Mr. James Bearzi,
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East, Bldg. 1
Santa Fe, NM  87505

Dear Mr. Bearzi:

On behalf of Sandia Corporation (Sandia) and the Department of Energy (DOE), DOE is submitting a Summary Report for Technical Area V Monitoring Well Plug and Abandonment and Installation: Decommissioning of Groundwater Monitoring Well TAV-MW1 and Installation of Groundwater Monitoring Well TAV-MW10.

If you have any questions regarding this submittal, please contact me at (505) 845-6036, or Dan Pellegrino of my staff at (505) 845-5398.

Sincerely,

[Signature]
Patty Wagner
Manager

cc w/enclosure:
W. Moats, NMED (Via Certified Mail)
L. King, EPA, Region 6 (Via Certified Mail)
T. Skibitski, NMED-OB
B. Birch, NMED-OB
James Bearzi

cc w/o enclosure:

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D. Miller, SNL/NM, Org 6765, MS 0718
J. Cochran, SNL/NM, Org 6765, MS 0719
M. Sanders, SNL/NM, Org. 6765, MS 1089
S. Griffith, SNL/NM, Org. 6765, MS 1089
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B. Langkopf, SNL/NM, Org. 6765, MS 1089
Records Center, SNL/NM, Org.6765, MS 1089
T. Longo, HQ/GTN, NA-56
CERTIFICATION STATEMENT FOR APPROVAL AND FINAL RELEASE OF DOCUMENTS


Document author: Mike Sanders, Department 06765

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature: Francis B. Kimick
Deputy to the
Nuclear Energy and Global Security Technologies
Center 6700
Sandia National Laboratories/New Mexico
Albuquerque, New Mexico 87185
Operator

and

Signature: Patty Wagner
Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
Owner and Co-Operator

Date: 6/18/08

Date: 6/27/08
SUMMARY REPORT FOR TECHNICAL AREA V
MONITORING WELL PLUG AND ABANDONMENT AND INSTALLATION
Decommissioning of
Groundwater Monitoring Well TAV-MW1
Installation of
Groundwater Monitoring Well TAV-MW10

June 2008

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

Sandia National Laboratories 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-AC04-94AL8500
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E  Well Construction Diagram for TAV-MW10
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# ACRONYMS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Acronym</th>
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<tr>
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</tr>
<tr>
<td>ARCH</td>
<td>air rotary casing hammer</td>
</tr>
<tr>
<td>bgs</td>
<td>below ground surface</td>
</tr>
<tr>
<td>BV</td>
<td>bore volume</td>
</tr>
<tr>
<td>°C</td>
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</tr>
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<td>foot, feet</td>
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<td>FOP</td>
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</tr>
<tr>
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</tr>
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<td>KAFB</td>
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<tr>
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</tr>
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<tr>
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<td>National Nuclear Safety Administration</td>
</tr>
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<td>nephelometric turbidity unit</td>
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<td>New Mexico Environment Department</td>
</tr>
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<td>NMOSE</td>
<td>New Mexico Office of State Engineer</td>
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<tr>
<td>NOD</td>
<td>Notice of Deficiency</td>
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1.0 INTRODUCTION

This report documents the activities for the plugging and abandoning (P&A), and the installation of groundwater monitoring wells at Technical Area V (TA-V) at Sandia National Laboratories/New Mexico (SNL/NM). The activities were performed in January through March 2008 by the SNL/NM Environmental Restoration (ER) Project personnel and the drilling contractor WDC Exploration and Wells (WDC).

1.1 Regulatory Action

On April 20, 2007, the U. S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) and Sandia Corporation (Sandia), hereinafter referred to as NNSA/Sandia, submitted to the New Mexico Environment Department (NMED) a Well Plug and Abandonment and Replacement Plan for groundwater monitoring well TAV-MW1 (SNL/NM April 2007).

However, in June 2007, the NMED issued a Notice of Disapproval (NOD) regarding this plan (Bearzi June 2007). The NOD listed 13 items that needed to be addressed in a revised plan.

In August 2007, NNSA/Sandia submitted the revised Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan: Decommissioning of Groundwater Monitoring Well TAV-MW1 and Installation of Replacement Groundwater Monitoring Well TAV-MW10 (the Plan) to the NMED (SNL/NM August 2007). The revised plan addressed the issues listed in the NOD. The NMED issued a Notice of Approval on October 26, 2007 (Bearzi October 2007).

1.2 Site Description and History

TA-V is located on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). TA-V is located in the central part of KAFB, south of the City of Albuquerque (Figure 1-1). TA-V facilities are designed to test radiation effects on components. These facilities include two research reactors, an intense gamma irradiation facility, and a hot-cell facility. Historically, wastewater containing contaminants derived from these facilities was disposed to drainfields, seepage pits, and unlined ponds.

Numerous subsurface investigations have been conducted in conjunction with surface remediation activities at TA-V. These investigations have resulted in a substantial body of information available in a series of publications and other data sources concerning elements of conceptual models of contaminant release and transport through the vadose zone and Santa Fe Group aquifer (SNL/NM April 2004).

After the replacement of TAV-MW1 with TAV MW10, the current TA-V groundwater monitoring well network consists of thirteen wells completed within interfingering alluvial fan and fluvial deposits of the Upper Santa Fe Group (Figure 1-2) (SNL/NM April 2004). The current TA-V monitoring well network includes three background wells (TAV-MW3, AVN-1, and AVN-2), eight performance wells (TAV-MW2, TAV-MW4, TAV-MW6, TAV-MW7, TAV-MW8, TAV-MW9, the new TAV-MW10, and LWDS-MW1), and two sentry wells (TAV-MW5 and LWDS-MW2). With the exception of AVN-1 (constructed of 5-inch stainless steel), the TAV monitoring wells are constructed of nominal 5-inch, Schedule 80 polyvinyl chloride (PVC) casing, and have 20-foot (ft) long slotted Schedule 80 PVC screens.
Figure 1-1. Location Map of Sandia National Laboratories and Kirtland Air Force Base
Groundwater levels have been declining in the regional aquifer throughout the SNL/NM and KAFB area, and monitoring well TAV-MW1, installed in 1995, contained less than 1 ft of water when it was last measured in December 2007. For this reason, TAV-MW1 was decommissioned and new replacement monitoring well TAV-MW10 was installed at a location approximately 10 feet (ft) west of TAV-MW1. (Figure 1-2).

1.3 Objective

The objective of this project was to successfully P&A TAV-MW1 by grouting the well in situ and to install replacement well TAV-MW10. This report is organized in chronologic order of activities: the P&A of TAV-MW1, the drilling and installation of TAV-MW10, and the development of TAV-MW10.

The report meets the reporting requirements of the NMED and the New Mexico Office of the State Engineer (NMOSE). The NMED Compliance Order on Consent (the Order) specifies the required elements for reporting on installation of monitoring wells (NMED April 2004) (Attachment A). The NMOSE requirements and guidance can be found in Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells (NMOSE August 2005).
Figure 1-2. TA-V Groundwater Monitoring Well Network, Including Abandoned Well TAV-MW1, and Replacement Well TAV-MW10
2.0 PLUG AND ABANDONMENT

The monitoring well TAV-MW1 was plugged in situ on January 30 and February 5, 2008. A Groundwater Well Abandonment Diagram is included as B. On January 30 bentonite slurry grout mix was pumped into the well casing and screen with a portable grout plant. Grout was pumped through tubing placed at the bottom of the well and was pulled up as well was filled. The well was grouted from the bottom of the well at 509.5 ft below ground surface (bgs) to within approximately 20 ft of the surface and allowed to set overnight. A total of approximately 670 gallons of bentonite grout (consisting of twenty-eight 50-pound bags of bentonite and water) were pumped into the well on January 30. On February 5, the well and open portion of the annulus was filled to close to the surface by mixing bentonite grout in a tub, and pumping it into the well. The existing 5-ft length of protective conductor casing, concrete well pad, and steel guard posts were then removed from the surface of the well head at that time. On February 6, 2008, the well and annulus were filled to within 2 ft of the surface with coarse bentonite chips. The final 2 ft of the well and annulus were then filled with concrete, and a 3-ft by 3-ft concrete well monument was constructed over the location of the former well, and a brass marker was set in the monument. The marker was stamped with the abandoned well name, date of P&A, and well depth. Field notes for the TAV-MW1 P&A are provided as Attachment C.
3.0 DRILLING AND WELL INSTALLATION

All drilling, well installation, and well development operations were performed by WDC and were supervised by SNL/NM ER Project personnel. No geophysical logging was completed in this borehole. The borehole for TAV-MW10 was drilled using the air rotary casing hammer (ARCH) method.

The following sections describe the borehole drilling, lithologic logging, and well construction. Complete field documentation, field forms, daily driller reports, and lithologic logs, are on file at the SNL/NM Customer-Funded Records Center. Field notes for the installation and construction of TAV-MW10 are also included as Attachment C.

3.1 Drilling Operations

Prior to the start of drilling operations in TA-V, the drilling equipment (a Speedstar 30K drilling rig and associated equipment) was decontaminated at the ER Project decontamination pad in TA-III prior to the start of drilling operations. Drilling of the borehole for well TAV-MW10 commenced on January 31, 2008. The first 200 ft of borehole was advanced with a tricone bit and with 11 3/4-inch outside diameter (OD) drive casing to accommodate drilling through caliche and gravel zones. At 200 ft bgs, the bit and drive casing was switched to 9 5/8-inch OD and the smaller drive casing was telescoped into the larger diameter drive casing. This telescoping procedure was used to reduce the buildup of borehole wall friction, and mitigate difficulties in removing the drive pipe if only one diameter had been used for the entire length of the borehole. The depth to water in the adjacent well TAV-MW1 (located approximately 10 ft east of the drilling location) was approximately 510 ft bgs in December 2007 before it was decommissioned, and the total depth (TD) of the replacement well TAV-MW10 borehole TD was determined and planned for based upon this known water level at the site. The TD of the cased borehole (539 ft bgs) was achieved on February 2, 2008.

