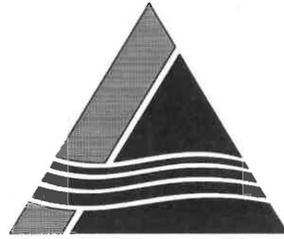


Inter-Agency Management Integration Team (IAMIT) Meeting Minutes

Department of Ecology Building
Richland, Washington

April 24, 2019

Inter-Agency Management Integration Team (IAMIT) Meeting Minutes
April 24, 2019



Tri-Party Agreement

U.S. Department of Energy
Washington State Department of Ecology
U.S. Environmental Protection Agency

SIGNATURES:

Approval: 
W.F. Hamel, DOE-RL Representative

Date: 5/31/2019

Approval: 
R.G. Hastings, DOE-ORP Representative

Date: 6/14/19

Approval: 
A.K. Smith, Ecology Representative

Date: 6/20/19

Approval: 
D.R. Einan, EPA Representative

Date: 6/27/19

Minutes Prepared by: 
S.L. Brasher, Mission Support Alliance

Date: 5/31/19

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1. Sensitivity Analysis on Groundwater Recharge Rates for the 200-EA-1 Operable Unit

- A. See Attachment 1, the Washington State Department of Ecology (Ecology) Position on Sensitivity Analysis on Groundwater Recharge Rates for the 200-EA-1 Operable Unit (OU).
- B. See Attachment 2, the U.S. Department of Energy, Richland Operations Office (DOE-RL) Position on Sensitivity Analysis on Groundwater Recharge Rates for the 200-EA-1 OU.
- C. IAMIT Discussion

Ecology stated a sensitivity analysis should be performed to evaluate the uncertainty in impacts to groundwater with varying levels of recharge, meaning DOE would evaluate the uncertainties with a larger recharge rate than what is currently used to model.

Ecology also stated there were a lot of studies done that looked at historical data, but that it was considering the future, particularly that shrub-steppe vegetation is disappearing in the western United States and cheatgrass, an invasive species, was to blame for that.

Ecology stated the U.S. Environmental Protection Agency (EPA) guidance also requires sensitivity analysis for models to evaluate the impacts of uncertainty. Ecology referred to Pacific Northwest National Laboratory (PNNL) documents which state:

- Vegetation and impacts of wildfires, climate, and land use create uncertainty that needs to be evaluated (PNNL-16688, PNNL-14702, and PNNL-10285).
- The 1984 fire had a significant impact on recharge rates because it changed the species composition and future recharge rates should consider the frequency and impact of fires (PNNL-10285, *Estimated Recharge Rates at the Hanford Site*).

DOE and Ecology disagree on whether to use the long-term recharge rate of 4 mm/year at revegetated waste sites.

Ecology is asking DOE to do a standard modeling approach of evaluating the uncertainty of a key parameter.

DOE stated the long-term recharge rate has been discussed amongst the Tri-Parties for at least 10 years and in January 2012, the Tri-Parties agreed on the graded approach document, which provides the Central Plateau recharge values (DOE/RL-2011-50, *Regulatory Basis and Implementation of a Graded Approach to Evaluation of Groundwater Protection*).

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EPA stated they were not sure if they would use the 22 mm/year number to do a sensitivity analysis.

Ecology noted they were looking at the cheatgrass scenario, not the no-vegetation scenario. This is based on what PNNL gives for cheatgrass, 25 or 22 mm/year.

EPA stated we have had a cheatgrass issue for a number of years and asked what the relative progress is on that.

DOE reminded everyone that this topic has been talked about for a long time, experts have been brought in, discussions have been had at high levels, to include talking about fire cycles, and we are talking about it again. Establishing new long-term recharge rates for cleanup levels would discount decades of research and negate decisions already made by the Tri-Parties.

Ecology proposed DOE perform a sensitivity analysis that includes the immature shrub-steppe and the mature shrub-steppe using the same timeframes and using the cheatgrass dominant value of 22 mm/year for post 2051 out 1,000 years.

DOE recommended preserving the status quo, and using a long-term recharge rate of 4 mm/year for revegetative waste sites.

DOE stated the Cumulative Impact Evaluation can explore recharge rates; however, they would like to maintain consistency between the 200-EA-1 OU and the other OUs.

MSA took the action to schedule another meeting between the IAMIT representatives to discuss and resolve this, along with the PCB method analysis issue below.

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2. Polychlorinated Biphenyl (PCB) Method Analysis Selection 8082 and 1668A for the 200-EA-1 Operable Unit

- A. See Attachment 3, Ecology Position on PCB Method Analysis Selection 8082 and 1668A for the 200-EA-1 OU.
- B. See Attachment 4, DOE-RL Position on PCB Method Analysis Selection 8082 and 1668A for the 200-EA-1 OU.
- C. IAMIT Discussion

DOE and Ecology disagree on which method to use for analyzing PCBs. DOE prefers EPA Method 8082, which measures aroclor concentrations, while Ecology favors EPA Method 1668, which measures the 209 congener concentrations.

Ecology noted that EPA Method 8082 does not test for all dioxin-like congeners and EPA Method 1668 tests for all congeners.

Ecology stated EPA surmised that Hanford was a dry climate, and as a result, there wasn't a lot of "weathering", which may drive contaminants down or dilute dioxin-like toxicity, but that had not been demonstrated. Ecology is asking for that demonstration.

Ecology referred to the EPA Region 10, April 2007 memo that recommends a subset of samples be analyzed with EPA Method 1668 because EPA Method 8082 is not sufficient as a trigger for 1668 because it is blind to 1668 and lacks the sensitivity to see concentrations of congeners.

EPA stated the memo is dependent upon site conditions and is not a blanket recommendation for every single site.

DOE talked about the production of PCBs by Monsanto and stated they produced aroclor PCBs in mixtures, which have a whole range of congeners in them.

DOE also discussed weathering and the fact that if PCBs weather, you will still see a recognizable aroclor pattern, although somewhat altered.

EPA believes looking at a subset of 139 samples that are non-detect for aroclors seems like an enormous number of samples to determine if congeners are above aroclors if we are not seeing anything out there as aroclors.

EPA stated 139 samples at a cost of \$600,000, seems excessive to determine whether or not PCBs should be a contaminant of potential concern.

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Ecology asked for clarification of the purpose of this sampling exercise. Is it to determine contaminants of potential concern or to determine cleanup levels or do a risk analysis?

DOE responded it is ultimately for a Baseline Risk Assessment.

DOE proposed to jointly select with Ecology, 47 of 114 waste sites for PCB analysis at the 200-EA-1 OU, utilizing Method 8086 for the analysis. If aroclors are detected with Method 8082, the congeners will be evaluated with Method 1668. If aroclors are not detected with Method 8082, congeners will be evaluated with Method 1668 at a subset of seven (7) selected waste sites.

DOE proposed to perform Method 8082 on shallow-zone samples at 20 waste sites identified by Ecology and perform Method 1668 for a sample where there is a Method 8082 detect above the practical quantitation limit.

