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(a) Author (Print/Sign): M. P. Connelly	Date: 08/11/2010
(b) Responsible Manager (Print/Sign): S. J. Eberlein	Date: 08/11/2010
(c) Reviewer (Optional, Print/Sign): K. J. Dunbar	Date: 08/11/2010
(d) Reviewer (Optional, Print/Sign):	Date:

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M. P. Bergeron	E6-31	L. A. Fort	E6-31
M. P. Connelly	E6-31		
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Meeting Minutes for the WMA C PA Engineered Systems #2 Working Session – Steel Corrosion; Concrete/Grout Degradation

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

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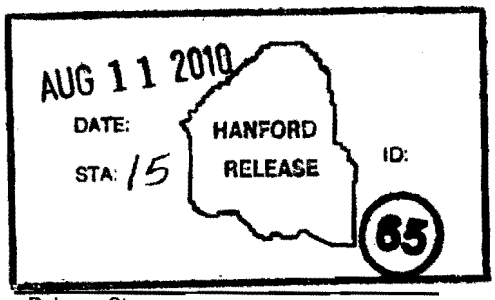
Abstract: Summary of meeting between DOE-ORP, Washington Department of Ecology, Environmental Protection Agency, Nuclear Regulator Commission, Native American Tribes, and stakeholders regarding Engineered Systems #2 – Steel Corrosion; Concrete/Grout Degradation Working Session for the Waste Management 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
Engineered Systems #2 Working Session
Steel Corrosion; Concrete/Grout Degradation

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

on
July 27 through July 29, 2010

LIST OF TERMS

Abbreviations and Acronyms

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CHPRC	CH2M HILL Plateau Remediation Company
CNWRA	Center for Nuclear Waste Regulatory Analysis
CRESP	Consortium for Risk Evaluation with Stakeholder Participation
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
Ecology	State of Washington Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEP	Features, Events, and Processes
HAB	Hanford Advisory Board
INL	Idaho National Laboratory
MCL	maximum contaminant level
MCS	mitigation control system
MDL	minimum detection limit
MTCA	Model Toxics Control Act
NPT-ERWM	Nez Perce Tribe – Environmental Restoration and Waste Management (program)

NRC	U.S. Nuclear Regulatory Commission
PA	performance assessment
PQL	practical quantitation limit
RCRA	*Resource Conservation and Recovery Act of 1976*
SAIC	Science Applications International Corporation
SRR	Savannah River Remediation
SRS	U.S. Department of Energy Savannah River Site
SST	single-shell tank
TC&WM	Tank Closure and Waste Management
TPA	Tri-Party Agreement (*Hanford Federal Facility Agreement and Consent Order*)
UPR	unplanned release
WAC	*Washington Administrative Code*
WIR	waste incidental to reprocessing
WMA	waste management area
WRPS	Washington River Protection Solutions, LLC

Attendees: Representatives from U.S. 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. Environmental Protection Agency (EPA), Region X, the U.S. Nuclear Regulatory Commission (NRC), 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 27 through 29 July, 2010. The roster of participants is given below, followed by the agenda for Engineered Systems #2.

Roster of Participants			
Name	**Organization**	**Phone Number**	**E-Mail Address**
Li, Chunhong	Areva	505-507-5719	Chunhong.Li@Areva.com
Saulnier, George	Areva	206-909-7613	george.saulnier@areva.com
Lehman, Linda	CHPRC	509-376-1473	Linda_L_Lehman@rl.gov
Mehta, Sunil	CHPRC	509-376-7478	Sunil.mehta@pnl.gov
Wood, Mark	CHPRC	509-373-3308	Marcus_I_Wood@rl.gov
Crandall, Tom	DOE HQ	301-903-7454	thomas.crandall@em.doe.gov
Teimouri, Alex	DOE-EM-51	509-376-6222	alexoteimouri@em.doe.gov
Levitan, Bill	DOE-HQ	301-903-3339	william.levitan@em.doe.gov
Kemp, Chris	DOE-ORP	509-373-0649	Christopher_J_Kemp@orp.doe.gov
Lober, Robert	DOE-ORP	509-373-7949	Robert_W_Lober@orp.doe.gov
Hildebrand, RD	DOE-RL	509-377-9626	R_D_Hildebrand@rl.gov
Barnes, Mike	Ecology	509-372-7927	mikb461@ecy.wa.gov
Caggiano, Joe	Ecology	509-372-7915	jcag461@ecy.wa.gov
Hendrickson, Michelle	Ecology	509-372-7970	Mich461@ecy.wa.gov
Jackson, Zelma	Ecology	509-372-7910	zjac461@ecy.wa.gov
Jentzen, Brenda	Ecology	509-372-7912	Bjen461@ecy.wa.gov
Lyon, Jeff	Ecology	509-539-1996	jlyon461@ecy.wa.gov
Okemgbo, Asupuru	Ecology	509-372-7956	aoke461@ecy.wa.gov
Rochette, Beth	Ecology	509-372-7922	broc461@ecy.wa.gov
Uziemblo, Nancy	Ecology	509-372-7928	nuzi461@ecy.wa.gov
Wallace, Jeanne	Ecology	509-372-7931	Jeaw461@ecy.wa.gov
Whalen, Cheryl	Ecology	509-372-7972	cwha461@ecy.wa.gov
Wold, Kristi	Ecology	509-372-7985	Kwol461@rcy.wa.gov
Gerhart, Rebecca	EPA	206-553-1094	Gerhart.rebecca@epa.gov

