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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

October 3, 2019

Doug Hintze, Manager
Environmental Management
Los Alamos Field Office
P.O. Box 1663 MS-M984
Los Alamos, NM 87545

RE: SEMIANNUAL PROGRESS REPORT ON CHROMIUM PLUME CONTROL INTERIM MEASURE PERFORMANCE
LOS ALAMOS NATIONAL LABORATORY (LANL)
EPA ID #NM0890010515
LANL-19-011

Dear Mr. Hintze:

The New Mexico Environment Department (NMED) has received the United States Department of Energy's (DOE) *Semiannual Progress Report on Chromium Plume Control Interim Measure Performance* (Report), dated March 2019 and referenced by EM2019-0059. The Report was received on March 22, 2019. NMED issued draft comments on the Report on June 5, 2019 and August 27, 2019. DOE submitted responses on August 20, 2019 and September 19, 2019. All of NMED's draft comments were adequately addressed by DOE and no revisions to the Report were required. NMED hereby issues this approval.

If you have any questions or comments regarding this correspondence, please contact Robert Murphy at 505-476-6022.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

Att: NMED Draft Comments and DOE Responses

cc: N. Dhawan, NMED HWB
R. Murphy, NMED HWB
S. Yanicak, NMED DOE OB, MS M894
L. King, EPA Region 6, Dallas, TX
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File: Reading and LANL 2019, TA-05 Chromium plume interim measure semiannual report LANL-19-011

The New Mexico Environment Department's Draft Comments on the *Semiannual Progress Report on Chromium Plume Control Interim Measure Performance,* March 2019

General Comments:

1.) June 5, 2019

The *Semiannual Progress Report on Chromium Plume Control Interim Measure Performance* (Report) uses 3 primary lines of evidence to assess the Interim Measure (IM) performance: groundwater concentration trends, water-table maps, and results from tracer tests. Additional lines of evidence such as simulations from the numerical groundwater model and capture/flooding zone width calculations must be included in future IM performance reports to sufficiently assess the IM performance.

Permittee Response: August, 20, 2019

IM data is being incorporated into ongoing work for the chromium project and provides very valuable input for assessing plume-scale hydrology related to pumping and injection, especially as it informs evaluation of remedial design. Applicability and incorporation of numerical modeling for semiannual reporting might be appropriate to guide IM operational strategies if performance monitoring wells are not responding favorably. The use of modeling for the chromium project should be further discussed with NMED in pre-submission meetings for future semiannual progress reports.

NMED Response: August 27, 2019

The Permittee's response is acceptable.

2.) June 5, 2019

Please include in the Report a table that identifies the total volume of water injected into each CrIN well (on a quarterly-time basis) and the average monthly heads for each CrIN well.

Permittee Response: August, 20, 2019

Information on volume of water injected into each CrIN well, as currently presented in quarterly reports submitted under discharge permit (DP)-1835, will be incorporated into future semi-annual progress reports. The table is shown below.

Period	CrIN-1 (gal)	CrIN-2 (gal)	CrIN-3 (gal)	CrIN-4 (gal)	CrIN-5 (gal)	CrIN-6 (gal)
1st Quarter 2019	0	0	4,027,211	7,810,905	7,715,286	0

2nd Quarter 2019	293	575	1,719,534	3,493,624	3,255,714	0

The Cr Infrastructure wells' water level instrumentation is not calibrated to mean sea level like monitoring wells; therefore, average monthly head data should not be provided. The water levels are simply relative to the transducer and communicate the water level data to SCADA. Plots are provided with flow and water level for the CrIN wells, but those levels are feet of water above the instrument, which provides a method for direct comparison to the static level. This is what operators need to evaluate CrIN performance and make adjustments. For this reason, the plots provided are the best means of communicating CrIN water levels.

NMED Response: August 27, 2019
The Permittee's response is acceptable.

Specific Comments:

1.) June 5, 2019

1.0, Introduction, page 1, third paragraph: The Report states that the initial IM configuration of extraction at CrEX-1, CrEX-2, and CrEX-3 with corresponding injection into CrIN-3, CrIN-4, and CrIN-5 "addresses the downgradient portion of the plume." However, as stated in the *Chromium Plume Control Interim Measure Performance Monitoring Work Plan* (LANL, 2018; see EP2018-0055), the primary focus of the initial configuration is hydraulic control of the chromium plume along the Laboratory boundary with the Pueblo de San Ildefonso. Please correct this statement to reflect the primary focus of the initial IM configuration.

Permittee Response: August, 20, 2019
DOE understands that the portion of the plume along the San Ildefonso boundary does not represent the entire downgradient portion of the plume; however, the intent of the Interim Measure is to address the entire downgradient portion of the plume and should remain as such.

NMED Response: August 27, 2019
The Permittee's response is acceptable.

2.) June 5, 2019

3.2, Monitoring Results, page 4, second paragraph: Please include in the Report a plot showing Na-1,5 NDS concentration trends at CrEX-1.

