

Review of Risk Informing Environmental Cleanup Priorities for Hanford

Summary

The Environmental Management Advisory Board (EMAB) based on the analysis of its Hanford Risk Analysis Subcommittee submits this report and recommendation to DOE-EM for the completion of environmental cleanup Priorities at the Hanford Site.

The EMAB Subcommittee approach was:

- Detailed technical review of the Hanford Site-Wide Risk Review Project Final Report and Appendices (Aug. 31, 2018; hereafter “Hanford Site-Wide Risk Review”) prepared by Consortium for Risk Evaluation with Stakeholder Participation (CRESP) including a review of related reviews and communications
- Assessment of the use of the Hanford Site-Wide Risk Review in executing the DOE EM Mission
- Development of EMAB Recommendations to DOE EM for reducing risk at Hanford and completing the EM mission

The *EMAB technical review* of the Final Report found that the scope was appropriate. The approach to the project was integrated. The analysts were appropriately credentialed. Finally, the findings are supported and actionable based on the risks as defined.

The EMAB assessment of the use of the Hanford Risk Site-wide Risk Review for executing the EM mission is that the findings and recommendations should be accepted and considered by DOE. The Report is the most comprehensive and integrated analysis of Hanford risks completed to date. Recommendations appear to be well supported based on the data and analyses. However, DOE will need to take some additional steps to compare results and recommendations of the “Hanford Site-Wide Risk Review Project Final Report” to existing agreements and regulatory requirements to identify common elements and those that could require legal or regulatory changes or additional negotiation prior to implementation.

The EMAB recommendations to DOE EM for reducing risk at Hanford and completing the EM mission at Hanford are:

- DOE use the risk ratings and results contained in the Hanford Risk Review as a major tool to integrate risk into the development of clean-up priorities, contract scopes of work, action and project plans at the Hanford Site.
- EM develop a ‘crosswalk’ or comparison of the Hanford Risk Review recommendations for clean-up completion to the Tri Party Agreement and any other

governing agreements (e.g., 2016 Amended Consent Decree) as well as with Contracts and current cleanup plans.

- DOE begin discussions with the State and federal regulators on potential opportunities to achieve significant risk reduction at Hanford by 2020 and beyond. These opportunities should be discussed with community stakeholders.
- Additionally, if the 'crosswalk' evaluation demonstrates some clear discrepancies which could affect prioritization DOE discuss and jointly evaluate the need for potential renegotiation of previous cleanup agreements with the appropriate regulators.
- DOE EM update the Hanford Lifecycle Baseline and create a revised baseline for the Hanford Site, including the tank waste treatment and disposition mission, that use the results of the Hanford Risk Review and other relevant data to create a risk informed prioritization of cleanup at the Hanford Site. The results should be discussed with community stakeholders, including local and tribal governments and Hanford advisory committees.

Technical Review of the Hanford Site-Wide Risk Review

Scope of EMAB Subcommittee Review

DOE Deputy Under Secretary for Management requested Consortium for Risk Evaluation with Stakeholder Participation (CRESP) to conduct an independent review of Hanford site-wide risks to human health, nuclear safety, and environmental and cultural resources.

The goal of the Risk Review Project is to carry out a screening process for risks and impacts to human health and resources. The results of the Risk Review Project are intended to provide the DOE, regulators, Tribal Nations and the public with a more comprehensive understanding of the remaining cleanup at the Hanford Site.

The report was intended to help inform (1) decisions on sequencing of future cleanup activities, and (2) selection, planning and execution of specific cleanup actions, including which areas at the Hanford Site should be addressed earlier for additional characterization, analysis, and remediation.

The Hanford Site-Wide Risk Review Final Report was the **primary** document to be reviewed <http://www.cresp.org/hanford/>. The subcommittee reviewed in detail the Final Report and all Appendices.

Other Documents Reviewed. Relevant documents from The State of Washington, EPA, the State of Oregon, the Hanford Advisory Board (HAB), the State and Tribal Government Working Group (STGWG), and the Army Corps of Engineers were also reviewed to assure a detailed understanding of stakeholder perspectives on Hanford Site-Wide Risk Review. The EMAB Subcommittee also review the “Omnibus Report and

Epilogue” from the Consolidated Appropriations Act 2014. Because the report was commissioned for the purpose of supporting the Congressional processes, it was deemed by the Subcommittee to have no meaningful relevance to its review of the Hanford Site-Wide Risk Review Report.

