

TAS4

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Sent: Thu 1/7/2010 3:06 PM

From: Dale, Michael, NMENV
To: Everett, Mark C
Cc: Cobrain, Dave, NMENV; Kulis, Jerzy, NMENV; Ball, Theodore T
Subject: RE: R-54 proposed well design
Attachments:

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Mark,

This e-mail serves as NMED approval for installation of regional aquifer well R-54 as proposed in the document attached to the original e-mail received by NMED today (January 7, 2010 at 1:47 PM). This approval is based on the information available to NMED at the time of the approval. NMED understands that LANL will provide the results of preliminary sampling, any modifications to the well design proposed in the above-mentioned e-mail, and any additional information related to the installation of well R-54 as soon as such information becomes available. In addition, LANL shall notify HWB within three days of water-quality sampling at the conclusion of the aquifer-testing period at R-54 screens 1 and 2. If the referenced Baski sampling system is not installed within one month of placing the packer between screens 1 and 2, LANL shall collect representative samples from screen 1 via temporary or removable pump. LANL shall give notice of this installation to the New Mexico Office of the State Engineer as soon as possible. Thank you.

Michael Dale, NMED HWB

Hazardous Waste Bureau
New Mexico Environment Department
2905, Rodeo Park Drive East, Building 1
Santa Fe, NM 87505
Phone (505) 476-6052 / Fax (505) 476-6030
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-----Original Message-----

From: Everett, Mark C [mailto:meverett@lanl.gov]
Sent: Thu 1/7/2010 1:47 PM
To: Cobrain, Dave, NMENV; Kulis, Jerzy, NMENV; Dale, Michael, NMENV
Cc: Ball, Theodore T
Subject: R-54 proposed well design

Jerzy and Michael,

32450



Here is LANL's proposed well design for R-54. As we discussed, we will construct a 2-screen well to be fitted with a Baski sampling system. The screens will be isolated from one another with a packer or mechanical plug during the time we are not actively developing or testing the well. The packer/plug will be removed once the Baski sampling system is ready for installation.

Please respond to this e-mail with your concurrence or contact me to discuss further.

Thanks,

Mark Everett, PG  
Drilling Project Technical Lead  
EP-WSP  
LANL  
(505) 667-5931 (office)  
(505) 231-6002 (mobile)

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## **R-54 Well Objectives**

The principal objective of Well R-54 is to monitor the regional aquifer beneath Pajarito Canyon in close proximity to MDA-L (Figure 1). R-54 was sited in Pajarito Canyon south-southwest of MDA-L, on the north bank of the stream channel in Pajarito Canyon, to enhance early-arrival regional aquifer monitoring for Material Disposal Area (MDA) L and to provide additional information for determining the potential source(s) of contamination that may be found beneath Mesita del Buey. The location of R-54 is close to the southwestern extent of volatile organic compound (VOC) contamination within the vadose zone beneath MDA-L. In addition to detection of potential contaminants migrating downward from MDA-L, the screens at R-54 will also monitor potential contaminants originating from sources up-canyon within the Pajarito Canyon watershed.

Secondary objectives for R-54 were to collect drill-cutting samples and borehole geophysical data, as well as to sample any significant perched groundwater zones encountered.

The drilling workplan for R-54 called for completion of a monitoring well with two screens in the regional aquifer. The R-54 borehole reached a total depth of 944.5 ft with an estimated depth to regional saturation of ~815 ft.

## **R-54 Recommended Well Design**

It is recommended that R-54 be installed as a two-screen well with a 10-ft stainless-steel, 20 slot, wire-wrapped well screen extending from 830 ft to 840 ft bgs and a 10-ft stainless-steel, 20 slot, wire-wrapped well screen extending from 915 ft to 925 ft bgs. The depth to top of regional saturation is about 815 feet (see discussion below). The primary filter packs for each screen will consist of 10/20 sand extending 5 ft above and 5 ft below the screen openings. A 2-ft secondary filter pack will be placed above each primary filter pack. The proposed well design is shown in Figure 2.

