April 2009

DOE/Sandia Responses to NMED's

"NOTICE OF DISAPPROVAL: CORRECTIVE MEASURES EVALUATION REPORT FOR TECHNICAL AREA-V GROUNDWATER, JULY, 2005 SANDIA NATIONAL LABORATORIES, EPA ID# NM5890110518 HWB-SNL-05-027"

INTRODUCTION

This document responds to the comments received in a Notice of Disapproval (NOD) letter from the New Mexico Environment Department (NMED) to the U.S. Department of Energy (DOE) and Sandia Corporation (Sandia) on July 28th, 2008 regarding the Corrective Measures Evaluation Report for the Technical Area V (TA-V) study area at Sandia National Laboratories, New Mexico (SNL/NM). The letter is entitled: "*Notice Of Disapproval: Corrective Measures Evaluation Report For Technical Area-V Groundwater, July, 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027,*" (NMED July 2008)

The NMED NOD letter contained 21 comments, 8 of which are addressed in this response. Per the final paragraph of page 5 of the NOD letter:

> *The U.S. Department of Energy and Sandia Corporation ("Permittees") must submit a revised CME Report. However, before submittal of a revised CME Report, the Permittees must respond to comments 1-8 above and submit a work plan to the NMED for approval to adequately characterize groundwater at TA-V by October 1, 2008. The work plan, in consideration of all of the comments above, must describe the work that will be performed to adequately characterize the contaminated groundwater and hydrogeology at TA-V. The work plan must also contain a proposed schedule of the work to be completed, subject to NMED review and approval including the dates of submission to the NMED of an investigation report and revised CME Report.*

Based on these requirements, responses to comments 1 through 8 are provided below and any investigation requirements are addressed in the TA-V Groundwater Investigation Work Plan included as Appendix A of this NOD Response. Comments 9 through 21 will be addressed in a future submittal after the elements of the TA-V Groundwater Investigation Work Plan have been successfully implemented and the TA-V Corrective Measures Evaluation Report is revised and resubmitted to the NMED.

Sandia is a multiprogram laboratory managed and operated by Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

A second letter was received from NMED on March 10, 2009, entitled: "*Time Extension Request for Response to Notice Of Disapproval: Corrective Measures Evaluation Report For Technical Area-V Groundwater, July, 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027,*" (NMED March 2009). The March 2009 letter provided additional characterization requirements (specifically, soil-vapor monitoring wells) and granted an extension to respond to the NMED by April 17, 2009. Although the soil-vapor monitoring wells are not addressed in any of the comment responses provided below, the added requirements are addressed in the TA-V Groundwater Investigation Work Plan (Appendix A).

This document lists each NMED comment in boldface, followed by the DOE/Sandia response written in normal font under "Response". Attached to this reponse to comments are appendices with supporting materials.

References cited:

New Mexico Environment Department (NMED), July 2008. "Notice Of Disapproval: Corrective Measures Evaluation Report for Technical Area-V Groundwater, July, 2005; Sandia National Laboratories, EPA ID# NM5890110518; HWB-SNL-05-027," New Mexico Environment Department, Santa Fe, New Mexico. July 28, 2008.

New Mexico Environment Department (NMED), March 2009. "Time Extension Request for Response to Notice Of Disapproval: Corrective Measures Evaluation Report for Technical Area-V Groundwater, SAND2005-4492, July, 2005; Sandia National Laboratories, EPA ID# NM5890110518; HWB-SNL-05-027," New Mexico Environment Department, Santa Fe, New Mexico. March 10, 2009.

COMMENTS RELATED TO FURTHER CHARACTERIZATION

1. **Section 2.1 p.12, 2nd paragraph states: "the extent of TCE, PCE, and nitrate contaminated groundwater is stable (or not expanding) because concentration trends are not increasing in TA-V monitoring wells." While this may have been correct at the time the document was being prepared, it is not accurate now. Analytical results of groundwater samples from monitoring well TAV-MW6 have shown an increasing trend in trichloroethene (TCE) concentration since early 2004, and by mid 2006 levels have increased to above the MCL (5 µg/L). TCE concentrations are still increasing as of this date.**

   Section 3.2.1, Figure 3-4, p. 23, shows "plume contours are static or retreating" as part of the decision framework for evaluating monitored natural attenuation (MNA) and Section 3.2.1paragraph 3.Tier I. Item 3.states [sic] that the plume contours are stable. However, due to the increase of TCE concentration in water samples from TAV-MW6, the contaminant plume appears to be expanding or migrating.

   The local groundwater flow direction at TAV-MW6 (the well with increasing TCE concentration) is southeasterly. The nearest downgradient monitoring well to the east, TAV-MW3, where TCE has not been detected, is about 1700 feet away. The nearest downgradient well to the south is TAV-MW1, about 300 feet away. Typically TCE is detected in groundwater samples from TAV-MW1 at levels below the MCL, but at times concentrations may exceed the MCL, as was the case in 2005 and 2006. Figure 2-1, p. 14, shows the TCE plume extending in a southerly direction with no monitoring wells in place to detect the leading edge of the plume to the south. The Lawrence Livermore National Laboratory Groundwater Flow Study, Attachment 3 of the Summary Report of Groundwater Investigations at Technical Area V, Operable Units 1306 and 1307, March 1999, indicates a southerly flow component at LWDS-MW1 and TAV-MW1 using a direct groundwater-flow measurement borehole tool. Additional wells must therefore be installed for the purposes of better defining the ground water flow direction and for monitoring the TCE plume to the south and east.

Response: DOE/Sandia agree with the NMED's statement that conditions have changed since the submittal of the CME Report for review and approval. However, DOE/Sandia believe that the changes are occurring in a predictable manner. Regardless, based on the September 18, 2008 meeting with NMED (SNL/NM September 2008) and the March 10, 2009 letter from NMED (NMED March 2009), NMED indicated that three groundwater wells and three soil-vapor monitoring wells are required to resolve the issues identified in this comment. Specifications for the additional wells are provided in the TA-V Groundwater Investigation Work Plan included as Appendix A.

References cited:

New Mexico Environment Department (NMED), March 2009. "Time Extension Request for Response to Notice Of Disapproval: Corrective Measures Evaluation Report for

Technical Area-V Groundwater, SAND2005-4492, July, 2005; Sandia National Laboratories, EPA ID# NM5890110518; HWB-SNL-05-027," New Mexico Environment Department, Santa Fe, New Mexico. March 10, 2009.

Sandia National Laboratories/New Mexico (SNL/NM), September 2008. "Notes of Meeting—September 18, 2008 Meeting Between NMED, DOE, and SNL/NM to Discuss the Notice of Disapproval for the TA-V CME Report," Internal Memorandum from Michael Skelly (Dept 6765) to John Cochran (Dept. 6765), Sandia National Laboratories/New Mexico, Albuquerque, New Mexico. September 26, 2008.

2. The regional conceptual model in the TA-V area needs clarification. Figure 1-2, p. B-15 of Attachment B does not show the "mixed coarse to fine-grained alluvial fan sediments" encountered in the drilling of TAV-MW3. This zone was once considered to be Ancestral Rio Grande (ARG) based on identification of pumice in at least 4 separate zones in the geologist's log. It was reinterpreted as "mixed coarse to fine-grained alluvial fan sediments" when it was decided that ARG did not extend as far to the east as previously believed (SAND2003-1869, Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico, p. 50).

Figure 5-11 of SAND2003-1869 depicts a large area of fine to coarse grained alluvial fan sediments in the TA-V area as exemplified by the location of KAFB-10. Figure 5-7 of SAND2003-1869 shows an area of mixed alluvial fan lithofacies. Both of these figures distinguish between a zone of mixed deposits and the separate coarse grained and fine grained units shown on Figure 1-2. While Figures 5-7 and 5-11 don't agree with each other in the TA-V area, they both show the regional importance of this "mixed coarse to fine-grained alluvial fan sediments" unit, contrary to what is reported in the CME (Figure 1-2 in Attachment B, p. B-15).