3.2 Lithologic Logging

A lithologic log based on the cuttings returned from the borehole was generated by the ER Project geologist. A combination diagram showing the lithologic log, and well construction details is included as Attachment D.

The surface geology in the TA-V area is characterized by a veneer of post-Santa Fe Group aeolian sediments underlain by late Pliocene to Pleistocene upper Santa Fe Group alluvial fan deposits. These alluvial fan deposits extend to, and below the water table in the TA-V area, and originated in the Manzanita Mountains east of TA-V. They typically consist of a mixture of silts, sands, and gravels that are poorly sorted, and exhibit moderately connected lenticular bedding. Individual beds range from 1 to 5 ft in thickness with a preferred east-west orientation and have moderate to low hydraulic conductivities (SNL/NM March 1996).

From the surface to 80 ft bgs, the TAV-MW10 borehole penetrated a mixture of gravel, sand, and silt, with gravel fragments up to 1.5 inches in diameter. Sediments from 80 to 512 ft bgs consisted predominantly of fine-grained silty sand and clayey sandy silt. This interval also contained relatively thin layers of mixed gravel, sand, and silt from 343 to 348, 435 to 448, and 499 to 503 ft bgs. A relatively coarse interval consisting of a mixture of gravel (with fragments up to 3 inches in diameter), sand, and silt was then penetrated at approximately two ft below the water table (at 510 ft. bgs) and was present from
512 to 531 ft bgs. The bottom 8 ft of the borehole from 531 to 539 ft bgs penetrated relatively fine silts and sands.

3.3 Initial Groundwater Level and Well Construction

As borehole drilling penetrated the saturated zone starting at approximately 510 ft bgs, cuttings returns to the surface became increasingly sparse because the damp fine-grained sediments were sticking to the interior of the drive pipe. The cuttings indicated that the lithology changed from relatively fine, low hydraulic conductivity material (clayey sandy silt) to significantly coarser sediments at a depth of 512 ft bgs. Water injection was started at 517 ft bgs to facilitate return of the cuttings to the surface. The coarser material persisted to 531 ft bgs, and then appeared to change back into relatively fine grained sediments to the bottom of the borehole at 539 ft bgs.

Since this new borehole was located only about 10 ft away from the TAV-MW1 well, and it was known that the last water level in that well (measured in December 2007) was approximately 510 ft bgs, it was concluded that the new well could be designed and constructed without waiting overnight for the static water level to recover in the borehole. Well installation therefore began on the same day that the borehole TD was achieved (February 2, 2008), and commenced as soon as the drill bit and pipe were tripped out of the hole. The well was constructed of nominal 5-inch diameter (inside diameter [ID] of 4.767 inches and OD of 5.563 inches) Schedule 80 PVC flush-threaded blank casing and a 20-ft length of 0.020-inch slot schedule-80 PVC screen. This screen slot size was specified in the Plan to accommodate the relatively coarse sands and gravels present in most of the screened interval. The sump consisted of a 5-ft length of nominal 5-inch diameter Schedule 80 PVC flush-threaded blank casing with a threaded end cap placed at the bottom.

The bottom of the 5-ft-long sump in well TAV-MW10 was placed at 533 ft bgs and the 20-ft screen section was placed from 508 to 528 ft bgs. Most of the 20-ft well screen was installed in the relatively coarse, transmissive unit encountered from 512 to 531 ft bgs in the borehole. Approximately 6 ft of #10-20 sand (Colorado Silica Sand) was used to backfill the borehole below the sump from 539 to 533 ft bgs. The #10-20 sand was also used as the primary sand pack in the annulus around the screen, and also 9 ft above the top of the screen to 499 ft bgs. A 5-ft secondary sand pack layer using #40-60 Colorado Silica sand was then placed from 499 to 494 ft bgs. A 39-ft volclay coarse chip plug was then placed above the secondary sand pack, from 494 to 455 ft bgs. The chip plug was then hydrated with approximately 150 gallons of water, and was allowed to set for more than one hour. A bentonite grout mixture (consisting of a ratio of three 50-pound bags of sand-sized bentonite product mixed with 100 gallons of water) was used to fill the annulus from 455 to 7 ft bgs. The first lift of approximately 120 ft of grout was placed and allowed to set for 24 hours. The subsequent lifts of grout were placed in approximately 100-ft lifts and allowed to set for a minimum of approximately one hour. Figure 3-1 shows well construction activities taking place on February 4, 2008. The final grout lift was installed on February 5, 2008, and was brought to 7 ft bgs. The drive pipe was tripped out of the borehole as well construction materials were added, with care being taken to keep the bottom of the drive pipe below the top of the construction materials at all times during well construction, to prevent collapse of the borehole. The Well Construction Diagram for TAV-MW10 is provided in Attachment E.

3.4 Wellhead Construction

A 10-ft length of nominal 12-inch diameter steel casing was used as the protective casing at the surface. On February 6, 2008 the casing was placed approximately 7-ft below ground and 3-ft above and was equipped with a hinged locking cap. A fitted locking well cap was also placed on the PVC casing. Concrete was placed in the annulus from the top of the grout at 7 ft bgs to the surface. A 3-ft by 3-ft pad was built around the casing and a brass marker cap was placed in the pad denoting the well name. Three steel guard posts were placed around the pad, and the posts and the protective casing were painted yellow.
Figure 3-1. TAV-MW10 Well Construction Activities on February 4, 2008. View Looking Northeast.
4.0 WELL DEVELOPMENT

Well development of TAV-MW10 was conducted March 12 and 13, 2008, in accordance with the Well Development Field Operating Procedure (FOP) 94-41 (SNL/NM November 1994). The well was developed with a WDC development rig. The pre-development water level reading taken on March 12, 2008, was approximately 509.5 ft bgs. The calculated saturated well bore volume (BV) includes the saturated portion of the screen, and the pore space [estimated to be 30 percent] in the portion of the annular gravel pack surrounding the saturated portion of the screen) was approximately 33 gallons.

Water quality parameters required by FOP 94-41 were measured and recorded with a flow-through meter during the well development, including:

- Temperature (degrees Celsius [°C])
- Specific Conductivity (millisiemens/cubic centimeter [mS/cm³])
- pH (potential of hydrogen), and
- Turbidity (measured in nephelometric turbidity units [NTUs]).

Additional water measurements not required by FOP 94-41 that were recorded during purging included:

- Oxygen-reduction potential (millivolts [MV])
- Dissolved oxygen (DO), percent
- Dissolved oxygen (milligrams per liter [mg/L])

The development began by initially removing accumulated fine sediment in the well sump with a stainless steel bailer (very little sediment was recovered from the sump). The well screen was then swabbed for approximately 30 minutes, and the bailer was then used to evacuate 150 gallons of very turbid (much greater than 1000 NTUs) water from the well. The well screen was then swabbed a second time for approximately 30 minutes, and another 150 gallons of turbid water was bailed. The well was swabbed for a third and final time, followed by bailing another 150 gallons of water. A total of 450 gallons (13.6 BVs) of water was bailed from the well, and it continued to be fairly turbid (approximately 1000 NTUs) when bailing was discontinued on March 12, 2008.

On the following day (March 13, 2008) an electric submersible pump was installed into the well, with the bottom of the pump placed at 525 ft bgs (3 ft above the bottom of the screen). An additional 200 gallons of water were pumped from the well with the pump. Water quality parameters were stable (less than 10% variability over at least 3 consecutive well bore volumes) at conclusion of pumping, and the water was visually clear of suspended solids. The final turbidity measurement was 1.66 NTUs, compared to the goal of less than 5 NTUs. A total of 650 gallons (approximately 20 BVs) were bailed and pumped from the well over the two days of development.

At the conclusion of development the static water level was measured at approximately 509.6 ft bgs, very similar to the initial pre-development measurement of 509.5 ft bgs. A summary of the water quality parameters measured during pumping are presented in Table 4-1. The Well Development Forms are provided as Attachment F.
Table 4-1. Summary of Water Quality Parameters During TAV-MW10 Well Development

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<th>Date, Time</th>
<th>Well Evacuation Method</th>
<th>Cumulative Gallons Removed</th>
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<th>Specific Conductivity (mS/cm³)</th>
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ft = feet  
°C = degrees Celsius  
mS/cm³ = millisiemens/cubic centimeter  
NTUs = Nephelometric turbidity units  
pH = potential of hydrogen  
subm. = submersible
5.0 VARIANCES

All FOPs and Administrative Operating Procedures (AOPs) cited in the Plan (SNL/NM August 2007) were followed. Two variances from the Plan occurred during installation of TAV-MW10, including:

- Section 5.1 of the Plan states that TAV-MW10 will be installed at a location approximately 50 ft away from TAV-MW1. However, because of the severe space limitations due to existing infrastructure, fences, and buried and overhead utilities at the site, TAV-MW10 was drilled approximately 10 ft west of TAV-MW1.

