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EPA

January 12, 1993

Eric D. Goller
U.S. Department of Energy
P.O. Box 550, A6-95
Richland, Washington 99352

Re: 100-HR-3 Groundwater Treatability Test Plan 26274

Dear Mr. Goller:

The U.S. Environmental Protection Agency (EPA) and its contractors have reviewed the "100-HR-3 Groundwater Treatability Test Plan" (DOE/RL-92-73, Draft A). Enclosed are EPA's comments.

Although the 100-HR-3 Operable Unit is an Ecology lead, the regulators are viewing this as a 100 Aggregate Area task that is being implemented at the 100-HR-3 Operable Unit. Thus, we view this test plan as a co-lead. Because of this, comments are being submitted separately by the two regulatory agencies. As a result, there may be some discrepancies in comments by Ecology and EPA. Any disparity can be resolved during the comment resolution process.

If you have any questions, please contact me at (509) 376-8665.

Sincerely,

Paul R. Beaver
Operable Unit Manager

Enclosure

cc: Dib Goswami, Ecology
Rich Hibbard, Ecology
Audree DeAngeles, PRC
Becky Austin, WHC
Steve Wisness, DOE
Dave Jansen, Ecology
Julie Erickson, DOE
Brian Drost, USGS
Administrative Record (100-HR-3 Operable Unit)

GENERAL COMMENTS

The <u>100-HR-3 Groundwater Treatability Test Plan</u> presents the general methodology for evaluating the performance of biodenitrification, chemical reduction/precipitation, and ion exchange technologies to remediate 100-HR-3 groundwater. In general, the test plan follows EPA guidelines for conducting treatability studies under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (EPA 1989). However, several issues should be addressed in this test plan.
Comment: Section 1.0, page 1, last sentence of last full paragraph.
The treatability study under which reverse osmosis will be investigated needs to be identified. If it is not completed in time or with DQOs sufficient to support the HR-3 Treatability Studies, than a contingency plan needs to be detailed to obtain this information.

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- The selected monitoring wells 199-D5-15, 199-H4-3, and 199-H4-17 may not provide representative groundwater samples that cover the range of contaminants and concentrations in the 100-HR-3 operable unit for treatability studies. The wells are selected on the basis of current chemical and radiological data (Section 1.2). Current data shows the presence of only chromium, nitrate, gross alpha, and gross beta levels in samples from each of the three wells chosen. Elevated levels of technetium-90 (2,000 pCi/liter) and uranium (100 pCi/liter) were also detected in 100-HR-3 groundwater (DOE 1992). Also, hexavalent chromium [chromium (VI)] concentrations are above the 50 μg/liter drinking water standards in all wells except 199-H3-2A, 699-83-47, 699-89-35, and 699-90-45 (DOE 1992b). The monitoring wells should be selected based on the results of previous and current investigations to provide representative groundwater samples that will cover the range of contaminants and concentrations in the 100-HR-3 operable unit.

- Contaminants of concern and performance levels for the 100-HR-3 operable unit are listed in Table 1-2. There are few discrepancies in this table that need to be addressed.

  - The average concentrations for chromium is reported as chromium (III) or total chromium. But the footnote states, "reported as total chromium." This discrepancy should be addressed.

  - The performance levels presented are not justified based on the site risk assessment or ARARs for the intended future groundwater use. The basis for the use of Model Toxics Control Act (MTCA) method B to estimate the performance level for chromium (VI) should be stated. Also, the maximum contaminant level goal (MCLG) is used for total chromium as performance level (100 ppb). Maximum contaminant level goals are nonenforceable health goals. The enforceable maximum contaminant level (MCL) of 50 ppb should be used as performance level for total chromium. Also, a rationale for the use of 0.04 times derived concentration guide (DCG) for radionuclides in water (footnote A) should be explained.

- The performance levels for radionuclides should include technetium-90 and uranium which are also contaminants of concern in the 100-HR-3 groundwater.

- It should be clarified whether the reported average contaminant concentrations are averages over a period of one year sampling or from many years.

- The plan proposes to use samples from each of the selected wells in the remedy selection tests to identify how each technology performs at different contaminant concentrations. However, the levels of some contaminants are very low compared to the others in some wells and will not be useful in demonstrating the effectiveness of biodenitrification in combination with chemical reduction/precipitation and ion exchange for meetIng treatment criteria. For example, only the concentration of total chromium in groundwater sample from well 199-D5-15 exceeded its performance level. The levels of other contaminants such as nitrate, gross alpha and gross beta activity are within their performance levels. Chemical reduction/precipitation is the only treatment required for the groundwater sample from well 199-D5-15. For well 199-H4-3, biodenitrification followed by ion exchange is the treatment required to reduce the levels of gross beta activity and nitrate below their performance levels. At the proposed MCLs in Table 1-2, no treatment is required for groundwater samples from well 199-H4-17 for all of the contaminants of concern. The plan should therefore identify appropriate wells that will produce groundwater samples containing all contaminants of concern at different concentration levels but exceeding their performance levels to evaluate how each technology performs at different concentrations with different contaminants.

- In addition to the primary objectives of the groundwater treatability study stated in Section 2.1, the following objective should be included: to verify the effectiveness of the proposed treatment train for achieving the interim or final cleanup levels for target groundwater contaminants.

