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Savannah River Site

Scoping Summary for the Upper Three Runs Integrator Operable Unit

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1.0 PROJECT PHASE AND STATUS OF THE UPPER THREE RUNS INTEGRATOR OPERABLE UNIT

This Scoping Summary reflects the status of development of Upper Three Runs (UTR) Integrator Operable Unit (IOU) Periodic Report 5 (PR5).

The objectives of this scoping summary are to:

- update the UTR IOU conceptual site model (CSM) based on information and data obtained since submittal of UTR PR4; PR5 includes new data associated with a rain-induced discharge in 2013 from the Z-Area stormwater (Z-01 Outfall) resulting in human health and ecological exceedances
- identify any new data needs arising from the evaluation of data for PR5; PR5 identified the need for additional surrogate-fish data (using diffusive gradients in thin films (DGT) passive samplers deployed in the UTR Middle and Lower subunits) to assess potential threats to ecological receptors and consumption threats for the HH subsistence fisherman scenario
- evaluate the need for early actions based on the revised CSM and new data indicated above; no early actions are proposed based on review of PR5 data.

The UTR PR5 Revision 0 document is due for submittal February 28, 2018. The fifth Phase II Field Start is March 31, 2019.

The status of data needs identified in PR4 associated with monitoring the long-term health of the IOU is provided below.

- PR 4 identified continuance of the site-wide trophic modeling effort to assess potential threats to ecological receptors from metal exposure based on additional biotic/abiotic data (primarily from Tims Branch and Crouch Branch within the Middle subunit), and additional receptors (raccoon and great blue heron). This **data need has been met** with the compilation of additional abiotic and biotic data for assessing exposure, and with the collection of macroinvertebrate and fish assemblage data collected in 2017
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to access ecological health. Fish and macroinvertebrate data were collected in Tims Branch and Crouch Branch, and a site in Tinker Creek to serve as background. Analysis of the data is in progress. These data will be reported in the next PR for UTR IOU (PR6).

- PR 4 also identified review of on-going sampling/research efforts associated with effluent monitoring/research in Crouch Branch associated with the H-02 outfall wetlands complex metals abatement, and with the Tims Branch stannous chloride research to mitigate mercury inputs from groundwater. Mercury was previously identified as a potential threat in the UTR-Lower subunit in PR3, although it was present in background locations as well. The research associated with Crouch Branch, located in the Middle UTR subunit, is supporting the SRS National Pollutant Discharge Elimination System (NPDES) monitoring program for the H-02 outfall system. This **data need has been met** with a review of ongoing studies from Crouch Branch and Tims Branch with the review of literature as documented in PR5.

2.0 BACKGROUND

The UTR IOU is defined as UTR and its tributaries including surface water, sediment, sediment/soil, and related biota in these streams and their associated floodplains. This area represents the integration of potential contaminant exposure pathways to onsite human and ecological receptors from potential SRS contaminant sources. The UTR IOU is divided into five exposure areas (subunits): Upper, Middle, Lower, Tims Branch, and Tinker Creek. UTR originates northeast of the SRS boundary and follows a southwesterly direction for approximately 30 km (19 mi) within the SRS boundary. The entire watershed drains about 645 km² (245 mi²). The offsite portion (approximately 60%) of the UTR watershed has multiple agricultural, residential, and commercial sources that could potentially impact the UTR IOU. Within the SRS boundary, the UTR watershed drains approximately 250 km² (97 mi²). UTR discharges directly into the Savannah River approximately 1.5 km (0.9 mi) upstream of T Area. The northern portion of the watershed within the site boundary includes portions of A Area, M Area, SRNL, and SREL. The southern portion of the UTR watershed includes the entirety of the S Area Vitrification Facility and Z Area Saltstone Facility, as well as portions of the B Area, E Area Waste Management Complex, F and H

Separations Areas, and R Reactor Area. The main tributaries within the SRS portion of the UTR watershed include Tinker Creek, Tims Branch, and Mill Creek, which is a tributary of Tinker Creek. Smaller tributaries include Crouch Branch and McQueen Branch. Steed Pond (which received historical uranium and nickel discharges from M-Area) lies in the Tims Branch subunit.

