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Plugging and Abandonment Summary Report for Test Holes TH-1, TH-2, TH-3, and TH-5 at Technical Area 49

Prepared by the Environmental Programs Directorate

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March 2012

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EXECUTIVE SUMMARY

This report describes the methods Los Alamos National Laboratory used to plug and abandon neutron moisture logging Test Hole 1 (TH-1), TH-2, TH-3, and TH-5 at Technical Area 49 (TA-49), Los Alamos, New Mexico. TH-4 is located within the nuclear environmental site boundary at TA-49 and was not abandoned.

TH-1, TH-2, TH-3, and TH-5 were plugged and abandoned in accordance with the approved "Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory."

Plugging and abandonment activities at TH-1, TH-2, TH-3, and TH-5 occurred from May 16, 2011, to May 23, 2011, using a CME-85 hollow-stem auger all-terrain drill rig and ancillary equipment.

TH-3 was abandoned first, followed by TH-5, TH-1, and TH-2. Surface casing was removed, and the boreholes were plugged and abandoned via tremie pipe with 3/8-in. bentonite chips from the bottom to 10 ft below ground surface (bgs). The remainder of each borehole was then filled to within 2 ft bgs with Portland Type I/II neat cement. Concrete was placed above the cement to the top of the borehole and then formed into a 2-ft × 2-ft × 0.5-ft-thick surface pad. A brass marker was embedded in the surface of the pad and surveyed in accordance with Section IX.B.2.f of the Compliance Order on Consent.

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1.0 INTRODUCTION

This report summarizes the methods Los Alamos National Laboratory (LANL or the Laboratory) used to plug and abandon Test Hole 1 (TH-1), TH-2, TH-3, and TH-5 at Technical Area 49 (TA-49). Well abandonment was consistent with the requirements and guidelines in Sections IV.B.1.b.v and X.D (Well Abandonment) of the New Mexico Environment Department (NMED) Compliance Order on Consent (the Consent Order). Additionally, the plugging and abandonment procedures complied with New Mexico Administrative Code 19.27.4, Well Driller Licensing; Construction, Repair and Plugging of Wells. The document titled "Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory" (LANL 2010, 111131) helped guide the implementation of the scope of work for the plugging and abandonment project of TH-1, TH-2, TH-3, and TH-5 at TA-49.

2.0 BACKGROUND

TH-1, TH-2, TH-3, and TH-5 are located at TA-49, Los Alamos, New Mexico (Figure 2.0-1). TH-4 is located within the nuclear environmental site (NES) boundary at TA-49. TH-1, TH-2, TH-3, TH-4, and TH-5 were installed in 1980 to 123 ft below ground surface (bgs) for neutron moisture logging at Area 2 in TA-49.

2.1 Well History

In 1980, a study was conducted to explain the observed accumulation of water in Core Hole 2 (CH-2). The study involved drilling five test holes (TH-1, TH-2, TH-3, TH-4, and TH-5) at locations adjacent to Areas 2, 2A, and 2B at TA-49. The boreholes were drilled to depths that would provide moisture monitoring of the tuff below the bottom of the shafts in Areas 2, 2A, and 2B. The boreholes were drilled through the sand fill and into the underlying tuff. Cuttings from the test holes were logged, and moisture content was determined over 5-ft drilling intervals. The test holes were cased to 2 ft bgs with 5-in. polyvinyl chloride (PVC) pipe to facilitate neutron logging (Purtymun and Ahlquist 1986, 014722, p. 16). The well construction diagram for the test wells before plugging and abandonment is presented in Figure 2.0-2 and is based on field observations.

2.2 Rationale for Plugging and Abandonment

TH-1, TH-2, TH-3, and TH-5 were abandoned in accordance with direction from NMED as communicated in the "Notice of Approval with Modifications, Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory" (NMED 2011, 201231). TH-4 will be plugged and abandoned at a later date.

3.0 SCOPE OF ACTIVITIES

The scope of activities for the plugging and abandonment of TH-1, TH-2, TH-3, and TH-5 is presented below.