EMAB Review of the Hanford Site-Wide Risk Review Project

CRESP Approach. As the first step of the Hanford Site-Wide Risk Review, CRESP and the Core Team comprised of senior representatives from CRESP, PNNL, DOE-RL, DOE-ORP, Washington Department of Ecology, Washington Department of Health and US EPA spent several months developing the approach¹ that CRESP would use to accomplish the project objective of “*providing DOE, regulators, and the public with a more comprehensive understanding of the current and future risks to receptors and to help inform decisions on order and timing of future cleanup activities*”. A draft Methodology Report (citation) was released and briefed broadly to receive organization and public input and then revised and finalized in response to input received. The result was an approach to assessment of “risk” that was significantly different than a risk assessment under CERCLA or a Natural Resources Damage assessment. For those familiar with that type of assessment, the CRESP approach might be better characterized as *the potential for a release or radioactive or hazardous materials from an “evaluation unit” (EU) that could have a negative impact on human health or ecological and cultural resources.*

The evaluation of risks was considered to be on a rough order of magnitude scale and included an assessment of the status of the individual EUs during various time periods including prior to cleanup, during cleanup, near-term post cleanup and long-term post cleanup, as applicable. Receptors were identified as human receptors (facility workers, co-located persons, controlled access persons and the general public) and protected resources (groundwater, the Columbia River and ecological resources). In addition to their current status, the risks associated with individual EUs were also evaluated under various “initiating events” such as fire, earthquake, loss of power or loss of cooling that could result in degradation of existing barriers. Finally, risks were ranked into broad groupings that included very high, high, medium, low and not discernable.

EMAB Response: *The Hanford Site-Wide Risk Review Project report goes to considerable lengths to provide disclaimers regarding its intended purpose and more specifically, what it was NOT intended to provide. This includes statements regarding influence on cleanup options, priorities and sequence. Some of the statements appear to be contradictory when the report contains specific chapters like the one entitled “Specific Observations that Inform Cleanup Order and Timing”. The statements in the report were*

¹ The full methodology document is available at (CRESP 2015b; www.cresp.org/hanford/)

intended to indicate that the report was not a decision document but rather to provide input for consideration as part of decision processes

Major Findings of the Hanford Site-Wide Risk Review Project

The report contains several thoroughly investigated, logical and well thought out recommendations for the order and timing of remedial activities. The EMAB believes that the report can be used as one of primary tools to inform those decisions, but that it should only be used in conjunction with existing regulatory requirements and negotiated agreements. The committee further believes that before the CRESA recommendations can be considered for implementation and in order to address stakeholder concerns regarding the intended use of the report, DOE staff should do a crosswalk between the detailed observations included in the CRESA report and the existing agreements, standards and schedules for remediation.

The major findings of the Hanford Site-Wide Risk Review team were divided into five categories and are summarized below, along with the perspective of the EMAB involved in the review of the final report, appendices, and associated document.

- **Risks to the public are minimal or very low** – the Hanford Site-Wide Risk Review indicated that risks and the potential for impacts to the general public from the contaminated areas of the Hanford site are extremely low or unlikely. This was based on a number of observations including limited access to the site and specific prohibition of access to contaminated areas or areas currently undergoing cleanup. Hanford Site-Wide Risk Review also indicated that contaminated groundwater should not be considered a threat to the public because groundwater on the site is not currently used or consumed and precluded from future use by DOE controls.

The team further determined that, although the potential is small, the only risk to the general public is from atmospheric dispersion of radioactive contaminants that could occur as a result of a radiological release following a major fire or earthquake. The probability of such an event remains low because of engineered barriers and controls on areas where contaminants could be released. The example provided was the Plutonium Uranium Extraction Plant (PUREX) tunnels and prior to publication of the report, one of tunnels did collapse. However, there was no fire and no release of radioactive contamination.

EMAB Response: *The EMAB generally supports the Hanford Site-Wide Risk Review findings and agrees that risk to the public from activities on the site is and should remain low. Review of some of the supporting data and conclusions for individual EUs suggested there may be gaps in data, based on the absence of some radionuclides, and that predictions regarding current and future production of hydrogen or VOCs may need additional background or explanations. Fully*

understanding these issues is important because it predicts treatment and disposal options.

The committee also believes that an addendum to the existing report adding recommendations as a result of the PUREX tunnel collapse or inclusion as a reference of any DOE reports generated on the event could be valuable and support previous conclusions regarding risks.

- **Risk to site workers is higher than to other people** – as would be intuitive, the Hanford Site-Wide Risk Review found that the highest risks identified as part of their review was for workers physically located on the Hanford site. The higher risk for this cohort is due to the potential for accidents that could happen especially during retrieval of buried waste or remediation of certain EUs and structural deterioration of existing engineered barriers where inventories of high activity (Curie content) radioactive materials are stored.

EMAB Response: The EMAB generally supports this finding. The subcommittee believes that the local and headquarters DOE need to review the worker risk assessment and assure that interim action and ongoing maintenance operations are conducted to minimize worker risk.

- **Risks from tank wastes vary depending on waste composition in each tank** – The Hanford Site-Wide Risk Review found that tank wastes collectively represent the single largest inventory of radioactive materials on the Hanford site. However, there is a wide range in the chemical/radionuclide content between the tanks. While the tanks represent a risk to the workers managing them, the most significant risk is hydrogen production and accumulation, through radiolysis, during loss of active ventilation with subsequent fire and, separately, the potential for the release of key radionuclides (Tc-99 and I-129) that are highly mobile in the environment. The hydrogen production through radiolysis represents a potential fire or explosion hazard. The highly mobile Tc-99 and I-129 could be transported to contaminate groundwater, which is a protected resource. The tank farms have also had on-going issues with worker exposure to tank vapors during waste retrieval.

