of potential contaminant sources and migration pathways for the UTR IOU. Sources listed in Table 1-1 with a potential to impact the IOU are included in the UTR CSM. Primary sources of contamination include the waste materials and the effluents generated from process facilities. Environmental media impacted by the release of primary source contamination become a secondary source. Secondary sources of contamination include sediment, sediment/soils, SW, and GW. Figure 1-~~67~~ is a general overview Site-wide CSM model representing all the IOUs that includes historical pathways.

**Figure 1-3. Operable Units Associated with the UTR IOU**

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Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
Zone: 17

To place on the North American Datum 1983, move the projection line 13 meters south and 15 meters west.

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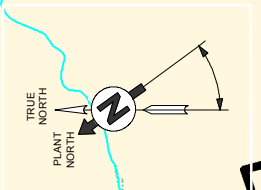
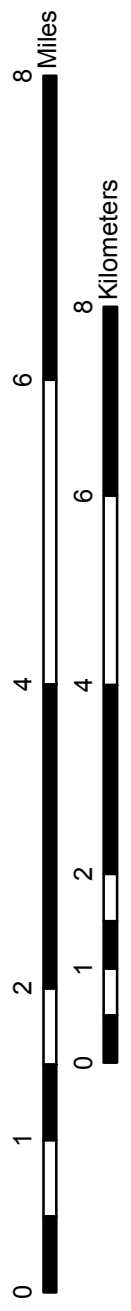
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Figure 1-3: Operable Units Associated with the UTR IOU

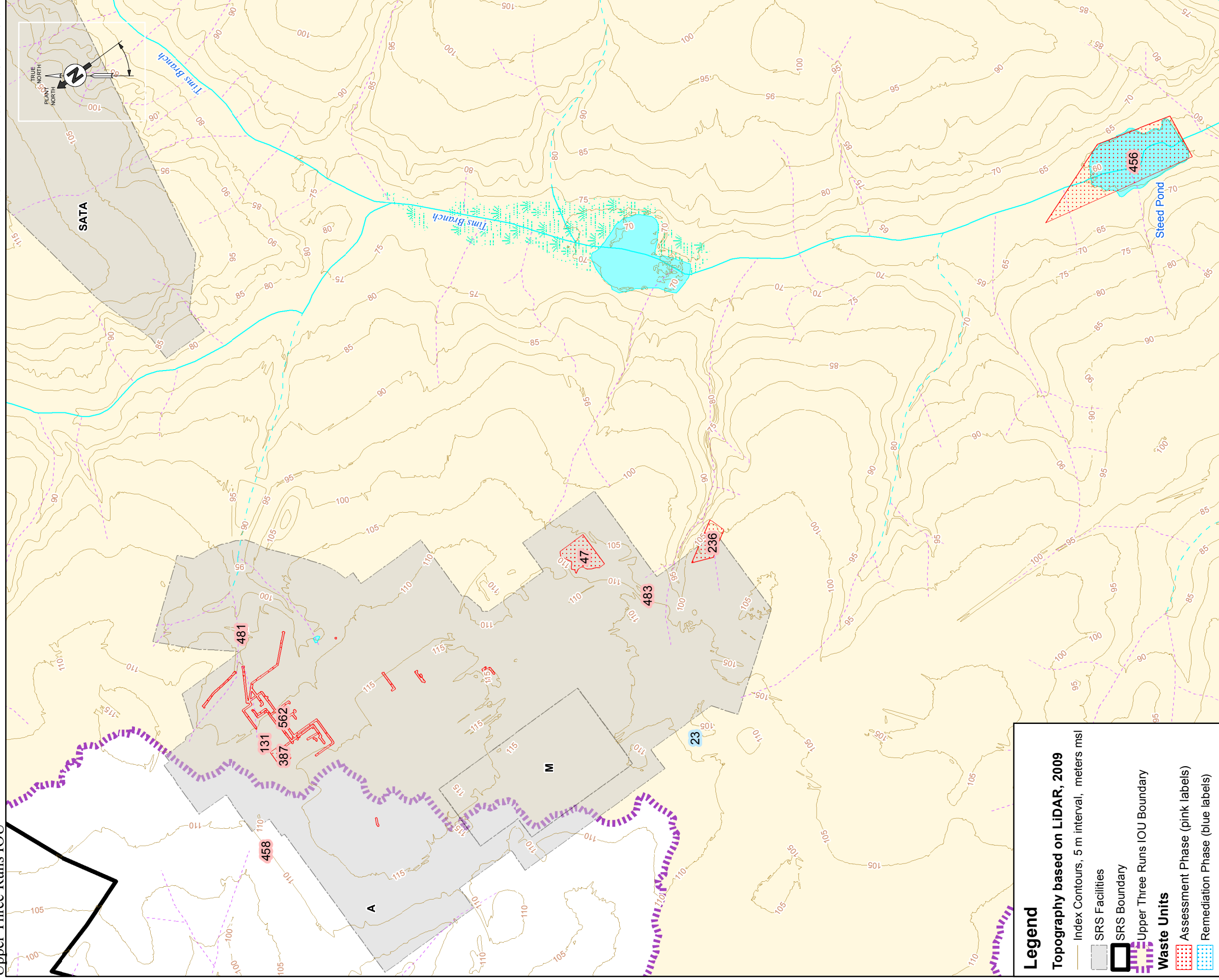
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Aiken, South Carolina



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UTR/IOU/FIG1_4GIS/2018	REVISED: 06/25/18
1	DATE: 06/25/18
Operable Units Associated with the UTR IOU	
PREPARED BY: Natalie Lopez	APPROVED BY: Susan Blas
DATE: 06/25/18	DATE: 06/25/18



**Figure 1-~~34~~a. Operable Units and Topography Associated with the UTR IOU – A/M Area  
and G-Area Unit Steed Pond**



**Legend**

**Topography based on LIDAR, 2009**

- Index Contours, 5 m interval, meters msl
- SRS Facilities
- SRS Boundary
- Upper Three Runs IOU Boundary

**Waste Units**

- Assessment Phase (pink labels)
- Remediation Phase (blue labels)



Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
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Figure 1-4a: Operable Units and Topography Associated with the UTR IOU - A/M Area and G Area Unit Steed Pond

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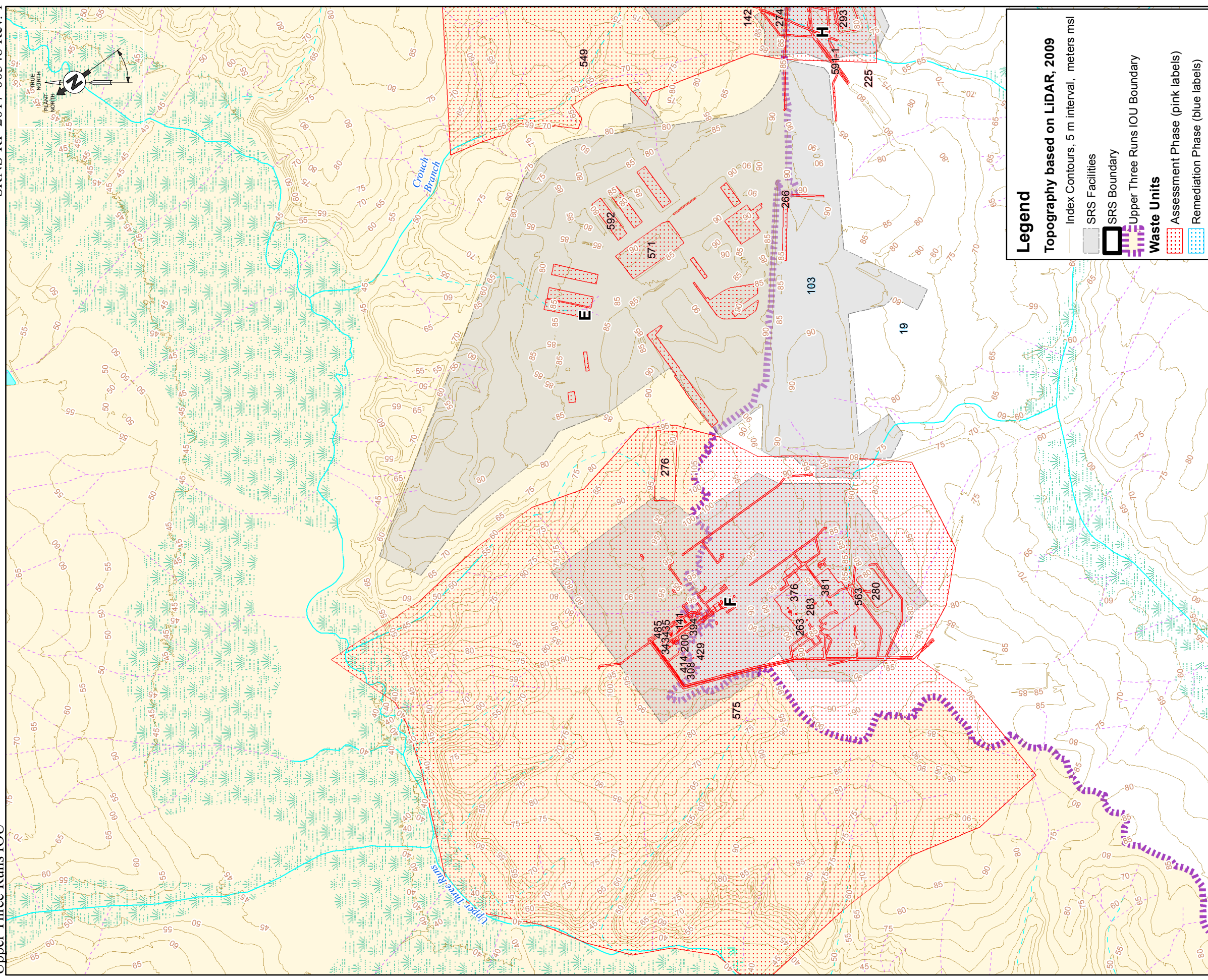
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Operable Units and Topography  
Associated with the UTR IOU - A/M Areas

DATE	APPROVED BY	DATE
06/19/18	Susan Blas	06/19/18
	Natalie Lopez	

Figure 1-~~3e~~4b. **Operable Units and Topography Associated with the UTR IOU – F  
Area, and E Area, and G Area Unit GSA Western Groundwater OU**



Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
Zone: 17

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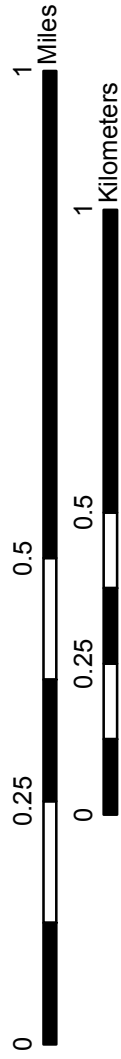
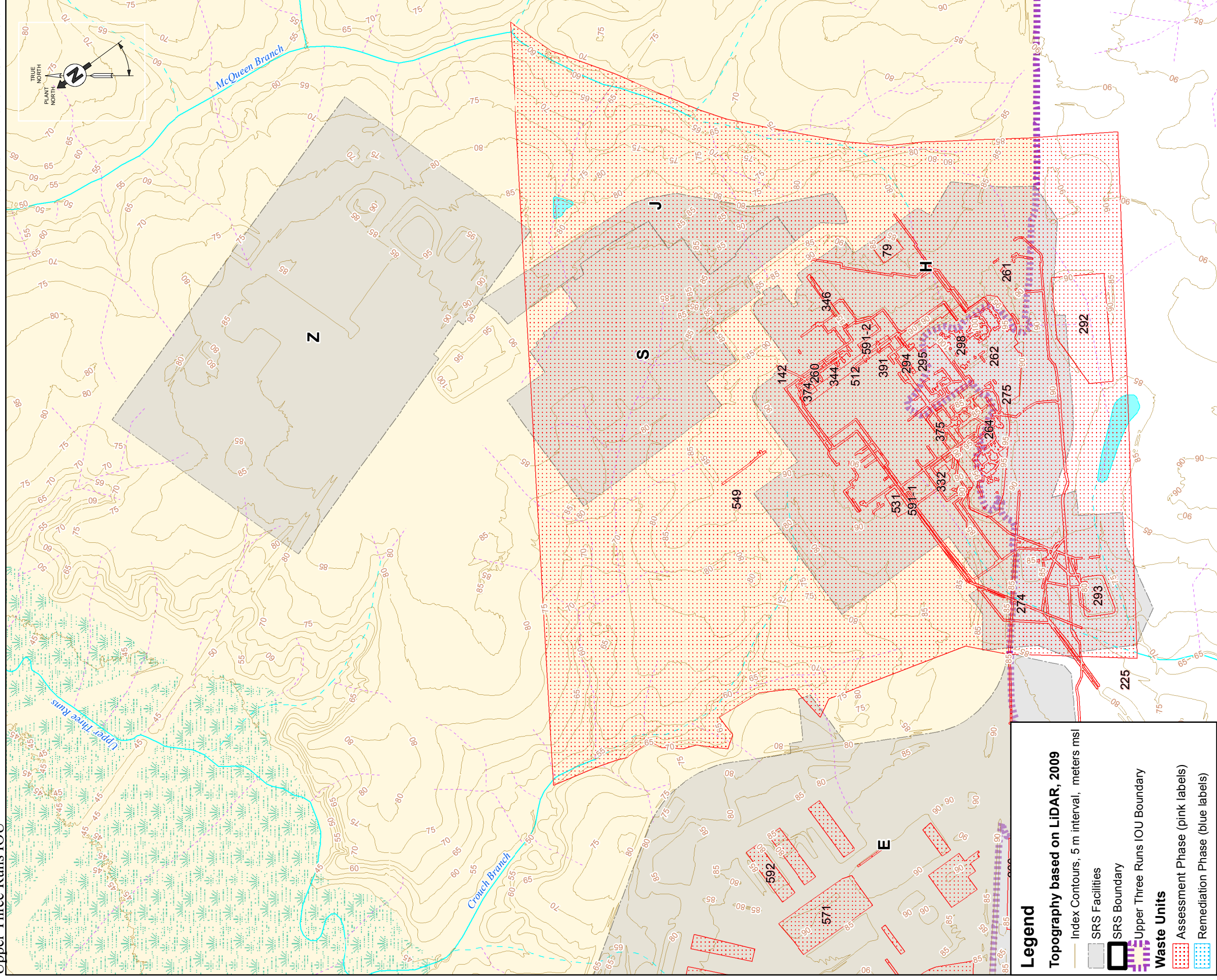
**Figure 1-4b: Operable Units and Topography Associated with the UTR IOU - F Area, E Area, and G Area Unit GSA Western Groundwater OU**