MSA took the action to schedule another meeting between the IAMIT representatives to discuss and resolve this, along with the recharge rate issue above.

3. Status Update – IAMIT Dispute for M-015-93C, Initiate Characterization Field Work for 200-SW-2 OU Landfills

Ecology noted their deadline for issuing a Director's Determination on this dispute may have run out and this is a procedural flaw.

Ecology also noted this milestone was impacted by the appropriation of the Federal Fiscal Year (FFY) 2018 and 2019 budgets, and the FFY 2020 budget could conceivably affect it as well.

Ecology proposed extending this dispute at the IAMIT level until the Tri-Parties can meet to discuss the FFY 2018 and 2019 budget impacts to all 12 milestones in the draft Agreement in Principle (AIP) and draft Tentative Agreement (TA).

DOE-RL indicated an extension puts them in an awkward position as they are waiting on resolution and now Ecology is proposing to go back to resolving this dispute with the draft AIP and TA.

Ecology stated they did not know what would happen if DOE did not agree to an extension because their timeline for issuing a Director's Determination had been exceeded and did not know if that meant Ecology lost their right to issue a Director's Determination or not.

DOE-RL noted this milestone was being resolved at the project manager (PM) level. Ecology refused to extend it at the PM level, raised it to the IAMIT level, and now Ecology wants to go back to the PM level for resolution.

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DOE-RL stated they would have liked to keep this milestone in the draft AIP and TA and resolve them together; however, they would take the action to schedule the meeting to discuss the president's budget and impacts to the milestones.

4. Status Update – IAMIT Dispute for Tank 241-C-106 Waiver Request Denial

Ecology noted the same procedural flaw with this dispute, which raised confusion regarding if issuing the Director's Determination needed to be within 35 days after issuance of the Statement of Dispute.

To resolve this flaw, Ecology and DOE agreed to sign an extension that clarified the Director's Determination is not due until 14 days after the IAMIT cannot come to a resolution (See Administrative Record Accession No. AR-01196).

MSA stated a Special IAMIT meeting was scheduled on May 6, 2019 for the IAMIT representatives to discuss resolution of this dispute.

5. Review IAMIT Action Tracking Table (See Attachment 5)

A. Table I - Action Items

- i. Sensitivity Analysis on Groundwater Recharge Rates for the 200-EA-1 Operable Unit – MSA took the action to schedule a follow-on meeting for the IAMIT representatives to discuss further and/or resolve. DOE requested this issue be scheduled along with the PCB method analysis selection issue. This item remains open.
- ii. PCB Method Analysis Selection 8082 and 1668A for the 200-EA-1 OU – MSA took the action to schedule a follow-on meeting for the IAMIT representatives to discuss further and/or resolve. DOE requested this issue be scheduled along with the groundwater recharge rate issue. This item remains open.
- iii. Baseline Risk Assessment for WMA-C – A follow-on meeting for the IAMIT representatives to discuss further and/or resolve was scheduled for April 25, 2019. This item remains open.
- iv. TPA Dispute (IAMIT Level) 241-C-106 Waste Retrieval Denial of Waiver Request – An extension was signed by the IAMIT, which gives the Ecology Director until May 28, 2019 to issue a final determination (See Administrative Record Accession No. AR-01196). This item remains open.
- v. TPA Dispute (IAMIT Level) Milestone M-015-93C / TPA Change Control Form M-15-18-03 – Initiate Characterization Field Work for 200-SW-2 OU Landfills – Ecology suggested extending this dispute until the Tri-Parties can meet about the

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broad range of milestone impacts due to budget. DOE-RL took the action to schedule the meeting to discuss the FFY2018 and 2019 president's budget and impacts to the milestones. This item remains open.

B. Table II - Status Updates

- i. TPA Five-year Review – EPA stated they are still working on providing comments on TPA paragraphs 148/149 and indicated they would like to be doing the same things that are in the TPA, just update them to reflect current terminology. This item remains open.
- ii. Milestone M-037-10/Closure Actions for Five Specified TSDs aka “Coordinated Closure” – This is being worked at the project manager level, therefore, the IAMIT agreed to discontinue tracking this action at their level. This action was closed.
- iii. Modification to TPA Section 9.4, “Administrative Record,” to Eliminate Hard Copy Requirements – MSA noted that work on the Hanford Administrative Record upgrade continues and should be completed during the third quarter of FY2019. The action remains open.
- iv. Agreement in Principle for the Negotiation of HFFACO Revisions in Response to Federal Fiscal Year (FFY) 2018 Appropriation and FFY 2019 President's Budget – Ecology stated they had reviewed the AIP and it had omitted one thing. It was not clear how the AIP could be terminated if negotiations were not successful. Ecology sent this comment to EPA. DOE-RL took the action to schedule a teleconference between the Tri-Parties to discuss current status and path forward to negotiations. The action remains open.
- v. Milestone M-035-09K, Conduct Biennial Assessment of Information and Data Access Needs with EPA and Ecology – Ecology stated they could see a dispute impending for this milestone and requested a meeting be scheduled prior to the next regularly scheduled IAMIT on May 16, to see if their issue can be resolved. DOE-RL took the action to schedule this meeting with the Tri-Parties. The action remains open.

C. Table III - Recently Closed/Other Agreements

IAMIT Determination 2009-002: Agreement Not To Perform Unfiltered Hexavalent Chromium [Cr(VI)] Sampling – This IAMIT Determination was signed and closed at the last IAMIT meeting and will be removed from the list. This action is closed.

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6. Upcoming IAMITs – Schedule and Length

Ecology noted they are not in favor of having additional staff at the follow-up IAMIT meetings where the IAMIT representatives need to meet to discuss disputes and/or issues and come to resolution.

Ecology has observed an increase in the number and duration of IAMIT meetings and it has become a scheduling concern. Ecology suggested changing the times and durations and possibly swapping with the other meetings, the DOE-ORP and -RL quarterlies, that start after the IAMIT concludes. The IAMIT agreed to come prepared to the May 16 IAMIT meeting ready to discuss any schedule changes they want to make.

7. Other Items

A. EPA Opinion on using the Integrated Risk Information System (IRIS):

EPA was asked by the IAMIT to talk about a meeting held with Mr. Marc Stifelman, EPA Region 10. EPA relayed that Mr. Stifelman talked about how EPA uses IRIS and how it takes an extensive review of other documentation to use something else over IRIS and if there is an IRIS number available, that is the number used.

B. Update TPA Legal Agreement, Article VIII. Resolution of Disputes:

Ecology noted their deadline for issuing a Director's Determination on the M-015-93C and 241-C-106 disputes may have run out due to a TPA procedural flaw. Ecology suggested updating the TPA Legal Agreement, Article VIII, Resolution of Disputes (paragraph 30.D) to clarify that the Director's Determination is not due until 14 days after the IAMIT cannot come to a resolution.

