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**Los Alamos National Laboratory/University of California**  
Risk Reduction & Environmental Stewardship (RRES)  
Groundwater Protection Program (GPP), MS M992  
Los Alamos, New Mexico 87545  
(505) 665-4681/FAX (505) 665-4747



**U.S. Department of Energy**  
Los Alamos Area Office, MS A316  
Environmental Restoration Program  
Los Alamos, New Mexico 87544  
(505) 667-7203/FAX (505) 665-4504

Date: December 23, 2002  
Refer to: RRES-GPP:02-022

Mr. John Young, Corrective Action Project Leader  
Permits Management Program  
NMED – Hazardous Waste Bureau  
2905 Rodeo Park Drive East  
Building 1  
Santa Fe, NM 87505-6303

DEC 2002

**SUBJECT: LETTER DATED NOVEMBER 14, 2002 REGARDING INTERMEDIATE PERCHED GROUNDWATER IN REGIONAL CHARACTERIZATION WELL R-32**

Dear Mr. Young:

This letter is written in response to your letter of November 14, 2002 regarding "intermediate depth perched groundwater in regional aquifer characterization well R-32". Your letter indicated that handouts from the Los Alamos National Laboratory (LANL) Hydrogeologic Characterization Program Quarterly Meeting (October 30, 2002) provided the technical basis for your letter, and that LANL's communication of information during borehole drilling and well construction needs improvement. The following information is provided in response to the issues raised in your letter.

During the drilling of R-32, no intermediate perched groundwater was detected, therefore the Laboratory did not contact NMED per the usual procedure when such water is found. Three methods are used to evaluate whether perched water is present when installing wells such as R-32. Identification of perched water is based on:

Monitoring for changes in the physical appearance of circulation fluids during drilling, Examination of the borehole wall for the presence of flowing water using a downhole camera, and Evaluation of moisture-sensitive geophysical logs run in the open borehole for the vadose zone.

These data are typically evaluated in conjunction with other available information such as, but not limited to, lithologic and stratigraphic data provided by cuttings and core.

The vadose zone portion of R-32 was drilled with stiff foam as a circulation fluid. When drilling with stiff foam as a circulation fluid, the presence of perched water is identified by the driller as a decrease in the viscosity of the stiff foam.



There was no decrease in viscosity noted by the driller above the regional aquifer at well R-32.

Two borehole videos were obtained in the uncased borehole; the borehole video obtained on 7/18/02 includes depths of 0 to 314.5 ft and borehole video obtained on 7/31/02 includes depths of 0 to 720 ft. The two borehole videos are instructive because the first was run just after the mostly dry coring operations while the second was run after the borehole had been advanced to depth using drilling fluids. The first borehole video shows the borehole wall to be dry down to 314.5 ft (the bottom of the video run) while the second video shows the borehole wall in same interval to be moist. The moist wall conditions in the second video must be attributed to the addition of drilling fluids to the borehole. These moist conditions persisted to the bottom of the second video run. No flowing water was observed on the borehole wall in both videos, (flowing water can be indicative of perched water as in the case of MCOBT-4.4).

The borehole geophysics (including the CMR log) successfully mapped moisture variations through the basalt sequence in R-32, but the logs do not support the presence of intermediate perched groundwater. Higher moisture is commonly associated with interflow zones between massive lava flows. The CMR free water zones identified on the figure from the October 30, 2002 meeting (referenced in your letter), helped map these interflow zones (along with other geophysical logs, the borehole videos, core, and cuttings). There was no statement equating these high CMR responses to perched water during the October presentation.

In response to LANL questions about the likelihood of perched water at R-32 based on the geophysical logs, Ned Clayton of Schlumberger-Sema Utilities provided the following summary (email message attached):

"Above 722 ft. the processed log results indicate a number of zones with higher water content that are likely not fully saturated and the water present is largely irreducible (i.e. cannot flow under existing conditions and typical pressures). The CMR shows minimal moveable water, except in the Guaje Pumice Bed where CMR moveable water content is about 10%, which is seen in almost every well and is likely due to the easy invasion of drilling fluid into this extremely porous formation. Also, most of the zones with higher water content shown by the logs are in large borehole washouts - suggesting that the elevated amount of irreducible water could be due to the invasion of bentonite-laden drilling foam/fluid."

Based on the drillers observations and the geophysical log results, LANL has determined that no intermediate perched water is present at the R-32 well location, therefore meeting the Data Quality Objective (DQO) for R-32 regarding intermediate perched groundwater (as referenced in the Technical Area (TA)-54 Groundwater Sampling and Analysis Plan (SAP) [LA-UR-02-0334]. At this time, there is no technical basis for installing additional wells adjacent to R-32 to investigate intermediate perched groundwater. However, information on the presence and water quality of intermediate perched water zones

remains a DQO of the Hydrogeologic Workplan, and thus the information obtained from R-32 and all other wells, borings, and noninvasive investigation methods in Pajarito Canyon will be comprehensively considered in determining if additional wells are needed in lower Pajarito Canyon in the future.

Regarding your issue concerning communications, we agree that communications over the past few months have been limited due to events related to NMED compliance activities. We believe that the standard communication protocols were followed by LANL during the drilling and well construction of well R-32, including a weekly email to you regarding drilling/well construction status, telephone calls (especially regarding well design), and of course the quarterly status meetings. Your letter was prompted by your review of a handout provided at the October quarterly meeting. We would have appreciated an opportunity to discuss the handout with you at the quarterly meeting, and avoid an apparent misunderstanding. The legend on the handout indicating "zones of abundant free water" was mistakenly prepared by LANL staff. This choice of words misrepresents the results of the CMR log, as explained above by Ned Clayton's quotation. In the future, LANL would be pleased to explore with you, other means of improving the technical communication of information developed during the implementation of the Hydrogeologic Workplan. Particularly, we look forward to meeting with you in the near future, as a member of the Groundwater Technical Team to discuss this year's FY-03 drilling plan.

If you have any questions regarding this information, please contact me at 665-4681 or Mat Johansen at 665-5046.

Sincerely,



Charles Nylander, Program Manager  
Groundwater Protection Program  
Los Alamos National Laboratory

Sincerely,



Matthew Johansen, Groundwater Program  
Program Compliance Manager  
National Nuclear Security Administration  
Los Alamos Site Office

CN/MJ/th

Cy:

H. Granzow, RRES-GPP, MS M992  
K. Hargis, RRES-DO, MS J591  
J. McCann, RRES-WQH, MS 992  
D. McInroy, RRES-R, MS 992  
C. Nylander, RRES-GPP, MS M992  
N. Quintana, RRES-R, MS M992  
B. Ramsey, RRES-DO, MS J591  
D. Stavert, RRES-DO, MS J591  
R. Enz, DOE-OLASO, MS A316

Mr. John Young  
RRES-GPP:02-022

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December 23, 2002

D. Woitte, LANL, LC-GL, MS A187  
M. Johansen, DOE-OLASO, MS A316  
E. Trollinger, DOE-OLASO, MS A316  
J. Vozella, DOE-OLASO, MS A316  
T. Whitacre, DOE-OLASO, MS A316  
J. Bearzi, NMED-HWB  
D. Cobrain, NMED-HWB  
C. Cooper, NMED-HWB  
J. Kieling, NMED-HRMB  
M. Leavitt, NMED-GWQB  
J. Parker, NMED-DOE-OB  
C. Will, NMED-HWB  
S. Yanicak, NMED-DOE OB, MS J993  
L. King, US EPA 6PD-N  
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