

LA-UR-13-23467
October 2013
EP2013-0089

Plugging and Abandonment Summary Report for Sigma Mesa Well


Prepared by the Environmental Programs Directorate

Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy under Contract No. DE-AC52-06NA25396, has prepared this document pursuant to the Compliance Order on Consent, signed March 1, 2005. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

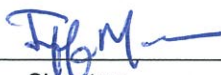
Plugging and Abandonment Summary Report for Sigma Mesa Well

October 2013

Responsible project manager:

Ted Ball		Project Manager	Environmental Programs	10/25/13
Printed Name	Signature	Title	Organization	Date

Responsible LANS representative:

Jeff Mousseau		Associate Director	Environmental Programs	11/10
Printed Name	Signature	Title	Organization	Date

Responsible DOE representative:

Peter Maggiore		Assistant Manager	DOE-NA-00-LA	11-8-2013
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

This report details the methods Los Alamos National Laboratory (LANL or the Laboratory) and its subcontractor TerranearPMC used to plug and abandon the Sigma Mesa Well. The well was plugged and abandoned in accordance with direction from the New Mexico Environment Department (NMED), the Laboratory's "Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory," and NMED's notice of approval with modifications for the work plans.

Plugging and abandonment activities took place between February 21 and March 22, 2013. Before the well was abandoned, all above- and belowground appurtenances were removed. The Sigma Mesa Well was video-logged in 2011. A final water-level measurement and the total depth of the well were verified using a water-level meter.

A pump hoist rig was used during plugging and abandonment activities at the Sigma Mesa Well in an attempt to mechanically perforate the well casing. After an unsuccessful attempt, high explosives were used to perforate the well casing. The well was surged after it was perforated to loosen up any debris that may have potentially clogged the perforations. The well was video logged on March 15, 2013, after the well casing had been surged. The well was plugged with Portland Type I/II cement.

The well was cement-grouted to approximately 3 ft below ground surface (bgs) using a tremie pipe to place the cement. The well casing was cut and removed at 3 ft bgs, and the surface casing was cut and removed at 2 ft bgs. A concrete surface pad was installed near ground surface with an aluminum survey marker. The surface completion was surveyed in accordance with Section IX.B.2.f of the Compliance Order on Consent.

CONTENTS

1.0	INTRODUCTION	1
2.0	BACKGROUND	1
2.1	Sigma Mesa Well.....	1
3.0	PLUGGING AND ABANDONMENT.....	2
3.1	Sigma Mesa Well.....	2
4.0	COMPLETION.....	3
4.1	Geodetic Survey	3
5.0	POSTABANDONMENT ACTIVITIES	3
5.1	Site Restoration	3
5.2	Waste Management.....	3
6.0	DEVIATIONS FROM PLANNED ACTIVITIES	3
6.1	NMOSE-Approved Modifications to Work Plan	4
7.0	SUMMARY	4
8.0	REFERENCES AND MAP DATA SOURCES	4
8.1	References	4
8.2	Map Data Sources for Plugging and Abandonment Report Location Map	5

Figures

Figure 1.0-1	Location of the Sigma Mesa Well	7
Figure 2.1-1	Sigma Mesa Well as-built diagram	8
Figure 3.1-1	Sigma Mesa Well abandonment diagram	9

Tables

Table 3.1-1	Sigma Mesa Well Perforations.....	11
Table 3.1-2	Quantity and Materials Used to Plug and Abandon Sigma Mesa Well.....	12
Table 4.1-1	Survey Coordinates from Aluminum Pin Embedded in Surface Pad.....	12

Appendixes

Appendix A	Approval of Alternate Plugging and Abandonment Approach for the Sigma Mesa Well
Appendix B	Video Logs of Sigma Mesa Well (on DVD included with this document)

Acronyms and Abbreviations

AK	acceptable knowledge
amsl	above mean sea level
bgs	below ground surface
Consent Order	Compliance Order on Consent
JWG	Jet West Geophysical
I.D.	inside diameter
LANL	Los Alamos National Laboratory
NAD	North American Datum
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
O.D.	outside diameter
RPF	Records Processing Facility
TD	total depth

1.0 INTRODUCTION

This report summarizes the methods Los Alamos National Laboratory (LANL or the Laboratory) used to plug and abandon the Sigma Mesa Well, located in Technical Area 60 at the Laboratory in Los Alamos, New Mexico, as shown in Figure 1.0-1.

Well abandonment was conducted in accordance with the requirements and guidelines in Sections IV.B.1.b.v and X.D, Well Abandonment, of the Compliance Order on Consent (the Consent Order). In addition, the plugging and abandonment procedures complied with 19.27.4 New Mexico Administrative Code rules and regulations governing “Well Driller Licensing; Construction, Repair and Plugging of Wells.” The following documents helped guide the implementation of the scope of work for the plugging and abandonment project:

- “Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory” (LANL 2010, 111131);
- The New Mexico Environment Department’s (NMED’s) notice of approval with modifications for the “Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory” (NMED 2011, 201231);
- “Field Implementation Plan to Plug and Abandon Wells and Boreholes SHB 1, SHB 3, SHB 4, TH 5, TH 6, Beta Hole, Sigma Mesa Well, H-19, and TA-21 Distillation Hole” (TerranearPMC 2011, 206495).