Roster of Participants			
Name	**Organization**	**Phone Number**	**E-Mail Address**
Panesko, Vince	HAB	509-946-1229	vince@owt.com
Tomlinson, Priscilla	Integral	425-894-6872	ptomlinson@integral-corp.com
Kozak, Matt	Intera	303-985-0005	mkozak@intera.com
Saulnier, George	Intera	425-985-7722	gsaulnier@avera.com
Pabalan, Robert	CNWRA	210-522-5304	rpabalon@gwri.org
Bernhard, David	NPT-ERWM	208-507-1914	davidb@nezperce.org
Sobczyk, Stan	NPT-ERWM	208-621-3751	stans@nezperce.org
Lowman, Don	NRC	301-415-5452	donald.lowman@nrc.com
McKenney, Chris	NRC	301-415-6663	Christopher.mckenney@nrc.gov
Traynham, Brooke	NRC	301-415-5283	brooke.traynham@nrc.com
Dunning, Dirk	Oregon	5023-378-3187	Dirk.a.dunning@state.or.us
Johnson, Charlotte	SAIC	509-372-8162	johnsonch@saic.com
Orr, Everett	SAIC	509-372-7730	orrd@saic.com
Price, Joe	SAIC	301-353-8215	joseph.d.price@saic.com
Martin, Todd	Self	509-270-2362	toddmartin@telus.net
Rosenberger, Kent	SRR	803-557-9328	Kent.rosenberger@srs.gov
Subramanian, Karthik	SRR	803-208-8715	Karthik.subramanian@srs.gov
G. Brown, Kevin	Vanderbilt/CRESP	615-343-0391	Kevin.g.brown@Vanderbuilt.edu
Kosson, David	Vanderbilt/CRESP	615-322-2697	David.Kosson@Vanderbuilt.edu
Bergeron, Marcel	WRPS	509-373-9296	Marcel_P_Bergeron@rl.gov
Connelly, Mike	WRPS	509-373-3981	Michael_Connelly@rl.gov
Eberlein, Susan	WRPS	509-372-1689	Susan_J_Eberlein@rl.gov
Quigley, Keith	WRPS	509-554-4940	Keith_D_Quigley@rl.gov
Robertson, Julie	WRPS	509-376-8162	Julie_R_Robertson@rl.gov
Skorska, Marysia	WRPS	509-372-7935	Maria_B_Skorska@rl.gov

