SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
www.nmenv.state.nm.us

RYAN FLYNN
Cabinet Secretary-Designate

BUTCH TONGATE
Deputy Secretary

TOM BLAINE, P.E.
Director
Environmental Health Division

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

June 26, 2013

Peter Maggiore
Assistant Manager, Env. Projects Office
Los Alamos Site Office, DOE
3747 West Jemez Rd, MS A316
Los Alamos, NM 87544

Jeffrey D. Mousseau
Associate Director, Environmental Programs
Los Alamos National Security, L.L.C.
P.O. Box 1663, MS M991
Los Alamos, NM 87545

RE: APPROVAL WITH MODIFICATION
INTERIM MEASURES WORK PLAN FOR THE EVALUATION OF CHROMIUM MASS REMOVAL
LOS ALAMOS NATIONAL LABORATORY
EPA ID#NM0890010515
HWB-LANL-13-026

Dear Messrs. Maggiore and Mousseau:

The New Mexico Environment Department (NMED) has received the United States Department of Energy (DOE) and the Los Alamos National Security, L.L.C.'s (LANS) (collectively, the Permittees) *Interim Measures Work Plan for the Evaluation of Chromium Mass Removal,* dated April 2013 and referenced by LA-UR-13-22534/EP2013-0073 (Plan). NMED has reviewed the Permittees' Plan and hereby issues this Approval with the following modifications.

1. Section 2.1, Hydraulic and Tracer Tests, Pages 2 - 7

The Permittees are required to conduct extended duration constant discharge tests at wells R-28 and R-42 for a period of not less than a total of 100 days with the objective of evaluating contaminant and hydraulic behavior of the upper portion of the regional aquifer within the hexavalent chromium [Cr(VI)] plume. In addition, the Permittees are required to perform a 30-day groundwater extraction test at well SCI-2 that may be conducted concurrent with the pumping tests at R-28 and/or R-42.

Pumping at SCI-2 may be extended beyond 30 days, assuming data collected during the first 30 days support this decision. The tests must be designed to achieve maximum steady-state flow without inducing drawdown below the top of the screened interval of each well. Therefore, each pumping test must begin with a step-drawdown test in order to establish an optimum pumping rate. Based on the inability of the Permittees to procure a sufficient number of redundant storage tanks, the pumping tests are proposed to begin with well R-42. The Permittees must halt the pumping test at R-42 one week before the arrival of the necessary storage tanks to accommodate recovery and must begin the R-28 pumping test immediately upon acquisition of a sufficient number of redundant storage tanks to support the higher groundwater extraction rates at R-28.

The Permittees must submit a groundwater sampling and analysis plan for wells R-28, R-42, and SCI-2 via email for NMED approval prior to initiation of any pumping test. Due to limited resources for conducting groundwater characterization and monitoring, all other proposed activities and/or testing must be deferred or eliminated pending the resumption of normal funding levels.

The justification for the requirement to defer or remove proposed activities other than those outlined above is as follows:

a. Aquifer characterization at wells R-43 and R-62 is not warranted at this time. Due to limited funding allocated to groundwater protection, the focus of the interim measure must be on the area in the vicinity of wells R-42, R-28, and R-50 where the majority of the mass of hexavalent chromium is present and is currently migrating offsite south of R-50. Further characterization activities at R-43 (screen 1) and R-62 as described in the Plan are not necessary at this time.

   In addition, flow rates at R-62 are too low for proposed testing. Aquifer testing following the completion of the regional well R-62 indicates that the screened portion of the aquifer is not capable of supporting flow rates greater than about one to two gallons per minute without causing the water level to drop below the top of screen or the pump intake. At these flow and recharge rates, the pumping test as proposed in the Plan for R-62 is not practicable.

b. Dispersion and diffusion experiments are not warranted at this time. Dispersion and diffusion are not critical processes governing the chromium plume. The Plan proposes to evaluate contaminant transport processes including advection, dispersion, and diffusion in the regional aquifer by performing tracer push/pull tests followed by extended pumping tests. Contaminant distributions along the flow path of the chromium plume from R-42 to R-28 and R-50 suggest that the bulk of chromium is transported through advective processes (e.g., preferential flow paths) and that dispersion and diffusion have little influence on the mass-transport or large-scale

migration of chromium in the regional aquifer. Short-term pumping test results obtained from R-28 and simple time-distance velocity calculations for R-42 to R-28 to R-50 S1 have provided sufficient data to assess large-scale advective processes along the central portion of the plume. Therefore, the tracer push/pull and pumping tests, as well as the associated dilution tracer tests, are not necessary at this time and must be deferred or eliminated from the Plan. In addition, the proposed push/pull tracer tests risk cross-contamination between screens 1 and 2 at well R-43 and are not recommended for this well, especially considering that chromium concentrations at screen 1 are at or near the groundwater standard.

