

**FINAL MEETING SUMMARY**

HANFORD ADVISORY BOARD  
RIVER AND PLATEAU COMMITTEE

*August 6, 2013  
Richland, WA*

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This is only a summary of issues and actions in this meeting. It may not fully represent the ideas discussed or opinions given. Examination of this document cannot equal or replace attendance and public participation.

**Opening**

Pam Larsen, River and Plateau Committee (RAP) chair, welcomed the committee and introductions were made. The committee approved the June meeting summary.

Hillary Johnson, EnviroIssues, suggested deferring two topics originally on the meeting agenda since there is no new information for RAP to discuss: responses to advice and a review of the updated 2014 Hanford Advisory Board (HAB or Board) Work Plan. RAP already reviewed a draft of the Work Plan during the June meeting and the Executive Issues Committee (EIC) will be reviewing the Work Plan before bringing it to the entire Board during the September meeting. The committee agreed to table these two items.

**100-N Remedial Investigation/Feasibility Study and Proposed Plan Draft A:**  
**Part 1, Presentation and Q&A\***

*Introduction*

Dale Engstrom, Issue Manger (IM) for the 100-N Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan Draft A, said the 100-N reactor is different from the other reactors at the Hanford Site; it was built with the dual purpose of generating power as well as for plutonium production. The U.S. Department of Energy (DOE) completed the RI/FS process and is currently determining a remediation approach through the Proposed Plan in consultation with the other Tri-Party Agreement (TPA) agencies.

Dale noted that the Board has been given an opportunity to provide input early in the process through reviewing Draft A, which is an early draft that has not been approved by the U.S. Environmental Protection Agency (EPA) or the Washington State Department of Ecology (Ecology).

*Agency presentation*

Mike Thompson, DOE – Richland Operations Office (RL), provided a presentation on the 100-N Proposed Plan (Attachment 2). During his presentation, Mike emphasized the following points:

- The RI/FS and Proposed Plan was delivered to Ecology in June 2013 as the lead regulatory agency per TPA Milestone M-015-75. Ecology has received a 30 day extension on an initial 45 day review period.
- The N Reactor has a completely different design and operational history than other reactors at the Hanford Site. Consequently, the contamination is very different and the cleanup approach will need to be different as well.
- 100-N consists of 234 facilities and 136 waste sites. There is a strontium-90 plume in the groundwater that is unique to this facility. There have also been several petroleum spills, including a spill of 80,000 gallons in 1966.
- The 100-N area includes culturally sensitive lands that have significant importance for Native American tribes.
- There is no persistent chromium plume from 100-N operations. The chromium discharged at the site has been flushed by approximately 21 billion gallons of water so most of the chromium is no longer in the system, which is unique compared to other reactors at the Hanford Site.
- DOE has placed an apatite barrier directly along the shoreline to prevent further spread of the strontium-90 plume. DOE has also considered phytoremediation using Coyote Willow but does not recommend that approach.

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\* Please see Attachment 1 – Transcribed Flip Chart Notes for key points/follow up actions recorded during the committee discussion.

- The shoreline along 100-N consists of riprap made of heavy boulders that were put in place during the operational phase of N Reactor. Erosion of the shoreline is not a major issue because of the riprap barrier and also because the bank itself is fairly stable. The injection wells are along the roadway at highest level of river flow.
- All of the remedial alternatives contain some common elements, including: a remove, treat, dispose (RTD) approach at waste sites, the use of institutional controls (ICs), bioventing for TPH-D, groundwater monitoring, removal of free product TPH-D, use of apatite for near-shore strontium-90, and a Technical Impracticality (TI) Waiver for upland strontium-90.
- Alternative 3 is DOE's preferred alternative. This approach includes RTD at waste sites, an apatite barrier for near-shore strontium-90, a TI waiver for upland strontium-90, bioventing and biosparging for TPH-D, groundwater monitoring, and ICs.

#### *Agency perspectives*

Nina Menard, Ecology, said Ecology is in the midst of reviewing the draft RI/FS and Proposed Plan. The agency is carefully evaluating the alternatives with particular attention to issues regarding nitrates, the proposed TI waiver for strontium-90, new information about remediation of the oil and diesel pipelines as well as leakage considerations.

Dib Goswami, Ecology, said the agencies believed they would be able to remove a large amount of the strontium-90 using a pump and treat approach but it did not work as well as anticipated. The path forward has been slow and there have been a number of different possible cleanup paths proposed. Over the last decade two approaches have been widely discussed for strontium-90 remediation: apatite sequestration and phytoremediation coupled with monitored natural attenuation (MNA).