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Aiken, South Carolina



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UTR/IOU/F/G1_SBG/IS/2018	REV: 05/22/18
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Operable Units and Topography Associated with the UTR IOU - F and E Areas	
DATE: 05/22/18	APPROVED BY: Susan Blas
DATE: 05/22/18	BY: Natalie Lopez

Figure 1-~~3d~~4c. Operable Units and Topography Associated with the UTR IOU – H,  
S, and Z Areas



Projection: Universal Transverse Mercator  
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Figure 1-4c: Operable Units and Topography Associated with the UTR IOU - H, S and Z Areas

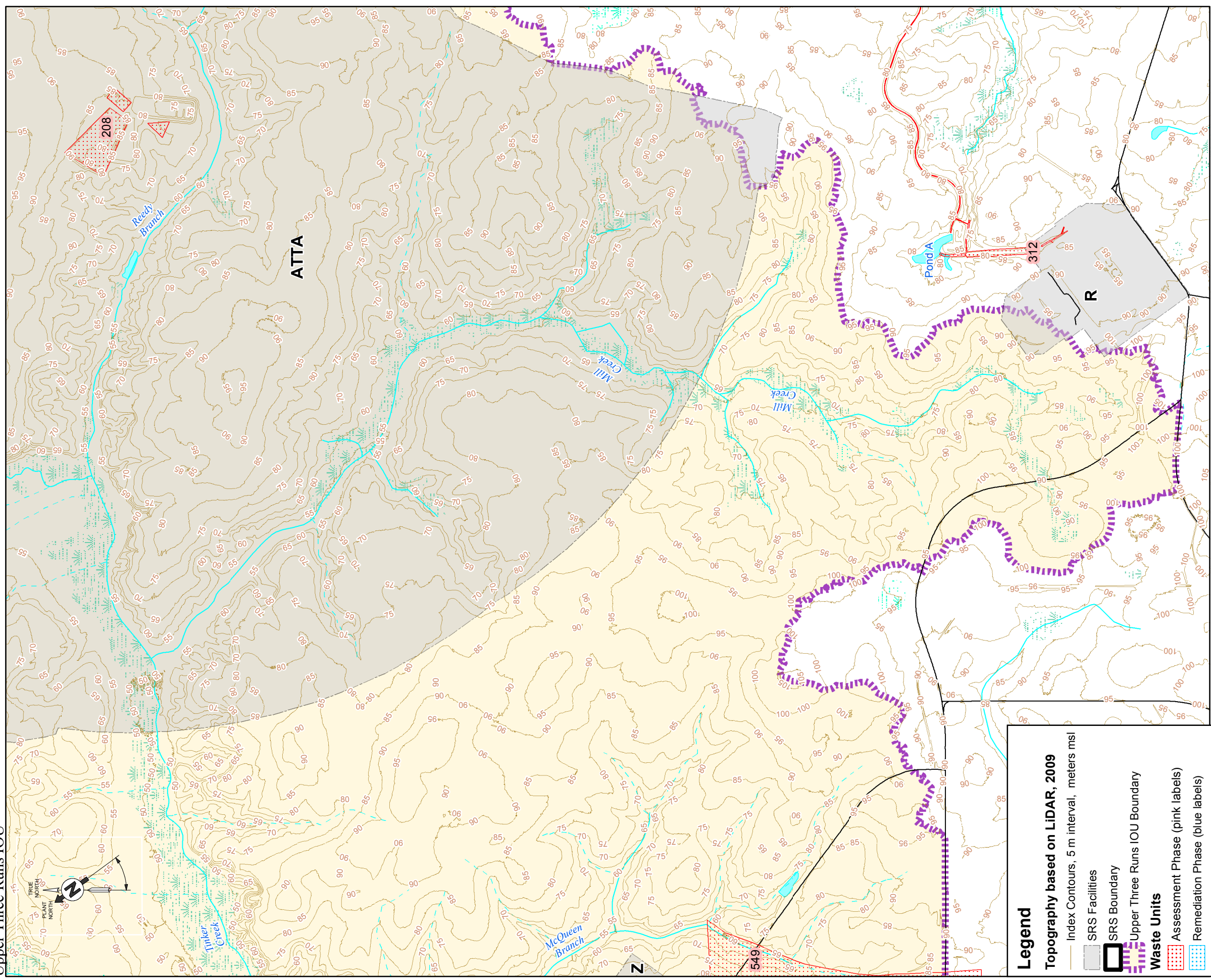
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UTR/IOU/FIG1_S-CIS/2018	REV: 05/22/18
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Operable Units and Topography Associated with the UTR IOU - H, S and Z Areas	
DATE: 05/22/18	APPROVED BY: Susan Blas
DATE: 05/22/18	BY: Natalie Lopez

**Figure 1-4d. Operable Units and Topography Associated with the UTR IOU – R Area and G Area Unit ATTA**

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**Legend**

**Topography based on LIDAR, 2009**

- Index Contours, 5 m interval, meters msl
- SRS Facilities
- SRS Boundary
- Upper Three Runs IOU Boundary

**Waste Units**

- Assessment Phase (pink labels)
- Remediation Phase (blue labels)



Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
Zone: 17

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Figure 1-4d: Operable Units and Topography Associated with the UTR IOU - R Area and G Area Unit ATTA

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Operable Units and Topography Associated with the UTR IOU - R and G Areas	
PREPARED BY: Natalie Lopez	DATE: 05/22/18
APPROVED BY: Susan Blas	DATE: 05/22/18

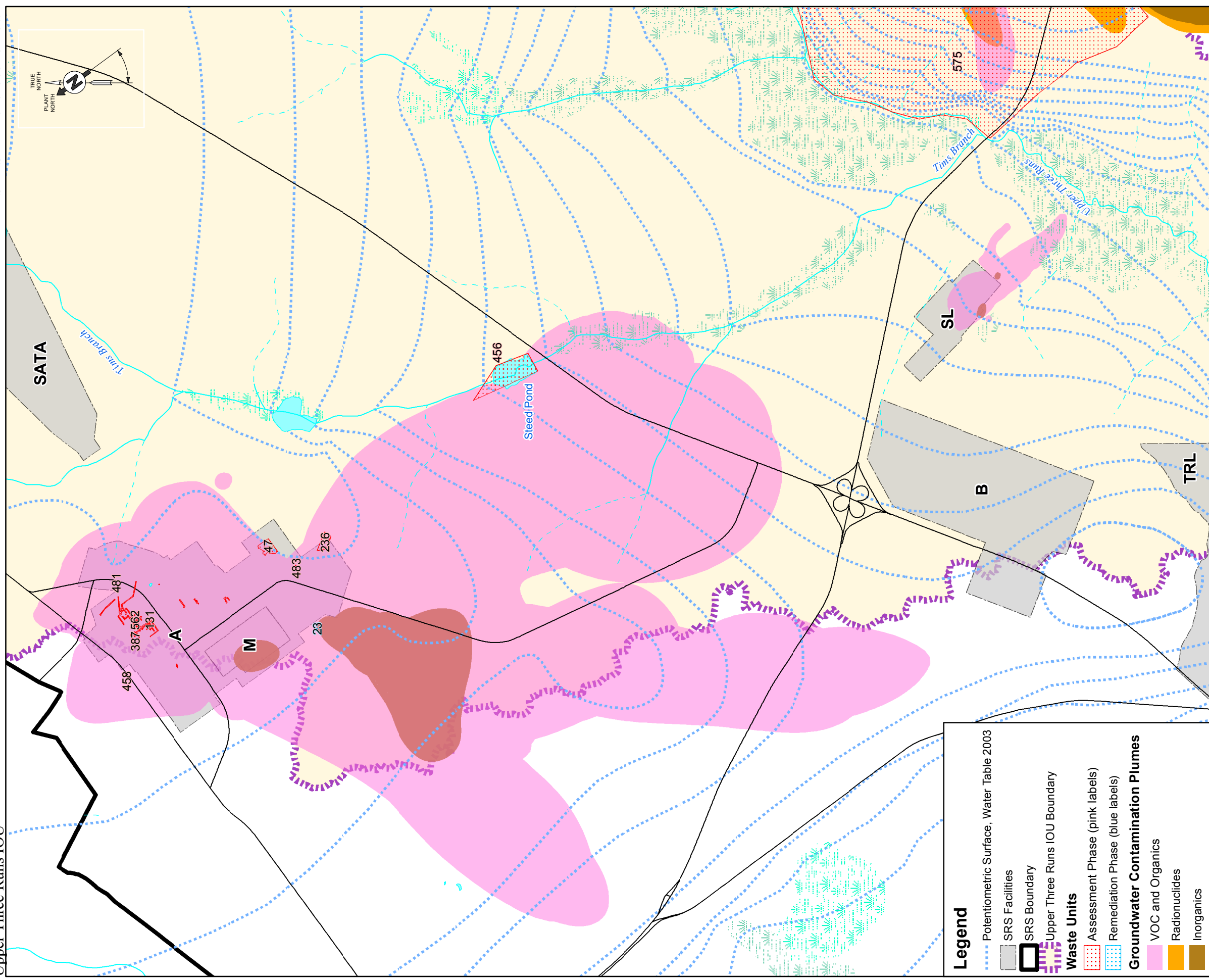
~~Figure 1-3e. Operable Units and Topography Associated with the UTR IOU R Area~~

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~~Figure 1-3f. Operable Units and Topography Associated with the UTR IOU - G Area~~

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**Figure 1-45a. Operable Units, Potentiometric Contours, and Groundwater Plumes  
Associated with the UTR IOU – A/M Area, ~~and B Area,~~ and G Area Unit  
Steed Pond**



**Legend**

- Potentiometric Surface, Water Table 2003
- SRS Facilities
- SRS Boundary
- Upper Three Runs IOU Boundary

**Waste Units**

- Assessment Phase (pink labels)
- Remediation Phase (blue labels)

**Groundwater Contamination Plumes**

- VOC and Organics
- Radionuclides
- Inorganics



Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
Zone: 17  
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Figure 1-5a: Operable Units, Potentiometric Contours and Groundwater Plumes Associated with the UTR IOU - A/M Area, B Area, and G Area Unit Steed Pond