3.1 Plugging and Abandonment Design and Approach

The total depth (TD) of each test hole was tagged before abandonment. The abandonment approach implemented at the test holes was to remove all aboveground and belowground appurtenances. The boreholes were abandoned by removing the 5–in. PVC casings and filling the open boreholes with 3/8-in. bentonite chips from TD to within 10 ft of ground surface. The remainder of each borehole was filled with neat cement to within 2 ft of ground surface. Concrete was placed above the cement.

3.2 Borehole Logging

No borehole logging was conducted before the plugging and abandonment of TH-1, TH-2, TH-3, and TH-5.

3.3 Plugging and Abandonment

Plugging and abandonment activities included mobilization, casing removal, grouting/sealing, and demobilization. All activities were performed following appropriate standard operating procedures and Laboratory-approved health and safety documents. TH-1, TH-2, TH-3, and TH-5 were plugged and abandoned in accordance with the NMED-approved work plans (LANL 2010, 111131). Figure 3.3-1 illustrates the final well configurations after plugging and abandonment.

3.3.1 Field Activities

Plugging and Abandonment of TH-1, TH-2, TH-3, and TH-5

Mobilization of a CME-85 hollow-stem auger all-terrain drill rig and ancillary equipment to TH-3 was performed on May 16, 2011. TH-3, TH-5, and TH-1 were abandoned on May 16, 2011. TH-2 was abandoned on May 17, 2011. Aboveground surface completions were completed on May 19 and 20, and the brass monuments were stamped on May 23. Each of the test holes was inspected and tagged. Inspection revealed that the casing extended only to 2 ft bgs with a 3-ft stick-up. Therefore, the casing at each of the test holes was pulled before the plugging and abandonment. After each borehole was tagged and the casing pulled, the test holes were filled from TD to approximately 10 ft bgs with 3/8-in. bentonite chips. The chips were tremied into the open borehole and hydrated using municipal water. The remainder of each of the boreholes was filled with neat cement to within 2 ft of ground surface and capped with concrete. The tagged depth and volume and type of abandonment materials used to abandon each of the test holes are presented in Table 3.3-1.

3.3.2 Completion

Concrete was placed above the cement at the top of each borehole and then formed into a 2-ft × 2-ft × 0.5-ft-thick surface pad. Brass survey markers were surveyed in accordance with Section IX.B.2.f of the Consent Order.

4.0 POSTABANDONMENT ACTIVITIES

Postabandonment activities are described below.

4.1 Well Site Restoration

Plugging and abandonment activities at the test hole sites did not disturb site conditions, and no restoration efforts were required.

4.2 Waste Management

Contact waste (i.e., PVC casing) was generated during the plugging and abandonment of TH-1, TH-2, TH-3, and TH-5. All contact waste was recycled or reused.

5.0 DEVIATIONS FROM PLANNED ACTIVITIES

The work plan indicated that surface casing extended to approximately 10 ft bgs. However, the PVC surface casing at each of the test holes extended to only 2 ft bgs and had a 3-ft stick-up. Each 5-ft length of PVC casing was removed from the boreholes. TH-4 is located within the NES Boundary at TA-49 and was not abandoned during this effort because it is planned for abandonment with other wells and boreholes inside the NES, which will require a separate readiness process.

6.0 SUMMARY

TH-1, TH-2, TH-3, and TH-5 were plugged and abandoned in accordance with the NMED-approved work plans (LANL 2010, 111131). TH-3 was abandoned first, followed by TH-5, TH-1, and TH-2. Surface casing was removed, and the boreholes were plugged and abandoned via tremie pipe with 3/8-in. bentonite chips from the bottom to 10 ft bgs. The bentonite chips were hydrated with municipal water. The remainder of each of the boreholes was filled with Portland Type I/II neat cement. Concrete was placed above the cement at the top of the borehole and then formed into a 2-ft × 2-ft × 0.5-ft-thick surface pad. A brass marker was embedded in the surface of the pad and surveyed in accordance with Section IX.B.2.f of the Consent Order.