Agenda for Waste Management Area C Performance Assessment – Engineered Systems #2 Working Session Steel Corrosion; Concrete/Grout Degradation July 27–29, 2010	
July 27 AM	**Introductions, Goals and Objectives - Engineered System #2 Session, Review of Past Working Session Decisions, Tank Structural Integrity Work**
8:00 AM	**Refreshments**
8:15 AM	**Introductions** (C. Kemp/S. Eberlein)
8:45 AM	**C- Farm Decision Schedule** (C. Kemp/J. Lyon)
9:00 AM	**Goals and Objectives of Engineered Systems #2 Working Session** (S. Eberlein)
9:15 AM	**Updates on Past Working Session Decisions, Natural System & Open items** (M. Connelly)
9:45 AM	Break
10:00 AM	**Continued - Updates on Past Working Session Decisions, Natural System & Open items** (M. Connelly)
10:30 AM	**Tank Structural Integrity Work Underway** (K. Boomer)
	Other Perspectives on Tank Structural Integrity Work *(D. Dunning -* ***DOE-State of Oregon****)*
11:30 AM	Lunch
July 27 PM	**Features of Engineered System #2: Degradation of Tank Structural Concrete**
12:45 PM	**Steel Liner Corrosion** (L. Fort)
1:30 PM	**Corrosion and Degradation of Steel Liner - Savannah River** (K. Subramanian, SRS & Hanford Integrity Integration**)**
2:00 PM	Break
2:15 PM	**Continued - Corrosion and Degradation of Steel Liner - Savannah River** (K. Subramanian, SRS & Hanford Integrity Integration**)**
3:00 PM	**Dissolution and Degradation of Tank Structural Concrete** (L. Fort)
4:00 PM	Adjournment
July 28 AM	**Degradation of Tank Structural Concrete (continued)**
8:00 AM	**Refreshments**
8:15 AM	**TC&WM EIS - Waste Form Release Assumptions** (EIS team)
9:15 AM	**Degradation of Ancillary Equipment; Pipelines, Diversion Boxes (CR Vault)** (L. Fort)
9:45 AM	**Infrastructure Closure Planning** (S. Eberlein)

Agenda for Waste Management Area C Performance Assessment – Engineered Systems #2 Working Session Steel Corrosion; Concrete/Grout Degradation July 27–29, 2010	
10:15 AM	Break
10:30 AM	**Grout Mixing Studies and Testing** (K. Quigley)
11:00 AM	**Grout Degradation Findings Result of Carbonate and Sulfates** (K. Rosenberger, SRS & Hanford Integrity Integration**)**
11:30 AM	Lunch
July 28 PM	**Initial Scoping Calculations; Proposed Denominator and Sensitivity Cases for Contaminant Release from Residuals**
12:45 PM	**Steel and Concrete Degradation (Open Discussion and Q & A)**
1:00 PM	**Initial Scoping Analysis of Contaminant Release from Tank Waste Residuals** (M. Kozak)
2:00 PM	**Review of Proposed Denominator and Sensitivity Cases –** (M. Bergeron)
2:30 PM	Break
2:45 PM	**Animation of WMA C Water Quality Data** (S. Sobczyk, Nez Perce Tribe)
3:15 PM	**3-D Model of Pipelines of WMA C** (M. Connelly)
4:00 PM	Adjournment
July 29 AM	**Toxicological Look Ahead, Exposure Scenarios; Engineered System #2 Working Session Close-out/Feedback, Look Forward**
8:00 AM	Refreshments
8:15 AM	**Toxicological Look Ahead, Exposure Scenarios** (P. Thomason)
9:15 AM	**Toxicological Look Ahead, Exposure Scenarios** (Open Discussion and Q&A)
9:30 AM	Break
9:45 AM	**Engineered System #2** (Open Discussion and Q&A)
10:30 AM	**Review of Consensuses and Notes** (T. Martin)
11:00 AM	**Working Session Feedback** (T. Martin)
11:15 AM	**Look Forward to Upcoming Working Sessions** (S. Eberlein)
11:30 AM	Adjournment

Summary Notes from 27 - 29 July, 2010 Office of River Protection Waste Management Area C Tank Farm Performance Assessment Input Meeting

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 seventh in 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. C Farm Decision Schedule
2. Goals and Objectives of Engineered Systems #2 Working Session
3. Update on Past Working Session Decisions – Natural Systems
4. Tank Structural Integrity Work Currently Underway
5. Other Perspectives on Tank Structural Integrity
6. Steel Liner Corrosion Overview
7. Corrosion and Degradation of Steel Liner – Savannah River Studies
8. Degradation of Tank Structural Concrete
9. Tank Closure and Waste Management Environmental Impact Statement – Waste Form Release Assumptions
10. Degradation of Ancillary Equipment – Pipelines, Diversion Boxes, CR Vault
11. Infrastructure Closure Planning
12. Grout Mixing Studies and Testing
13. Grout Degradation Findings – Results of Carbonate and Sulfates
14. Initial Scoping Analysis of Contaminant Release from Tank Waste Residuals
15. Application of the Kd Model
16. Animation of Waste Management Area C Water Quality Data
17. Toxicological Look Ahead, Exposure Scenarios
18. 3-D Model of Pipelines of Waste Management Area C
19. Review of Proposed Denominator and Sensitivity Cases
20. Review of Consensuses, Notes , Working Session Feedback
21. Forward Look to Upcoming Working Sessions
22. Closing Comments

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

C Farm Decision Schedule

- DOE-ORP Staff and Ecology Staff provided an overview of the sequence and timing of actions required to obtain closure conditions in WMA C. The WMA C PA is a key supporting document for a number of closure plans that must undergo regulatory approval (including required public reviews) before closure actions can take place. The schedule to support closure of WMA C in 2019 is very aggressive, and emphasizes the importance of identifying and resolving issues early to avoid delays. It was noted that the WMA C PA will undergo iterative updates through the closure process, as more information is obtained and made available.

