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PETER MAGGIORE
SECRETARY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

March 1, 2002

Cory Cruz, Acting Area Manager
Office of Los Alamos Site Operations
Department of Energy
528 35th Street
Los Alamos, New Mexico 87544

John C. Browne, Director
Los Alamos National Laboratory
Post Office Box 1663, MS-A100
Los Alamos, New Mexico 87545

**SUBJECT: HYDROGEOLOGIC WORKPLAN AND DRILLING SCHEDULE
LOS ALAMOS NATIONAL LABORATORY, NM0890010515**

Dear Mr. Cruz and Dr. Browne:

The New Mexico Environment Department (NMED) takes this opportunity to provide additional input concerning outstanding issues associated with the U.S. Department of Energy's and University of California's (collectively, the Permittees') implementation of the Hydrogeologic Workplan (HWP) at Los Alamos National Laboratory (LANL). Specifically, this correspondence is directed to issues pertaining to drilling methodologies; well construction and development; data collection and reporting; drilling schedule and cost; and modeling.

Drilling Methodologies

There still seems to be some confusion surrounding NMED's position with regard to appropriate drilling methodologies. The NMED has not required that a casing advance drilling technique be utilized to the exclusion of all others. In fact, to promote efficiency the NMED has advocated the use of other drilling methods such as mud rotary, dual-wall reverse air rotary, cable tool, and other techniques so long as the methods suit the data quality objectives for the borehole. Of course, compromises in data collection and quality between the various drilling methods are expected and will need to be weighed before making a final selection of drilling method.

Well Construction and Development

Proper well design, construction, and development are critical for obtaining accurate and



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General

defensible data. This is true if the data are intended for compliance under RCRA, or if the data are intended to provide accurate and useful RCRA characterization information. The NMED is concerned that wells installed under the HWP and other projects at LANL may not always have been properly constructed or developed. In particular, we have concerns over screen selection, sealant placement procedures, filter pack and screen slot-size determination, filter pack lengths, and development methods. Specifically:

1. The NMED does not concur with the use of pipe-base screens because they tend to trap foreign material such as EZ-Mud and other fine-grained material. Instead, NMED recommends using industry standard V-shaped wire screens that are less likely to trap fines, resulting in better and easier well development that yields quality data.
2. The Permittees should be pressure grouting the sealant rather than gravity floating, particularly in wells with multiple completion intervals. Gravity floating of the grout is problematic even in shallow wells; in deeper wells (e.g., 700 to 2000 feet deep) the grout may become bridged, potentially causing problems with annular-space seal integrity.
3. The approved HWP requires that sieve analyses be conducted on formation materials to define the appropriate particle-size distribution for filter pack media, as well as proper slot size for the well screen. Proper filter pack and well screen slot-size selection are important aspects of well construction that help ensure a quality well. As sieve analyses are not currently being performed in accordance with the approved HWP, the NMED is requiring that henceforth sieve analyses be completed prior to well construction. Where screens are placed adjacent to fractured bedrock, industry standard practices should be utilized to protect well integrity.
4. Screen lengths shall be limited to no more than 20 feet unless it is likely that drawdown occurring in the area will limit the useful life of a well (to less than 20 years). In all cases the screened interval should be kept to a minimum to limit the potential for crossing hydrostratigraphic boundaries.
5. From the well completion reports that have been submitted to the NMED, it is apparent that filter pack lengths routinely exceed 10 feet beyond the screened interval. The filter pack length shall be no more than 10 feet above or below the screened interval unless formation sloughing results in increased filter pack lengths. Ten feet should allow for settling of filter pack media while minimizing the potential for formation fluids to cross hydrostratigraphic boundaries.
6. If drilling fluids are used, the NMED requires that well development be vigorous enough to minimize adverse geochemical and hydraulic property impacts to the formation. The Permittees shall submit to the NMED more stringent well development procedures for approval within forty-five days of receipt of this letter. The development methods must match or exceed that of industry standards.