Increasing TCE concentrations at TAV-MW6 and local potentiometric surface maps imply groundwater is flowing toward TAV-MW3 and the "mixed coarse to fine-grained alluvial fan sediments". The ground water level is dropping faster at TAV-MW3 (the well finished in that unit) compared to the water levels in any other TA-V wells, implying a ground water flow gradient that is increasing faster to the east than to the west. While it could be argued that a larger gradient toward the east is good in that it leads to a longer travel time before the contaminant plume eventually moves west, it is not clear that there is a monitoring well appropriately placed to intersect the edge of a plume, nor are the hydrologic parameters of the "mixed coarse to fine-grained alluvial fan sediments" unit understood. Additional monitoring wells are needed to characterize the edge of the plume and its relationship to the mixed coarse to fine-grained alluvial fan sediments, and the hydrogeologic properties of the unit.

Response: The TA-V Current Conceptual Model will be revised and resubmitted with the TA-V CME Report after new wells are installed and 8 quarters of groundwater and soil-vapor

sampling are completed. Details of the additional monitoring wells that are proposed are in the TA-V Groundwater Investigation Work Plan (Appendix A). Hydrogeologic properties will be further refined by borehole geophysics and slug tests (Appendix A).

3. The Permittees must include surveying all the TAV, LWDS and AVN monitoring wells for accurate horizontal and vertical coordinates in a single survey to remove the possibility that the persistent, uncharacteristic "groundwater mound" is an artifact of survey errors and that the new wells help to show correctly the overall groundwater flow pattern.

Response: A resurvey of the 13 wells in the TA-V groundwater monitoring well network was completed in September 2008. Northing and easting coordinates based on the New Mexico State Plane Coordinate System, Central Zone, were determined to within ± 0.01 ft using survey-grade global positioning system (GPS) equipment. Elevations for four features (ground surface, well pad, top of the inner well casing [TOC], and top of the protective casing) were determined at each well by differential leveling to within ± 0.01 ft. Elevations were obtained starting and closing with the elevation (derived by a previous monitor well survey in March 2008) of the top of the inner well casing at well TAV-MW10.

Previous TOC elevations were compared to the September 2008-derived elevations for the 13 TA-V monitoring wells, and are summarized in Table B-1 in Appendix B. The change from the previous to the new TOC elevations was less then 0.33 feet, with the exception of well LWDS-MW1 which decreased 1.14 feet in elevation. LWDS-MW1 was installed in 1993 at a location in an asphalt parking lot. The change in elevation is due to modifications that were made to the well completion in the late 1990s due to construction in the area. LWDS-MW1 is currently constructed as an at-grade completion. The inner well casing was modified and lowered during construction activities, which accounts for the 1.14-foot difference. The new elevations of the four well features as determined by the September 2008 survey are summarized in Table B-2 in Appendix B.

The depth to water in the 13 TA-V groundwater monitoring wells was most recently measured from January 5 through January 15, 2009. The depths to water and water level elevations (based on the September 2008 TOC survey elevations) are summarized in Table B-3 in Appendix B. The January 2009 water level elevations were used as a basis for the revised TA-V potentiometric surface contour map, presented as Figure B-1 in Appendix B.

Pursuant to DOE Order, Sandia protects certain unclassified controlled information which may be exempt from public release under the Freedom of Information Act (FOIA). Designated Official Use Only (OUO), this category of information includes certain geological and geophysical data concerning wells (FOIA Exemption 9) as well as information pertaining to the Nation's critical infrastructure (FOIA Exemption 2) which if released might pose a homeland security risk. The elevation data requested by NMED can be provided without the OUO designation, and we have provided that to you with this response. However, inclusion of other forms of related information with the elevation data could result in creation of OUO information which under the DOE Order is subject to restricted distribution. Please consider

whether the elevation data provided here will suffice for your needs. If further discussion of this requirement is necessary, please contact us.

4. Attachment C, Figure 3-2, p. C-29, and Figure 4-1, p. C-38, indicate ARG deposits occur approximately 2 miles away from TA-V. Section 2.2.4, p. C-23 states "[g]roundwater moves westward approximately 10,000 ft through the alluvial-fan lithofacies, where it enters the highly permeable ARG lithofacies….". However, Figure 2-3, p. C-16 indicates ARG was found at TAV-MW5 (600 feet from edge of plume and possibly closer to the plume). This would decrease the travel time needed for a contaminant to reach the Ridgecrest and KAFB well fields. The ARG at TAV-MW5 should be monitored.

Response: The proposed deep groundwater monitor well TAV-MW13 (to be located near TAV-MW5) will be installed to monitor the ARG lithofacies in the study area (Appendix A).

MISCELLANEOUS COMMENTS

5. A U. S. Department of Energy letter to NMED dated November 27, 2006, concerning an increase in TCE concentration above the MCL at TAV-MW6 states "Sandia attributes increasing TCE concentrations in TAV-MW6 to groundwater with higher TCE concentrations migrating from upgradient locations." Describe what is meant by the phrase "upgradient locations".

Response: The term "upgradient" used in the November 27, 2006 letter pertains to the localized field of flow immediately beneath TA-V. The "upgradient location" in this usage was the area northwest of TAV-MW6 around LWDS-MW1, the monitoring well historically exhibiting the maximum TCE concentrations.

6. The water level in the easternmost well, TAV-MW3, is declining faster than that in the westernmost well, TAV-MW5, implying a lessening of the gradient to the west of the center of the contaminant plume and a steepening of the gradient to the east of the center of the plume. Indicate whether this is expected to continue and explain how this might affect the conceptual and computer model of the contaminant plume.

Response: Differential dewatering of the aquifer is occurring and is expected to continue as long as production wells in the region continue to pump. The disproportionate rates of water level declines will be accounted for in revised computer model simulations and discussed in the revised TA-V Current Conceptual Model submitted with the revised TA-V CME Report.

7. The conceptual model in the TA-V area, as presented in Figure 1-2, p. B-15 of Attachment B, shows strata dipping with a westerly component. Strata at the few hundred feet depth to the south at the Mixed Waste Landfill and to the north

in the TAG area exhibit dips with an easterly component. Explain this difference in dip direction.

Response: The conceptual model cartoon presented in Figure 1-2 of Attachment B of the CME Report is highly schematic and provided to illustrate major concepts. This diagram was not presented as a scientifically accurate cross section. For clarity, this figure will be modified in the revised TA-V Current Conceptual Model that will be resubmitted with the revised TA-V CME Report.

8. Submit in electronic form an updated spreadsheet of analytical results for groundwater sampling and elevations at all TAV, LWDS and AVN monitoring wells since the CME was submitted.

Response: An electronic spreadsheet of the analytical results and groundwater elevations from July 2005 through December 2008 are provided on a compact disk delivered with this NOD Response.

April 2009

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Appendices

Appendix A

Documentation in Support of Notice of Disapproval Comment 1 and 2:

- Technical Area V Groundwater Investigation Work Plan; Installation of Groundwater Monitoring Wells TAV-MW11, TAV-MW12, and TAV-MW13; Installation of Soil-Vapor Monitoring Wells TAV-SV01, TAV-SV02, and TAV-SV03.

Technical Area V Groundwater Investigation Work Plan

Installation of Groundwater Monitoring Wells TAV-MW11, TAV-MW12, and TAV-MW13

Installation of Soil-Vapor Monitoring Wells TAV-SV01, TAV-SV02, and TAV-SV03

April 2009

Environmental Restoration Project Sandia National Laboratories, New Mexico

Sandia is a multiprogram laboratory managed and operated by Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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1 Project and Site Information

Task Description: Sandia National Laboratories/New Mexico (SNL/NM) Technical Area V (TA-V) installation of groundwater and soil-vapor monitoring wells; quarterly sampling of groundwater and soil vapor.

Case No.: 98026.01.01

Project Leader/Department No.: John Cochran/6765

Scheduled Start Date: June 2009 (NMED Approval of this Work Plan)

Estimated Completion Date: August 2012 (Re-submittal of the CME Report and Current Conceptual Model)

Operations/Technical Area: OU 1330, Groundwater Initiative

2 Regulatory Criteria

In April 2004 the New Mexico Environment Department (NMED) issued a Compliance Order on Consent (the Order) (NMED April 2004) to the U.S. Department of Energy (DOE) and Sandia Corporation (Sandia), which identified TA-V as an area of groundwater contamination at Sandia National Laboratories, New Mexico (SNL/NM) requiring completion of a Corrective Measures Evaluation (CME). The Order directed that a CME Work Plan be developed to identify and outline a process to evaluate remedial alternatives for implementation at TA-V. The CME Work Plan was submitted in April 2004 (SNL/NM April 2004a), was formally approved with modifications by the NMED in October 2004 (NMED October 2004), and was revised in December 2004 (SNL/NM December 2004). The performance and compliance goals and objectives for TA-V groundwater were developed in the TA-V CME Work Plan (SNL/NM April 2004a).