Phytoremediation is occurring at Superfund sites nation-wide and around the world to treat a variety of contaminants. Dib said that in Mike's presentation he mentioned that there are 800 curies of strontium still at the site but Dib noted that only 25 of those 800 curies will enter the Columbia River if no action is taken because of strontium-90's slow mobility and 29-year decay rate. There are about five curies of strontium-90 in the riparian zone that could feed into the Columbia River but no actions are being taken to remediate that contamination. Ecology, with support from EPA, asked DOE to test the effectiveness of phytoremediation for strontium-90 in the 100-N area. Dib suggested the Board hear from an expert panel or from EPA on strontium-90 remediation approaches to understand more about the effectiveness of apatite barriers versus phytoremediation. Phytoremediation could achieve 95% drinking water standards in 50-75 years compared to the estimated 110 or 115 years with use of an apatite barrier. Dib added that cost is another major factor that must be considered when evaluating remediation approaches and that DOE did originally propose phytoremediation but ran out of funding.

*R. [DOE] The liner trench is an artificial barrier engineered to treat strontium-90 along the shoreline as well as at well sites. The injection solution must be balanced to prevent a lot of phosphate from entering the Columbia River. The area not receiving treatment is a small area in the vadose zone where a few curies of strontium-90 remain. Since the half life of strontium-90 is only 29 years, bringing that material up into the system through plants is questionable. Strontium-*

*90 could spread through flood events that wash away plant material or any protective structures. DOE did conduct a number of tests on phytoremediation and results indicated that the approach can be effective. Coyote willow will take up strontium at an equal ratio to calcium and it is possible to control the leaves and stems through harvesting. Phytoremediation requires a lot of maintenance and ICs for a relatively small amount of material. Any phytoremediation would be focused on the narrow area between the roadway and the shoreline riprap.*

*Committee discussion*

*Note: This section reflects individual questions, comments, and agency responses, as well as a synthesis where there were similar questions or comments. Questions, comments, and responses were provided by HAB members unless noted otherwise.*

C. There was a recent article regarding work at West Valley detailing how the pretreatment used decreased strontium-90 contamination by 77% in 3 years, which is very impressive.

*R. [DOE] DOE expects to be able to reduce strontium-90 in the 100-N Area by 90% in three years because of the ability to reach the strontium-90 in the soil and vadose zone without needing to dig up the area.*

Q. What are the ICs that are being considered and how will those affect tribal interests?

*R. [DOE] The ICs would include restrictions on withdrawing groundwater until drinking water standards are met as well as drinking water restrictions along the shoreline. ICs would only be in place for drinking water above 8 curies. There would not be, and are not currently, any restrictions on spending time along the bank. Fishing would also be permitted.*

C. Is it accurate to say that only the middle part of the barrier has been injected and there are holes at the ends?

*R. [DOE] DOE began injections at the highest concentrations of strontium-90 along a 300 foot section of the shoreline. American Recovery and Reinvestment Act money was used to install the number of wells necessary to inject groundwater while there was only enough funding to begin injections along the 300 foot stretch. This initial injection area acted as a learning opportunity before further injections begin. DOE has received funding for an additional 600 feet and will be continuing injections along 300 feet either side of the initial injection stretch. DOE has received approval for the entire 2500 feet and could also move forward with phytoremediation if funding becomes available.*

C. The barrier will become a waste site itself over time as radioactive strontium-90 is captured. That barrier will bind strontium-90 in the ground and eventually that strontium-90 will reach the groundwater. This waste site will need to be monitored in the future.

C. Phytoremediation removes the last bit of strontium-90 that would go into the Columbia River. The barrier does not go all the way down so there is a small amount of strontium that remains.

*R. [DOE] The groundwater is treated to reduce strontium-90 in the groundwater. Less than five curies of strontium remain in the vadose zone and that is not expected to travel because of how effectively strontium-90 binds to soil. This strontium is not at risk of coming to the surface and maintenance will not be required to prevent digging to that depth.*

Q. What is Ecology's opinion about the proposed TI waiver and DOE's statement that the remaining 25 curies in the vadose zone will not travel to the Columbia River?