- Section 5.2.1 of the Plan specified that the cased borehole will be logged using natural gamma and neutron wire-line geophysical methods. However, no geophysical logging was conducted in the borehole because geophysical was performed in adjacent TAV-MW1 borehole in 1995. Also, the depth to water in well TAV-MW1 was known, and logging was not required to help determine the initial depth to water at the TAV-MW10 borehole location.
6.0 REFERENCES


New Mexico Environment Department (NMED), April 2004. “Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act,” § 74-4-10, New Mexico Environment Department.


ATTACHMENT A

Well Data Required by the NMED Compliance Order on Consent for TAV-MW10
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</tr>
</thead>
<tbody>
<tr>
<td>1. Well name/number</td>
<td>TAV-MW10</td>
</tr>
<tr>
<td>2. Date of well construction</td>
<td>February 6, 2008 (completion)</td>
</tr>
<tr>
<td>3. Drilling method</td>
<td>Air rotary casing hammer</td>
</tr>
<tr>
<td>4. Drilling contractor and name of driller</td>
<td>WDC Exploration and Wells, Mark Green</td>
</tr>
</tbody>
</table>
| 5. Borehole diameter and well casing diameter | Borehole: 11 3/4 inches 0 to 200 ft bgs, 9 5/8 inches 200 to 539 ft bgs  
Well casing: 5.563 inches OD, 4.767 inches ID |
| 6. Well depth                              | 533 ft bgs (borehole depth 539 ft bgs) |
| 7. Casing length                           | 535.35 ft total (533 ft bgs, 2.35 ft above ground) |
| 8. Casing materials                        | Schedule 80 PVC |
| 9. Casing and screen joint type            | Flush thread |
| 10. Screened interval(s)                   | 508 to 528 ft bgs |
| 11. Screen materials                       | Schedule 80 PVC |
| 12. Screen slot size and design            | 0.020-inch slotted screen |
| 13. Filter pack material and gradation     | Primary: #10-20 silica sand  
Secondary: #40-60 silica sand |
| 14. Filter pack volume (calculated and actual) | Calculated: 14 ft³, (28) 50-lb bags  
Actual: 18 ft³, (36) 50-lb bags |
| 15. Filter pack placement method           | Gravity feed through drive casing |
| 16. Filter pack interval(s)                | Primary: 539 to 499 ft bgs  
Secondary: 499 to 494 ft bgs |
| 17. Annular sealant composition            | Volclay chip plug, bentonite grout |
| 18. Annular sealant placement method       | Gravity feed through drive casing |
| 19. Annular sealant volume (calculated and actual) | Calculated: Plug 13.3 ft³, (17.7 50-lb bags  
Grout 1st 100-ft lift, 35.0 ft³, 300 gallons  
Grout 2nd through 4th approx. 100-ft lifts, approx. 1280 gallons total (brought to 7 ft bgs)  
Actual: Plug: 15.8 ft³, (21 50-lb bags of chips  
Grout 1st 100-ft lift (not tagged), 35.0 ft³, 300 gallons  
Grout 2nd through 4th approx. 100-ft lifts, approx. 1280 gallons total (brought to 7 ft bgs) |
| 20. Annular sealant interval(s)             | Plug: 494 to 455 ft bgs  
Grout: 455 to 7 ft bgs |
| 21. Surface sealant composition            | Concrete |
| 22. Surface seal placement method          | Gravity feed into annulus |
| 23. Surface sealant volume (calculated and actual) | Calculated: 2.45 ft³  
Actual: not recorded, placed concrete 7 to 0 ft bgs |
<p>| 24. Surface sealant interval               | 7 to 0 ft bgs |
| 25. Surface seal and well apron design and construction | 3-ft by 3-ft by approximately 4-inch deep concrete pad |
| 26. Well development procedure and turbidity measurements | Stainless steel bailer and submersible pump (see Table 4-1 for turbidity measurements) |
| 27. Well development parameter measurements | Total of 650 gallons (see Table 4.1 for parameter measurements) |
| 28. Type and design and construction of protective casing | 10-ft length of 12-inch diameter steel casing with hinged cap (7 ft bgs and 3 ft above ground) |
| 29. Well cap and lock                      | Hinged cap on protective casing with padlock and locking well cap with padlock on well casing |
| 30. Ground surface elevation               | 5431.95 ft amsl |
| 31. Survey reference point elevation on well casing | 5434.3 ft amsl |
| 32. Top of monitoring well casing elevation | 5434.3 ft amsl |
| 33. Top of protective steel casing elevation | 5434.98 ft amsl (locking cover removed) |</p>
<table>
<thead>
<tr>
<th>Items Required by the Order&lt;sup&gt;a&lt;/sup&gt; Section VIII.D</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>34. Name of geologist</td>
<td>Mike Sanders</td>
</tr>
<tr>
<td>35. Initial water level</td>
<td>509.5 ft bgs (pre-development water level, March 12, 2008)</td>
</tr>
<tr>
<td>36. Final water level</td>
<td>509.6 ft bgs (post-development water level, March 13, 2008)</td>
</tr>
<tr>
<td>37. Date of well development</td>
<td>March 13, 2008 (completed)</td>
</tr>
</tbody>
</table>

<sup>a</sup> New Mexico Environment Department, April 2004. "Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act," § 74-4-10, New Mexico Environment Department.

amsl = above mean seal level  
bgs = below ground surface  
COOC = Compliance Order on Consent  
ft = feet  
ft<sup>3</sup> = cubic feet  
ID = inside diameter  
NMED = New Mexico Environment Department  
OD = outside diameter  
PVC = polyvinyl chloride
ATTACHMENT B

Groundwater Monitoring Well Abandonment Diagram for TAV-MW1
SNL/NM ER PROJECT
GROUNDWATER MONITORING WELL ABANDONMENT DIAGRAM

Wells Decommissioned in Place

WELL PAD
SURFACE CASING
ORIGINAL ANNULAR SEAL
WELL CASING

CONDITIONED BOREHOLE
CEMENT PLUG

Wells Decommissioned through Casing Removal

WELL PAD

ORIGINAL BENTONITE SEAL
SECONDARY FILTER PACK
PRIMARY FILTER PACK
ORIGINAL WELL SCREEN

Not to Scale

WELL NAME
TAV-MN-2
LOCATION DESCRIPTIVE
SUL/NM TA-V
STATE PLANE COORDINATE X: 414699.908
Y: 1454627.5
SURFACE CASING TYPE
12 IN. STEEL
SURFACE CASING LENGTH
5 FT.
I.D. OF WELL CASING
4.75 IN.
WELL CASING DEPTH
509.5 FT B.S.S
SCREEN INTERVAL
409.5-509.5 FT B.S.S
PLUGGING GROUT TYPE
BENTONITE CONCRETE
GROUT VOLUME USED
700 GALS
DEPTH LIFT 1
509.5 - 20 FT B.S.S
DEPTH LIFT 2
20 - 2 FT B.S.S
DEPTH LIFT 3
2 - 0 FT B.S.S
DATE OF DECOMMISSIONING
2/6/08

WELL NAME
LOCATION DESCRIPTIVE
STATE PLANE COORDINATE X:
Y:
CASING REMOVAL METHOD
FINAL HOLE DIAMETER
FINAL HOLE TOTAL DEPTH
PLUGGING GROUT TYPE
GROUT VOLUME USED
DEPTH LIFT 1
DEPTH LIFT 2
DEPTH LIFT 3
DATE OF DECOMMISSIONING
ATTACHMENT C

Field Notes for Activities at TAV-MW1 and TAV-MW10
1/25/08: Sanders into office to work last minute Security Problem (Ben Huff is contact). Decon Drivers on standby. Visit to Tan, advance planning 1/28/08 Mon.

- 0830 Met Paul Silva, Craig Hauser (SNL Safety Engr) + John Chavez (DOE Drill Engr). Chavez completed Tan Safety videos 6 & 3, 6585. Followed by site visit by all four folks. Concluded that all equip will be 710' away from overhead powerline, and no de-energizing will be needed. Hauser will send email to Ben Huff (SNL Security Guy) to this effect. Drivers on site all day (10).

- 1220 Departed site.

1/29/08 Tues.

Still working (hard) on trying to gain access to Tan for drilling work.
Not able to complete process by end of day.
Drivers on standby since last Thursday PM 1/24/08 due to soil/ice delays and the fault of DOE.

- 1130/08 Wed.

Personnel: Mike Sanders (SIL/GRM),
Tim MacDonald, Jack Green, John Chavez, Richard Banks (GM),
BASIC: Gain access (hopefully) to Tan, fit up, start drilling.
Weather: Overcast, cold (-20 to -40°F).

- 0722 Arrive & decon PEO in TF-III, wait for drivers to load up + move out to Tan Cafe Area.

- 0820 Waiting for equip near TF-III entrance.
Paul Silva came out, said OK to proceed. Everything is acceptable. We sure site but still lacking a couple of Due signatures (Due can Rep + Randy Kubaski [BP 800]).

- 1130/08
HAS CLEARED EVERYTHING THRU S&L SECURITY. OK TO PROCEED.

CALLED DAVE SIOOOLAY (VCT) TO COME OUT & CHECK EQUIP.

DAVE SIOOOLAY CHECKED EQUIP FOR RAD OK (CALED TERRY MACDONALD & SILVA). START MOVING IN EQUIP.

1150 STAGED MOST OF DRILL RIG EQUIP. INTO TA-V. AFTER BEING TOLD BY PAUL RAGLAND (TA-V MGR) OK TO PROCEED (IN WORK OF 538-1030 HR DAVID MILLER ON SPEAKER). DAVID ARNESON @ TA-V X1115. TOLD ME WE STILL HAD ISSUES W/ DUE & STOP AGAIN. DAVID TALKING TO TERRY LOVATO (DUE) ABOUT VARIOUS ASPECTS OF THIS WORK.

