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MEETING NOTES
Data Quality Objectives for the Waste Management Area A-AX

MEETING NUMBER: WMA-A-AX-DQO-2017-4
MEETING DATE: April 13, 2017
LOCATION: 3110 Port of Benton Boulevard, Richland, WA
ATTENDEES:

Jim Alzheimer (Ecology)	Jim Field (WRPS)	Beth Rochette (Ecology)
Mike Barnes (Ecology)	Paul Gassman (WRPS)	Kristin Singleton (WRPS)
Marcel Bergeron (WRPS)	Bob Hiergesell (WRPS)	Harold Sydnor (WRPS)
Jan Bovier (DOE-ORP)	Melissa Holm (WRPS)	Cindy Tabor (WRPS)
Joe Caggiano (Ecology)	Scott Luke (WRPS)	Robin Varljen (WRPS)
Ryan Childress (TerraGraphics)	Alan Olander (WRPS)	Mign Walmsley (Ecology)
Kathi Dunbar (WRPS)	Julie Robertson (Freestone)	

BACKGROUND INFORMATION: These meetings are to promote discussions among 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), and Washington River Protection Solutions (WRPS) to develop data quality objectives (DQO) for Waste Management Area (WMA) A-AX vadose zone soil. Representatives from the DOE Richland Operations Office (DOE-RL) and the Central Plateau contractor (CH2MHILL Plateau Remediation Contractor [CHPRC]), were invited to participate to promote integration. A DQO process for the same purpose was started in 2011 but was suspended prior to completion in May 2011. Agreements and progress made as part of the 2011 effort will be leveraged in support of the current DQO process.

Lists of agreements and actions (including the status of any actions) are documented in the meeting notes.

PURPOSE OF MEETING: This meeting was called to continue the WMA A-AX vadose zone characterization DQO process initiated in January 2017.

STATUS OF PRIOR MEETING NOTES: Ms. Tabor stated that meeting notes for the March 1, 2017, meeting (Meeting #2) were in Ecology review and that the meeting notes for the March 30, 2017 meeting (Meeting #3) were in internal review.

DISCUSSION: Ms. Tabor provided Handout #1 to support the discussion.

1. **General Schedule**: Ms. Tabor provided a preliminary schedule for the remainder of this DQO process (Handout #1, Agenda). The overall schedule goal is to complete a draft DQO summary report this fiscal year. Intermediate steps will be to discuss sample locations in May and August, the constituent list in June, and DQO steps 5 and 6 in July. See action **2017-04-13-01**.

2. **Approach**: Ms. Tabor led a discussion of the proposed DQO approach to applying the results of each DQO step to the Tanks A-104/105 focus area DQO and also to WMA A-AX as a whole (Handout #1, Attachment 1). There was a recognition that further discussion will be needed to reach agreement on Step 4 regarding the definition of the WMA A-AX boundary.

3. **Information on Tank A-104 DQO**: Ms. Tabor stated that the planned DQO process for Tank A-104 is scheduled for fiscal year 2018. She noted that the scope and objectives have not been defined yet.

4. **Review Results of DQO Steps 1 and 2**: Referring to Handout #1, Attachment 2, Ms. Tabor highlighted a proposed change to one of the previously agreed-upon objectives of the DQO. ~~(See Agreement 1 below.)~~ The first bullet under Objectives was changed to read "Define the WMA A-AX vadose zone characterization data necessary to guide planning to make vadose zone soil remedial decisions, support an evaluation of risks by direct contact and to ecological receptors, and support integration of vadose zone and groundwater decisions." The change was made to clarify the last part of that objective. The attendees supported the proposed change.

   Ms. Tabor also identified that an Estimation Statement that was not previously discussed was added below Table 2 of Attachment 2 to Handout #1.

   Ms. Tabor provided Handout #2, which listed Principal Study Questions (PSQs), Proposed Alternative Actions (AAs), and Decision Statements (DSs) that had been shared in a previous meeting, as well as proposed updated PSQs, AAs, and DSs. Ms. Tabor described the proposed changes, noting that the changes were intended to provide clarification of the PSQs and DSs. The updated Table 2 contained five rather than four PSQs/DSs, because one of the prior four (old #3) was divided into two separate PSQs/DSs (new #3 and #4).

