

## Meeting Record

<b>Purpose:</b> <b>DQO Meeting to Recommend Characterization Activities for Well R-27, near Cañon de Valle/Water Canyon Confluence</b>	<b>Meeting Date:</b> 1/30/03
<p><b><i>Background Information:</i></b></p> <p>The Hydrogeologic Workplan rationale for R-27 was to provide information about the water quality in intermediate perched zones and in the regional aquifer upgradient of Aggregate 3. The location for R-27 in the Hydrogeologic Workplan was at the confluence of Cañon de Valle and Water Canyon, which was good for detecting HE from upstream sources. However, that location is very narrow, a tight spot with large boulders. It is also spotted owl habitat. After several visits, including with NMED, the conclusion was reached that the location is not feasible. The first area where the canyon widens sufficiently for drilling is southeast of PHERMEX and northeast of TA-49, MDA AB. This area is very close to the original Hydrogeologic Workplan location for R-28. If R-27 is moved to the proposed location, there is no need to install R-28. There is NMED concurrence on the R-27 location, about 1 mile below the confluence of Cañon de Valle and Water Canyon and eliminating the need to put R-28 at the location shown in the Hydrogeologic Workplan. The DQOs for the R-27 well are described below.</p> <p><b>Geology –</b></p> <p>The Bandelier down through the Guaje and down into the Puye is well constrained. The Bandelier is very thick, but questions of interest are the thickness and degree of saturation in the Cerro Toledo. The Cerro Toledo was very thick at R-19. The lithologic logs from well DT-5A have interesting notations – they sound like Tschicoma – but Tschicoma was not encountered in CDV-R-37. Are the “Cerros del Rio” lavas found in TA-49 drill holes connected to eastern (Cerros del Rio) or western (Tschicoma) sources? In the DT-5A lithologic log the Totavi was quite thin. The 3-D Geologic Model predicts about 50 feet of Totavi at this location. The pumiceous Puye Formation unit was prominent in R-19, but apparently was not present in DT-5A. The Santa Fe Group may be present, based on the designation of “sands” on the DT-5A logs. Confirming the presence of Santa Fe Group in this area is very important for the 3-D Geologic Model. Is Purtymun’s productive hydrologic unit in the regional part of the Santa Fe or part of the pumiceous unit that’s found to the north at R-19? If the pumiceous unit is present, then the transmissive basin identified by Purtymun would run out the eastern boundary of the Laboratory.</p> <p><b>Hydrology –</b></p> <p><b><i>Vadose zone:</i></b> This is an area where surface water in both Cañon de Valle and Water Canyon infiltrates. It would be important to understand the infiltration rate here. Core should be collected in the upper portion of the borehole and tested for moisture, anions, stable isotopes, barium, HE and radionuclide suite. Perched zones are anticipated, and they should be identified, sampled, and analyzed for the same suites.</p> <p><b><i>Regional aquifer:</i></b> Regional saturation is expected at a depth of about 750 ft. This well would be located down stream of significant recharge and downward gradients are expected. It is important to measure the vertical gradient at this well. It would also be very useful to measure the permeability of the Santa Fe Group if present at this location.</p>	



#### Geochemistry-

Water from the regional aquifer should be analyzed for the standard suite of analyses, HE, and plutonium. It is a likely candidate for C-14 analyses to measure the age of water at this location (pending a regional aquifer age dating plan, to be developed)

#### ***Recommendations:***

Based on discussions at the R-27 DQO meeting, a recommendation is made that R-27 located about 1 mile down stream of the Cañon de Valle and Water Canyon confluence. This goal is consistent with the original criteria for siting this well in the Hydrogeologic Workplan.

The R-27 Cañon de Valle and Water Canyon confluence site is designed to address the following data needs:

- To determine if the lavas that are present are Cerros del Rio or Tschicoma, to determine the presence and character of the Puye Formation and the Santa Fe Group. These data are needed to refine the 3-D geologic model, which is critical for identifying geologic controls on groundwater pathways.
- To measure the water table elevation in the regional aquifer; this data is important to constraining the water level map in an area near the edge of the PM well field capture zone and are part of the general characterization of groundwater conditions beneath the Laboratory and support ongoing efforts to improve the hydrogeologic conceptual model.
- To provide vertical gradient, aquifer characteristics and water chemistry down gradient of firing sites, for improving the regional flow and transport model.