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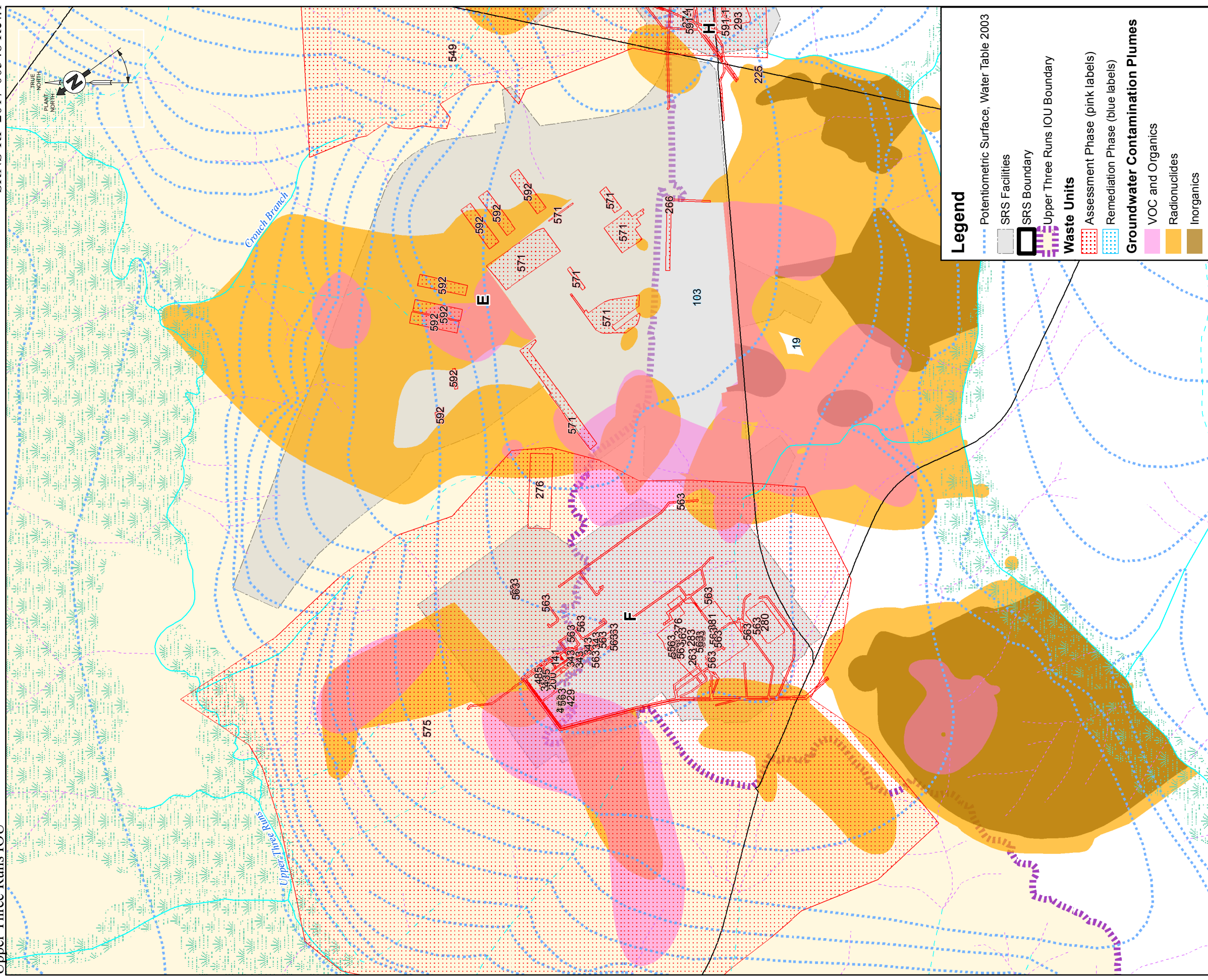


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UTR IOU FIG 1-5a	6/19/18
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Susan Blas	06/19/18
Operable Units, Potentiometric Contours and Groundwater Plumes Associated with the UTR IOU - A/M and B Areas	

~~Figure 1-4b. Operable Units, Potentiometric Contours, and Groundwater Plumes  
Associated with the UTR IOU - B Area~~

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**Figure 1-45~~eb~~.**      **Operable Units, Potentiometric Contours, and Groundwater Plumes  
Associated with the UTR IOU – F Area, ~~and E Area~~, and G Area Unit GSA  
Western Groundwater OU**



Projection: Universal Transverse Mercator  
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Figure 1-5b: Operable Units, Potentiometric Contours and Groundwater Plumes Associated with the UTR IOU - F Area, E Area, and G Area Unit GSA Western Groundwater OU

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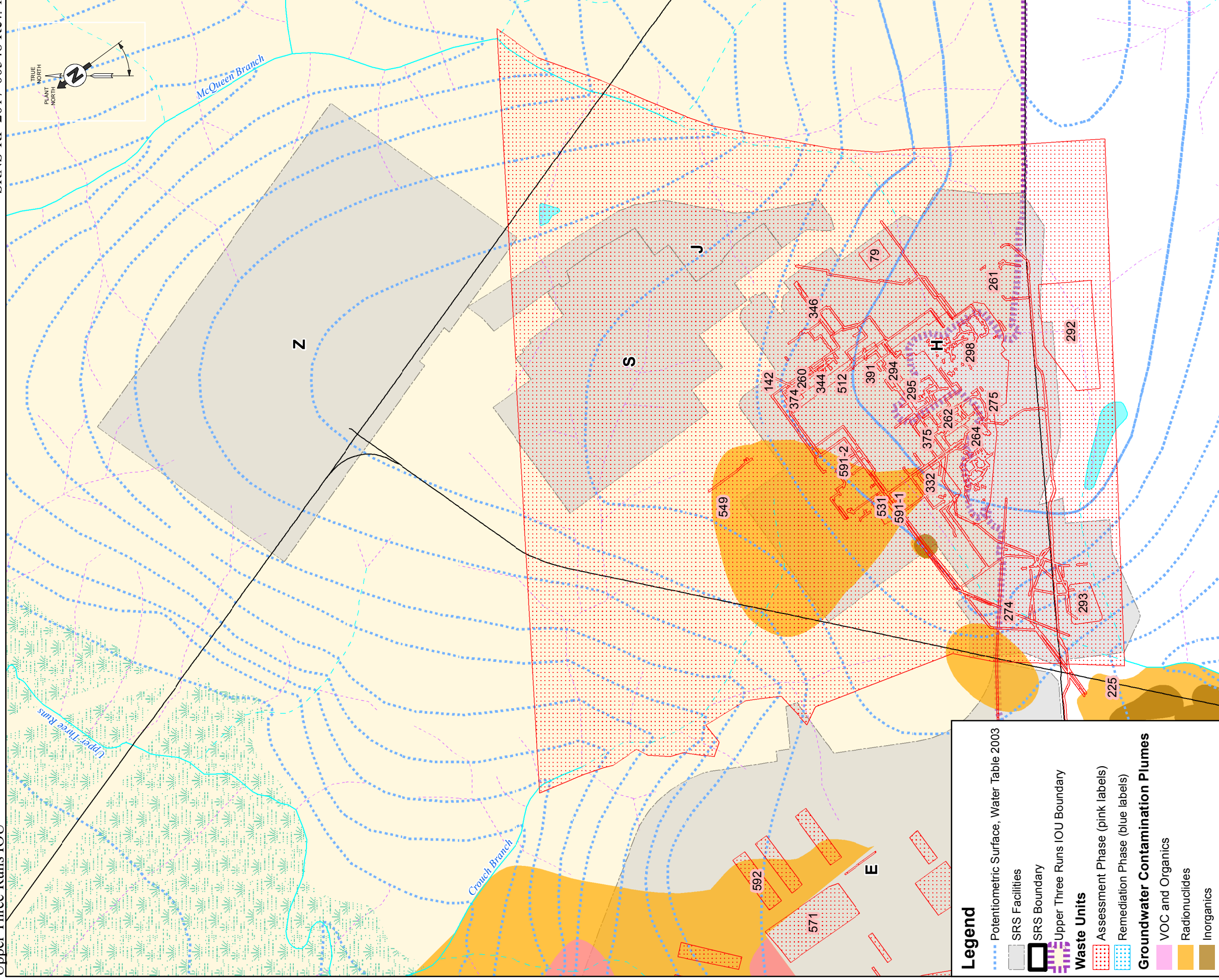


**Legend**

- Potentiometric Surface, Water Table 2003
- SRS Facilities
- SRS Boundary
- Upper Three Runs IOU Boundary
- Waste Units**
- Assessment Phase (pink labels)
- Remediation Phase (blue labels)
- Groundwater Contamination Plumes**
- VOC and Organics
- Radionuclides
- Inorganics

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Operable Units, Potentiometric Contours and Groundwater Plumes Associated with the UTR IOU - F and E Areas	
DATE: 06/19/18	APPROVED BY: Susan Blas
DATE: 06/19/18	BY: 06/19/18

**Figure 1-45**cd. **Operable Units, Potentiometric Contours, and Groundwater Plumes  
Associated with the UTR IOU – H, S, and Z Areas**



**Legend**

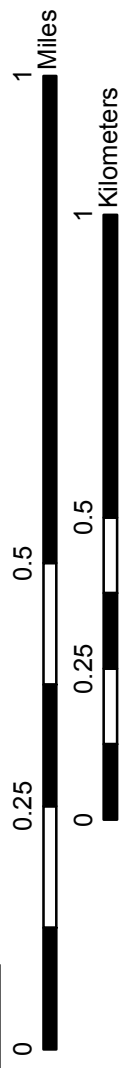
- - - Potentiometric Surface, Water Table 2003
- SRS Facilities
- SRS Boundary
- Upper Three Runs IOU Boundary

**Waste Units**

- Assessment Phase (pink labels)
- Remediation Phase (blue labels)

**Groundwater Contamination Plumes**

- VOC and Organics
- Radionuclides
- Inorganics



Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
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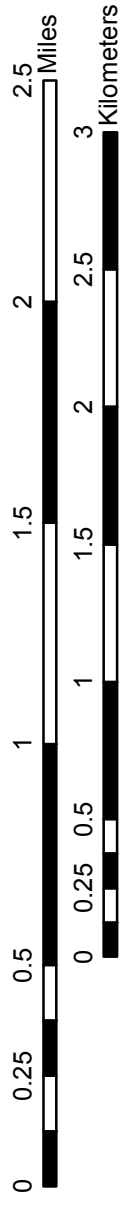
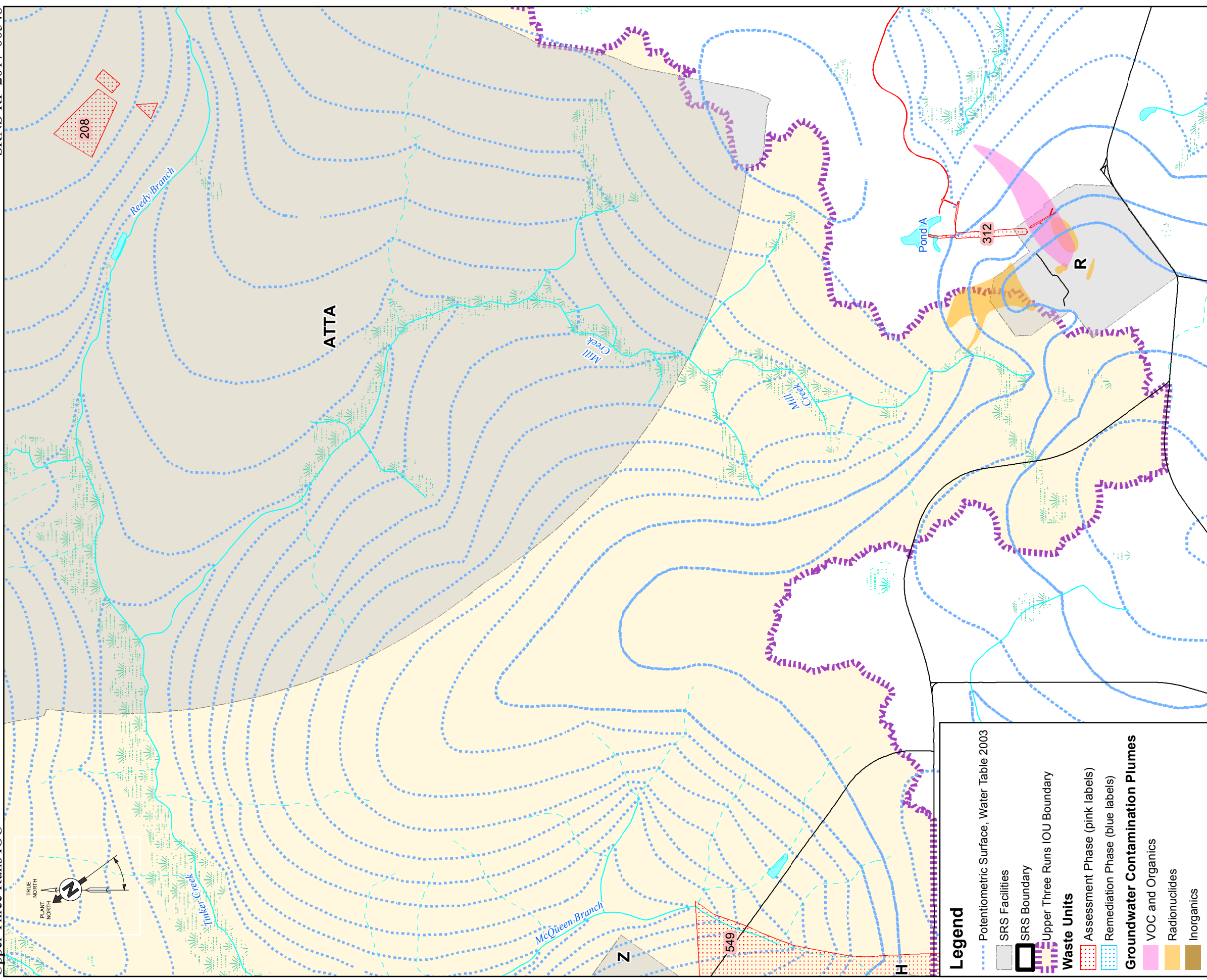
Figure 1-5c: Operable Units, Potentiometric Contours, and Groundwater Plumes Associated with the UTR IOU - H, S and Z Areas

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Aiken, South Carolina



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UTR IOU FIG 1-5c	6-c-GIS2018
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Susan Blas	05/22/18
Operable Units, Potentiometric Contours and Groundwater Plumes Associated with the UTR IOU - H, S and Z Areas	

**Figure 1-4e**5d. **Operable Units, Potentiometric Contours, and Groundwater Plumes  
Associated with the UTR IOU – R Area and G Area Unit ATTA**



Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
Zone: 17

To place on the North American Datum 1983, move the projection line 13 meters south and 15 meters west.