The Order also stated that an evaluation of remedial alternatives for contaminants of concern in groundwater at TA-V requires a current conceptual model of groundwater flow and contaminant transport. Therefore, a current conceptual model was also provided in April 2004 (SNL/NM April 2004b) as the basis for a technically defensible evaluation that was developed and documented in the CME. No comments were received from NMED on the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V* (SNL/NM April 2004b) submitted in April 2004.

Results of activities performed under the TA-V CME Work Plan were documented in the CME Report (SNL/NM July 2005). The purpose of the CME Report was to select a preferred remedial alternative for implementation at TA-V based on the results of information gathered during the CME process. The CME was conducted to ascertain which remedial alternative would most effectively meet the project goals and objectives for cleanup within the regulatory framework. As a result of the CME, it was determined that monitored natural attenuation of all contaminants of concern was the preferred remedial alternative for implementation as the corrective measure to remediate contaminated groundwater at TA-V (SNL/NM July 2005).

This TA-V Groundwater Investigation Work Plan was prepared in response to comments received in a Notice of Disapproval (NOD) letter from the NMED to the DOE and Sandia on

July 28th, 2008 regarding the CME Report for the TA-V study area at SNL (NMED July 2008). The letter is entitled: "*Notice of Disapproval: Corrective Measures Evaluation Report for Technical Area-V Groundwater, July, 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027.*"

The NMED's NOD letter contained 21 comments, and the closing paragraph states:

> *"The U.S. Department of Energy and Sandia Corporation ("Permittees") must submit a revised CME Report. However, before submittal of a revised CME Report, the Permittees must respond to comments 1-8 above and submit a work plan to the NMED for approval to adequately characterize groundwater at TA-V by October 1, 2008. The work plan, in consideration of all of the comments above, must describe the work that will be performed to adequately characterize the contaminated groundwater and hydrogeology at TA-V. The work plan must also contain a proposed schedule of the work to be completed, subject to NMED review and approval including the dates of submission to the NMED of an investigation report and revised CME Report."*

The NOD letter required that DOE/Sandia respond to the NOD and prepare a work plan for NMED approval to adequately characterize groundwater at TA-V by October 1, 2008. DOE/Sandia requested an extension on the due date for a response to the NOD in light of the extensive comments received from the NMED review of the TA-V CME Report. In addition, DOE/Sandia requested a meeting with the NMED to clarify specific information (e.g., the number and location of additional groundwater wells required by NMED). And finally, several meetings were held between NMED, DOE and Sandia to resolve characterization issues. Upon clarification and resolution of all issues, the due date for the response to the NOD was set at 90 days after the final meeting with NMED on December 12, 2008. The results of the discussions at those meetings have been incorporated into this TA-V Groundwater Investigation Work Plan.

A second letter was received from NMED on March 10, 2009, entitled: "*Time Extension Request for Response to Notice Of Disapproval: Corrective Measures Evaluation Report For Technical Area-V Groundwater, July, 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027,*" (NMED March 2009). The March 2009 letter provided additional characterization requirements (specifically, soil-vapor monitoring wells) and granted an extension to respond to the NOD by April 17, 2009.

This TA-V Groundwater Investigation Work Plan outlines the activities and procedures to install and sample groundwater and soil-vapor monitoring wells to comply with the requirements of the NOD, the March 2009 NMED letter, and requirements of the New Mexico Office of the State Engineer (NMOSE) (NMOSE August 2005). To meet these regulatory requirements, the following tasks will be completed at SNL/NM:

- Submit this TA-V Groundwater Investigation Work Plan to the NMED and NMOSE for review and approval.
- Use a licensed well driller and approved materials to install groundwater monitoring wells.
- Use a licensed well driller and approved materials to install soil-vapor monitoring wells.

- Upon completion of the well-installation field activities, submit a report describing the field activities to the NMED.
- Sample the newly installed groundwater and soil-vapor monitoring wells for eight consecutive quarters.
- Prepare an Investigation Report (revised Current Conceptual Model) and submit to the NMED.
- Reevaluate the corrective measures and submit a revised CME Report to the NMED.

Based on the requirements established by the NMED, three groundwater monitoring wells and three soil-vapor monitoring wells will be installed. Applicable Field Operating Procedures (FOPs) and Administrative Operating Procedures (AOPs) are listed in Table 1; however, this site-specific TA-V Groundwater Investigation Work Plan should be used as the primary guidance in the field.

Table 1. Applicable Operating Procedures

Number of Procedure	Title of Procedure
FOP 94-01	Safety Meetings, Inspections, and Pre-Entry Briefings Rev. 1, 12/16/96
FOP 94-05	Borehole Lithologic Logging, Rev. 0, 2/10/94
FOP 94-22	Deep Soil Gas Sampling, Rev. 0, 3/31/94
FOP 94-25	Documentation of Field Activities, Rev. 0, 11/4/94
FOP 94-28	Health and Safety Monitoring of Organic Vapors (FID and PID), Rev. 2, 4/27/97
FOP 94-38	Drilling Methods and Drill Site Management, Rev. 0, 4/14/94
FOP 94-41	Well Development, Rev. 0, 11/21/94
FOP 94-42	Integration of the design, Installation, Rehabilitation, and Decommissioning of Environmental Restoration Wells, Rev. 1, 5/31/94
FOP 94-45	Designing and Installing Groundwater Monitoring Wells, Rev. 0, 5/31/94
FOP 94-57	Decontaminating Drilling and Other Field Equipment, Rev. 0, 5/31/94
FOP 94-68	Field Change Control, Rev. 2 (in revision)
FOP 94-69	Personnel Decontamination (Level D, C, and B Protection), Rev. 1, 1/23/98
FOP 05-01	Groundwater Monitoring Well Sampling and Field Analytical Measurements
FOP 05-03	General Sampling Equipment Decontamination
AOP 94-24	System and Performance Audits, Rev. 0, 1/12/95
AOP 94-25	Deficiency Reporting, Rev. 0, 1/12/95
AOP 95-16	Administrative Operating Procedure for Sample Management and Custody, Rev. 1, 4/18/96

3 Groundwater Monitoring Well Installation

Three 5-inch nominal diameter polyvinyl chloride (PVC) casing groundwater monitoring wells (TAV-MW11, TAV-MW12, and TAV-MW13) will be installed to provide representative groundwater samples. The groundwater monitoring well boreholes will be drilled using Air-

Rotary Casing-Hammer (ARCH) drilling methods. TAV-MW11 will be installed at a location approximately 750 feet (ft) east of TAV-MW6; TAV-MW12 will be installed at a location approximately 600 ft south of TAV-MW10; and TAV-MW13 will be installed at a location approximately 50 ft north of TAV-MW5 (Figure 1). The precise location of these wells will be determined in the field to avoid existing above-ground and underground utilities and structures.