This well design is based on the objectives stated above and on the information summarized below.

## **R-54 Well Design Considerations**

Preliminary lithologic logs indicate that the geologic units encountered while drilling the R-54 borehole are alluvium (0-20 ft), Tshirege Member of the Bandelier Tuff (20-155 ft), Cerro Toledo interval (155-187 ft), Otowi Member of the Bandelier Tuff (187-330 ft), Guaje Pumice Bed (330-351.5 ft), Cerros del Rio volcanic series (351.5-750 ft), and Puye Formation (750-944.5 ft TD). The top of regional saturation is within the Puye Formation.

Significant perched intermediate groundwater was not encountered at a R-54. A water sample was collected above the regional aquifer, at 783 ft bgs, but this sample was heavily sediment charged and the water is believed to be drilling fluid. Video logging in the open borehole from 336 to 783 ft bgs showed no indication of perched water flowing into the borehole. In the video log water was observed standing in the borehole at 783 ft depth, at which time the borehole depth was 827 ft; however, subsequent testing with the water-level probe suggested sloughing up to 785 ft depth and it is believed that the water collected at 783 ft is drilling water.

Water production from the regional aquifer was first noticed by the driller at a depth of 845 ft, with estimated flow of ~10-15 gpm between 845 and-885 ft bgs. Below 885 ft flow generally increased, with estimated production of ~10-80 gpm. Two water samples were collected from the regional aquifer during drilling, one at 845 ft depth and one at 865 ft.

Examination of cuttings throughout the Puye Formation at R-54 indicates a transition from basalt-rich gravels in the upper section, likely from Cerros del Rio volcanic sources, to more typical Tschicoma sources in the lower section. This transition occurs at ~820 ft depth. Significant at R-54 is a very clay-rich silt at 860-870 ft depth that may form a prominent aquitard; this interval produced only rare gravel and is distinctively clay-rich. Matrix clays are less abundant but ubiquitous above and below this interval, from 845 to 900 ft depth. These observations indicate that a screen should not be located within the 845-900 ft interval; furthermore, optimal placement of two screens to sample shallower and deeper portions of the regional aquifer should be above and below this interval.

At completion of drilling at R-54 the 12-inch casing extended to TD. Initial water level tagged on removal of tools from the borehole was 814.6 ft bgs. Subsequent measurements of depth to water declined over a period of ~15 hours to a relatively stable depth of 815.4 ft. The predicted top of regional saturation at this locality was 812 ft bgs and the somewhat lower final measurement of depth to water of 815.4 ft may indicate a lower composite head due to casing exclusion of aquifer units above 944.5 ft. The marked clay interval from 860-870 ft may provide a significant isolation horizon that separates upper and lower subzones of the regional aquifer. The well design proposed in figure 2 provides for both sampling of the upper subzone near the top of regional saturation as well as sampling of transmissive gravels below the clay aquitard.

### **Alternative Design Considerations**

The placement depths for two regional aquifer screens at R-54 is greatly limited by (1) the desire to place the upper screen close to the top of regional saturation yet submerged enough to allow adequate development and (2) the desire to avoid the clay-bearing interval from 845 to 900 ft depth. Figure 1 shows screen placements that can vary no more than ~10 ft if both of these constraints are honored. A significantly altered design would be a single-screen completion at this site using only the upper screen position. This would satisfy the major objective of capturing downward migration of contaminants from MDA-L; such contamination might reasonably be expected to be concentrated above the clay aquitard. However, the two-screen design provides additional hydrologic information across the clay aquitard and allows for possible complex flow paths from up-canyon that may lead to horizons below rather than above the aquitard.

