

MEETING NOTES

Waste Management Area A-AX: Briefing on Focus Area 2 and Field Updates on Focus Area 1

MEETING DATE: March 5, 2019

LOCATION: 2440 Stevens Center Boulevard, Room 1600, Richland, WA

ATTENDEES:

Jim Alzheimer (Ecology)	Jim Field (WRPS)	Julie Robertson (Freestone)
Mike Barnes (Ecology)	Doug Hildebrand (DOE-RL)	Beth Rochette (Ecology)
David Becker (WRPS)	Bob Hiergesell (WRPS)	Kim Schuyler (Freestone)
Jan Bovier (DOE-ORP)	Jon Lindberg (Ecology)	Marysia Skorska (Ecology)
Damon Delistraty (Ecology)	Rod Lobos (DOE-ORP)	Cindy Tabor (WRPS)

BACKGROUND INFORMATION: Between January and August 2017, representatives of the Washington State Department of Ecology (Ecology), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy Office of River Protection (DOE-ORP), the U.S. Department of Energy Richland Operations Office (DOE-RL), Washington River Protection Solutions (WRPS), and CH2MHILL Plateau Remediation Contractor (CHPRC) participated in a series of meetings to develop data quality objectives (DQO) for Waste Management Area (WMA) A-AX vadose zone soil. The results of those meetings are documented in *Data Quality Objectives for Vadose Zone Characterization at Waste Management Area A-AX* (RPP-RPT-60227, Rev. 0; henceforth called the DQO Report). In April 2018, WRPS issued *Sampling and Analysis Plan for WMA A-AX Focus Area 1 (Tanks 241-A-104 and 241-A-105)* (RPP-PLAN-62041, Rev. 0) and subsequently initiated fieldwork at WMA A-AX to meet the data needs identified in the DQO Report. WRPS and DOE-ORP have continued to work with Ecology and are now preparing to issue a revision to the DQO Report to address DQOs for WMA A-AX Focus Area 2.

PURPOSE OF MEETING: This meeting was called to provide the organizations that participated in the development of the DQO Report with a status of field activities at WMA A-AX Focus Area 1, and a briefing on Revision 1 of the DQO Report that addresses data needs at WMA A-AX Focus Area 2.

DISCUSSION:

Field Updates on Focus Area 1:

Pointing to a large map of the WMA A-AX area, Ms. Tabor identified the locations of Focus Areas 1 and 2 and the associated sampling locations at the 241-A Tank Farm.

Fieldwork Status

Ms. Tabor discussed the status of activities at the five Focus Area 1 drilling locations identified in the DQO Report.

- Location C9385/C9386 has been logged and sampled. The direct push holes were backfilled without electrodes because electrodes have already been installed close by.
- Location C9391 has been re-pushed due to a break in the tubing, and geophysical logging has been started; no samples have been collected from C9392.
- Location C9395 has been logged; no samples have been collected from C9396.

- Location C9393 has been logged; four samples have been collected from C9394.
- Work has not started at C9387/C9388 due to complications with finding a suitable location due to infrastructure and retrieval activities.

Ms. Tabor noted that all the completed direct push holes met target depths. She added that field work has been impacted by re-starting the field program, pushing the technology further than before (i.e., deeper depths), broken tubing, weather, and the down-hole loss of a geophysical logging tool. Lessons learned have been considered and process improvements made as field work progresses.

Quick-Turn Results

Ms. Tabor reviewed quick-turn laboratory results from vertical push location C9386 (all depths) and angled push location C9394 (three depths), emphasizing that the results are preliminary in nature. The meeting participants discussed the following observations.

- Technetium-99 results from both C9386 and C9394 were non-detect. The meeting attendees noted that a smaller, finer-grained, or more porous sample might have a higher detection limit.
- Results from C9386 at 273-277 ft bgs indicate elevated moisture, nitrate, and conductivity. There is also an elevated moisture peak from 132-133.5 ft bgs in this hole. **ACTION: Ms. Tabor to provide a comparison of the analytical moisture measurements and the geophysical logging moisture results.** Mr. Barnes noted the existence of a positive correlation of nitrate and technetium-99 at the 241-TX Tank Farm, but no such correlation is indicated by the quick-turn samples at C9386.
- Results from C9394 at 12-14 ft piperun indicate unusually high pH levels within the backfill material.
- Results from C9386 show an unusual inverse relationship between pH levels and conductivity (elevated) at depth.

