

The Remedial Investigation/Feasibility Study for the 100-KR-1, 100-KR-2 and 100-KR-4 Operable Units (DOE/RL-2010-97, Draft A) and Proposed Plan for Remediation of 100-KR-1, 100-KR-2 and 100-KR-4 Operable Units (DOE/RL-2011-82, Draft A).

Background

In the spirit of cooperation and early disclosure, the Tri-Party Agencies provided the Hanford Advisory Board (HAB) the opportunity to examine the Remedial Investigation/Feasibility Study for the 100-KR-1, 100-KR-2 and 100-KR-4 Operable Units (DOE/RL-2010-97, Draft A) and the Proposed Plan for Remediation of 100-KR-1, 100-KR-2 and 100-KR-4 Operable Units (DOE/RL-2011-82, Draft A, received on September 29, 2011). The HAB appreciates the early opportunity to review these documents. There are a couple of important points the HAB would like to make to help improve these documents. We understand that these documents are at an early stage of development, and will evolve with Regulators' input, however, the HAB feels that our high-policy level comments may be useful.

The 165 waste sites at 100-K include the two reactors that will be dealt with in a separate action later, six tanks that have been removed and 29 sites that are classified as closed. Another 16 sites are a combination of nine sites that contain no unacceptable risk after remedial actions, four sites that are carried forward because after interim remediation, there was ecological risk due to mercury, and three sites with contaminants of potential concern (COPCs) above the risk threshold of 1×10^{-4} .

That leaves 116 waste sites, twice as many as above, 46 of which have completed interim cleanup actions, but may not meet final primary remediation goals (PRGs) for cesium¹³⁷, strontium⁹⁰, arsenic, boron, and PCBs (Pre-ROD To-Go sites), and 66 waste sites where a quantitative risk assessment has not been done before the final ROD (Post-ROD To-Go sites). With the uncertainty of the 46 sites which have yet met PRGs and that might further assessment and possible action, as well as the 66 sites that have not been adequately assessed, the path forward for two-thirds of the waste sites in this ROD seem relatively undetermined.

General Comments about the RI/FS Report

What are the contaminants of concern at K-100 and how are they being addressed? The 100-K Operable Unit is known for hosting spent fuel for decades in the KE-fuel storage basin. There has been a recent concern about the existence of a mixed contaminants plume (UPR-100-K-1) that requires the removal of the 105-KE reactor for characterization and remediation. The multiple plume map (Figure 11. 100-K Groundwater Plume map) on page 19 of the Proposed Plan shows plumes of high levels of chromium, nitrate, tritium, strontium⁹⁰, carbon¹⁴ and TCE. The map does not show the reactor plume, and does not indicate any detected cesium, uranium, europium, or plutonium (or numerous other radionuclides that would be associated with spent fuel) even though direct push bores that were emplaced under the reactor indicate

contamination is present at very high levels under the reactor and the former fuel storage basin.

The Proposed Plan suggests that; “The groundwater COCs lie largely within the extent of the hexavalent chromium plumes. The extraction well network installed for the pump-and-treat systems for remediating hexavalent chromium plumes will capture these contaminants” (p. 32, lines 19-22). The HAB is concerned because nothing is offered in the Proposed Plan for actual capture, control and disposal for each of the non-chromium elements in the groundwater. For example, how will nitrate be removed from the pumped water? Will there be additional ion-specific exchange beds for removal of strontium added to the processing facility? What is a cost effective treatment method for tritium? How will separate trichloroethene removal and treatment be approached? What about the COPCs the Proposed Plan does not mention like uranium, europium, plutonium, and cesium? The premise seems to be that the design of the treatment plant(s) will take care of itself. The HAB feels that the Proposed Plan for Remediation of 100-KR-1, 100-KR-2 and 100-KR-4 Operable Units has not been totally thought out nor sufficiently developed.

The Proposed Plan seems to be under-prepared in a number of places. Considering the movement of contaminants away from waste sites, the Proposed Plan says, “There is potential for contaminant transport into the non-operational areas through five mechanisms . . . materials disposal, spread by animals, stack emissions, blowing dust or vegetation, and overland flow.” This list seems to fail to recognize other reasonable mechanisms like unrecorded and/or unplanned releases both liquid and solid, redeposition during flooding of the Columbia River, surface springs (like the steaming springs in pictures of the on-going 100-K operations). To the HAB’s knowledge, most of the description of remediation is about remediated surface waste disposal sites, and these have been characterized as sufficiently remediated by cleanup verification data. There has been no report of between-waste site sampling to determine how clean (or unclean) these areas which make up the majority of the Operable Unit area might be.