Permittee Response: August, 20, 2019

Future semiannual progress reports will include time-series plots for performance monitoring wells and extraction wells that show detections of tracers deployed as part of the Interim Measure.

NMED Response: August 27, 2019
The Permittee's response is acceptable.

3.) June 5, 2019

3.4, Water-Table Map, page 6, third paragraph: The Report states "These maps do not include data from the injection and extraction wells because there is no way to extrapolate in-well transducer data to a water level elevation in the aquifer around the wells." This statement is misleading since water levels near an injection/extraction well can be estimated by correcting in-well transducer data for well inefficiencies. Please amend this statement to indicate that water-level elevations adjacent to injection/extraction wells can be estimated, and that these data may be included in future water-table maps.

Permittee Response: August, 20, 2019
No Change. Although there are methodologies for estimating a simplified configuration of the water table in the aquifer surrounding an injection or extraction well, the inherent uncertainties that would be present in such calculations due to aquifer heterogeneity would be too large to effectively contribute to a water-table map for the Chromium Project area because of the extremely flat water-table gradient.

NMED Response: August 27, 2019
The Permittee's response is acceptable.

4.) June 5, 2019

4.0, Discussion, page 6: The discussion section must identify any key uncertainties or data gaps related to assessing IM performance and determine if these uncertainties need to be addressed. For instance, is the chromium plume adequately defined in three dimensions such that the IM performance can be sufficiently evaluated? Are preferential flow paths for chromium transport near the southern plume boundary adequately characterized, and is the current IM configuration capable of controlling chromium migration along these flow paths?

Permittee Response: August, 20, 2019
Specific pre-submittal discussions will be held with NMED in advance of issuance of each semiannual report to reach consensus on content of the discussion section.

Regarding the potential for preferential flow paths for chromium transport near the southern plume boundary, data from R-50 S2 and R-44 S2 show background concentrations of chromium and no indication of breakthrough of tracers deployed into nearby injection wells. These data indicate negligible uncertainty with respect to whether potential fast or deep paths are adequately characterized along the southern portion of the plume. Additional discussions can be had in Chromium Technical Team discussions.

NMED Response: August 27, 2019
The Permittee's response does not provide sufficient information about the relationship between potential fast pathways and the absence of tracers at R-50 S2 and R-44 S2. Provide additional information to clarify why the absence of tracer breakthrough at R-50 S2 and R-44 S2 is evidence that there are no preferential flow paths for chromium transport near the southern plume boundary.

Permittee Response: September 19, 2019
The deep screens at R-50 and R-42 both show chromium concentrations within background range indicating that the vertical extent of chromium contamination is defined at those locations. As for the role of preferential flow paths, the Permittee's consider fast pathways to be specific geologic strata (formation scale or discrete depositional units) within which groundwater (and contaminants) move(s) faster than in surrounding horizons. The injection wells, specifically CrIN-3 and CrIN-4 that are believed to be playing the primary role in the favorable plume response observed at R-50 S1 and R-44 S1, have screen-penetration depths of approximately 60-70 ft beneath the water table. Injection water in these screens will inherently find the preferential flow paths in the aquifer. As stated in the prior response, tracer detections in R-50 S1 and R-44 S1 indicate a clear hydrologic connection between those performance monitoring wells and these injection well locations/depths. Whether the hydraulic connection occurs uniquely within one or more of the most preferential hydraulic strata cannot be definitively determined at these depths, and is not considered necessary for the assessment of IM performance.
Additional discussions can be had in Chromium Technical Team discussions.

5.) June 5, 2019
Figure 3.2-13, page 27, and Figure 3.2-14, page 28: The plots on these pages reference the piezometers CrPZ-2 S1 and CrPZ-2 S2. In other sections of the Report, these piezometers are referred to as CrPZ-2a and CrPZ-2b. Please correct the labeling on these plots to be consistent with the rest of the Report.

Permittee Response: August, 20, 2019
Future semiannual reports will refer to these locations as CrPZ-2a and CrPZ-2b. We will also make changes to EIM/Intellus to name the locations accordingly.

NMED Response: August 27, 2019
The Permittee's response is acceptable.

6.) June 5, 2019

Figure 3.3-1, page 39, and Table 3.3-1, page 49: Based on the types of tracers injected into CrPZ-2a and CrPZ-2b and post-injection sampling results collected at these two piezometers (as found in Intellus), CrPZ-2a and CrPZ-2b appear to be incorrectly labeled on Figure 3.3-1 and Table 3.3-1. For instance, data downloaded from Intellus indicate relatively high levels of bromide (813 mg/L) and relatively low levels of rhenium (1,818 mg/L) in CrPZ-2a (the shallow piezometer), and relatively low levels of bromide (80 mg/L) and relatively high levels of rhenium (39,128 mg/L) in CrPZ-2b (the deeper piezometer). Please correct this discrepancy.

Permittee Response: August, 20, 2019

No Change. The information shown on Figure 3.3-1 for tracer deployments at the CrPZ-2 piezometers is correct as presented. The explanation is presented below.