Mr. Barnes noted that as characterization work continues, the meeting participants should keep in mind that contamination was detected in groundwater before A Farm was used.

Briefing on Focus Area 2:

Ms. Tabor referred to a PowerPoint presentation onscreen and a handout (Attachment 1) as she discussed the proposed work in Focus Area 2. Attachment 1 summarizes the strategy for selecting direct push locations in Focus Area 2; sample depths and type of testing or evaluation at each depth; and the list of physical, contaminant, and geochemical properties to be included as a "Special Study."

Boundary of Focus Area 2

Ms. Tabor noted that in August 2018, Ecology documented their selection of the area around two corroded groundwater wells just outside the WMA A fenceline as Focus Area 2 (Action 2017-03-30-03). Mr. Barnes confirmed he approved the proposed Focus Area 2 boundary.

Purpose of the Investigation

The purpose of characterization work in this area is to determine whether corrosion of well casings southwest of A Farm is associated with releases from A Farm. The wells are ~200 ft from Tanks A-104 and A-105. The corrosion occurs in the vadose zone at ~260 ft bgs. Sediment underlying the tanks is thought to be highly conductive. There has been a documented significant water loss in the area of the tanks. Flow and transport studies indicate that contaminants can move rapidly through the unsaturated vadose zone to the groundwater. *Interim-Status Groundwater Quality Assessment Plan for the Single-Shell Tank Waste Management Area A-AX* (DOE/RL-2015-49) concludes that the most likely cause of the corrosion is chloride associated with historic powerhouse releases to the 200-E-286 Ditch, which runs through the southwest corner of A Farm. Mr. Barnes noted that *Investigation of Accelerated Casing Corrosion in Two Wells at Waste Management Area A-AX* (PNNL-15141) also indicate the presence of elevated sulfate, which may be from sulfuric acid used to sluice the tanks in A Farm. Mr. Barnes added that the backfill used in A Farm was excavated from a portion of the 200-E-286 Ditch and was reused when the single-shell tanks were installed; thus, he recommends sampling the backfill at Focus Area 2.

Proposed Locations

Ms. Tabor stated that three Focus Area 2 locations were proposed for sampling based on the following.

- Ground penetrating radar, walk-downs, and document reviews indicate there are minimal physical interferences.
- The locations are south of A-105.
- The locations are near the corroded wells.
- The locations are near the 200-E-286 Ditch.

ACTION: Mr. Barnes will review the proposed Focus Area 2 characterization locations and provide feedback.

Two of the proposed sample holes will be installed inside the A Farm fenceline using direct push. The third, large-diameter borehole will be installed south of the A Farm fenceline using sonic technology.

Proposed Sample Depths and Analyses

Ms. Tabor stated that DOE/WRPS are proposing to sample for standard chemical, radiological and basic physical properties at the same number of depths in each Focus Area 2 location as at Focus Area 1 locations (10). Back to back samples will be collected to see if “Special Study” analysis can be performed.

Ms. Tabor stated that installation of the larger diameter hole south of the fenceline will generate a greater volume of sampled material, which will be used for a Special Study to support DQO Principle Study Questions 2 and 4 and the WMA A-AX performance assessment. Additional physical property testing will be performed at five depths in the large-diameter borehole south of A Farm. Ms. Tabor described using a tiered approach to contaminant and geochemical property evaluations to be performed at an additional 10 sample depths as a “Special Study” at Focus Area 2. Each successive tier will be completed based on results from the previous tier. A select set of constituents (e.g., chloride, fluoride, technetium-99) already analyzed as part of the standard analysis called out in the DQO may be

analyzed again under “Tier I” to inform the decision about whether to perform evaluations in subsequent tiers. Ms. Tabor noted that the intent is to have a different laboratory perform the special study analyses so that results can be returned more quickly.

