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Meeting Minutes for the WMA C PA Ecological Risk Working Session

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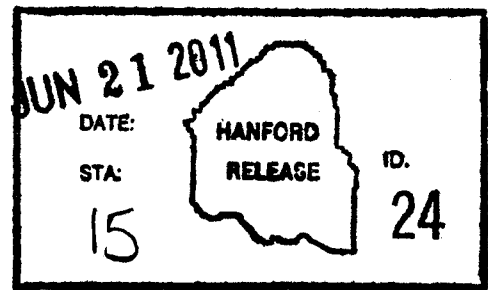
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Key Words: Waste Management Area C, Performance Assessment, tank closure, waste inventory

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

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Meeting Minutes
Waste Management Area C Performance Assessment
Ecological Risk Working Session
held at
Washington State Department of Ecology Offices
3100 Port of Benton Boulevard
Richland, WA 99352
on
May 17 through May 18, 2011

LIST OF TERMS

Abbreviations and Acronyms

AREVA Fed Svcs	AREVA Federal Services LLC
CA	Composite Analysis
CHPRC	CH2M HILL Plateau Remediation Company
CRCIA	Columbia River Comprehensive Impact Assessment
DOE	U.S. Department of Energy
DOE-EM	U.S. Department of Energy-Office of Environmental Management
DOE-HQ	U.S. Department of Energy-Headquarters
DOE-ORP	U.S. Department of Energy-Office of River Protection
DOE-RL	U.S. Department of Energy, Richland Operations Office
DQO	data quality objective
Ecology	State of Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
FEPs	features, events, and processes
NPT	Nez Perce Tribe – Environmental Restoration and Waste Management (program)
NRC	U.S. Nuclear Regulatory Commission
ODOE	Oregon Department of Energy
OSU	Oregon State University
PA	performance assessment
PNNL	Pacific Northwest National Laboratory
ROD	record of decision
STOMP	Subsurface Transport Over Multiple Phases (code)
Tc	technetium
WMA	waste management area
WRPS	Washington River Protection Solutions, LLC
YN ERWM	Yakama Nation Environmental Restoration and Waste Management

Attendees: Representatives from Department of Energy (DOE)-Office of River Protection (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), State of Oregon, and representatives of the Nez Perce and Yakama Tribes met at the Ecology offices in Richland, Washington on May 17 – 18 2011.

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Agenda for Waste Management Area C Performance Assessment – Ecological Risk Working Session May 17 – 18, 2011	
May 17 AM	Introductions, Goals and Objectives – Ecological Risk Working Session
8:00 AM	Refreshments
8:15 AM	Introductions (C. Kemp/S. Eberlein/J. Lyon/T. Martin)
8:30 AM	DOE Remarks (T. Fletcher DOE)
8:35 AM	Goals and Objectives of Ecological Risk Working Session (S. Eberlein)
8:45 AM	Ecology Expectations
9:00 AM	Ecological Risk Overview (Les Williams Integral Consulting)
10:00 AM	Break
10:15 AM	Discussion on Overview
10:30 AM	Central Plateau Ecological Risk Assessment Process (Chris McCarthy CH2M HILL)
11:30 AM	Discussion on the Central Plateau
11:45 AM	Lunch
May 17 PM	Ecological Risk (continued)
1:15 PM	Approach to Ecological Risk Assessment for Waste Management Area C (Les Williams Integral Consulting)
2:15 PM	Discussion on Waste Management Area Ecological Risk
2:15 PM	Break
2:30 PM	Dr. Vicky Freedman from PNNL to talk about Lateral Flow in the Vadose Zone
3:30 PM	Discussion on Lateral Flow in the Vadose Zone
3:45 PM	Adjournment
May 18 AM	Appendix B Modeling Cases; Updates on Characterization, Features, Events and Processes, and Leak Assessment
8:00 AM	Refreshments
8:15 AM	Features, Events and Processes database structure
9:00 AM	Appendix B Denominator and Sensitivity Cases (M. Bergeron)
10:00 AM	Break
11:15 AM	Appendix B Denominator and Sensitivity Cases (continued)
11:30 AM	Lunch
May 18 PM	Proposed Modeling Approach and Scope (continued)
1:00 PM	Phase 2 Characterization Program
1:45 PM	Discussion of Characterization Program
2:00 PM	Break
2:15 PM	Leak Assessment for Waste Management Area C (L. Fort)
3:15 PM	Outstanding issues
4:00 PM	Adjournment