- Determination of optimum reactor configuration (i.e., fixed film, fluidized bed, or suspended growth system) is stated as one of the data quality objectives for remedy selection testing of biodenitrification (Section 2.2). But testing of configuration is planned in the pilot-scale biodenitrification program for the later remedy design phase (Section 4.3.1). This inconsistency should be clarified. The principal objective of pilot-scale testing is to obtain quantitative performance, design, and cost data to be used in the feasibility study or in the implementation of the remedial technology. Because the principal objective is to quantify the performance and cost of a technology, the number of parameters to be studied may be limited to critical engineering parameters that affect the cost and performance of a technology. Determination of optimum reactor configuration in the remedy design phase may increase the cost of pilot-scale testing due to the use of field testing equipment of a configuration similar to that of the full-scale operating unit, large volume of waste to be handled compared to laboratory or bench-scale testing, and use of rigorous quality assurance/quality control to generate data. Therefore, optimum reactor configuration should be determined in the remedy selection phase with bench-scale models.

- A schematic of a conceptual groundwater treatment system for the two processing approaches stated in Section 4.0 should be presented, including chemical additions, residuals treatment, and final disposal of effluent and residuals.

  The first approach provides only one treatment combination consisting of biodenitrification, chemical reduction/precipitation and ion exchange. At the laboratory scale level, different combinations of the proposed technologies should be tested to select the appropriate treatment combinations for removal of a range of contaminants concentrations with reduced levels of process problems and sludge production. For example, a treatment combination of chemical reduction/precipitation for removal of metals followed by biodenitrification may reduce process problems due to metals and generate nonhazardous biological sludge in biodenitrification that can be disposed of in a sanitary landfill when metals and nitrates are the contaminants of concern in the groundwater. Similarly, ion exchange alone may be evaluated with biodenitrification when nitrates are contaminants of concern. Ion exchange or a demineralization process is commonly used to reduce nitrate concentrations from drinking water (ASCE and AWWA 1990).

- The types of equipment and materials which will be required for remedy selection laboratory/bench-scale tests are not provided and should be listed.

- The requirements for obtaining and analyzing samples as part of the 100-HR-3 groundwater treatability tests are not presented and should be included in an appendix.

SPECIFIC COMMENTS

Comment: Section 1.2, page 4, first paragraph, last sentence.
It is not clear how "performance level" is defined. If this is equivalent to an MCL, then other radionuclides need to be included (according to the 1991 Site-Wide Environmental Report, tritium, strontium-90, and technetium-99 all exceed MCLs in some parts of the 100-HR-3 OU).

Comment: Section 1.2, page 4, last bullet.
It is stated that well H4-17 represents an area of low nitrate. However, table 1-1 lists nitrate as "medium" for H4-17.

Comment: Section 1.3, page 5, Table 1-1.
The Chromium level for 199-H4-3 is listed as "Low". The 100-HR-3 Work Plan indicates a concentration of 243 ug/L in 1987. Has the concentration subsequently decreased to a "Low" level?

Comment: Section 1.3, page 5, Table 1-2.
"Performance Level" and "ACV" are not defined.

Comment: Section 1.4, general.
A section 1.4.4 entitled "Reverse Osmosis" is needed. This is identified as one of the technologies selected for evaluation (page 6, line 2) but it is not clarified as are the other three selected technologies. Also a section 1.4.5 is needed entitled something like "Bioassimilation/conversion". This section would discuss the use of bacterial/algal/vegetative systems for: (A) the uptake of metals into biomass that is later harvested, ashed, and recycled/disposed; (B) uptake and catabolism of hydrocarbon contaminant (or storage until the ashing process wherein they would be incinerated); (C) uptake of inorganic nitrogen for assimilation into biomass (conversion to a non-contaminated form).

Comment: Section 1.4, page 6, first paragraph, first sentence.

An additional process should be added--bioassimilation. The utility of using a bacterial/algal/vegetative process for uptake of contaminants for incorporation into biomass or other biotransformation should be considered.

Comment: Section 1.4, page 6, first paragraph, line 8.
"...producing the greatest..." should be changed to "...producing the greater..."

Comment: Section 1.4.1, page 6, third sentence.
Fora technical accuracy, the sentence should be changed to "Denitrification specifically acts on N2O, nitrite, nitrate..."

Comment: Section 1.4.1, page 6.
Sugars/carbohydrates should be included in the example list of carbon sources.

Comment: Section 1.4.1, page 7, first line.
Change "limiting " to "co-limiting" (in order to reduce the BOD load in the resulting effluent).

Comment: Section 1.4.1, page 7, second full paragraph, line 5.
Should " Fixed growth reactors..." be "Fixed film reactors..."?

Comment: Section 1.4.1, page 7, third full paragraph, line 5.
"...biomass concentrations..." should be ".. biomass concentration..."

Comment: Section 1.4.1, page 8, lines 2-4.
The sentence "Hydrocarbon contaminant plumes..." should be dropped as it does not fit the topic of this paragraph. Denitrification systems may provide remediation for lots of other categories of contaminants. If your goal is to sell this approach because it has additional potential benefits, this should be a separate paragraph or section (similar to the one started in the first full paragraph on this page). And if that is the goal, metals are likely a more significant co-contaminant than hydrocarbons and you may better achieve your objectives by pointing out metal assimilation into the bacterial biomass for harvesting (contaminant removal) and ashing (volume reduction).

Comment: Section 1.4.3, page 9, second paragraph, last line.
"...prior the next..." should be "...prior to the next..."

Comment: Section 4.2.1, page 19, seventh bullet on page.
"...using in the determining..." should be "...use in determining..."

Comment: Table 2-1, page 11
Need to add "Bioassimilation/conversion"

Comment: Section 2.2, page 12-13.
Need a section for "Remedy Selection/Design Testing of Bioassimilation/conversion (Pilot-scale)"