A plugging plan of operations was filed with the New Mexico Office of the State Engineer (NMOSE) for the Sigma Mesa Well. Appendix A presents email correspondence from NMED and NMOSE regarding approvals of alternate plugging and abandonment approach for the Sigma Mesa Well.

2.0 BACKGROUND

This section describes the location, construction, and condition of the Sigma Mesa Well before plugging and abandonment activities were undertaken.

2.1 Sigma Mesa Well

The Sigma Mesa Well was intended as a test of the geothermal potential of the area and was drilled in 1979 to 2292 ft below ground surface (bgs) (Purtymun 1995, 045344). The depth to water in 1979 was 1330 ft bgs. The borehole was 36 in. in diameter from 0 to 85 ft bgs and 26 in. in diameter from 85 to 2292 ft bgs. The well was constructed as follows:

- 0–85 ft bgs: 28-in.–outside diameter (O.D.)/27.25-in.–inside diameter (I.D.) surface casing
- 0–1627 ft bgs: 20-in. –O.D./19-in.-I.D. well casing
- 1482.8 ft bgs: Total depth (TD); hole previously plugged with cement
- >1627 ft bgs: Drill stem, drill collars, and bit lost in bottom of hole

Pre-abandonment Conditions

The Sigma Mesa Well was video logged on June 20, 2011. A static water level was recorded at 585.8 ft bgs. The video was terminated at 630 ft bgs because of reduced visibility. A second video log was run on March 20, 2013, to verify casing perforations before the well was abandoned. The video logs collected are included in Appendix B (on DVD).

TD of the well was measured at 1482.8 ft bgs, and a standing water level was recorded at 587.3 ft bgs on February 22, 2013. The annulus between the surface casing and well casing was measured to 21.0 ft bgs, and water between the casing strings was recorded at 8.0 ft bgs on March 21, 2013. TDs and water levels were measured with a water-level meter.

Figure 2.1-1 is an as-built diagram that depicts the construction details and pre-abandonment conditions of the Sigma Mesa well.

3.0 PLUGGING AND ABANDONMENT

Plugging and abandonment activities included mobilization, casing perforation, pressure-grouting/sealing, casing removal, and demobilization. All activities were performed following appropriate standard operating procedures and Laboratory-approved health and safety documents. The well was plugged and abandoned in accordance with the NMED-approved work plan and NMOSE Plugging Plan with variances approved by both agencies (Appendix A).

3.1 Sigma Mesa Well

Plugging and abandonment activities at the Sigma Mesa Well took place between February 21 and March 22, 2013, using a pump hoist rig and ancillary equipment. On February 23, a mechanical perforator was installed in the 19-in.-I.D. well casing to 670 ft bgs, where the perforator hung up in the well. An attempt to perforate the casing at 670 ft bgs with the mechanical perforator was unsuccessful.

On March 12, Jet West Geophysical (JWG) mobilized to the Sigma Mesa Well. JWG installed perforation guns and perforated the casing in a series of four sections (175-ft intervals) from top to bottom (Table 3.1-1). The perforation gun used a small quantity of high explosives inside the well to perforate the casing. To help keep tamp on the perforating guns, additional water (approximately 8350 gal.) was added to the well casing to approximately 20 ft bgs. As designed, the shot tool would provide 3 perforations 120 degrees apart. However, the March 20, 2013, video log of the upper 730 ft of casing exposed above the standing water shows that, in general, each perforation set included two penetrations of the casing, with or without a third perforation (Appendix B). This is probably a result of the perforation tool not being centered in this large-diameter (19-in.) well casing. The results of the perforation job were discussed with both NMED and NMOSE. Both regulatory agencies gave their approval to continue with the plugging and abandonment of the well (Appendix A).

Because the water level in the well was draining so slowly to the level of the regional aquifer, the well was surged after perforating to remove any debris that may have potentially clogged the perforations.

On March 14, TD of the Sigma Mesa Well was measured again at approximately 1480.0 ft bgs, indicating that approximately 2.8 ft of debris had accumulated in the bottom of the well as the result of the surging. A 2.0-in. tremie pipe was installed, and the well was plugged with approximately 2794.9 ft³ of neat cement grout from 1480.0 (TD) to 3 ft bgs. The annulus between the two casing strings was then plugged with approximately 26.7 ft³ of neat cement grout from 21.0 (TD) to 3 ft bgs via tremie pipe. The neat cement emplaced at the Sigma Mesa Well was mixed at the Los Alamos batch plant and delivered by truck to the site. The well casing was cut and removed from 3 ft bgs, and the surface casing was cut and removed from 2 ft bgs. The final surface completion was installed on March 22, 2013. The final borehole configuration is shown in Figure 3.1-1.

The volume and type of abandonment materials used to abandon the Sigma Mesa Well are presented in Table 3.1-2. A review of the table indicates that several intervals apparently took less cement to fill than the calculated volume. This is attributed to the cement truck deliveries containing more cement than the

batch tickets indicated and, to a lesser extent, the casing containing cement from the previous abandonment job in 1979 where cement was poured from the surface, and possibly remaining scale from rusting of the casing. The use of a tremie pipe to fill the borehole from the bottom makes the possibility of voids inside the casing highly unlikely.