*R. [Ecology] A TI waiver examines whether there are technologies available to treat certain types of contamination. EPA would grant the TI waiver and would need to review the details in the RI/FS to determine whether DOE can meet the criteria for a TI waiver in this situation. Time alone is not necessarily a reason to qualify for a waiver since there are potential actions that could be taken; technologies may still exist even if they are cost prohibitive.*

Q. Will the material in the vadose zone move into the aquifer before it fully decays? Cleanup efforts should also focus on contamination that could move to the river edge and carefully note contaminant travel times.

*R. [Ecology] Modeling studies were conducted on the transport of strontium-90 to the groundwater. If excavation does occur and the strontium-90 source material is removed, strontium-90 will not travel to the groundwater and the concentration will remain below the 8 pica curies per liter standard for drinking water. The highest strontium-90 concentration is currently about 1,000 times drinking water standards.*

C. RAP requested some sort of documentation outlining the projected costs of the proposed cleanup alternatives for the 100-N Area over the years. The committee would like to understand the complete cost of an apatite barrier over the entire 2500 foot stretch of the vadose zone with notations on which aspects of the cleanup would be funded or not depending on the amount of money received.

Q. Why is DOE choosing not to construct an additional apatite barrier slightly inland?

*R. [DOE] DOE does consider an additional apatite barrier under Alternative 5 and outlines the pros and cons in the Proposed Plan. Focusing on an inland hot spot where the vast majority of the strontium-90 is located will reduce the amount of time required to meet drinking water standards but the resource investment would be large and it would not be an efficient use of resources. DOE must always consider the return on investment for each project with so many competing priorities at the Hanford Site.*

Q. Habitat along the Columbia River is an incredibly valuable part of the ecosystem. The riprap currently along the shoreline poses a serious problem for the natural habitats. Have there been any discussions about removing the riprap or the habitat benefits of phytoremediation?

*R. [DOE] DOE has had conversations about using other types of structures. The riprap was installed in consultation with the Washington State Department of Fish and Wildlife. DOE has not seriously considered removing the riprap and it will remain in place until the strontium-90 is no longer a risk to the system.*

C. The question of how these remediation efforts will affect tribal treaty rights has not been resolved. This area is very important for the tribes and is used for ceremonial purposes.

Q. It would be useful to have information about how much strontium would be absorbed by any plants used for phytoremediation. What are the risks of phytoremediation?

*R. [DOE] The risks from phytoremediation are minimal. There is lab data showing that the strontium-90 is absorbed by plants in an equal ratio to the amount of calcium absorbed and it is related to the amount present in the soil. Strontium-90 is not concentrated in the plants and plants do not selectively absorb strontium. Strontium would be found in plant leaves, which causes a lot of concern from the tribes and other stakeholders because of potential strontium exposure as the material is brought up in the food chain from deep within the soil. There are potential exposures from bugs eating plant material and spreading contaminants through droppings plus risks of losing plant material after flood events. Additionally, once the phytoremediation is complete herbicides would be used along the shoreline to remove the plants and that creates other contamination concerns.*

C. The Nez Perce tribe has been following this issue very closely and is not entirely in agreement with DOE. The tribe will be recommending another alternative, which is a modification of the alternatives DOE analyzed. The Nez Perce believes that there are three additional strontium-90 hot spots that should receive additional RTD. Treating these additional hot spots would reduce the amount of strontium-90 moving into the Columbia River and how the apatite barrier would work. There are major risks of contamination whenever materials are brought up the food chain, which is greater than the risk of leaving material in place. The tribe will be sharing these concerns with DOE.

C. 100-N is contaminated with materials other than just strontium-90; there are pipelines with waste in them. 100-N is both a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) cleanup. Strontium-90 is a major concern but there are also contaminants that fall under RCRA and should also be addressed; petroleum is under the RCRA permit.

C. Steve Golian, DOE-Headquarters, commented on the TI waiver issue. The groundwater guidance suggests that 100 years may be an appropriate timeframe to consider a TI waiver; the question is not whether the contamination can be technically remediated, but if it can be remediated within a reasonable timeframe. That timeframe has never fully been defined. EPA has given many TI waivers for remediation projects that would take greater than 100 years. The policy regarding MNA was issued approximately 10 years ago and that lead to major concerns for individuals in the remediation field because they did not want MNA to become a “do nothing” remedy. The use of a TI waiver does not represent a failure; a TI

waiver means that there is nothing that the responsible parties are able to do in a reasonable timeframe. There will continue to be monitoring or ICs.