   The attendees modified the new PSQ #5 from "Does the available contaminant concentration data provide sufficient information to determine whether waste passed through the WMA A-AX vadose zone soil?" to "Does the available contaminant concentration data provide sufficient information to determine whether and if so where waste passed through the WMA A-AX vadose zone soil?" The attendees generally supported the updated Table 2 (PSQs and DSs).

5. **Step 3 and Step 4**: Referring to Handout #1, Attachment 3, Tables 3 and 4, Ms. Tabor led a discussion of Step 3 of the DQO process (identify information inputs). On Table 3, Ms. Rochette expressed concern about the inclusion of "MTCA Method C for cleanup" in the table. Ms. Tabor proposed striking that from the table. Ms. Rochette also asked which requirement identified 500 mrem/yr above background as a threshold level. No specific change was proposed, but an action was taken (**2017-04-13-04**). Finally, Ms. Tabor pointed out the inclusion of "background levels" on the last line of Table 3, as shown below. See action **2017-04-13-03**.

Table 3. Bases for Identification and Setting of Acceptable Levels for Decision Statements				
PSQ/DS	**Constituents of Concern (COC)**	**Basis [source] for Protection Threshold**	**Acceptable Levels**	**Basis for Setting Acceptable Levels**
2, 5	Radiological and chemical	NA	Contaminant specific; Hanford site soil background levels and fate and transport modeling	• Soil background levels and fate and transport analyses of past leaks

   The attendees then discussed Handout #1, Attachment 3, Table 4. A note was added beneath Table 4 as follows: "Note: Reinterpreting available data (e.g., surface geophysical exploration data) and/or determine if analysis on existing cores could be performed."

   The parties then discussed Step 4 of the DQO process (define the boundaries of the study) for the Tanks A-104/105 focus area. Ms. Tabor expressed a need to establish a relatively small focus area physically close to Tanks A-104/105 to ensure fieldwork can proceed in a timely fashion. Mr. Barnes expressed a desire to include evaluation of information from wells farther from Tanks A-104/105, where data analysis indicates the presence of technetium that he is concerned is a result of releases from Tanks A-104/105. An agreement was not reached on boundaries, but two actions were taken (**2017-04-13-02** and **2017-04-13-05**).

AGREEMENTS AND ACTIONS: A summary of agreements and actions are provided in the tables below. Several new actions were recorded at this meeting.

NEXT MEETING: Ms. Tabor proposed holding the next meeting in three to four weeks, or in early May 2017.

JAN B BOVIER	Jan B Bovier	5/24/2017
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Michael W Barnes	Michael W Barnes	5/25/2017
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

DATE	AGREEMENTS
01/26/2017	1. DOE-ORP acknowledged the need for a Phase 2 RFI at WMA A-AX.
01/26/2017	2. Available tank waste and concrete condition information will be considered for inclusion in the RFI/CMS report(s).
01/26/2017	3. Problem Statement: "Vadose zone contamination in and adjacent to the A-AX Tank Farms my pose a current and future risk to human health and the environment, including groundwater, that requires corrective action to support closure."
03/30/17	4. The DQO will move forward with a modified scope. The DQO will evaluate the Tank 241-A-104/105 focus area. Additional information is needed on an accelerated timeline regarding the movement of contaminants in the environment that came from releases from these tanks. Information from the resulting investigation will inform the development of the model being developed for the 241-A/AX performance assessment.

ACTIONS (3 pages)			
Action Number	**Actionee**	**Description**	**Status**
2017-01-26-02	Radloff	Locate the Woodward-Clyde document and verify whether it is available for public release.	In progress. The document is *An Estimate of Bottom Topography, Volume and Other conditions in Tank 105A, Hanford, Washington,* WCC Project 1397A – 0300. Its clearance status is under investigation with the intent being to ensure it is available to the public.
2017-03-30-01	Tabor	Provide copy of internal lessons learned notes to Ecology.	Closed 4/13/2017.