C. DOE-ORP Quarterly and PM meeting change: DOE-ORP suggested discontinuing their quarterly meetings and continuing to conduct the monthly project manager meetings because the report is the same for both meetings. Both Ecology and EPA stated they were okay with the concept as long as they receive the reports and have calendar invites to attend the ORP monthly PMMs. DOE-ORP took the action to ensure both Ecology and EPA were on distribution for the monthly reports.



Inter-Agency Management Integration Team Meeting
Wednesday, April 24, 2019, 10:00 a.m. - Noon
 Department of Ecology, 3100 Port of Benton Blvd, Conf. Rooms 3A/B, Richland, WA

Agenda

No	Time	POC / Org	Topic
1	10:00 – 10:05 am	Turner, Michael, MSA	Welcome and Meeting Logistics/Format
2	10:05 – 10:10 am	Nina Menard, ECY	Sensitivity Analysis on Groundwater Recharge Rates for the 200-EA-1 Operable Unit
	10:10 – 10:15 am	Doug Hildebrand, RL	
	10:15 – 10:30 am	IAMIT Discussion	
3	10:30 – 10:35 am	Nina Menard, ECY	Polychlorinated Biphenyl (PCB) – Method Analysis Selection 8082 and 1668A for the 200-EA-1 Operable Unit
	10:35 – 10:40 am	Doug Hildebrand, RL	
	10:40 – 10:55 am	IAMIT Discussion	
4	10:55 – 11:00 am	IAMIT Discussion	Status Update – IAMIT Dispute for M-015-93C, Initiate Characterization Field Work for 200-SW-2 OU Landfills
5	11:00 – 11:10 am	IAMIT Discussion (Sign Determination Extension)	Status Update – IAMIT Dispute for C-106 Waiver Request - Extension/Clarification of timing of Directors Determination
6	11:10 – 11:15 am	IAMIT Members	New Items for Upcoming IAMIT Meetings
7	11:15 – 11:25	Price, John, ECY	Upcoming IAMITs – Schedule and Length
8	11:25 – ?	Turner, Michael, MSA (IAMIT and attendees)	IAMIT Action Tracking Table

Inter-Agency Management Integration Team Decision Table/Action Tracking

April 24, 2019

*New information shown in blue

Table I. Action Items

1. Sensitivity Analysis on Groundwater Recharge Rates for the 200-EA-1 Operable Unit

Reference: 200-EA-1 Operable Unit Work Plan, Draft A (DOE/RL-2016-58)
Affected Milestones: N/A
Originated: 09/12/2018
Status: Open
Dispute Extended: N/A
Action: Parties are being asked to agree on the path forward/resolution on recharge sensitivity analysis for 200-EA-1 OU.
Comments: Presentations will be given by DOE and Ecology at today's IAMIT. The Parties are being asked to come to a decision.

2. Polychlorinated Biphenyl (PCB) – Method Analysis Selection 8082 and 1668A for the 200-EA-1 Operable Unit

Reference: 200-EA-1 Operable Unit Work Plan, Draft A (DOE/RL-2016-58)
Affected Milestones: N/A
Originated: 09/12/2018
Status: Open
Dispute Extended: N/A
Action: Parties are being asked to agree on the path forward/resolution for use of Method 1668 in conjunction with Method 8082 for soil characterization at the 200-EA-1 OU.
Comments: Presentations will be given by DOE and Ecology at today's IAMIT. The Parties are being asked to come to a decision.

3. Baseline Risk Assessment for WMA-C

Reference: Phase II RCRA Facility Investigation for Waste Management Area C (RPP-RPT-58339)
Affected Milestones: M-045-61 (completed)/TPA Appendix I
Originated: 02/21/19
Status: Open
Dispute Extended: N/A
Action: Parties are being asked to agree on the path forward/resolution for four specific areas of the Baseline Risk Assessment: Judgmental Samples; Hazard Index; Groundwater Ingestion and Food Chain Pathway
Comments: Presentations were given by Ecology and DOE at the 2/19/19 IAMIT. At that meeting, Ecology requested more time to consider the issue. There was no change in status at the 3/21/19 IAMIT.

Inter-Agency Management Integration Team Decision Table/Action Tracking

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Table II. Status Updates

1. TPA Five-Year Review

Reference: TPA Article XXXVIII

Affected Milestones: N/A

Originated: N/A

Status: Agency Review – closed (via IAMIT Determination)/TPA update – complete

Dispute Extended: N/A

Action: Parties will meet for close-out meeting and commit to meet regularly (or semi-regularly) on remaining agreed-upon sections targeted for updating (*see below).

Comments: Ten TPA Class II Change Control Forms were signed at the August 17, 2017 IAMIT meeting. One Class I Change Control Form was signed at the ECY Director and EPA Regional Administrator level. One Class I Change Control Form was disapproved by EPA.

*Some of the TPA Change Forms initially proposed as part of the TPA update (Paragraphs 148/149, Appendices H and I, and Section 11.8) will not be implemented due to time and available resources. However, the parties have agreed to continue talks on these areas.

Notes: The TPA agencies have determined the changes to the TPA were “not significant” and thereby not subject to public comment. A reprint decision of the TPA has been postponed to late Fall pending changes to the above-mentioned sections of the TPA meeting agreement by the parties. The Parties have committed to continuing talks on other potential changes to the TPA, notably Appendices H, I, Section 11.8 and Paragraphs 148/149.

Pending the outcome of these potential changes, a decision to reprint the TPA will be made. As of 12/14/17 IAMIT, no change in the status, however it was determined that both Ecology and EPA Legal should be involved in the 148/149 discussions and that potential changes to TPA Appendices H and I may be included in the scope of the “System Plan” negotiations. The System Plan negotiations are scheduled to conclude by 4/17/19. A decision to reprint must be made by July 31st to complete by the end of the fiscal year. At the October 18, 2018 IAMIT meeting, EPA agreed to take the lead in coordinating a Paragraph 148/149 meeting to discuss EPA’s legal comments with the Parties for resolution.

At the 12/20/18 IAMIT meeting, Ecology stated they have been discussing minor changes to Appendix I with ORP.

At the 1/31/19 IAMIT, EPA requested the latest proposed changes to TPA Paragraphs 148/149. EPA agreed to review the draft change control form (L-16-01) and provide a status at the February IAMIT.

At the 3/21/19 IAMIT, the Parties were asked for an update on proposed changes to TPA Paragraphs 148/149. There was no change in status. Action remains with EPA to provide comments.