Ms. Skorska asked whether the samples from Focus Area 2 would be representative of A Farm. Ms. Tabor and Mr. Barnes stated that they and personnel associated with the WMA A-AX performance assessment believe the samples will be representative.

Dr. Rochette expressed concern about the proposed “Special Study” tiered approach and how the results will be used. Mr. Barnes stated that Ecology representatives had been given the opportunity to review the draft revision of the DQO Report but had not commented on the proposed approach. Ms. Tabor stated that the proposed approach will be detailed in the future Focus Area 2 sampling and analysis plan (SAP) that Ecology will have an opportunity to review and approve. Dr. Rochette requested access to the analytical results from 222-S. **ACTION: Ms. Tabor will provide Ecology with final laboratory report when it is released.**

Mr. Hildebrand stated that at Savannah River and Oak Ridge, the presence of iron and organics in soil influence the iodine distribution coefficient (Kd). He suggested that the proposed tiered approach may need to take that into account. **ACTION: During the development of the Focus Area 2 SAP, Ms. Tabor will research whether to modify the tiered approach based on work at Oak Ridge and Savannah River regarding soil property affects on iodine speciation.**

Primary Changes to DQO Report Rev. 1

Ms. Tabor identified the primary changes being made as part of Revision 1 to the DQO report:

- Addition of Appendix D for Focus Area 2
- Update to the conceptual site model information
- Removal of residential scenario/unrestricted land use references in risk assessment, to be consistent with Central Plateau Inner area principles
- Use of cerium-bromide geophysical logging tool and sonic drilling technology
- Elimination of volatile organic compounds, dioxins, furans from the list of potential WMA A-AX constituents
- Revision of Decision Rule 1 to delete reference to using maximum detected concentrations in relation to acceptable levels.

Dr. Rochette suggested that the unrestricted use scenario should not be removed because the tank farms are treatment, storage, and disposal units (TSDs).

Mr. Barnes stated that he agreed with the elimination of volatile organic compounds, dioxins, furans, and the removal of acceptable levels for the residential scenario for WMA A-AX. Dr. Rochette expressed concern about these two changes because dioxins and furans were detected in groundwater near WMA A-AX. Ms. Tabor stated that while these changes have already been incorporated into the draft revision

of the DQO Report, they will also be reflected in the future WMA A-AX Focus Area 2 SAP and the future WMA A-AX RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) Work Plan, both of which Ecology will have an opportunity to review and approve. Dr. Rochette stated that she expects that the RFI/CMS Work Plan will be consistent with the requirements of WAC 173-340 and Ecology guidance regarding the use of maximum detected concentrations and determination of acceptable levels.

ACTIONS: Ms. Robertson reviewed the status of actions that remained open as of the August 31, 2017, WMA A-AX DQO development meeting. A summary of this information is provided in Table 1 below. Table 1 also incorporates new actions recorded at this meeting.