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Figure 1-5d: Operable Units, Potentiometric Contours and Groundwater Plumes Associated with the UTR IOU - R Area and G Area Unit ATTA

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Operable Units, Potentiometric Contours and Groundwater Plumes Associated with the UTR IOU - R and G Areas	
DATE: 06/19/18	APPROVED BY: Susan Blas
DATE: 06/19/18	BY: 06/19/18

~~Figure 1-4f. Operable Units, Potentiometric Contours, and Groundwater Plumes  
Associated with the UTR IOU - G Area~~

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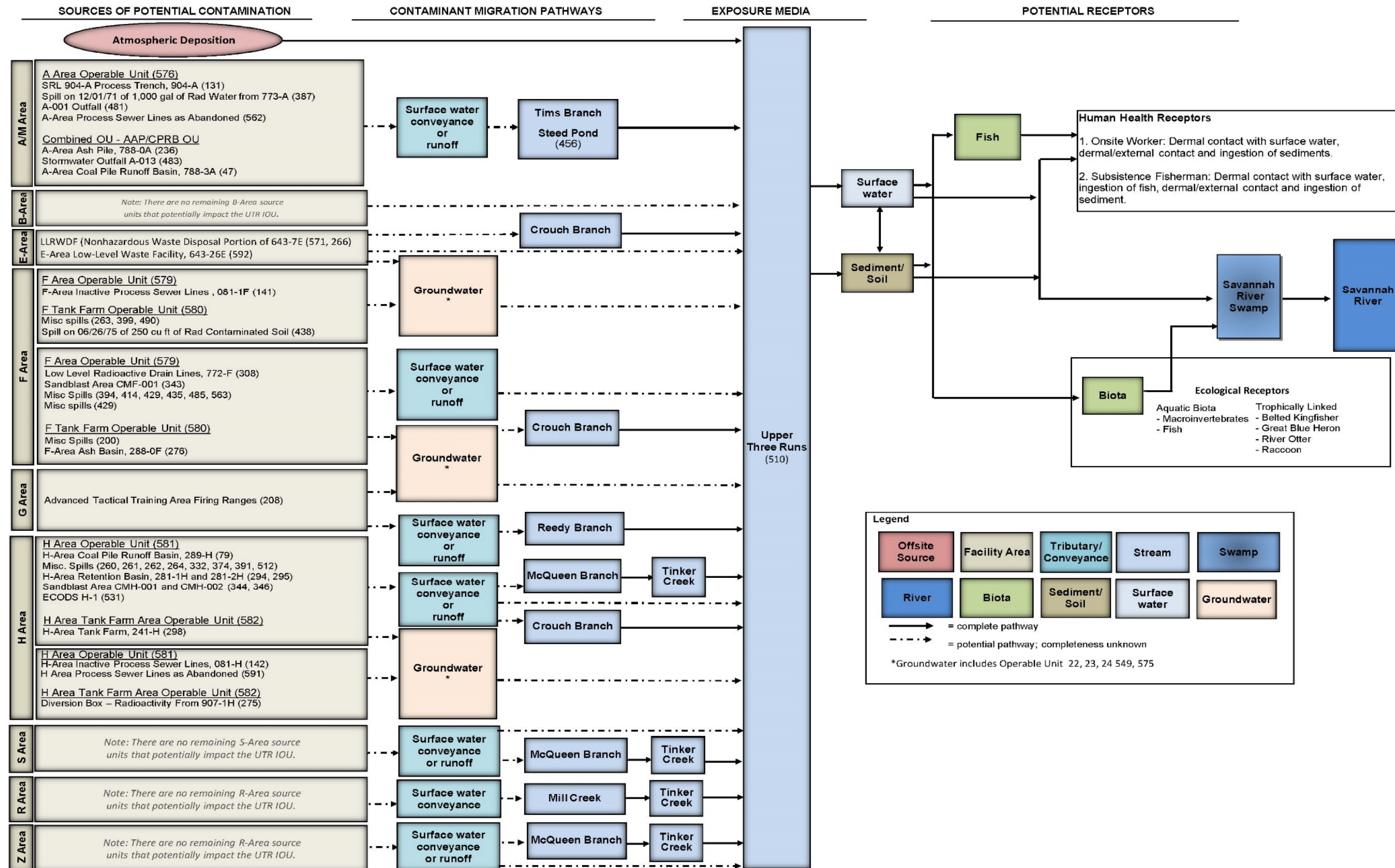


Figure 1-56. Upper Three Runs IOU Conceptual Site Model

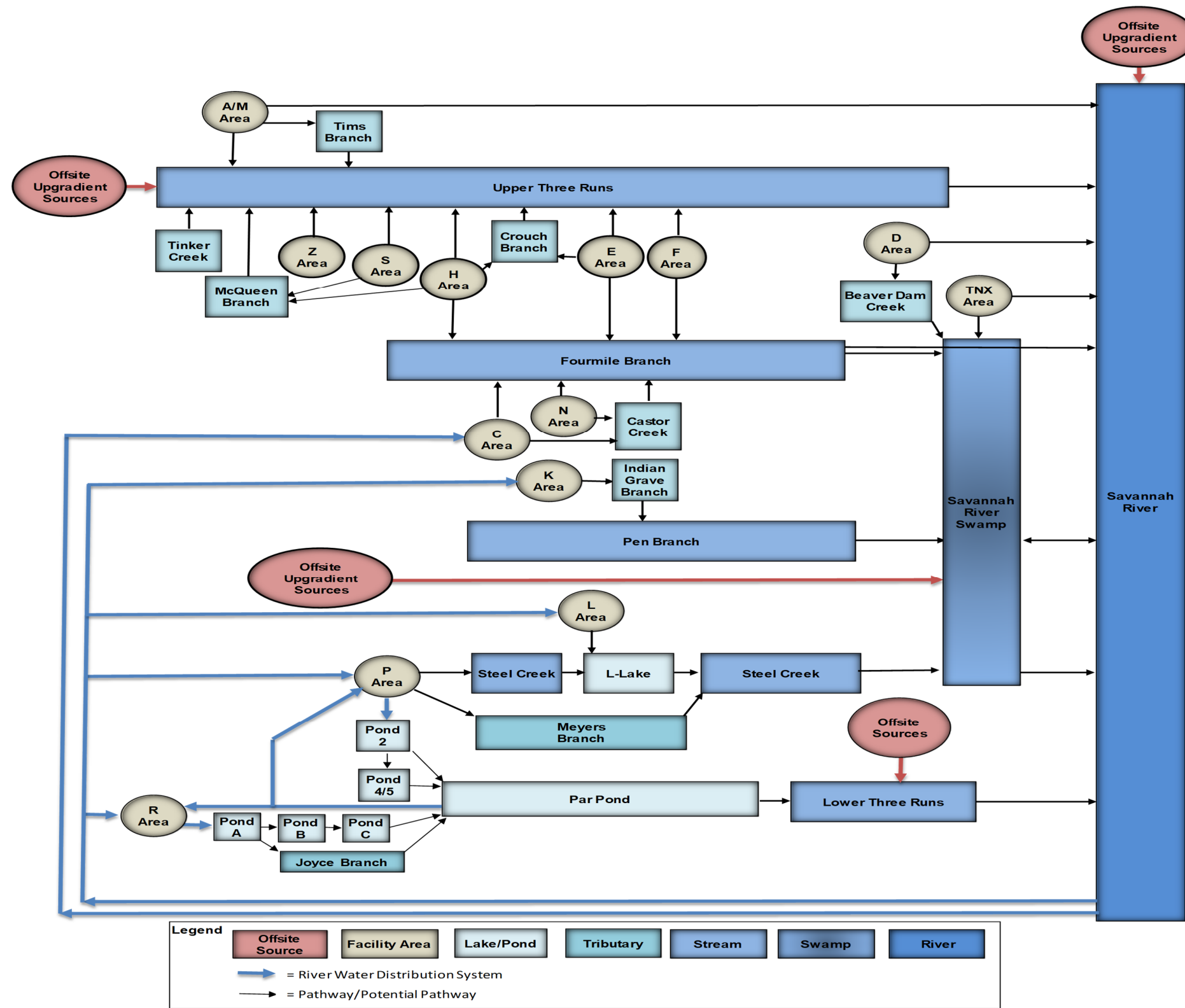


Figure 1-67. SRS-Wide Conceptual Site Model

Table 1-1. Operable Units Associated with the Upper Three Runs IOU (Continued)

Area	Unit ID	Potential SW and GW Transport Pathway <sup>1</sup>	Unit Name	Potential Impact to GW <sup>2</sup>	Potential Impact to SW <sup>2</sup>	Contaminated Media	Unit Status <sup>3</sup>
B	527	GW to UTR SW to UTR	ECODS B-2 (South of B Area)	No	No	Soil	Unit complete. NFA approved by SCDHEC Oct 2005.
B	528	GW to UTR SW to UTR	ECODS B-3 (East of B Area, South of Road C)	No	No	Soil	Part of BAOU (593). NTCR action conducted. Removal Action Report approved by USEPA and SCDHEC June 2011 (SRNS-RP-2011-00210). LUCIP (SRNS-RP-2013-00113) for unrestricted use.
B	529	GW to UTR SW to UTR	ECODS B-4 (East of B Area, South of Road C)	No	No	Soil	Unit complete. NFA approved by USEPA Aug 2005 and SCDHEC Oct 2003
B	530	GW to UTR SW to UTR	ECODS B-5 (Adjacent to ECODS B-3)	No	No	Soil	Part of BAOU (593). NTCR action conducted. Removal Action Report approved by USEPA and SCDHEC June 2011 (SRNS-RP-2011-00210). LUCIP (SRNS-RP-2013-00113) for unrestricted use.
B	590	GW to UTR SW to UTR	B-Area Disposal Trench, NBN	No	No	Soil	Unit complete. NFA approved by SCDHEC Oct 2006.
E	16	GW to UTR/FMB SW to UTR	Mixed Waste Management Facility (including the RCRA Regulated Portions of Low-Level Radioactive Waste Disposal Facility (LLRWDF) 643-7E), 643-28E	No	No	Soil	Closed under RCRA. Corrective Action Remediation and monitoring continuing and cap maintenance. GW addressed under RCRA Part B Permit.
E	20	GW to UTR/FMB SW to UTR	LLRWDF ( <del>non-hazardous waste disposal portion of 643-7E</del> RCRA Regulated Portions), 643-7E	No	No	Soil	Closed under RCRA. Corrective Action Remediation and monitoring continuing and cap maintenance. GW addressed under RCRA Part B Permit.
E	523	GW to UTR/FMB SW to UTR	ECODS F-1 (Southeast of F-Area Ash Basin, 276-0F)	No	No	Soil	Unit complete. NFA approved by SCDHEC July 2003.
E	524	GW to UTR SW UTR	ECODS F-3 (East of ECODS F-1)	No	No	Soil	Unit complete. NFA approved by SCDHEC July 2003
E	571, 266	GW to UTR/FMB SW to UTR	LLRWDF ( <del>RCRA Regulated Portion</del> non-hazardous waste disposal portion of 643-7E) (including Combined Spills from 643-G as reported in WSRC-RP-97-419)	<del>No</del> Yes	<del>No</del> Yes	Soil	<del>Closed under RCRA. Corrective Action Remediation and monitoring continuing and cap maintenance. GW addressed under RCRA Part B Permit. ROD Issuance March 2063, RA Start December 2063</del>
<u>E</u>	<u>592</u>	<u>GW to UTR</u> <u>SW to UTR</u>	<u>E-Area Low Level Waste Facility, 643-26E</u>	<u>Yes</u>	<u>Yes</u>	<u>Soil</u>	<u>ROD Issuance March 2063, RA Start December 2063</u>
F	2	GW to UTR SW to UTR	F-Area Acid/Caustic Basin, 904-74G	No	No	Soil	Closed under RCRA closure plan for F-, H-, K-, and P-Area Acid/Caustic Basins June 1995. GW is part of the General Separations Area (GSA) Western GW OU (575). Scoping Summary for the GSA Western GW Operable Unit, ERD-EN-2005-0127, revised Oct 2016
F	5	GW to FM/UTR SW FMB	F-Area HWMF (F-Area Seepage Basin, 904-43G)	No	No	Soil	Unit complete. ROD for F-Area HWMF Sept 1993. GW is part of the GSA Western Groundwater OU (575). Scoping Summary for the GSA Western GW Operable Unit, ERD-EN-2005-0127, revised Oct 2016
F	30	GW to UTR SW to UTR	Burma Road Rubble Pit, 231-4F	No	No	Soil	No remedial action required for this unit (ESD to the Rev 1 ROD, WSRC-RP-98-4170). GW from upgradient sources is part of the GSA Western GW OU (575). Scoping Summary for the GSA Western GW Operable Unit, ERD-EN-2005-0127, revised Oct 2016
F	34	GW to UTR SW to UTR	F-Area Burning/Rubble Pits, 231-1F	No	No	Groundwater	Unit complete. ROD for F-Area Burning/Rubble Pits (231-F, -1F, and -2F) April 1997. GW addressed under GSA Western GW OU (575). Scoping Summary for the GSA Western GW Operable Unit, ERD-EN-2005-0127, revised Oct 2016
F	35	GW to UTR SW to UTR	F-Area Burning/Rubble Pits, 231-2F	No	No	Soil	Unit complete. ROD for F-Area Burning/Rubble Pits (231-F, -1F, and -2F) April 1997. GW addressed under GSA Western GW OU (575). Scoping Summary for the GSA Western GW Operable Unit, ERD-EN-2005-0127, revised Oct 2016
F	36	GW to UTR SW to UTR	F-Area Burning/Rubble Pits, 231-F	No	No	Soil	Unit complete. ROD for F-Area Burning/Rubble Pits (231-F, -1F, and -2F) April 1997. GW addressed under GSA Western GW OU (575). Scoping Summary for the GSA Western GW Operable Unit, ERD-EN-2005-0127, revised Oct 2016