The R-27 well should be drilled to penetrate 500 feet into the regional aquifer, to approximately 1250 ft. The well should be completed with three screens in the regional aquifer: one in the lavas near the water table, one in the Totavi, and one in the Santa Fe. The screens will provide access to groundwater to three geologic units in the regional aquifer so that the permeability of the units at this location can be estimated by hydrologic testing. Hydraulic testing is planned to determine the conductivity of geologic unit at the well screen. Testing will consist of injection tests or aquifer pumping tests.

It is recommended that R-30 be drilled as an open borehole, using air with minimal fluids. The open hole will facilitate the use of borehole geophysics, which can be used to characterize moisture distribution and identify perched groundwater in the vadose zone. Open-hole geophysics will also provide data to characterize the hydraulic properties of saturated rocks in the regional aquifer as well as provide key information for the selection of well screen depth.

The desire for open-hole characterization data will be balanced against the potential for creating a groundwater pathway to the regional aquifer. If perched groundwater is encountered during drilling, borehole water samples shall be collected and submitted for rapid turn-around analyses for non-sorbing potential contaminants (e.g.  $\text{ClO}_4$ ,  $\text{NO}_3$ ); these screening analyses will be used to evaluate whether contaminants in perched water zones should be isolated with drill casing before the regional aquifer is penetrated.

Core will be collected in the upper 300 feet of the borehole and tested for moisture content, anions, stable isotopes, barium, HE, and radionuclides. Cuttings will be collected every 5 feet by the subcontractor to identify geologic contacts, describe rock characteristics, and provide samples for additional geologic characterization. These data will be used to prepare a lithologic log of the borehole.

A summary of the data needs and data collection is shown in the following table:

Data Needed	Data Collection
Stratigraphy	Core, cuttings, and geophysical logs
Vadose zone infiltration rate	Core the upper 300 feet, test for moisture, anions, and stable isotopes
Vadose zone contaminant distribution	Core the upper 300 feet, test for anions, barium, HE, and radionuclides
Perched zone identification	Driller observations, borehole video, drill with minimal fluids
Perched zone water chemistry	Borehole screening sample, if perched water is encountered
Regional aquifer water level	Measure water level in borehole and well
Regional aquifer water chemistry	Collect water samples from well
Regional aquifer hydraulic characteristics	Hydrologic testing

Action Items:	Action Assigned To:
<ol style="list-style-type: none"> <li>1. Propose R-27 location to NMED and get concurrence</li> <li>2. Update cost estimates based on approved R-27 work scope.</li> <li>3. Brief NMED on work scope and location for R-27</li> <li>4. Finalize R-27 well site location</li> </ol>	<p>Nylander McCann</p> <p>Nylander McCann/Pearson/ Broxton</p>

5. Prepare FIP for R-27	Broxton
<b>Participants:</b> Elizabeth Keating Bruce Gallaher Brent Newman David Vaniman Tom Whitacre Bob Enz David Broxton Kelly Bitner Steve Booth David Rogers	
<b>Meeting Record Prepared By</b> Kelly Bitner	<b>Date:</b> 2/3/03