- Action 2017-03-30-03: Mr. Barnes stated that future investigation near Tanks A-103, AX-102, and AX-104 may be of value. These tanks were formerly identified as leakers but have more recently been recategorized as non-leakers.
- Action 2017-08-07-09: Mr. Barnes expressed a desire to expand the boundary of WMA A-AX to encompass disposal units beyond the fenceline. He referred to the presence of technetium-99 outside the fenceline and stated that the project should be looking at PUREX-related waste as a possible source for some contaminants, as opposed to waste from the single-shell tanks. (See discussion under Action 2017-08-31-06). Ms. Skorska stated that defining the boundary of WMA A-AX should be addressed sooner rather than later. Mr. Hildebrand stated that there are active discussions related to the 200-IS-1 Operable Unit regarding how to manage pipelines that could influence decisions WMA boundaries. **ACTION: Mr. Hildebrand will discuss the matter with DOE-RL and CHPRC counterparts and report back.**
- Action 2017-08-31-06: Ms. Robertson stated that language has been added to the draft revision of the DQO Report supporting eliminating evaluation of dioxins and furans at WMA A-AX. Dr. Rochette repeated her concern about eliminating these evaluations. Tributyl phosphate (TBP) has been identified in tank waste, and small amounts of dioxins and furans have been identified in tank head space. Mr. Barnes stated his belief that it would be more valuable to investigate the possible presence of dioxins and furans at the 216-A-2 Crib than at WMA A-AX. This crib received organic waste (TBP) from the Plutonium-Uranium extraction (PUREX) process. He noted that TBP polymerizes to furans. **ACTION: Mr. Barnes will provide information on the disposal of TBP to the 216-A-2 Crib.**
- Action 2017-03-31-08: Ms. Tabor noted that the decision rule was modified to remove reference to using the maximum concentration in a sample compared to the acceptable levels in revision 1 of the DQO Report. Dr. Rochette commented that the maximum concentration of a constituent should be used in risk assessment for all judgmental samples, not a 95% UCL. Ms. Tabor repeated that the matter will be addressed in the future WMA A-AX RFI/CMS Work Plan that Ecology will have the opportunity to review and approve.

Rodrigo Lobos
DOE Project Manager (print)


DOE Project Manager (signature)

9/10/19
Date

Michael W Berner
Ecology Project Manager (print)


Ecology Project Manager (signature)

4-11-19
Date

Table 1. Actions (3 pages)

Action Number	Actionee	Description	Status
2017-03-30-03	Lyon/Bovier	Ecology and DOE-ORP will identify whether there are other potential WMA A/AX focus areas of interest and their level of interest in other focus areas relative to the Tanks A-104/105 focus area. 8/31/17: Ecology identified the areas near Tanks A-103, AX-102, and AX-104 as being of interest. Retain as open item for draft DQO summary report.	Remains open. In an email dated 08/24/2018, Ecology documented their selection of the area around two corroded groundwater wells just outside the WMA A fenceline as Focus Area 2.
2017-04-13-02	Bovier/Lyon	Discuss how DQO Step 4, define the boundaries of the study, will be addressed for the whole of WMA A-AX. See related Action 2017-08-07-09.	Remains open.
2017-05-25-01	Tabor	Evaluate borehole placement/configuration after getting updated GPR results.	Close. Adjustments were discussed with Ecology, and final borehole placement/configuration is documented in RPP-PLAN-62041, Rev. 0.
2017-08-07-05	Tabor	Provide Ecology WMA C Phase 2 language regarding use of 95% UCL.	Closed. Action was to email WMA C Phase 2 language, which was provided 8/9/17 to Beth Rochette. Open UCL issue is covered in action 2017-08-31-08.
2017-08-07-09	Bovier/Hildebrand	To support Action 2017-04-13-02, DOE representatives will meet to discuss how to address areas outside the WMA A-AX fenceline that are not yet identified in the 200-IS-1 Operable Unit.	Remains open.
2017-08-31-01	Tabor	ORP/WRPS will look into using a VOC field screening tool at A-104/105.	Close. Tanks A-104/105 Focus Area (Focus Area 1) is being sampled in accordance with RPP-PLAN-62041, Rev. 0. Language in DQO Report Rev.1 eliminates analysis of VOCs at WMA A-AX.
2017-08-31-02	Tabor	Pull text from page 1 of 8/31/17 Handout #1 into DQO report ("Similar WMA C analyses...requirements of new laboratory contractors.").	Closed. Text was incorporated into DQO Report Rev. 0.
2017-08-31-03	Bovier/Lyon	Ecology, DOE-ORP, and WRPS will continue discussions on where at WMA A-AX to perform a VOC study and what VOCs to analyze.	Close. Language in DQO Report Rev.1 eliminates analysis of VOCs.

