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Meeting Minutes for the WMA C PA Engineering System #1 Working Session

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Washington River Protection Solutions LLC
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-08RV14800

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Key Words: Waste Management Area C, Performance Assessment, tank closure, waste inventory

Abstract: Summary of meeting between DOE-ORP, Washington Department of Ecology, Environmental Protection Agency, Nuclear Regulator Commission, Native American Tribes, and stakeholders regarding Engineered Systems #1 Working Session for the Waste Management Area C performance assessment. The meeting minutes consist of roster of attendees, summary notes take at the meeting and content of flip charts used during the meeting.

Nancy A Fouad 3-3-10
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Meeting Minutes

Waste Management Area C Performance Assessment
Engineering System #1 Working Session

held at
Washington State Department of Ecology Offices
3100 Port of Benton Boulevard
Richland, WA 99352

on
January 26, 27, and 28, 2010

LIST OF TERMS

Abbreviations and Acronyms

AM	Action Memorandum
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
C-106	241-C-106
CA	cost analysis
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
CMS	corrective measures study
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOE/RL	U.S. Department of Energy, Richland Operations Office
DQO	data quality objective
DST	double-shell tank
Ecology	State of Washington Department of Ecology
EE	engineering evaluation
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEP	Features, Events, and Processes
GEA	gamma energy analysis
GTP	grade thickness product

HFEP	Hanford-specific FEP
HFFACO	*Hanford Federal Facility Agreement and Consent Order*
HWMA	*Hazardous Waste Management Act of 1976*
IFEP	international FEP
LLW	low-level waste
MCL	maximum contaminant level
NEA/OECD	Nuclear Energy Agency for the Organization for Economic Co-operation and Development
NEPA	*National Environmental Policy Act of 1969*
NRC	U.S. Nuclear Regulatory Commission
ORP	U.S. Department of Energy, Office of River Protection
OU	operable unit
PA	performance assessment
PRC	Plateau Remediation Contractor
PRD	process relationship diagram
PUREX	plutonium uranium extraction
RAS	radionuclide assessment system
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
RL	U.S. Department of Energy, Richland Operations Office
ROD	Record of Decision
SEPA	*State Environmental Policy Act of 1971*
SGLS	spectral gamma logging system
SMCL	secondary maximum containment level
SST	single-shell tank
TC&WM	Tank Closure and Waste Management
UPR	unplanned release
WAC	*Washington Administrative Code*
WMA	waste management area

Waste Release Terms

APS	Advanced Photon Source at Argonne National Laboratory
BDL	below detection limit
bse	backscattered electron
CH2M HILL	CH2M HILL Hanford Group, Inc.
DDI	distilled deionized (water)
DOE	U.S. Department of Energy
EDS	energy dispersive spectroscopy
EMP	electron microprobe, also known as an electron probe microanalyser (EPMA)
EPA	U.S. Environmental Protection Agency
EQL	estimated quantification limit
EDS	energy dispersive x-ray spectrometry or spectrometer
EXAFS	extended x-ray absorption fine structure
EPMA	electron probe microanalysis
HFFACO	Hanford Federal Facility Agreement and Consent Order
ICP-MS	inductively coupled plasma-mass spectroscopy (spectrometer)
ICP-OES	inductively coupled plasma-optical emission spectroscopy
ICDD	International Center for Diffraction Data, Newtown Square, Pennsylvania
JCPDS	Joint Committee on Powder Diffraction Standards
ND	not determined
NIST	National Institute of Standards and Technology
ORP	Office of River Protection at the U.S Department of Energy, Richland, Washington
PNC-CAT	Pacific Northwest Consortium Collaborative Access Team
PNL	Pacific Northwest Laboratory
PNNL	Pacific Northwest National Laboratory
SEM	scanning electron microscopy (or microscope)
SRM	Standard Reference Material
USA	United States of America
wt	weight
XANES	X-ray absorption near edge structure
XAS	X-ray absorption spectroscopy
XRD	X-ray diffraction
µSXRF	X-ray microscanning fluorescence
µXRF	X-ray microfluorescence
µXRD	X-ray microdiffraction