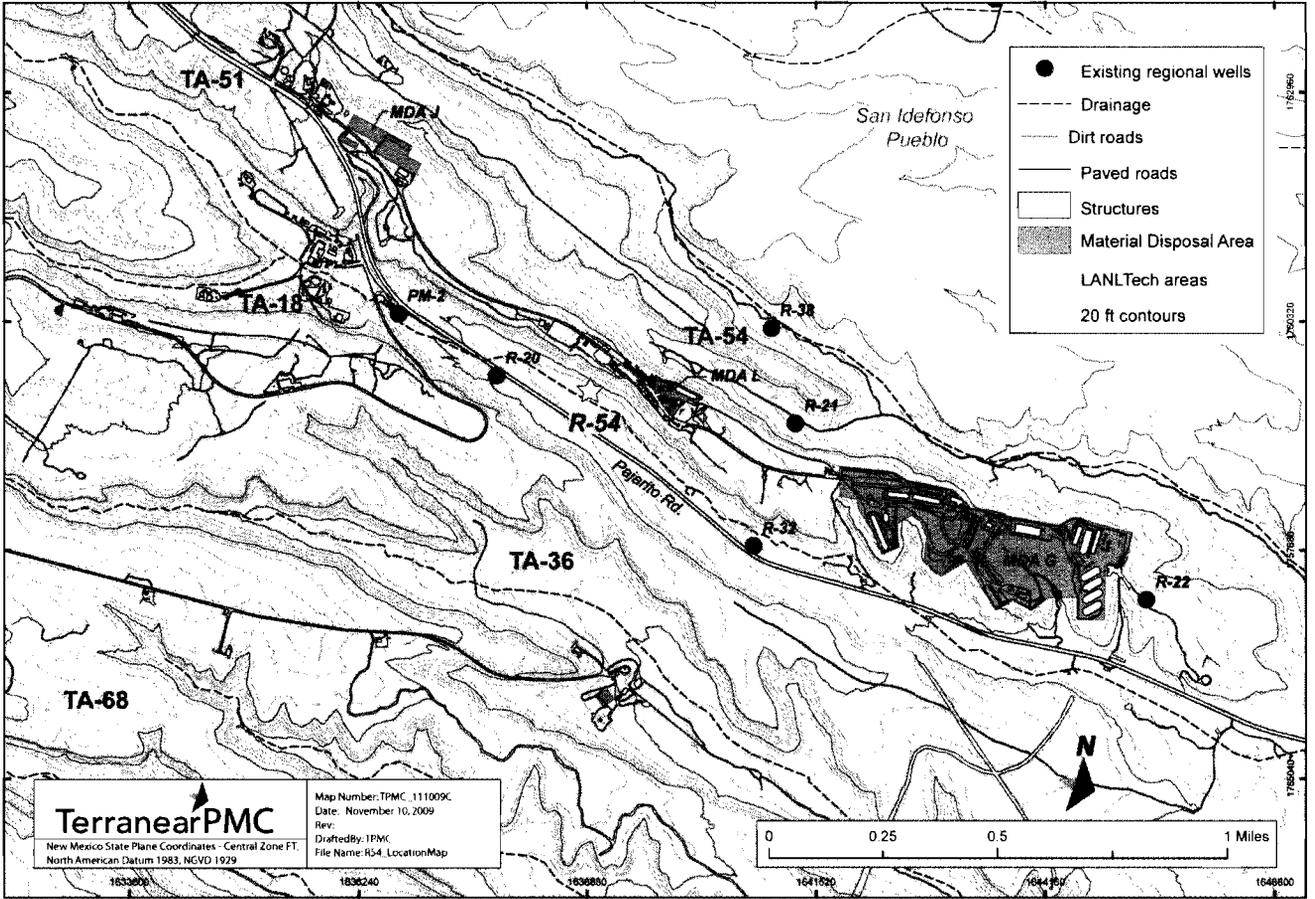


Figure 1: Location map for R-54.