7. The NMED is not requiring that each of the boreholes drilled under the HWP be completed as a well.

Data Collection and Reporting

In correspondence dated January 24, 2001, the NMED required that the Permittees submit fact sheets regarding the construction of wells within thirty days of well completion. To date, well construction fact sheets have not been submitted consistently or within the 30-day time frame. Additionally, well completion reports that are to include all data collected during drilling (e.g., hydraulic property tests, geophysical data, core analyses, water quality results) are to be submitted within sixty days of well completion. Some of these reports are presently more than sixty days overdue. This reporting requirement should not include quarterly sampling data as it will be reported in the Quarterly Technical Reports submitted to NMED. In light of LANL's obvious difficulty in meeting the sixty-day time frame, the deadline for submission of well completion reports is, by means of this letter, formally extended to one hundred-twenty days after well completion.

The HWP requires that at least 10 percent of each borehole be cored for hydraulic and geochemical testing. Core was collected for several of the boreholes; however, the collected core may or may not have been (as little detailed information has been reported) targeted on hydrostratigraphic units of primary interest or to identify intermediate groundwater and the top of saturation of the regional aquifer. For example, very little core has been collected from key hydrostratigraphic units such as weathered Bandelier Tuff, the Guaje Pumice Bed and "Cerro Toledo interval."

The depth at which saturation was first encountered is not well documented in most of the boreholes drilled to date. Composite water levels measured in boreholes may or may not reflect the actual top of saturation. An understanding of the location of the top of saturation is key for proper well construction (e.g., where to place the screened interval) and for a better understanding of the hydrogeologic system beneath the Pajarito Plateau, a requirement of the HWP. Drilling methods and data collection must be selected based on these data needs.

In order to get caught up on submission of data to NMED, the Permittees shall submit fact sheets and well completion reports for all wells not submitted thus far, except R-8a, which is currently under construction, by March 30, 2002. The NMED considers the failure to submit the required fact sheets and well completion reports a violation of the permit. Furthermore, submittal of fact sheets within thirty days of completion and well completion reports within one hundred and twenty days of completion for R-8a and subsequent wells is required. Note that fact sheet and well completion report submittals are not restricted to wells installed under the HWP. Any well, piezometer, or borehole (alluvial, intermediate or regional in depth) shall also follow these reporting requirements.

Drilling Schedule and Cost

The Permittees' document entitled, "*Schedule of Groundwater Characterization Program Activities for FY 2001 and 2002*" and referenced by ESH-18/WQ&H:01-315, indicates that the drilling schedule is not fulfilling the requirements outlined in NMED correspondence dated January 24, 2001. The proposed scope for fiscal year 2002 drilling activities under the HWP is inadequate because it includes wells that are nearly complete, have been completed, or were scheduled for completion the previous fiscal year.

NMED's January 24, 2001 letter to the Permittees enumerates wells R-5, R-7, R-8, R-13, R-22 and R-27 as slated for completion in FY 2001. As of this writing, only wells R-5, R-7, R-13 and R-22 have been completed. Completion of well R-8a has been delayed due to technical problems, and drilling activities at well R-27 have not yet been initiated.

The Permittees September 20, 2001 letter regarding the proposed scope for drilling activities in FY 2002 states that wells R-13, R-8 and R-20 are scheduled for completion. However, because wells R-8, R-13 and R-27 were to be completed during FY 2001, the NMED has outlined in the schedule (Attachment A) that wells R-8, R-13 and R-27 must be completed during the current calendar year (2002) *in addition* to wells R-11, R-14, R-18, R-20 and R-21.

Subsequent well installation requirements are given a placeholder in the revised schedule for the years 2003 through 2005. Requirements for other canyon- or site-specific vadose zone or groundwater investigation wells and boreholes (e.g., 16-021(c) Outfall, Mortandad Canyon and the material disposal areas at TA-54) are not directly addressed in this schedule. The schedule does not reflect changes in the number of wells to be drilled that may arise in the future based on potential changes to the data quality objectives. Rather it merely serves as a place-holder for the wells and needed budget.

Please note that under normal circumstances, the NMED is not concerned with the costs of drilling. In the case of the HWP, however, technical problems and associated cost overruns have compromised the drilling schedule. Consequently, the extra funding needed to accomplish the drilling results in funds being taken away from other investigation and remediation activities. This condition is wholly unacceptable to the NMED, and requires our intervention to try and ensure that HWP schedule is met without adversely affecting other critical, permit-related activities.