Goals and Objectives of Engineered Systems #2 Working Sessions

- DOE-ORP Staff provided an overview of the Engineered Systems #2 working session and the topics that would be addressed during this working session, including tank steel liner corrosion and concrete degradation, scoping calculations developed in response to previous working sessions, and a tutorial on toxicology providing information to assist in the future session on exposure scenarios.

Update on Past Working Session Decisions – Natural Systems

- DOE-ORP Staff provided an overview of the proposed denominator and sensitivity cases for natural systems. It was noted that a "denominator" case is intended only as a case against which to compare other cases, and may not be the most likely case. Initial calculations may lead to changes in the designated denominator (and other cases) as more information is gathered. The importance of including the right conceptual model(s) was discussed.

Tank Structural Integrity Work Currently Underway

- DOE-ORP Staff provided an overview of single shell tank (SST) structural integrity studies that have been done in the past and studies that are currently underway or recommended. A Tank Integrity Panel has reviewed the Hanford SSTs and made recommendations for future actions. These recommendations are under review and a plan is being developed.
- Recommendations include obtaining core sample of the concrete sidewall of an SST and the tank section removed for the proposed new riser in tank 241-C-107. The group discussed the potential for testing of such items to better define expected degradation parameters for the PA.

Other Perspectives on Tank Structural Integrity

- Oregon Department of Energy Staff provided a perspective on tank structural integrity. From an integrity standpoint, the rebar-reinforced concrete is considered the tank, while the carbon steel is the liner. Potential issues include leakage from the steel liner into the concrete shell, and overfill of the steel liner leading to waste trapped between the concrete and the liner. Source terms from these configurations should be considered.
- Oregon Staff also raised questions regarding the best modeling approaches for adsorption and desorption of contaminants as they move through the soil. These questions were discussed in more detail in the subsequent discussion on the use of the Kd model.

Steel Liner Corrosion Overview

- DOE-ORP Staff provided a summary of the construction history and features of the SSTs in WMA C, and a summary of the key Features, Events, and Processes (FEPs) that could affect the steel liners of the tanks. The summary included processes that are most likely to have a large impact on steel corrosion in the tank farm environment, as well as those that would likely have a minor impact.

Corrosion and Degradation of Steel Liner – Savannah River Studies

- Technical personnel from Savannah River Site (SRS) provided a presentation on the technical studies done on waste tank steel for the F-Tank Farm Closure Performance Assessment at Savannah River. They provided modeling results estimating time to penetration of the steel in the grouted tank conditions, for the various tank configurations at Savannah River. Their evaluations indicated expected time to failure of steel liners inside a concrete shell would be on the order of thousands of years, while directly buried steel would be several hundred years.
- Meeting Participants discussed the need to consider corrosion mechanisms acting on the steel liner during operations (in order to understand the state of the steel going in to closure) as well as the mechanisms acting on the steel in the closure configuration.
- The issue of determining a “conservative” approach was identified. Savannah River technical staff gave an example of a case where earlier failure of a structure would not be conservative. If release of contaminants from the waste form itself is slow, later failure of the tank structure would allow more contaminants to build up and produce a potentially higher peak groundwater concentration.
- The issue of galvanic corrosion was raised. Galvanic corrosion will occur at contact points between different types of metal, such as places where tanks had been repaired. The buried Hanford tanks have not undergone repairs. However, metal objects in the bottom of the tanks at closure (e.g., discarded equipment) could be a source of local galvanic corrosion.
- Savannah River technical staff indicated that they used a National Bureau of Standards report on actual corrosion rates of metal in soil to assess corrosion for directly buried structures. Use of these reports with the soil type that best resembles Hanford soil may provide input for the WMA C PA.