Discussion: DOE is pursuing closure of Waste Management Area (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 U.S. Environmental Protection Agency (EPA) and Ecology in accordance with the Tri-Party Agreement and State-approved closure plans. The DOE, NRC, and Ecology met for the eleventh 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. Goals and Objectives of Ecological Risk Working Session
2. Ecological Risk Overview
3. Central Plateau Ecological Risk Assessment Process
4. Approach to Ecological Risk Assessment for Waste Management Area C
5. Lateral Flow in the Vadose Zone
6. Features, Events, and Processes Database Structure
7. Appendix B Denominator and Sensitivity Cases
8. Phase 2 Characterization Program
9. Leak Assessment for Waste Management Area C

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

Goals and Objectives of Ecological Risk Working Session

- DOE-ORP Staff provided an overview of the goals and objectives of the ecological risk working session.

Ecological Risk Overview

- DOE-ORP Staff provided an overview of the ecological risk conceptual site model being developed to apply to the WMA C PA.
- DOE-ORP Staff identified the analysis plan to be used to complete the ecological risk assessment, noting that getting data is often one of the most difficult parts of the assessment process.
- DOE-ORP Staff noted that the identification and measurement of the endpoints for each assessment includes effects, exposure, and ecosystem characteristics. In order to characterize ecological risk adequately, identification of complete exposure pathways is required.

- DOE-ORP Staff provided the calculational methods that would be used to compute exposure and uptake for affected plants and animals. The emphasis of the calculation is to identify whether there is the potential for toxicity to individual, or populations of, receptors.
- DOE-ORP Staff provided an overview of the differences between laboratory studies and field studies that might be conducted to complete the ecological risk assessment.
- DOE-ORP Staff identified that multiple lines of evidence are likely to be used in completing the ecological risk assessment, including other data sources and studies.
- DOE-ORP Staff discussed the role of uncertainty analysis in the ecological risk assessment, including conceptual site model uncertainty, information and data uncertainty, natural variability, and errors in design, sampling, or analysis.
- DOE-ORP Staff summarized the overall approach to ecological risk assessment including lines of evidence, adequacy and quality of data, degree and type of uncertainty, relationships to risk hypotheses, and ecological impacts, e.g., Hazard Index greater than 1.
- DOE-ORP Staff noted that DOE has developed an approach for conducting ecological risk using the RESRAD-BIOTA code¹. The DOE approach is a graded approach that allows for limits for absorbed dose. The DOE approach is applied to ecological risk assessment, to calculate site-specific biota concentration guidelines in soil or water, and to develop remediation goals.
- DOE-ORP Staff also discussed the Washington State ecological risk requirements as implemented through the State Model Toxics Control Act (WAC 173-340, “Model Toxics Control Act – Cleanup,” *Washington Administrative Code*, as amended). This approach is based on a simple site conceptual model.
- DOE-ORP Staff provided an overview of the State Model Toxics Control Act approach to ecological risk and how it could be applied at the Hanford Site. In essence, it is a terrestrial ecological evaluation approach.
- DOE-ORP Staff presented several case studies of the application of the terrestrial ecological evaluation approach.
- Meeting participants asked clarifying questions about the various discussed approaches for ecological risk assessment as could be applied to WMA C.

Central Plateau Ecological Risk Assessment Process

- DOE-ORP Staff provided an overview of the ecological risk assessment approaches that are being used by DOE in Central Plateau remediation activities.
- DOE-ORP Staff indicated that the approach being used in the Central Plateau is consistent with EPA, State of Washington, and DOE guidelines.

¹ *RESRAD-BIOTA for Windows* (Version 1.21), May 10, Environmental Science Division, Argonne National Laboratory, Argonne, Illinois.