EMAB Response: The EMAB generally supports this finding. However, as mentioned previously, the report suggested that some of hydrogen production would be mitigated by the removal of Cs-137. With the inventory of other long-lived radionuclides present, the committee would be interested in some additional supporting information for that conclusion.

- **Risks to the Columbia River and Ecological Resources are limited** – the Hanford Site-Wide Risk Review found that ecological risks to the riparian zone immediately adjacent to the Columbia River and the river itself were primarily limited to physical disruption during remediation activities, including destruction of high value habitat

and the benthic zone or river bed. DOE is engaged in surface and near-surface remediation of these areas and is also committed to ground water remediation through a pump and treat facility.

EMAB Response: *The EMAB generally supports this finding. The subcommittee believes that both the Ecological and the Cultural Analyses are less comprehensive than the report in general. While there are additional data which could contribute to a complete analysis, no additional data are needed for DOE to take appropriate actions to minimize risks.*

- **Risks to protected resources varies (Groundwater, Ecological and Cultural Resources)** – the Hanford Site-Wide Risk Review indicated that the greatest long-term risk to protected resources is likely to be from (i) further migration of contaminants already in groundwater, (ii) by destruction or disruption of the ecological and cultural resources, and (iii) introduction of non-native invasive species through surface remediation activities. The Hanford Site-Wide Risk Review identifies the groundwater areas with the highest potential risk are location in the 200 East areas of the Central Plateau. The Hanford Site-Wide Risk Review found that the Columbia River is not at significant risk for contamination from these groundwater areas.

EMAB Response: *The EMAB generally supports this finding. There is contamination still reaching the Columbia River, however, the treatment systems operating are effectively minimizing that contamination. Treatment needs to be continued and monitored to determine when it can be minimized or discontinued. The potential for continued migration of contamination to the Columbia River, from more distal sites, still exists and will also need to be monitored and treated as necessary. The Subcommittee believes the potential for cultural and ecological degradation of these areas can best be addressed by appropriate monitoring contracts with qualified organizations, utilizing appropriate contractual incentives to eliminate (if detected) the introduction of invasive (non-native biota).*

Assessment of Utility of the Hanford Site-Wide Risk Review Project Final Report in Executing the DOE EM Mission.

Based on the Subcommittee's detailed review of the report, stakeholder comments and associated documents since 2014, we believe the final report is a comprehensive, and integrated basis for DOE EM action. However, there are a few DOE actions (based on the scoping of the Project) which are needed for the recommendations to be implemented.

We recognize that priorities of the stakeholders differ and some preferred actions, such as restoration of the entire Hanford Site to pre-Manhattan Engineer District development

and subsequent DOE operations cannot be realistically achieved. The EMAB believes the following can be and should be achieved by DOE:

- Protection of human health, ecosystem services, and ecological/cultural resources is the priority short-term and long-term
- Access to view the unique/restored landscapes and to cultural resources should be maximized
- The on-going socio-economic support to the host communities and to tribal communities needs to be identified and communicated with the stakeholders for long-term planning purposes, and post cleanup completion.

Recommendations from EMAB to DOE Assistant Secretary, Environmental Management:

1. DOE should use the risk ratings and results contained in the Hanford Risk Review as a major tool to integrate risk into the development of clean-up priorities, contract scopes of work, action and project plans at the Hanford Site.
2. To support this, EM should develop a 'crosswalk' or comparison of the Hanford Risk Review recommendations for clean-up completion to the Tri Party Agreement and any other governing agreements (e.g., 2016 Amended Consent Decree) as well as with Contracts and current cleanup plans. The crosswalks should identify areas of agreement and potential barriers to implementation.
3. DOE should begin discussions with the State and federal regulators on potential opportunities to achieve significant risk reduction at Hanford by 2020 and beyond. These opportunities should be discussed with community stakeholders, including local and tribal governments and Hanford advisory committees.
4. Additionally, if the 'crosswalk' evaluation demonstrates some clear discrepancies which could affect prioritization DOE should discuss and jointly evaluate the need for potential renegotiation of previous cleanup agreements with the appropriate regulators. The parties should consider key elements from the report, including:
 - Emphasizing worker health and safety risk reduction short-term and throughout Hanford Stewardship Management
 - Minimizing public health risks associated with increased access to specific Hanford cultural and ecological sites
 - Minimizing potential for biological update in terrestrial and aquatic ecosystems and potential discharges of contaminants from groundwater
 - Restoring ecologically viable landscapes using indigenous plants as a goal where cleanup has been completed
 - Expanding (consistent with risk management principles) and protecting high value cultural and ecological (services, diversity and populations) sites within Hanford
 - Decreasing the footprint for management activities to those appropriate to long-term stewardship operations.
5. DOE EM should update the Hanford Lifecycle Baseline and create a revised baseline for the Hanford Site, including the tank waste treatment and disposition mission, that use the results of the Hanford Risk Review and other relevant data to create a risk informed prioritization of cleanup at the Hanford Site. The goal should be to complete clean-up safely, expeditiously and efficiently, in a manner that reduces risk to the public, workers, and the environment. The results should be discussed with community stakeholders, including local and tribal governments and Hanford advisory committees.