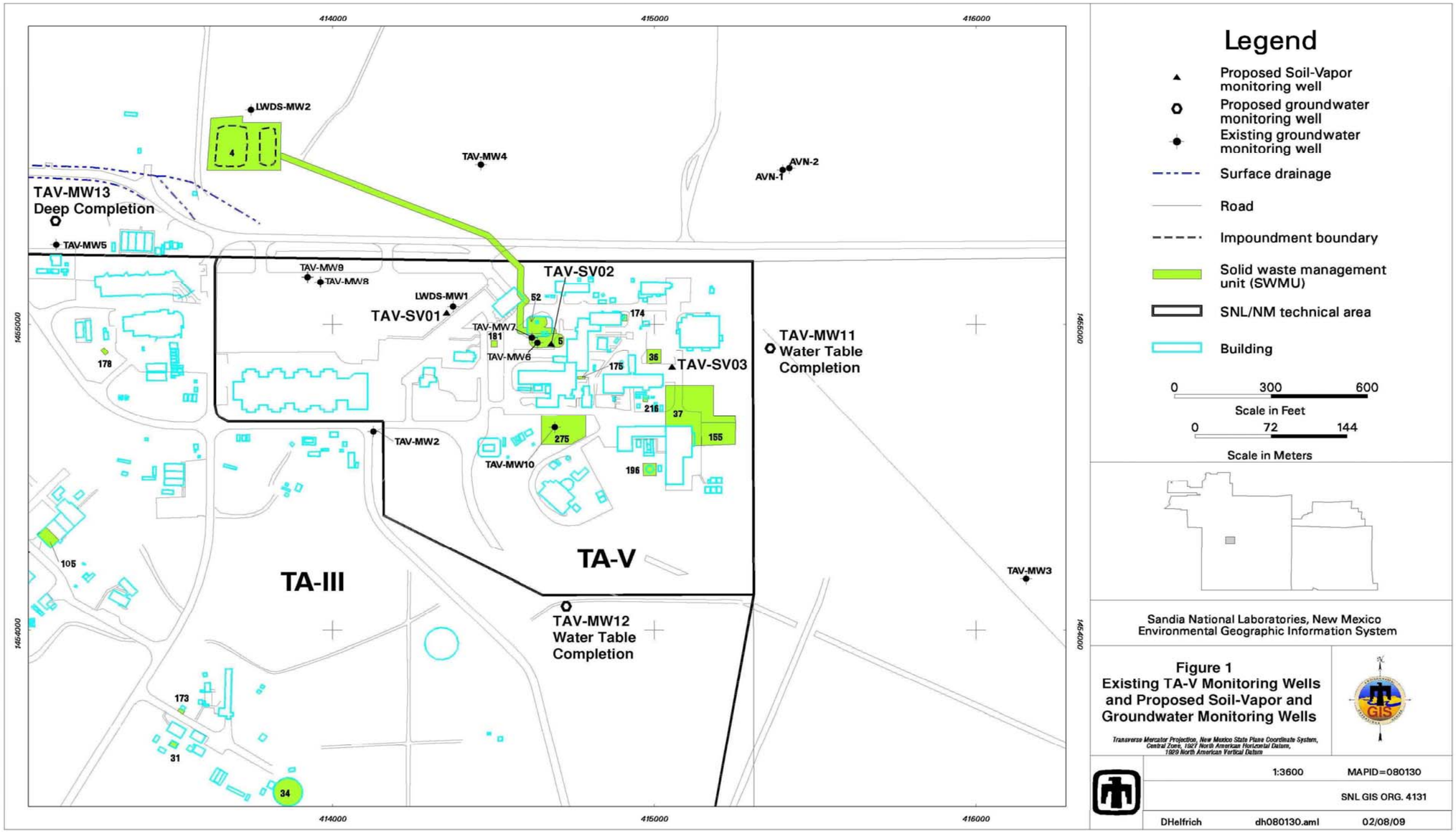
3.1 Borehole Drilling

The ARCH drilling method will use environmentally-friendly lubricants and will be able to penetrate highly variable lithologies such as cobbles, boulders, gravel, sand, clay, and caliche while maintaining an open, competent borehole. The borehole lithology will be logged by the SNL/NM field geologist during drilling. The total depth of the boreholes for wells TAV-MW11 and TAV-MW12 will be determined by the SNL/NM field geologist, but the depth is anticipated to be 20 to 25 ft deeper than the water table. The depth of the first encounter with regional groundwater and any perched groundwater will be noted and recorded during drilling. After reaching total depth, the cased borehole will be logged using natural gamma and neutron wire-line geophysical methods.

Minimal water (but no other foams/liquids) in the form of “mist” may be introduced into the borehole to aid in the removal of cuttings. Waste generation will be kept to a minimum. Borehole cuttings will be contained within an area adjacent to the well. Water produced from the well during drilling or development will be contained in 55-gallon drums and placed on spill control pallets. Management and final disposition of cuttings and water will be performed as stipulated in the project Waste Management Plan.

Based on current conditions in TA-V and recent groundwater level measurements, the two water table completion monitoring wells (TAV-MW11 and TAV-MW12) are anticipated to be drilled to approximately 530 ft below ground surface (bgs). Twenty foot PVC well screens will be placed so that the top of the screen is approximately 5 ft above the water table. The anticipated depth to water at these locations is approximately 510 ft bgs; therefore, the screen completion intervals are expected to be approximately 505 to 525 ft bgs with a 5-ft sump placed below the screen.

For the deeper completion well (TAV-MW13), the 20-ft PVC well screen will be completely submerged at a depth not to exceed 100 ft below the water table. The anticipated depth to water at this location is approximately 480 ft bgs; therefore, the maximum screen completion interval is expected to be approximately 560 to 580 ft bgs with a 5-ft sump placed below the screen. Based on NMED requirements, this well is being installed to monitor Ancestral Rio Grande (ARG) deposits (higher permeability fluvial lithofacies) near TAV-MW5. Therefore, the screened interval will be determined in the field by the geologist based on lithologic information.


414000
415000
416000
1465000
1464000
LWDS-MW2
TAV-MW4
AVN-1
AVN-2
TAV-MW13
Deep Completion
TAV-MW5
TAV-MW9
TAV-MW8
LWDS-MW1
TAV-SV01
TAV-SV02
52
174
TAV-MW7
181
5
TAV-MW6
175
36
TAV-SV03
TAV-MW11
Water Table
Completion
178
216
37
155
275
TAV-MW2
TAV-MW10
196
105
TA-III
TA-V
TAV-MW3
TAV-MW12
Water Table
Completion
173
31
34
Legend
Proposed Soil-Vapor monitoring well
Proposed groundwater monitoring well
Existing groundwater monitoring well
Surface drainage
Road
Impoundment boundary
Solid waste management unit (SWMU)
SNL/NM technical area
Building
0 300 600
Scale in Feet
0 72 144
Scale in Meters
Sandia National Laboratories, New Mexico
Environmental Geographic Information System
Figure 1
Existing TA-V Monitoring Wells and Proposed Soil-Vapor and Groundwater Monitoring Wells
Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum
1:3600
MAPID=080130
SNL GIS ORG. 4131
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dh080130.aml
02/08/09

3.2 Well Construction

The groundwater monitoring wells will be installed through the temporary steel drive casing (nominal 10-inch diameter), and completed using 5-inch nominal diameter, flush-threaded, PVC Schedule-80 water well casing. No solvents, cleaners, or lubricants will be used for construction of the monitoring well. The casing will be delivered pre-cleaned and bagged, or steam-cleaned on site prior to installation. To preserve the integrity of the well materials, the well screen and riser pipe will be suspended in the borehole until the primary filter pack, bentonite pellet seal and annular seal are installed.

A 20-ft length of PVC screen with a 0.010-inch or 0.020-inch slot size will be used for the three wells. A 5-ft sump will be placed at the base of the screen and sealed with a threaded end cap. PVC centralizers will be placed at the base and top of the well screen and then at intervals not to exceed 100 ft up to the ground surface. As discussed above, the screens will be placed so that the top of the screen is approximately 5 ft above the water table (TAV-MW11 and TAV-MW12) or completely submerged (TAV-MW13).

The appropriate screen slot size and gradation of the filter pack material will be based on the gradation of the sediments in the screen interval as determined in the field by the geologist logging the borehole. If the predominant water-bearing interval consists mostly of clay and silt, a 0.010-inch screen slot and a primary filter pack of clean 20-40 silica sand will be placed in the annulus. However, if the predominant water-bearing interval consists mostly of silt and sand, a 0.020-inch screen slot and a primary filter pack of clean 10-20 silica sand will be placed in the annulus. The primary filter pack will extend from the bottom of the sump to at least 5 ft above the top of the screen. A 5-ft thick layer of clean 60 sand will be placed above the primary filter pack. Both sand packs will be tagged using a tag line to verify their depth. Preliminary well development using a surge block will be performed at this time to help settle the filter pack.

An approximately 30-ft thick layer of 1/4-inch bentonite pellets or 3/8-inch bentonite chips will be placed and hydrated above the filter pack prior to emplacement of the bentonite-grout annular seal. The bentonite pellets/chips will be allowed to set for a time adequate for hydration (at least one hour). The remaining annular space to ground surface will then be filled with bentonite grout. To prevent overloading, the bentonite grout will be installed in multiple lifts. The first bentonite grout lift will be approximately 100 ft thick and will be allowed to set a minimum of 24 hours before installation of the next lift. Subsequent bentonite grout lifts will each be approximately 200 ft thick. The bentonite grout will be topped off to within 6-inches to 1-ft bgs.

The well casing will extend approximately 30 inches above ground surface with a water-tight cap. The monitoring well will be completed with a 36-inch high protective steel casing with a hinged locking cap. The protective casing will be primed and painted yellow. A 3-ft by 3-ft, sloped concrete pad will be constructed around the casing. The pad will contain a 3-inch brass cap stamped with the well identification. Three, 4-inch diameter concrete-filled, steel guard posts (also primed and painted yellow) will be placed around the pad, equidistant from the well.