Q. Is the strontium-90 actually in the Columbia River or is it in shoreline upwelling?

*R. [DOE] The FS contains a synopsis of the environmental monitoring in the river and upwelling. The plume is clearly upwelling into the Columbia River in an area where there is treatment. DOE is observing an approximately 90% reduction in strontium-90, but some material is reaching the river at levels that do not cause concern.*

*C. [DOE] When DOE conducted the investigation for the RI/FS, all imaginable RCRA constituents were considered along with all possible COCs that could be in the system. All those COCs are listed in the Proposed Plan. The presentation today focused on areas DOE feels are the key risk elements, but there are over 60 additional COCs being considered in the Proposed Plan.*

C. It should be possible to analyze other alternatives beyond what DOE has included in the draft RI/FS and Proposed Plan, such as RTD of some additional hot spots. The Board could ask the tribes to share their proposal and discuss whether the Board agrees with the recommendations.

## **100-N Remedial Investigation/Feasibility Study and Proposed Plan Draft A,**

### **Part 2: Round-Robin Activity**

Hillary Johnson described the Round Robin activity and noted that it was an approach being tested for providing committee feedback on Draft A documents. The Executive Issues Committee (EIC) and facilitation team will be interested to hear if it was a worthwhile and appropriate exercise for such purpose. Each committee member was given two minutes to share their thoughts on the 100-N RI/FS and Proposed Plan Draft A. These comments will be tracked in the committee meeting summary as part of the committee meeting record. Prompting questions had been provided for committee member consideration: Are there any compelling factors or issues that you believe haven't been adequately addressed in the draft plan? Do you think the proposed plan remedy is reasonable as presented in the draft plan?

- Dale Engstrom said the 100-N cleanup process appears to have worked well. The apatite barriers have reduced the amount of strontium-90 that is reaching the Columbia River and it can be promoted as a successful process. Dale said he does have concerns with the remediation scenario for the final Record of Decision (ROD); a lot of strontium-90 is planned to be left behind in upland area. Some of that material could be treated as outlined in Alternative 5 with the additional RTD and apatite barrier. Petroleum remediation may not be advisable because it could affect the apatite barrier. Nitrate treatment is the larger issue; the nitrate plume is equal in size to the strontium plume. The current plan for nitrate is MNA. Dale said he is concerned about other Contaminants of Concern COCs that do not appear to have been addressed and he will be reviewing the RI/FS in more detail.

- Bob Suyama said that this is culturally sensitive area. Since budget is always a concern, the outlined approach is reasonable because it does not require a lot of excavation and avoids problems that arise from RTD. The apatite barrier does appear to be working to isolate strontium-90. Bob said he is concerned about long-term stewardship (LTS) in the area because the apatite barrier needs to be maintained with monitoring for bioventing. These maintenance costs along with vegetation control will add up over time and will be ongoing. Bob said he would like to review the other alternatives in more detail before stating whether he supports the proposed approach or not.
- Steve Hudson said the plan appears reasonable, although the draft plan can only be reasonable if adequate funding to address all the issues is identified. He questioned what aspects of the problem will not be solved if the entire funding amount is not received. There is a serious concern that there will not be adequate funding to meet expectations.
- Dan Serres said he is concerned about leaving strontium-90 in place both in the soil column and the vadose zone. He is also concerned that the model assumptions will not reflect reality. Dan said materials will accrue, even if they do not accrue quickly, and there is concern about how durable remediation will be over 200 years. He asked if there will be factors that could cause strontium-90 to move into the Columbia River over that timeframe. Dan said he does not have faith in ICs over the proposed timeframe, especially in such close proximity to the Columbia River. He added that the timeframe for the TI waiver should be high and is curious to see how the agencies respond to the request.
- Jean Vanni said the area of the apatite barrier will be a waste site in the future that will require some type of remediation. She will examine the details in the RI more closely. The reasoning behind the TI waiver for groundwater is concerning and the notion that some materials will be left in the area in perpetuity. Jean suggested that there should potentially be another alternative considered and she may support the Nez Perce recommendation, but will need more information.
- John Stanfill said he agrees with what others have been saying about needing more information on the plan to cleanup nitrate and petroleum. All contaminants must be remediated, but other contaminants in the area appear to have disappeared with the focus on strontium-90. John said the Nez Perce will be sending a letter to DOE suggesting that the agency select Alternative 4 with some modifications.
- Gerry Pollet said he is concerned that the proposed remedy is not truly permanent; a waste site is being created right alongside the Columbia River, which is very concerning especially with expected rising river levels in the future. The Board should request a presentation with more information about the other alternatives before providing comments on Draft A. There should be an additional alternative for nitrate that includes RTDs and the additional apatite barrier upland and along the River Corridor. Gerry said he shares the concerns about phytoremediation and

noted that there are already concerns about heavy herbicide use to control plants. One cost not considered is the loss of habitat and what happens if there is a lack of money to finish the area.