Table 1-1. Operable Units Associated with the Upper Three Runs IOU (Continued)

Area	Unit ID	Potential SW and GW Transport Pathway <sup>1</sup>	Unit Name	Potential Impact to GW <sup>2</sup>	Potential Impact to SW <sup>2</sup>	Contaminated Media	Unit Status <sup>3</sup>
H	6	GW to UTR SW to UTR	H-Area Acid/Caustic Basin, 904-75G	No	No	Soil	Unit complete. Closed under RCRA closure plan for F-, H-, K-, and P-Area Acid/Caustic Basins June 1995.
H	79	GW to UTR SW to UTR	H-Area Coal Pile Runoff Basin, 289-H	Yes	Yes	Soil	Part of H-Area Operable Unit (HAOU) (581). FFA start date, Sept 2037
H	142	GW to UTR SW UTR	H-Area Inactive Process Sewer Lines from building to the Security Fence, 081-H	Yes	No	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	166	GW to UTR SW to UTR	H-Area Burning Pit, NBN	No	No	Soil	Unit complete. NFA approved by USEPA June 1995 and SCDHEC May 1994
H	260	GW to UTR SW to UTR	Combined Spills from 211-H, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	261	GW to UTR/FMB SW UTR	Combined Spills from 241-84H, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	262	GW to UTR/FMB SW to UTR/FMB	Combined Spills from 241-H, NBN	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, August 2039
H	264	GW to UTR SW to UTR/FMB	Combined Spills from 242-H, NBN	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, August 2039
H	275	GW to UTR SW FMB	Diversion Box – Radioactivity From 907-1H, NBN	Yes	No	Soil	Part of H Tank Farm AOU (582). FFA start date, August 2039 <del>5</del>
H	294	GW to UTR SW to UTR	H-Area Retention Basin, 281-1H	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	295	GW to UTR SW to UTR	H-Area Retention Basin, 281-2H	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	298	GW to UTR/FMB SW to UTR/FMB	H-Area Tank Farm, 241-H	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, August 2039
H	332	GW to UTR SW to UTR	Spill on 10/07/85 of 20,000 gallons of Contaminated Water from 244-H, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	344	GW to UTR SW to UTR	Sandblast Area CMH-001, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	345	GW to UTR SW to FMB	Sandblast Area CMH-003, NBN	No	No	Soil	Unit complete. NFA approved by USEPA Feb 2006 and SCDHEC Dec 2006
H	346	GW to UTR SW to UTR	Sandblast Area CMH-002, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	357	GW to UTR SW to UTR	Sandblast Area CMS-001, NBN	No	No	Soil	Unit complete. NFA approved by SCDHEC Jan 2001
H	360	GW to UTR SW to UTR	Spill of <1/2 lb Mercury in Bldg. 232-H, NBN	No	No	Soil	Unit complete. NFA approved by USEPA and SCDHEC April 2001
H	364	GW to UTR SW to UTR	Spill on 01/01/78 of 600 lb of 50% Sodium Hydroxide, NBN	No	No	Soil	Unit complete. NFA approved by USEPA Dec 1999 and SCDHEC Oct 1999
H	374	GW to UTR SW to UTR	Spill on 01/12/87 of <100 gm of Mercury North of 211-H, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	375	GW to UTR SW to UTR	Spill on 01/19/80 of Unknown of Chromated Water from H-Area Pump House, NBN	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, Aug 2039
H	383*	GW to UTR SW to UTR	Spill on 11/10/81 of 500 gal of Chromated Water from 243-H, NBN	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, Aug 2039.
H	391	GW to UTR SW to UTR	Spill on 02/01/83 of 50 gal of Oil - RAD, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037

Table 1-1. Operable Units Associated with the Upper Three Runs IOU (Continued)

Area	Unit ID	Potential SW and GW Transport Pathway <sup>1</sup>	Unit Name	Potential Impact to GW <sup>2</sup>	Potential Impact to SW <sup>2</sup>	Contaminated Media	Unit Status <sup>3</sup>
H	403	GW to UTR SW to UTR	Spill on 03/28/87 of <15,000 gal of Chromated Water from 241-24H, NBN	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, Aug 2039
H	412*	GW to UTR SW to UTR	Spill on 04/18/80 of Unknown of Chromated Water from Valve House 3, NBN	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, Aug 2039
H	423*	GW to UTR SW to UTR	Spill on 05/02/85 of 10 gal of Cooling Water from Tank Farm, NBN	Yes	Yes	Soil	Part of H Tank Farm AOU (582). FFA start date, Aug 2039
H	433	GW to UTR SW to UTR	Spill on 05/04/87 of 30 gal of Caustic from 295-H, NBN	No	No	Soil	Unit complete. NFA approved by US Jan 1999 and SCDHEC Dec 1998
H	512	GW to UTR SW to UTR	Combined Spills From 221-H, NBN	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	531	GW to UTR SW to UTR	ECODS H-1 (West of main H-Area facilities)	Yes	Yes	Soil	Part of HAOU (581). FFA start date, Sept 2037
H	549	GW to UTR/FMB SW to UTR/FMB	GSA Eastern GW OU (NBN)	Yes	Yes	GW	Under a GW monitoring program. Scoping summary WSRC-RP-2000-4134 revised Sept 2015
H	591	GW to UTR/FMB SW to UTR/FMB	H-Area Process Sewer Lines as Abandoned	Yes	No	Soil	Part of HAOU (581) Waste Units 554 and 564 are retired numbers. These units are now addressed as Waste Unit number 591. FFA start date Sept 2037.
R	119	GW to UTR SW to LTR	R-Area Reactor Seepage Basins, 904-103G	No	No	Soil	ROD (WSRC-RP-2003-4093, Rev. 1) October 2003. Approved Remedial Action Implementation Plan (RAIP) (WSRC-RP-2004-4006, Rev.1.1) 2004. GW addressed by the R-Area Reactor Seepage Basins/108-4R Overflow Basin OU GW Mixing Zone Application, Nov 2004. Mixing zone sampling summary report for 2015 submitted May 2016.
R	120	GW to UTR SW LTR	R-Area Reactor Seepage Basins, 904-104G	No	No	Soil	ROD (WSRC-RP-2003-4093, Rev. 1) October 2003. Approved RAIP (WSRC-RP-2004-4006, Rev.1.1) 2004. GW addressed by the R-Area Reactor Seepage Basins/108-4R Overflow Basin OU GW Mixing Zone Application, Nov 2004. Mixing zone sampling summary report for 2015 submitted May 2016.
R	121	GW UTR SW LTR	R-Area Reactor Seepage Basins, 904-57G	No	No	Soil	ROD (WSRC-RP-2003-4093, Rev. 1) October 2003. Approved RAIP (WSRC-RP-2004-4006, Rev.1.1) 2004. GW addressed by the R-Area Reactor Seepage Basins/108-4R Overflow Basin OU GW Mixing Zone Application, Nov 2004. Mixing zone sampling summary report for 2015 submitted May 2016.
R	122	GW to UTR SW UTR	R-Area Reactor Seepage Basins, 904-58G	No	No	Soil	ROD (WSRC-RP-2003-4093, Rev. 1) October 2003. Approved RAIP (WSRC-RP-2004-4006, Rev.1.1) 2004. GW addressed by the R-Area Reactor Seepage Basins/108-4R Overflow Basin OU GW Mixing Zone Application, Nov 2004. Mixing zone sampling summary report for 2015 submitted May 2016.
R	123	GW to UTR SW UTR/LTR	R-Area Reactor Seepage Basins, 904-59G	No	No	Soil	ROD (WSRC-RP-2003-4093, Rev. 1) October 2003. Approved RAIP (WSRC-RP-2004-4006, Rev.1.1) 2004. GW addressed by the R-Area Reactor Seepage Basins/108-4R Overflow Basin OU GW Mixing Zone Application, Nov 2004. Mixing zone sampling summary report for 2015 submitted May 2016.
R	124	GW to UTR SW LTR	R-Area Reactor Seepage Basins, 904-60G	No	No	Soil	ROD (WSRC-RP-2003-4093, Rev. 1) October 2003. Approved RAIP (WSRC-RP-2004-4006, Rev.1.1) 2004. GW addressed by the R-Area Reactor Seepage Basins/108-4R Overflow Basin OU GW Mixing Zone Application, Nov 2004. Mixing zone sampling summary report for 2015 submitted May 2016.
R	179	GW to UTR SW LTR	R-Area Rubble Pits 131-2R	No	No	Soil	Unit complete. NFA approved by USEPA Jun 1995 and SCDHEC Feb 1995
R	288	GW to UTR/LTR SW LTR	R-Area GW, NBN	Yes	No	GW	Part of RAOU (588), Effectiveness Monitoring report submitted annually; 2016 monitoring report submitted June 2017 (SRNS-RP-2017-00232)
R	556	GW to LTR/UTR SW to LTR/UTR	R-Area Process Sewer Lines As Abandoned, NBN	No	No	Soil	Unit complete. Part of RAOU (588). LUCIP (SRNS-RP-2010-01208) approved by SCDHEC and USEPA March 2011 Post Construction Report for RAOU approved by USEPA Aug 2012 and SCDHEC April 2012.

Table 1-1. Operable Units Associated with the Upper Three Runs IOU (Continued/End)

Area	Unit ID	Potential SW and GW Transport Pathway <sup>1</sup>	Unit Name	Potential Impact to GW <sup>2</sup>	Potential Impact to SW <sup>2</sup>	Contaminated Media	Unit Status <sup>3</sup>
S	161	GW to UTR SW UTR	Defense Waste Processing Facility (DWPF) Concrete Batch Plant, NBN	No	No	Soil	Unit complete. NFA approved by SCDHEC July 1993
S	339	GW to UTR SW UTR	S-Area Erosion Control Site, NBN	No	No	Soil	Unit complete. NFA approved by SCHEC May 2003
S	393	GW to UTR SW UTR	Spill on 02/20/85 of 1 1/2 qt of Acid mixture from S-Area Trailer S-16, NBN	No	No	Soil	Unit complete. NFA approved by USEPA Jan 1999 and SCDHEC Dec 1998
S	425	GW to UTR SW UTR	Spill on 05/21/85 of 20 gal of Acid from S-Area, NBN	No	No	Soil	Unit complete. NFA approved by USEPA Jan 1999 and SCDHEC Dec 1998

\*Unit does not have a georeferenced location and is not shown on accompanying figure (note 1 below).

<sup>1</sup> The potential GW and SW transport pathway determinations are based on the location of the unit within the respective watershed and associated topographic contours for SW (Figures 1-3a-4a through 1-3f4d) and potentiometric lines for GW (Figures 1-45a through 1-4f5d).

<sup>2</sup> The term "potential impact" is used to denote whether further evaluation may be required by the IOU program during Phase II monitoring and assessment. All potential sources will be reassessed as the UTR IOU approaches Phase III final action determinations.

<sup>3</sup> NFA approvals by SCDHEC only assumed USEPA approval after 120 days.

- CMIR = Corrective Measures Implementation Report
- CMI/RAIP = Corrective Measures Implementation/Remedial Action Implementation Plan
- FMB = Fourmile Branch IOU
- GW = Groundwater
- GSA = General Separations Area
- LUCIP = Land Use Controls Implementation Plan
- LTR = Lower Three Runs IOU
- NTCR action = Non-Time Critical Removal action
- N/A = Not Applicable (particle tracks are based on individual units, not Operable Units)
- SRFS = Savannah River and Floodplain Swamp IOU

no new fish data for UTR PR5. The sediment medium represents stream/pond sediments that generally remain inundated (covered) with SW. The sediment/soil medium represents wetland/floodplain sediment that may periodically dry. The sediment/soil medium is screened against both sediment and soil benchmarks for both HH and ecological receptors. The sediment, SW, and fish benchmark comparisons, when fish data are available, are used to support early action determinations and data needs determinations. The soil benchmark comparisons are used primarily to support the data needs identification.

Benchmark screening is conducted to:

- identify any discernable areas within the IOU warranting early action consideration,
- identify OUs for potential reprioritization, and
- identify areas in need of additional sampling or periodic monitoring.

The benchmark evaluations are based on the UTR PR5 dataset compiled by subunit, but are also supplemented by additional data from the IOU database if further scrutiny is required. For both the HH and ecological evaluations, the benchmark exceedance discussions are supplemented with statistical parameters associated with the magnitude and frequency of benchmark exceedances. A maximum hazard quotient (HQ) (maximum detected value/benchmark) and a mean HQ (mean detected value/benchmark) are calculated for each constituent per subunit and are used to determine if maximum and/or mean values are greater than the benchmark (i.e., maximum and/or mean HQ >1.0). The mean HQ is used to represent receptors that average their exposure within the IOU subunit. For Phase II IOU evaluations, the mean is calculated using only detected values to provide a more conservative approach to screening. Constituents with a low mean HQ (mean HQ <1.0), as grouped by subunit, do not warrant further evaluation. Similarly, constituents with a low frequency of exceedance (5% or less) do not require additional evaluation by the IOU program. For the frequency of exceedance determination, a minimum of 20 samples is required for assessment at the 5% level. The background data are also used to determine the importance of benchmark exceedances. If levels observed within the IOU are within background levels, this indicates contaminants within the IOU are not unit related, and that further investigation by the IOU is not warranted at this time.