Closed:

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4. Agreement in Principle for the Negotiation of HFFACO Revisions in Response to Federal Fiscal Year (FFY) 2018 Appropriation and FFY 2019 President's Budget

Reference: N/A
Affected Milestones: M-015-84, M-015-91B, M-015-92C, M-015-93B, M-015-93C, M-015-98, M-015-99, M-015-112, M-016-255, M-016-256, M-085-70, M-085-80
Originated: 12/20/18
Status: Agreement in Principle and corresponding Tentative Agreement have been drafted
Dispute Extended: N/A
Action: Sign Agreement in Principle, enter into negotiations
Comments: These negotiations are driven primarily by requirements found in HFFACO, Legal Agreement, Paragraph 148.A, which requires DOE-RL to include in its annual budget request to the DOE Office of Environmental Management (DOE-EM) estimated funding levels required to achieve full compliance with HFFACO milestones. The FFY 2018 appropriation by Congress and the FFY 2019 President's budget request to Congress, respectively, were less than the DOE-RL estimated funding levels submitted to DOE-EM. HFFACO, Legal Agreement, Paragraph 149.G allows DOE-RL to propose changes to milestones in response to congressional budget appropriations that are less than estimated funding levels required to achieve full compliance. HFFACO, Legal Agreement, Paragraph 149.D states that DOE-RL shall assess the impacts of the President's budget on DOE-RL's ability to complete milestones on time.

At the 12/20/18 IAMIT meeting, Ecology stated they had received drafts of the AIP and TA on 12/19/18, were scheduled to meet with their attorneys to review them, and will respond back to DOE. At the 1/31/19 IAMIT, Ecology stated EPA had been on furlough and needed to restart these discussions.

At the 2/21/19 IAMIT, the Parties were asked for an update on status. There was no change in status.

At the 3/21/19 IAMIT, Ecology stated that both Ecology and EPA were tweaking language in the AIP and will send to DOE. Action is with Ecology and EPA to provide comments.

Closed:

5. Milestone M-035-09K "Conduct biennial assessments of information and data access needs with EPA and Ecology"

Reference: 19-NWP-050, 19-AMRP-0059
Affected Milestones: M-035-09K (potentially)
Originated: 04/24/19
Status: Potential for dispute exists
Dispute Extended: N/A
Action: Status only
Comments: On 03/15/19, Ecology sent DOE letter 19-NWP-050, stating that it believed M-035-09K was in jeopardy of being missed, and that it had determined that DOE was non-compliant with TPA sections 9.6.2 and 9.6.5. In the same letter, Ecology stated that DOE must grant Ecology access to "all data and databases that are relevant to work performed or to be performed under the TPA by March 31, 2019" or face potential penalties of \$5,000 for the first week and \$10,000 per week, per violation thereafter. On 03/29/19, DOE sent Ecology letter 19-AMRP-0059, stating that it had completed a full assessment of the data access needs spelled out in milestone M-035-09K, and thereby had met the milestone.

Closed:

WA State Department of Ecology Recharge Sensitivity Analysis Addressing Uncertainty

Presented at the IAMIT

4/24/2019

Recharge Sensitivity Analysis Uncertainty Factors

- Changes to plant communities
 - The historical plant community for the Hanford Site is Shrub Steppe
 - Much of Shrub Steppe plant community in the Central Plateau has been greatly impacted
 - Many PNNL documents state that vegetation and impacts of wildfires, climate and land use create uncertainty that needs to be evaluated (PNNL-16688 Chap 2, PNNL-14702 pg 4-25 4-26; PNL-10285, pg 2.1)
 - Cheatgrass is an expected interim stage prior to immature shrub steppe

Recharge Sensitivity Analysis Uncertainty Factors

- Soil Disturbances
 - PNNL-14702, Table 4.13 “Estimate Recharge Rates for Mature Shrub Steppe Soil Types”
 - Burbank Loamy Sand – 3.0 mm/yr
 - Ephrata Sandy Loam – 1.5 mm/yr
 - Quincy Sand (Rupert Sand) – 4.0 mm/yr
 - PNNL-14702, Table 4.14 “Estimated Recharge Rates for Disturbed Soil Types Without Vegetation”
 - Burbank Loamy Sand – 52 mm/yr
 - Ephrata Sandy Loam – 17 mm/yr
 - Quincy Sand (Rupert Sand) – 44 mm/yr

Recharge Sensitivity Analysis Uncertainty Factors

- Soil Disturbances
 - Recharge rates will be applied to soil waste sites where the soil has been disturbed by past activities and will be disturbed for remediation.
 - PNL-10285 states “Sixty-eight percent of the recharge volume of the future Site occurred in Rupert sand...” (Future site is the current Hanford Site) (Rupert Sand = Quincy Sand)
 - There is no data for the following communities
 - Assumed recharge rates for a shallow rooted community is $\frac{1}{2}$ the “no vegetation” rate
 - Assumed recharge rates for a young shrub steppe community is twice the “mature shrub steppe” recharge rate.

DOE Sensitivity Analysis on Groundwater Recharge Rates Presentation/Position

Groundwater Recharge Issue

History

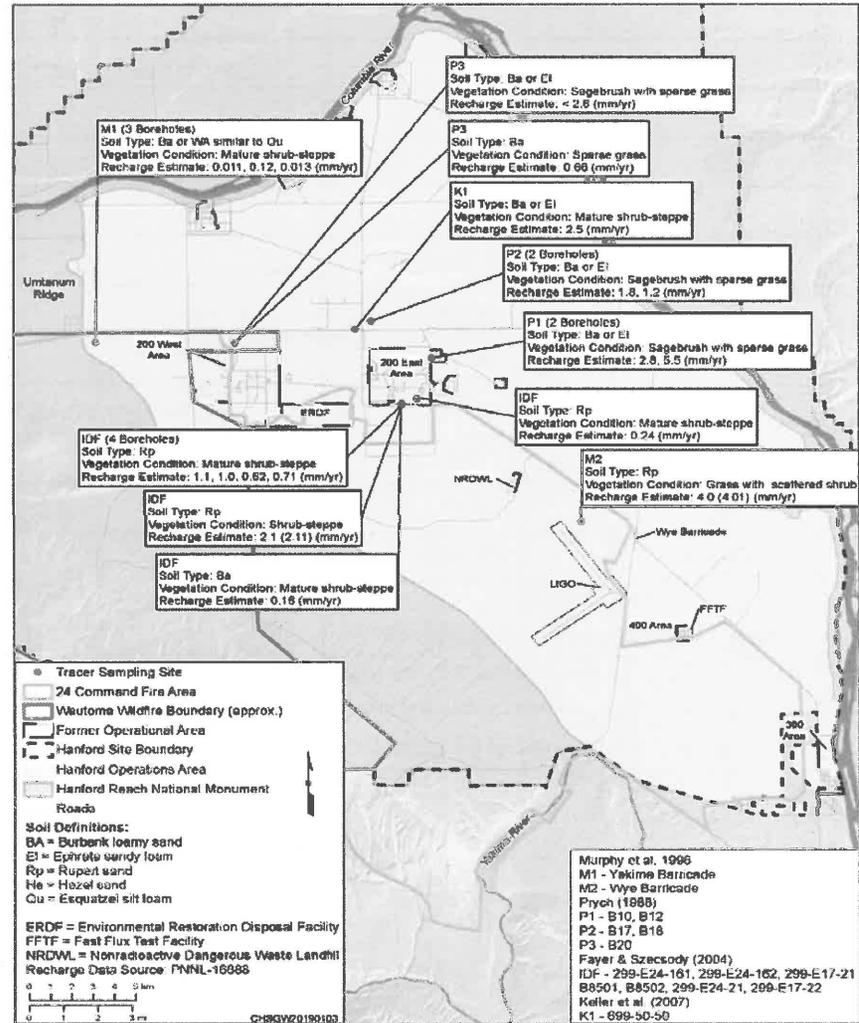
- Long-term recharge has been discussed among TPA agencies for 10 years.
- The long-term recharge rate of 4.0 mm/yr was selected for 3 approved Central Plateau RI/FS work plans (200-SW-2, 200-DV-1, 200-WA-1).
- In January 2012, DOE-RL, DOE-ORP, Ecology, and EPA reached concurrence and signed *Regulatory Basis and Implementation of a Graded Approach to Evaluation of Groundwater Protection* (Graded Approach document), which provides the basis for Central Plateau recharge values.
- The long-term recharge rate of 4.0 mm/yr for revegetated waste sites was selected for the native vegetation scenario used in 3 RODs (300 Area, 100-F/IU, 100-D/H).
- The long-term recharge rate of 4.0 mm/yr for revegetated waste sites was selected for groundwater protection evaluations supporting 200-PW-1/3/6 and 200-CW-5 ROD (FS appendix included sensitivity analysis for higher recharge rates).
- In December 2012, the *Tank Closure and Waste Management EIS* model used 3.5 mm/yr for long-term recharge.