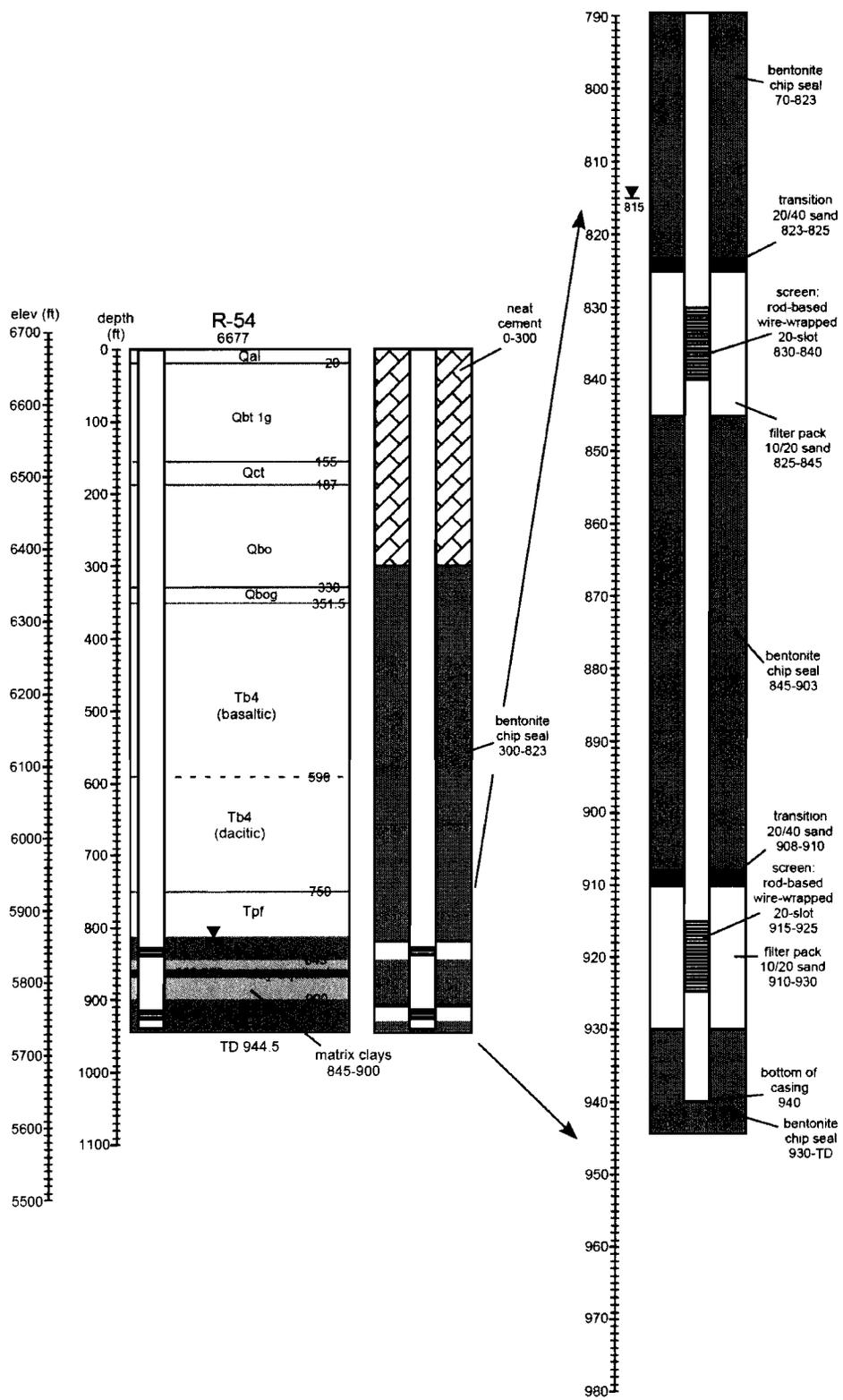


Figure 2. Proposed well design, R-54 (Qal = alluvium, Qbt 1g = lower vitric Tshirege Member of Bandelier Tuff, Qct – Cero Toledo interval, Qbo = Otowi Member of Bandelier Tuff, Qbog = Guaje Pumice Bed, Tb4 = Cerros del Rio volcanic series, Tpf = Puye Formation).