Attendees: Representatives from Department of Energy-Office of River Protection (DOE-ORP), DOE Richland Operations Office (DOE-RL), DOE-Headquarters (DOE-HQ), the Washington State Department of Ecology (Ecology), the U.S. Nuclear Regulatory Commission (NRC), U.S. Environmental Protection Agency (EPA), Region X, State of Oregon, and representatives of the Nez Perce Tribe, and Confederated Tribes of the Umatilla met at the Ecology offices in Richland, Washington on 26 through 28 January 2010.

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Agenda for WMA C PA – Engineered Systems #1

Jan. 26 AM	**Introductions, Review of Proposed WMA C PA Decisions, Proposed FEPs Process**
8:00 AM	Refreshments
8:30 AM	**Introductions** (C. Kemp/S. Eberlein)
8:45 AM	**Goals and Objectives of Engineered Systems #1 Working Session** (S. Eberlein)
9:00 AM	**Review of Past Proposed Inputs/Assumptions for Interim WMA C PA** (M. Connelly)
9:30 AM	Break
9:45 AM	**Review of Past Proposed Inputs/Assumptions for Interim WMA C PA** (continued)
10:30 AM	**Process for Identification of Features, Events and Processes (FEPs)** (S. Eberlein)
11:30 AM	Lunch
	Features of Engineered System, Recharge and Engineered Surface Barriers
1:00 PM	**Major Features of Engineered System** (M. Connelly)
2:15 PM	Break
2:45 PM	**Factors Affecting Recharge** (M. Fayer)
3:30 PM	**Discussion of Surface Barriers and Recharge** (M. Fayer)
4:00 PM	Performance Assessment Context (Open Discussion and Q&A)
Jan. 27 AM	**Recharge and Engineered Surface Barriers (continued)**
8:00 AM	Refreshments
8:30 AM	**Discussion of Recharge and Engineered Surface Barriers** (M. Fayer) (continued)
9:30 AM	Break
9:45 AM	**Current Recharge Estimates** (M. Fayer)
10:00 AM	**Conceptual Models of Recharge for WMA C** (M. Bergeron)
10:45 AM	**Proposed Reference Case and Recommended Sensitivity Cases** (M. Bergeron)
11:15 AM	**Recharge and Engineered Surface Barrier (Open Discussion and Q & A)**
11:30 AM	Lunch
Jan. 27 PM	**Contaminant Release from Tank Waste Residuals**
12:45 PM	**Context of Contaminant Release from Tank Waste Residuals** (M. Connelly)
1:15 PM	**Tank Waste Residual Characterization** (K. Krupka/K. Cantrell)
2:30 PM	Break
2:45 PM	**Tank Waste Residual Characterization (continued)**
3:15 PM	**Contaminant Release Models** (K. Cantrell)
4:00 PM	Adjournment
Jan. 28 AM	**Contaminant Release from Tank Waste Residuals (continued)**
8:00 AM	Refreshments
8:15 AM	**TC&WM EIS perspectives on Engineered System #1 Topics** **(**M. Burandt and TC&WM EIS Staff)
9:30 AM	Break
9:45 AM	**Contaminant Release from Tank residuals** (Open Discussion and Q&A)
10:30 AM	**Engineered System #1** (Open Discussion and Q&A)
12:00 PM	Lunch
1:00 PM	Re**view of Consensuses/ Review of Notes /Working Session Feedback**
1:45 PM	**Look Forward to March Working Session** (Eberlein)
2:30 PM	Adjournment

Summary Notes 26 – 28 January 2010

Discussion: DOE is pursuing closure of Waste Management Area C (WMA C) located at the Hanford Site. At some point in the future, DOE and NRC will consult on waste determinations for these tank closures; additionally these tanks will be closed in coordination with EPA and Ecology in accordance with the Tri-Party Agreement and State-approved closure plans. The DOE, NRC, EPA, and Ecology met for the second of a series of technical exchanges on the proposed inputs for a WMA C Performance Assessment (PA). The technical exchanges are intended to capitalize on early interactions between the agencies with a goal of developing DOE's WMA C PA. Technical discussions during the meeting are intended to allow for the clarification of general modeling approaches and for the identification of other specific questions.