3.3 Well Development

Well development will be completed no sooner than 48 hours after grouting. The well will be developed for approximately 10 hours, and will consist of pumping, surge-block, swabbing, and/or bailing techniques. During development, the groundwater field parameters (pH, specific conductivity (SC), temperature, and turbidity) will be continuously monitored, and development will continue until parameters have stabilized. All development water will be contained in drums and will not be allowed to discharge to the ground surface. The method of development, the volume of water added or removed, the parameters measured, the results of the measurements, and the time these activities take place will be documented in writing during well development. If required, only potable water shall be added to the well during development.

During well development, a minimum of five well bore volumes will be removed. After the minimum volume has been removed, development will continue until representative water is obtained. Representative water is assumed to be obtained when pH, temperature, turbidity, and specific conductivity readings stabilize (less than 10% variability over three consecutive well bore volumes) and the water is visually clear of suspended solids with a target turbidity of less than five Nephelometric Turbidity Units.

4 Soil-Vapor Monitoring Well Installation

The soil-vapor monitoring system will provide data regarding vadose-zone volatile organic compound (VOC) profiles with depth, and will consist of three Flexible Liner Underground Technologies (FLUTe™) soil-vapor monitoring wells (hereinafter referred to as FLUTe™ wells). The FLUTe™ wells will be constructed in ARCH boreholes at the three locations shown in Figure 1 (TAV-SV01, TAV-SV02, and TAV-SV03). Soil-vapor sampling ports will be installed in each FLUTe™ well at targeted depths of approximately 50 ft, 100 ft, 150 ft, 200 ft, 250 ft, 300 ft, 350 ft, 400 ft, 450 ft, and 500 ft bgs. The deepest sampling port will be approximately 5 to 10 feet above the water table. A schematic of a typical FLUTe™ well installation is shown in Attachment 1.

The FLUTe™ liners will be installed as directed by the manufacturer. Boreholes for the FLUTe™ wells will be drilled using ARCH in order to minimize the addition of water or drilling fluid to the borehole. The FLUTe™ installation requires the following steps:

- Remove a 10 ft length of steel casing. Unroll the liner and lower through the ARCH drive casing to the bottom of the borehole.
- Lower a 4-inch diameter PVC tremie pipe inside the liner to the bottom of the borehole to ensure the liner is deployed. Pull the tremie pipe off the bottom of the borehole approximately 10 ft.
- Install silica sand through the tremie pipe (adding no water) to expand the liner and force the fabric against the inside wall of the steel casing.
- Tag the top of the sand within the FLUTe™.

- Simultaneously pull the 10 ft joint of steel casing and 10 ft joint of tremie allowing the calculated volume of sand to fall through the tremie and forcing the fabric liner against the borehole wall.
- Repeat this process until the FLUTe™ is full of sand and the fabric liner is pressed against the borehole wall to within approximately 5 ft of the ground surface.
- Pour bentonite pellets into and around the FLUTe™ for the final 5 ft of completion, and hydrate.
- Install a multi-port completion PVC cap to accommodate the soil vapor discharge lines.
- Install a 6-ft long steel protective casing that extends approximately 3 ft above the ground surface, a 4 ft by 4 ft, sloped concrete pad, 3 inch brass cap, and three 4-inch diameter, concrete-filled, steel posts.

5 Equipment Decontamination

The drilling rig and related equipment will be decontaminated at the decontamination pad in Technical Area III prior to the beginning of drilling operations. Decontamination of equipment will also be required after completing each well. Decontamination waste will be kept to a minimum and contained in drums placed on spill control pallets at the decontamination pad.

6 Health and Safety

Level D personal protective equipment is required for all drilling operations. Health and Safety records associated with drilling and development personnel will be maintained on site and will be available from the commencement of drilling activities. All field personnel will operate under an SNL/NM Health and Safety Plan (HASP) and will have SNL/NM-required training, including 40-Hr Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) training and subsequent yearly refresher courses. An SNL/NM Subject Matter Expert will perform a safety inspection of the drill rig before drilling commences.

7 Pre-field activities

Pre-field activities that must be completed prior to drilling include:

- Preparation of the Statement of Work for drilling and monitoring well installation;
- SNL/NM digging permit request and approval;
- SNL/NM site-specific HASP preparation, review, and signatures;
- National Environmental Policy Act review and signatures;
- Sample bottle order for waste samples through Sample Management Office;
- Waste Management Plan preparation;
- Field checklist completion, review, and approval; and
- Readiness review meeting.

8 Mobilization and Site Setup

SNL/NM personnel will ensure that containers for cuttings have been obtained and are ready for drilling operations. If required, roll-off bins supplied by SNL/NM will be used to collect drill cuttings for waste management purposes.

9 Reporting

Based on the requirements established by the NMED, NMOSE and SNL/NM FOPs, the field activities associated with decommissioning and installation of the monitoring wells will be documented.

All well installation field activities will be documented in a field log book per guidance in FOP 94-45. Upon completion of the well installation, the Field Report will document all site activities and provide final as-built well completion diagrams developed from the Groundwater Monitoring Well Data Sheets (Attachment 2). The Field Report will contain a brief narrative describing actual work performed at the site and any variances to the Technical Area-V Groundwater Investigation Work Plan. Information to be contained in the Field Report include: (1) daily field activity notes, (2) all materials used, (3) a final "as-built" well completion diagram, (4) geophysical logs, and (5) documentation of notification of SNL/NM Geographic Information System group and the appropriate regulatory agencies. The documentation will also include the 37 information elements required in Section VIII.D of the Order (NMED April 2004). The following list of documents and records that are generated as part of the well installation process will be provided to the SNL/NM Well File Coordinator who, in turn, will submit them to the SNL/NM Customer-Funded Records Center:

- Well permit agreement
- Well file contents checklist
- Well data summary sheet
- Statement of work for drilling the well
- Drilling permit
- Lithologic (boring) log
- Geophysical logs
- Well construction diagram and completion parameters
- Well development data and groundwater parameters
- Copies of field logbook (geologist, driller)
- Surveyed elevations and location in New Mexico state plane coordinates (with a degree of accuracy of ± 0.01 ft)
- Location map
- Water level measurements
- Aquifer test data
- Analytical data
- Waste management documentation
- Photographs

10 Sampling

SNL/NM will perform eight quarters of groundwater sampling at the three new TA-V groundwater monitoring wells, and eight quarters of soil-vapor sampling at the three new TA-V FLUTe™ wells. The existing groundwater monitoring wells (AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW3, TAV-MW4, TAV-MW5, TAV-MW6, TAV-MW7, TAV-MW8, TAV-MW9, and TAV-MW10) will be sampled annually. Groundwater and soil-vapor sampling will be conducted in conformance with Sampling and Analysis Plans prepared for each quarterly/annual sampling event.

10.1 Groundwater Sampling

Sampling will be conducted in accordance with the NMED Position Paper "Use of Low-Flow and other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring" (NMED October 2001) or in accordance with U.S. Environmental Protection Agency (EPA) guidance "RCRA Groundwater Monitoring Technical Enforcement Guidance Document" (EPA September 1986).

A portable Bennett™ sampling system will be used to collect the groundwater samples. The Bennett™ sampling pump and tubing bundle shall be decontaminated prior to installation in monitoring wells according to procedures described in FOP 05-03 "General Sampling Equipment Decontamination." After decontamination, the pump intake will be set near the bottom of the screen interval at all well locations. Given the limitations of the equipment and the hydrologic properties of each well, a minimal flow rate will be maintained during purging and sampling activities.

In accordance with procedures described in FOP 05-01 "Groundwater Monitoring Well Sampling and Field Analytical Measurements", all wells will be purged a minimum of one saturated casing volume (the volume of one length of the saturated screen plus the borehole annulus around the saturated screen interval). After the minimum volume is removed, purging will continue until four consecutive measurements of water quality parameters (turbidity, pH, temperature, and SC) exhibit stabilized conditions. Groundwater stability is considered acceptable for monitoring when measurements are within 10 % (or $\leq$ 5) nephelometric turbidity units for turbidity, 0.1 pH units, 1.0 degrees Celsius, and SC is within 5 %. Additional field parameters to be collected for all wells may include redox potential, dissolved oxygen, and water level measurements. Dissolved oxygen units shall be reported in both percent saturation and milligrams per liter. The static water level will be measured at each well prior to well purging, and water levels will be measured during purging and recorded on the field measurement log.