ACTIONS (3 pages)			
Action Number	**Actionee**	**Description**	**Status**
2017-03-30-02	Tabor	Provide information on when performance assessment model results will be available to identify whether there are data gaps that would require additional vadose zone characterization work.	Closed 4/13/2017. Initial modeling will occur fall 2017. Results will be documented in fiscal year 2018.
2017-03-30-03	Lyon	Ecology will identify whether there are other potential 241-A/AX focus areas of interest and their level of interest in other focus areas relative to the Tanks A-104/105 focus area.	Open.
2017-03-30-04	Tabor	Report back about whether an engineering evaluation has been or could be developed to determine whether temperatures seen in 2014 at direct push boreholes can be explained by thermal heat propagating from Tanks A-104/105.	In progress.
2017-03-30-05	Barnes	Provide document references related to thermal heat levels in and near Tanks A-104/105.	Closed with email dated 3/31/2017.
2017-03-30-06	Tabor	Report back with information about the retrieval construction schedule for the 241-A/AX Tank Farms so that it can be factored into discussions on focus areas and timing of investigation activities.	In progress.
2017-03-30-07	Luke/Tabor	Report back regarding whether the Tank 241-A-104 DQO is considering the need to obtain information on the physical/chemical properties of the tank waste that could affect the movement of that waste in the environment.	Closed 4/13/2017. See agenda item 3.
2017-03-30-08	Hildebrand	Provide information about releases (e.g., volumes, contaminants – including chloride from ion exchange) related to power house filter wash down effluent discharged to a trench.	In progress.
2017-04-13-01	Sydnor	Provide Ecology a map of proposed sample locations before the relevant DQO meeting (May).	New.
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.	New.

ACTIONS (3 pages)			
Action Number	**Actionee**	**Description**	**Status**
2017-04-13-03	Tabor	Add footnote to 4/13/17 Handout #1, Attachment 3, Table 3 listing background level reports.	New.
2017-04-13-04	Rochette	Ecology will discuss the use of "MTCA C for cleanup" and "500 mrem/yr above background via industrial land-use scenario" in Handout #1, Attachment 3, Table 3.	New.
2017-04-13-05	Tabor	Review PNNL report 15141 to determine whether wells can be included within the A-104/105 focus area boundary.	New.

Handout #1

WMA A-AX DQO Meeting # 4 – March 30, 2017
Agenda

1) General Schedule:

   - Completion of DQO this FY
   - May: Discussing Potential Sample Locations (Part of Step 7)
   - June: Discussing Constituent List (Part of Step 3)
   - July: Discussing Steps 5 and 6
   - August: Continuing Step 7 and closing out any other steps

   Note: Prelimary Schedule that may change, as needed.

2) Approach (Attachment 1)

3) Information on Tank A-104 DQO

4) Re-review Steps 1 and 2 (Discussed at Meeting #3): (Attachment 2)

   - Problem, Goals, Objectives, Principle Study Questions, and Decision Statements

   - (New Discussion) Estimation Statements – Do we need specifics for Focus Area Tanks A-104/A-105

5) Start Step 3: Information Inputs – what type of data is needed
   Step 4: Define Boundaries

   (Attachment 3: *Table 3.* Bases for Identification and Setting of Acceptable Levels for Decision Statements and *Table 4.* Potentially Appropriate Field Methods and/or Analytical Methods)

6) Review of Agreements and Action Items (New and Old)

7) Next Meeting: May ?

Attachment 1: Approach for WMA A-AX DQO Process

Quote from DQO guidance: **"The DQO Process is a series of logical steps that guides managers or staff to a plan for the resource-effective acquisition of environmental data. It is both flexible and iterative, and applies to both decision-making (e.g., compliance/non-compliance with a standard) and estimation (e.g., ascertaining the mean concentration level of a contaminant). "**

The DQO process for WMA A-AX will be iterative, with revisions being prepared to address focus areas, as needed. It will be setup to ensure that the data needs to support the performance assessment (PA) and risk-informed retrieval process and ultimately the Phase 2 RFI/CMS efforts are achieved.