DOE Position

4 mm/yr is Reasonable, Conservative

- Tracer values identified in the figure range from 0.011 mm/yr to 5.5 mm/yr.
- Measured infiltration rate under the Prototype Hanford Barrier is 0.0045 mm/yr.
- 4 mm/yr is a conservative value and bounds a large range of soil types and natural vegetative conditions.

Graphic derived from PNNL-16688 data
(Larger version in Issue Summary Statement)



DOE Position

Successful Revegetation Follows Wildfires

- There are good examples of natural plant succession following fires.
 - In September 2008, half of the Prototype Hanford Barrier was burned under controlled conditions. In 2010, species diversity increased from 15 species (pre-burn) to 24 species (after burn).
 - *Upland Vegetation of the Central Hanford Site* notes, after fires, reestablishment of big sagebrush has been good and in some areas, robust (e.g., south slope of Umtanum Ridge, near the Wye Barricade, LIGO, and FFTF).
- There are good examples of successful human revegetation following fires.
 - *Post-Fire Revegetation at Hanford* discusses successful revegetation efforts following the 24 Command Fire of 2000 and the Wautoma Fire of 2007.
 - By planting in islands, shrubs were reintroduced through the entire revegetated area after the 24 Command Fire.
 - After the Wautoma Fire, shrub survival was excellent and estimated to be 70 percent.
- ✖ While a wildfire would eliminate plant cover, soil storage capacity and subsequent natural revegetation are expected to eliminate the stored moisture in the top soil horizons; therefore, no enhanced recharge would be expected within 2-3 years after a wildfire.

Groundwater Recharge Issue Summary

DOE/Ecology/EPA Discussion History:

- Long-term recharge has been discussed among TPA agencies for at least 10 years.
- The long-term recharge rate of 4.0 mm/year was selected in three approved RI/FS work plans in the Central Plateau (200-SW-2, 200-DV-1, and 200-WA-1).
- In January 2012, DOE-RL, DOE-ORP, Ecology, and EPA reached concurrence and signed *Regulatory Basis and Implementation of a Graded Approach to Evaluation of Groundwater Protection* (the Graded Approach document) which provides the basis for the Central Plateau recharge values.
- The long-term recharge rate of 4.0 mm/year was selected for the native vegetation scenario used for waste site evaluations of revegetated waste sites in the 300 Area, 100-F/IU, and 100-D/H RODs.
- The long-term recharge rate of 4.0 mm/year was selected for groundwater protection evaluations supporting the 200-PW-1/3/6 and 200-CW-5 ROD (FS appendix included sensitivity analysis for higher recharge rates).
- In December 2012, the *Tank Closure and Waste Management EIS* model used 3.5 mm/year for long-term recharge.

Ecology Position:

- On February 4, 2019, Ecology agreed with all recharge rates in 200-EA-1 OU Work Plan, except for the use of 4 mm/year for long-term recharge.
 - Ecology is asking for a sensitivity analysis to use 22 mm/year for long-term recharge.
 - Ecology Letter 19-NWP-016 states, "Based on the results of the sensitivity analysis, Ecology and USDOE-RL can then discuss appropriate cleanup levels for the 200-EA-1 OU Work Plan."

DOE Position:

- Several environmental tracer isotope studies provide recharge estimates that are "reflective of conditions 100s to 1000s of years ago..." Using 4 mm/year for long-term recharge at revegetated waste sites is a conservative value and bounds a large range of Central Plateau soil types and vegetative conditions.
- DOE supports recharge rate and cleanup level consistency among OUs and other decisions across the Central Plateau.

Implications to 200-EA-1 Work Plan and the Central Plateau:

- Establishing new long-term recharge rates for cleanup levels would discount decades of research, negate decisions made by senior Tri-Party subject-matter-experts, and adversely impact existing Hanford Site decisions (e.g., the TC&WM EIS ROD, CERCLA RODs, and signed work plans).

DOE Recommended Path Forward:

- DOE recommends preserving the status quo – a long-term recharge rate of 4 mm/year for revegetated waste sites. There are no new data supporting a change in the 4 mm/year recharge rate.
- The CIE will have the ability to explore ranges of recharge, as appropriate, and at DOE discretion.

Groundwater Recharge Issue Summary

- **Wildfires – Analyzing frequency, realizing successful natural plant succession/revegetation**
 - There are good examples of natural plant succession (i.e., recovery without human intervention) following fires.
 - In late September 2008, half of the Prototype Hanford Barrier was burned under controlled conditions. Post-fire barrier performance monitoring, and other objectives of the post-fire study include: monitoring of plant succession/recovery, erosion, and runoff. In 2010, species diversity increased from 15 species (pre-burn) to 24 species (after burn)."
 - HNF-61417, *Upland Vegetation of the Central Hanford Site* notes, "After fire, reestablishment by big sagebrush varied across the site and appears to be loosely correlated to landscape geomorphology. The species has reestablished most successfully on finer sands and silt facies of the cataclysmic floods (such as on the south slope of Umtanum Ridge and between the Wye Barricade, Laser Interferometer Gravitational-Wave Observatory, and Fast Flux Test Facility sites) and on loess (such as east of the 200 Area Plateau). In some of these areas, recruitment has been robust."
 - While a wildfire would eliminate plant cover, soil storage capacity and subsequent natural revegetation are expected to eliminate the stored moisture in the top soil horizons; therefore, no enhanced recharge would be expected within 2-3 years after a wildfire.
 - There are good examples of successful revegetation (i.e., revegetation with human intervention) following fires.
 - *Post-Fire Revegetation at Hanford*; HNF-42601-FP discusses successful revegetation efforts following the 24 Command Fire of 2000 and the Wautoma Fire of 2007.
 - Regarding the 24 Command Fire of 2000, "By planting in islands, shrubs were reintroduced through the entire revegetated area."
 - Regarding the Wautoma Fire of 2007, "In spring 2009, we evaluated shrub survival. We estimated the survival rate to be 70 percent, which is considered excellent."
 - Data supporting increased wildfire frequency on the Hanford Site or in Benton County has not been documented.
- **Graphic derived from PNNL-16688 data** (below) provides a list of sites where environmental tracers have been used across the Hanford Site to measure recharge rates. The tracer values identified in the figure range from 0.011 mm/year to 5.5 mm/year. These values provide recharge estimates that are "reflective of conditions 10s to 100s of years ago". Under the Prototype Hanford Barrier (PHB), the measured infiltration rate is 0.0045 mm/year. 4 mm/year is a conservative value and bounds a large range of soil types and vegetative conditions.