In order to improve drilling efficiency and maintain the drilling schedule outlined in the Installation Work Plan schedule, the NMED strongly recommends that the Permittees pursue the industry practice of unit cost per foot drilling contracts rather than unit cost per time. This contract should also require that drilling companies with the most environmental experience drilling in complex terrains be used. The NMED further recommends that the Permittees consider using a "turnkey" contracting approach for the HWP characterization, plume investigation, and monitoring network construction requirements.

Modeling

In correspondence dated March 16, 2001, the NMED discussed concerns pertaining to the data quality utilized by the Permittees in any groundwater model. As stated earlier, it is not apparent to NMED what data are available and the quality of the data utilized by the Permittees in the Finite Element Heat and Mass Transfer (FEHM) ground water code. Therefore, the NMED questions the appropriateness of using FEHM output in making regulatory compliance, corrective action, and groundwater protection decisions at this time.

Recently, the Permittees proposed to stakeholders that groundwater modeling be used extensively to assess the efficacy of the existing groundwater monitoring program. Under this proposal, modeling efforts would focus on simulating contaminant transport from sources to potential receptors, comparing calculated concentrations at the wellhead with "protective limits", and to "determin[e] if the existing monitoring wells will detect contamination before protective limits are exceeded." The NMED believes there are presently too few data to allow for a high degree of confidence in such modeled results.

Finally, in correspondence dated March 16, 2001, the NMED stated some of its concerns regarding groundwater modeling at LANL. The NMED alerted the Permittees to several requirements identified in Attachment B of the correspondence. Because the Permittees have only provided brief discussions of some of the requirements in Attachment B in the Groundwater Annual Status Report and have not submitted the requested detailed information, the NMED requires that the reporting requirements discussed in Attachment B be submitted no later than July 1, 2002.

The NMED concurs with the Permittees that it is overly involved with drilling oversight responsibilities at LANL. However, much of the involvement stems from the NMED's lack of confidence that drilling methods, well construction, well development, and data collection procedures and submittal are providing the necessary type and quality of data. The NMED's level of involvement will likely continue at its current level until it is assured that characterization activities are proceeding appropriately. This HWP was developed, in part, to collect hydrogeologic information so that an adequate monitoring network can be designed and installed, because the current monitoring program is not adequate to detect or monitor releases from past and present facility operations. As the installation of an adequate groundwater monitoring system is required under 40 CFR 264, Subparts F and G, as well as the current Hazardous and Solid Waste Amendments portion of the Resource Conservation and Recovery Act operating permit, NMED confidence and concurrence in the drilling activities and data collection at LANL are essential.

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Attachment C outlines all reporting requirements imposed by this letter. Should you have any questions, please feel free to contact me at (505) 428-2512. Should you have question about the schedule in Attachment A, or the data requirements in Attachment B, contact John Young of my staff at (505) 428-2538.

Sincerely,



James P. Bearzi
Chief
Hazardous Waste Bureau

BRZ:jry

Attachments

cc: G. Lewis, NMED WWMD
D. Cobrain, NMED HWB
J. Kieling, NMED HWB
C. Will, NMED HWB
J. Parker, NMED DOE-OB
S. Yanicak, NMED DOE-OB, MS J993
M. Leavitt, NMED GWQB
R. Mayer, EPA, 6PD-N
M. Johansen, DOE LAAO, MS A316
J. Vozella, DOE LAAO, MS A316
J. Canepa, LANL, EM/ER, MS M992
M. Kirsch, LANL EM/ER, MS M992
D. McInroy, LANL EM/ER, MS M992
L. McAtee, ESH-DO, MS K491
C. Nylander, ESH-18, MS K497

file: Reading and LANL GENERAL [Hydrogeologic Workplan]

**ATTACHMENT A
Schedule of Hydrogeologic
Workplan Deliverables by Calendar Year**

WELL	DELIVERABLE	DUE DATE
CY02		
R-8a	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-11	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-13	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-14	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-18	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-20	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-21	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-27	Fact Sheet and Well Completion Report Groundwater monitoring data from all wells (to be submitted in the ER Quarterly Technical Reports)	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed. Quarterly
CY03		
R-10	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-16	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.