## Meeting Record

<b>Purpose:</b> DQO Meeting to Recommend Characterization Activities for Well R-30, TA-49	<b>Meeting Date:</b> 1/30/03
<p><b>Background Information:</b></p> <p>The Hydrogeologic Workplan rationale for R-30 was to provide information about the water quality in intermediate perched zones and in the regional aquifer beneath MDA AB. The Hydrogeologic Workplan envisioned deepening an existing 700-foot deep borehole to make R-30. However, the TA-49 investigators would prefer to keep the 700-foot intact and not use it for a well. The DQO planning team suggested a new location for R-30 as down gradient from MDA AB. The DQOs for the R-30 well are described below.</p> <p><b>Geology –</b></p> <p>The Bandelier down through the Guaje and down into the Puye is well constrained. The lithologic logs from well DT-5A have interesting notations – they sound like Tschicoma – but Tschicoma was not encountered in CDV-R-37. Are the “Cerros del Rio” lavas found in TA-49 drill holes connected to eastern (Cerros del Rio) or western (Tschicoma) sources? In the DT-5A lithologic log the Totavi was quite thin. Is the Totavi present and if so, can it be used to get permeability data for comparison to the surprisingly low permeabilities at R-31? The pumiceous Puye Formation unit was prominent in R-19, but apparently was not present in DT-5A. The Santa Fe Group may be present, based on the designation of “sands” on the DT-5A logs. Confirming the presence of Santa Fe Group in this area is very important for the 3-D geologic model. Is Purtymun’s productive hydrologic unit in the regional part of the Santa Fe or part of the pumiceous unit that’s found to the north at R-19? If the pumiceous unit is present, then the transmissive basin identified by Purtymun would run out the eastern boundary of the Laboratory.</p> <p><b>Hydrology –</b></p> <p><b>Vadose zone:</b> The mesa has no to very low fluxes, no chloride and 2% volumetric water content. The mesa is underlain by Unit 3 and 4 of the Tshirege. The mesa hydrology is very similar to Area G. Kay Birdsell did FEHM simulations of the mesa to look at plutonium migration out of the MDA AB test holes. In her simulations, the plutonium does not get far. There are slant boreholes planned under the test holes to test the prediction of no migration. There may be some interflow in Area 2. A corehole placed in the center of Area 2 occasionally had water accumulated in it. The asphalt was implicated in the presence of moisture in corehole 2, but the asphalt has been removed from Area 2, and the soil has remained wet, possibly the result of interflow.</p> <p><b>Regional aquifer:</b> Regional saturation is expected at a depth of about 1125 ft. This is an area where, on the water table map, the flow direct changes from easterly to northerly in response to pumping of the PM wells. The DT wells are marginally helpful, but a well with a reliable water table elevation would be helpful in establishing the extent of the current PM well field capture zone. It is not clear whether this well could serve a long-term monitoring function for TA-49, because it is uncertain which way the water is flowing, but it would be a useful regional aquifer characterization well. However, if well R-27 were drilled first, providing more constraint on the water level map, it would be possible to site R-30 down gradient of MDA AB.</p>	

#### Geochemistry-

TA-49 was used for underground testing. The materials used in the tests are generally not mobile – lead, plutonium. However, there are two unexplained observations: occasional presence of vadose zone water in corehole 2 and the single occurrence of HE degradation compounds in well DT-5A. The presence of a perched intermediate saturated zone has not been demonstrated with the TA-49 investigations to date. The original analyses were problematic and quarterly sampling has not been able to repeat the detections. The DT wells were constructed 40 years ago with steel casing. They can not be used to detect the presence of metals in groundwater. Water from the regional aquifer should be analyzed for the standard suite of analyses, HE, and plutonium.

#### ***Recommendations:***

Based on discussions at the R-30 DQO meeting, a recommendation is made that R-30 be sited after R-27 has been installed and there is more certainty in the direction of water flow in the regional aquifer. The goal is to site R-30 down gradient of MDA AB so that R-30 can be used as a long-term monitoring well for this site. This goal is consistent with the original criteria for siting this well in the Hydrogeologic Workplan.

The R-30 TA-49 site is designed to address the following data needs:

- To determine if the lavas that are present are Cerros del Rio or Tschicoma, to determine the presence and character of the Puye Formation and the Santa Fe Group. These data are needed to refine the 3-D geologic model, which is critical for identifying geologic controls on groundwater pathways.
- To measure the water table elevation in the regional aquifer; this data is important to constraining the water level map in an area at the edge of the PM well field capture zone and are part of the general characterization of groundwater conditions beneath the Laboratory and support ongoing efforts to improve the hydrogeologic conceptual model.
- To provide aquifer characteristics and water chemistry down gradient of TA-49, for improving the regional flow and transport model.

The R-30 well should be drilled to penetrate below the top of the regional aquifer, to approximately 1200 ft. The well should be completed with a single screen in the regional aquifer, just below the water table. The screen will provide access to groundwater at the top of the regional aquifer so that the permeability of the units at this location can be estimated by hydrologic testing. Hydraulic testing is planned to determine the conductivity of geologic unit at the well screen. Testing will consist of injection tests or aquifer pumping tests.