The tables presenting the statistical parameters associated with each media-receptor combination are provided in Sections 2.1.2 and 2.1.3 for the HH and ecological screening, respectively. Benchmark exceedances are listed in Table 2-2 through 2-5. The exceedance tables include a “Bkgrd Date, Location” column that lists the background location and year the background data were collected to support the background screening criterion. The figures showing the sampling locations for constituents with benchmark exceedances are presented in Figures 2-2~~1~~ through 2-9. Several exceedances may be present at a single sampling location; therefore, the total number of exceedances may not be visible on the figures. The sample locations are color-coded to indicate the UTR subunit associated with each particular sample location.

### **2.1.1 Human Health and Ecological Benchmark Screening**

For the UTR IOU, benchmarks screening is conducted to evaluate potential contaminants in sediment, sediment/soil, SW, and fish media. The receptor activities and specific pathways selected for quantification are the same as those described in the *Remedial Investigation Work Plan for the UTR IOU* (WSRC 2002). Analytical data for each media (i.e., sediment, sediment/soil, SW, and fish) are combined by subunit, and evaluated based on established criteria as discussed below.

### **2.1.2 Human Health Benchmark Screening and Results**

For the UTR IOU HH evaluation, benchmark screening is conducted to evaluate potential contaminants in sediment, sediment/soil, SW, and fish media. The on-site worker benchmarks are used to screen sediment, sediment/soil, and SW data. The subsistence fisherman benchmarks are used to evaluate the fish medium when fish data are available. The HH benchmark values are used to identify constituent concentrations that result in a cancer risk  $>1 \times 10^{-4}$  or an HQ  $>3$  for Phase II evaluations. If a HH benchmark value is exceeded, the following criteria are considered to determine the significance of the exceedance(s):

1. exceedance frequency (number of exceedances/the number of samples x 100);
2. a mean-value consideration (detected mean value/benchmark is  $>1.0$ );

3. background data (mean detected value is greater than maximum background levels (or if background is indeterminate); and
4. receptor appropriateness.

If the frequency of exceedance is >5%, the mean HQ >1.0, and the mean detected value is greater than maximum background levels (or if background is indeterminate) for a constituent, further evaluation is required. The benchmarks used for the HH evaluation are provided in Appendix A.

### Sediment

Based on review of UTR PR5 data, there were benchmark exceedances for cesium-137 for the onsite worker for the Tinker Creek subunit (Table 2-2, Figure 2-1). The sediment benchmark for sediment for the onsite worker is 89.2 pCi/g. There were 5 exceedances out of 15 samples for the Tinker Creek subunit representing a frequency of exceedance >5%. The mean of detected values (4.87E+02 pCi/g) was above background (0.623 pCi/g), and the mean ratio (5.45) was >1.0. The exceedances for the Tinker Creek subunit require further evaluation since the mean ratio is >1.0, the frequency of exceedances is >5%, and the mean detected value is greater than background.

The five Tinker Creek exceedances revealed these data were collected in 2014 and 2015 and are associated with the Z-Area stormwater basin that receives stormwater from Z-Area saltstone processing and disposal facilities, and the Z-Area Z-01 Outfall. The basin is part of a monitoring program, and reported through the SRS annual environmental reports (NPDES General Permit for Storm Water Discharges Associated with Industrial Activities stormwater permit, SCR000000). Additionally, the basin and outfall area is posted as a soil contamination area. The cesium-137 data were associated with higher than average rainfall events in 2013 that caused the Z-Area stormwater basin to discharge through the Z-01 Outfall (SRNS 2014a). This basin does not normally discharge. The stormwater runoff accumulation in the Z-Area basin included low level radiological contamination from runoff associated with Saltstone Disposal Unit (SDU) 4. Since the releases, rainwater intrusion barriers have been implemented and rainwater flow paths engineered to prevent future low level contaminated runoff. In addition, contaminated soils associated with the SDU runoff have been removed. The discharge pipe and Z-01 Outfall were also grouted and closed, and a newly constructed Z-01 Outfall discharge structure is in place. The

basin was also expanded to accommodate a 100-year storm event that eliminates the potential for future releases from the basin. Details associated with the basin releases, follow-up sampling, and actions taken to mitigate the unplanned releases are detailed in the Z-01 Outfall Data Report (SRNS 2015) and 2012 Z-Area Special Environmental Monitoring Results report (SRNS 2012a).

The exceedances associated with the Z-Area basin and Z-01 Outfall show the sediment sample locations further downgradient of the basin did not exceed the onsite worker benchmark for cesium-137. The 2015 sampling effort followed the extent of contamination (SRNS 2015). The Z-01 Outfall continues to be part of the radiological administrative control buffer area to protect site workers from inadvertent exposure to contaminated sediments. Since these exceedances are associated with an existing monitoring and reporting program, further evaluation by the IOU program is not warranted. Additionally, the SREL conducted sampling to assess the potential impact of the discharges from the basin and found little evidence of impacts to McQueen Branch attributable to the Z-Area basin discharges in their sediment sample analyses or macroinvertebrate assessment (SREL 2015). The abstract of this investigation is provided in Appendix B (as SREL 2015). Since these exceedances are associated with an existing monitoring and reporting program, further evaluation by the IOU program is not warranted.

#### Sediment/Soil (Sediment)

Review sediment/soil data for UTR PR5 revealed exceedances for the onsite worker for cesium-137 (benchmark = 89.2 pCi/g) for the Tinker Creek subunit (Table 2-2, Figure 2-2). The exceedances have a frequency of exceedance >5% (40.0%) and mean detected level (1.11E+02) greater than background (0.623 pCi/g) for cesium-137. The Tinker Creek subunit also had a mean ratio >1.0 (6.21) thus requiring further evaluation.

As with the sediment cesium-137 exceedances, further evaluation of the Tinker Creek sediment/soil exceedances show these data are associated with the Z-Area stormwater basin, Z-01 Outfall, that ultimately leads to McQueen Branch. These data are from a 2015 sampling effort and represent cesium-137 activities that range from a high of 760 pCi/g to 0.393 pCi/g. The sampling locations follow the intended water flow from the basin toward McQueen Branch and show cesium-137 activities above the onsite worker benchmark at locations in proximity to the Z-01

### *2.1.3 Ecological Benchmark Screening and Results*

The purpose of the ecological evaluation is to provide an overall indicator of ecological health for the UTR IOU. The biological data is supplemented with benchmark comparisons that are used as a screening step to identify constituents that may pose a threat to ecological receptors. The ecological benchmark screening process provides the basis for determining whether early action may need to be considered, and provides the justification for subsequent investigations that support the ecological risk assessment (ERA) process for the UTR IOU. The ecological benchmark comparisons are conducted by comparing ecological screening values (ESVs) to sediment, sediment/soil, and SW media constituent concentrations. The benchmarks are toxicological thresholds used for preliminary risk screening. The benchmark evaluation is based on Tier I and Tier II screening benchmarks. The Tier I benchmarks are derived from ecologically relevant criteria and standards such as USEPA Region 4 Screening Values and National Ambient Water Quality Criteria (AWQC) derived from the ESV benchmark protocol (SRNS 2012b). Tier I sediment and sediment/soil benchmarks are based on “no effect level” toxicological data, while Tier II sediment/soil benchmarks are based on “low effect” level toxicological data. Therefore, the Tier II sediment and sediment/soil benchmarks could be indicative of potential ecological contaminant threats.

For ~~surface water~~SW screening, the Tier I benchmark is not based on “no effect” level toxicological data, but rather, from “low effect” chronic thresholds. Since the IOU database includes data from various data stewards, the IOU program assumes surface water results for metals are representative of total metals. As the UTR IOU approaches Phase III of the IOU program and final deposition of the UTR IOU, the dissolved fraction will be evaluated to better address bioavailability for constituents that pose a potential threat to ecological receptors. The Tier II SW screening benchmarks are based on acute-level thresholds. Therefore, a potential threat to ecological receptors could be indicated by either the Tier I or Tier II SW screening benchmarks.

The radionuclide benchmark comparison, also part of the Tier I screening, is based on the International Atomic Energy Agency (IAEA) report that states that irradiation at chronic dose rates of 1.0 rad/day or less does not appear likely to cause observable changes in aquatic animal

populations (IAEA 1992). The benchmark for aquatic receptor populations exposed to SW or sediment is 0.1 rad/day applying a tenfold safety factor to the IAEA level.

Sediment Tier II early action consideration benchmarks used for screening sediment and sediment/soil data include Canadian Council of Ministers of the Environment (CCME), Oak Ridge National Laboratory (ORNL) Median Level, and ORNL Effects Level low effect thresholds. Tier I early action consideration benchmarks used for screening SW data are based on chronic level toxicological benchmarks and Tier II on acute-level AWQC and ORNL thresholds. Sediment and sediment/soil Tier II screening, and SW Tier I and Tier II screening is used to focus the evaluation for Phase II early action consideration and to assist in refining the ERA process prior to the BRA and Phase III final deposition. For the ecological evaluation, the exceedances that fail the criteria, along with biological data, are used to determine if possible early actions may need to be considered. For the ecological evaluation, early actions may include additional ecological data collection during Phase II of the IOU program (long-term monitoring and assessment) to further assess potential threats. Phase III will initiate the RI/BRA for the UTR IOU. The ecological benchmarks are provided in Appendix A. Constituents that exceed benchmark values are processed further using a lines-of-evidence approach for four criteria: 1) the frequency of benchmark exceedances, 2) mean HQ, 3) a background evaluation, and 4) an evaluation of existing biological data.

### Sediment

A summary of the ecological exceedances for the sediment medium are provided in Table 2-3 and shown in Figure 2-6. Tier I no effect level benchmark screening for UTR PR5 resulted in a benchmark exceedance for arsenic (benchmark =  $7.24E+00$  pCi/g) in the Tinker Creek subunit with one exceedance out of five samples, a frequency of exceedance >5% (20%), a mean ratio >1.0 (1.19), and a mean detected value (8.6 mg/kg) greater than background (6.7 mg/kg). The exceedance is located at the perimeter of Z-Area and is associated with the Z-01 Outfall. Review of all arsenic data from the Tinker Creek subunit (including McQueen Branch) shows a total of 25 arsenic records with four detected results, three estimated “J” value results, and 18 non-detects.

In terms of the UTR watershed, arsenic has been detected in background locations within the UTR IOU in the Upper and Tinker Creek subunits upgradient of SRS operational influences. Two of the detected results from the Tinker Creek subunit are from 2015 with the highest 2015 value (15.3 mg/kg) being located at the Z-01 Outfall. The other result collected downgradient of the Z-01 Outfall at McQueen Branch was 1.9 mg/kg well below the arsenic sediment benchmark (7.24 mg/kg). The highest reported result for arsenic was a result of 22.9 mg/kg from the SRS Background Soil Study, however, for the Tinker Creek subunit, 15.3 mg/kg was the maximum detected. Based on the available data, the Z-01 Outfall exceedance is elevated, but is a single exceedance. The Z-01 Outfall is part of the SRS annual environmental report monitoring, and results of arsenic downgradient of the outfall are non-detects or within background. Also, the level is less than the SRS Background Soil Study. In addition, the basin has been expanded to accommodate a 100-year storm event and contaminated soils have been removed. Also, since, arsenic did not exceed Tier II benchmarks for the Tinker Creek subunit, further evaluation by the IOU program is not warranted at this time.

There were no Tier II low effect level sediment exceedances for UTR PR5. Therefore, further evaluation is not warranted.

#### Sediment/Soil (Sediment)

Benchmark exceedances for the sediment/soil medium based on sediment benchmarks are presented in Table 2-4 and depicted in Figure 2-7. For Tier I sediment/soil exceedances for UTR PR5, based on effect level sediment benchmarks, there were exceedances for the Tinker Creek subunit for arsenic (benchmark = 7.24 mg/kg), barium (benchmark = 2.00E+02 mg/kg), copper (benchmark = 1.87E+01 mg/kg), mercury (benchmark = 1.30E-01 mg/kg), nickel (benchmark = 1.59E+01 mg/kg), zinc (benchmark = 1.24E+02 mg/kg), and acetone (benchmark = 8.70E-03 mg/kg). Acetone is a common laboratory artifact and does not require further evaluation. Arsenic was present with mean ratio >1.0 (15.1), and the mean based on detected values for arsenic was greater than background with a mean detected value for arsenic of 7.87E+00 mg/kg with a background level of 6.7 mg/kg. Frequency of exceedances were also >5% for arsenic with a 15% frequency of exceedance based on 3 exceedances out of 20 samples. Therefore,

### Sediment/Soil (Soil)

The soil benchmark comparisons are used solely as a data needs assessment screening tool during IOU Phase II reporting rather than for early action consideration. A summary of the Tier I benchmark exceedances are provided in Table 2-4 and are depicted in Figure 2-8. There are no Tier II screening benchmarks for soil.