UTR has never received thermal or radiological discharges from SRS reactors. Above its confluence with Tinker Creek, UTR Creek is relatively unimpacted by SRS activities. Due to the ecological uniqueness of UTR, portions of the creek have been protected from site discharges, and it is currently managed and protected by a United States Department of Energy (USDOE) Stream Management Policy. The E. P. Odom Wetland Set-Aside includes the northern section of UTR within the confines of the SRS boundary and its tributaries upstream of the confluence of Tinker Creek, including Tinker Creek, comprising 7,362 acres (2,979 ha). UTR is known internationally in the scientific community as an outstanding biological resource. This riverine ecosystem has one of the most species-rich assemblages of aquatic insects in North America, if not in 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.

3.0 LAND USE

Current land use in the UTR IOU is mixed. Industrial areas cover less than 5% of the UTR watershed within the SRS boundary and presently exist in A and M Areas, B Area, S Area, Z Area, and portions of E, F, H, and R Areas. Additionally, the Three Rivers Regional Subtitle D Municipal Solid Waste Landfill, operated by Three Rivers Solid Waste Authority, is located south of B Area. Within the SRS boundary, the remainder of the watershed consists of managed forest and bottomland forest and is not used for industrial purposes.

The habitats associated with the UTR IOU continue beyond the SRS boundary. The SRS-controlled section of the Savannah River/Savannah River swamp, from above UTR to below Steel Creek, is currently posted "No Hunting, No Fishing, and No Unauthorized Access" and patrolled by SRS as part of the SRS access control program. No residential or unrestricted use of the on-site portion of the IOU is planned or anticipated.

3.1 Human Health and Ecological Screening

Human health (HH) and ecological screening is conducted by comparing constituent concentrations to pre-established benchmark values for sediment, soil, surface water, and fish. The sediment/soil medium is screened against both sediment and soil benchmarks for both human health and ecological receptors. The sediment comparisons are used to support early action determinations, and the soil benchmarks (for the sediment/soil medium) are used to support the data needs assessment. In reviewing the data, to supplement the frequency of exceedance and maximum hazard quotient (HQ, maximum detected value/benchmark), a mean HQ (mean detected value/benchmark) is calculated for each constituent per subunit and is used to determine if mean values are greater than the benchmark (i.e., mean HQ > 1.0).

In general, the HH benchmark values for IOU Phase II evaluations are used to identify constituent concentrations that result in a cancer risk equal to or greater than 1×10^{-4} or a hazard quotient (HQ) equal to or greater than 3 to determine the potential need for early action.

For the purposes of identifying problems warranting early actions, the human health evaluation focuses on the following human health scenarios:

- on-site worker for sediment, sediment/soil, and surface water
- hypothetical subsistence fisherman for the ingestion of fish

The ecological early action screening is conducted by comparing ecological screening values to media constituent concentrations for each medium for non-radionuclides. The ecological radionuclide screening is a benchmark comparison based on dose applying a tenfold safety factor to International Atomic Energy Agency levels for population level dose effects. Biological data supplement the ecological

benchmark screening and are used to assess the ecological health of the IOU based on contaminant data, bioassessment indices, and literature-based wildlife survey information.

The ecological benchmark screening is conducted against both Tier I and Tier II level exceedances. The Tier I level screening is a conservative comparison against Ecological Screening Values (ESV) benchmarks. 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 screening, the Tier I benchmark is not based on “no effect” level toxicological data, but rather, from “low effect” thresholds. The Tier II surface water screening is based on acute-level thresholds. Therefore, a potential threat to ecological receptors could be indicated by either the Tier I or Tier II surface water screening benchmarks.

Constituents with surface water Tier I and Tier II exceedances, or constituents with sediment or 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 greater than 5%.
3. The mean detected value > maximum background, or if background data are non-determinant.