Ecology PCB Congeners Presentation/Position

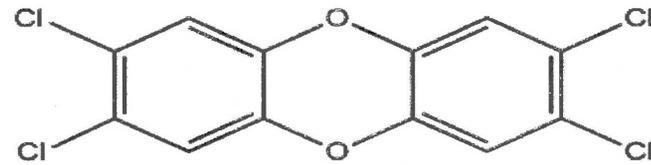
IAMIT issue: Evaluation of Polychlorinated Biphenyls (PCBs)- Aroclor vs. Dioxin Like Congener Toxicity and Analysis (200-EA-1)

Damon Delistraty

Washington State Dept of Ecology

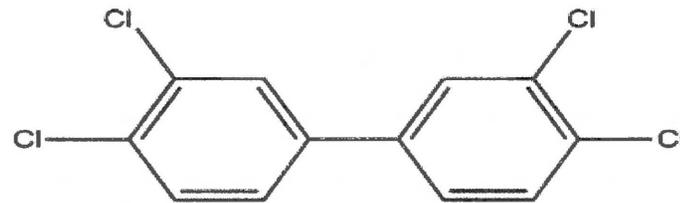
April 2019

Structures



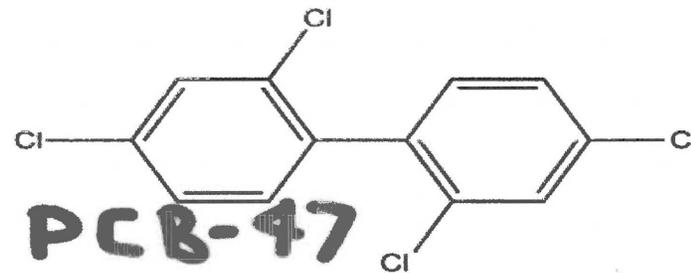
2,3,7,8-tetrachlorodibenzo-p-dioxin

TCDD



3,3',4,4' tetrachlorobiphenyl coplanar

PCB-77



PCB-47

3,3',4,4' tetrachlorobiphenyl non coplanar

Environmental Weathering

- Aroclors may undergo “weathering” in the environment
 - EPA describes this process in many reports (e.g., EPA, 1996, 2005)
 - full references provided in Ecology’s accompanying memo
 - congener profiles may be altered
 - mechanisms include, e.g., thermal processes (burn pits), microbial activity (reductive dechlorination)
- Therefore: invalid to assume “pure product” congener composition for PCBs in the environment
- Necessitates use of Method 1668 to evaluate dioxin-like toxicity
 - subset of samples recommended by EPA Region 10 (April 2007 memo)
 - Ecology also recommends this testing (July 2015 Implementation Memo #12)

Memo

TO: Interagency Management Integration Team (IAMIT)
CC: Cheryl Whalen, Beth Rochette, Noe'l Smith-Jackson, Nina Menard, John Price, Alex Smith, Dave Bartus (EPA)
FROM: Damon Delistraty (Ecology)
DATE: 8 Mar 2019
RE: Analysis of Aroclors vs. PCB congeners at soil waste sites at Hanford (200-EA-1)

Questions

The purpose of this memo is to address the following two questions:

- 1) Can Aroclor analysis (Method 8082) be used to trigger PCB congener analysis (Method 1668) at soil waste sites?
- 2) Can Aroclor analysis miss PCB congeners (eliciting dioxin-like toxicity) that exceed soil cleanup levels (CULs)?

Response to questions

Method 8082 (EPA, 1996a, 2007a) does not measure individual dioxin-like PCB congeners (see EPA method description). It also would lack the analytical sensitivity to sufficiently evaluate CULs for dioxin-like toxicity, expressed as 2,3,7,8-TCDD toxic equivalents (TEQ). Using Aroclor analysis (Method 8082) as a trigger to perform PCB congener analysis (Method 1668 [EPA, 2010]) is not necessarily protective of human and ecological receptors.

Independent of Aroclor analysis, PCB congener analysis is needed, because commercial Aroclors may have undergone significant weathering, obscuring Aroclor identification and either diminishing or enhancing dioxin-like TEQ. Dioxin-like PCB congeners may be present at levels that exceed soil CULs for TEQ (e.g., 2E-6 to 1.7E-3 mg/kg) but fall below the MDL for Aroclor analysis (e.g., 5E-2 mg/kg) (see Table 1), demonstrating the shortcoming of using Aroclor identification (Method 8082) as a trigger for TEQ evaluation.

Toxicity

There are at least two types of toxicity evaluated with PCBs: total PCB toxicity and dioxin-like PCB toxicity. Total PCBs can be estimated by summing Aroclors (EPA Method 8082), or more accurately, by summing individual congeners (EPA Method 1668). Dioxin-like PCBs can be estimated with Method 1668. Dioxin-like PCB toxicity is contributed by 12 specific PCB congeners, mediated via the aryl hydrocarbon receptor (AHR), and expressed as TEQ (Van den Berg et al, 1998, 2006). There is also non-dioxin-like PCB toxicity (independent of AHR), exhibiting a wide range of effects (Henry and DeVito, 2003), but for which there are no regulatory toxicity factors.

For human oral toxicity, EPA and MTCA provide cancer slope factors (CSFs) for total PCBs and TEQ. Similarly, for human oral toxicity, EPA and MTCA provide noncancer reference doses (RfDs) for Aroclors 1016 and 1254, as well as for TEQ. For ecotoxicity, MTCA provides wildlife toxicity reference values (TRVs) for total PCBs (based on Aroclor 1254) and TEQ (based on 2,3,7,8-TCDD).

In their IRIS database, EPA (2019) cautions, "Although PCB exposures are often characterized in terms of Aroclors, this can be both imprecise and inappropriate. Total PCBs or congener or isomer analyses are recommended. When congener concentrations are available, the slope-factor approach can be supplemented by analysis of dioxin TEQs to evaluate dioxin-like toxicity."