- Shelley Cimon said a lot of the assumptions about waterways are difficult to understand and important for making recommendations on the preferred alternative. She is concerned about the modeling of fate transport. DOE is building a de facto waste site by using an apatite barrier and should acknowledge that. Shelley said nitrate is also a big issue. She would like to better understand the coyote willow uptake approach and whether it would be worthwhile to pursue, although there are major concerns about the prospect of bringing contaminants to the surface.
- John Howieson said an ongoing frustration with the Hanford Site cleanup is the thousands of separable waste sites that are not easily prioritized. The 100-N area has groundwater with strontium-90 levels that are 1,000 times drinking water standards. However, the Columbia River flows at 7.5 million liters per second so that amount of strontium-90 would be undetectable in the river. John requested information on the ten most important projects at the Hanford Site. He acknowledged that cleanup at 100-N is important but questioned if 100-N would be on the list of top cleanup priorities over the next year or next decade.
- Pam Larsen said the strontium-90 plume at N-Area has been topic of conversation in RAP for many years. The geography of the site includes a very high bank with the strontium deep beneath the surface. Reaching that contamination would require an astronomical excavation effort. The tribes also do not want excavation in the area because of the cultural significance of the landscape. DOE installed an apatite barrier and drilled wells plus there is monitoring in place to track these efforts. Pam said one option might be to follow the approach at West Valley where a 650 foot wall was installed for a cost of \$6.5 million that has contained a lot of strontium. Pam added that in terms of priorities for the Hanford Site, there are other more pressing source terms to address than this long-range issue.
- Liz Mattson said she shares many of the concerns such as the concern about LTS, the uncertainty about how long the remedy will last, and how much maintenance would be required. Cleanup projects at the Hanford Site often require more openness and uncertainty through the process, especially for polarizing topics like phytoremediation where people tend to either be completely for or against the process. It is easier to be flexible when implementing solutions with a more open process, especially when faced with information that is changing or even wrong. Models can turn out to be untrue. Liz added that she appreciates the opportunity to comment early in the process and hopes the Board will be given more opportunities to provide early input.
- Susan Leckband commented that the Board has heard before that the Hanford Site will receive additional funding in the future, even though current funding levels are low. It is important to be cautious when thinking about future funding. The RI/FS and Proposed Plan should include a consideration of lessons learned from other proposed plans, such as the Proposed Plan for the 300 Area that the Board recently considered. DOE should assume that whatever cleanup approach is

chosen, it will take longer and cost more money than initially envisioned. It is always advisable to complete cleanup sooner rather than later. The shoreline will be an attractive nuisance where someone will likely either want to build or drill a well in the future.

- Alex Nazarali said he is concerned about the inventory assessment on mass balance; the amount of material produced and what will be left on the site. He is also concerned about the groundwater plume and how much DOE really understands about the area because wells do not go below 20 feet. Information available is for the upper part of the aquifer and assumes strontium is on the top. He cautioned against relying on the inventory because if this assumption is wrong the entire inventory is flawed.
- Barbara Harper said she agrees with the need for a post remedial risk assessment that includes all COCs; not just deciding the work is complete once drinking water standards for the individual contaminants has been met. The Natural Resource Inventory Assessment will examine all materials that are left on site. The costs for ICs will need to be included in the cost analysis, including herbicide applications. The possibility of an approach that would use more RTD to address additional hot spots is interesting.

DOE is expecting to receive comments on the Draft A from Ecology by September 9 and DOE expects to issue Revision 0 sometime after December, allowing time for comment resolution. RAP proposed that the Round Robin portion of the meeting summary be submitted to the agencies via a letter from the Board Chair as preliminary informal commentary from the committee. The EIC will consider this proposal and determine if this is an appropriate process.

RAP will continue discussion of the topic and allow more time to review before drafting advice, potentially to bring forward at the December Board meeting. RAP expressed appreciation for having the opportunity to review documents early in the process.

### **Groundwater Modeling Q&A**\*

#### *Introduction*

Dale Engstrom gave a presentation on groundwater modeling (Attachment 3) and how it is used at the Hanford Site. In his presentation, Dale noted the following points:

- Models use gridded landscapes to predict what will move into and out of the boxes, which can be done in three dimensions. Computational engines are used to generate results with numbers that are input based on parameters such as porosity and permeability.