7.0 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)

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., and A.J. Ahlquist, 1986. "Geologic and Hydrologic Evaluation of Technical Area 49," Los Alamos National Laboratory document HSE-8-86-1183, Los Alamos, New Mexico. (Purtymun and Ahlquist 1986, 014722)

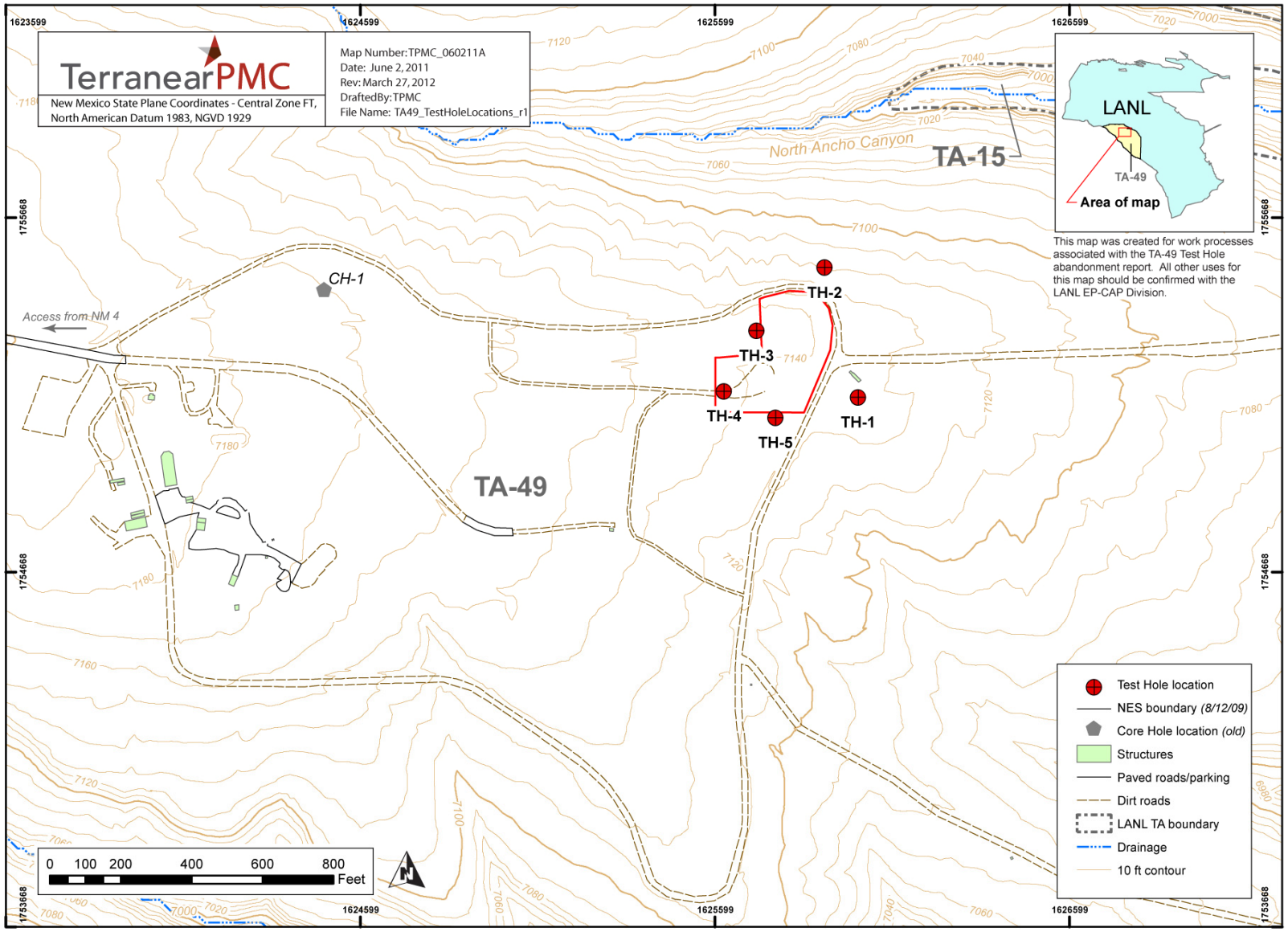


Figure 2.0-1 Location of TH-1, TH-2, TH-3, TH-4, and TH-5

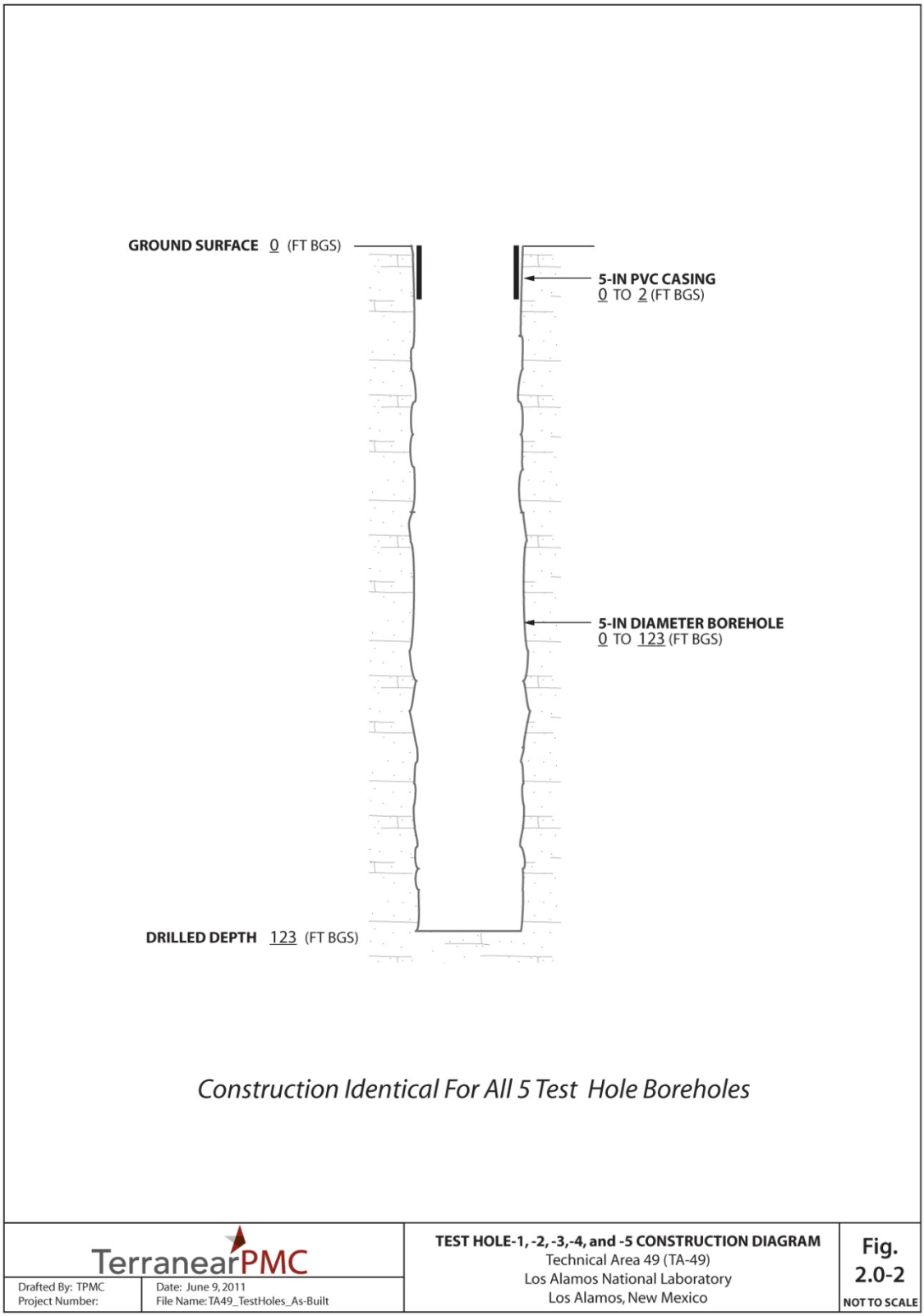
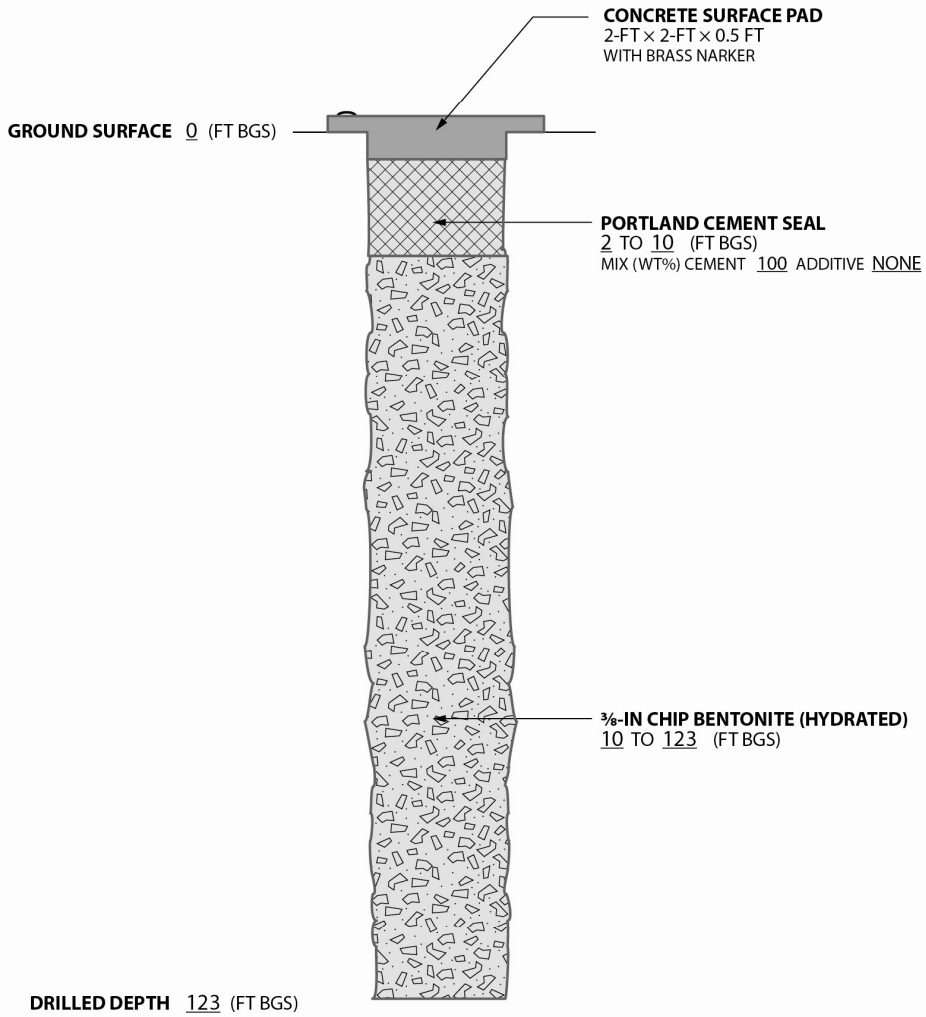