Soil MDL needed for PCB-126 (TEF=0.1) for EPA outdoor worker CUL (see text above)	2.4E-4 mg/kg
Soil MDL for Method 8082	5E-2 mg/kg

Ecology recommendation

Ecology recommends that PCB congeners be evaluated with Method 1668 for a subset of contaminated soil sites, independent of Method 8082, where there is a need to test for dioxin-like PCB congeners and use TEFs, specified in WAC 173-340-708(8)(f) to calculate dioxin-like TEQ. This is consistent with previous guidance, issued by Ecology (2015). EPA (2007b) at Region 10 also supports analysis of PCB congeners, stating, "Analyses of dioxin-like PCB congeners from at least a portion of media samples are strongly recommended by this office as the default procedure for estimating baseline risks and for developing and demonstrating compliance with cleanup levels."

References

ATSDR. 2000. Toxicological profile for polychlorinated biphenyls (update). Agency for Toxic Substances Disease Registry (ATSDR).

Buser, H. 1985. Formation, occurrence and analysis of polychlorinated dibenzofurans, dioxins and related compounds. Environ Health Perspect 60:259-267.

Ecology. 2015. When to use EPA Method 1668 for PCB congener analyses: Implementation Memo #12 from Jeff Johnston, Toxics Cleanup Program, Ecology.
(<https://fortress.wa.gov/ecy/publications/documents/1509052.pdf>)

EPA. 1996a. Method 8082. Polychlorinated biphenyls (PCBs) by gas chromatography. Rev 0.

EPA. 1996b. PCBs: Cancer dose-response assessment and application to environmental mixtures. Office of Research and Development, National Center for Environmental Assessment, Washington, DC, EPA/600/P-96/001F.

EPA. 2005. Memorandum: Response to ecological risk assessment forum request for information on the benefits of PCB congener-specific analyses. NCEA-C-1315, ERASC-002F.
(<https://cfpub.epa.gov/ncea/erasc/recordisplay.cfm?deid=309542>)

EPA. 2007a. Method 8082A. Polychlorinated biphenyls (PCBs) by gas chromatography. Rev 1.

EPA. 2007b. Recommendations for human health risk-based chemical screening and related issues at EPA Region 10 CERCLA and RCRA sites. OEA-095. Memo from Michael Cox, Risk Evaluation Unit, Office of Environmental Assessment, USEPA, Seattle, WA.

EPA. 2010. Method 1668C: Chlorinated biphenyl congeners in water, soil, sediment, and tissue by HRGC/HRMS. Office of Water, EPA-820-R-10-005.

EPA. 2019. Integrated Risk Information System (IRIS). Polychlorinated biphenyls (PCBs): CASRN 1336-36-3. (https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0294_summary.pdf)

Henry, TR and DeVito, MJ. 2003. Non-dioxin-like PCBs: effects and consideration in ecological risk

Table 1. Selected soil CULs and analytical soil MDLs. All listed CULs and MDLs have units of mg/kg.

	MTCA B Soil	MTCA C Soil	MTCA B Soil	MTCA Soil	EPA Soil	Method 8082	Method 1668
	Direct Contact	Direct Contact	Protect Groundwater	Protect Wildlife (based on LOAEL)	Outdoor Worker ^d	MDL for Aroclors	MDL for PCB congeners
Risk Level	1E-6	1E-5	1E-5 ^b	NA	1E-6	NA	NA
Total PCB	0.5	65	0.69	0.65 ^c	1.1	5E-2	NA
Dioxin-like TEQ ^a	1.3E-5	1.7E-3	3.4E-5	2E-6	2.4E-5	NA	1E-6 to 1E-5 ^e

NA=Not applicable.

^aBased on 2,3,7,8-TCDD.

^bBased on adjusted MCL.

^cBased on Aroclor 1254.

^dEPA Regional Screening Levels (RSLs) calculator (<https://www.epa.gov/risk/regional-screening-levels-rsls>).

^eCongener dependent.

DOE PCB Congeners Presentation/Position

PCB Congeners Issue

Introduction

- PCBs are a class of chemicals persistent in the environment and toxic.
- Aroclors are standardized mixtures of PCB congeners defined by percent chloride (e.g., Aroclor 1254 is 54% chloride).
- PCBs are rare at Hanford; if present, they are typically from Aroclor 1254 and Aroclor 1260.
- Analysis of PCBs may be performed by EPA Method 8082 (which measures aroclor concentrations) or by EPA Method 1668 (which measures 209 congener concentrations).
- 200-EA-1 did not have a PCB waste stream, although some aroclors have been found, historically.

DOE Position, continued

Method 8082 Compliance, Precedent, Sensitivity

- CHPRC demonstrated Method 8082 was sensitive enough to detect aroclors at a PQL that correlates to the TEQ (2,3,7,8-TCDD toxicity equivalence), which is approximately 100 times below the screening level.
 - If an aroclor is not detected above the PQL, there is a reasonable conclusion that the TEQ risk threshold is also not exceeded.
 - The Aroclor 1254 composition of dioxin like congeners is small based on concentration; congener 126 representing <0.01% and congener 169 representing <0.001%.
- Marc Stifelman, EPA Region 10 Toxicologist, states that EPA Method 8082 is an adequate method for PCBs and is sufficient for risk characterization purposes.

Implications to 200-EA-1 Work Plan and Central Plateau

- Method 1668 is very expensive and not warranted.
 - Method 8082 is regulatorily compliant and adequately sensitive for risk characterization.
- DOE's estimated cost for the methods, including data management and review costs, are quite different.
 - Method 8082 (reporting aroclors) is approximately \$330/sample.
 - Method 1668 (reporting 209 congeners) is approximately \$3700/sample.
- DOE's cost estimate for Ecology's counter proposal follows.
 - The cost of performing Method 1668 at the seven selected waste sites within the three identified groups is estimated to be \$600,000.
 - The cost of performing Method 1668 at all 20 waste sites associated with the three identified groups is estimated to be \$1,200,000.

PCB Congeners Issue Summary

Introduction:

- PCBs are a class of chemicals that are persistent in the environment and toxic.
- Aroclors are standardized mixtures of PCB congeners defined by percent chloride (e.g., Aroclor 1254 is 54% chloride).
- PCBs are rare at Hanford; if present, they are typically from Aroclor 1254 and Aroclor 1260.
- Analysis of PCBs may be performed by EPA Method 8082, which measures aroclor concentrations, or by EPA Method 1668, which measures the 209 congener concentrations.
- 200-EA-1 did not have a PCB waste stream, although some aroclors have been found historically.

