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Replacement Work Plans for the Plugging and Abandonment of Wells for 2014

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Prepared by the Environmental Programs Directorate

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Replacement Work Plans for the Plugging and Abandonment of Wells for 2014

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CONTENTS

Figures

Table

1.0 INTRODUCTION

This report contains information and work plans for the plugging and abandonment of three wells and boreholes at Los Alamos National Laboratory (LANL or the Laboratory) and is part of the Laboratory's ongoing efforts to plug and abandon legacy wells and boreholes. It replaces the work plans for the eight boreholes proposed for plugging and abandonment in calendar year 2014, prepared by the Laboratory in October 2013.

The work plans describe plugging and abandonment procedures that comply with the New Mexico Office of the State Engineer (NMOSE) well or borehole abandonment regulations (19.27.4 New Mexico Administrative Code Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells). The work plans will be submitted to NMOSE before the wells are abandoned.

This report includes three stand-alone work plans and associated figures as shown in Table 1.0-1. References for the work plans are provided at the end of this report.

Table 1.0-1
Organization of Work Plans

2.0 BACKGROUND INFORMATION AND RATIONALE

Prioritization of wells and boreholes to be abandoned is based on criteria that determine their potential for providing a pathway for contaminants to reach the regional aquifer. These criteria include the depth of the well, its location (canyon bottom versus mesa top), its condition (wet or dry), its proximity to known sources of contamination, its age, its construction, and its accessibility to the public. In addition, recent experience from work performed in 2011, 2012, and 2013 has added some practical criteria to maximize cost savings and stay within allotted budgets. These criteria include grouping wells and boreholes within a given location to minimize mobilization costs and required permitting and combining difficult and thus expensive wells with less difficult ones. The information available about legacy boreholes may be inaccurate, and unexpected conditions may be encountered. Therefore, field reconnaissance will be conducted at the wells and boreholes to verify construction details of the well. These details include ease of site access, condition of surface well pad, security of the surface casing and well head, verification of total well depth, depth of groundwater (if present) location of any potential obstructions, and other issues that may hamper implementing the abandonment work plan.

The locations of wells and boreholes to be abandoned are shown in Figure 2.0-1. The rationale for plugging and abandoning each hole is provided below.

2.1 Intermediate Well LAWS-02

Intermediate well LAWS-02 was installed under the Los Alamos Canyon low-head weir at the east end of Los Alamos Canyon in 2001 (Stone and Newell 2002, 099125). This well is angled at 43 degrees below horizontal and is 156 ft long reaching a vertical depth of 106 ft below ground surface (bgs). It was installed to investigate infiltration of water standing behind the retention structure at the Los Alamos Canyon low-head weir. The well contains a scalloped polyvinyl chloride (PVC) shield and a FLUTe water monitoring system. The research project for which the well was installed has been completed and the well is no longer needed. The well may provide a pathway for contaminants to reach intermediate groundwater, and therefore, the Laboratory proposes that it should be plugged and abandoned.

2.2 Intermediate Well LAWS-03

Intermediate well LAWS-03 was installed under the Los Alamos Canyon low-head weir at the east end of Los Alamos Canyon in 2001 (Stone and Newell 2002, 099125). This well is angled at 34 degrees below horizontal and was initially 136 ft long, reaching a vertical depth of 76 ft bgs. However, during installation of the scalloped PVC, the well became blocked at 85 ft along the length of the boring. It was installed to investigate infiltration of water standing behind the retention structure at the Los Alamos Canyon low-head weir. The well contains a perforated PVC shield and a FLUTe water monitoring system set to 85 ft. The research project for which the well was installed has been completed and the well is no longer needed. The well may provide a pathway for contaminants to reach intermediate groundwater and therefore, the Laboratory proposes that it should be plugged and abandoned.

2.3 Test Well DT-5A

Test well DT-5A was drilled by the U.S. Geological Survey in January 1960 at Technical Area 49 (TA-49) to a depth of 1821 ft bgs as part of determining if the Frijoles Mesa site at TA-49 would be suitable for conducting hydronuclear and related experiments (Weir and Purtymun 1962, 011890; Purtymun 1995, 045344). The well is constructed of 525 ft of 12-in.-diameter steel casing cemented in place. Inside the 12-in. casing is 1821 ft of 8-in.-diameter steel casing with a total of 220 ft of torch-cut slots throughout the area from 1172 to 1821 ft bgs (LANL 2008, 102215). There is no information on backfilling, and it is assumed that native material makes up the backfill.