4.0 COMPLETION

The well was cement-grouted to approximately 3 ft bgs. A concrete surface plug was installed and mounded slightly abovegrade and slightly larger than the borehole diameter. An aluminum survey marker was installed in the plug and was surveyed in accordance with Section IX.B.2.f of the Consent Order.

4.1 Geodetic Survey

A geodetic survey was conducted on the surface completion (Table 4.1-1) with a Topcon GRS-1 global positioning system utilizing an external antenna. The survey data collected conform to Laboratory Information Architecture project standards IA-CB02, "GIS Horizontal Spatial Reference System," and IA-D802, "Geospatial Positioning Accuracy Standard for A/E/C and Facility Management." All coordinates are expressed relative to the New Mexico State Plane Coordinate System Central Zone (North American Datum [NAD] 83); elevation is expressed relative to feet above mean sea level (amsl) using the National Geodetic Vertical Datum of 1929. The survey point was the aluminum pin placed in the concrete pad.

5.0 POSTABANDONMENT ACTIVITIES

Post-abandonment activities are described below.

5.1 Site Restoration

Plugging and abandonment activities at the well required only minimal restoration efforts to return the site to pre-plugging and abandonment conditions.

5.2 Waste Management

Waste generated from the plugging and abandonment project included fluids and contact waste.

All waste streams produced during plugging and abandonment activities were sampled in accordance with "Waste Characterization Strategy Form for Plug and Abandonment (P&A) of LANL Wells" and its amendments (LANL 2011, 205839; LANL 2012, 209732; LANL 2013, 238457).

Fluids produced were limited to concrete washout water. Some of this water was evaporated on-site. The remainder was shipped to an authorized facility. Characterization of contact waste will be based upon acceptable knowledge (AK), pending analysis of the waste samples collected.

6.0 DEVIATIONS FROM PLANNED ACTIVITIES

Deviations are described below.

- High explosives were used to make the casing perforations when the mechanical perforator could not be used as planned.
- Perforations using high explosives were only about two-thirds effective in penetrating the casing.

- The lowest perforation interval was moved down from 1250–1425 ft bgs to 1300–1475 ft bgs when the well bottom was tagged at 1482.8 ft rather than the reported 1425 ft bgs.
- The 20-in. well casing and 30-in. surface casing were cut and removed at 3 and 2 ft bgs, respectively, when the mechanical casing cutter could not be used to cut the 30-in. casing at 20 ft bgs as planned.

6.1 NMOSE-Approved Modifications to Work Plan

LANL sought and received approval from NMOSE to abandon the Sigma Mesa Well with an explosives perforator. NMOSE was informed of the effectiveness of the explosives-based perforations. Approval was also received from NMOSE to move the lowest interval of perforations down 50 ft and to cut and remove the well casing and surface casing at 3 and 2 ft bgs, respectively (Appendix A).

7.0 SUMMARY

The Sigma Mesa Well was plugged and abandoned in accordance with the NMED-approved work plan with approved modifications. Before abandonment activities, all above- and belowground appurtenances were removed.

A pump hoist rig was used during plugging and abandonment activities at the Sigma Mesa Well. After the well casing at the Sigma Mesa Well was successfully perforated with high explosives, the well casing was surged to remove any debris from the perforations.

The well casing and annulus were plugged with Portland Type I/II cement, placed by tremie. The well casing and surface casing were removed at 3 and 2 ft bgs, respectively, before the surface completion was installed.

8.0 REFERENCES AND MAP DATA SOURCES

8.1 References

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), November 2010. "Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-10-6972, Los Alamos, New Mexico. (LANL 2010, 111131)

LANL (Los Alamos National Laboratory), August 16, 2011. "Waste Characterization Strategy Form for Plug and Abandonment (P&A) of LANL Wells," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2011, 205839)

- LANL (Los Alamos National Laboratory), January 2012. "Amendment #1 to the Waste Characterization Strategy Form for Plug and Abandonment (P&A) of LANL Wells," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2012, 209732)
- LANL (Los Alamos National Laboratory), March 21, 2013. "Amendment #2 to the Waste Characterization Strategy Form for Plug and Abandonment (P&A) of LANL Wells," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2013, 238457)
- NMED (New Mexico Environment Department), March 9, 2011. "Notice of Approval with Modifications, Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 201231)
- Purtymun, W.D., January 1995. "Geologic and Hydrologic Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface Water Stations in the Los Alamos Area," Los Alamos National Laboratory report LA-12883-MS, Los Alamos, New Mexico. (Purtymun 1995, 045344)
- TerranearPMC, August 2011. "Field Implementation Plan to Plug and Abandon Wells and Boreholes SHB 1, SHB 3, SHB 4, TH 5, TH 6, Beta Hole, Sigma Mesa Well, H-19, and TA-21 Distillation Hole," plan prepared for Los Alamos National Laboratory, Los Alamos, New Mexico. (TerranearPMC 2011, 206495)

8.2 Map Data Sources for Plugging and Abandonment Report Location Map

- Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0109; 12 April 2010.
- Hypsography, 100 and 20 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.
- Surface Drainages, 1991; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program, ER2002-0591; 1:24,000 Scale Data; Unknown publication date.
- Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
- Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
- Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
- Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Division; 4 December 2009.