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\* Please see Attachment 1 – Transcribed Flip Chart Notes for key points/follow up actions recorded during the committee discussion.

- Models are checked against reality using uncertainty analysis or sensitivity analysis to determine if the suggested parameters reflect reality. If the model does not match the reality, the data is examined to determine if there is an error with the parameters. Conditions can be recalibrated to make the model match reality more closely.
- The Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS) groundwater model differs from other models used at the Hanford Site in that it was only used to generally compare alternatives proposed in the EIS and is less focused on reflecting reality. The model uses very large grid cells and averaged parameters. Other Hanford Site models use smaller scales with more detail to more closely reflect the reality.
- Parameter selection is a difficult process. The TPA agencies discussed the possibilities and drafted a document outlining parameters to be used with the EIS models. These parameters do not change and are used for every model.

*Agency presentation*

Mike Thompson, DOE, provide an overview of CERCLA models (Attachment 4). In his presentation Mike noted the following points:

- The TC&WM EIS vadose zone models are in transfer status. The models are being tested by DOE to assure they can be successfully run and DOE has not identified any issues.
- The suite of models used will become the baseline for any site-wide analysis in future. Configuration controls over the input parameters will be very important as new information becomes available over time.
- The EIS model has limited applicability to CERCLA decisions because of the large scale of the model.
- Change to the grid size will change the average parameter. DOE is trying to complete a multi-dimensional calculation of flow and mass balance within the blocks, essential the same as what occurs in the groundwater model.
- There are a variety of modeling needs currently and in the future. Modeling needs are put in terms of risk assessment needs. These needs fall under the National Environmental Policy Act (NEPA), RCRA, CERCLA, and the TPA tank closure process.
- Models are built to the scale that is appropriate for the objectives of the analysis. For example, 100-N modeling incorporates groundwater movement and impacts of contaminants to the Columbia River. The regional model provides boundaries and conditions for local models. The 300 Area model was not three-dimensional, but it was built specifically for the questions being asked and information available.

- CERCLA models have three objectives: development of soil clean-up levels to protect groundwater and surface water, comparing performance of remedial alternatives, and design and optimization of remedial systems. The goal of this modeling is to determine which alternative should be applied.
- Models used at the Hanford Site derive parameters from the same data sources and use the same implementing software but differ with respect to model objectives. The differing objectives in turn determine the appropriate resolutions, dimensionality, stresses and representation of key features.

#### *Regulator perspective*

Dib Goswami, Ecology, said he agrees with the points made in the presentations and noted that the regulations (RCRA, CERCLA or NEPA) all require modeling. The regulations do not, however, require that a certain type of model be used or determine what code should be used. Modeling can be thought of as an art and it can also be abused if used improperly. The Hanford Site has become very good at modeling and there has been a lot of progress since modeling efforts first began. Because of the large size of the Hanford Site and the large number of waste sites present, stakeholders and regulators have often expressed the need for site-wide modeling to determine cumulative impacts.

#### *Committee discussion*

*Note: This section reflects individual questions, comments, and agency responses, as well as a synthesis where there were similar questions or comments. Questions, comments, and responses were provided by HAB members unless noted otherwise.*

Q. Are contaminants moving into the 300 Area from the Central Plateau included in the model? There is a concern about cumulative impacts; the impacts of multiple contaminants moving into one area should be examined.

*R. [DOE] There are plumes from the 200 Area that enter the 300 Area, but those are not included in the decision-making process because they would not have an impact on the remediation alternatives under consideration. If there are radionuclide plums approaching the standards coming from elsewhere and comingling with contaminants in the area under consideration, DOE will be required to consider each plume individually and then consider them collectively to ensure they are not exceeding the limits.*

Q. What is the document that contains information about all the parameters used in the modeling?

*R. [DOE] There is a TPA technical guidance document that includes most of the parameters used for the EIS model. DOE would like to be able to do configuration control in the future if there is a different conceptualization. The goal is to transfer the site-wide model to DOE-RL and ensure it works properly. DOE has invested an incredible amount of resources and developed a model that*

*is very good for the purpose it was developed for; DOE does not want to lose that investment. The model continues to evolve as more information is learned.*

C. Hanford Site modeling used to estimate through 1,000 years but now estimates are only through 100 years or 50 years. Why are decisions based on 50 to 100 years when some constituents have a lifespan of thousands of years?