UN3 - LAB. INTEGRATED MNT SYSTEM -

AND ON S&L WEB. DESCRIBES ALL

PROJECT DOCUMENTS.

1205 DAVID M. SAID OK AS PER TERRY LOVATO

(S&L SEC. REP @ TA-V), PAUL RAGLAND.

IF DUE AUDITORS VISIT DRILL SITE THEY

NEED TO NOTIFY DAVID MILLER THAT THEY ARE AT SITE.

1321 MOVING WATER TRUCK BACK INTO TA-V W/ LOAD OF WATER FOR P&A. CALLED SIOOOLAY (VCT) FOR CHECK ON GROUT PLANT BEFORE GOING INTO TA-V.

1350 GROUT PLANT CHECKED, START SET-UP FOR P&A.

1600 STILL DUMPING GROUT INTO TA-V-MUL.

CHECKED IN W/ PAUL SILVA CONFIRMED THAT RIG NEEDS TO BE MOVED TO GRAVEL AREA @ NIGHT (6K). TOLD TO CONTINUE WORK.
1623  FILLED WELL TO WITHIN 120' OF SURFACE
(28) SVEG BAGS USED
CROUT 2.5 BAGS PER 20 GALLONS WATER
WILL TOP OFF IN AM ACCORD TO SCA'S
STAND BY POLY 7-9 11-1 430-6:00. CAN'T
DO ANY MORE WORK TONIGHT AFTER 4PM
CROUT NEEDS TO SET OVERNIGHT IN WELL.

1645 ALL HAMS DEMAND TA-V. I LEFT MESSAGE
JOAQUIN GENERALES RE DELIVERY OF POUCHES
930-10 AM TONIGHT & MESSAGE TO PAUL
SILVA RE ANTICIPATED MAST RAISING N9 AM
TOMORROW AFTER TOPPING OFF BENT,
CROUT IN TAV-MWI.

THURS 1/3/08
PERSONNEL: SANDERS MACDONALD (ESCOOT),
GREEN CHAVES BARE (WHO)
WEATHER: CLEAR 60/42 AM (20°) 12PM
TASK: TOP OFF TAV-MWI & CROUT PULL
SURFACE CONCRETE START TAV-MWI 104
Borehole

0700 MEET DRIVERS AT TAV SITE, START ENTRY
PROCEDURE W/ MACDONALD
0855 MACDONALD & SITE CHANGES RETURNING
PLACE Lt. NOTE@DonBerryOffice to
COME TO SIZE ASAP TO DISCUSS.
UTIL BEFORE DRIVING STARTS TAV-MWI
TEST CO P/I & SURFACE FOR PRETION REMOVED,
CIRC BORIE OFF 1' BELOW GRADE.
0900 MAST IS UP. NO EQUIPMENT WILL BE
CLOSER THEN 15' FROM OVERHEAD PUMP
LINE OK IF 210'2.
0914 CHAUC JOAQUIN GENERALES (PUNCH) ASKED IF
PUNCH DELIVERY COULD BE EXTENDED TO
AID IN MASTE STAND BY #2 HECUTRY & SAIQ
1/12 11:31/08
TAV-MEX DRILLING TUES 1/31/98

to call his manager (Iken Tetrault),
who had explained situations.
He said cant do before this afternoon.
We will have to wait to see what
happens.

9:50 Start drilling. Dan Berry, Paul
Silva, Kevin Gray stopped to check
progress, made suggestions. Paul
added:

10:20 To 36' BES, add JT. Silty gravel has
runing 11.5' dia. Drive casing (DC)
to 300' @ this point.

10:30 DC 65'. Some gravel 3' out of
cyclone. Add 20' J.T. Gravel is 1P25
for state only.

10:53 to 65'. Now gravel (from Manzanitas).
Est 25% mix of silty sand, prob.
gravel lens < 2.5'. 0.4 FLD @
are full, waiting for Boyd
roll-offs. Drives to Peralta yard.
Standby again. Headed back to office
To await page from Joaquin Gonzalez
(Roll-off Mover).

Discussed TAV weekend access issue.
Told her it was cleared thru Cheryl.
Desjarlais who will put it on the "Plan
of the Day." Baca said if Cheryl approves
they were good to go. I'll verify. 
Cheryl today that weekend plans are
in place. Dan Berry is weekend
contact can be reached @ 561-0740 (P).
Need to also contact David Miller
for progress & lack of problems (except
roll-off delay). Today left message.

13:56 1st Roll-off delivered heading to mill to
retriev 2nd roll-off. Drives
Dan Sunday 1/31/98
THURS 11/31/08

1430 START DRILLING AGAIN. AFTER DEPLOYING
HEAVY LINE FOR 1st WALL OFF. DUMPED
2 HOPPERS OF CUTTINGS (*WATER + GROUT FROM
P&A OF YESTERDAY)* INTO 1ST LINED ROLL-OFF.

1454 TO 76. TRANSITION FROM Silt Sand + Fine
Gravel to Sand + Fine Gravel (Dry + Dusty)
Add 20 ft.

1500 TO 80‘ TRANS. TO DAMP Silty Sand No
Dust. Paul Silva dropped by to
Progress. U will be in tomorrow.

1510 TO 96‘. ADD 20‘ UT: Silty Sand + Minor
(25%) Penco Gravel + 1.5‘ DAMP.

1515 110‘. Rakey Drill string bouncing. Only for
A few ft.

1528 116‘ Add Silty Sand + Minor: Case sand,
DAMP

1538 126‘ Add 20‘ Same as above

1548 136‘ ‘

1604 175‘ Gravel lens, Min. Plant Rock types

1630 TO 196‘ Trip out Drill Pipe + Bit) Switch
to 9 5/8‘ DC.

(705 Trip out Drill Pipe + Bit, Fuel Pig
Prepare for Swap to 9 5/8‘ DC tomorrow.

1750 All Hands Depart Site. Mark Green & I
Agreed on 5.5 Hrs for yesterday (wed) +
25 today (for Raff of delay). Till
To date n 68 (+ 712 Budget for Job).

21/08 Fri

PERSONNEL: Sanders, MacDonald (SWC)
Green, Chanes (RWC)
Weather: Clear, Calm, Cool (40°)
Task: Continue Borehole Drilling hopefully
To Today. 

21/08 Fri
1100 AM - MUSIC DRILLING - 2/11/08

1100 AM: TAN CREW (electrician) escaped from inside TAN CREW RIG & STARTED WORKING ON... 

AUG: TAN CREW DRIVERS PREPARED SQUAD 

BONES PARK (TAN CREW RIG) 79%

BONECRAWLER

DC went to BONECRAWLER OFFICE FOR CELLPHONES (LONG-TERM BONECRAWLER & CT 247)

1104 SUGAR SAUCE: CASES AWAITS ORDER FOR JOB

CHECKS ON EQUIP. LEAVING TAN ON A WEEKEND (NO ANSWER). CHECKS IN Y.

PAUL SILVA: RE VARIOUS ISSUES, DRIVERS & MACCOW INSTALLING LINER IN JT

POW

1138 PIPE TRUCK IS BACKED UP TO RIG BUT

WENT INTO SOFT GROUND, PROBABLY DUE TO EXCAVATION & CONSTRUCTION OF OLD SEWER SYSTEM IN 1960'S. DISCUSSED SITUATION.

LENGTH WITH DRIVERS, CONCLUDED THAT SETUP IS NOT IN UNSAFE CONDITION AS IS, AND TRUCK IS TOO HEAVY & PRESENT TO NOT REPOSITION (WITH HEAVY LOAD OF PIPE). ELECTED TO GO AHEAD AND CONTINUE DRILLING.

GET WEIGHT OF PIPE TRUCK & THEN TRY TO REPOSITION VERY LIMITED OPTIONS FOR REPOSITIONING DUE TO SOFT GROUND AREA & LIGHT & POWER POLES ON EITHER SIDE OF PIPE TRUCK & PIPE ALIGNMENT BETWEEN RIG & PIPE TRUCK. SAFEST OPTION IS TO CONTINUE DRILLING & WEIGH OFF PIPE TRUCK & RE-POSITION TO DEGREE POSSIBLE. DRIVERS KNOW THEIR OPERATIONS MUCH BETTER THAN MYSELF, AND I'M GOING WITH THEIR RECOMMENDATIONS.

Also, two RAO TECHS BILL LARKIN & WADE MICKEY stopped by to discuss RAO UNLOADING OF EQUIPMENT AS IT LEAVES SITE.

M/D ETRAC-2 2/11/08
TAV-MW10 DRILLING 2/1/08 10 A.M.

(DAVE SIDEWAYS NOT IN TODAY. WE AGREED THAT WE WOULD LEAVE AS MUCH EQUIP. INSIDE TA-N AS POSSIBLE AFTER WEEKEND SO IT COULD BE CHECKED WHEN LEAVING AREA NEXT WEEK. ANY EQUIP THAT DOES LEAVE AREA WILL BE TAKEN TO STAGING AREA @ DEAN PRO & CAN BE CHECKED THERE BEFORE LEAVING SNL PROPERTY.

1140 START TRIPPING 9 3/8 DC INTO HOLE (Q = 200'/

DETH NOW).

1214 LUNCH BREAK.

1330 9 3/8 DC & DRILL PIPE TRIPPED IN TO 200'

START DRILLING W/ 9 3/8 DC.