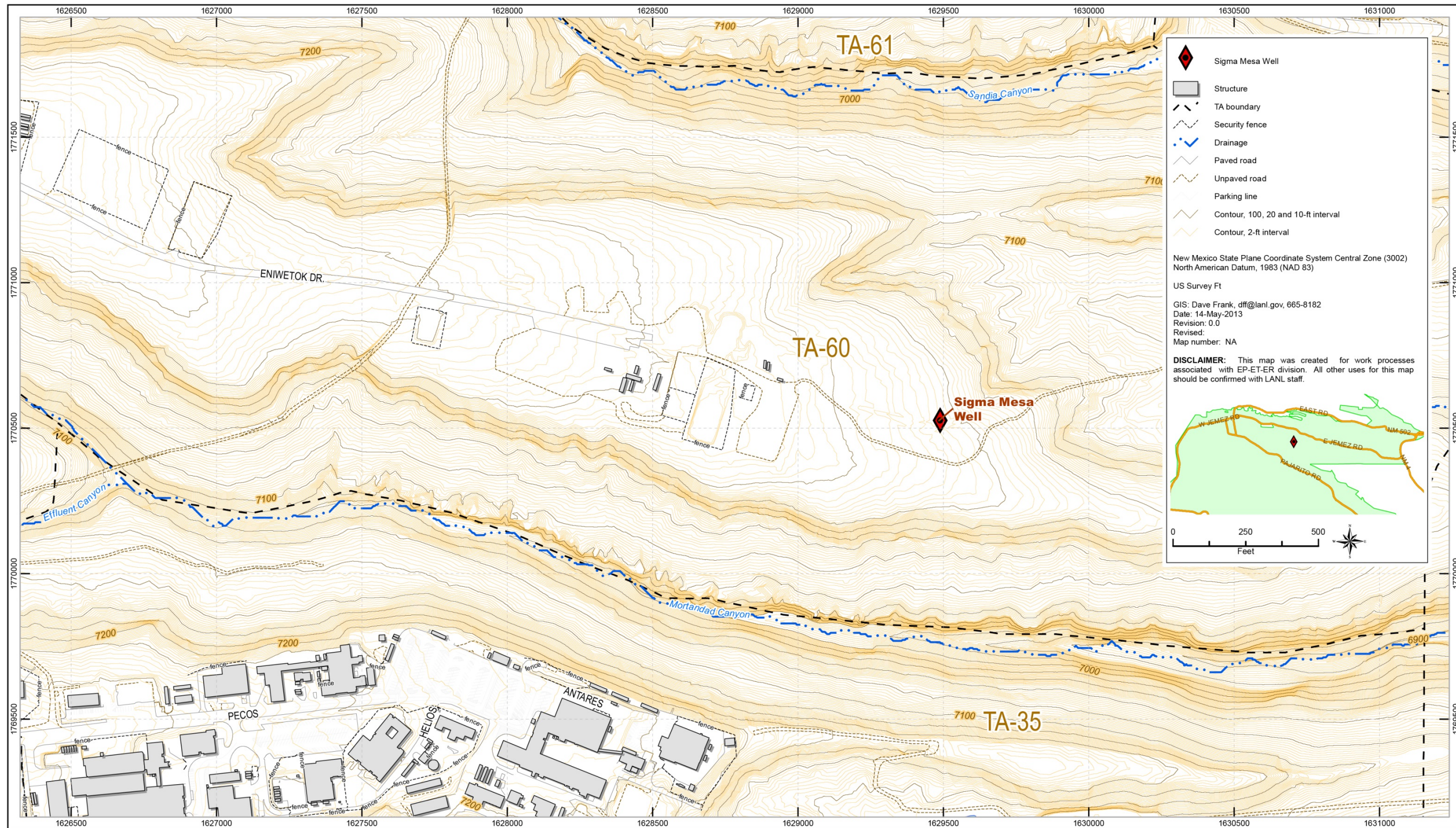


Figure 1.0-1 Location of the Sigma Mesa Well

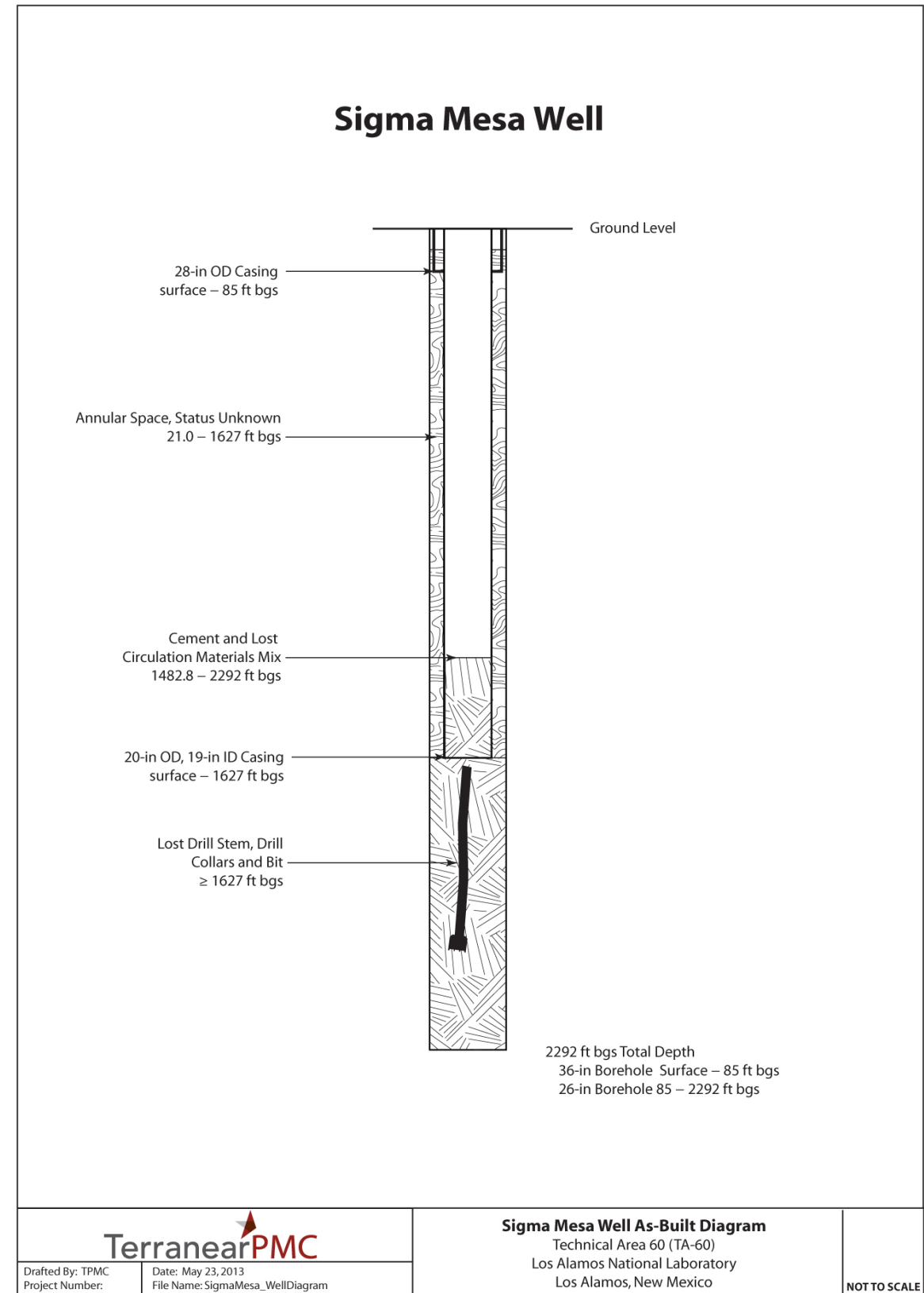


Figure 2.1-1 Sigma Mesa Well as-built diagram

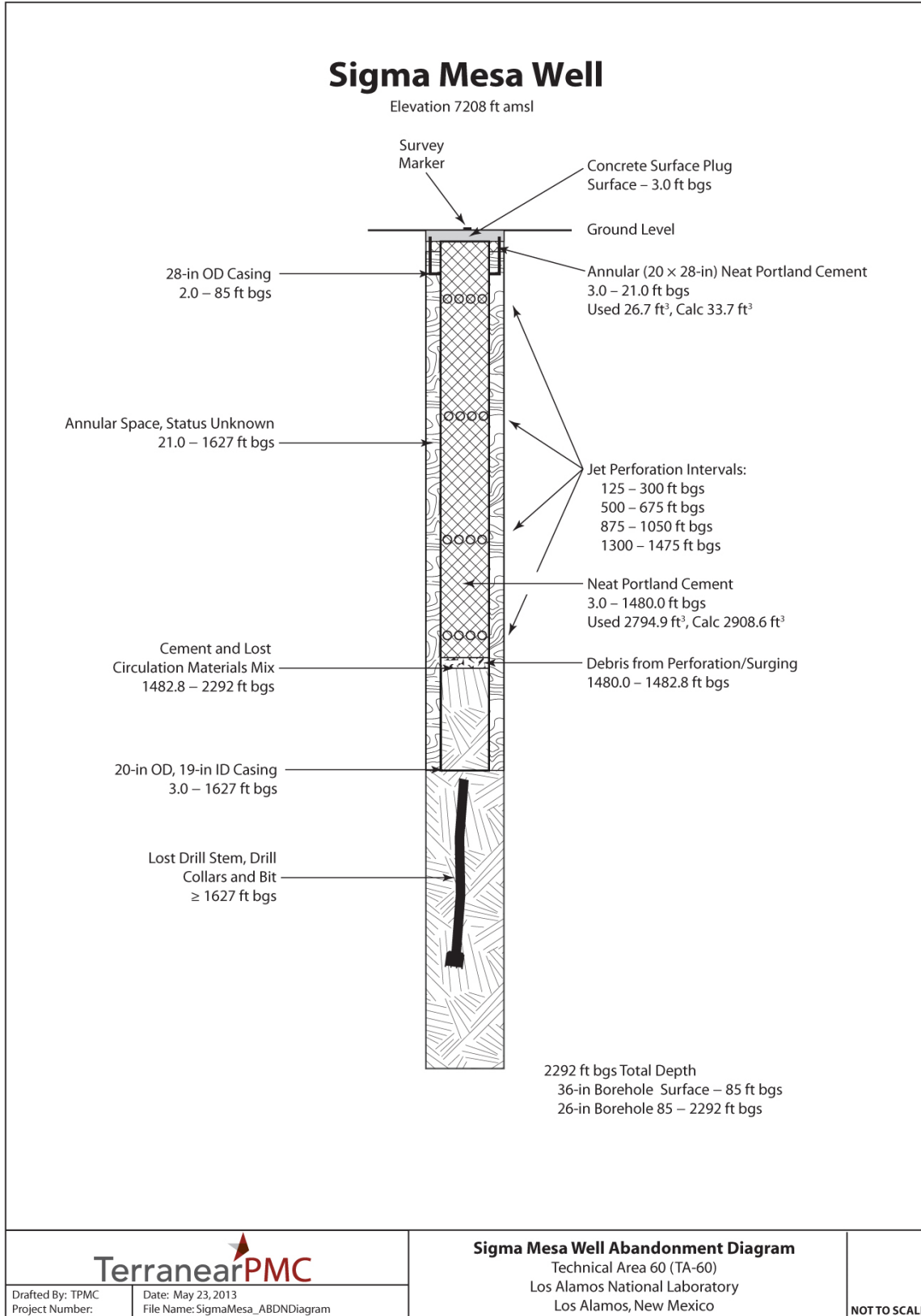


Figure 3.1-1 Sigma Mesa Well abandonment diagram

**Table 3.1-1
Sigma Mesa Well Perforations**

Shot Interval (ft bgs)	Target Perforation Interval (ft bgs)	Actual Perforation Depth (ft bgs)
Interval 1: 125–300	125–145	130
Interval 1: 125–300	145–165	150
Interval 1: 125–300	165–185	170
Interval 1: 125–300	185–205	190
Interval 1: 125–300	205–225	210
Interval 1: 125–300	225–245	230
Interval 1: 125–300	245–265	250
Interval 1: 125–300	265–285	270
Interval 1: 125–300	285– 300	290
Interval 1: 125–300	285– 300	300
Interval 2: 500–675	500–520	510
Interval 2: 500–675	520–540	530
Interval 2: 500–675	540–560	550
Interval 2: 500–675	560–580	570
Interval 2: 500–675	580–600	590
Interval 2: 500–675	600–620	610
Interval 2: 500–675	620–640	630