- DOE-ORP Staff noted that the approach at the Central Plateau is based on work that has been conducted over many years, including a baseline evaluation, data quality objective process, and lessons learned from the River Corridor process.
- DOE-ORP Staff identified the key elements of the ecological risk assessment approach, including a conceptual exposure model, data selection, identification of contaminants of potential concern, identification of ecological risk-based protective concentrations, evaluation of baseline risk, identification of preliminary remediation goals, and selection of contaminants of concern.
- DOE-ORP Staff identified the components of the baseline risk assessment, including nature and extent, fate and transport, linkage with Hanford soil background, comparability to other Hanford ecological risk assessments, problem formulations, risk characterization, and scientific management of the decision points.
- DOE-ORP Staff presented the conceptual model of the terrestrial food web that the ecological risk assessment is based on.
- DOE-ORP Staff discussed the selection of data for the baseline risk assessment, including looking at all data from the Hanford Environmental Information System, data from within waste sites and operational areas, and reflective of current conditions.
- DOE-ORP Staff discussed the process for identifying contaminants of potential ecological concern, including whether or not a contaminant has been detected; excluding nutrients, short lived radionuclides, and radionuclides associated with background; looking at above background and risk-based concentrations; and using process knowledge.
- DOE-ORP Staff discussed the components of the evaluation of baseline risk, including plant and soil invertebrate communities, bird and mammal populations, using a tiered approach, screening area-wide maximum concentrations, refining estimates to waste-specific concentrations, and getting regulator agreement to each approach and changes.
- DOE-ORP Staff elaborated on the graded approach to developing risk-based concentrations, including the iterative nature of the process, development of additional information as appropriate to improve decisions, integrating ecological risk assessment with the remedy evaluation process, and ensuring conformance with regulatory guidelines.
- DOE-ORP Staff identified the tiers of the risk-based concentrations protective of ecological receptors. Tier 1 is to look at all Hanford receptors and accepted methods. Tier 2 is to use only Hanford-specific data. Tier 3 is to use waste site-specific and/or location-specific data.
- DOE-ORP discussed the use of generic risk screening levels, including screening based on readily available published literature; protectiveness of plants, invertebrates, and wildlife; and that which is applicable across a broad area.
- DOE-ORP Staff elaborated on Tier 1 values, including accepted methods, calculated organisms at Hanford, literature-derived exposure factors, and other applicable information across all terrestrial environments at the Hanford Site.

- DOE-ORP Staff elaborated on Tier 2 values, including the use of Hanford-specific exposure, bioaccumulation, or bioassay data; applicability across all terrestrial environments at the Hanford Site; and what may be used to aid in remedy selection.
- DOE-ORP Staff elaborated on Tier 3 values, including the differences in spatial resolution and specificity, focus on waste sites or locations. These are developed on an as-needed basis and address specific receptor-contaminant risks.
- DOE-ORP Staff summarized the process for identifying contaminants of concern, including use of available data, consideration of waste site specifics and spatial relationships, properties of the contaminants of concern, basis and confidence, receptors at risk, and field observations.
- Meeting participants asked clarifying questions about the Central Plateau approach to ecological risk assessment and discussed limitations and considerations for applying such approaches to WMA C.

Approach to Ecological Risk Assessment for Waste Management Area C

- DOE-ORP Staff provided an overview of the ecological risk assessment approach to support *Resource Conservation and Recovery Act of 1976* facility investigation of WMA C, including the site setting, the role of ecological risk assessment, programmatic elements of ecological risk assessment, the selection of risk metrics, preliminary ecological conceptual site models, and the risk assessment framework.
- DOE-ORP Staff noted that the site setting is in the northeast corner of the Central Plateau inner area, which is an industrialized area, with fragmented habitat adjacent to a sagebrush-steppe habitat.
- DOE-ORP Staff presented ecological risk assessment issues associated with the site setting, including pre-remediation conditions (local sagebrush-steppe habitat patches, past releases in surface soil, infiltration), and post-remediation conditions (colonization of soil cover, bio-intrusion, remobilization of subsurface materials, evapotranspiration barrier effectiveness).
- DOE-ORP Staff discussed the role of ecological risk assessment to evaluate threats to terrestrial habitat, establish site-specific cleanup goals, and address future conditions.
- DOE-ORP Staff reiterated the programmatic elements of ecological risk assessment, including the EPA framework, the DOE graded approach, Washington State terrestrial ecological approach, and Hanford tiered approach.
- DOE-ORP Staff proposed that for WMA C, the approach to ecological risk assessment would be to start with the Model Toxics Control Act approach framework, then pull in the Central Plateau approach, and supplement with other data sources and values as necessary.
- DOE-ORP Staff provided detail of the proposed approach and how it would be applied step-by-step to WMA C.