1345 MIKE SCHELY, SID BRANION, ARIVE @ SITE

1346 JOHN GOULD, LUIS VALLASQUER (DAE 550)

ARRIVED AT CHECK OUT OPS, INSPECT SSG-1

FAC. CLEARANCE FORM DEPART. DRILL & 278P.

WSS0 264' SAMPLE DUE TO VISITAS - DAMP

SILTY SAND.

1526 STILL @ 274', STILL PLUGGED UP (INCR SILTY

CLAY?).

1525 SHELBY & BRANION DEPART GOOD MOR

DISCUSSION IN TRAILER. 9

1545 START DRILLING AGAIN Q 278', DAMP SILTY

SAND & SMALL MISTERY CUL DE SAC 7" 12NDC <10%.

1543 TO 332' STILL MANY DAMP SILTY SAND @

<30% WO-CLAY SAND OCCAS CUL CHNG 5X2

1610 LIFTING BELT & CLEAR FOR PILE DRIVER JAMMED

TOGETHER. NEED TO LEAVE SITE TO FIX

STOPPED @ 314' FOR DAY.

1700 ALL HANDS DEPART TA-N, PLESS EX-WASH STATION

INT 52 SIGNS DAILY REPORTS THRU 1/31/08

[Signature]

2/1/08
0700 MEET MACDONALD & GREEN AT TAN CATE
START ENTIRE PROCEDURE
0818 FILL IN DEPRESSION (CAUSED PIPE TRUCK TILT YESTERDAY) Y CUTTINGS, CRAVEL START DRILLING @ 346' 2/31'
0845 DRILLED THROUGH GRAVELLY LAYO @ 346' 2/31'
4.1" MANHATTAN MATERIAL (LS PEAK), BACK INTO SILTY SAND (DAMP) @ 345', POSION OF ARCS, VOLCANIC SFT.
0937 TO 363', SILTY SAND @ 247' CRACK @ 1"
NOTE: USING "MATEX" FISH-OIL BASED PIPE JOINT LUBE (DRILLER SAYS IT SUCKS!)
0947 TO 373', HOLE 02 CYCLONE PLUGGING UP.
N Y FINE SANDY SILT (MUT CLAY) SOTY DAMP @ 333'
1005 TO 380', BLEW OUT RNOO - SUBRO GRAVEL (50%), FINE SILT @ 370-379 @ FINE SILTY (90%), => SAND, LS + PE ROCK NO VOLCANICS.
1032 ABD', MINOR (1-2") SMALL CLAYEY RAKES.
MAINLY STILL DAMP SANDY SILT @ 65%
CASE SAND-PEBBLES @ 2" SUBRO LS + PE 493'
1057 TO 423', ADD 2", MIXTURE OF SILTY SAND (60%), FINE SAND (30%), FINE- MO GRAVEL @ 1" (16%), 424-449
1108 445' GRAVELLY LAYO @ 444-445, BACK
INTO DAMP SILTY SAND/ SANDY SILT @ 445,
LS + PE ROCK GRASS ONLY, NO VOLCANICS.
1116 456', GETTING MORE CLAYEY CLAYEY SANDY SILT
459', OCCAS. GRAVEL/GRASS TO 2" NO ARG ROCK TYPES, 2/12 SIMON 2/2/08
TAY-W10 DRILLING 2/2/08 SAT

1130 TO 423' CLAYEY SANDY Silt, Same As Above. No Gravel or Gravel. Hose Plugging

1147 428' Same As Above, Somewhat Damp, As Before

1156 490' " " " " " Building Up In Hose

1223 Put Water In Yet.

1205 498' Pass To Dam Clayey Sandy Silt To

499' Fly, Dusty Out Of Cyclone) Silt, FC Sand

531' Fly, MO. Gravel @ 493'

1215 533' Pass Back Into clayey Sandy

Silt @ 498' SO & 1/4 Layer of Fly Gravel

MAT

1223 532' BGS - Containing Silt Zone Sparse

Silt. 9/3 Returns

NOTE: B'LANG SHAE @ Bottom of DC, So Depths
BGS Noted Above (1223 and Before) Need To
Be Increased By 3'. 11.74" DC Had A 1"
Shoe So Adjust Actual Depths @ 11.74 By
Adding 1 Foot

1238 517' Insert Water To Clear Out Pipe. Good

Sandy Silt, F-MO Gravel @ 512 @ 531

1247 520' Insert Water. Sparse Unreliable Returns.

Catching Some Gravel To 1.5' In Catcher.

Wet Scurvy, Accumulating In Hopper

1334 To 539' (Only Need @ 535' Of Hole).

Passed From Fairly Thick (> 80') Of Clayey

Sandy Silt Into Good Coarse Sandy Gravel &

Starting @ 517'. Stay In Good Sandy Silk &

Gravel Until @ 531' Then Appeared To Drill

Back Into Sandy Silt (?). No More Coarse Sandy

Gravel After @ 531'. We Know Current Water

Level (In Tan-Muni @ 10' East Of This Borehole)

Was 516' BGS 12/07, Therefore Driller To Set

Top Of Screen @ 50' BGS (2' Out Of Water)

To Screen As Much Of The Good Sand/Gravel

MAR 2/2/08
TAV-110 WEL Design, Construction
ZONE AS Possible, STILL SCREEN ACROSS
AIR/WATER INTERFACE AS READ, BY NUMED.
THIS WILL ALSO GIVE ~ 3 EXTRA YEARS OF LIFE
TO THIS WELL, ASSUMING CONTINUING WATER
LEVEL DECLINE OF ~ 1% YEAR. WE'LL ALSO GO W
20-SLOT (.024") SCREEN + 14/20 CRANVEL
PACK, GIVEN RELATIVELY COARSE NATURE OF
ZONE BEING SCREENED, TAV-110 WEL
BUCKET LIKE THIS, AND IT PRODUCED WELL
1415
DRILLER TRIPPING OUT BIT & DRILL PIPE
BOTTOM OF BOREHOLE IS 5'39', GIVES 36'
OF EXTRA HAVE BEEN EATH BOTTOM OF 5'
SUMO @ 533' IBS (OK, IN CASE SAT SEPS
COME UP, SOMEWHAT INSIDE DC)
1430
TRIPPED OUT PIPE & BIT, NO REASON TO
WAIT FOR WATER LEVEL TO STABILIZE, SINCE
WE KNOW WATER IS @ 510'. START PREP.
TO RUN CASING.
1455
START RUNNING SUMO SCREEN, CASING,
505
SCREEN IN DC, INSTALLED TOP CONTROLLER.
TAN-MILL CONSTRUCTION 2/12/08 SAT

1455 PVC CASING TALLY

20' 20.2'V

19.98' V

20.1' V

19.98'

5.25 (SUMP) (INSTALLED CENTRALIZER)

20.5

20.0 (0.024" SCREEN)

20.0

20.0 (99.91)

20.0

20.0

19.81

520 20.0, 20.0, 19.9, 20.0, 20.0 (99.9)

526 20.0, 20.0, 20.0, 20.0, 20.0 (100.2)

537 20.0, 20.0 (20)


551 9.75, 4.74 (14.49)

TOTAL 524.71 + 9.75 + 4.74 = 539.2 TOTAL

= 533.4' in the Hole (6.2' Stickup)

535 MEASURE DISTANCE INSIDE WELLY TO VERIFY TOTAL PIPE + SCREEN LENGTH. WE GET 537.3' (VS. 539.2 W/I NOD. MEASUREMENTS)

1615 MEASURE INSIDE OF WELL - 1 SM TAPPER (RESIST CABLE SHOULD BE VERY ACCURATE)

Also got 537.3' OF PIPE. CHECKS HIS TAPPER AGAINST A NEW WATER LEVEL DIFFERENT ACURATE, SOI 537.3 - 533.9 equals to 4.3' OF STICKUP.

1618 START DUMMING 10/20 SAND INTO HOLE.

70'-6' (10/20 TATER 1825' ABOVE TOP OF SCREEN OR 563' 13.6' (TOP OF SCREEN IS 5.0' (363') MOVE RIG (MANT DOWN), SET UP PC PULLER

1717 PULLED 10' OF PC, BOTTOM 2' N 530' HAVING PRODUCING TAGGING 10/20 SAND BEC. OF CENTRALIZER
TAN-MW10 CONSTRUCTION 2/2/08 SAT
1507 BETTER CENTRALIZER DESIGN COULD BE:
2040 3 PVC WINGS
EASIERTOGET
TAGGET THE PVC CENTRALIZER RING
AROUND 5.5" CASING
(~9.0" ID)

WE NEED TO ALLOW ST. STEEL CENTRALIZERS
ABOVE WATER TABLE, 4 IN. OUT. MORE
ROBUST, EASY TO TAG THAN ACCORDING TO
DRILLER.
1805 DEPOTED TAN AFTER FIGHTING APPARENT
BROKEN CENT. ABOVE SCREEN (8N 503')
TAGGER HUNG UP, SANOSS BACK TO OFFICE
TO DO SAND VOL. CALCS

PERSONNEL: SANOSS, MACDONALD (SN2)
GREEN, CHAVES, BARKER (WOC)
WEATHER: OVERCAST COLD COLD (20°-40°)
TANK: INSTALL 10/20 & 20/40 SANOS, +
1ST LIFT (~100) @ 40' BENT: CHIP 50L, +
1ST LIFT (~100) @ BENT: GROW IN
TAN-MW10

0655 ARRIVE @ TAN GATE, START CHECK-IN
PROCEDURE.
0815 FINALLY GET PEOPLE & EQUIP. INTO
AREA. CONTINUE RUNNING SAND.
TAGGER IS STUCK IN ANNULES, CAUGHT UP
IN CENTRALIZER ABOVE SCREEN. WILL
PLACE SAND BASED ON VOL. CALCS, IF WE
DON'T FREE TAGGER.