Table 1. Actions (3 pages)			
Action Number	Actionee	Description	Status
2017-08-31-04	Tabor	Remove color coding from Table 6 to reduce confusion.	Closed.
2017-08-31-05	Tabor	Add justification for not doing dioxin/furan sampling at the A-104/105 focus area to the draft DQO summary report and to the DQO meeting handout.	Closed. Justification was incorporated in DQO Report Rev. 0.
2017-08-31-06	Bovier/ Hildebrand/ Lyon	Ecology, DOE-ORP, and WRPS will continue discussions regarding the need to analyze WMA A-AX vadose zone soil samples for dioxins and furans.	Close. Language in DQO Report Rev.1 eliminates analysis of dioxins and furans.
2017-08-31-07	Tabor	When they become available, provide issued reports to Ecology with information about VOCs found in 200-DV-1 Operable Unit boreholes.	Close. The requested 200-DV-1 documents were provided to Ecology. The document numbers and titles were also emailed to Ecology on 11/27/2018.
2017-08-31-08	Bovier/ Hildebrand/ Lyon	Ecology, DOE-ORP, and WRPS will continue discussions about WMA A-AX Decision Rule and Performance Criteria text on data evaluation (e.g., use of 95% UCL).	Remains open. Refer to Section 6.2 in DQO Report Rev. 1, which states: "Use of acceptable levels will be documented during the development of the WMA A-AX RFI/CMS Phase 2 Work Plan. Additionally, cumulative risk calculations will be documented during the development of the WMA A-AX RFI/CMS Phase 2 Work Plan."
2017-08-31-09	Tabor	Text about groundwater information was presented to Ecology at the 8/31/17 meeting and was accepted. Incorporate the text into draft DQO summary report.	Closed. Text was incorporated in DQO Report Rev. 0.
2017-08-31-10	Tabor/ Rochette	Ms. Tabor will email Table 6 revisions to Dr. Rochette, who will review and respond.	Closed. Table 6 was emailed to Ecology on 09/07/2017. Ecology responded by email on 09/07/17 and 09/08/17.
2017-08-31-11	Tabor/ Rochette	Ms. Tabor will email Table 8 revisions to Dr. Rochette, who will review and respond.	Closed. Table 8 was emailed to Ecology on 09/07/2017. Ecology responded by email on 09/07/17 and 09/08/17.
2019-03-05-01	Tabor	Provide a comparison of the analytical moisture measurements and the geophysical logging results.	New.
2019-03-05-02	Barnes	Review the proposed Focus Area 2 characterization locations and provide feedback.	New.

Table 1. Actions (3 pages)

Action Number	Actionee	Description	Status
2019-03-05-03	Tabor	Provide Ecology with final laboratory report when it is released.	New.
2019-03-05-04	Tabor	During the development of the Focus Area 2 SAP, research whether to modify the tiered approach based on work at Oak Ridge and Savannah River.	New.
2019-03-05-05	Hildebrand	Report back on RL discussions about management of pipelines just outside tank farm fencelines as a part of 200-IS-1 OU.	New.
2019-03-05-06	Barnes	Provide information on the disposal of TBP to the 216-A-2 Crib	New.

Attachment 1

Handout for Focus Area 2

Handout for Focus Area 2

Location Strategy for Focus Area 2

Borehole ID	Approximate Location	Input Factors Associated with Location	Target Depth (bgs)
		Reason for Sampling	
D0012 Large Diameter Borehole	Southwest of decommissioned well 299-E25-46 (Vertical borehole)	<ul style="list-style-type: none"> Downgradient of Tanks A-104 and A-105 Outside A Farm Near two wells (299-E25-46 and 200-E25-236) with casing corrosion Investigate zones of cementation with carbonate matrix, "limonite staining", and "confining layer" noted in borehole log from well 299-E25-46 at 275 ft bgs. Determine "Special Study" physical properties for primary lithologic units. Quantify contaminant mobility, if contamination is found. <hr/> <p>Assess magnitude of contamination for modeling, risk, and nature and extent. Determine "Special Study" physical properties for primary lithologic units and Quantify contaminant mobility, if contamination is found ("Special Study").</p>	290 ft
D0005/D0006 Direct Push	East of decommissioned well 299-E24-19 (Vertical push)	<ul style="list-style-type: none"> Within the previous footprint of 200-E-286 Ditch. Downgradient of Tanks A-104 and A-105 Quantify contaminant mobility, if contamination is found. <hr/> <p>Assess magnitude of contamination for modeling, risk, and nature and extent and Quantify contaminant mobility, if contamination is found ("Special Study").</p>	290 ft
D0007/D0008 Direct Push	Southeast of decommissioned well 299-E24-19 (Vertical push)	<ul style="list-style-type: none"> Downgradient of Tanks A-104 and A-105 Near one well (299-E24-19) with casing corrosion Investigate dark reddish brown (rust colored) sand and low level radiological contamination at 187 ft bgs seen at well 299-E24-19 Investigate cemented sand that "could possibly be a barrier to contaminant transport" from 189 to 190 ft bgs seen at well 299-E24-19. Quantify contaminant mobility, if contamination is found. <hr/> <p>Assess magnitude of contamination for modeling, risk, and nature and extent and Quantify contaminant mobility, if contamination is found ("Special Study").</p>	290 ft