Furthermore, the tracer tests have no direct implications on the location of a test pumping well, which is the primary focus of this phase of interim measures. The Permittees recently requested a third extension due to monetary concerns for the deployment of tracers for a study at TA-16 that was originally scheduled to occur in 2012. NMED is unable to approve the use of limited funds for activities that are not directly associated with the objective of the interim measures. Should additional funding become available in the future and other important tasks which have been delayed are undertaken, this task may be re-evaluated.

c. Field analyses for redox-sensitive constituents are not warranted. The Plan proposes to perform field analyses for redox-sensitive constituents at different times during pumping. According to the Plan, the presence of reductive constituents in groundwater samples would indicate aquifer conditions conducive to chromium (VI) reduction. The Permittees propose field sampling using Hach kits due to the concern that changes in oxidation states of groundwater samples may be occurring as a result of sample collection and during the sample holding time prior to laboratory analyses. However, the existing geochemical data indicate that there are no natural chemical reductants, excluding trace amounts of magnetite, present in the regional aquifer that would reduce oxidized forms of multivalent constituents including dissolved oxygen, nitrate, manganese, chromium(VI), iron, sulfate, and uranium(VI). The accumulation of data collected during several years of characterization and water-quality monitoring show that the regional aquifer is moderately to strongly oxidizing and that redox changes do not occur when proper sampling procedures are followed. Field or on-site Hach colorimetric analyses for dissolved chromium(VI) performed at the time of sampling by NMED at several wells correspond well with laboratory analytical measurements using inductively coupled plasma mass spectroscopy (ICPMS). Furthermore, an extensive chromium-isotope data set collected by the Permittees provides additional evidence that chromium reduction in the regional aquifer is limited. The Permittees must defer or eliminate these evaluations.

2. Section 2.2, Geochemical Characterization, pages 7-9

Due to the limited resources available for groundwater characterization and monitoring, the Permittees must defer or remove the proposed geochemical testing on core or cuttings to determine chemical speciation of chromium and iron.

The Plan proposes to use archived core and cutting samples for batch studies of geochemical interactions between injected treated groundwater and the aquifer materials. However, the proposed studies, as presented, do not provide sufficient information to allow for evaluation by NMED. The Permittees must submit to NMED a separate work plan for geochemical characterization of interaction between treated groundwater and aquifer material that provides detailed information on the selection of materials, testing methodology, evaluation criteria, and analytical methods. The work plan must be submitted at least 90 days before the proposed commencement of the study.

3. Section 3, Schedule, pages 9-10

Due to the anticipated time length of up to 18 months required to secure a permit from the New Mexico Office of the State Engineer (OSE) for the operation of pollution recovery well(s), the Permittees must immediately start preparing an application to OSE for the likely future pilot pumping well(s) for chromium recovery. In order to optimize the application process and have the flexibility to select the appropriate number of chromium recovery wells in the future, if necessary, the Permittees must prepare the OSE application for four chromium recovery wells capable of pumping 200 gpm each and six to eight reinjection wells for treated groundwater (unless a groundwater disposal method other than reinjection can be verified as available). Since there is a possibility that the Permittees will be required to submit co-application to OSE with Los Alamos County, the Permittees must contact OSE as soon as possible to obtain detailed information regarding the application process for different treated groundwater disposal scenarios. The Permittees must initiate the OSE permit process as soon as possible and send to NMED an e-mail update on the progress of the OSE application process during the first week of each month, starting with July 2013.

NMED understands that the Permittees are subject to major constraints imposed by limited funding. While the proposed studies that were deferred by this letter could yield some useful information, higher priority activities, such as installation of additional wells to complete the determination of the nature and extent of the chromium plume and to enhance the groundwater monitoring network at TA-54, replacement of improperly installed and unusable monitoring wells, and the approved tracer study at TA-16, should be undertaken before conducting tracer studies at the chromium plume to utilize limited funds in a more efficient manner.

The Permittees provided a sampling and analysis plan via email on June 12, 2013. NMED understands that the Permittees began pumping groundwater from well R-42 on June 17, 2013. The Permittees must submit a status report in letter format summarizing the preliminary results of pumping and analysis of samples collected from wells R-28, R-42 and SCI-2 conducted prior to September 1, 2013, as appropriate, by **September 30, 2013**. The Permittees must submit a report summarizing the results of the 2013 testing activities that also contains the proposed design and location of a groundwater extraction test well, as appropriate, no later than **March 31, 2014**.

Should you have any questions or comments, please contact Michael Dale at (505) 661-2673.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
N. Dhawan, NMED HWB
B. Wear, NMED HWB
M. Dale, NMED HWB
J. Kulis, NMED HWB
S. Yanicak, NMED DOE OB, MS M894
L. King, EPA 6PD-N
S. Rydeen, San Ildefonso Pueblo
J. Chavarria, Santa Clara Pueblo
S. Paris, EP-CAP, MS M992
C. Rodriquez, DOE-LASO, MS A316
H. Shen, DOE-LASO, MSA316

File: Reading and LANL 2013, Chromium Plume