*R. [DOE] CERCLA decision models are largely focused on impacts of contaminants to groundwater and determining whether the amount left will meet the standards as well as the variable alternatives that can be utilized to address contamination that currently exists or is reasonably expected to exist in the foreseeable future. DOE is always questioning what will occur over the long term but modeling becomes less certain the longer the time of calculation is extended. After 100 years the level of certainty decreases substantially so projects are cut off at that point.*

C. The modeling approach used at the Hanford Site is still confusing for laypeople on the committee and people are still not comfortable with the modeling approach. It seems like there should be as much specificity as possible, even for regional models, to make any sort of accurate determinations.

*R. [DOE] DOE tries to understand the regional flow scheme for how groundwater behaves and, within that regional context, set the boundary conditions for regional flow and then set the architecture at more local scales. The local scale has to correspond to the regional information with additional details such as contaminant transport. The regional scale focuses primarily on groundwater flow analysis and other big picture factors.*

C. The parameters set in the Technical Guidance have created an issue where DOE is forced to use unreal parameters in order to match the model to realities for groundwater conditions.

*R. [DOE] DOE has asked the same question; the parameters set in the Technical Guidance are a starting point. Parameters that are leading to erroneous results can be reexamined and changed in the future. The modelers assure DOE that they have the ability to work through that issue.*

Q. Why is it so difficult to add discrete information into a site-wide model? It might be a good investment instead of using data from 7,000 separate sites. DOE could complete a thorough review and create a more accurate model through that approach.

*R. [DOE] There are computing limitations and calculation limits that make using too much detail at the site-wide level challenging; it would require supercomputing power.*

C. RAP has been speaking about modeling conceptually without considering the reality. Years ago, RAP discussed how models were built and given grand projections about actual groundwater samples in comparison to modeling results. It would be useful to hear a presentation focused on an actual modeling example.

C. RAP could focus on the model used for 100-N Area, which could also help with advice development on the Proposed Plan for 100-N. It will be important to be clear about what information RAP would like; the example model presentation should help RAP understand how cleanup levels are set and how groundwater modeling occurs. There needs to be a connection between the modeling information and cleanup decisions at the policy level.

Committee members expressed continued interest in groundwater modeling and agreed that it would be more productive and easier to follow if the committee tried to tackle modeling in context of a particular area or decision. The committee agreed that it will focus on groundwater modeling in the context of 100-N Area, at the policy-level. Dale, Liz and Shelley are issue managers for this topic.

### **PNNL Deep Vadose Zone Technologies\***

#### *Agency presentation*

Mark Freshley, Pacific Northwest National Lab (PNNL), gave a presentation on current research and development efforts for deep vadose zones technologies (Attachment 5). In his presentation, Mark noted the following points:

- PNNL is working to develop a framework that provides structure for the initiatives being dealt with known as the Endpoint Framework. This framework will provide justification for decision-making.
- Vadose zone characterization provides technical basis for remediation.
- The mass flux assessment examines the vadose zone using methods to quantify the source and strength of that source in the vadose zone. The assessment is designed to quantify the amount of contamination and to evaluate risk at both the human health and ecological level.
- PNNL is working on several systems-based assessments including: the coupled vadose zone/groundwater system, the vadose zone remedy framework, Scientific Opportunities for Modeling at Environmental Remediation Sites (SOMERS).

#### *Committee discussion*

*Note: This section reflects individual questions, comments, and agency responses, as well as a synthesis where there were similar questions or comments. Questions, comments, and responses were provided by HAB members unless noted otherwise.*

Q. How many waste sites include the deep vadose zone?

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\* Please see Attachment 1 – Transcribed Flip Chart Notes for key points/follow up actions recorded during the committee discussion.

*R. [PNNL] There are 44 waste sites with potential deep vadose zone issues and there could be others. There could be additional perch areas. DOE is working on a treatability test for perched water in the B Complex and will determine whether that can be scaled up to the entire area and still be within CERCLA requirements. The goal is to add five additional wells within areas that have high concentrations of uranium and technetium-99 to remove the contaminants before they reach the groundwater.*

Q. Can PNNL describe the process of sequestering uranium?

*R. [DOE] Uranium has a reactive and gas phase. When a caustic ammonium vapor is introduced, some of the coating on the sediment is removed and reactions with carbon dioxide over time capture the uranium, binding it to sediment particles in a much more stable configuration.*

Q. Would this approach be applicable in the 300 Area?

*R. [DOE] DOE did not consider using this approach in the 300 Area because the entire 300 Area is periodically wetted. Sequestration does not work in wetted environments; uranium forms different materials depending on what it is exposed to. There are some very immobile forms of uranium and others that are very mobile, such as in the B Complex.*

PNNL provided a written list of possible Board discussion topics to Dale as the IM. The committee appreciates hearing updates from PNNL and will discuss future topics of interest.