bgs = below ground surface

Handout for Focus Area 2

Large Diameter Borehole - Approximate Sample Depths and Evaluations

Lithologic Unit	Zone of Interest	Type of Testing and Evaluations Required			Rationale (from nearby well 299-E25-46)
		Standard Analysis (ft bgs) ^{a,b}	“Special Study” Physical property tests (ft bgs) ^{a,c}	“Special Study” Contaminant and geochemical properties (ft bgs) ^{a,d}	
Backfill	Surface	Surface	-	-	Shallow risk assessment
H1	7-9	7-9	-	-	Shallow risk assessment
	12-14	12-14	-	-	Shallow risk assessment
	22-26	22-24	-	24-26	Sandy silt lens
	50-52		50-52	-	“Silty pebble sand”
	95-99	95-97	-	97-99	Intermediate sample depth. Increase vertical profile of constituent distribution.
H2	135-137		135-137	-	“Silty sand,” increase in gross gamma signature
	164-170	164-166	168-170	166-168	Increase in total gamma, partially due to change in casing size, but there does appear to be an increase in silt content beginning at 164 ft bgs with calcium carbonate cementation noted in borehole log
	195-199	195-197	-	197-199	Limonite staining, carbonate cementation
	256-260	256-258	-	258-260	Carbonate cementation
CCuz	272-278	272-274	276-278	274-276	“Silt” in CCuz. Zone of cementation with carbonate matrix, “limonite staining”, and “confining layer”
CCug	284-290	284-286	288-290	286-288	“Silty pebble sand” in CCug

a. Depths may be adjusted based on sampling technique and actual field conditions.

b. Analyses identified in Table 6-1 and 6-2

c. Physical property tests identified in Table D-4 and Table 6-1.

d. Testing and evaluations as appropriate, identified in Tables D-5, D-6, and D-7 (i.e., Tiered Analysis Approach).

bgs = below ground surface

CCug = Cold Creek unit gravels

CCuz = Cold Creek unit silt

H1 = Hanford formation unit 1

H2 = Hanford formation unit 2

Handout for Focus Area 2

Special Study Evaluations

Physical properties
Measurements will be used for the purpose of fate and transport modeling at WMA A-AX. Physical Properties to be measured at 5 sample depths include: <ul style="list-style-type: none">• Soil pictures and geologic description• Particle density, and porosity• Bulk density• Total carbon and total inorganic carbon• Particle size distribution• Saturated and unsaturated hydraulic properties
Contaminant and geochemical properties
Tier I: Needed to determine contaminant mobility and will be tested using a tiered approach. If quick turn results indicate contamination may be present, a Tier I evaluation will be performed. Tier I evaluations include: <ul style="list-style-type: none">• Bulk density and weight fraction• Percent water• Soil pictures and geologic description• Specific conductance• Particle size distribution• pH• Chloride• Fluoride• Sulfate• Nitrate• Technetium-99• Iodine-129 and total Iodine• Total uranium and uranium (VI)• Strontium-90• Cesium-137
Tier II: If contamination is confirmed in Tier I, then Tier II evaluation will be performed. Tier II targets geochemical properties that provide evidence for contaminant associations with sediment phases. Tier II evaluations include: <ul style="list-style-type: none">• Major anions• Major cations• Alkalinity• Sequential extractions• 1,000-hour carbonate extraction• Total carbon, total inorganic carbon, total organic carbon• Iodate and iodide (only if I-129 is present in a sample from Tier I analysis)
Tier III: Tier III analyses will be performed for those constituents and mechanisms of interest identified from Tier I and II analyses. Tier III evaluates and quantifies attenuation mechanisms and impacts from tank waste that affect contaminant mobility. Tier III evaluations include: <ul style="list-style-type: none">• X-ray diffraction• Sequential suite of electron microscopy analyses• Column and batch tests• Iron and manganese redox species