Interval 2: 500–675	640–660	650
Interval 2: 500–675	660–675	660
Interval 2: 500–675	660–675	675
Interval 3: 875–1050	875–895	880
Interval 3: 875–1050	895–915	900
Interval 3: 875–1050	915–925	920
Interval 3: 875–1050	925–945	930
Interval 3: 875–1050	945–965	950
Interval 3: 875–1050	965–985	970
Interval 3: 875–1050	985–1005	990
Interval 3: 875–1050	1005–1025	1010
Interval 3: 875–1050	1025–1045	1030
Interval 3: 875–1050	1045–1050	1050
Interval 4: 1300–1475	1300–1320	1300
Interval 4: 1300–1475	1320–1340	1320

Table 3.1-1 (continued)

Shot Interval (ft bgs)	Target Perforation Interval (ft bgs)	Actual Perforation Depth (ft bgs)
Interval 4: 1300–1475	1340–1360	1340
Interval 4: 1300–1475	1360–1380	1360
Interval 4: 1300–1475	1380–1400	1380
Interval 4: 1300–1475	1400–1420	1400
Interval 4: 1300–1475	1420–1440	1420
Interval 4: 1300–1475	1440–1460	1440
Interval 4: 1300–1475	1460–1475	1460
Interval 4: 1300–1475	1460–1475	1475
Interval 4: 1300–1475	1475–1480	1477

Table 3.1-2
Quantity and Materials Used to Plug and Abandon Sigma Mesa Well

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II used (lb)	Quantity Municipal Water Used (gal.)	Calculated Volume (ft ³) ^a	Actual Volume (ft ³)
3/18/13	1480.0–1021.6	60,000	5100	902.7	945.0
3/19/13	1021.6–602.9	48,000	4080	824.5	756.0
3/20/13	602.9–391.2	24,000	2040	416.9	378.0
3/21/13	391.2–3.0	45,600	3876	764.5	715.9
3/21/13	21.0–3.0	1920	163	33.7 ^b	26.7
Total		179,520	15,259	2942.3	2821.6

^a Calculate volume is based on 19-in.-I.D. casing volume

^b Calculated volume is for the annulus between the well casing and surface casing.

Table 4.1-1
Survey Coordinates from Aluminum Pin Embedded in Surface Pad

Identification	Northing	Easting	Elevation
Sigma Mesa Well	1770618.24	1628828.27	7208

Note: Coordinates are expressed as New Mexico State Plane Coordinate System Central Zone (NAD 83); elevation is expressed in feet amsl using the National Geodetic Vertical Datum of 1929.