Groundwater samples will be collected directly from the sample discharge tube into laboratory prepared sample containers. If required, chemical preservatives will be added to the sample containers at the analytical laboratories prior to shipment to the field crew. Immediately after collection, all sample containers will be custody-taped, sealed in plastic bags, and placed on blue ice in shipping containers. Analytical Request/Chain-of-Custody forms will be completed at the time of collection and will accompany the sample containers to the analytical laboratories.

Environmental samples will be collected and analyzed for VOCs and nitrate plus nitrite using EPA analytical Method SW846-8260 and Method 353.2 (EPA 1990 and EPA 1983), respectively. Samples will be sent to General Engineering Laboratories (or other EPA-certified contract laboratory) for analysis. Quality control samples will include trip blank samples, duplicate samples, equipment blank samples, and field blank samples.

10.2 Soil-Vapor Sampling

Soil-vapor sampling field activities consist of preparation, purging, VOC monitoring, sample collection, and sample shipping. The SNL/NM AOPs and FOPs for these activities are listed in Table 1.

Pre-field preparations include a vacuum check of the Summa canister and calibration of the photo ionization detector (PID). At the FLUTe™ wellhead, a vacuum pump connected to the sample tubing via a Swagelok® or equivalent fitting will be used to purge soil vapor from the monitoring ports and sample tubing. The stream of soil vapor extracted from the sampling port during purging will be monitored with the PID and the readings recorded in the field logbook. Samples will be collected through the multiport manifold provided by the FLUTe™ well manufacturer, which allows uniform purging at each sampling depth.

The soil-vapor samples will be transferred directly for the vapor discharge line to Summa® canisters. Summa® canisters are reusable containers provided with a permanent identification number. The number will be recorded in the logbook and the Analysis Request/Chain of Custody form. The canisters will be placed in shipping boxes and returned to the Sample Management Office for shipment to the laboratory.

The soil-vapor samples will be analyzed for VOCs by EPA Compendium of Methods for the Determination of Toxic Organic (TO) Compounds in Ambient Air (Method TO-14A) (EPA January 1999). The off-site laboratory is responsible for implementing the requirements of the method, including analytical methodology, target analytes for quantification, and internal Quality Assurance/Quality Control procedures.

11 Aquifer Parameters

Aquifer testing within a well provides estimates of hydraulic parameters by measuring the effects of induced stress in an aquifer around a well. Stress can be induced by either withdrawing or injecting water into the well, creating a change in the water level in the well. Such a change in water level can be made instantaneously with a discrete column, referred to as a slug test.

Slug tests will be performed on TAV-MW11, TAV-MW12, and TAV-MW13 with a solid aluminum rod “slug” lowered into the well to raise and lower the water level in the well. Water-level changes induced in the wells will be measured using a Solinst™ electronic pressure transducer (or equivalent) and data logger software. The “slug out” (removal of slug from the water column) portion of the test for each well will be recoded and analyzed. The Hvorslev analytical method (Hvorslev 1951) will be applied to the slug test data and the hydraulic conductivities calculated from the slug tests performed on the three wells will be presented in the revised TA-V Current Conceptual Model.

12 Schedule

The basis for the schedule shown in Figure 2 is the logical development of project tasks and activities to implement the tasks described in this TA-V Groundwater Investigation Work Plan.

Per the requirements of the NOD (NMED July 2008) the schedule includes the date of submission to the NMED of the Well Installation Report (February 2010); and TA-V Groundwater Investigation Report (revised Current Conceptual Model)/revised CME Report (August 2012).

13 References

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bulletin No. 26, Waterways Experiment Station, Corps of Engineers, U.S. Army, Vicksburg, Mississippi.

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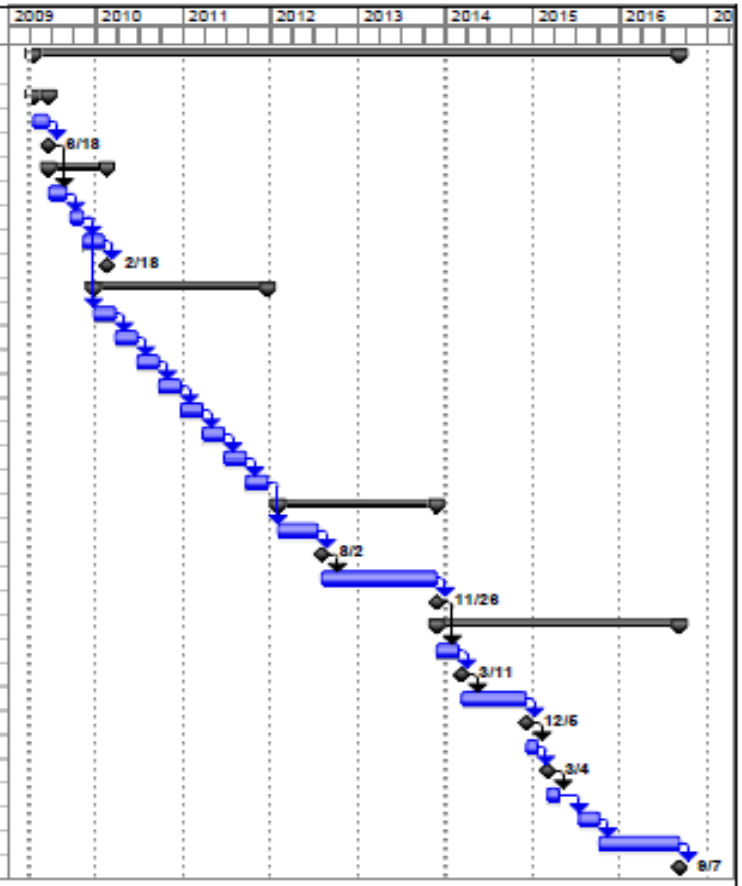
Figure 2. TA-V Groundwater Investigation Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Corrective Measures Evaluation and Implementation for TA-V Groundwater**	**1828 days**	**Fri 4/17/09**	**Wed 9/7/16**	
2	**Work Plan/ Respond to NOD**	**46 days**	**Fri 4/17/09**	**Thu 6/18/09**	
3	NMED Review (based on COoC)	45 days	Fri 4/17/09	Thu 6/18/09	
4	NMED Approval of Work Plan	0 days	Thu 6/18/09	Thu 6/18/09	3
5	**Drilling Program**	**176 days**	**Fri 6/19/09**	**Thu 2/18/10**	
6	Pre-Field Planning (SOW, OSE, HASP)	55 days	Fri 6/19/09	Thu 9/3/09	4
7	Field Effort	40 days	Fri 9/18/09	Thu 11/12/09	6FS+10 days
8	Post-Field (Prepare Installation Report)	60 days	Fri 11/13/09	Thu 2/4/10	7
9	Submit Installation Report to NMED	0 days	Thu 2/18/10	Thu 2/18/10	8FS+10 days
10	**Quarterly Sampling**	**620 days**	**Fri 12/25/09**	**Thu 12/22/11**	
11	Groundwater: Event 1	65 days	Fri 12/25/09	Thu 3/25/10	7FS+30 days
12	Groundwater: Event 2	65 days	Fri 3/26/10	Thu 6/24/10	11
13	Groundwater: Event 3	65 days	Fri 6/25/10	Thu 9/23/10	12
14	Groundwater: Event 4	65 days	Fri 9/24/10	Thu 12/23/10	13
15	Groundwater: Event 5	65 days	Fri 12/24/10	Thu 3/24/11	14
16	Groundwater: Event 6	65 days	Fri 3/25/11	Thu 6/23/11	15
17	Groundwater: Event 7	65 days	Fri 6/24/11	Thu 9/22/11	16
18	Groundwater: Event 8	65 days	Fri 9/23/11	Thu 12/22/11	17
19	**Revise Current Conceptual Model/CME Report**	**473 days**	**Fri 2/3/12**	**Tue 11/26/13**	
20	Prepare/Review/Revise	120 days	Fri 2/3/12	Thu 7/19/12	18FS+30 days
21	Submit to NMED	0 days	Thu 8/2/12	Thu 8/2/12	20FS+10 days
22	NMED Review (Based on Fee Regulations)	343 days	Fri 8/3/12	Tue 11/26/13	21
23	NMED Approval of Investigation Report	0 days	Tue 11/26/13	Tue 11/26/13	22
24	**CM Implementation Plan**	**728 days**	**Wed 11/27/13**	**Wed 9/7/16**	
25	Prepare/Review/Revise	65 days	Wed 11/27/13	Tue 2/25/14	23
26	Submit to NMED	0 days	Tue 3/11/14	Tue 3/11/14	25FS+10 days
27	NMED Review (Base on Fee Regulations)	193 days	Wed 3/12/14	Fri 12/5/14	26
28	NMED Approval of CM Implementation Plan	0 days	Fri 12/5/14	Fri 12/5/14	27
29	Public Review of CME Report	33 days	Mon 12/8/14	Wed 1/21/15	28
30	NMED Issue SOB, Intent to Select Final Remedy	0 days	Wed 3/4/15	Wed 3/4/15	29FS+30 days
31	Public Review of Final Remedy	35 days	Thu 3/5/15	Wed 4/22/15	30
32	NMED Selects Final Remedy	60 days	Thu 7/16/15	Wed 10/7/15	31FS+60 days
33	Prepare/Conduct Remedy Selection Hearing	240 days	Thu 10/8/15	Wed 9/7/16	32
34	NMED Issues Decision of Final Remedy	0 days	Wed 9/7/16	Wed 9/7/16	33