### **Committee Business\***

#### *Three Month Work Plan*

The committee updated the Three-Month Work Plan (Attachment 6) and developed the September Potential Meeting Topics Table. Kim Ballinger, DOE, will check on timeliness of several discussion topics proposed for the September RAP meeting, including: BC Cribs, vertical pipe units in 618-10 and the documented safety analysis, and K Reactors.

Several HAB members will be attending an upcoming emergency preparedness drill. The drill will not be a full drill and will not include a lot of off-site personnel. Dale and Pam will be attending as part of their work, Sam Dechter and Becky Holland will be attending on behalf of the Board. The Health, Safety, and Environmental Protection Committee (HSEP) is lead for this joint topic and may include a briefing of the drill on their next meeting agenda.

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\* Please see Attachment 1 – Transcribed Flip Chart Notes for key points/follow up actions recorded during the committee discussion.

In October, RAP will potentially discuss advice development for 100-N paired with a groundwater modeling tutorial of the model used for the 100-N Proposed Plan. RAP may also include a Plutonium Finishing Plant briefing on the agenda.

RAP requested an update on the Orchard Lands because there is some concern that DOE will not clean up arsenic unless levels are higher than 20 mg/kg while the background level is 7 mg/kg. Ecology recently released some information and RAP would like an update. Kim will determine if DOE has new information to share.

At the end of the meeting, some RAP committee members noted that the 300 Area RI/FS and Proposed Plan Revision 0 had been issued and the public comment period was underway (earlier than anticipated). They noted there were some changes in Revision 0 from the Draft A, but the Board had still not received a response to its advice on the Draft A. DOE noted that the Board's advice was also entered as a public comment and a response to the advice will not be available until the comment response document is completed. The response to advice is expected to direct the Board to the comment response document that will be available at the end of September. The Board's advice did state that the Board did not believe MNA is an acceptable approach so it may be unnecessary to issue more advice stating the same concern. Some committee members discussed quickly drafting advice for the September Board meeting, but given the time constraints and limited participation during this discussion, the committee decided to request a briefing from DOE at the September Board meeting and potentially conduct a Sounding Board.

Committee members noted the need to develop a process for providing feedback on a document throughout its revision process, since schedules can be challenging (e.g. issue multiple pieces of advice on a single document throughout its development).

The committee will hold an August committee call to refine the September Potential Meeting Topics Table.

### **Attachments**

- Attachment 1: Transcribed Flip Chart Notes
- Attachment 2: 100-N Proposed Plan & RI/FS Presentation
- Attachment 3: Groundwater Model Presentation – Dale Engstrom
- Attachment 4: DOE Overview of CERCLA Groundwater Models
- Attachment 5: PNNL Deep Vadose Zone Research and Development
- Attachment 6: River and Plateau Committee – Three Month Work Plan

### **Attendees**

Board Members and Alternates

Richard Bloom (phone)	Steve Hudson	Daniel Serres
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Shelley Cimon	Pam Larsen	John Stanfill
Dirk Dunning	Susan Leckband	Bob Suyama
Dale Engstrom	Liz Mattson	Steve White
Barbara Harper (phone)	Gerry Pollet	Jean Vanni
John Howieson	Dick Smith (phone)	

Others

Steve Golian, DOE-HQ	Rick Bond, Ecology	Alex Nazarali, CTUIR
Ming Zhu, DOE-HQ	Alicia Boyd, Ecology	Tom Rogers, DOH
Jeff Daniels, DOE-ORP	Madeleine Brown, Ecology	Nicole Addington, EnviroIssues
Kim Ballinger, DOE-RL	Wanda Elliot, Ecology	Hillary Johnson, EnviroIssues
Briant Charboneau, DOE-RL	Dib Goswami, Ecology	Michael Turner, MSA
Jim Hansen, DOE-RL	Nina Menard, Ecology	Amoret Bunn, PNNL
John Morse, DOE-RL	Cheryl Whalen, Ecology	Mark Freshley, PNNL
K. Michael Thompson, DOE-RL		Mike Truex, PNNL
Geoff Tyree, DOE-RL (phone)		Regina Lundgren, Public (phone)
		Annette Cary, Tri-City Herald
		Ed Revell, TRIDEC