The Tier I ecological benchmark screening for the sediment/soil medium, based on soil benchmarks, resulted in exceedances for the Tinker Creek subunit, there were exceedances for aluminum (benchmark =  $5.00E+01$  mg/kg), arsenic (benchmark =  $1.00E+01$  mg/kg), barium (benchmark =  $1.65E+02$  mg/kg), beryllium (benchmark = 1.1 mg/kg), chromium (benchmark =  $3.20E+01$  mg/kg), copper (benchmark =  $4.00E+01$  mg/kg), iron (benchmark =  $2.00E+02$  mg/kg), manganese (benchmark =  $1.00E+02$  mg/kg), mercury (benchmark =  $3.00E-01$  mg/kg), selenium (benchmark =  $8.10E-01$  mg/kg), vanadium (benchmark = 2.00 mg/kg), zinc (benchmark =  $5.00E+01$  mg/kg), and cesium-137 ( $2.39E+02$  pCi/g). These exceedances are 2015 data associated with the Z-01 Outfall that experienced a rain induced discharge in 2013/2014.

Aluminum ( ~~$2.11E-01$~~ ) $1.05E+02$ , iron ( $5.38E+01$ ), manganese ( $1.22E+00$ ), selenium (2.42), vanadium ( $1.49E+01$ ), and zinc (at 1.15) had mean ratios  $>1.0$ . Cesium-137 (7.1%), aluminum (100%), iron (100%), manganese (55%), selenium (65%), vanadium (100%), zinc (30%), and cesium-137 (10%) had frequencies of exceedance  $>5\%$ . Only arsenic and cesium-137 had mean values greater than background. However, no constituent failed all criteria (mean ratio  $>1.0$ , frequency of exceedance  $>5\%$ , and mean detected values greater than background, further evaluation is not warranted. The 2015 sampling effort followed the extent of contamination from the Z-01 Outfall release, and contaminated soil has been removed. In addition, a new outlet structure is in place and the basin associated with the Z-01 Outfall has been expanded to accommodate a 100-year storm event alleviating future releases from the outfall.

### Surface Water

A summary of Tier I (low effect level) benchmark exceedances for the SW medium is provided in Table 2-5 and depicted in Figure 2-9. Tier I (~~acute~~low effect level) SW exceedances were

observed for aluminum (benchmark =  $8.70\text{E-}02$  mg/L), barium (benchmark =  $3.90\text{E-}03$  mg/L), beryllium (benchmark =  $5.30\text{E-}04$  mg/L), cadmium (benchmark =  $1.67\text{E-}04$  mg/L), cobalt (benchmark =  $3.00\text{E-}03$  mg/L), copper (benchmark =  $1.48\text{E-}03$  mg/L), dichlorodiphenyldichloroethane (DDD) (benchmark =  $6.00\text{E-}06$  mg/L), dichlorodiphenyltrichloroethane (DDT) (benchmark =  $1.00\text{E-}06$  mg/L), endosulfan II (benchmark =  $5.60\text{E-}05$  mg/L), endosulfan sulfate (benchmark =  $5.60\text{E-}05$  mg/L), endrin (benchmark =  $2.00\text{E-}06$  mg/L), iron (benchmark =  $1.00\text{E+}00$  mg/L), lead (benchmark =  $1.44\text{E-}04$  mg/L), manganese (benchmark =  $8.00\text{E-}02$  mg/L), mercury (benchmark =  $1.20\text{E-}05$  mg/L), nickel (benchmark =  $2.02\text{E-}02$  mg/L), silver (benchmark =  $1.20\text{E-}05$  mg/L), thallium (benchmark =  $4.00\text{E-}03$  mg/L), and zinc (benchmark =  $1.35\text{E-}02$  mg/L).

Of these analytes, copper, manganese, and zinc in the Upper subunit, iron in the Tinker Creek subunit, mercury and zinc in Tims Branch, beryllium, cadmium, ~~chromium,~~ and cobalt, ~~and manganese~~ in the Middle subunit, and iron and zinc in the Lower subunit had mean ratios  $<1.0$  and do not warrant further evaluation at this time. Thallium, copper, and manganese in the Upper subunit, nickel in the Tinker Creek subunit, lead and mercury in Tims Branch, ~~chromium,~~ silver, ~~vanadium,~~ and zinc in the Middle subunit, and mercury in the Lower subunit had exceedances with a low frequency of exceedance ( $\leq 5\%$ ) and do not require further evaluation from a data review perspective.

Constituents requiring additional evaluation include copper in the Tinker Creek subunit, ~~and mercury in the Tims Branch subunit.~~ Additionally, the exceedances associated with the Upper and Tinker Creek subunits do not require further evaluation since these subunits are upgradient of SRS operations, and are considered background with the exception any exceedances associated with McQueen Branch. McQueen Branch receives potential discharges from Z Area, S Area, and the western portion of H Area and is not considered a background system.

Copper in the Tinker Creek subunit was present with a mean ratio  $>1.0$  ( $1.18\text{E+}02$ ), a frequency of exceedance  $>5\%$  ( $5.9\%$ ), and a mean of detected values ( $1.74\text{E-}01$  mg/L) greater than background ( $7.0\text{E-}02$  mg/L). ~~Mercury in the Tims Branch subunit was present with a mean ratio~~

~~>1.0 (1.27E+02), a frequency of exceedance >5% (22.1), a mean of detected results (1.52E-03 mg/L) greater than background (0.001 mg/L).~~

Of the two copper exceedances requiring further evaluation for the Tinker Creek subunit, one of the exceedances (0.004 mg/L) was located near the SRS boundary upgradient of SRS operations and is below background (0.007 mg/L). Since this exceedance was location upgradient of potential SRS discharges, in a background area, further evaluation of this exceedance is not warranted. The Tinker Creek subunit, with the exception of McQueen Branch, is considered background. McQueen Branch, although part of the Tinker Creek watershed, receives potential discharges from Z Area, S Area, and the western portion of H Area and, therefore, is not considered a background system. The other copper exceedance (0.518 mg/L) was identified in DWPF non-process water at the S-04 Outfall and is above background. From a historical perspective, there are a total of two copper results above background in the Tinker Creek subunit based on review of all 248 samples. Since the exceedance occurred at an outfall that is part of annual environmental monitoring and already under a monitoring and reporting program (SCR000000), there are infrequent copper exceedances in Tinker Creek, and this is a single exceedance above background, further assessment by the IOU program is not warranted.

~~The mercury exceedances within the Tims Branch subunit (15 exceedances out of 68 analyses) include 14 sample results associated with NPDES industrial outfall A-11 for Area powerhouse operations near A Area, and one location further down gradient toward UTR. The mercury levels are above the IOU Tier II benchmark, but are within NPDES permit limits. Since the mercury exceedances are data from an NPDES permitted outfall and part of a monitoring and reporting program, further evaluation by the IOU program is not warranted at this time. Additionally, Tims Branch is already undergoing additional study associated with the stannous chloride additions to the system and mercury abatement.~~

There were Tier II SW exceedances for aluminum, cadmium, copper, DDD, endosulfan II, endosulfan sulfate, endrin, lead, mercury, silver, and zinc (Table 2-5, Figure 2-9). Constituents with mean ratios >1.0, a frequency of exceedance >5%, and with a mean detected value greater than background levels (or background data are non-determinant) requiring further evaluation

based on AWQC based benchmarks include copper (benchmark =  $1.80\text{E-}03$  mg/L), and DDD (benchmark =  $6.40\text{E-}05$  mg/L).

Review of copper data shows two detects out of 34 analyses for UTR PR5 for the Tinker Creek subunit. However, only one result is over the benchmark (0.07 mg/L). The one result (0.518 mg/L) at the S-04 Outfall representing a sample taken in 2014. This location, the S-04 Outfall, is described as DWPF non-process wastewater. This outfall is part of the annual environmental monitoring and already under a monitoring and reporting program. Since this is a single result above background, further assessment by the IOU program is not warranted.

The DDD Tier II AWQC exceedance is located in Tinker Creek upgradient of SRS operational sources. This sample was collected in 2012 and is one detect out of ~~70~~ 9 samples for DDD in the Tinker Creek subunit. Prior to the acquisition of SRS in the 1950's, the SRS landscape was comprised primarily rural farming communities where insecticides such as DDT were used. DDD is a result of the breakdown/degradation of DDT. There is no known SRS use of DDT or DDD, and since this exceedance is located upgradient of operational discharges, no further evaluation is warranted at this time.

The Tier II evaluation also includes exceedances based on ORNL benchmarks. Mercury was the only constituent to exceed ORNL benchmarks. Mercury was not present Constituents with mean ratios  $>1.0$ , a frequency of exceedance  $>5\%$ , ~~and or~~ with a mean detected value greater than background. ~~levels (or if background data are non-determinant)~~ Therefore, mercury does not require further evaluation based on ORNL benchmarks ~~include mercury (benchmark =  $9.90\text{E-}05$  mg/L) and DDD (benchmark =  $1.90\text{E-}04$  mg/L).~~

~~As discussed above, the DDD exceedance is located in the Tinker Creek upgradient of potential SRS operational discharges. And since there is no known SRS use of DDT or DDD, and this constituent is detected infrequently, no further evaluation by the IOU program is warranted at this time.~~

~~The mercury exceedances within the Tims Branch subunit (13 exceedances out of 68 analyses) are all 2014 data associated with NPDES industrial outfall A-11 for Area powerhouse~~

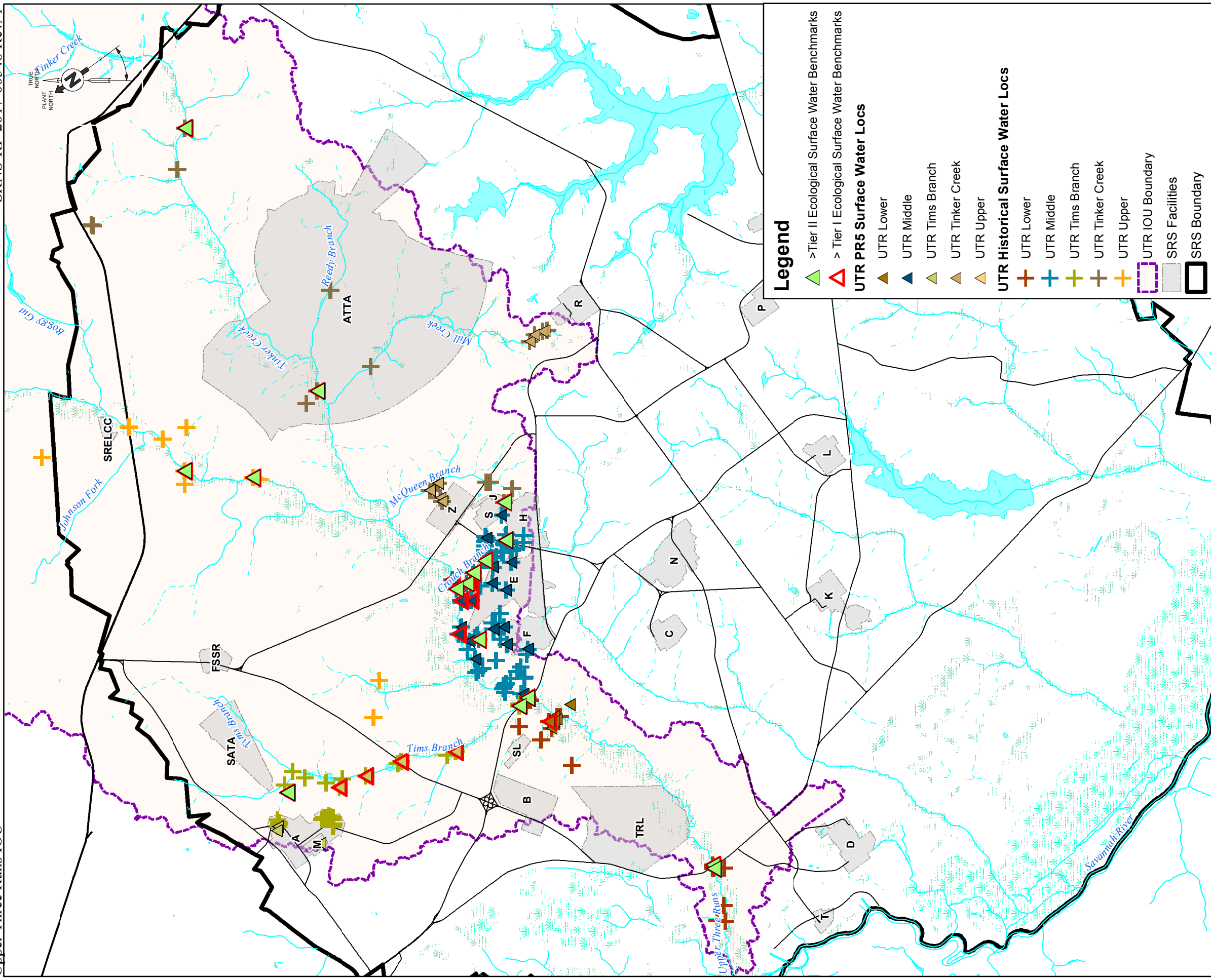
~~operations. The mercury levels are above the IOU Tier II benchmark, but are within NPDES permitted limits. Since the mercury exceedances are data from NPDES permitted monitoring and reporting program, further evaluation by the IOU program is not warranted at this time. Additionally, Tims Branch is already undergoing additional study associated with the stannous chloride additions to the system.~~

### Biological Data and Benchmark Screening Results

Benchmark screening is useful in assessing potential contaminant threats to ecological receptors based on toxicity thresholds. However, site-specific biological data are a better indicator of site conditions. Results of these types of studies are beneficial in determining if deleterious effects are occurring or are likely to occur. The annual update of the literature-based wildlife survey and bioassessment data collected for the IOU program are used to assess overall stream system health.