Topics: The following specific topical areas were discussed during the meeting:

1. Review of Past Proposed Inputs/Assumptions for Interim WMA C Performance Assessment
2. Process for Identification of Features, Events, and Processes (FEPs)
3. Major Features of Engineered System
4. Factors Affecting Recharge
5. Surface Barriers and Recharge
6. Current Recharge Estimates
7. Conceptual Models for Recharge for WMA C
8. Proposed Reference Cases and Recommended Sensitivity Cases
9. Recharge and Engineered Surface Barrier Open Discussion
10. Contaminant Release from Tank Waste Residuals
11. Content of Contaminant Release from Tank Residuals
12. Tank Waste Residual Characterization
13. Contaminant Release Models
14. TC & WM EIS Perspectives on Engineered Systems
15. Contaminant Releases from Tank Residuals

Summary: The following summarizes the discussion during the meeting, by topical area.

Review of Past Proposed Inputs/Assumptions for Interim WMA C Performance Assessment

- DOE-ORP Staff provided an overview of proposed model inputs and assumptions that have been collated from previous WMA C PA working sessions and data that is assumed to be used in the future WMA C PA analyses. Assumptions reviewed included those for residual inventory, time and points of assessment, soil inventory, recharge rates, and contaminant release from waste residuals. Meeting participants also discussed the relationship between the data being used in the WMA C PA and that used in the TC & WM EIS.
- Meeting participants discussed how the values in the Proposed Inputs/Assumptions table were established, and relationships to previous and future analyses.
- DOE-ORP Staff indicated that any comments on the Proposed Inputs/Assumptions table should be forwarded by email and would be addressed. DOE-ORP Staff indicated that a written response to comments received (RCR) would be prepared and archived for any comments received.

Process for Identification of Features, Events, and Processes (FEPs)

- DOE-ORP Staff provided an overview of FEPs, including definitions from NRC NUREG 1804 of each of the terms and the five general steps associated with identification and classification of FEPs.
- DOE-ORP Staff identified seven timeframes of activities in the timeline of WMA C operations that provide insights into understanding FEPs for WMA C. These include four pre-closure activities of: the pre-Hanford state of the environment, the period of construction of the tanks and associated activities, the time of active tank farm operations, and the period of tank retrieval and corrective actions. The three post-closure activities in this timeline include the time during which DOE plans to maintain institutional control over the closed tank farm, the period after institutional controls are assumed to cease up to the assumed end of barrier design life, and the period after the assumed barrier design life.

- DOE-ORP Staff identified the major features of the WMA C system to be the existing surface and future barrier, the tanks, ancillary facilities, and the hydrogeologic system. Examples were provided of how different features have been or will be affected by activities during each of the timeframes identified.
- Meeting participants discussed the role of the FEPs as applied to the WMA C analyses and what role FEPs should play in the overall performance assessment scoping discussions being addressed in these meetings.
- DOE-ORP Staff provided a glossary of technical terms being used in these scoping meetings for review and comment by meeting participants.