Figure 2.0-2 Test hole as-built well construction diagram



Abandonment Identical For All 4 Test Hole Boreholes,
All Casing Removed; see Table 3.3-1 for Abandoment Material Quantities.

TerranearPMC		**TEST HOLE-1, -2, -3, and -5 ABANDONMENT DIAGRAM** Technical Area 49 (TA-49) Los Alamos National Laboratory Los Alamos, New Mexico	**Fig. 3.3-1** NOT TO SCALE
Drafted By: TPMC Project Number:	Date: June 9, 2011 File Name: TA49_TestHoles_ABD As-Built		

Figure 3.3-1 Test hole as-built well abandonment diagram

Table 3.3-1
Materials and Quantities Used to Plug and Abandon Test Holes

Test Hole ID	Depth Interval (ft bgs)	Quantity Portland Type I/II/V Used (lb)	Quantity 3/8-in. Bentonite Used (lb)	Quantity Municipal Water Used (gal.)	Calculated Volume (ft^3)[a]	Actual Volume (ft^3)
TH-1	0–10	94	na[b]	10	15.1	20.6
TH-1	10–111	n/a	900	144		
TH-2	0–10	94	n/a	10	14.1	16.3
TH-2	10–104	n/a	700	112		
TH-3	0–10	94	n/a	10	14.8	18.4
TH-3	10–109	n/a	800	128		
TH-5	0–10	94	n/a	10	15.4	20.6
TH-5	10–113	n/a	900	144		

[a] Calculated volumes are based on the following dimensions:
0–respective TD ft bgs: 5-in. open hole.

[b] n/a = Not applicable.