Degradation of Tank Structural Concrete

- DOE-ORP Staff provided an overview of the corrosion mechanisms acting on the tank structural concrete. Concrete degradation processes were discussed, and those likely to have greater and smaller effect in the closure configuration were discussed.
- Several very old concrete structures were identified. Meeting Participants discussed the limited ability to use that information in a quantitative manner because we do not know how many similar structures were built historically that have not survived (success/failure rate).
- DOE-ORP Staff recommended a starting assumption that tank structural concrete will survive 500 years after closure. Participants discussed whether enough data had been provided as the basis for that assumption. Scoping calculations may be performed to determine what impact that assumption has on the PA outcomes, to determine whether more data in this area is needed. Participants recommended several sources of existing data that may be incorporated into the technical evaluation.

Tank Closure and Waste Management Environmental Impact Statement – Waste Form Release Assumptions

- DOE-ORP Staff provided an overview of the waste release modeling done in the Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS). Because multiple facilities are considered in the EIS, several release models are used. Grouted tank residuals were among the configurations evaluated. In the case where the release from the tank waste residuals is not inventory limited, taking credit for the tank and liner has the effect of delaying the time at which the peak release reaches ground water, without affecting the peak magnitude. This approach was considered conservative.
- Participants discussed the observation that a detailed mechanistic model for release of residuals from the tank would be on a different scale than the rest of the EIS, where much of the contribution to groundwater contamination stems from material that is already in the soil.

Degradation of Ancillary Equipment – Pipelines, Diversion Boxes, CR Vault

- DOE-RL Staff presented an overview of corrosion mechanisms affecting ancillary equipment. Because many pipelines are directly buried, corrosion of steel is likely to occur more rapidly than in the concrete encased tanks. The proposed denominator case will not take credit for any structural integrity associated with pipelines.
- Participants asked about subsidence controls required for ancillary equipment. Depending on void volume, fill may be required for equipment left in place (e.g., for a diversion box). Requirements will be developed as part of closure cap conceptual design.

Infrastructure Closure Planning

- DOE-RL Staff presented the outline of activities required to evaluate closure options for ancillary equipment and develop closure plans. It was emphasized that the WMA C PA is a tool that will evaluate several closure configurations (including removal of equipment) to support informed decision making on closure design. Closure plans must go through regulatory approval processes before implementation.
- Participants indicated that it was important not to allow pre-conceived notions about closure configuration to define what data to collect. Participants indicated that criteria should be identified for making decisions on the closure configuration of various system components to ensure that meaningful information is collected.
- Participants discussed worker risk as a consideration in making decisions on closure configuration. Designs for closure should consider how to minimize risk to workers. However, risk minimization will eventually translate into cost, which will also need to be evaluated.

Grout Mixing Studies and Testing

- DOE-ORP Staff presented results of grout mixing and testing performed at Hanford. The behavior of various types of concrete is fairly well understood. During curing, concrete hardens, shrinks, and cracks. Use of more sand in the mixture (less concrete) leads to less shrinkage and fewer cracks, but also lower compressive strength in the final product. The requirements for tank fill grout will need to be determined.
- Participants raised the question on what to expect regarding the mixing of residual waste with grout. Findings showed it was unreasonable to expect much residual waste/grout mixing.
- Participants identified a number of items that may have a significant impact on performance, including chloride content in the water, consistency of the materials themselves, operational impacts (e.g., unexpected shut-down in the middle of a grout pour). It was noted that the language used to specify construction standards and the language used to specify assumptions in a PA could differ, and should be chosen carefully.

Grout Degradation Findings – Results of Carbonate and Sulfates

- Technical personnel from SRS provided an overview of studies on concrete and grout degradation at Savannah River. They noted that the degradation came from the outside (i.e., the soil) in for the tank structural concrete. They discussed impact of sulfate and carbonate. It was noted that the carbonation from interaction of structural grout with rebar, and of fill grout with cooling coils, had a dominant effect.

Initial Scoping Analysis of Contaminant Release from Tank Waste Residuals

- DOE-ORP Staff presented results of scoping calculations of contaminant release from waste residuals, prepared in response to questions in previous working sessions. The evaluations considered a number of diffusion coefficients as well as the impact of gradual release vs. sudden release due to failure. It was noted that high diffusion rates are similar to low advection rates, so the presence or absence of advection is important to the modeling.
- Meeting participants discussed how a simple model could be used effectively to evaluate a complex process. It was noted that the models would not be perfect, and were not intended to replicate reality. However, simple models may help identify certain processes (for example, water flow within the system) that have such dominant effects that other aspects of the system may be less important.
- Participants discussed the need to understand what the models were trying to achieve. An evaluation of flux flow may be achievable, while prediction of the specific shape of a plume will probably be inadequate. The model needs to be driven by an understanding of what information is needed to make a decision.
- Participants noted that different simplified models may be useful for different questions, and that simplified models may define critical parameters that support definition of a more detailed model for a small part of the system.