[Signature]
2/2/08
T/N-MWD WELL 2/3/08 5:4

TAPE OF 10/20 SAND & ANN.

0.5 - 0.165 = 0.335 ft²

IN UNCASED ANNULUS.

10' 5.5 ft³/ft in RATHOLE

5.33'

VOLUME OF SAND TO FILL RATHOLE & UNCASED
ANNULUS TO 506:

1) 539' - 533' = 6' OF RATHOLE x 0.5 ft³/ft = 3 ft³

HOLE VOLUME.

2) 533' - 500' = 33' OF UNCASED ANNULUS x 0.335 ft³/ft

= 11.1 ft³ OF ANNULUS VOLUME.

TOTAL VOLUME: 3 + 11.1 = 14.1 ft³ / 0.5 ft³/SACK

= 28.2 SACKS 10/20 SAND TO BRING TOP OF 10/20 TO 506. DRILLER COMES UP WITH SAME # SACKS.

0918 30' OF DC OUT 5/13' IN HOLE. PUSHER DC C

- 509' 135. TAGGED 2 1/2' TO SNE. TAGGED 493' 245. PULL 10 MORE # DC, TAG AGAIN.

SHOOTING FOR 500. TAGGED & CUT HUNT UP.

0928 503' DC IN HOLE. 499' IN HOLE. TAGGED (WD)

CAME LASE FROM CENTRALIZER @ 503'

APPE DC RAISED ABOVE IT.

DNC CENTRALIZERS DOING NO GOOD (TOO WEAK)

ONLY CAUSING PROBLEMS.

0935 TAGGED 10/20 AFTER RAISING D.C. - 499' 155

(607). ADD 21845 (100 LBS. 11 FT²) 20/40
SAND. USED 36 BAGS (50 LBS. 0.5 FT²) 10/20

VS. 28 THEORETICAL BASED ON VOL. CASES, 50

HAVE IS SIMILARLY LARGE DISM. THEY 10'

(NM BITE SURPRISE) 2/3/08 (CUTTER 2/3/08
Date: 2/17/8

2 2,000-lb bags 40/60 sand fill
2 1/2' of annulus preb. to suit hole
Enlargement about 2x, figure
Top of 40/60 @ 19' 4-1/2". 12' 12/5 bags =

0457 Dumps 5 50-lb bags coarse volcay
chips (1"+ and 5'1") into annulus, tagged
48' 2' 36". So 49' 4-1/2' = 12' 12/5 bags =
~ 2.5' of bags. 36' to hole = 47'
12' 6' to bottom of D.C

1018 16 1/3 bags in tagged 45' 1' 36" (go on).
So 49' 4-1/2" = 3' 10" of chips for 5'4'

1037 12' 4-1/2' stickup. 500 6' 36" bags, 2' 4-1/2'

1040 Reflects influence of injecto water,
stabilized @ 10' 36".

1042 Watered chips @ ~ 150 Cals. (well
wait 1/2 (as per installation plan) for
12' 6' of chips to hydrate.

1150 Lunch break. Setup to run 1st lift of
gROUT AFTER hydrating chips

1154 Pump 1st load: (9) 50 lb bags "quick
gROUT" (same size particles) + 300 Cals
H2O. Shove fill = 120 ft of annulus assuming
hole is 9 1/2' diameter. Less footage if larger
diameter hole (likely): 350 Cals = 7.48 Cals/ft³
49' 4-1/2' volume. 49' 4-1/2' Cals/ft³/ft³
annulus = 119.7' of annulus filled

1157 Start pulling more D.C. Top of first lift
should theoretically be 45° - 12' 4-1/2'

1300 Pulled 14, 0' = 1' 10". Better at 880' (pull
drum). Kevin gray code 550 down BB

1315 Heat to the gate. Standby staff 1 AM
7:15 AM (6 H28)

1324 All hands down.
I^1

PERSONNEL: SANDERS, MACDONALD (SNL)
GREEN, CHANES, RAVE (WDC)
WEATHER: PARTLY CLOUDY, BREEZY, COLD, SNOW & RAIN IN AM

TASK: CONTINUE TAN-MW10 WELL

1300 ARRIVED AT TA-V GATE, MET TERRY MACDONALD & DAVE SLOANE. DAVE SLOANE SHOWED WAY (TA-V)
ROD). ASKED HIM TO CHECK D.C. ON PIPE.
TRUCK THAT PULLED OUT YESTERDAY & NICE PIPE
TO BE UNLOAD & DECON PAO. TRUCKY PIPE
ARE PARKED OUTSIDE TA-V GATE.

1310 SLOANE CHECKED PIPE & FOUND OK TO
UNLOAD & DECON PAO. HE'S ALSO CLEARED
TR COMPRESS. SO DRIVERS WILL BRING IT
OUT NEXT. MACDONALD ESCORTING HIM

NOTE AT 11:30 TALKED TO PAUL PLESHKE.
AMY BROMBERG IN OFFICE, DISPENSED RUMOR
THAT ANY HEARD FROM "MICHELLE" + JIM
TOO (OCE 556) THAT WE HAD TAKEN
WASTE (CUTTINGS) CONTAMINATED W/HEAVY
METALS FROM TA-V TO TA-W (RIDICULOUS!).
ALL CUTTINGS FROM HOLE ARE STORED IN TA-V,
IN 2 PALLETS NEAR SITE. AMY ASKED THAT
WASTE REMAIN IN TA-V UNTIL WASTE CHART.
SAMPLES ARE COLLECTED & RESULTS AVAILABLE.
I AGREE TO THIS IF AND UNTIL SOMEONE ELSE
ASKS THAT THEY'RE MOVED. I'LL DO WHATEVER
IS ULTIMATELY DECIDED NEEDS TO BE DONE

1359 COMPRESS OUT OF TA-V.

13:39 DRILLS ADDED 200 GALS MOR
3' CRUFT, 2.065 GALS/7.48 GALS/FT = 26.7 FT/3
CRUFT, 2.67 FT^3/0.335 FT^3/FT = UNCASSED
ANNULUS = 3.8, ADD CRUFT, ASSUMING
DIAMET OF 9 1/2 RIM HOLE 15'-PLUS OUT (WROOK?) SPEED
1537 TAW-MW10 WELL CONSTRUCT 2/4/08 7:00 AM
FRAZIER LAUNDRY FABRIC/BY
1539 TALKING TO HIM WHILE READING
2 1/2 ' DC PULLED. ALL WASH OUT BY
1539 365. STA
1540 START PULLING 1 3/4 ' DC. BOTTOM
200' BCS.
1635 ALL HANDS DEPART TA-W, SLOWING
STEADILY
PERSONNEL: SANDER, HARDMAN, 2/5/08 TIES
GREEN (SHANE) BAE (WOC)
WEATHER: Cold, windy, snow on ground 30°
TOOK FIRST CONSTRUCTION OF TAW-MW10,
TP TA-6 TAW-MW1
0735 ALL WENT TA-W GATE START 2/4/08
PROCEDURES
0830 TRAVELED TO MEASURE WATER LEVEL
IN PVC IT WAS 4 1/2 INCHES IN PLACE.
0755 FOUND OUT FROM MARK GREEN THAT
DEVELOPER (JIM HARRIS) IS ARRIVING
IN SITE TODAY WILL START DEVELOP
TOMORROW (TUES). CALLED CRIMIN
& SKELLY TO LET THEM KNOW, LT.
MESSAGES
0756 PUMPED MORE CREEK INTO ANNULAR
START PULLING MORE 1 3/4 ' DC
DAVE SAW PIPING (PCT) CHECKED PIPING
ON PIPE TRUCK (PULLED OUT YESTERDAY)
GLAD I HAVE PIPING
0823 CPT PVC (AP, TS) TACKED H20
IN 504.5' BCS (SIMILAR TO LAST TS) AND
SIGN OF CROAT INVASION. EXPECT WATER
TO DROP TO 50' WHEN DEVELOPMENT IS
DONE
MIC GANDER 2/5/08
TAN MUD CONSTRUCTION 2/6/68 TUES

0740 MIKE SKELLY START GOFF 5 1/2 BRANDWEIN (NW50) AT SITE.
1026 SKELLY, GRIFFTIT BRANDWEIN DEPART
SITE CONTINUING TO ADD grout, Pulled 1 1/4" D.C. & AU IS NOW OUT.
1043 TAN MUD grout to surface. DUMPED EXCESS grout INTO NEARBY TAN MUD.
DUMPED 4 OR 5 BAGS OF CHIPS INTO TAN MUD ANNULUS BEFORE TURNING OFF GROUT TO SURFACE.

1214 RIC & OTHER EQUIPMENT OFF SITE.
MEETING IN RIC BY SIDEWAY START BUILDING PROS IN TAN MUD.

2/6/68 WSS
PERSONNEL: SABLES (SNL), GREEN, CHAMPS, KANE (WSS)
WEATHER: CALM, CLEAR 45°
TASL: WRAP UP WELL COMPLETION, RECON EQUIPMENT, DRILL RIC & EQUIP. DEPART.