Table 1. WMA A-AX DQO Approach

Step	Purpose of Step	WMA A-AX DQO Document Information
1	**State the Problem** *Define the problem that necessitates the study, identify the planning team, examine budget, and schedule*	The problem statement will be the same for each revision of the DQO. It will address the overall issue of collecting WMA A-AX data to support the PA, retrieval, and RFI/CMS.
2	**Identify the Goal of the Study** *State how environmental data will be used in meeting objectives and solving the problem, identify study questions, define alternative outcomes*	The goal of the study will be the same for each revision of the DQO. It will address the overall issue of collecting WMA A-AX data to support the PA, retrieval, and RFI/CMS.
3	**Identify Information Inputs** *Identify data and information needed to answer study questions*	The information inputs will be the same for each revision of the DQO. It will address the overall issue of collecting WMA A-AX data to support the PA, retrieval, and RFI/CMS.
4	**Define the Boundaries of the Study** *Specify the target population and characteristics of interest, define spatial and temporal limits, scale of inference*	Each revision will be specific to a focus area.
5	**Develop the Analytical Approach** *Define the parameter of interest, specify the type of inference, and develop the logic for drawing conclusions and findings*	The analytical approach will be the same for each revision of the DQO. It will address the overall issue of collecting WMA A-AX data to support the PA, retrieval, and RFI/CMS.
6	**Specify Performance or Acceptance Criteria** *Specify probability limits for false acceptance decision errors*	Performance/Acceptance Criteria will be the same for each revision of the DQO. It will address the overall issue of collecting WMA A-AX data to support the PA, retrieval, and RFI/CMS.
7	**Develop the Plan for Obtaining Data** *Select the resource-effective sampling and analysis plan that meets the performance criteria*	Each revision will be specific to a focus area.

Note: Steps that reflect the "overall issue of collecting WMA A-AX data to support the PA, retrieval, and RFI/CMS" will be reviewed to determine if any specifics are needed for Focus Area Evaluation.

Attachment 2: Steps 1 and 2

Step 1: Problem Statement:
Vadose zone contamination in and adjacent to the A-AX Tank Farms may pose a current and future risk to human health and the environment, including groundwater that requires corrective action to support closure.

Step 2: Identify goals (objectives, principal study questions, and decision statements):
The goal is to ensure the appropriate vadose zone soil characterization data needs are identified to support corrective measure decisions for WMA A-AX, recognizing the need to integrate characterization and closure actions with ongoing and nearby operations and waste site/groundwater remedial actions.

The objectives of the DQO are to:

- Define the WMA A-AX vadose zone characterization data necessary to guide planning to make vadose zone soil remedial decisions, support an evaluation of risks by direct contact and to ecological receptors, and support integration of vadose zone and groundwater decisions.
- Optimize a data collection program that will be used to support the Phase 2 RFI/CMS characterization of WMA A-AX.
- Support refining the preliminary conceptual contaminant distribution model.

Table 2. Principal Study Questions and Decisions Statements

Principal Study Question (PSQ)	Proposed Alternative Action	Decision Statement (DS)
#1— Is there sufficient chemical/radiological concentration and distribution data to perform risk assessment for WMA A-AX vadose zone soil (exceedances of applicable levels to define magnitude and extent of risk issues).	If yes, use existing data to develop risk assessment in support of the RCRA facility investigation report and performance assessment. If not, collect data or determine if other information can be used.	**#1** — Determine whether or not the chemical/radiological concentration and distribution data are sufficient to perform risk assessment for WMA A-AX vadose zone soil.
#2— Is there sufficient chemical/radiological concentration and distribution data to define the WMA A-AX vadose zone soil nature and extent of contamination (exceedances of applicable levels to define magnitude and extent of contamination).	If yes, use existing data to refine the conceptual/numerical site models and develop the RCRA facility investigation report. If not, collect data or determine if other information can be used.	**#2** — Determine whether or not the chemical/radiological concentration and distribution data are sufficient to define WMA A-AX vadose zone soil nature and extent of contamination.
#3 – Is there sufficient information about vadose zone soil chemical/physical properties to determine how contaminants move through vadose zone soil in and near WMA A-AX?	If yes, use existing vadose zone soil chemical/physical property data to refine the conceptual/numerical site models. If not, collect data or determine if other information could be used.	**#3** – Determine whether or not there is sufficient information about vadose zone soil chemical/physical properties that could affect contaminant movement through vadose zone soil in and near WMA A-AX.

Table 2. Principal Study Questions and Decisions Statements		
Principal Study Question (PSQ)	**Proposed Alternative Action**	**Decision Statement (DS)**
#4 – Is there sufficient information about tank waste chemical/physical properties that could affect contaminant movement through the WMA A-AX vadose zone soil?	If yes, use existing tank waste chemical/physical property data to refine the conceptual/numerical site models. If not, identify tank waste chemical/physical property data needs to be considered as a part of a future tank DQO.	**#4** – Determine whether or not there is sufficient information about tank waste chemical/physical properties that could affect contaminant movement through the WMA A-AX vadose zone soil.
#5 – Does the available contaminant concentration data provide sufficient information to determine whether waste passed through the WMA A-AX vadose zone soil?	If yes, use existing contaminant concentration data to evaluate the leak loss interpretation. If not, collect data or determine if other information could be used.	**#5** – Determine whether or not there is sufficient contaminant concentration data to determine whether waste passed through the WMA A-AX VZ soil.