Application of the Kd Model

- DOE-ORP Staff presented a discussion on the use of the Kd model. It was noted that Kd is a lumped parameter representing a number of physical characteristics, often generalized from a point measurement.
- Meeting participants discussed limitations of Kd models, including potential consequences of using a Kd that was much higher or lower than the real case. Dependencies of Kd on various parameters (chemical configuration of the analyte, other chemicals present in the soil, chemical kinetics, etc.) were discussed.
- Meeting participants discussed situations where lower estimates of Kd may be informative (e.g., greatest impact on ground water) or where higher estimates of Kd may be informative (e.g., evaluation of intruder scenarios).

Animation of Waste Management Area C Water Quality Data

- Representatives of the Nez Perce tribe presented an animation of contaminant movement through the vadose zone and through the ground water, based on a compilation of existing data. Contamination from C Farm has reached ground water. The animation is a tool for visualizing the data, to assist in evaluating potential sources of contamination.

Toxicological Look Ahead, Exposure Scenarios

- DOE-ORP Staff presented a tutorial on chemical risk assessment requirements and methods to provide a basis for the discussion of exposure scenarios in the next working session. Terminology and methods used in chemical risk assessment were discussed. Differences among approaches from different regulatory frameworks were considered.
- Meeting participants discussed issues regarding how non-detects could be approached in a risk assessment. Issues regarding chemicals with target levels less than method detection limits were discussed. It was noted that the practical quantification limit and the method detection limit are not necessarily the same, and are affected by a number of factors (e.g., sample dilution).
- Methods of selecting chemicals of potential concern were discussed. Methods of evaluating multiple chemicals were discussed. Statistical methods were discussed.
- Variability and uncertainty were considered. It was noted that these are not the same; true variability may exist in a population, while uncertainty may result from a limited set of data. In some cases, there may be both variability and uncertainty.

3-D Model of Pipelines of Waste Management Area C

- DOE-ORP Staff presented a visual tool showing the pipelines and infrastructure in WMA C. This tool is continuing to be updated to provide a visual interface to a larger body of data for closure planning purposes.
- DOE-ORP Staff presented a brief summary of findings to date in the WMA C soil sampling investigations. A number of sites have been sampled, but no major plume of mobile contaminants has been identified. A number of increases in technetium concentrations in the groundwater have been observed. ORP and Ecology will be reviewing these findings to see if any changes in the soil evaluation plan are warranted.

Review of Proposed Denominator and Sensitivity Cases

- DOE-ORP Staff asked meeting participants to review the proposed cases in the data package provided for this working session, and provide any comments.
- It was noted that the comments captured on the flip charts would be transferred to Review Comment Record forms and resolved as needed in a revision to the data package. Written comments on the data package are also solicited within 30 days.
- DOE-ORP Staff requested feedback on additional scoping calculations that may be needed in regard to tank or liner degradation behavior, or to support the next working session.

Review of Consensuses, Notes, Working Session Feedback

- Meeting Facilitator summarized key points in this working session. In particular, he re-emphasized that this is not a decision making process. The WMA C PA will provide information for decision makers, but decisions will be made in other documents/processes.
- The Meeting Facilitator also noted the following key points brought out by participants:
    1. The schedule for the WMA C PA and resulting processes and decisions is aggressive
    2. Any use of a Kd in the modeling may not be right, but it should be useful
    3. Modeling of the degradation timing for the tank and liner needs to have a good basis, if it matters to the model results.

Forward Look to Upcoming Working Sessions

- A need for an additional session on the Ecological Risk Assessment was previously identified. The dates of May 17-19, 2011 were proposed. Participants were asked to check their calendars to determine if those dates were acceptable.

Closing Comments

- NRC Staff reminded us that we need to remember what we are trying to analyze and why we need that particular information, to guide us in setting priorities.
- NRC Staff emphasized that it is critical that we consider all the pathways for exposure. Future exposure scenarios may be added as long as the required pathways have been included in the modeling process.
- Oregon expressed concerns that we don't understand the sub-surface well enough to get the pathways right. The group re-emphasized the need to update the model as more information and understanding are gained.

