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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

October 17, 2007

David Gregory
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RE: NOTICE OF DISAPPROVAL
FATE AND TRANSPORT MODELING REPORT FOR CHROMIUM CONTAMINATION FROM SANDIA CANYON
LOS ALAMOS NATIONAL LABORATORY
EPA ID #NM0890010515
HWB-LANL-06-027

Dear Messrs. Gregory and McInroy:

The New Mexico Environment Department (NMED) is in receipt of the United States Department of Energy (DOE) and Los Alamos National Security, LLC (collectively, the Permittees) document entitled *Fate and Transport Modeling Report for Chromium Contamination from Sandia Canyon* (hereafter, the Report) dated September 2007 and referenced by LA-UR-07-6018/EP2007-0542. NMED has reviewed the Report and hereby issues this Notice of Disapproval. NMED provides the following comments to guide the Permittees' development of a next-phase work plan to improve and calibrate the fate and transport model for investigating chromium contamination in the regional aquifer:

1. **Assess Chromium Remaining in Wetland as a Potential Source**

One of the primary purposes of the fate and transport investigation is to identify the ultimate fate and transport of chromium in the subsurface to determine whether or not

2. **Determine Chromium Fate and Transport in Vadose Zone**

a. *Chromium Desorption in Vadose Zone.* The Report states that years of infiltration and percolation have flushed hexavalent chromium out of the upper vadose zone and into deeper parts of the vadose zone with some portion penetrating to the regional groundwater. The Permittees believe that adsorption of hexavalent chromium by geologic solids may play a significant role in retarding the infiltration of chromium in the deeper vadose zone. The Permittees therefore proposed to conduct experiments to measure hexavalent chromium adsorption constants. The site-specific data obtained through the experiments may be useful to refine the fate and transport modeling of chromium in the vadose zone and regional aquifer.

Similar to most adsorption processes, adsorption of hexavalent chromium by geologic solids at this site is most likely a reversible process. NMED is specially concerned about the portion of chromium that remains in the deeper vadose zone to be desorbed or remobilized by percolation water, thereby providing a continuous source of contamination for regional groundwater. Because the potential risks of chromium desorption and migration to the regional groundwater were not assessed in the Report, remedies for efficiently cleaning up the chromium contamination in the regional groundwater cannot be appropriately evaluated. Extending the adsorption experiments proposed in the Report will help evaluate the potential for chromium desorption from the geologic materials by infiltration of post-chromium-discharge water that contains no or low levels of chromium.

Specifically, after saturation or equilibrium has been reached between chromium and a geologic solid material, the Permittees must expand the experiments to evaluate the rate and extent of chromium desorbed from that geologic solid by infiltration water that contains no or low levels of chromium. These desorption experiments must be conducted using surface or subsurface water collected from Sandia Canyon, and must include all the geologic materials representing the Cerros del Rio basalt and Puye formation that comprise the deeper vadose zone beneath the primary infiltration area in Sandia Canyon. These site-specific data will help elucidate the mobility of chromium that is currently preserved in the deeper vadose zone. These data are critical to determine if the deeper vadose zone is a secondary source of chromium to the regional groundwater and subject to considerations in the CME.

b. *Chromium Reduction by Cerros del Rio Basalt.* In addition to the adsorption and desorption tests, the Permittees must conduct similar experiments to characterize hexavalent chromium reduction by the Cerros del Rio basalt, which is likely the most important geochemical mechanism in controlling mobility of redox-sensitive chromium in the vadose zone. The National Academies already indicate the importance of redox geochemistry in determining the chromium fate and transport.

evaluate the extent of chromium currently retained in the deeper vadose zone. These data will be very useful to confirm the conceptual site model, refine the fate and transport model in the deeper unsaturated zone, and assess remedial options, if necessary, in the CME process. The Permittees must collect core samples for chemical analysis from the deeper vadose zone in the inferred primary area of chromium transport in Sandia Canyon.

3. **Evaluate Hydraulic Controls to Prevent Chromium Migration in Regional Groundwater**

The Report highlights that chromium migration in the regional groundwater follows the water-table gradient in the shallow (approximately 30 to 50 meters in thickness) portion of the regional aquifer, rather than diverting toward municipal water-supply wells that are generally screened deeper. These findings are very useful for design of not only a monitoring network, but also a hydraulic control system in the regional aquifer. The chromium plume migrating predominantly in the zone near the water table suggests the feasibility of using a hydraulic control system to effectively prevent the chromium plume from expanding in the regional aquifer. Installation of a hydraulic control system also appears necessary because shallow zone migration implies that the plume could move laterally at high concentrations for a long distance in the regional aquifer. As a result, the risk that chromium may migrate downward to a water-supply well at high concentrations increases due to hydraulic windows that allow vertical transport in the regional aquifer. This is recognized in the Report.

In the next-phase investigation, the Permittees must therefore refine and calibrate the chromium fate and transport model in the regional groundwater based on field data and parameters obtained from the required experiments. Once accomplished, the Permittees must conduct modeling simulations to address the necessity and feasibility using hydraulic controls to prevent further migration of the chromium plume in the regional aquifer near R-28. The modeling evaluation must be conducted by considering the worst-case scenario by simulating the deeper vadose zone as a continuous source of chromium to the regional groundwater as suggested by the current site conceptual model in the Report (given that this conceptual model can be validated by the deeper vadose zone core sample results). The chromium plume dimensions in the regional groundwater in the vicinity of R-28 must be adequately estimated based on data that will be collected from a scheduled pumping test at R-28 and modeling results generated by a vadose zone model that has been calibrated by field data. These modeling evaluations of chromium fate and transport under hydraulic control conditions will provide information for the CME to address the chromium contamination in the regional groundwater.

The Permittees must incorporate the above comments and all the recommendations presented in the Report to develop the next-phase work plan for investigating chromium fate and transport in