These criteria are also used for the human health evaluation to determine if early action consideration may be warranted. 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 Remedial Investigation/Baseline Risk Assessment for the UTR IOU.

4.0 FISH EXPOSURE MEDIUM AND ECOLOGICAL EVALUATION

This section provides an evaluation of fish data based on human health screening for the subsistence fisherman. This section also includes an assessment of biological data that supports the UTR IOU ecological evaluation.

Human Health Evaluation

There were no new fish data for UTR PR5. Therefore, there were no human health exceedances for the subsistence fisherman.

Ecological Evaluation

The purpose of the ecological evaluation is to provide an overall indicator of ecological health for the UTR IOU. The biological data are supplemented with benchmark comparisons that are used as a screening step to identify constituents that may pose a threat to ecological receptors. Past assessments of fish and macroinvertebrates have been used to assess the health of the UTR IOU. These evaluations were supplemented by the IOU trophic modeling effort as documented in the *Ecological Effects of Contaminants in the Upper Three Runs Integrator Operable Unit* report (SRNL-TR-2011-00201, 2011). Overall, these lines of evidence show no deleterious ecological effects within the Upper, Lower, and Tinker Creek subunits compared to background data. The trophic modeling effort identified a possible threat from mercury in Tims Branch based on a potential risk to mammals and birds due to elevated mercury levels in fish. Tims Branch, the upper reaches of Crouch Branch and the upper reaches of McQueen Branch have shown historical habitat degradation which is evidenced by low integrity (fewer species) of fish and macroinvertebrates in Tims Branch (a system frequently impounded by beaver), depressed macroinvertebrate assemblages in the upper reaches of Crouch Branch, and impaired fish and macroinvertebrate assemblages in the upper reaches of McQueen Branch (due to poor habitat quality).

Both Tims Branch and Crouch Branch stream systems have undergone additional study since UTR PR4. Macroinvertebrate sampling was conducted in 2017 for the IOU program in Crouch Branch, Tims Branch, and Tinker Creek which serves as a background location. Index of Biotic Integrity fish assemblage assessments were also conducted. Results of these data collection efforts will be reported in the next PR for UTR IOU (PR 6) after data analysis is complete.

Additional information is available from ongoing studies conducted by the Savannah River National Laboratory and collaborators in Tims Branch associated with stannous chloride additions and surface water modeling. Tims Branch has been receiving groundwater that has been treated by air stripping to remove chlorinated solvents. In 2007, an innovative treatment process to remove mercury from the groundwater was initiated. The process uses a stannous chloride (tin chloride) addition prior to air stripping to convert the mercury to a strippable form for removal by the existing treatment equipment.

Crouch Branch, as well, is the site of ongoing research associated with the H-02 outfall wetlands complex that was created to treat heavy metals associated with industrial discharges and stormwater runoff. The Crouch Branch research is being conducted by the Savannah River Ecology Laboratory in support of the SRS NPDES program. Results of these on-going research areas are discussed in UTR PR 5.

4.1 Problems Warranting Action (Early Action Only)

There are no new problems warranting action under the early action criteria.

4.2 Interim Remedial Action Objectives

- Protect subsistence fisherman from unacceptable concentrations of contaminants in fish (risk > 1×10^{-4} or HQ > 3).
 - Protect ecological receptors within the IOU (stream and wetlands) from exposure to site related contaminants and biotic contaminant tissue burdens.
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4.3 Scope of the Problem Warranting Early Action

No early actions were identified based on the evaluation of UTR PR5 data. The scope of future actions, if required, will be determined as Phase II continues.

4.4 Likely Early Response Actions

No early response actions were identified based on the evaluation of UTR PR5 data. Current access controls will be maintained.

4.5 Uncertainties

- New fish and macroinvertebrate samples have been collected and analysis of the data is in progress. These data are used to assess the ecological health of the UTR IOU. It is uncertain if the results of these bioassessment efforts will identify an ecological impact for the UTR IOU.

Data Need/Evaluation: To address this uncertainty, the fish and macroinvertebrate data collected will be evaluated to assess the health of the IOU as Phase II of the IOU program continues.