Flip Charts from Waste Management Area C Working Session, Engineered Systems #2, July 27-29, 2010

Items we're tracking

- Mike's 10x document
- Disconnect between EIS, PA and final barrier design
- Clarity on sensitivity versus uncertainty
- Aiming for 2011 eco/direct contact session
- Clearer picture of getting to decisions
- Consistent terminology for subsurface.

Closure Decision Schedule (Chris and Jeff)

- EIS by May 2011 unlikely (Dirk)
- Comment periods not shown and RCRA closure plans not completed before grouting starts (Dirk)
- WIR process may end up in court (Dirk)
- Schedule relies on documenting decisions (Chris M)
- Schedule does not show iterations of PA through 2019 (Mike C)
- Schedule is utopian (Joe C)
- We all need to get the PA right so provide and resolve comments (Jeff L).

Updates on Working Session Decisions (Mike and Marcel)

- Discard Kd's as they really should be Kf's (Dirk). Sensitivity cases not including the Kd's will be run (Mike C). Dirk will give citations to Mike.
- BX report shows the stair-stepping is what is occurring—it is not an alternate conceptual model (Dirk).
- Natural systems uncertainty/sensitivity Kd for I-129 should be .02, not .2 (Mike C).
- Early you should focus on alternate conceptual models as opposed to just parameter modifications (Chris M).

Tank Structural Integrity (Kayle Boomer)

- Consider chemical analyses of core to better understand long-term degradation mechanisms.
- Where is 'fit for use' document (Michelle M)?
- Is there a document that outlines simulants for coupon test (David, NPT)? Not out yet.

Steel Liner Corrosion (Les Fort)

- Did cathodic protection in the past help (Joe C)? It does not appear it was helpful (Les).
- Iron oxide can absorb radionuclides (Mike C).
- Assuming liner is gone may not be conservative (Karthik).
- Ignoring physical realities harms your modeling efforts (David, CRESP).

Corrosion and Degradation of Steel Liner-Steel Integrity Parameters (Karthik)

- Any assumed chemical alterations (e.g. leaked waste) that would impact rates (Michelle M)? No (Karthik).
- Karthik used data where they had it to produce deterministic calculations (Karthik).
- Why no advection (Beth)? Assumed different diffusion rates to account for mechanisms, basically, they didn't care how it got there (Karthik). So this account does not account for percolation, cracking, etc. (Beth).
- Not knowing density of cracks impacts analysis since it is a different mechanism (David, CRESP).
- Be careful and think about any equipment left in tank that could cause galvanic corrosion potential (Kent).
- Biased high on chloride addition assumption because you are actually losing chloride to the soil but not accounting for it (Dave, CRESP).
- It's a big leap to go from Karthik's 'life in soil estimations' in SRS soils to Hanford soils (Mike C).

Degradation of Tank Structural Concrete (Les)

- Be careful extrapolating from ancient analogs (e.g., Pantheon) because (1) they have different formulations; and (2) they only show successes—there is no data on the failures.
- Slide 74: Hypothesis that tank will last 500 years needs more justification (Dave, CRESP). 500 years is just a starting point that will be augmented by many sensitivity cases (Mike C). Are we going to perform the sort of work Karthik did to support his numbers or just make a general assumption (Jeff L)? We need to figure out if it makes sense to collect more data (Susan).
- Is the purpose of the PA to model reality or focus on sensitivities (Jeff)?
- If we find the denominator case is particularly sensitive to a parameter the case should be updated (David, CRESP).
- The take home message is that the tanks will be there a lot longer than previously assumed (Karthik).

EIS Discussion (Joe P)

- Tc-99 release rates are increased for bulk vitrification because the Tc is driven out into the ceramic (Dirk).
- The sensitivity of maintaining the same permeability between tanks and soil (essentially the grout has the same permeability as the surrounding soil) should be calculated (David, CRESP). Really only results in a timing difference in contaminant release (Joe P).
- Detailed mechanistic release models are not useful in the EIS given what source term already exists in the vadose zone.
- The only parameter from technical guidance document that changed was tortuosity (Joe P).
- Is it possible to perform more probabilistic uncertainty on the preferred alternative (David, NPT)?
- No sense in the EIS of when the uncertainty becomes so large it dominated the results (Dirk).