It is recommended that R-30 be drilled as an open borehole, using air with minimal fluids. The open hole will facilitate the use of borehole geophysics, which can be used to characterize moisture distribution and identify perched groundwater in the vadose zone. Open-hole geophysics will also provide data to characterize the hydraulic properties of saturated rocks in the regional aquifer as well as provide key information for the selection of well screen depth.

The desire for open-hole characterization data will be balanced against the potential for creating a groundwater pathway to the regional aquifer. If perched groundwater is encountered during drilling, borehole water samples shall be collected and submitted for rapid turn-around analyses for non-sorbing potential contaminants (e.g. ClO<sub>4</sub>, NO<sub>3</sub>); these screening analyses will be used to evaluate whether contaminants in perched water zones should be isolated with drill casing before the regional aquifer is penetrated.

Cuttings will be collected every 5 feet by the subcontractor to identify geologic contacts, describe rock characteristics, and provide samples for additional geologic characterization. These data will be used to prepare a lithologic log of the borehole.

A summary of the data needs and data collection is shown in the following table:

Data Needed	Data Collection
Stratigraphy	Core, cuttings, and geophysical logs
Perched zone identification	Driller observations, borehole video, drill with minimal fluids
Perched zone water chemistry	Borehole screening sample, if perched water is encountered
Regional aquifer water level	Measure water level in borehole and well
Regional aquifer water chemistry	Collect water samples from well
Regional aquifer hydraulic characteristics	Hydrologic testing

**Action Items:**

1. Propose R-30 location after completion of R-27
2. Proposed new R-30 location to NMED and get concurrence
3. Update cost estimates based on approved R-30 work scope.
4. Brief NMED on work scope and location for R-30

**Action Assigned To:**

Keating  
 Nylander  
 McCann  
 Nylander  
 McCann/Pearson/

5. Finalize R-30 well site location	Broxton
6. Prepare FIP for R-30	Broxton
<b>Participants:</b> Elizabeth Keating Bruce Gallaher Brent Newman David Vaniman Tom Whitacre Bob Enz David Broxton Kelly Bitner Steve Booth Bill Criswell David Rogers	
<b>Meeting Record Prepared By</b> Kelly Bitner	<b>Date:</b> 2/3/03

## Meeting Record

<b>Purpose:</b> DQO Meeting to Recommend Characterization Activities for a Well on San Ildefonso Pueblo	<b>Meeting Date:</b> 1/30/03
<p><b>Background Information:</b></p> <p>San Ildefonso has expressed an interest in having LANL place a monitoring well on their land. Three potential locations were identified by the DQO meeting participants, but representatives of San Ildefonso must be included in formulating objectives for the well, selecting the well location, and developing the Data Quality Objectives. The three potential locations identified were:</p> <ol style="list-style-type: none"> <li>1. South of R-13: the primary purpose would be to detect contaminants from Mortandad Canyon</li> <li>2. Halfway between R-12 and R-22: the primary purpose would be to fill in a gap in the water table map and increase the certainty of flow direction in that area.</li> <li>3. Lower Los Alamos Canyon: the primary purpose would be to detect contaminants from Los Alamos/Pueblo Canyon.</li> </ol>	
<b>Action Items:</b>  Set up a meeting with San Ildefonso to discuss purpose, location, and DQOs	<b>Action Assigned To:</b>  Nylander
<b>Participants:</b>  Elizabeth Keating Bruce Gallaher Brent Newman David Vaniman Tom Whitacre Bob Enz David Broxton Kelly Bitner Steve Booth David Rogers	
<b>Meeting Record Prepared By</b>  Kelly Bitner	<b>Date:</b>  2/3/03