Well DT-5A is the deepest of the test wells installed as part of the geological characterization of Frijoles Mesa. This well is within Area 5, which served as the main control area for the hydronuclear and related experiments and thus is located in close proximity to Material Disposal Area (MDA) AB and Area 4, where substantial inventories of nuclear materials exist (LANL 2007, 098523). Primary contaminants at MDA AB include tritium, plutonium, americium, cesium, arsenic, chromium, copper, lead, and perchlorate. Three decades of water-quality records from regional wells in this area (test wells DT-5A, DT-9, and DT-10) show no substantial changes in water chemistry or the presence of Laboratory contaminants in the regional aquifer (LANL 2011, 205231). No perched water was found during the drilling of DT-5A or in DT-5P, drilled to a depth of 692 ft as a dry hole. An unsuccessful well, DT-5 was abandoned at a depth of 927 ft bgs after circulation was lost into fractures in the tuff. Groundwater samples collected from DT-5A have shown elevated metal concentrations related to corrosion or flaking of well components (LANL 2011, 205231). For these reasons, test well DT-5A was replaced by wells R-29 and R-30 in 2008 as part of the Laboratory's groundwater monitoring program. The age, construction, location, and depth of this well within the regional aquifer require that it be plugged and abandoned to prevent any possibility of contaminant migration.

3.0 WORK PLANS FOR PLUGGING AND ABANDONMENT

3.1 Work Plan to Plug and Abandon Intermediate Well LAWS-02

Primary Purpose	The purpose for plugging and abandoning this borehole is to prevent the migration of surface water in the well to depth. This work plan summarizes the plugging and abandonment methods the Laboratory proposes for well LAWS-02, located at the Los Alamos Canyon low-head weir structure, TA-72 in Los Alamos Canyon. Well abandonment will be consistent with Section X.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan will be submitted to NMOSE before the well is abandoned.
Construction	Well LAWS-02 is an angled hole drilled in 2001 at a 43-degree angle under the site of the Los Alamos Canyon low-head weir. The hole was drilled in two phases. First, a 12-in.-diameter hole was augered approximately 9 ft to the top of the basalt. A 10¾-in.–outside diameter surface casing was then set. Next, the hole was advanced to 156 ft using air-rotary, casing-advance methods. No drilling fluids were used during drilling. A scalloped PVC shield was installed in the borehole to total depth (TD) into which a FLUTe water monitoring system with the associated transducers and sampling ports was deployed. The well is constructed as follows (Figure 3.1-1): • 156 ft of 6-in. schedule 80 PVC with scallops
Abandonment Methods	All surface and subsurface appurtenances, including the FLUTe system will be removed from the well before it is abandoned. The scalloped PVC shield is expected to be locked in place by formation collapse around it and so it will not be removed. The well will be pressure grouted from 156 ft to the surface. A schematic diagram of well abandonment is shown in Figure 3.1-1.
Surface Completion	The stainless-steel surface casing will be cut off level with the concrete surface pad. The existing brass marker will be left in the cement pad with the plugged well.
Waste Disposal	A waste characterization strategy form (WCSF) will be prepared to guide disposal of any wastes generated during abandonment. No waste samples will be collected. Materials removed from the borehole will be reused or recycled if possible. Non-recyclable materials will be disposed in accordance with the WCSF.
Summary Report	A report will be prepared detailing the abandonment methods and the quantities of backfill materials used. A location map and abandonment schematic will also be included in the report.