- DOE-ORP Staff provided an overview of the process that could be applied for selecting risk metrics for WMA C under the Hanford Tier 1 approach, including selecting receptors indigenous to the Columbia Plateau, applying the Hanford exposure factors, using generic bioaccumulation models, and calculating eco-toxicity thresholds.
- DOE-ORP Staff identified the complete exposure pathways issues that need to be resolved, including for current conditions (industrial setting, terrestrial wildlife both onsite and offsite within 500 feet), and future conditions (still industrial setting, vegetated cover, terrestrial wildlife likely, cover design and barrier to subsurface).
- Meeting participants discussed the conceptual site model for ecological risk, including bioaccumulation and the use of representative animals for the relevant feeding guilds expected to be at the site. Meeting participants also discussed the merits of understanding current conditions to be able to understand potential ecological risk for future conditions.
- DOE-ORP Staff presented the processes and issues associated with identifying chemicals of interest and completing the terrestrial ecological evaluation.
- DOE-ORP Staff identified the eco-toxicity threshold values that are proposed to be used in the ecological risk assessment framework for WMA C.
- DOE-ORP Staff summarized the overall approach that would be applied to WMA C for ecological risk assessment to support site decisions, including selection of data quality objectives for soil and biota, selection of risk metrics, the appropriate magnitude and weighting of each line of evidence, whether further assessment is needed, and what assumptions need to be made about future conditions.
- Meeting participants discussed the actions that have been taken to date to support the ecological risk assessment activities, including collection of mice for tissue studies.

Lateral Flow in the Vadose Zone

- DOE-ORP Staff presented a conceptual model development for the vadose zone, including how it has currently been applied at the BC Cribs and Trenches, which are similar to WMA C in that there is heterogeneity, uncertain release histories, and sparse data.
- DOE-ORP Staff summarized the heterogeneous nature of the Hanford sediments that results in lateral spreading of moisture.
- DOE-ORP Staff provided a history of the BC Cribs and Trenches, including when they were constructed and how they were used to receive more than 30 million gallons of waste through 1958.
- DOE-ORP Staff presented alternate conceptual models that are being looked at for the BC Cribs and Trenches, including layered geology, layered geology with lenses, and two geo-statistical approaches that assign property values to the vadose zone for hydraulic conductivity.

- DOE-ORP Staff discussed the particulars of each of the alternate conceptual models, including the inherent biases associated with each, e.g., a model may be biased to predicting earlier breakthrough times than are observed.
- DOE-ORP Staff presented the results of borehole analyses that have been done for BC Cribs and Trenches to support the conclusion that there are discrete lenses of finer sediments at various depths.
- DOE-ORP Staff noted that the geo-statistical property assignment approach is limited because of limited data, that up-scaling can be an issue, and that there is a need to evaluate the importance of capturing heterogeneities and at what scale.
- DOE-ORP Staff described the geo-statistical distribution of lithofacies approach, which uses stochastic simulations of sediments. This approach is currently planned to be further analyzed for potential application. However, this approach is also limited because of limited data, up-scaling can be an issue, and there is a need to evaluate the importance of capturing heterogeneities and at what scale
- DOE-ORP Staff noted that the same methods for developing alternative conceptual models can be applied to WMA C, including capturing known layers and lenses. It was also noted, however, that the conceptual model needs to account for geophysical log data, grain size, and borehole data.
- DOE-ORP Staff noted that geology is not the only or primary element of a conceptual model. Source terms, recharge rates, and process identification may be more important in certain circumstances.
- DOE-ORP Staff summarized that there are lots of different methods for developing alternative conceptual models, identifying one is probably not enough, selecting the appropriate scale is difficult and has tradeoffs, uncertainty analyses need to be performed, and it is important to ground-truth conceptual models against existing characterization and monitoring data.
- Meeting participants discussed the concepts that were presented and how the information may or may not apply to WMA C.

Day Two

- Meeting participants discussed the status of the performance assessment effort and the path forward, including scheduling weekly meetings to address open items, including working through the features, events, and processes database.

Features, Events, and Processes Database Structure

- DOE-ORP Staff provided an overview of the status of the database for features, events, and processes.

Appendix B Denominator and Sensitivity Cases

- DOE-ORP Staff provided status on the Appendix B Denominator Cases and sensitivity cases. This addresses the parameter sensitivity and uncertainty analysis proposed for the initial performance assessment of WMA C.
- DOE-ORP Staff described how the concept for the performance assessment now envisions addressing pre-closure and post-closure as separate analyses.
- DOE-ORP Staff provided an overview of the pre-closure analysis assumptions, including assessment times and locations, soil and tank inventories, unplanned releases, other sources, alternative conceptual models and hydraulic properties of the vadose zone, transport properties of the vadose zone, and hydraulic and transport properties of the aquifer.
- DOE-ORP Staff provided an overview of the post-closure analysis assumptions, including assessment time and locations, transport properties of the vadose zone, hydraulic and transport properties of the aquifer, proposed denominator and sensitivity cases, expected residual inventories in soils and tanks, inventories from ancillary equipment and facilities, unplanned releases and other sources, contaminant release, initial conditions for contaminant distributions, hydraulic properties of the vadose zone, hydraulic and transport properties of the aquifer, and other transport properties of the vadose zone and groundwater.