## Meeting Record

<b>Purpose:</b> <b>DQO Meeting to Recommend Characterization Activities for Well R-27, near Cañon de Valle/Water Canyon Confluence</b>	<b>Meeting Date:</b> 1/30/03
<p><b><i>Background Information:</i></b></p> <p>The Hydrogeologic Workplan rationale for R-27 was to provide information about the water quality in intermediate perched zones and in the regional aquifer upgradient of Aggregate 3. The location for R-27 in the Hydrogeologic Workplan was at the confluence of Cañon de Valle and Water Canyon, which was good for detecting HE from upstream sources. However, that location is very narrow, a tight spot with large boulders. It is also spotted owl habitat. After several visits, including with NMED, the conclusion was reached that the location is not feasible. The first area where the canyon widens sufficiently for drilling is southeast of PHERMEX and northeast of TA-49, MDA AB. This area is very close to the original Hydrogeologic Workplan location for R-28. If R-27 is moved to the proposed location, there is no need to install R-28. There is NMED concurrence on the R-27 location, about 1 mile below the confluence of Cañon de Valle and Water Canyon and eliminating the need to put R-28 at the location shown in the Hydrogeologic Workplan. The DQOs for the R-27 well are described below.</p> <p><b>Geology –</b></p> <p>The Bandelier down through the Guaje and down into the Puye is well constrained. The Bandelier is very thick, but questions of interest are the thickness and degree of saturation in the Cerro Toledo. The Cerro Toledo was very thick at R-19. The lithologic logs from well DT-5A have interesting notations – they sound like Tschicoma – but Tschicoma was not encountered in CDV-R-37. Are the “Cerros del Rio” lavas found in TA-49 drill holes connected to eastern (Cerros del Rio) or western (Tschicoma) sources? In the DT-5A lithologic log the Totavi was quite thin. The 3-D Geologic Model predicts about 50 feet of Totavi at this location. The pumiceous Puye Formation unit was prominent in R-19, but apparently was not present in DT-5A. The Santa Fe Group may be present, based on the designation of “sands” on the DT-5A logs. Confirming the presence of Santa Fe Group in this area is very important for the 3-D Geologic Model. Is Purtymun’s productive hydrologic unit in the regional part of the Santa Fe or part of the pumiceous unit that’s found to the north at R-19? If the pumiceous unit is present, then the transmissive basin identified by Purtymun would run out the eastern boundary of the Laboratory.</p> <p><b>Hydrology –</b></p> <p><b><i>Vadose zone:</i></b> This is an area where surface water in both Cañon de Valle and Water Canyon infiltrates. It would be important to understand the infiltration rate here. Core should be collected in the upper portion of the borehole and tested for moisture, anions, stable isotopes, barium, HE and radionuclide suite. Perched zones are anticipated, and they should be identified, sampled, and analyzed for the same suites.</p> <p><b><i>Regional aquifer:</i></b> Regional saturation is expected at a depth of about 750 ft. This well would be located down stream of significant recharge and downward gradients are expected. It is important to measure the vertical gradient at this well. It would also be very useful to measure the permeability of the Santa Fe Group if present at this location.</p>	

### **Geochemistry-**

Water from the regional aquifer should be analyzed for the standard suite of analyses, HE, and plutonium. It is a likely candidate for C-14 analyses to measure the age of water at this location (pending a regional aquifer age dating plan, to be developed)

### ***Recommendations:***

Based on discussions at the R-27 DQO meeting, a recommendation is made that R-27 located about 1 mile down stream of the Cañon de Valle and Water Canyon confluence. This goal is consistent with the original criteria for siting this well in the Hydrogeologic Workplan.

The R-27 Cañon de Valle and Water Canyon confluence site is designed to address the following data needs:

- To determine if the lavas that are present are Cerros del Rio or Tschicoma, to determine the presence and character of the Puye Formation and the Santa Fe Group. These data are needed to refine the 3-D geologic model, which is critical for identifying geologic controls on groundwater pathways.
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Action Items:	Action Assigned To:
<ol style="list-style-type: none"> <li>1. Propose R-27 location to NMED and get concurrence</li> <li>2. Update cost estimates based on approved R-27 work scope.</li> <li>3. Brief NMED on work scope and location for R-27</li> <li>4. Finalize R-27 well site location</li> </ol>	<p>Nylander McCann</p> <p>Nylander McCann/Pearson/ Broxton</p>

5. Prepare FIP for R-27	Broxton
<b>Participants:</b> Elizabeth Keating Bruce Gallaher Brent Newman David Vaniman Tom Whitacre Bob Enz David Broxton Kelly Bitner Steve Booth David Rogers	
<b>Meeting Record Prepared By</b> Kelly Bitner	<b>Date:</b> 2/3/03