Infrastructure Closure Planning (Susan)

- 2015 too late to be performing closure demonstration work. The sooner we have a decision about how to close a tank, the better transparency and utilization of dialogue we can have during permitting process (Jeff).
- Iterative development of subsystem component closure would help with future farm closures.
- Understanding what drives criteria (e.g., waste form interactions) is very important (David, CRESP).
- Disconnect between this work and vadose zone CERCLA work—could require removal of tank farm equipment (Dirk).
- We should try to resolve concerns with WIR, not defend against these concerns (Dirk).
- Design work to avoid worker risk, don't avoid the work (Dirk). Don't forget about cost associated with avoiding worker exposure (Chris M).
- We should demonstrate how to dig up a tank (Dirk).

Grout Mixing Studies and Testing (Keith)

- Lots of grouting going on at SRS that presents a good opportunity to learn for Hanford projects (Karthik).
- Would have been nice to compare INL grout to 50-foot drop test at Hanford (Chris M).
- Make sure grout formulation doesn't harm the liner. For example, there are many inconsistencies in materials such as fly-ash (Karthik).
- Construction standards and PA standards are different. This should be recognized.
- Don't assume a perfect pour—plan for issues (Vince).

Contaminant release scoping calculations (Matt)

- Advective flow through a crack is very different if saturated versus unsaturated (David, CRESP).
- Two items impact diffusivity: (1) Type of concrete; and (2) chemical interactions (David, CRESP).

Kd Discussion (Matt)

- Only way to get uranium Kd (given the presence of natural uranium) is to measure it (Stan, Matt). Kd of uranium releases relies on what it is bound to (carbonate for example) (Beth).
- What appears to be dilute uranium saturation can in reality be near saturation making the low Kd wrong (Dirk). This situation makes uranium transport essentially a go/no go situation; if uranium is added to the system it will move quickly (Dirk).
- Unless you do pH and carbonate you are applying a constant to something that is highly variable (Dirk).
- You may not be right, but a really low Kd may be useful in the PA (Beth, Dirk).
- Lots going on with uranium at Hanford (precipitates, solubility issues, etc.) that must be dealt with in the PA—there is no single 'right' Kd (Todd).
- A validated model on the Hanford Site is near impossible (Mike C).
- Limiting Kd is saturated solution at the right pH (Dirk). .Uranium in C Farm is approximately 3-4 X 10^{-6} and flat (nothing from elsewhere) (Mike C).
- Be cautious for taking credit for bitumen because of radioactive and microbial degradation (Dirk, Beth).
- Need to be careful and honest about what we can learn from simple models applied to complex systems (Jeff).

Stan's animation discussion

- Should be able to determine uranium contamination by calculating isotopic ratios (Chris M).
- It appears there is more uranium from 200 series tanks than is currently accounted for in UPRs (Stan).

CERCLA RCRA Risk Assessment (Priscilla)

- How do you deal with PQLs when samples are diluted (Jeff)? If sample arrives at lab diluted, PQLs apply to diluted sample (Beth).
- MCLs are generally at that tap, but DOE going for MCSs in groundwater (Bill L).
- MDLs and PQLs are different and shouldn't be substituted for one another (Dirk).
- Jerry Yokel should attend the next session to ensure Ecology chemist is present.
- How do we deal with additive risks at Hanford (Brenda)?
- What are requirements in MTCA to demonstrate a barrier is protective (Jeff)? This should be on the agenda for the September session.
- For September, slide 16 should include direct rad exposure (Mike C).
- Show all different exposure assumptions (DOE, CERCLA, RCRA) for comparison (Mike C).
- 'Frequency of detection' a bad elimination criteria at Hanford (often contamination isn't analyzed for) (Beth, Michelle M).

Work Plan Update (Mike C)

- When do you decide that the workplan has been changed enough and we're not going to find the big source of contamination (Jeff)?

Proposed Cases (Marcel)

- Where and when are breakpoints in what matters (vadose zone, source, groundwater)? Right now, it appears to be the vadose zone that is the most important feature in the PA (Dirk).
- Subtract individual parts of the system to see what matters (Linda). We need to prioritize sensitivity cases and how to run them (Jeff, Mike C).

Todd's summary

- PA is not a decision making process.
- Purpose of process: Ensure participants get information for decision makers.
- Initial PA helps us understand what matters.
- TPA milestone is aggressive.
- PA is not going to be right on Kd (particularly for uranium) but it needs to be useful.
- Hypothesis of 500 year tank/grout life needs more basis and consideration (does it really even matter?).
- Eco session will be in the spring.