Major Features of Engineered System

- DOE-ORP Staff provided a brief history of the construction of WMA C, including the "pre-Hanford" state of the land area, the original construction activities, and specifications of the tanks and associated pipelines and diversion boxes. Construction of the WMA C system began in January 1944 and was completed in January 1945.
- DOE-ORP Staff provided photographs documenting the stages of construction of the WMA C tanks and associated equipment. It was noted, however, that there is little written documentation of the construction methods used and associated activities, e.g., whether soils were compacted before construction began.
- DOE-ORP Staff noted that additional construction activity occurred in February 1951 to install a new vault and diversion boxes. Additional pipelines were also installed between 1946 and 1957. Between 1961 and 1978, other additional pipelines were added to WMA C. From 1975 o 2001, interim stabilization activities also resulted in the installation of additional pipelines.
- DOE-ORP Staff provided an overview of the construction specifications and locations of the C-100 series and C-200 series tanks, diversion boxes, vaults, and catch tanks.

Factors Affecting Recharge

- Pacific Northwest National Laboratory (PNNL) Staff provided an overview of factors affecting recharge in WMA C. Recharge plays a large role in mobilizing and transporting contaminants. Recharge can be affected by weather and climate, soil, topography, vegetation, and other site-specific features.

- PNNL Staff provided an overview of the methodologies used to estimate the recharge rates for WMA C. Lysimeter studies, tracer studies, and recharge modeling have all been used at the Hanford Site to develop the estimates of recharge for WMA C. Modeling results are consistent with the observed lysimeters and tracer study data.
- PNNL Staff summarized that meteorological and precipitation records are well-known and that estimates of infiltration rates exist for subsets of soil and plant combinations and surface barrier designs that have been demonstrated at Hanford through lysimeter studies for over 15 years under various conditions. Recommendations were provided for recharge rates that should be considered under various surface and vegetation conditions.
- Meeting participants discussed the confidence and limitations associated with the infiltration and recharge data and how it may be used in the WMA C performance assessment.

Observations on Tank Systems and Source Term Estimates

- State of Oregon Staff provided a presentation on observations about the tank systems and source term estimates.

Surface Barriers and Recharge

- Meeting participants discussed issues associated with barrier recharge estimates and perturbations that could change those estimates.

Current Recharge Estimates

- DOE-ORP Staff provided an overview of the recharge estimates currently planned to be used in the WMA C performance assessment, including the pre-Hanford period (before 1943), the construction period (1944), the active operational period (1945 – 1995), the retrieval and corrective action period, the institutional control period, the period after institutional control until the end of the barrier design life, and the period after the barrier design life.

Conceptual Models of Recharge for WMA C

- DOE-ORP Staff presented the conceptual model assumptions for the WMA C performance assessment, including the pre-Hanford period (before 1943), the construction period (1944), the active operational period (1945 – 1995), the retrieval and corrective action period, the institutional control period, the period after institutional control until the end of the barrier design life, and the period after the barrier design life.

- DOE-ORP staff noted that some proposed recharge cases have already been committed to with Department of Ecology based on review of previous performance assessment efforts.

Proposed Reference Cases and Recommended Sensitivity Cases

- DOE-ORP presented the recharge assumptions that are planned to be used for the pre-Hanford period (before 1943), the construction period (1944), the active operational period (1945 – 1995), the retrieval and corrective action period, the institutional control period, the period after institutional control until the end of the barrier design life, and the period after the barrier design life.
- DOE-ORP Staff presented sensitivity cases that are expected to be analyzed for alternative assumptions about recharge rates during the relative periods of the WMA C operations, closure, and post-closure periods.

Recharge and Engineered Surface Barrier Open Discussion

- Meeting participants discussed the implications of different recharge assumptions and sensitivity cases for the different operational periods and how historical understanding of operations could be incorporated into the assumptions and conceptual models of recharge for WMA C.

Contaminant Release from Tank Waste Residuals and Tank Waste Residual Characterization

- DOE-ORP Staff provided an overview of the assumptions planned to be used in the WMA C performance assessment about contaminant residuals in tanks and their release.
- DOE-ORP Staff noted that there is little real data on tank waste residual release and that most previous approaches to accounting for tank residual releases have been through modeled assumptions.
- DOE-ORP Staff noted that the two potential release mechanisms are diffusion and advection, and presented the assumptions that have traditionally been used for each of these mechanisms.
- Meeting participants discussed the limitations and considerations of the assumptions that were presented.