Appendix A

*Approval of Alternate Plugging and
Abandonment Approach for the Sigma Mesa Well*

From: [Trujillo, Jerri, OSE](mailto:Trujillo, Jerri_OSE)
To: [Everett, Mark C](mailto:Everett, Mark_C)
Subject: RE: RG-92975 P&A update
Date: Wednesday, March 06, 2013 7:30:12 AM

Thank you Mark, We appreciate how quickly you contact us with changes in the plan. The OSE approves these changes, you may proceed with receipt of this email.
Regards,

Jerri Trujillo
Upper Pecos Basin Manager
Office of the State Engineer
PO Box 25102
Santa Fe, NM 87504-5102

505-827-7848
jerri.trujillo@state.nm.us

-----Original Message-----

From: Everett, Mark C [<mailto:meverett@lanl.gov>]
Sent: Tuesday, March 05, 2013 3:36 PM
To: Trujillo, Jerri, OSE
Subject: Re: RG-92975 P&A update

From drilling in the area we know that there isn't any perched water. The seal (either tremied behind the casing or pumped through perfs) is to prevent impacts from any surface fluids entering the borehole. So, I believe that grout entering the annulus through the perfs at 130 will be protective of the first aquifer (1330 ft).
Mark Everett

----- Original Message -----

From: Trujillo, Jerri, OSE [<mailto:jerri.trujillo@state.nm.us>]
Sent: Tuesday, March 05, 2013 02:26 PM
To: Everett, Mark C
Subject: RE: RG-92975 P&A update

Mark,

The proposal for using explosive shape charges is the most logical alternative to make the perforations required for a good plug. The OSE is amenable to this change. LANL's threshold loss of 300% of grout (casing interior + annulus) to consider the addition of a loss circulation material such as bentonite. OSE deems this approach a conservative method of approach.

Question, if you are unable for some reason to place the tremmie between the 20 and 30 inch casing between 2-3 feet, do you believe that the first explosive blast at 130 feet will allow for the seal to be made protecting any perched water there?

jerri

-----Original Message-----

From: Everett, Mark C [<mailto:meverett@lanl.gov>]
Sent: Tuesday, March 05, 2013 10:28 AM
To: Trujillo, Jerri, OSE
Subject: RG-92975 P&A update

Jerri,

As you and I discussed, the well casing in the Sigma Mesa well is 1/2 inch wall and therefore cannot be penetrated by the mechanical, hydraulic, or pneumatic perforating tools we can readily obtain. We therefore propose to perforate using a Jet Perforating tool which employs explosives to generate high pressure plasma creating 1/2 inch diameter holes in the casing. The hole pattern is three (3) holes per shot, 120 degrees apart. The shot frequency is described in the attached shot plan.

Once the entire perforating sequence is completed, we will pressure grout the well from the bottom up with a 20% sand-cement mix. If grout loss exceeds 300% of the calculated volume (casing interior + annulus) we propose to add bentonite grout to the mixture as lost circulation material. The bentonite will be added until the loss is controlled and then we will return to the 20% sand-cement grout.

Additionally, because of the wall thickness, we will not be able to cut the casings at 20 and 25 feet below ground surface (bgs) as proposed in our plugging plan. Instead, we propose to manually cut the 20-inch casing at 3 feet bgs and the 30-inch casing at 2 feet bgs. We will attempt to place grout, tremied from the surface, between the casing strings once they are cut.

Please respond to this e-mail with your concurrence or give me a call to discuss.

Thanks,

Mark Everett
ADEP ET-EI
Los Alamos National Laboratory
(505) 667-5931
(505 231-6002 (cell))

-----Original Message-----

From: Trujillo, Jerri, OSE [<mailto:jerri.trujillo@state.nm.us>]
Sent: Friday, February 22, 2013 3:03 PM
To: Everett, Mark C
Subject: RE: RG-92975 sealant material change approved

Thank you, and best of luck.
Jerri

-----Original Message-----

From: Everett, Mark C [<mailto:meverett@lanl.gov>]
Sent: Friday, February 22, 2013 3:03 PM
To: Trujillo, Jerri, OSE
Subject: Re: RG-92975 sealant material change approved

Thank you for the quick response Jerri. I will be in touch if anything else comes up.
Mark Everett

----- Original Message -----

From: Trujillo, Jerri, OSE [<mailto:jerri.trujillo@state.nm.us>]
Sent: Friday, February 22, 2013 02:12 PM
To: Everett, Mark C
Cc: Myers, Kevin, OSE <kevin.myers@state.nm.us>; Trujillo, Jerri, OSE <jerri.trujillo@state.nm.us>
Subject: RE: RG-92975 sealant material change approved

Mark,
I just spoke with Kevin and he agrees that adding sand may reduce viscosity, but it will add strength. The size of the perforation and interval in the plan below help provide confidence of a good seal. This proposed change in sealing material is approved by authority of this email.
Thank you for contacting us regarding this matter.
Regards,
Jerri

-----Original Message-----

From: Everett, Mark C [<mailto:meverett@lanl.gov>]

Sent: Friday, February 22, 2013 1:39 PM

To: Trujillo, Jerri, OSE

Subject: RG-92975 plugging plan change

Jerri,

The Los Alamos National Laboratory requests permission to modify the plugging plan for the subject well as follows.