The Proposed Plan says “Future land use is predominantly conservation (mining). . . . The residential monument worker and casual user exposure scenarios represent the reasonably anticipated future land use and no further action is warranted” (p. 22, lines 3-4). While creating a CLUP to anticipate future uses is laudable, land use should not be used to determine cleanup levels. This is backwards; the level of cleanup success should determine allowable land use. First remediate to the best extent possible, and then designate land use restrictions to handle the places that cannot be cleaned well enough. There is literally no way to accurately predict what the land use will be at Hanford in 100, much less 500 years, which is not close to the half-life of many of the contaminants.

In the 100-K Waste Site Map (Figure 10) the groundwater Operable Unit much smaller than 2012 modeled extent of contaminant plumes shown in Figure 14 or 16. The HAB advises that at

the least, the Operable Unit should encompass all of the known (or suspected) extent of the plume.

The HAB doesn't understand why the Proposed Plan discusses the "north shoreline" recreational activities when the "north shoreline" is not a part of the 100-K Operable Unit. (p. 15, lines 11-12). Discussion of areas outside the Remedial Investigation does not appear to add to the quality of the document, and adds unnecessary reading material.

Alternatives Comparison

Alternative Three, the alternative not selected, employs Remove-Treat-Disposal (RTD) to remove contaminants from the waste sites yet to be sufficiently remediated, and expands the pump-and-treatment of groundwater with 65 additional wells and the installation of a new 4920 L/min pump-and-treat facility. Figures 16 and 18 provide projected contaminant plumes for Alternative Three which demonstrate that Alternative 3 will be more effective in less time at groundwater cleanup.

In contrast, Alternative Two, *R-T-D and groundwater Pump-and-Treat, Optimized with other Techniques*, the preferred alternative, seems to lack proof of effectiveness for a number of new techniques that are proposed as final solutions to remediation problems. The Proposed Plan includes new technologies (soil flushing, bio-venting, air-stripping for example) that will have to go through a bench scale to field scale tests to determine whether they will be appropriate for Hanford conditions (p. 46, lines 21-26). The development of these techniques may be delayed to the point that they will not be deployed for decades. The bio-infiltration and bio-injection techniques have been used in a treatability test at Hanford, but never used on a large scale, and did not appear to be effective at creating the reducing environment necessary to immobilize chromium. Likewise, Land Farming petroleum products has been shown to be effective in other remediation of very shallow chemical spills, but may not be appropriate for Hanford and deeper petroleum remediation.

The Proposed Plan says that Alternative 2 is more implementable than Alternative 3. The HAB does not understand this statement because, other than some new wells and expanded pump capacity, Alternative 3 needs little new infrastructure (Figures 15 and 17). In contrast, Alternative 2 needs new buildings and infrastructure like tanks, wells, piping and pumps, for each of the new technologies discussed. Additional infrastructure (for soil flushing, bio-venting, bio-injection, bio-infiltration) would seem to take quite a lot of implementation. This fact provides a sense of uncertainty in the adequacy and reliability of these methods, and these lab tests will add to the time before these methods may be implemented. Since these remediation methods are somewhat new to Hanford, there must be a degree of uncertainty in the cost and implementability estimates provided in the Proposed Plan for Alternative 2. The provided estimated costs for Alternatives 2 and 3 are close to equal (\$1.030 versus \$1.088 billion). The annual operation and maintenance cost for groundwater treatment in the Proposed Plan

alternatives is \$177.9M (Alternative 2) versus \$138.5M (Alternative 3) per year which may also impact the estimated total alternative costs.

Alternative 3 involves unequivocal remove-treat-dispose. The Proposed Plan assumes that a purely RTD approach would mean more waste sites would be removed rather than immobilized, which would imply more surface disturbance and operational contamination (ecologically less attractive). Alternative 2 employs more technologies that propose to immobilize vadose zone or groundwater contaminants in place, and does not remove them from near the river. This immobilization of groundwater contaminants leaves “deposits” which will eventually make their way to the river; this makes Alternative 2 less ecologically attractive than outright removal. The HAB has always maintained a preference for removal (RTD) of contaminants, especially near the river whenever possible.

The HAB appreciates the early opportunity to review these documents. We understand that these documents are at an early stage of development, and will improve and evolve with Tri-Party collaboration. We hope you will consider these points as you work to improve the RI/FS and the Proposed Plan.