- PNNL Staff presented an overview of the residual tank waste contaminant release analysis that has been performed to date by PNNL on post-cleaning tank waste residual samples that have been taken from WMA C. PNNL source term release modeling includes leach testing, solid phase characterization, and geochemical interactions. Characterization of actual waste residual is important because of the complex process histories that led to the generation of the wastes.

Contaminant Release Models

- PNNL Staff provided an overview of the contaminant release model assumptions based on the solubility and leaching testing of post-cleaning tank waste residual samples being performed by PNNL.

TC & WM EIS Perspectives on Source Area Modeling

- DOE-ORP Staff and TC & WM EIS Staff provided an overview of the release and vadose zone modeling in the TC& WM EIS. TC & WM EIS modeling accounts for tank farm sources, ancillary equipment, and past leaks and unplanned releases.
- Meeting participants discussed the modeling assumptions and results presented in the TC & WM EIS.

Contaminant Releases from Tank Residuals

- DOE-ORP Staff presented additional information concerning assumptions about contaminant releases from residuals expected to remain in tanks after cleaning.

Flip Charts from Engineering Systems #1 Working Session, 26 – 28 January 2010

Proposed sessions discussion

- Natural systems maybe shouldn't be delayed as it will dominate the PA.
- Next session on FEPS process would be useful.
- The earlier you do FEPS, the better.
- Current proposed order probably best (Susan's slide 7).
- Slide 7: Change 'dosimetry' to 'exposure scenarios.'

'Cheat Sheet' discussion

- Put revised residual inventory data package on website.
- Consider whether 90% of 2009 BBI would be useful (it's as important as the 2002 90% case).
- Residual inventory will be run based on BBI initially, final PA will be run on actuals. Catch tank estimate is BBI average.
- 'Proposed uncertainty/sensitivity for Interim PA' are really 'sensitivities', not 'uncertainties.' Probably not enough trend data on actuals to calculate uncertainty on unretrieved tanks.
- Clarify text in assessment context box to say will calculate peak and sensitivity cases. Say you will calculate peaks to 50,000 years, don't relate to Kd. Peak for top 5 contaminants no matter when they occur.
- Change 'N/A' in points of assessment box direct contact to 'TBD'.
- Lots of evidence that 15 feet below ground surface is not sufficient for sage and Russian thistle.
- Ensure when scale down for radionuclides based on half-life that hazardous contaminants are not similarly scaled down.
- Vadose zone data disconnects can impact rate of groundwater contamination.
- Add retrieval leaks to 'soil inventory' section.
- Still weak on justification for 10x uncertainty.
- Put a list of 'in-process' items on the website.

FEPS

- Process is 'steady state' (although there is long-term change) and event is a upset of process.
- Did C Farm go thru 'clean and stable' (addition of gravel) process? If so, it could add another operational period.
- Consider using 'quintesa' confidence tool to evaluate barrier life.
- What were actual construction practices (e.g. compaction, etc.) that might have created some barrier to contaminant migration.
- Is there water quality data pre-construction?
- Summary document of pre-Hanford developed area could be useful.

Glossary

- Update ALARA definition to include legal definition (Mike Fuller) and how concept is applied at tank farms.
- ALARA is not generally applied to hazardous contaminants.
- Add 'validation, risk, likelihood, alternative conceptual models, scenario, alternate scenarios, assumption, boundary conditions, FEP exclusion criteria, sensitivity, uncertainty, probabilistic, deterministic, variability (iliatory)' to glossary.

Features of Engineered System

- Mike or Les F. to get close-up cross section of tank to Hans.