Estimation Statement for Focus Area Tanks A-104/105: Use data to support the continued development of the conceptual site model, support risk informed retrieval, and evaluate leak assessment interpretation.

Attachment 3: Step 3

Step 3: Identify information inputs (Inputs to the decision)

Per EPA QA/G-4, the major outputs of this step are:

- *Lists of environmental characteristics that will resolve the decision or estimate and potential sources for the desired information inputs*
- *Information on the number of variables that will need to be collected*
- *Type of information needed to meet performance or acceptance criteria*
- *Information on the performance of appropriate sampling and analysis methods*

Table 3. Bases for Identification and Setting of Acceptable Levels for Decision Statements

PSQ/DS	Constituents of Concern (COC)		Basis [source] for Protection Threshold	Acceptable Levels	Basis for Setting Acceptable Levels
1	Radionuclides	Shallow zone (<4.6m [<15 ft.] bgs)	500 mrem/yr above background via industrial land-use scenario, no additional groundwater degradation, ecological protection.	Contaminant specific; fate and transport modeling	• Radiological lookup values for shallow zone soils based on fate and transport analyses for the applicable scenarios • Deep zone values will be determined using STOMP or another model
		Deep zone (>4.6m [>15 ft] bgs)	No additional groundwater degradation	MCLs, state and Federal ambient water quality control criteria; alternatively, site-specific modeling	
1	Chemicals	Shallow zone (<4.6m [<15 ft] bgs)	• MTCA Method B for need for action • MTCA Method C for cleanup • Ecological protection	Chemical-specific	MTCA Method C cleanup levels and ecological protection values with contaminant-specific variations.
		Deep zone (>4.6m [<15 ft] bgs)	MTCA Three Phase Model	Alternatively, site-specific modeling	
3, 4	Chemical/physical properties		NA	NA	• Acceptable levels do not apply for preliminary conceptual contaminant distribution model evaluation. • This is a judgmental assessment.
2, 5	Radiological and chemical		NA	Contaminant specific; Hanford site soil background levels and fate and transport modeling	• Soil background levels and fate and transport analyses of past leaks

Table 4. Potentially Appropriate Field and Analytical Methods for Vadose Zone Soil for Characterization

Potentially Appropriate Field Method/Analytical Method	Parameter	Possible Limitations
Ground Penetrating Radar (GPR): Radar-reflection surface geophysical survey technique that detects contrasts in di-electric constants in the below-grade environments from the surface.	Underground structures or interferences	Requires subjective interpretation of the reflected signals. Lack of reflective below-grade surfaces or the presence of interfering matrices can complicate or invalidate the findings. The presence of nearby buildings and utilities can interfere with reflected signals. Fines (e.g., clay and heavy fly ash) can act as a reflector to the radar signal.
Electromagnetic Induction (EMI): Surface geophysical survey technique that measures electrical conductivity in below-grade soils based on detected changes in electrical fields. Generally used to support the interpretation of GPR surveys.		The presence of nearby buildings and utilities can interfere with reflected signals.
Surface Geophysical Exploration: Electrical Resistivity Imaging can be acquired to develop shallow and deep, 2-dimensional and 3-dimensional images.	Resistivity (conductivity)	Results are impacted by interference from infrastructure such as pipelines, tanks, buildings, and other large features.
Large Diameter Hole (LDH) Conventional Drilling (e.g., cable tool):	Geophysical Logging and Laboratory Analysis	Most drilling methods have difficulty in cobbles and boulders. Waste/tailings are brought to the surface and need to be properly contained and disposed, increasing cost and risk of exposure to workers. Not viable for new exploration in the tank farms due to waste generation and logistics (e.g., dome loading and access).
LDH Geophysical Logging	Gross and isotopic gamma emissions	Larger size instrument has lower detection limits (more sensitive) but does not fit into a small diameter hole (SDH) (<3-inch); therefore, is not a compatible technology for use with direct push methods.