- Although fish and macroinvertebrate assemblage data has been collected, body burden fish tissue data, used to assess potential consumption threats, have not been collected since 1998 in the Middle or Lower subunits. Although fishing for consumption is not currently allowed in UTR, passive samplers can be used as a screening tool.

Data Need/Evaluation: To address this uncertainty, passive samplers will be deployed in the Middle and Lower UTR subunits to assess contaminant levels where edible sized game fish would be more likely. Passive samplers will also be deployed in Upper UTR to serve as background. These data will be reported in a future PR.

5.0 SEDIMENT AND SEDIMENT/SOIL EXPOSURE MEDIA

The UTR PR5 evaluation is based on a subset of all UTR data. However, all UTR data analytical records are available to determine the significance of sediment or sediment/soil exceedances. There are currently 1,029 sediment and 1,972 sediment/soil records in the UTR PR5 database appropriate for benchmark screening.

In reviewing the data for PR reporting, to supplement the frequency of exceedance and maximum exceedance ratio (maximum detected/benchmark), a mean ratio (mean detected value/benchmark) is calculated for each constituent per subunit and is used to determine if mean values are greater than the benchmark (i.e., mean ratio > 1) as a screening criteria.

Human Health Evaluation

- The UTR PR5 sediment evaluation revealed exceedances for cesium-137 for the onsite worker (benchmark = 89.2 pCi/g) for the Tinker Creek subunit. There were 5 exceedances out of 15 sediment samples for the Tinker Creek subunit representing a frequency of exceedance >5%. The mean detected value for cesium-137 in Tinker Creek sediment ($4.87E+02$) was above background (0.623 pCi/g), and the mean ratio was >1.0 (5.45). The exceedances associated with the Tinker Creek subunit require further discussion since the mean ratio is >1.0, the frequency of exceedances is >5%, and the mean detected value is greater than background.

Further evaluation of the five Tinker Creek exceedances revealed that 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-01 Outfall. These data were associated with higher than average rainfall beginning in 2013 that caused the Z-Area stormwater basin to overflow and discharge to the Z-01 Outfall location. The basin is posted as a soil contamination area (due

to radionuclides, including cesium-137) and does not normally discharge. After the 2013 discharge, sedimentation breaks were installed at the Z-01 Outfall to minimize contamination spread. Soil contaminated with low-level radionuclides (primarily cesium-137) associated with the Saltstone Disposal Unit (SDU) runoff where downgradient contamination initiated was removed. Later in 2014, the Z-Area stormwater basin was expanded to accommodate increased rainfall events (100-year storm event). The sediment sample location farther downgradient of the Z-Area stormwater basin did not exceed the onsite worker benchmark for cesium-137. The cesium-137 exceedances in Tinker Creek are associated with an operational basin that is being monitored and reported through the SRS annual environmental reports (NPDES General Permit for Storm Water Discharges Associated with Industrial Activities stormwater permit, SCR000000). Since these exceedances are associated with a permitted basin that is included in an existing monitoring and reporting program, further evaluation by the IOU program is not warranted.

- Sediment/soil exceedances, based on sediment benchmarks for the onsite worker (benchmark = 89.2 pCi/g), were observed for cesium-137 for the Tinker Creek subunit. The Tinker Creek subunit had a frequency of exceedance >5% (40.0%) and mean background levels (1.11E+02 pCi/g) greater than background (0.623 pCi/g). The Tinker Creek subunit also had a mean ratio >1.0 (1.25) thus requiring further evaluation. Similar to 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, particularly the 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 Outfall. The samples collected at the furthest extent downgradient of the basin, toward McQueen Branch, were less the onsite worker benchmark. The 2015 sampling effort followed the extent of contamination. 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
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extent of contamination has been established, contaminated soil associated with the SDU have been removed, and protective controls are already in place for workers, no further evaluation is warranted by the IOU program.