WELL	DELIVERABLE	DUE DATE
R-2	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-3	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-30	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-4	Fact Sheet and Well Completion Report Groundwater monitoring data from all wells (to be submitted in the ER Quarterly Technical Reports)	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed. Quarterly
CY04		
R-23	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-28	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-1	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-17	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-24	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
	Groundwater monitoring data from all wells (to be submitted in the ER Quarterly Technical Reports)	Quarterly
CY05		

WELL	DELIVERABLE	DUE DATE
R-26	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-29	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-6	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
R-32	Fact Sheet and Well Completion Report	Submit fact sheets and well completion report 30 days and 120 days after well construction is completed.
	Groundwater monitoring data from all wells (to be submitted in the ER Quarterly Technical Reports)	Quarterly

Attachment B

Data Needs:

The NMED has developed a list of the following basic physical, mathematical and conceptual information needed in order to adequately model the subsurface. Due to the lack of information available, the NMED believes the following data are needed for each component and/or watershed of the hydrogeologic system. The Permittees shall provide a detailed discussion of the status regarding the collection of the basic physical, mathematical and conceptual information listed below for the hydrogeologic system.

- 1) aquifer boundaries
- 2) extent of saturation (lateral and horizontal)
- 3) thickness of saturation
- 4) water levels/water table and potentiometric surface map-head distributions
- 5) groundwater flow directions and velocities
- 6) transmission or movement of ground water across hydrostratigraphic boundaries
- 7) water balance information
 - a. recharge/discharge locations, rates and volumes
 - b. evapotranspiration data and/or estimates
 - c. stream-flow data
 - d. pumping influences, zones of influence, etc
- 8) geologic maps (e.g., surface geology, structure contour maps, top of formation)
- 9) topographic map(s)
- 10) saturated and unsaturated hydraulic-conductivity ($K_{x,y,z}$), porosity, effective porosity, transmissivity, storage coefficients and estimated fracture/secondary porosity for the important hydrostratigraphic units (e.g., weathered Bandelier Tuff, alluvium, Cerros del Rio Basalt, Puye Formation)
- 11) sorption coefficients (K_d s) for important hydrostratigraphic units (e.g., weathered Bandelier Tuff, alluvium, Puye Formation)

Modeling Issues:

The NMED requires that detailed discussions regarding the following issues be developed to address each on a canyon-specific basis, from the surface system down to the regional aquifer.

- 1) Compile a listing of all model input parameters, with discussion/rationale of the methodologies used to determine appropriate values for those parameters;
- 2) Provide information regarding the quality of the input parameters and discussions as to the procedures used to assess the quality of the data used;

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- 3) Identify the most critical (sensitive) input parameters for each model and discussion of the uncertainties associated with the available data;
- 4) Identify the current data needs and how those data needs will be satisfied for each component of the hydrogeologic system;
- 5) Indicate the expected and acceptable confidence and/or uncertainty level of the modeled results;
- 6) Provide a discussion of whether existing data are sufficient for a meaningful model, model calibration and how the process will be implemented.

Attachment C
Schedule of Deliverables Imposed by this Letter

1. The Permittees shall submit fact sheets and well completion reports for all wells not submitted thus far, except R-8a, which is currently under construction, by *March 30, 2002*.
2. NMED requires that the reporting requirements discussed in Attachment B be submitted no later than *July 1, 2002*. Subsequent updates to this information shall be compiled in the Annual Groundwater Status Summary Report.
3. The Permittees shall submit to the NMED updated, stringent well development procedures for approval within *forty-five (45) days* of receipt of this letter.
4. Fact sheets regarding the construction of wells shall be submitted within *thirty (30) days* of well completion.
5. Well completion reports that include results from all data collected (e.g., hydraulic property tests, water levels, geophysical logs and interpretations, core analyses, groundwater chemistry, etc.) during drilling are to be submitted with *one hundred-twenty (120) days* of well completion.