Table 4. Potentially Appropriate Field and Analytical Methods for Vadose Zone Soil for Characterization

Potentially Appropriate Field Method/Analytical Method	Parameter	Possible Limitations
LDH Geophysical Logging (continued)		The count rate can effect accuracy and precision of measurements.
	Gamma emissions from fission products, Am-241, Pu-239, and Np-237 It is considered by some to be more accurate than sampling and laboratory assay because the assay is performed in situ with less disturbance of the sample, there is higher vertical spatial resolution, and the sample size is much larger. This method may also be more economical than traditional sampling and analysis.	This method does not assess radionuclides or daughter products that do not emit gamma rays. The gamma energies from these isotopes are at the low end of the spectrum, which results in high numerical minimum detectable activities and possible matrix effects from other isotopes. This technique requires the use of a single casing (installed by drilling or driving) in contact with the soil formation. The detector is too large to fit in a SDH (<3-inch); therefore, is not a compatible technology for use with direct push methods.
	Neutron emissions from plutonium	Because of the very low incidence of spontaneous plutonium fission and alpha-N reactions, the passive neutron profile is orders of magnitude lower than the gamma emission. The detector is too large to fit in a SDH (<3-inch); therefore, is not a compatible technology for use with direct push methods.
	Active neutron emissions from transuranics	Although neutron activation methods have been developed, they are not expected to be useful for this initial characterization effort. At present, these techniques are too expensive and time consuming, and logistical problems are associated with the handling of intense sources or generators. The detector is too large to fit in a SDH (<3-inch); therefore, is not a compatible technology for use with direct push methods.
	Beta emissions	Not a fully developed technology.

Table 4. Potentially Appropriate Field and Analytical Methods for Vadose Zone Soil for Characterization

Potentially Appropriate Field Method/Analytical Method	Parameter	Possible Limitations
LDH Geophysical Logging (continued)	Neutron moisture	Moisture zones can be very thin and can be missed based on data collection intervals (distance and time).
	Temperature	Difficult differentiating/determining source and extent of high temperatures (e.g., soil versus infrastructure).
Laboratory Analysis for LDH	Chemical and radiological constituents and physical properties Constituent list will be discussed in future meetings	Highly contaminated samples may require use of on-site laboratories, with associated impacts (e.g., high cost, reduced analyte lists, matrix effects, degraded detection limits, and long turnaround times). Lower contamination levels may allow use of offsite laboratories, avoiding these limitations.
Small Diameter Hole (SDH) Direct Push	Geophysical Logging and Laboratory Analysis	Direct-push methods may be ineffective in cobbly or rocky soils.
SDH Geophysical Logging	Gross and isotopic gamma emissions	The smaller diameter detectors are not as sensitive as those used in LDH (Detection limits are not as low from instruments used in LDH.)
	Beta emissions	Not a fully developed technology.
SDH Geophysical Logging (continued)	Neutron moisture	Moisture zones can be very thin and can be missed based on data collection intervals (distance and time).
	Temperature	Difficult differentiating/determining source and extent of high temperatures (e.g., soil versus infrastructure).
Laboratory Analysis for SDH	Chemical and radiological constituents and physical properties Constituent list will be discussed in future meetings	Small sample size leads to difficulty to with large analysis list and low detection limits.

Table 4: Potentially Appropriate Field Methods and/or Analytical Methods (to be provided at the meeting: consists of such things as ground penetrating radar, geophysical logging, and direct push)

Step 4: Define the boundaries of the study

Identify the target population of interest and specify the spatial and temporal features pertinent for decision making or estimation.

Per EPA QA/G-4, the major outputs of this step are:

- *definition of the target population with detailed descriptions of geographic limits (spatial boundaries)*
- *detailed descriptions of what constitutes a sampling unit*
- *time frame appropriate for collecting data and making the decision or estimate, together with those practical constraints that may interfere with data collection*
- *the appropriate scale for decision making or estimation*

Focus Area:

Around Tanks A-104 and A-105, Surface to Groundwater (Vadose Zone Soil)

Time component:

Collect information prior to retrieval of Tanks A-104 and A-105

Note that it was agreed in 2011 that the vertical spatial area of interest was to be soil depths from the following:

- 0 to 11 inches for soil contamination to support ecological and direct contact assessment. This depth supports not needing an excavation permit.
- <15 ft to support direct contact assessment and groundwater assessment
- >15 ft to support groundwater assessment

Handout #2

Special Attachment for Step 2 – Table 2: Questions and Statements

Table 2. Principal Study Questions and Decisions Statements (From Meeting 3)