- Sediment/soil exceedances, based on soil benchmarks for the onsite worker (benchmark = 17.9 pCi/g), were observed for cesium-137 for the Tinker Creek subunit with a frequency of exceedances >5% (90%), and a mean of detected result (1.11E+02 pCi/g) greater than background (0.623 pCi/g). Additionally, the mean ratio was >1.0 (6.21).

The sediment benchmark is the early action screening threshold for the onsite worker, and the soil benchmark is used to assess data needs for the UTR IOU. The Tinker Creek subunit exceedances are associated with the Z-01 Outfall that experienced a rain-induced discharge in 2013. Sampling has already been conducted to assess the extent of the cesium-137 within the outfall channel as noted in the sediment/soil (sediment) exceedance discussion presented above, and contaminated soil associated with the SDU has been removed. Since the extent of contamination has been established, contaminated soils associated with the SDU have been removed, and administrative controls are already in place for the area downgradient of the Z-01 Outfall, further investigation by the IOU program is not warranted.

Ecological Evaluation

For sediment and sediment/soil media, the ecological benchmark screening is conducted against both Tier I (in general, no effect value) and Tier II (low effect value) exceedances. The Tier II exceedances are used to focus the ecological assessment on Phase II IOU program initiatives prior to final action (Phase III) goals. Tier II 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 thresholds.

Sediment Tier I Exceedances:

- Tier I benchmark screening for UTR PR5 resulted in a benchmark exceedance for arsenic (benchmark = 7.24E+00) for the Tinker Creek subunit, with 1 exceedance out of 5 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. Two of the detects are from 2015 (UTR PR5 data) 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). Arsenic has been detected in background locations, upgradient of SRS operational influences, within the Upper and Tinker Creek subunits, and the highest reported value of 22.9 mg/kg is 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. Results further downgradient of the outfall are non-detects or within background. Arsenic did not exceed Tier II benchmarks for the Tinker Creek subunit. therefore, further evaluation by the IOU program is not warranted. In addition, the Z-01 Outfall is part of the SRS annual environmental report monitoring.

Sediment Tier II Level Exceedances

- There were no Tier II sediment exceedances for UTR PR5.
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Sediment/Soil Tier I Level Sediment Exceedances

- For Tier I sediment/soil exceedances, based on the sediment benchmarks for UTR PR5, there were exceedances in 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), nickel (benchmark = 1.59E+01 mg/kg), zinc (benchmark = 1.24E+02), and acetone (benchmark = 8.70E-03). Of these, arsenic and acetone were present with mean ratios >1.0 (arsenic 1.09, acetone at 15.1). The mean based on detected values for arsenic was greater than background, and for acetone, background was non-determinant as background levels were all non-detects. The mean detected value for arsenic is 7.87 mg/kg, greater than the 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. Acetone had a 75% frequency of exceedance (15 exceedances out of 20 analyses), however, acetone is a common laboratory artifact and does not require further evaluation. Arsenic, with a mean ratio >1.0, a frequency of exceedance >5%, and mean detected value greater than background, requires further discussion.

The Tinker Creek subunit exceedances for arsenic are associated with the Z-01 Outfall which experienced a rain-induced discharge in 2013. Sampling has already been conducted to assess the extent of contamination along the confluence, approximately 390 meters [m] from the Z-Area basin toward McQueen Branch. There are three samples for arsenic above background levels along this transect based on review of UTR PR5 data. The highest detected result (78.8 mg/kg) is from the Z-01 Outfall at the uppermost sampling location at the Z-Area basin. The second highest result (9.21 mg/kg) is located at the next downgradient sampling location ~15 m from the basin. The third highest result (7.31 mg/kg), approaching the background level (6.7 mg/kg), is located further downgradient (at the eighth-sampling location) ~145 m from the basin toward the mid-point of the sampling transect. The remaining arsenic samples dispersed along the transect were either below background or non-detects.

Since the extent of contamination has been established for this release, and soil removal is complete, further investigation by the IOU program is not warranted.