Project: NOD ScheduleR1
Date: Mon 3/30/09

Task | Milestone | External Tasks
Split | Summary | External Milestone
Progress | Project Summary | Deadline

Page 1

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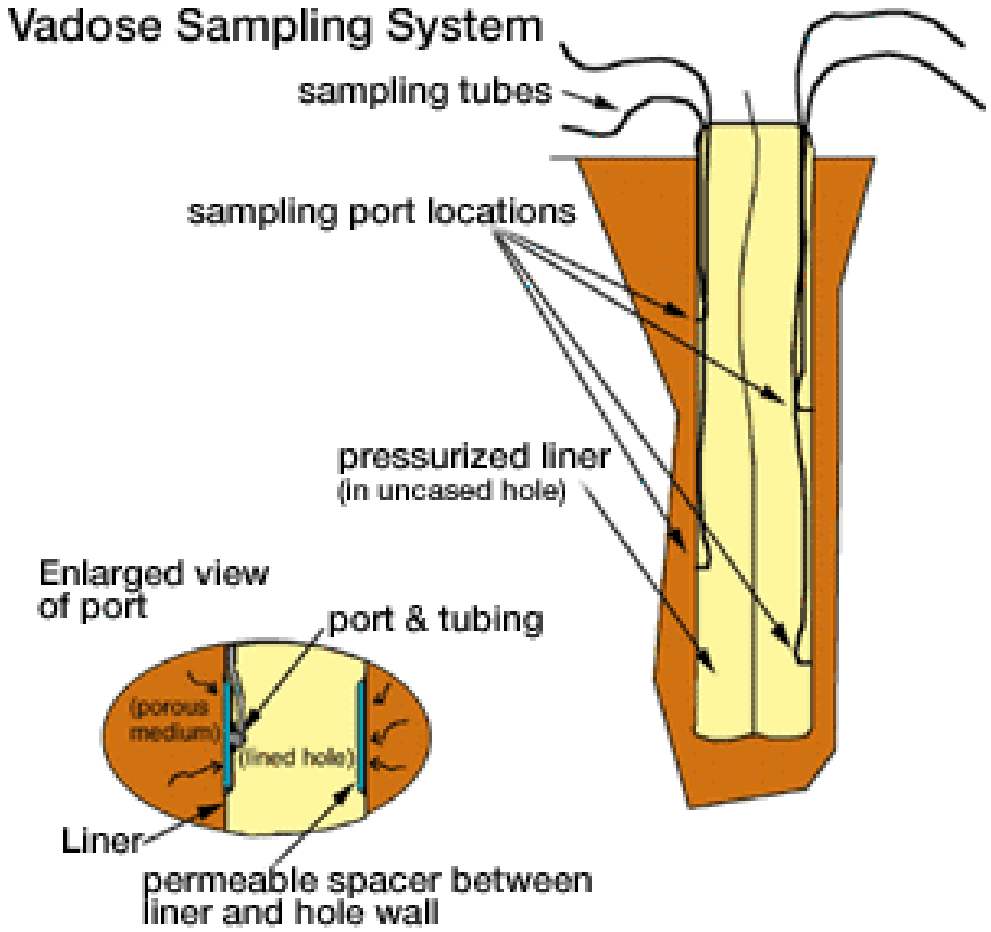
Attachment 1

Schematic of FLUTe™ Soil-Vapor Monitoring Well



Attachment 2

Groundwater Monitoring Well Data Sheet

SNL/NM Groundwater Monitoring Well Data Sheet

PROJECT NAME: _____
ER ADS #: _____
WELL NAME: _____
OWNER: _____
DATE DRILLING BEGAN: _____
DRILLING CONTRACTOR: _____
DRILLING METHOD: _____
BOREHOLE DEPTH: _____
BOREHOLE DIAMETERS: _____

GEOGRAPHIC LOCATION: _____
WELL COMPLETION DATE: _____
COMPLETION ZONE: _____
FORMATION OF COMPLETION: _____
REMARKS: _____

Survey Data

Survey Date: _____
Surveyed by: _____

State Plane Coordinates
(X) Easting = _____
(Y) Northing = _____

Surveyed Elevations
(feet above sea level)

Protective Casing: _____
(Elev. D - FOP 94–71)

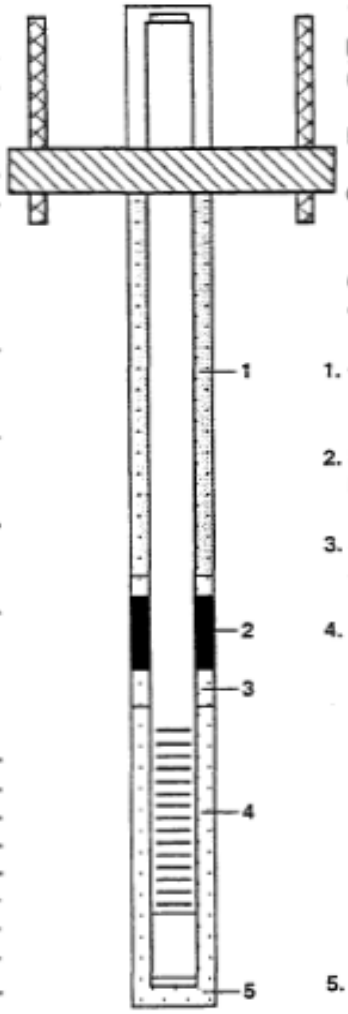
Top of Inner Well Casing: _____
(Elev C - FOP 94–71)

Concrete Pad: _____
(Elev B - FOP 94–71)

Ground Surface: _____
(Elev A - FOP 94–71)

Calculated Elevations
(feet above sea level)
Initial Water Level: _____
Other: _____
Comments: _____

Form Completed by: _____
Verified by: _____



Completion Data

Measured Depths
(feet below ground surface)

Initial Water Level: _____

Casing Stickup: _____
(above ground level)

Casing OD (in.): _____
Casing ID (in.): _____

1. Grout/Backfill Interval: _____
   Material: _____
2. Seal Interval: _____
   Material: _____
3. Secondary Pack Interval: _____
   Secondary Pack Size: _____
4. Primary Pack Interval: _____
   Primary Pack Size: _____

   Screen Interval: _____
   Slot Size: _____
   Material: _____

   Sump Length: _____

   Casing Depth: _____
   Material: _____
5. Plug Back Interval (if used): _____
   (Casing TD-Hole TD) _____
   Plug Material (if used): _____

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Appendix B

Documentation in Support of Notice of Disapproval Comment 3:

- New Table B-1: Comparison of Previous and New TOC Elevations for the TA-V Groundwater Monitoring Wells.
- New Table B-2: Summary of September 2008 Survey Elevations for the TA-V Monitoring Wells.
- New Table B-3: Summary of Water Level Elevations for the TA-V Monitoring Wells, January 2009.
- New Figure B-1: TA-V Monitoring Wells and Potentiometric Surface Map (January 2009).