1530 AMIRE (TAN) ASSIST DRILL GEAR IN COMPLETION TAN MUD COMPLETION DEVELOPMENT
DEAULTED UNTIL 3/1 DUE TO TAN RESTRICTIONS

1930 ALL HANDS DEPART TAN WNW TAN MUD

ABANDONMENT COMPLETED BY FILLING ANNULUS TO WITHIN 2 FEET OF THE SURFACE W/ CASE
1 1/2" ANCHOR BENTONITE CHIPS & FILLING REMAINING 2 FEET TO THE SURFACE W/ 4
2\x2' CONCRETE PAD CENTERED ON ABANDONED PNC CASING (BROKEN OFF W/ 1' BELOW GRADE)
WAS THEN CONSTRUCTED. A BRASS CAP WAS ALSO PLACED IN THE NEW 2\x2' PAD AND WILL BE
STAMPED WITH THE WELL NAME TOTAL DEPTH OF THE WELL, AND DATE OF DECOMMISSIONING.
THE NEW WELL TAN MUD WAS COMPLETED BY FILLING THE ANNULUS WITH BENTONITE GROUT & COARSE CHIPS
MRC Field - 2/6/68
12" DIAMETER X/0' LONG PROTECTIVE STEEL CASING

3.85' 7.50' DEPTH (FCS) LAND SURFACE

CONCRETE BENTONITE GROUP

NOTE: CENTRALIZERS INSTALLED @ APX. 100', 200', 300', 400', 500', 80 PVC CASING

5.5" OD SCH. 80 PVC CASING

CHARGE (1" AVG) BENT. CHIP SEAL

40/60 SAND

5.5" OD X 20' 0.022" S/L

10/20 SAND

5.5" OD X 5' SCH. 80 PVC CASING

539' (TD)

15' 7' of the surface, a 10' long 12" diameter protective casing was installed into the annulus with 7' below ground + 3' above ground. The lower 1/3 of protective casing was cemented in place to grade, resulting in a 36" stickup. 2 protective posts were also installed around the new 4" THK @ 3' X 3' well pad.

1734 All Hands Depart TAV.

[Signature] 2/6/08
14:30 FINISH TAN-MUJO CONSTRUCTION TUES 2/19/08
14:30 CAUSE PAUL SILVA TO VERIFY THAT TA-J ACCESS WAS AVAILABLE 2 MARCH 1. HE SAID WE USE GOOD TO GO ANYTIME BUT TA-V NEEDS 1 WEEK ADVANCE NOTICE TO BE PLACED ON PLAN OF THE WEEK.

TAN-MUJO DEVELOPMENT WED 3/12/08

PERSONNEL: NICHOLAS CORPER (W2C), MIKE SANDERS (6765 GRAMINO)

WEATHER: CLEAR, CALM, COS

TASK: COMPLETE TAN-MUJO DEVELOPMENT

0730 ARRIVE & DECON PADD, DEVELOP BRIGHT, CLEAR EQUIPMENT PRIOR TO HEADING TO TA-V.

GAS: TAN-MUJO BORE VOLS. CALCS:

GRAVEL PACK: 539' - 509.75' DTW 1365 = 29.25' SAT

GRAVEL PACK
29.25' X 0.5454 FT^3/FT X 16' HOLE = 115.95 FT^3

GRAVEL PACK (INCLUDING VOLS. OF CASING TEMARILY)

WELL CASING (5.5" OD): 533' FTS OF CASING = 509.75' DTW = 23.25' OF SCREEN + SUMP IN WATER. 23.25' X 0.1656 FT^3/FT X 5.5" OD CASING = 31.83 FT^3 OF SCREEN + SUMP

NET GRAVEL PACK VOL: 15.95 FT^3 - 3.83 FT^3 = 12.12 FT^3

12.12 FT^3 X 7.48 CALS/FT X 30% POROSITY = 27.2 CALS

IN 30% POROUS GRAVEL PACK

CASING VOL (5" ID): 23.25' X 1.02 Vol/FT = 23.7 GAS IN CASING.

1.25 = 27.2 + 23.7 = 50.9 GAS IN CAIS

0730 ARRIVE AT TAN-MUJO LOCATION SET UP EQUIP. COMPLETE TAN-MUJO GAS OIL

0746 TANKER WATER LEVEL: 512.2' BEGIN TOP OF TANKER 2.45' STICKUP = 509.75' DEPTH

TO WATER 255 BOW/NOE, PADD, WELL PAO

A 4" HIGH AVG, SO 255 1365 - LEFTON TANK
1018 Raised 50 gals H20-NY turbid, no sign of gravel pack infiltration (good!); well appears to be recovering quicker as expected even relatively coarse sand+oil that most (~18) of screen is set in.

1105 150 gals raised, still turbid (~1000 NTU), swab a 2nd time.

1125 Finish swabbing (2nd time)

1146 200 gals raised, still turbid (~1000 NTU)

1206 250

1322 300 (~1000 NTU).

1335 Start 3rd swab

1410 Complete 3rd swab.

1430 350 gals at, still turbid (~1000 NTU).

1501 400

1530 450 somewhat turbid (~1000 NTU).

1541 Dave Soldier (MC-1) comes out to 240-0616; equipment (MC-1) prepared to install submersible pump.

1550 Called Mike Skelly re status.

1700 Pump & pipe in well (25) 21-FT JTS + 2.5' pump - 2.5' stroke = 525' (65 to 85) of pump. Pump ready to go, depart TA-V.

0730 Pull into TA-V.

Personnel: Michael Cooper (MC), Mike Sanders

Weather: Clear calm w AM, 60s

Task: Finish well development

0850 Pumped total of 650 gals from well TA in parameters (temp, conductivity, pH, turbidity) stable after 3 hrs pumping.

3/13/08 Wed

3/19/08
TAN-MW16 WELL DEVELOPMENT
3/13/08

10:57 TASCO WABCO AFTER PUMPING - 5/12.05

11:17 TAKE OF PROT CASING - 2.45 STICK UP
509.60 PGS TO WATER VS. 510.10 TARGET CLOSE ENOUGH! WELL REGAINED QUICKLY

DAVE 5100 @WAY (RCP) 220 - SCANNED EQUIPMENT OK.
LV. TA-V TO GRAB 1 DRUM @ WEL MML-1362 LOCUS.

12:50 DECON @ TA-III DECON PAD DAVE, FICKO 13
DRAWS 1 DECON WATER @ TAN-MW16 LOCUS.

13:05 DEPART DECON PAD AFTER SIGNING DAILIES

PERSONNEL: SAUNDS (ROBERT) RIVERA, JOAQUIN
A CREW OF 42 FROM HARRF

TAKE CHECK SOIL IN ROLLER @ TA-V, FROM WEL
TAN-MW16 BOREHOLE

14:30 ARRIVE @ TA-V, INSPECT ROLLER, UNZIP
"BURRITO BAGS" TO INSPECT WEAKNESS OF SOIL
CONCLUSION: SOIL WILL BE HAUL @ DUMP
CTA-III BOREHOLE PIT THIS FRIDAY. RIVERA WILL
COORDINATE WITH TA-III BOREHOLE PIT
HAUSER DAVE HENRIX RETURN TO DUMP
ROLL OFFS.

15:00 DEPART TA-V, AFTER SEEING NEW MAN. WEL.

S/N: 4/16/08
ATTACHMENT D

Combination Lithologic and Well Construction Details for TAV-MW10
<table>
<thead>
<tr>
<th>Depth (FBGS)</th>
<th>Lithology</th>
<th>Lithologic Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 60</td>
<td>GM, gravel-sand-silt mixture, 30% fine - medium gravel angular - subrounded, &lt; 1.5 inches limestone and Precambrian gneiss and quartzite, 40% fine - coarse sand, 30% silt (light brown, SYR 64).</td>
<td></td>
</tr>
<tr>
<td>80' - 109'</td>
<td>SM, silty sand, light brown 5YR 5/6, slightly damp.</td>
<td></td>
</tr>
<tr>
<td>109' - 245'</td>
<td>SM, silty sand, light brown 5YR 6/4, slightly damp with sporadic lenses medium - coarse sand &lt; 10% of interval. Occasional gravel lenses with subangular, subrounded fragments &lt; 2 inches, especially at 175 FBGS. Limestone and Precambrian rock types.</td>
<td></td>
</tr>
<tr>
<td>343' - 348'</td>
<td>GM, gravel-sand-silt mixture, 60% fine - medium gravel (increased gravel 444 - 446 FBGS). Gravel fragments &lt; 1.5 inches, angular - subrounded, limestone and Precambrian rock types.</td>
<td></td>
</tr>
<tr>
<td>348' - 435'</td>
<td>SC, clayey sandy silt, light brown SYR 64 to SYR 56. Sporadic medium - coarse sand lenses. Limestone and Precambrian gravel fragments &lt; 2 inches, subangular - subrounded.</td>
<td></td>
</tr>
<tr>
<td>435' - 444'</td>
<td>GM, gravel-sand-silt mixture, 20% - 50% gravel (increased gravel 444 - 446 FBGS). Gravel fragments &lt; 1.5 inches, angular - subrounded, limestone and Precambrian fragments. Remainder is fine - coarse sand and silt (light brown SYR 4/4).</td>
<td></td>
</tr>
<tr>
<td>448' - 499'</td>
<td>SC, clayey sandy silt, light brown SYR 64 to SYR 56. Sporadic medium - coarse sand lenses. Limestone and Precambrian gravel fragments &lt; 2 inches, subangular - subrounded.</td>
<td></td>
</tr>
<tr>
<td>499' - 539'</td>
<td>SC, clayey sandy silt, light brown SYR 64 to SYR 56. Sporadic medium - coarse sand lenses. Limestone and Precambrian gravel fragments &lt; 2 inches, subangular - subrounded.</td>
<td></td>
</tr>
<tr>
<td>531' - 539'</td>
<td>GM, in saturated zone, inject water, fines washing thru sample sieve. Abundant medium - coarse sand and fine - coarse gravel caught in sieve, so relatively coarse interval. Limestone and Precambrian fragments and pebbles, 3 inches subangular - subrounded.</td>
<td></td>
</tr>
<tr>
<td>539' - 552'</td>
<td>SC, clayey sandy silt, light brown SYR 64 to SYR 56. Sporadic medium - coarse sand lenses. Tight formation.</td>
<td></td>
</tr>
<tr>
<td>552' - 599'</td>
<td>GM, gravel-sand-silt mixture, 60% fine - medium gravel, &lt; 1 inch limestone and Precambrian rock types.</td>
<td></td>
</tr>
<tr>
<td>599' - 600'</td>
<td>SC, clayey sandy silt, light brown SYR 64 to SYR 56. Sporadic medium - coarse sand lenses. Cyclone hose plugged at 613 FBGS.</td>
<td></td>
</tr>
<tr>
<td>600' - 640'</td>
<td>GM, gravel-sand-silt mixture, 30% fine - medium gravel angular - subrounded, &lt; 1.5 inches limestone and Precambrian gneiss and quartzite, 40% fine - coarse sand, 30% silt (light brown, SYR 64).</td>
<td></td>
</tr>
</tbody>
</table>