Sediment/Soil Tier II Level Sediment Exceedances

- Tier II exceedances were observed for arsenic, mercury, and zinc based on CCME (arsenic, mercury, and zinc), ORNL Median (arsenic) and ORNL Effects Level (arsenic and zinc) benchmarks. However, the early action consideration Tier II evaluation did not result in any constituents warranting further evaluation since mean ratios were <1.0 and frequencies of exceedances were 5% for all constituents (not $>5\%$). Therefore, further evaluation is not warranted based on the IOU Phase II screening conducted.

Sediment/Soil Tier I Level Soil Exceedances

- The Tier I ecological benchmark screening for the sediment/soil medium, based on soil benchmarks, resulted in exceedances for the Tinker Creek subunit, 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.

Aluminum ($2.11E-01$), 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. Since 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.

5.1 Problems Warranting Action (Early Action Only)

No early actions for sediment or sediment/soil are warranted based on the evaluation of UTR PR5 data.

5.2 Interim Remedial Action Objectives

- Protect the onsite worker from unacceptable risk (risk > 1×10^{-4} or HQ >3) from exposure to site-related contaminants in sediment or sediment/soil in the UTR IOU.
- Protect ecological receptors within the IOU (stream and wetlands) from unacceptable exposure (based on Tier II benchmarks and biological data) to site-related contaminants and biotic contaminant tissue burdens.

5.3 Scope of the Problem Warranting Early Action

No early actions were identified based on the evaluation of UTR PR5 data. The scope of future actions, if required, will be determined as the IOU continues with Phase II assessment.

5.4 Likely Early Response Actions

No early action response actions were identified based on the evaluation of UTR PR5 data.

5.5 Uncertainties

- There is uncertainty with the nature and extent of contamination in areas of the IOU yet to be sampled or associated with operable units (OUs) for which investigations have not been finalized. This uncertainty may result in data needs for the ongoing Phase II assessment.

Data Need/Evaluation: Data for the UTR IOU will be compiled and screened for future periodic reports. The data will be screened to determine if a sampling and analysis plan is required to satisfy the data needs. This data need is carried forward for future periodic reports during Phase II of the IOU program.

6.0 SURFACE WATER EXPOSURE MEDIA

The UTR PR5 evaluation is based on a subset of all data available (PR5 data). However, all data records are available to determine the significance of surface water exceedances. There are currently 14,839 analytical records in the UTR PR5 database for surface water appropriate for screening.

Human Health Evaluation

There were no SW benchmark exceedances for the onsite worker based on review of PR5 data.

Ecological Evaluation

For surface water, the ecological benchmark screening is conducted against both Tier I (in general, low effect value) and Tier II (in general, higher effect value) benchmarks. The Tier II exceedances are used to focus the ecological assessment on Phase II IOU program

initiatives prior to final action (Phase III) goals. Surface water Tier II benchmarks are based on ambient water quality criteria (AWQC) and ORNL Tier II thresholds.

Surface Water Tier I Level Exceedances

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

Constituents requiring additional evaluation include copper in the Tinker Creek subunit, and mercury in the Tims Branch subunit. The Tinker Creek subunit had copper exceedances with a mean ratio >1.0 ($1.18E+02$), a frequency of exceedance $>5\%$ (5.9%), and a mean of detected values ($1.74E-01$ mg/L) greater than background ($7.0E-02$ mg/L). There were copper exceedances in each subunit including background locations in the Tinker Creek and Upper subunit. Of the two 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 2 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.

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). 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. 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 = $1.80E-03$ mg/L) and DDD (benchmark = $6.40E-05$ mg/L).

Review of copper data shows three detects out of 34 analyses for UTR PR5 for the Tinker Creek subunit based on PR5 data. There are two results over the benchmark (0.07 mg/L). One copper exceedance is located in the upper portion of Tinker Creek

near the SRS boundary. This exceedance (0.004 mg/L) is located upgradient of any SRS operational discharges, occurred in a background area, and is below background (0.07 mg/L). The second 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 2 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 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 samples for DDD in the Tinker Creek subunit if historic data are also included. Prior to the acquisition of SRS by the federal government in the 1950's, the SRS landscape 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.