Past assessments of fish and macroinvertebrate assemblage assessments within the UTR IOU reveal fish and macroinvertebrate assemblages, in general, are comparable to background/control sites indicating that aquatic communities are similar to undisturbed reference sites. Locations where past macroinvertebrate surveys indicate impairment, the upper reaches of McQueen Branch and the upper reaches of Crouch Branch, were shown to be scoured by runoff and deeply channelized resulting in poor habitat quality. However, both these systems showed improvement in their lower reaches. Crouch Branch has received elevated copper discharges associated with the H-02 NPDES permitted SW outfall. The constructed wetland system designed to store and treat stormwater runoff and cooling wastewaters from H Area is proving effective in reducing levels of copper, lead, and zinc, and monitoring continues for that system.

IOU collected data including past fish condition factors and health assessment index (necropsy) data show no deleterious effects on the health of individual fish within the UTR system. The fish health assessments were conducted to supplement initial fish assemblage and body burden assessments. These types of data are particularly useful for assessing general fish health when comparing background (control) locations to potentially impacted sites as implemented at the SRS using the IOU bioassessment network locations. The trophic modeling most recently summarized in UTR PR3 (SRNS ~~2012a~~2012c) revealed that mercury and aluminum potentially posed a risk to



Projection: Universal Transverse Mercator  
Datum: North American Datum 1927  
Zone: 17

To place on the North American Datum 1983, move the projection line 13 meters south and 15 meters west.

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Figure 2-9: Location of Surface Water Samples  
Exceeding Ecological Benchmarks  
for the Upper Three Runs IOU

Savannah River Site  
Aiken, South Carolina



United States Department of Energy	
UTR10UFIG2_9G82018Rev1	Rev. SRS
1	06/20/18
Location of Surface Water Samples Exceeding Ecological Benchmarks for the Upper Three Runs IOU	
Prepared by: Natalie Lopez	06/20/18
Reviewed by: Susan Blas	06/20/18

Table 2-2. Human Health Benchmark Exceedance Summary for UTR PR5

Sediment – Onsite Worker

Subunit	Analyte Type	Analyte	Units	Benchmark	Max Result	Max Ratio	Mean Detect	Mean Ratio	# Exceed	# Samples	Freq Exceed (%)	# Detects	# Estimated	# Non-Detects	Max Bkgrd Level	Mean > Bkgrd?	Bkgrd Date, Location
UTR Tinker Creek	Radionuclides	Cesium-137*	pCi/g	8.92E+01	1.50E+03	1.68E+01	4.87E+02	5.45E+00	5	15	33.3	9	1	5	6.23E-01	yes	2010, BKGRDSS001

Sediment/Soil (Sediment) – Onsite Worker

Subunit	Analyte Type	Analyte	Units	Benchmark	Max Result	Max Ratio	Mean Detect	Mean Ratio	# Exceed	# Samples	Freq Exceed (%)	# Detects	# Estimated	# Non-Detects	Max Bkgrd Level	Mean > Bkgrd?	Bkgrd Date, Location
UTR Tinker Creek	Radionuclides	Cesium-137*	pCi/g	8.92E+01	7.60E+02	8.52E+00	1.11E+02	1.25E+00	8	20	40.0	20	0	0	6.23E-01	yes	2010, BKGRDSS001

Sediment/Soil (Soil) – Onsite Worker

Subunit	Analyte Type	Analyte	Units	Benchmark	Max Result	Max Ratio	Mean Detect	Mean Ratio	# Exceed	# Samples	Freq Exceed (%)	# Detects	# Estimated	# Non-Detects	Max Bkgrd Level	Mean > Bkgrd?	Bkgrd Date, Location
UTR Tinker Creek	Radionuclides	Cesium-137*	pCi/g	1.79E+01	7.60E+02	4.25E+01	1.11E+02	6.21E+00	18	20	90.0	20	0	0	6.23E-01	yes	2010, BKGRDSS001

Surface Water – Onsite Worker

Subunit	Analyte Type	Analyte	Units	Benchmark	Max Result	Max Ratio	Mean Detect	Mean Ratio	# Exceed	# Samples	Freq Exceed (%)	# Detects	# Estimated	# Non-Detects	Max Bkgrd Level	Mean > Bkgrd?	Bkgrd Date, Location
	<i>No constituents exceeded onsite worker benchmarks for surface water</i>																

\* Cesium-137 exceedances in the UTR Tinker Creek subunit were associated with McQueens Branch, a tributary of the Tinker Creek watershed located downgradient of Tinker Creek background locations. See Figure 2-1 for the location of exceedances.

### 3.0 DATA NEEDS AND EARLY ACTIONS

#### 3.1 Identification of Data Needs

The results of the benchmark evaluations conducted in Section 2.1 provide the rationale and justification for data needs to support the ongoing assessment of the UTR IOU. Table 3-1 lists IOU identified data needs and sampling conducted to address the data needs for the UTR IOU.

The PR5 HH evaluation lacked recent fish data (Section 2.1.1). Although fishing for consumption is not allowed in UTR IOU, monitoring contaminant levels over time is a useful in assessing potential contaminants threats. A new approach to monitoring contaminant levels and bioaccumulation in fish for the IOU program is planned. Passive diffusive gradients in thin films (DGT) samplers will be deployed in the UTR IOU to provide screening data to estimate concentrations in fish tissue without catching or destroying any fish to support future HH subsistence fisherman scenario benchmark screening and the ecological screening. DGT samplers target bioavailable fractions of contaminants to help identify contaminants of interest. The use of passive samplers was first developed in the 1980s, and samplers started to be deployed in the field for research purposes in the 1990s. Since then, passive samplers have been used for monitoring contaminant concentrations in the water column and sediment by regulatory agencies and researchers, and have been used on the SRS. Passive samplers are useful new tools for assessing contaminant exposures and evaluating the potential for adverse environmental impacts. The data obtained from passive samplers will provide consistent and comparable data allowing for spatial comparison and trending among and within the IOUs since the semipermeable medium is consistently prepared and deployed. As the DGT sampling data is supplemented with biological data/tissue samples, the comparability of the approach to biological data collections such as fish will be demonstrated. For the initial deployment, the passive sampler collections will focus on the Middle and Lower UTR subunits where edible sized game fish are more likely and high fish diversity of present. The data collected will be used to begin the process of refining the approach for assessing contaminant threats for the IOU program. These data will be reported in a future PR.

The PR5 ecological assessment showed Tier II sediment/soil and Tier I and II SW exceedances based on review of UTR PR5 data. None of these exceedances warranted further evaluation at this

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Reference	Citation
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**ECOLOGICAL BENCHMARKS — TIER II**

Analyte	Matrix	Benchmark	Units	Source
PCB-1248	SE	1.89E-01	mg/kg	Effect Level ORNL
PCB-1248	SE	1.80E-01	mg/kg	Effect Median ORNL
PCB-1254	SE	3.40E-01	mg/kg	Effect Level CCME
PCB-1254	SE	1.89E-01	mg/kg	Effect Level ORNL
PCB-1254	SE	1.80E-01	mg/kg	Effect Median ORNL
PCB-1260	SE	2.77E-01	mg/kg	Effect Level CCME
PCB-1260	SE	1.89E-01	mg/kg	Effect Level ORNL
PCB-1260	SE	1.80E-01	mg/kg	Effect Median ORNL
PCB-1262	SE	2.77E-01	mg/kg	Effect Level CCME
PCB-1262	SE	1.89E-01	mg/kg	Effect Level ORNL
PCB-1262	SE	1.80E-01	mg/kg	Effect Median ORNL
Phenanthrene	SE	5.15E-01	mg/kg	Effect Level CCME
Phenanthrene	SE	5.44E-01	mg/kg	Effect Level ORNL
Phenanthrene	SE	1.50E+00	mg/kg	Effect Median ORNL
Polychlorinated biphenyls	SE	2.77E-01	mg/kg	Effect Level CCME
Polychlorinated biphenyls	SE	1.89E-01	mg/kg	Effect Level ORNL
Polychlorinated biphenyls	SE	1.80E-01	mg/kg	Effect Median ORNL
Pyrene	SE	8.75E-01	mg/kg	Effect Level CCME
Pyrene	SE	1.40E+00	mg/kg	Effect Level ORNL
Pyrene	SE	2.60E+00	mg/kg	Effect Median ORNL
Silver	SE	1.77E+00	mg/kg	Effect Level ORNL
Silver	SE	3.70E+00	mg/kg	Effect Median ORNL
technical-Chlordane	SE	8.87E-03	mg/kg	Effect Level CCME
technical-Chlordane	SE	4.79E-03	mg/kg	Effect Level ORNL
technical-Chlordane	SE	6.00E-03	mg/kg	Effect Median ORNL
Toxaphene	SE	1.00E-04	mg/kg	Effect Level CCME
Zinc	SE	3.15E+02	mg/kg	Effect Level CCME
Zinc	SE	2.71E+02	mg/kg	Effect Level ORNL
Zinc	SE	4.10E+02	mg/kg	Effect Median ORNL
1,1,1,2-Tetrachloroethane	SW	9.32E-01	mg/L	AWQC (EPA 1995, WSRC 1998)
1,1,1,2-Tetrachloroethane	SW	2.10E+00	mg/L	ORNL
1,1,1-Trichloroethane	SW	5.28E+00	mg/L	AWQC
1,1,1-Trichloroethane	SW	2.00E-01	mg/L	ORNL
1,1,2,2-Tetrachloroethane	SW	9.32E-01	mg/L	AWQC

ECOLOGICAL BENCHMARKS — TIER II

Analyte	Matrix	Benchmark	Units	Source
1,1,2,2-Tetrachloroethane	SW	2.10E+00	mg/L	ORNL
1,1,2-Trichloroethane	SW	3.60E+00	mg/L	AWQC
1,1,2-Trichloroethane	SW	5.20E+00	mg/L	ORNL
1,1-Dichloroethane	SW	8.30E-01	mg/L	ORNL
1,1-Dichloroethene	SW	3.03E+00	mg/L	AWQC
1,1-Dichloroethene	SW	4.50E-01	mg/L	ORNL
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	SW	1.00E-04	mg/L	AWQCORNL
1,2,3,4,6,7,8-Heptachlorodibenzofuran	SW	1.00E-04	mg/L	ORNLAWQC
1,2,3,4,7,8-Hexachlorodibenzofuran	SW	1.00E-04	mg/L	ORNLAWQC
1,2,3,7,8-Pentachlorodibenzene-p-dioxin	SW	1.00E-04	mg/L	ORNLAWQC
1,2,3,7,8-Pentachlorodibenzene-p-furan	SW	1.00E-04	mg/L	ORNLAWQC
1,2,3-Trichloropropane	SW	5.25E+00	mg/L	ORNLAWQC
1,2,4,5-Tetrachlorobenzene	SW	2.50E-01	mg/L	ORNLAWQC
1,2,4-Trichlorobenzene	SW	1.50E-01	mg/L	ORNLAWQC
1,2,4-Trichlorobenzene	SW	7.00E-01	mg/L	ORNL
1,2-Dibromo-3-chloropropane	SW	5.25E+00	mg/L	ORNLAWQC
1,2-Dichlorobenzene	SW	1.58E-01	mg/L	AWQC
1,2-Dichlorobenzene	SW	2.60E-01	mg/L	ORNL
1,2-Dichloroethane	SW	1.18E+02	mg/L	AWQCORNL
1,2-Dichloroethane	SW	8.80E+00	mg/L	ORNL
1,2-Dichloroethene (total)	SW	1.35E+01	mg/L	AWQC
1,2-Dichloroethene (total)	SW	1.10E+00	mg/L	ORNL
1,2-Dichloropropane	SW	5.25E+00	mg/L	AWQC
1,3-Dichlorobenzene	SW	5.02E-01	mg/L	AWQC
1,3-Dichlorobenzene	SW	6.30E-01	mg/L	ORNL
1,3-Dichloropropene	SW	9.90E-04	mg/L	ORNL
1,4-Dichlorobenzene	SW	1.12E-01	mg/L	AWQC
1,4-Dichlorobenzene	SW	1.80E-01	mg/L	ORNL
2,3,7,8-Tetrachlorodibenzodioxin	SW	1.00E-04	mg/L	AWQC
2,3,7,8-Tetrachlorodibenzofuran	SW	1.00E-04	mg/L	AWQC
2,4,5-Trichlorophenol	SW	3.20E-02	mg/L	AWQC
2,4,6-Trichlorophenol	SW	3.20E-02	mg/L	AWQC
2,4-Dichlorophenol	SW	2.02E-01	mg/L	AWQC
2,4-Dimethylphenol	SW	2.12E-01	mg/L	AWQC