Table B-1
Comparison of Previous and New TOC Elevations for the TA-V Groundwater Monitoring Wells

Well ID	Previous TOC Elevation (FAMSL)	New September 2008 TOC Elevation (FAMSL)	Difference (new - previous) (ft)
AVN-1	5440.55	5440.27	-0.28
AVN-2	5439.93	5439.66	-0.27
LWDS-MW1	5422.19	5421.05	-1.14
LWDS-MW2	5409.81	5409.68	-0.13
TAV-MW2	5424.86	5424.60	-0.26
TAV-MW3	5461.73	5461.53	-0.2
TAV-MW4	5425.39	5425.16	-0.23
TAV-MW5	5406.20	5405.98	-0.22
TAV-MW6	5428.74	5428.44	-0.3
TAV-MW7	5428.00	5427.67	-0.33
TAV-MW8	5414.55	5414.27	-0.28
TAV-MW9	5413.83	5413.54	-0.29
TAV-MW10	5434.30	5434.30	0

Notes:
FAMSL = Feet above mean sea level
ft = Foot (feet)
ID = Identification
TA-V = Technical Area-V
TOC = Top of (inner well) casing

Table B-2
Summary of September 2008 Survey Elevations for the TA-V Monitoring Wells

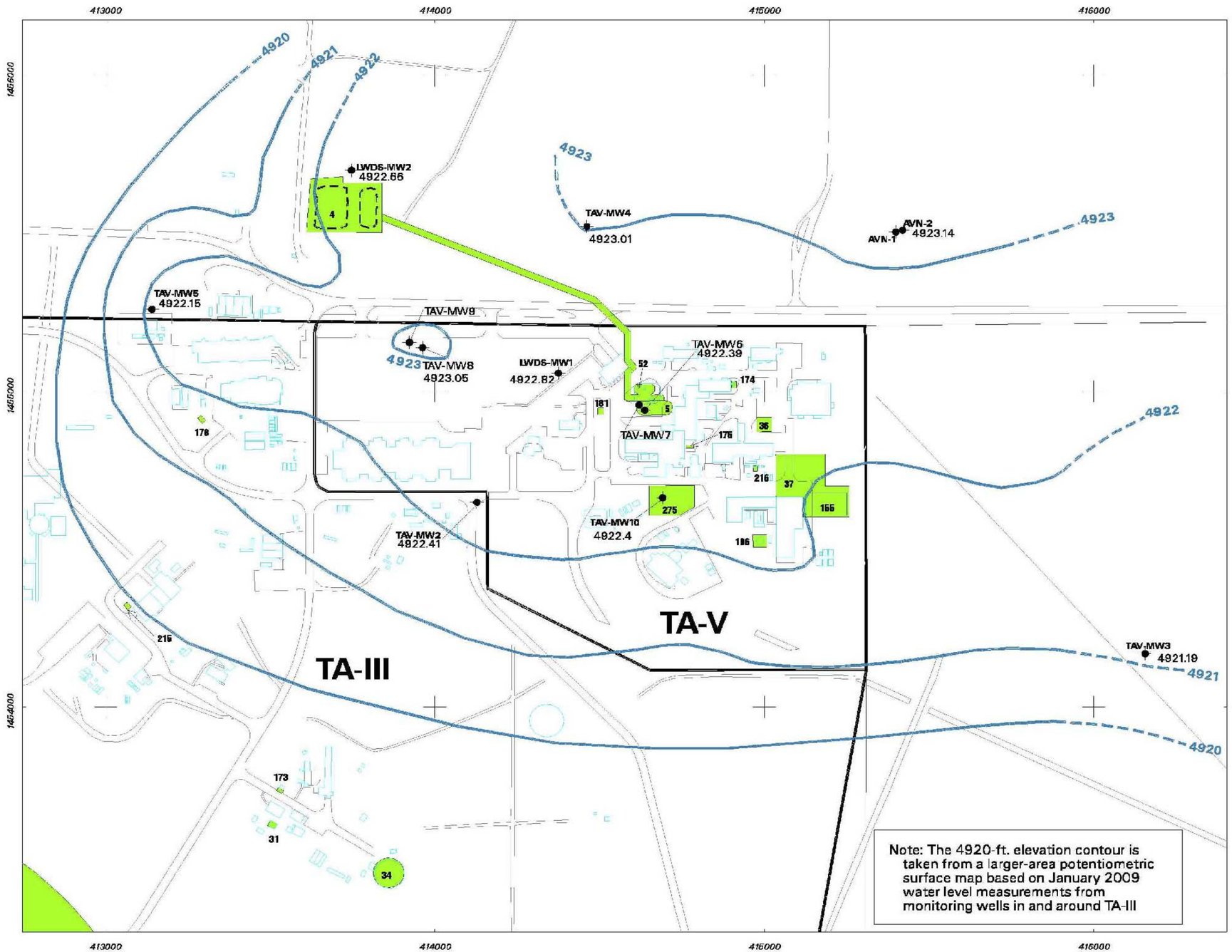
Well ID	Ground Elev. (FAMSL)	TOC Elev. (FAMSL)	Protective Cover Elev. (FAMSL)	Pad Elev. (FAMSL)
AVN-1	5437.50	5440.27	5441.32	5437.65
AVN-2	5437.86	5439.66	5440.42	5438.00
LWDS-MW1	at grade completion	5421.05	5421.75	5421.76
LWDS-MW2	5408.72	5409.68	5410.96	5408.9
TAV-MW2	5421.60	5424.60	5425.55	5421.99
TAV-MW3	5458.82	5461.53	5462.1	5459.19
TAV-MW4	5422.65	5425.16	5425.84	5423.16
TAV-MW5	5403.91	5405.98	5406.62	5403.96
TAV-MW6	at grade completion	5428.44	5428.83	5428.79
TAV-MW7	at grade completion	5427.67	5428.13	5428.12
TAV-MW8	at grade completion	5414.27	5414.69	5414.68
TAV-MW9	at grade completion	5413.54	5414.11	5414.13
TAV-MW10	5431.95	5434.30	5434.94	5432.53

Notes:
Elev. = Elevation
FAMSL = Feet above mean sea level
ID = Identification
TA-V = Technical Area-V
TOC = Top of casing

Table B-3
Summary of Water Level Elevations for the TA-V Monitoring Wells, January 2009

Well ID	TOC Elev. (FAMSL, September 2008)	Measured Depth to Water (FBTOC)	Water Level Elevation (FAMSL)
AVN-1	5440.27	519.77	4920.50
AVN-2	5439.66	516.52	4923.14
LWDS-MW1	5421.05	498.23	4922.82
LWDS-MW2	5409.68	487.02	4922.66
TAV-MW2	5424.60	502.19	4922.41
TAV-MW3	5461.53	540.34	4921.19
TAV-MW4	5425.16	502.15	4923.01
TAV-MW5	5405.98	483.83	4922.15
TAV-MW6	5428.44	506.05	4922.39
TAV-MW7	5427.67	508.66	4919.01
TAV-MW8	5414.27	491.22	4923.05
TAV-MW9	5413.54	495.03	4918.51
TAV-MW10	5434.30	511.90	4922.40

Notes:
FAMSL = Feet above mean sea level
FBTOC = Feet below top of casing
ID = Identification
TA-V = Technical Area-V
TOC = Top of (inner well) casing



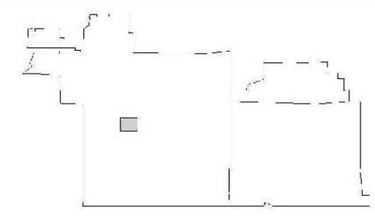
Legend

- Monitoring Well, with Water Table Elevation (feet above mean sea level)
- Groundwater Elevation Contour (1-ft. interval, dashed = inferred)
- Road
- Impoundment boundary
- Solid waste management unit (SWMU)
- SNL/NM technical area
- Building

Note: Wells AVN-1, TAV-MW7, and TAV-MW9 are completed below the water table, and were not used for water table contouring

0 340 680
Scale in Feet

0 82 164
Scale in Meters



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Figure B-1
TA-V Monitoring Wells and Potentiometric Surface Map (January 2009)

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

	1:4080	MAPID=090067
		SNL EGIS ORG. 4133
DHelfrich	dh090067.aml	03/06/09

Appendix C

Documentation in Support of Notice of Disapproval Comment 8:

- Compact Disk Containing Spreadsheet with Analytical Results for Groundwater Sampling and Elevations at All TA-V, LWDS, and AVN Monitoring Wells, July 2005 through December 2008.