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September 10, 2010

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Re: Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 5:
100-NR-1 and 100-NR-2 Operable Units (DOE/RL-2008-46-ADDS, Draft B) and Sample
Analysis Plan for the 100-NR-2 Operable Units RI/FS, (DOE/RL-2009-42, Draft B)

Dear Messrs. Brockman, McCormick, Faulk and Ms. Hedges,

Background

The 100-N area includes the last of Hanford's production reactors, the N-Reactor, buildings associated with the reactor, and soil and groundwater contamination from approximately 20 years of discharges to the river and the soil. The 100-N area consists of two decision units: NR-1, which is the contaminant source unit, and NR-2, which is the groundwater unit. The 100-N work plan will be the last addendum to the 100-Area Remedial Investigation/Feasibility Study (RI/FS). The U.S Department of Energy (DOE) transmitted Draft A of this document to the Washington State Department of Ecology (Ecology) in late December with a 60-day comment period. A 100-N workshop occurred on February 17, 2010 to facilitate Ecology's review. The document was returned by Ecology to DOE-

HAB Consensus Advice # 236

Subject: 100-N RIFS

Adopted: Sept. 10, 2010

Page 1

Richland Operations for revision to another draft version. This advice focuses on the Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 5, Draft B (the Work Plan) which was issued by DOE issued in April 2010.

Discussion

The Work Plan states that past limited field investigations combined with information gathered during the past and on-going remediation will fill existing data gaps and provide a sufficient basis for making final remediation decisions. According to the Work Plan, where interim actions have been completed, “the background information on the waste sites does not support the need for additional characterization based on residual concentrations. The clean closure determination shows the remedial actions were successful. Therefore, no further characterization is needed.”¹

In the Board’s judgment, the Work Plan does not contain either adequate or sufficient data to define the needed effort. Some examples of 100-N Work Plan data gaps include:

- The source of the strontium plume is not well characterized. The strontium concentrations in the plume exceed the drinking water standards by about a factor of 1000, and have not changed in years. However, the Work Plan recommends no additional sampling of the waste sites to locate the source¹. In the judgment of the Board, the assumption that future remediation work will sufficiently identify the source is questionable.
- The flux of strontium to the river is uncertain. The Work Plan states that estimates of the strontium flux to the river are “recognized to possibly contain substantial error.”¹ Even though strontium concentrations are described as “fluctuating widely”¹ since 1989, and most groundwater sampling done in the past was done annually, the sampling and analysis plan (SAP) proposes to sample groundwater only three times over the life of this Work Plan to characterize the seasonal contaminant concentration variability over time¹.
- The location of the strontium plume in the aquifer is uncertain. DOE believes the strontium plume is contained in the upper three meters of the aquifer. However, the Connelly Model² indicates the majority of the strontium may be contained in the lower part of the aquifer¹. The design of the apatite barrier treatability test intended to intercept the strontium plume does not extend to the bottom of the

¹ Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 5: 100-N Decision Unit (DOE/RL-2008-46-ADD5), and Sample and Analysis Plan for the 100-N Decision Unit RI/FS, (DOE/RL-2009-42)

² 1301-N and 1325-N Liquid Waste Disposal Facilities Limited Field Investigation Report, DOE/RL-96-11

aquifer. This design element becomes even more important if contaminated water could pass below the barrier.

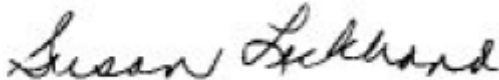
- The 100-N chromium needs to be addressed. The Work Plan reports chromium sampling at 100-N as “inconsistent and discontinuous in frequency and location”¹ and chromium was not a “typical analyte”¹ in much of past 100-N well sampling. The Work Plan interprets the current chromium plume at 100-N as having encroached from the K-Area and that the amount of chromium sourced from 100-N is not a contaminant of concern. However, the Board’s believes, this assumption is not supported by data. Chromium occurs widely across 100-N and at concentrations above action levels in at least one well.
- Knowledge of Ringold Upper Mud is limited. Chromium has been found in samples from a sandy layer within the Ringold Upper Mud (RUM)¹. The Work Plan states that “limited borehole information”¹ was used to characterize the RUM and the base of the aquifer, and that the quantitative value of some parameters (including hydraulic conductivity) in the RUM is “uncertain.”¹ The Work Plan says “the confined (Ringold and Basalt/interbeds system) aquifers are isolated from the overlying aquifers by low-permeability strata,”¹ but there are no reported wells in the 100-N Decision unit that have been screened in the lower Ringold or basalt confined aquifers to validate this assumption.
- The nitrate source is unknown. The RI/FS reports that “because the source of nitrate is unknown, its migration rate and remaining vadose zone volume cannot be determined.”¹ The strongly anionic nitrate plume could pull strontium cations away from the apatite mineral surface and therefore have significant negative chemical effects on the success of the apatite barrier to trap and hold strontium. The location, ionic strength and source of this plume are important.
- The petroleum hydrocarbons problem was not referred to in the Work Plan.
- Remediation data contains uncertainty. Post remediation sampling data should accompany data collected during remediation to ensure that remedial goals have been met.

Advice

The Work Plan should ensure that sufficient data be collected in the remedial investigation phase to adequately support final remediation decisions. Toward this goal:

- The Work Plan should ensure the remedial investigation include additional groundwater and soil characterization and analytics to identify all contaminant of concern sources, their volumes and risk to human health and the environment, over a reasonable timeframe, in order to adequately address the data gaps identified in this advice.
- Data confirming the effectiveness of interim remedial actions (such as confirmatory sampling as described in the Remedial Action Work Plan) is necessary to support final remedial decisions. Additionally, similar verification is necessary to confirm the effectiveness of final remedial actions.
- All potential contaminants of concern (including chromium, regardless of the initial source of chromium, nitrate, the other metals called out in the Work Plan, and petroleum) need to be better addressed by characterization or remediation actions in the RI/FS Work Plan.

Sincerely,



Susan Leckband, Chair
Hanford Advisory Board

This advice represents Board consensus for this specific topic. It should not be taken out of context to extrapolate Board agreement on other subject matters.

cc: J.D. Dowell, Co-Deputy Designated Official, U.S. Department of Energy, Office of River Protection
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