Principal Study Question (PSQ)	Proposed Alternative Action	Decision Statement
#1—Do the concentrations of contaminants (radiological and nonradiological) in vadose zone soils in and around WMA A-AX exceed acceptable levels?	If the contaminant concentrations in the vadose zone soil do not exceed acceptable levels, then corrective measures in a corrective measures study (CMS) are not required, otherwise corrective measures in a CMS are required.	**#1**—Determine if the vadose zone contaminant concentrations in and around WMA A-AX exceed acceptable levels and if corrective measures are required or not.
#2 – Do the available contaminant data and the conceptual site model (CSM) reflect the nature and extent of contamination in the vadose zone in WMA A-AX that will allow us to make corrective action decisions?	If the distribution of contaminants can be defined, then no additional information is needed, otherwise determine what additional information is needed to support the CMS process.	**#2** – Determine the nature and extent of contamination in the vadose zone that will allow us to make corrective action decisions.
#3 – Are there vadose zone soil and tank waste chemical/physical properties that could affect contaminant movement in and near WMA A-AX that can help define nature and extent and refine the CSM?	If vadose zone soil chemical/physical properties can be used to better refine the CSM, then update CSM.	**#3** – Determine the vadose zone soil chemical/physical and tank waste properties that could affect contaminant movement in and near WMA A-AX and if there is a need to refine the CSM or not.
#4 – Do the concentrations of contaminants in the vadose zone soils in and around WMA A-AX indicate a leak in the WMA has occurred and confirm leak loss interpretations?	If the vadose zone contaminant concentrations in and around WMA A-AX do not support leak loss interpretations, then determine if additional information is needed (e.g., refinement of leak loss interpretation, tank visual inspections or samples).	**#4** – Determine if vadose zone contaminant concentrations support the WMA A-AX leak loss interpretations and current tank waste conditions.

Special Attachment for Step 2 – Table 2: Questions and Statements

Table 2. Principal Study Questions and Decisions Statements (UPDATED)		
Principal Study Question (PSQ)	**Proposed Alternative Action**	**Decision Statement (DS)**
#1— Is there sufficient chemical/radiological concentration and distribution data to perform risk assessment for WMA A-AX vadose zone soil (exceedances of applicable levels to define magnitude and extent of risk issues).	If yes, use existing data to develop risk assessment in support of the RCRA facility investigation report and performance assessment. If not, collect data or determine if other information can be used.	**#1** — Determine whether or not the chemical/radiological concentration and distribution data are sufficient to perform risk assessment for WMA A-AX vadose zone soil.
#2— Is there sufficient chemical/radiological concentration and distribution data to define the WMA A-AX vadose zone soil nature and extent of contamination (exceedances of applicable levels to define magnitude and extent of contamination).	If yes, use existing data to refine the conceptual/numerical site models and develop the RCRA facility investigation report. If not, collect data or determine if other information can be used.	**#2** — Determine whether or not the chemical/radiological concentration and distribution data are sufficient to define WMA A-AX vadose zone soil nature and extent of contamination.
#3 – Is there sufficient information about vadose zone soil chemical/physical properties to determine how contaminants move through vadose zone soil in and near WMA A-AX?	If yes, use existing vadose zone soil chemical/physical property data to refine the conceptual/numerical site models. If not, collect data or determine if other information could be used.	**#3** – Determine whether or not there is sufficient information about vadose zone soil chemical/physical properties that could affect contaminant movement through vadose zone soil in and near WMA A-AX.
#4 – Is there sufficient information about tank waste chemical/physical properties that could affect contaminant movement through the WMA A-AX vadose zone soil?	If yes, use existing tank waste chemical/physical property data to refine the conceptual/numerical site models. If not, identify tank waste chemical/physical property data needs to be considered as a part of a future tank DQO.	**#4** – Determine whether or not there is sufficient information about tank waste chemical/physical properties that could affect contaminant movement through the WMA A-AX vadose zone soil.
#5 – Does the available contaminant concentration data provide sufficient information to determine whether waste passed through the WMA A-AX vadose zone soil?	If yes, use existing contaminant concentration data to evaluate the leak loss interpretation. If not, collect data or determine if other information could be used.	**#5** – Determine whether or not there is sufficient contaminant concentration data to determine whether waste passed through the WMA A-AX VZ soil.