Phase 2 Characterization Program

- DOE-ORP Staff provided an update on the Phase 2 characterization process for WMA C. Several documents, including Data Quality Objectives, Field Investigation/Corrective Measures Studies, Work Plans, and Sampling and Analysis Plans have been published since the start of the process, which incorporate the feedback received from these and other meetings.
- DOE-ORP Staff summarized the data quality objective process, and development of multiple conceptual models.
- DOE-ORP Staff reported on how concerns have been addressed, such as lack of data for upper 15 feet of soil, unplanned releases, tank leaks and overflow events, and other chemical constituents. Other issues raised by other organizations included the need to re-log dry wells, address and/or explain vadose zone contamination, implement temperature logging, characterize deep vadose zone, address down-dip stratigraphic movement, and address preferential pathways.
- DOE-ORP Staff identified actions that have been taken to address these and other issues, including the characterization activities identified through the data quality objective process, soil sampling, surface geophysical exploration, and tissue sampling of mice for ecological risk.

Leak Assessment for Waste Management Area C

- DOE-ORP Staff provided an update on the efforts that have been underway to re-assess the inventory estimates for waste releases in the soil in WMA C.
- DOE-ORP Staff described the process, using historical, process knowledge, and known ratios between different radionuclides to help understand which wastes were released when, and what else should be expected to be found. The evaluation is continuing, and additional historical, process knowledge, and analytical approaches are being used to better understand the releases.
- DOE-ORP Staff provided examples of how the information being brought together is shedding new light on how large or small certain releases may have been and providing evidence for developing better interpretations of what caused the observed existing areas of contamination in WMA C.
- DOE-ORP Staff noted that they are still identifying knowledge and information gaps, and characterization efforts are ongoing. There is a wide range of data with various levels of pedigree, and some data is inconsistent or ambiguous. Additional meetings are planned with tribes and others to further discuss and interpret the information that is being developed.
- DOE-ORP Staff noted that there are alternate conceptual models and hypotheses to estimate the waste release volumes.

Outstanding Issues and Concluding Statements

- Meeting participants discussed the path forward from here for completion of the WMA C PA. One of the things that is needed at this time is a critical path schedule for issuance of the PA that includes DOE and NRC review and ties to the critical path for closure of WMA C.

Flip Charts from Waste Management Area C Ecological Risk Working Session May 17 – 18, 2011

Welcome and Introduction (Todd Martin)

- Todd noted that this meeting is essentially three meetings in one:
 - Ecological risk
 - Where and how do we go forward (including FEPs database)?
 - Updates
 - Denominator and sensitivity cases
 - Characterization
 - Leak assessment

Central Plateau Ecological Risk Assessment Process (Chris McCarthy)

- Keep in mind organism represents entire terrestrial group in each box (Larry on the terrestrial foodweb slide).
- Mike will post document numbers from Chris' ERA slide.
- We have very little ecological data in the central plateau. This has been a historical problem (Vince).
- Soil-plant and soil-invertebrate uptake data has been collected in opportunistic/judgemental fashion and therefore might not capture variability. This is an example of an important data gap (Damon).
- Need to ensure that appropriate weight is given to the exposure of rare critters (Shelley).
- The multiple levels of uncertainty are not comforting. How will uncertainty be addressed (Joe)?
- PNNL data on long-term beagle studies should be used to compare with coyote data in ecological risk assessment (Michelle).
- Does ROD include ecological evaluation to ensure you see if populations start dropping in the future (Brenda)? There is a requirement on Hanford barrier that requires this (Michelle).
- Eco-assessments are not one-time affairs, they need to be carried on through time (Roy).
- For critical reports, independent review should be considered as it would increase credibility of both documents and agencies (Roy).

Approach to Ecological Risk Assessment for WMA-C (Les Williams)

- We should acknowledge that WMA-C is actively managed to prevent colonization and so this is different than a regular industrial site. We know there is ecological risk and therefore we need to take action (John P.).