3.2 Work Plan to Plug and Abandon Intermediate Well LAWS-03

Primary Purpose	The purpose for plugging and abandoning this borehole is to prevent the migration of surface water in the well to depth. This work plan summarizes the plugging and abandonment methods the Laboratory proposes for well LAWS-03, located at the Los Alamos Canyon low-head weir structure, TA-72 in Los Alamos Canyon. Well abandonment will be consistent with Section X.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan will be submitted to NMOSE before the well is abandoned.
Construction	Well LAWS-03 is an angled hole drilled in 2001 at a 34-degree angle under the site of the Los Alamos Canyon weir. The hole was drilled in two phases. First, a 12-in.-diameter hole was augered approximately 9 ft to the top of the basalt. A 10¾-in.–outside diameter surface casing was then set. Next, the hole was advanced to 136 ft using air-rotary, casing-advance methods. No drilling fluids were used during drilling. After several iterations trying to clear the borehole to TD, the well was constructed using 6½-in.-diameter schedule 40 PVC with a series of 2-in. holes drilled into the pipe. Fifty-one feet of 6-in.-diameter schedule 80 PVC was abandoned in place from 85 ft bgs to 136 ft bgs. The pipe was installed to 85 ft into which a FLUTe water monitoring system with the associated transducers and sampling ports was deployed. The well is constructed as follows (Figure 3.2-1): • 85 ft of 6.5-in. schedule 40 PVC with holes • 85–136 ft of 6-in. schedule 80 PVC with scallops
Abandonment Methods	All surface and subsurface appurtenances, including the FLUTe system, will be removed from the well before abandonment. The perforated PVC is expected to be locked in place by formation collapse around it and so it will not be removed. The well will be pressure grouted from 85 ft to the surface. A schematic diagram of well abandonment is shown in Figure 3.2-1.
Surface Completion	The stainless-steel surface casing will be cut off level with the concrete surface pad. The existing brass marker will be left in the cement pad with the plugged well.
Waste Disposal	A WCSF will be prepared to guide disposal of any wastes generated during abandonment. No waste samples will be collected. Materials removed from the borehole will be reused or recycled if possible. Non-recyclable materials will be disposed in accordance with the WCSF.
Summary Report	A report will be prepared detailing the abandonment methods and the quantities of backfill materials used. A location map and abandonment schematic will also be included in the report.

3.3 Work Plan to Plug and Abandon Test Well DT-5A

Primary Purpose	The purpose for plugging and abandoning this well is to prevent migration of water and contaminants from upper levels of the well to the zone of regional saturation. This work plan summarizes the plugging and abandonment methods the Laboratory proposes for test well DT-5A, located on Frijoles Mesa in TA-49, Area 5. Well abandonment will be consistent with Section X.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan will be submitted to NMOSE before abandonment.
Construction	Test well DT-5A was drilled to 1821 ft bgs in 1960 (Weir and Purtymun 1962, 011890; Purtymun 1995, 045344) with rotary equipment using mud as a drilling fluid. Water was encountered at 1173 ft bgs. Perched water was not encountered during the drilling of DT-5A. A total of 525 ft of 12-in.-diameter steel casing was cemented into the borehole. A series of torch-cut slots is present throughout the area below 1172 ft bgs. The water level in the well at the time of completion was 1173 ft bgs. There is no backfill in the well annulus.
Abandonment Methods	All surface and subsurface appurtenances will be removed from the well before it is abandoned. The well will be video and gamma surveyed to document preabandonment conditions. The well will be plugged and abandoned as follows: 1. Grout the well up to 800 ft bgs 2. Remove the tremmie pipe and trip in a cutting tool 3. Cut the 8-in. casing at 780 ft bgs 4. Pull the 8-in. casing back 5 ft 5. Trip out the cutting tool 6. Trip in the tremmie pipe to 780 ft bgs and begin pressure grouting as the 8-in. casing is pulled back and removed from the well
Surface Completion	A neat-cement mound with brass marker will be installed over the well at ground surface. The marker will be surveyed in accordance with Section IX.B.2.f of the Consent Order, which states that pertinent structures may be horizontally located with a global positioning system with an accuracy of ±0.5 ft.
Waste Disposal	A WCSF will be prepared to guide disposal of any wastes generated during abandonment. No waste samples will be collected. Materials removed from the borehole will be reused or recycled if possible. Non-recyclable materials will be disposed in accordance with the WCSF.
Summary Report	A report will be prepared detailing the abandonment methods and the quantities of backfill materials used. A location map and abandonment schematic will also be included in the report.

4.0 REFERENCES

The following list includes all documents cited in this plan. 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.