For background, CrPZ S1 is the shallower of the two piezometers and is CrPZ-2a. CrPZ S2 is the deeper piezometer and is CrPZ-2b. CrPZs-S1 and S2 will be renamed accordingly in future reports and in EIM/Intellus.

The first tracers (NaBr and 2-napthalene sulfonate) were deployed into CrPZ-2b, the deeper piezometer. Either during or immediately following this deployment, CrPZ-2a was sampled. It was observed that the tracers deployed into CrPZ-2b were present at high concentrations in CrPZ-2a. Multiple samples were subsequently collected at CrPZ-2a during the period when "chase" water (tracer free) was being deployed into CrPZ-2b. During that period, Br concentrations in CrPZ-2a steadily declined as chase water flushed the Br out of CrPZ-2a indicating that there was a hydrologic connection between the two screens.

Having observed that connection, we decided to collect frequent samples from CrPZ-2b during the deployment of Re 2,7-NDS (Re) into CrPZ-2a. Almost immediately upon starting the CrPZ-2a injection, Re concentrations in CrPZ-2b began to increase and eventually reached the injection concentration that was being deployed into CrPZ-2a (confirming the hydrologic connection in both directions). The Re concentrations in CrPZ-2b declined during the CrPZ-2a chase, but they still reached higher levels than was ever measured in CrPZ-2a because the first CrPZ-2a samples weren't taken until after the CrPZ-2a chase. That is the explanation for why there is a short period (middle of June 2016) where the Re concentrations reached higher levels in CrPZ-2b than were ever measured in CrPZ-2a even though Re was injected into CrPZ-2a.

NMED Response: August 27, 2019

NMED agrees that the results reported in Intellus are accurately attributed to the appropriate piezometer.

The Permittee provides a similar evaluation of the CrPZ-2a and 2b tracer deployments in "Compendium of Technical Reports Conducted Under the Work Plan for Chromium Plume Center Characterization," Attachment 1 (compendium). NMED notes that the Permittee's explanation of the nature of the connection between CrPZ-2a and 2b appears to differ between the compendium and their response to Specific Comment 6. In the compendium the rapid response between the two piezometers is attributed by the Permittee to some sort of leakage pathway in the well completion rather than the natural hydrologic flow pathways through the aquifer stratigraphy. Leakage in the well completion seems more likely given the very small vertical hydraulic conductivity measured between CrPZ-2a and 2b. Revise the response for clarity.

Permittee Response: September 19, 2019

The Permittees acknowledge that the explanation in the compendium attributed the connection to a potential leakage pathway in the borehole that contains the two piezometers. The explanation provided above in the initial response is not intended to suggest a different perspective from that presented in the Compendium. The term "hydrologic connection" was used simply to be less definitive about the nature of the connection.

7.) June 5, 2019

Figures 3.2-21, 3.2-22, 3.2-23, and 3.2-24, pages 35-38: Please add vertical line(s) on these plots indicating the dates and locations of tracer injections and the startup date of sustained IM operation.

Permittee Response: August, 20, 2019

Future semiannual progress reports will include vertical lines on the plots indicating the dates and locations of the tracer injections.

NMED Response: August 27, 2019

The Permittee's response is acceptable.

8.) June 5, 2019

Figure 3.4-2, Baseline water table for May 1, 2018: This map is intended to represent the baseline (pre-IM) water table in the regional aquifer. However, it appears a cone of depression exists between CrEX-1, CrEX-2, and CrEX-3, presumably from operation of the IM. Please revise this figure to depict baseline groundwater elevations. Additionally, in the southwest portion of the map (near the map legend), there appears to be a steep hydraulic gradient indicating groundwater flow towards the north-northeast. Please

indicate (on the map) the well and associated water level that these contours are based upon.

Permittee Response: August, 20, 2019
The period of water-level record used for the baseline water table map presented in Figure 3.4-2 will be discussed with NMED and a different time period for a baseline water table map will be discussed prior to submittal of the next semiannual progress report. To address NMED's observation of the steep hydraulic gradient in the southwest portion of the map, the next report will also include a discussion of which wells are used for the water table maps.

NMED Response: August 27, 2019
The Permittee's response is acceptable.

9.) June 5, 2019
Table 2.1-2, Interim Measure Chromium Mass Removal Estimates, page 47: Please add 2 columns to this table that report the total volume of treated water disposed of via injection and the total volume of treated water disposed of via land application.

Permittee Response: August, 20, 2019

No Change. By definition, all of the water associated with the IM and subject to treatment is dispositioned via injection. All water derived from CrEX locations is treated at CTUA and injected at CrIN locations under Discharge Permit DP-1835. This has been the case for the entire duration of time presented in Table 2.1-2. For this reason, adding two columns to Table 2.1-2 is unnecessary; the injection column would be identical to the existing extraction column and the land application column would always report zero. Water which is land applied is generated from the Chromium monitoring wells or newly installed wells.

NMED Response: August 27, 2019
The Permittee's response is acceptable.