Handout for Focus Area 2

Decision Rules and Specification of the Estimator^a

Step 2		Step 5
Principal Study Question	Decision/Estimation Statement (DS/ES)	Decision Rule/Specification of the Estimator (DR/E)
#1— Does contamination in the WMA A-AX vadose zone soil exceed acceptable levels?	#DS 1 — Determine whether contamination exceeds acceptable levels and, therefore, whether there is a need to evaluate corrective measures.	#DR 1 IF acceptable levels in Table 6-1 or Table 6-2 are identified as being exceeded during risk evaluations, THEN further evaluation will occur during the RFI/CMS ^b .
#2 – Is information available to define the chemical/physical properties of WMA A-AX vadose zone soil that can impact contaminant movement through the WMA A-AX vadose zone soil?	#ES 2 – The chemical/physical properties of WMA A-AX vadose zone soil that can impact contaminant movement through the soil will be defined and estimated. It is expected that vadose zone soil will be shown to have chemical and physical properties that can affect contaminant movement through the soil.	#E2 The best measurement of chemical and physical properties in WMA A-AX vadose zone soil that can impact contaminant movement through the soil will be estimated, and their impact on contaminant movement through the soil will be evaluated.
#3 – Is information available to define the chemical/physical properties of tank waste that can impact contaminant movement through the WMA A-AX vadose zone soil?	#ES 3 – The chemical/physical properties of WMA A-AX tank waste that can impact contaminant movement through the soil will be defined and estimated. It is expected that tank waste will be shown to have chemical and physical properties that can affect contaminant movement through the soil.	#E3 The best available measurements of chemical and physical properties in WMA A-AX tank waste that can impact contaminant movement through the soil will be estimated, and their impact on contaminant movement through the soil will be evaluated.
#4 – Is information available to define whether, and where, tank waste passed through portions of the WMA A-AX vadose zone soil?	#ES 4 – Chemicals and radionuclides in tank waste, as well as naturally occurring vadose zone soil constituents that are altered in the presence of tank waste in the environment, will be identified and their concentrations estimated. It is expected that tank waste contains indicator constituents that would remain in soil at detectable levels even after the bulk of the waste has passed through. Their detectable presence in the soil, even at low concentrations, could indicate that waste passed through those portions of the soil. It is also expected that as tank waste passed through the vadose zone soil, chemical reactions may have altered the levels of naturally occurring vadose zone soil constituents, potentially indicating that waste passed through those portions of the soil.	#E4A The concentrations of naturally occurring vadose zone soil constituents that are altered in the presence of tank waste in the environment will be estimated to evaluate where waste may have passed through portions of the soil. #E4B The concentrations in vadose zone soil of chemicals and radionuclides that can act as tank waste markers will be estimated to evaluate where waste may have passed through portions of the soil.

a. Data types to address PSQs are identified in Step 3 (Section 4.0, Table 4-1). Data collected to address PSQ #1 will also be used to address PSQs #2, #3, and #4. Data used to address PSQs #2, #3, and #4 will support development and refinement of the conceptual site model.

b. Use of acceptable levels will be documented during the development of the WMA A-AX RFI/CMS Phase 2 Work Plan. Additionally, cumulative risk calculations will be documented during the development of the WMA A-AX RFI/CMS Phase 2 Work Plan.