Surface Barriers and Recharge

- Identify which barrier is used in slide 43. Also note data is taken above capillary barrier.
- Could dune sand blow into WMA C? Something that should be considered-stabilized dune just southeast of WMA C.
- Basalt layer in Hanford Barrier was to deter human intrusion.
- ET cover plants important (no cheatgrass) if cover is not silty loam.
- Minimize need for human maintenance of barrier in future.
- Due to fire, much of barrier life will be with just grasses-not sage.
- Not much data below 10 feet on barriers.
- Claiming lots of credit with barrier out to 500 years. Need to justify and document.
- Is silt loam subject to mass wasting due to wind? Needs to be answered.
- What is longevity of dunes? It is moving away from the site (WSU study).
- Clastic dike field trip. Group should think about FEPS they want to see. Send items to Mike C.
- Include Andy Ward to talk about dikes.
- Faulting in basalts should be looked at.
- Mike will put Karl Fecht report on website.
- References to the dune study will be added to the website.
- Ecology is interested in the standard deviations on Mike F's annual lysimeter recharge rates.
- Barrier needs to not matter, but FEPS are critical if claiming credit for the barrier.
- Probably should run a case with no barrier.
- The feature most susceptible to events and processes is probably the barrier.
- Can we match a model result to one groundwater data point? Important in the PA to add credibility to the modeling.
- Slide 51: How significant were hydrant flushes?
- How deep is barrier effective? Again, this is to give the model some confidence.
- Slide 54: Add some detail to key features (e.g. feature of surface barrier like impermeable layer. Also add some numbers to FEPS on this slide.
- PA should reflect a conservative barrier probably not the Hanford barrier. Should have a less robust barrier for analysis.
- Slide 58: Should be clear that last column is for 9,500 years.
- Slide 59: Analyze failing barrier at 100 years.

- Clarify what 'reference case' actually means.
- Get rid of reference case and divide minimum and maximum and call it 'denominator' case.
- Using less recharge skews insights into model runs.
- Are there 'what if' runs that will help focus on important parts of regulatory case?
- On reference case, change closure data to 2019 (instead of 2050).
- Also change reference case to 3.5 mm recharge.
- Carry a 'what if' list through all sessions.
- Need to be able to see impacts of the 100 mm/yr case on Slide 57).
- 'What if' a road is built on the barrier? How does that impact recharge?
- Operations water balance should be greater than 100 mm (the 100 mm only represents precipitation.
- Kirk to send Mike C. a typical range of detection limits for addition to website.
- To ensure sufficient schedule time, the group will prioritize model run.
- The reference case will need to be developed soon.

General Discussion

- Challenges of communicating relationship between EIS and PA modeling efforts.
- Can we use modeling from EIS to support PA (with modifications where appropriate)? Probably should but will definitely need modifications. It would be difficult from a DOE perspective to not use it. There are concerns that STOMP cannot deal with PA issues (e.g. subsurface features). Transparency is difficult when using someone else's model.
- Many runs without significant pieces of system to get understanding of relative important pieces of system.

What We Did

- Minimize reliance on barrier.
- If you claim lots of credit, you need lots of justification and documentation.
- Matching model to groundwater data point important for credibility.
- Barrier assumptions should be protective and realistic.
- Clarify assessment context groundwater timeframes. Use 'peak' text, not K_d
- What ifs…
  - Residual inventory case with 90% of 2009 BBI.
  - Run case with no barrier.
  - Fail barrier earlier (100 years) (Slide 59).
  - Change reference case from 2050 to 2019 closure date.
  - Change reference case after barrier failure recharge to 3.5 mm.
  - Create a case that shows impacts of case 3 100 mm recharge without the baseline 140 mm recharge.
  - Run case including a road constructed on the barrier.

Upcoming FEPS session

- Timeline considerations (outside just C farm).
- Boundary conditions (e.g. duration of institutional controls).

Goal: By the end of natural systems session we will understand conceptual models for natural systems. By the end of engineered systems 2 the conceptual models will be complete for the engineered systems.

Identify key FEPS and how they were addressed in the TC & WM EIS.