Ecology Position:

- Method 8082 does not test for all the dioxin-like congeners
- Method 1668 tests for all congeners
- Method 8082 is not sensitive enough to analyze for congeners that make up the Total Toxic Equivalent of the Outdoor Worker clean up level of 2.4×10^{-5} mg/kg (10^{-6} risk level)
- Even though PCBs may not be detected by Method 8082, there could be congeners detected by Method 1668 that could exceed the TEQ limit

DOE Position:

Method 8082 Compliance, Precedent, Sensitivity

- Method 8082 is regulatorily compliant.
 - MTCA Cleanup WAC 173-340-830 Section (3)(a)(vii)(e) for soils calls for use of Method 1 (SW-846), which calls for use of Method 8082.
- Method 8082 has been previously accepted by EPA and Ecology.
 - 100-D/H Area: Aroclors were identified as target analytes for soil in the RI/FS SAP, using Method 8082. Method 1668 was not identified for soil.
 - 100-F/IU Area: Aroclors were identified as target analytes for soil in the RI/FS SAP, using Method 8082. Method 1668 was not identified.
 - 300 Area: Aroclors were identified as COPCs for soil in the RI/FS SAP, using Method 8082. Method 1668 was not identified.
 - 200-SW-2 OU: Aroclors are identified as COPCs in the RFI/CMS/RI/FS SAP, using Method 8082. Method 1668 was not identified.
- CHPRC demonstrated that Method 8082 was sensitive enough to detect aroclors at a PQL that correlates to the TEQ (2,3,7,8-TCDD toxicity equivalence), which is approximately 100 times below the screening level.
 - If an aroclor is not detected above the PQL, there is a reasonable conclusion that the TEQ risk threshold is also not exceeded.
 - The Aroclor 1254 composition of dioxin-like congeners is small based on concentration; congener 126 representing <0.01% and congener 169 representing <0.0001%.
- Marc Stifelman, EPA Region 10 Toxicologist, states that EPA Method 8082 is an adequate method for PCBs and is sufficient for risk characterization purposes.

PCB Weathering

- Aroclor 1254 and 1260 are not significantly affected by transport mechanisms in an arid soil environment.
 - PCBs sorb strongly to soils and will not leach extensively.¹
 - PCBs have low vapor pressures and are not expected to volatilize from dry soil.²
- Abiotic transformation processes are not significant for Aroclor 1254 and 1260.
 - PCBs are chemically inert and resistant to hydrolysis and oxidation.³
 - PCBs may be susceptible to photolysis⁴, but this does not apply for subsurface/stabilized soil.
- Biodegradation is likely not significant for Aroclor 1254 and 1260 in soil.
 - Congeners with 1-3 chlorines may undergo aerobic biodegradation; those with 4 chlorines have intermediate persistence; those with 5+ chlorines are not readily degraded.^{4,5,6,7}
 - Aroclor 1254 is >80% 5+ chlorine congeners; Aroclor 1260 is >90% 5+ chlorine congeners.⁸
 - Anaerobic conditions are likely not prevalent for Hanford soil.
 - Anaerobic biodegradation results in dechlorination, forming less toxic congeners.^{4,6,9}

PCB Congeners Issue Summary

Backup Information:

This supplement provides a summary evaluation to demonstrate that the Method 8082 practical quantitation limits for aroclors are sufficiently low for risk-based decision-making for PCBs at the 200-EA-1 OU, considering the potential presence of dioxin-like congeners.

Aroclors contain a mixture of many congeners, a portion of which are dioxin-like (12 of 209 congeners). Multiple analytical studies have quantified individual congener concentrations within aroclors. Dioxin-like congeners are evaluated as a single substance by converting concentrations to the index chemical 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) using the 2005 WHO toxic equivalency factors (TEFs) (van den Berg et al. 2006) to obtain toxic equivalent concentrations (TEQs). The individual TCDD TEQs are summed to evaluate the congener mixture as a single substance (total TCDD TEQ).

Tables 1 and 3 provide the concentrations of dioxin-like congeners that may be present at the practical quantitation limit (PQL) for individual aroclors based on data from Rushneck et al., 2003, as well as the corresponding TEQs. As shown in Tables 2 and 4, the resulting TEQs at the PQLs are below risk-based decision-making thresholds, indicating that Method 8082 has sufficient capability to detect the potential presence of PCBs at concentrations consequential to risk-based decision-making. (While PQLs are used for this evaluation, actual detection capability is about 1 order of magnitude lower; the values above the method detection limit (MDL) are reported.)

PCB Congeners Issue Summary

Table 3. Calculation of TCDD TEQ for Aroclor 1260 PQL

Aroclor 1260		Highest allowable aroclor PQL ^a (mg/kg)		
		0.033		
Congener	Concentration in aroclor ^b (ppm)	Corresponding congener soil concentration at aroclor PQL ^c (mg/kg)	TCDD TEF ^d	TCDD TEQ
77	33.8	1.1E-06	1.E-04	1.1E-10
81	3.33	1.1E-07	3.E-04	3.3E-11
105	434	1.4E-05	3.E-05	4.3E-10
114	17.0	5.6E-07	3.E-05	1.7E-11
118	5610	1.9E-04	3.E-05	5.6E-09
123	5.02	1.7E-07	3.E-05	5.0E-12
126	2.13	7.0E-08	1.E-01	7.0E-09
156	4860	1.6E-04	3.E-05	4.8E-09
157	252	8.3E-06	3.E-05	2.5E-10
167	1990	6.6E-05	3.E-05	2.0E-09
169	U (0.82)	-	3.E-02	-
189	1290	4.3E-05	3.E-05	1.3E-09
Total TCDD TEQ				2.1E-08
^a From the Draft A 200-EA-1 SAP. ^b From Rushneck et al., 2003, Table 2 (Hyperlink). ^c Product of allowable aroclor PQL and concentration in aroclor, with unit conversion correction, e.g.: $0.033 \frac{mg \text{ Aroclor } 1260}{kg \text{ soil}} \times 434 \frac{mg \text{ Congener } 105}{kg \text{ Aroclor } 1260} \times 1E-6 \frac{kg \text{ Aroclor } 1260}{mg \text{ Aroclor } 1260} = 1.4E-5 \frac{mg \text{ Congener } 105}{kg \text{ soil}}$ ^d From Van den Berg et al., 2006 (Hyperlink).				

Table 4. Comparison to Human Health Screening Values for Aroclor 1260

	PQL (mg/kg)	Outdoor Worker Screening Value ^a (mg/kg)	MTCA B CUL ^b (mg/kg)	MTCA C CUL ^b (mg/kg)
Aroclor 1260 PQL	0.033	1.1	0.5	66
TCDD TEQ	2.1E-08	2.30E-05	1.28E-05	1.68E-03
^a From the EPA regional screening level calculator, for an excess lifetime cancer risk of 1 in 1,000,000. ^b From the Ecology cleanup and risk calculation tables.				

IAMIT Meeting Sign in

04/24/19

Bill Hamel	Craig Cameron
Kathy Higgins	John Price
PA Hildebrand	Stephanie Brasher
RODRIGO LOBOS	
maria Lopez	
Michael Cline	
NAOMI JASCHKE	
Steve Belone	
Bert Day	
Karen Witzkela	
Donna Morgans	
Jason Capron	
Chris Kemp	
Beth Roberts	
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Alex Smith	
Sara Austin	
Dave Einar	
Laura Buelow	
Craig Cameron	
Rob Hastings	
Scott Davis	