The Tier II evaluation also includes exceedances based on ORNL benchmarks. Constituents with mean ratios >1.0 , a frequency of exceedance $>5\%$, and with a mean detected value greater than background levels (or if background data are non-determinant) requiring 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. 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 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.

See Section 4 for a summary of the ecological health of the UTR IOU based on biological data.

6.1 Problems Warranting Action (Early Action Only)

No early actions for surface water are warranted based on the evaluation of UTR PR5 data.

6.2 Interim Remedial Action Objectives

- Protect the onsite worker from unacceptable risk (risk > 1×10^{-4} or HQ > 3) from exposure to site related contaminants in surface water.
- Protect ecological receptors within the IOU (stream and wetlands) from unacceptable exposure (based on Tier I and II benchmarks and biological data) to site related contaminants in surface water and biotic contaminant tissue burdens.

6.3 Scope of the Problem Warranting Early Action

No early actions were identified based on the evaluation of UTR PR5 data. The scope of future actions, if required, will be determined as the IOU continues with Phase II assessment.

6.4 Likely Early Response Actions

No early action response actions were identified based on the evaluation of UTR PR5 data.

6.5 Uncertainties

- There is uncertainty with the nature and extent of contamination in areas of the IOU yet to be sampled or associated with OUs for which investigations have not been finalized. This uncertainty may result in data needs for the ongoing Phase II assessment.

Data Need/Evaluation: Data for the UTR IOU will be compiled and screened for future periodic reports. The data will be screened to determine if a sampling and analysis plan is required to satisfy the data needs. This data need is carried forward for future periodic reports during Phase II of the IOU program.

7.0 IOU STRATEGY

As Phase II continues, IOU data, new OU information, and pertinent OU characterization data will be incorporated into the UTR IOU GIS project, and periodic assessment will be conducted to refine the CSM. Phase III of the UTR IOU (completion of the RI/FS) will be conducted after remedial decisions for the OUs in the UTR watershed have been made. SRS missions are planned to continue in the industrial areas within the UTR watershed. Accordingly, the Phase III Assessment (RI/BRA, FS, and ROD) is currently scheduled to begin in fiscal year 2058.

The IOU ecological and human health benchmarks will be updated pending approval of the *Remedial Investigation/Baseline Risk Assessment for the Lower Three Runs Operable Unit (U)*, (SRNS-RP-2017-00139). It is anticipated that the revised benchmarks will be used in the upcoming Steel Creek PR 6 report due for submittal in September 30, 2018 and future PRs.

8.0 RECORD OF CORE TEAM AGREEMENTS AND KEY CHANGES

This section includes a Record of Core Team Agreements and Key Changes to the scoping summary.

RECORD OF CORE TEAM AGREEMENTS¹	
Date	Description of Agreement
Feb 23, 2005	<p><u>PR1 Scoping Summary</u></p> <p>The PR1 scoping summary documented that Steed Pond is now administratively part of the UTR IOU.</p>
July 10, 2002	<p><u>RI Work Plan Scoping Meeting</u></p> <p>The Core Team agreed the Three Rivers Landfill and New Ellenton treatment plant will be depicted as potential non-SRS contaminant sources.</p>

¹ Core team agreements are documented at each scoping phase and retained for each successive phase to maintain a comprehensive list for the life of the project.

KEY CHANGES TO SCOPING SUMMARY²			
Date	Section	Description	Rationale for Change
January 5, 2018	All	Updated all sections of scoping summary based on UTR PR5 data screening.	Scoping summary revised to support UTR PR5 and PR5 sediment, sediment/soil, and surface water data.
February 20, 2018	All	Updated applicable sections to reflect Core Team comments.	Scoping summary revised to address comments from the UTR PR5 scoping meeting held February 1, 2018

² The Key Changes table identifies significant changes from the previous scoping summary. The Key Changes table is not a continuous list and is updated each time the scoping summary is revised.

Figure 1. Upper Three Runs Subunits

