TA 36

Subject: Re: Well Installation
Date: Fri, 6 Sep 2002 10:52:41 -0600
From: "David E. Broxton" <broxton@lanl.gov>
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Carolyn, the LANL/DOE drilling team have prepared responses (in bold) to your e-mail message of 9-5-02 (in plain text). Please call if you have any further questions.

NMED has some concerns about the quality of well installation in recent Hydrogeologic Workplan wells. The drilling of well R-16 highlights some important issues.

The field personnel were unable to accurately locate the top of the regional aquifer. The geophysical logs did not help to delineate this important feature. Two screens were placed in locations which may or may not be near the top of the zone of regional saturation. NMED believes it is very important to set a screen across the potentiometric surface in each well.

We agree that obtaining an accurate piezometric surface for the regional aquifer is important for hydrologic characterization. In general, we have been very successful in obtaining these data, but several factors at R-16 prevented an accurate determination. Field personnel incorrectly assumed that the drilling foam would visibly degrade once regional saturation was encountered. Therefore, they continued drilling beyond the piezometric surface assuming they were still in the vadose zone. Additionally, the water levels at R-16 suggest that we may have penetrated a confining layer before water with a strong upward gradient rose in the borehole. As the borehole was advanced, cuttings did not indicate the presence of a confining layer that would have triggered a stoppage of drilling operations to attempt a water level measurement.

It should noted each effort to tag the top of the regional aquifer usually takes 12 or more hours because of the many steps required to obtain these data. These steps include de-foaming the drilling fluid, waiting for water levels from drilling fluids and possible native water to equilibrate, making multiple measurements to identify trends and equilibration, re-foaming the borehole, and re-establishing circulation for continued drilling operations. Thus each attempt at identifying the piezometric surface for the regional aquifer not only has significant cost and schedule impacts, but each attempt can adversely our ability to re-establish circulation for continued drilling.

We also understand there was a complete loss of circulation while using mud rotary drilling from 867-1047 feet. NMED is concerned about the volume of fluids that were lost, likely into the surrounding formation/aquifer, as well as the effects these fluids may have on the aquifer. While drilling muds enhance the stability of the borehole, they can also adversely affect the hydrologic properties and geochemistry of the surrounding aquifer. Drilling fluid invasion and the buildup of borehole filter cake may reduce the effective porosity of the aquifer in the vicinity of the borehole. NMED understands that LANL keeps accurate account of how much drilling fluid (muds and dispersants) is used and how much is recovered. NMED would like to receive this information for each borehole that is drilled.

Information about the amount of fluids introduced and recovered during drilling operations will be assembled and presented in well completion reports. We suggest a general discussion between NMED/LANL/DOE about drilling fluid inventories take place sooner to address the your more immediate concerns.

Additionally, NMED requests information on how LANL plans to enhance drilling fluid recovery from the borehole and subsequently what well development methods are planned given well casing already in the hole.

Fluid recovery and well development procedures are currently being refined as these first mud rotary wells are being installed. We have invited outside experts to work with the LANL/DOE drilling team to examine well development issues, and we anticipate that a revised well development plan will be available by the end of next week.

NMED also has concerns regarding the integrity of the seals between the screen and vadose zone, which may be impacted as the "caked" drilling fluids (mud) break down over time.

We do not believe that loss of seal integrity between screens is a significant problem in any of the wells being installed. The wall cake formed by drilling mud is very thin (hundredths of an inch) relative to the bentonite filling the annual space between the well and the borehole wall (2-5 inches). Swelling bentonite will seal any new voids created by the breakdown of residual wall cake. Bentonite seals between screens are typically 100 ft or more in thickness; loss of integrity at any one point along the seal will not compromise the overall effectiveness of the seal. Pressure transducers

located in each screened interval will monitor seal integrity.

If it is determined that sand will be pumped into the borehole at R-16 to form the filter packs, NMED would like some rationale for using the coarser grade of sand that LANL has proposed with this method, especially in the silty sand zone that is screened from approximately 1014-1022 feet.

A 20/40 sand filter pack will be used in all the screens at R-16 as originally planned. Plans to use a coarser sand pack proposed earlier in the week are no longer necessary.

Please contact us if you have any questions regarding these issues.
We hope these responses address your concerns; we welcome the opportunity to discuss these issues in more detail with you at your convenience.

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