**Well Completion Data**

- Casing stickup: ~2.5 above ground surface.
- Concrete Pad
- Reduction in borehole at 200 FBGS
- Seal Interval: 455 - 494 FBGS, coarse bentonite chips
- Secondary Pack Interval: 494 - 499 FBGS, 4000 sand
- Primary Pack Interval: 499 - 533 FBGS, 10/20 sand
- Initial water level: 508.42 FBGS (3/12/08)
- Screen Interval: 508-528 FBGS, 0.02-in slot Schedule 80 PVC
- Bump Interval: 528 - 533 FBGS
ATTACHMENT E

Well Construction Diagram for TAV-MW10
# WELL DATABASE SUMMARY SHEET

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>ENVIRONMENTAL RESTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER ADS #:</td>
<td></td>
</tr>
<tr>
<td>Well Name:</td>
<td>TAV-MW10</td>
</tr>
<tr>
<td>Owner Name:</td>
<td>U.S. DEPT OF ENERGY</td>
</tr>
<tr>
<td>Date Drilling Started:</td>
<td>31-JAN-2008</td>
</tr>
<tr>
<td>Drilling Contractor:</td>
<td>WDC EXPLORATION &amp; WELLS</td>
</tr>
<tr>
<td>Drilling Method:</td>
<td>AIR ROTARY CASING HAMMER</td>
</tr>
<tr>
<td>Borehole Depth:</td>
<td>539</td>
</tr>
<tr>
<td>Casing Depth:</td>
<td>533</td>
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<tr>
<td>Well Completion Date:</td>
<td>06-FEB-2008</td>
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<tr>
<td>Completion Zone:</td>
<td>ALLUVIAL MATERIAL</td>
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<tr>
<td>Formation of Completion:</td>
<td>SANTA FE GROUP</td>
</tr>
<tr>
<td>Well Comment:</td>
<td>11 3/4 INCH AND 9 5/8 INCH BOREHOLE DIAMETERS.</td>
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## Completion Data Measured Depths (FBGS)

<table>
<thead>
<tr>
<th>Interval</th>
<th>Start</th>
<th>Stop</th>
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<tbody>
<tr>
<td>BOREHOLE</td>
<td>0'</td>
<td>200'</td>
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<tr>
<td></td>
<td>O.D.</td>
<td>11.75&quot;</td>
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<thead>
<tr>
<th>Interval</th>
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<tbody>
<tr>
<td>GROUT/BACKFILL</td>
<td>0'</td>
<td>455'</td>
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<tr>
<td>BENTONITE GROUT</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CASING</td>
<td>0'</td>
<td>533'</td>
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<tr>
<td>SCH 80 PVC</td>
<td>I.D.</td>
<td>4.767&quot;</td>
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<tr>
<td></td>
<td>O.D.</td>
<td>5.563&quot;</td>
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<table>
<thead>
<tr>
<th>Interval</th>
<th>Start</th>
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<tbody>
<tr>
<td>BOREHOLE</td>
<td>200'</td>
<td>539'</td>
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<td></td>
<td>O.D.</td>
<td>9.625&quot;</td>
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<tr>
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<tbody>
<tr>
<td>SEAL</td>
<td>455'</td>
<td>494'</td>
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<tr>
<td>BENTONITE CHIPS</td>
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<tbody>
<tr>
<td>SECONDARY PACK</td>
<td>494'</td>
<td>499'</td>
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<td>#40/60 SAND</td>
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<table>
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<th>Interval</th>
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<tbody>
<tr>
<td>PRIMARY PACK</td>
<td>499'</td>
<td>539'</td>
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<tr>
<td>#10/20 SAND</td>
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<table>
<thead>
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<th>Interval</th>
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<tbody>
<tr>
<td>SCREEN</td>
<td>508'</td>
<td>528'</td>
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<td>SCH 80 PVC</td>
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<th>Stop</th>
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<tbody>
<tr>
<td>SUMP</td>
<td>528'</td>
<td>533'</td>
</tr>
</tbody>
</table>

## State Plane Coordinates

- (X) Easting: 414691.2
- (Y) Northing: 1454662.43

## Surveyed Elevations (FAMSL)

- Protective Casing: 5434.96
- Top of Inner Well Casing: 5434.3
- Concrete Pad: 5432.55
- Ground Surface: 5431.95

## Calculated Depths and Elevations

- Initial Water Elevation: 4924.7 (FAMSL)
- Initial Depth To Water: 509.6 (FBGS)
- Last measured water level was measured on 12-MAY-2008: 4922.58 FASL

## Survey Data

- Survey Date: 23-MAR-2008
- Surveyed By: SNL/NM

## Date Updated: 02-MAY-08

## Date Printed: 06-JUN-2008
<table>
<thead>
<tr>
<th>Project Name:</th>
<th>ENVIRONMENTAL RESTOR</th>
<th>Geo Location:</th>
<th>SNL/NM TA-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER ADS #:</td>
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<td></td>
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<td>Casing Depth:</td>
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</tr>
<tr>
<td>Interval</td>
<td>Start</td>
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<tr>
<td>PLUG BACK</td>
<td>533'</td>
<td>539'</td>
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<tr>
<td>#10/20 SAND</td>
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</table>

Additional Comments
ATTACHMENT F

Well Development Forms for TAV-MW10
FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Project No.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAV-MW10 WELL DEVELOPMENT</td>
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</table>

<table>
<thead>
<tr>
<th>Well I.D.:</th>
<th>Date:</th>
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<tbody>
<tr>
<td>TAV-MW10</td>
<td>3/13/08</td>
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</tbody>
</table>

Weather

Method: [ ] Portable pump  [ ] Dedicated pump  Pump depth: 525.165

PURGE MEASUREMENTS

<table>
<thead>
<tr>
<th>Depth to Water (FT)</th>
<th>Time 24 hr</th>
<th>Vol. L/g</th>
<th>Temp °C</th>
<th>mS/Cm</th>
<th>ORP MV</th>
<th>pH</th>
<th>Flow L/g</th>
<th>Turb NTU</th>
<th>DO mg/L</th>
<th>Color and appearance</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.30</td>
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<td>3.70</td>
<td>21.14</td>
<td>0.585</td>
<td>27.7</td>
<td>7.6</td>
<td>2.5</td>
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<td>21.65</td>
<td>0.586</td>
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<td>1.46.</td>
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<td>21.54</td>
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<td>1.66</td>
<td>25.9</td>
<td>2.28</td>
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COC number(s):

Sample number(s):

Purge Volume Calculations

Well Diameter

- 2" well: 0.16 gal/ft X (height of water column) = _______ gallons
- 4" well: 0.65 gal/ft X (height of water column) = _______ gallons
- 6" well: 1.47 gal/ft X (height of water column) = _______ gallons

Tubing Diameter

- 1/4" OD: 2.4 ml/ft X (length of tubing) = _______ milliliters
- 3/8" OD: 9.7 ml/ft X (length of tubing) = _______ milliliters
- 1/2" OD: 16.6 ml/ft X (length of tubing) = _______ milliliters
# FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>N-V-MW10 WELL DEVELOPMENT</th>
<th>Project No.:</th>
</tr>
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<tbody>
<tr>
<td>Well I.D.:</td>
<td>N-V-MW10</td>
<td>Date: 3/12/08 - 3/13/08</td>
</tr>
<tr>
<td>Weather:</td>
<td>Clear, Calm, 50-60°</td>
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<tr>
<td>Method:</td>
<td>Portable pump</td>
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<td></td>
<td>Dedicated pump</td>
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<tr>
<td>Pump depth:</td>
<td>~5.25'/3.5'</td>
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</tbody>
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## PURGE MEASUREMENTS

<table>
<thead>
<tr>
<th>Depth to Water (FT)</th>
<th>Time 24 hr</th>
<th>Vol. L gals</th>
<th>Temp °C</th>
<th>m/ft</th>
<th>ORP</th>
<th>MV</th>
<th>pH</th>
<th>Flow L gals</th>
<th>· Turb</th>
<th>DO %</th>
<th>Color and appearance</th>
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<tr>
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<td>50</td>
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<td>7/1000</td>
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<td>147.1</td>
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<td>15.0</td>
<td>1.32</td>
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</tbody>
</table>

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