- More careful problem formulation is necessary because you may be able to exit at step 2 under the regulation (John P.).
- Slide 22: Grasshopper mice may be carnivorous and, given that they are smaller, may be more sensitive than the badger (Dan L. and Beth).
- We probably shouldn't get too hung up on the grasshopper mouse since lab data is usually based on lab mice (Roy, Larry).
- Reptiles do not appear to be considered and they should be (Larry, Beth). Very little toxicological data exists on reptiles so they are using similar mammals and birds as surrogates (Les).
- Slide 25: It is not clear why we need to evaluate the 'current condition' in the ecological risk assessment. It seems the 'future condition' tells us what we need to know (Jeff).
- Since we know we have eco-risk inside the fence at WMA-C, the real question is how far we need to take action outside the fence (John P.).
- Slide 25: Soil invertebrates and plants 'not a concern.' They should be (Larry).
- When sampling biota and assessing risk, what is the assurance that the biota have lived at WMA-C and been exposed there (Roy)?

Weekly Meeting Proposal

- This is a good idea (Marty, Don).
- We will need to manage schedule conflicts (Beth).
- Need a master list of topics and rough chronology to be addressed and preparation of the agenda a week ahead of time.
- Need a clear decision-making process (Jeff). Someone needs to take role of keeping track of and ensuring closure of items (Les).
- Concern that agreements don't really hold at Hanford and how do we make agreements stick (Jeff).
- We need a PA in two years to meet schedule. How can these meetings over the next 12 weeks support this schedule (Jeff)?
- August should be considered a deadline for resolving issues on the agenda/master list (Jeff). Resolution means consensus of participants.
- Agreements do not bypass formal decision-making process (Brenda, Marty).
- How will the groundwater and vadose zone be addressed (Dave R., Brenda)? PA will address as much as it can, but much will only be understood with both the PA and CA; you need all the pieces to do closure (Marty).

FEPs Database

- Mike's database is on the cutting edge of FEPs work (Marty).
- Mike will look into company requirements for releasing the database (Don's request).
- CRCIA Part II has a good template for the database (Dirk).

Appendix B Discussion

- WMA-C fence line is not bounding for cleanup, the extent of contamination is what must be considered (Joe).
- Slide 8: If Les develops numbers for the N/As on this slide, those numbers should be used in the analysis (Beth, Stan).
- Marcel's approach of altering parameters to match what we see today is a good approach that will help with credibility (Jeff, Joe).
- Performing the top priority cases is important for Rev. 1 in order to support the permit schedule (Jeff).
- Slide 23: Case 2 and 3 in actual values column need to be switched (Jeff).
- When Paul's expert elicitation work plan is available, it will be shared with the group (Marcel).
- Slide 27: 20 curies important because it is near surface and so has to be considered for different receptors than we think of for the bulk of contamination that is threatening groundwater (Beth).
- Slide 33, Case 5: Diffusion coefficients seem very small (Gregory).
- Sounds like STOMP² and GOLDSIM³ activities are more parallel than sequential (Hans).

Phase 2 Characterization Update

- Characterization of saturated zone important for modeling but doesn't appear to be a focus of the effort (Hans). Characterization is difficult because of the nature of the aquifer (Marcel, Wade).
- Slide 9: Should include moisture logging (Stan).
- DQO revisions should focus on finding 75% of the Tc (Dirk).
- Down dip needs revision for additional scenario (Dirk).
- Need a series of boreholes to the N-NW of C Farm (Dirk).
- Need assessment of ant and worm activity to understand bioturbation (Dirk).
- Need additional direct push in area A for eco (Beth)? We should be reconsidering all of our characterization elements at this point (Mike).

Leak Inventory

- C-105 max leak number is not defensible (Stan). The shape of the plume is not realistic (Stan).

² Subsurface Transport Over Multiple Phases (STOMP) is copyrighted by Battelle Memorial Institute, 1996.

³ GoldSim simulation software is copyrighted by GoldSim Technology Group LLC of Issaquah, Washington.

Outstanding Issues

- Schedule looks very uncertain and foggy (Vince).
- Jeff wants a timeline of dates and activities to understand where we are. We know the Rev. 0 date but we don't know how we're getting there (Jeff).
- NRC review lengthy but can be sped up by clear referencing in the document (Marty).
- If Rev. 1 is what is needed, the schedule should show that (Jeff).
- Ecology would like to host a meeting to report out on weekly meeting outcomes (Jeff). Marty thinks a meeting in October would be more useful than one in August. That's ok, but it might not be sufficient (Jeff).