Instead of mixing neat cement on site as proposed, we would like to have a provider deliver cement with 20% sand to use as a sealing material. The perforated intervals will remain as proposed. Each perforation will be approximately 5"x1/2" and there will be 4 perforations 90 degrees from one another every 10 ft.

Please respond to this email with your concurrence or contact me at 231-6002 to discuss further.

Thanks,

Mark Everett

Mark Everett

From: Trujillo, Jerri, OSE <jerri.trujillo@state.nm.us>
Sent: Wednesday, March 20, 2013 8:00 AM
To: Everett, Mark C; Dale, Michael R
Cc: Ball, Ted; Woodworth, Woody; Myers, Kevin, OSE
Subject: RE: Sigma Mesa well (RG-92975) P&A status

The OSE Hydrology Bureau and Water Rights Division both concur that LANL has made more than a reasonable attempt to perforate the casing and the plugging should continue with the neat cement as communicated. The OSE does defer to NMED or any other regulatory agency sharing jurisdiction of this plugging project.

Thank you,

Jerri Trujillo
Water Rights Division

From: Everett, Mark C [<mailto:meverett@lanl.gov>]
Sent: Wednesday, March 20, 2013 7:51 AM
To: Trujillo, Jerri, OSE; Dale, Michael R
Cc: Ball, Ted; Woodworth, Woody
Subject: Sigma Mesa well (RG-92975) P&A status

Jerri and Michael,

This e-mail is a follow up to our phone conversations yesterday. After discovering that we are unable to rip holes in the casing and a less than impressive shot perforation job, we find ourselves out of options. We are using neat cement to fill the casing and are calculating a 5% loss to the annulus. Given the history of lost circulation and the resultant cement use during drilling of this well (over 7,000 sacks total, 675 in this interval alone) the current zone is likely already sealed. As we agreed yesterday, LANL has made more than a reasonable effort to perforate and seal this well and that the prudent thing to do is continue with the grout job until the well is fully plugged. Additionally, we will tremie cement into the annular space between the 20 and 30 inch casing strings to ensure a surface seal. I request that each of you respond to this e-mail with your concurrence so that we may keep the administrative record complete.

Thank you,

Mark Everett, PG
ADEP ET-EI
Los Alamos National Laboratory
(505) 667-5931
(505 231-6002 (cell))

From: Dale, Michael, NMENV <Michael.Dale@state.nm.us>
Sent: Thursday, March 21, 2013 11:14 AM
To: Everett, Mark C
Cc: Cobrain, Dave, NMENV; Trujillo, Jerri, OSE; Wear, Benjamin, NMENV; Kulis, Jerzy, NMENV; Shen, Hai
Subject: RE: Sigma Mesa well (RG-92975) P&A status

Mark,

NMED concurs and approves the path-forward proposal as described in your e-mail below for the Sigma Mesa well. The referenced e-mail was received today, March 21, 2013 at 7:51 am. Please contact me if you have questions concerning this approval.

Michael Dale

Hazardous Waste Bureau
New Mexico Environment Department
2905, Rodeo Park Drive East, Building 1
Santa Fe, NM 87505
Cell Phone: (505) 231-5423
Main HWB Phone (505) 476-6000
Los Alamos Phone (505) 661-2673

From: Everett, Mark C [meverett@lanl.gov]
Sent: Thursday, March 21, 2013 7:51 AM
To: Dale, Michael, NMENV
Subject: FW: Sigma Mesa well (RG-92975) P&A status

Michael,

You were right, I sent this to your LANL address.

Mark Everett, PG
ADEP ET-EI
Los Alamos National Laboratory
(505) 667-5931
(505 231-6002 (cell))

From: Everett, Mark C
Sent: Wednesday, March 20, 2013 7:51 AM
To: Jerri Trujillo (jerri.trujillo@state.nm.us); Dale, Michael R
Cc: Ball, Ted; Woody Woodworth (Lance.Woodworth@nnsa.doe.gov)
Subject: Sigma Mesa well (RG-92975) P&A status

Jerri and Michael,

This e-mail is a follow up to our phone conversations yesterday. After discovering that we are unable to rip holes in the casing and a less than impressive shot perforation job, we find ourselves out of options. We are using neat cement to fill

the casing and are calculating a 5% loss to the annulus. Given the history of lost circulation and the resultant cement use during drilling of this well (over 7,000 sacks total, 675 in this interval alone) the current zone is likely already sealed. As we agreed yesterday, LANL has made more than a reasonable effort to perforate and seal this well and that the prudent thing to do is continue with the grout job until the well is fully plugged. Additionally, we will tremie cement into the annular space between the 20 and 30 inch casing strings to ensure a surface seal. I request that each of you respond to this e-mail with your concurrence so that we may keep the administrative record complete.

Thank you,

Mark Everett, PG
ADEP ET-EI
Los Alamos National Laboratory
(505) 667-5931
(505 231-6002 (cell))

Appendix B

*Video Logs of Sigma Mesa Well
(on DVD included with this document)*