LANL (Los Alamos National Laboratory), October 2007. "Historical Investigation Report for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary," Los Alamos National Laboratory document LA-UR-07-6428, Los Alamos, New Mexico. (LANL 2007, 098523)

LANL (Los Alamos National Laboratory), January 2008. "Investigation Work Plan for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary, Revision 1," Los Alamos National Laboratory document LA-UR-08-0449, Los Alamos, New Mexico. (LANL 2008, 102215)

LANL (Los Alamos National Laboratory), August 2011. "2011 Interim Facility-Wide Groundwater Monitoring Plan," Los Alamos National Laboratory document LA-UR-11-2183, Los Alamos, New Mexico. (LANL 2011, 205231)

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)

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Weir, J.E., Jr., and W.D. Purtymun, 1962. "Geology and Hydrology of Technical Area 49, Frijoles Mesa, Los Alamos County, New Mexico," U.S. Geological Survey Administrative Release, Albuquerque, New Mexico. (Weir and Purtymun 1962, 011890)

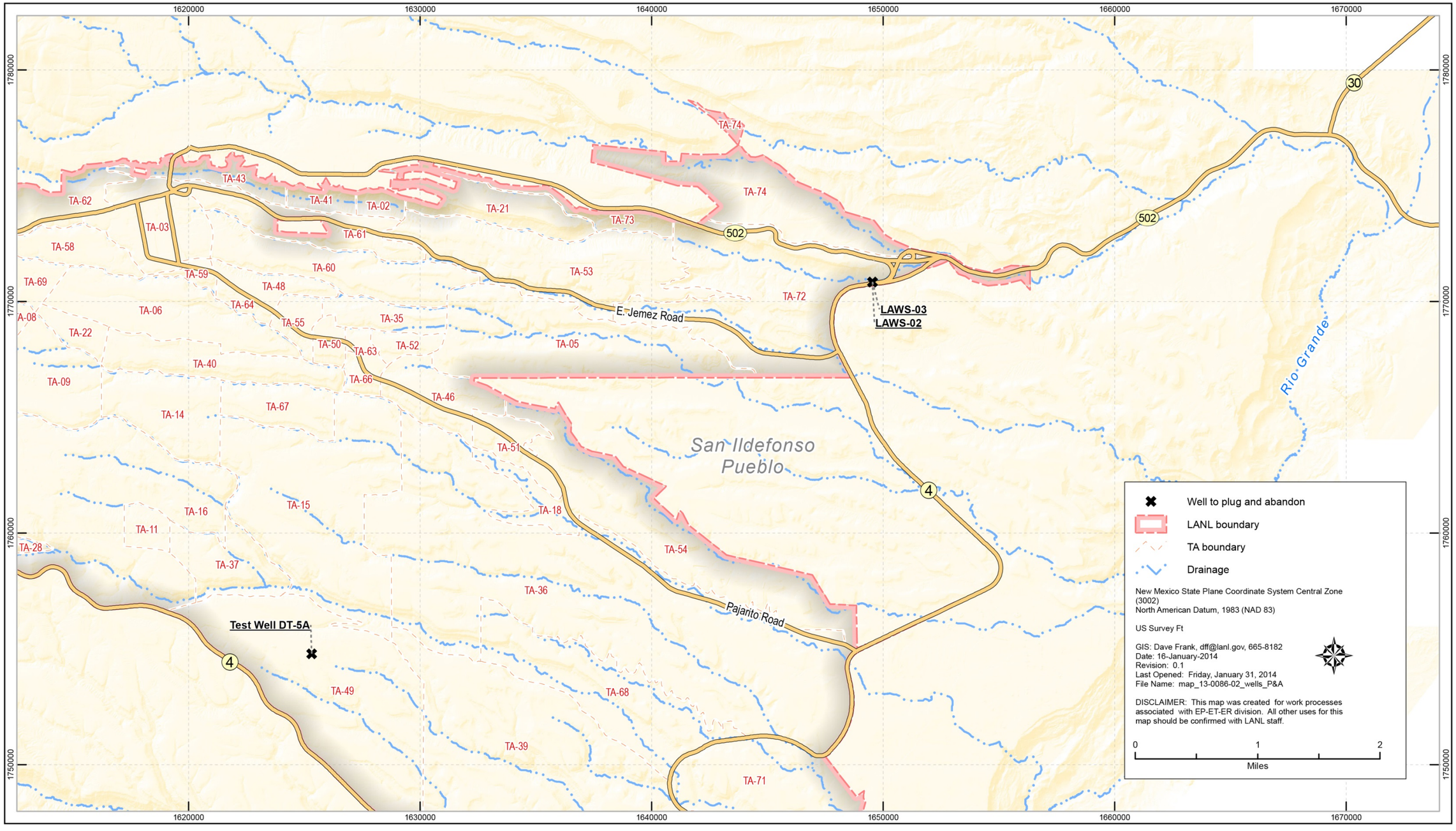

Figure 2.0-1 Locations of wells to be abandoned

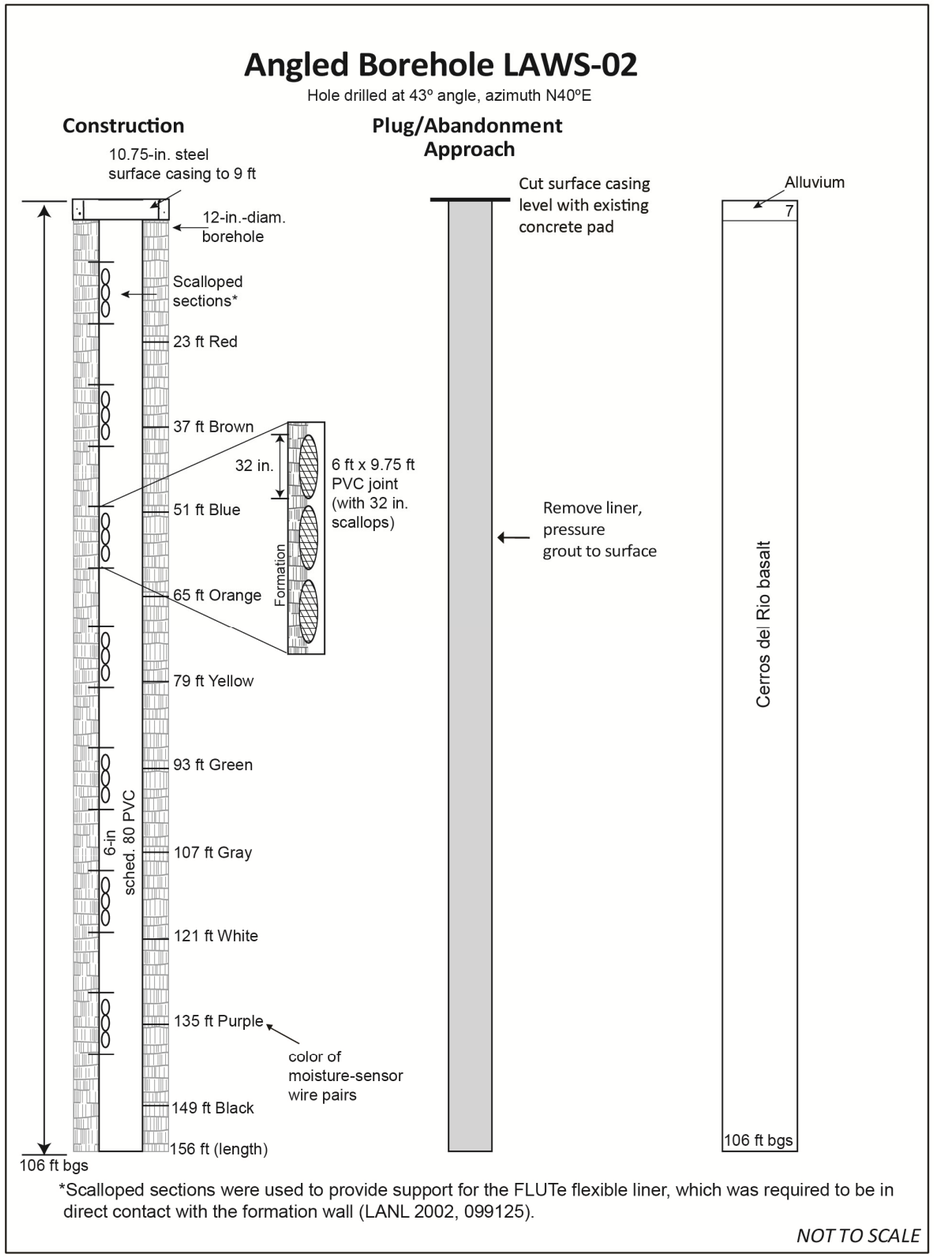

Figure 3.1-1 LAWS-02 abandonment schematic

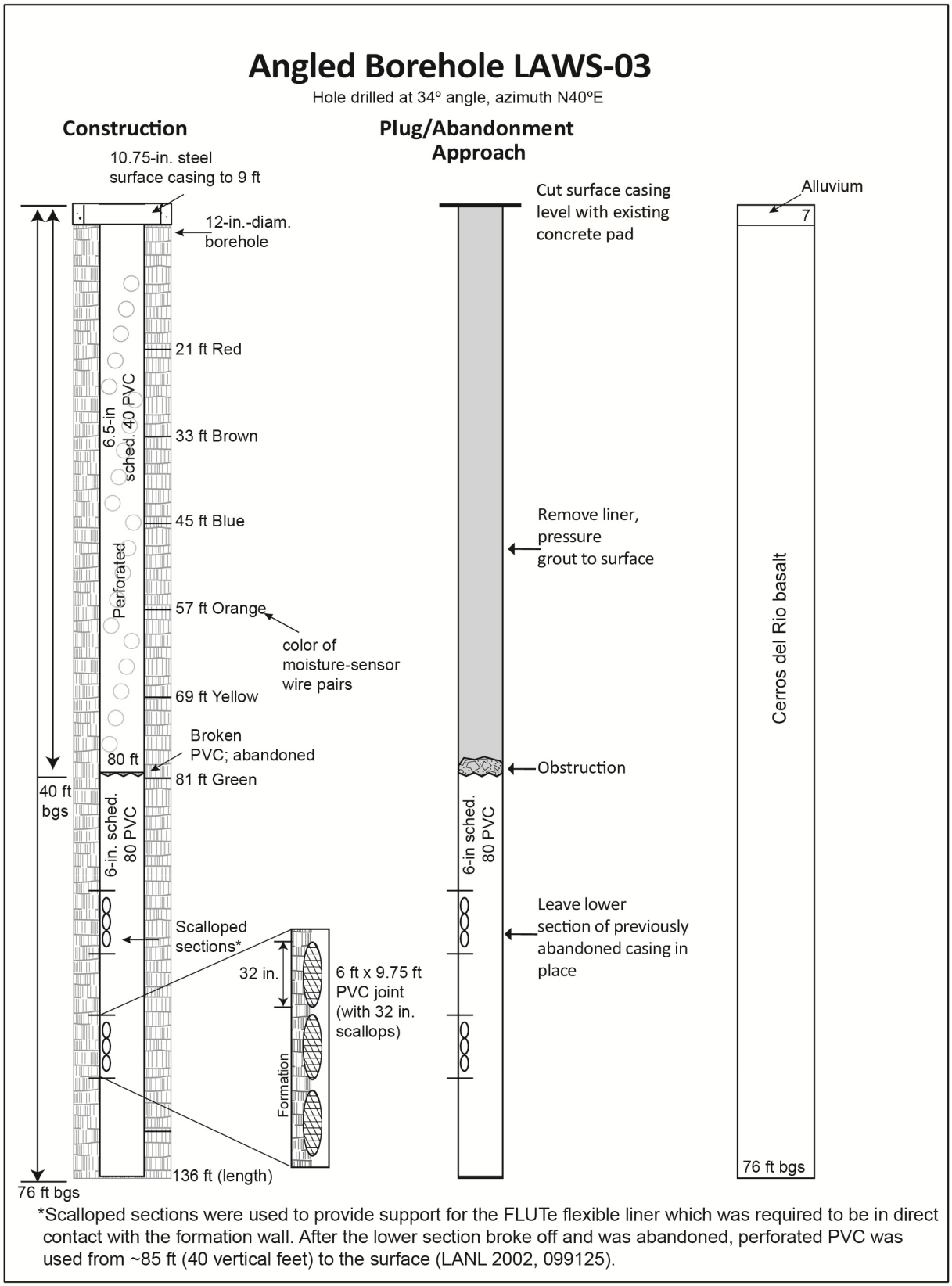

Figure 3.2-1 LAWS-03 abandonment schematic

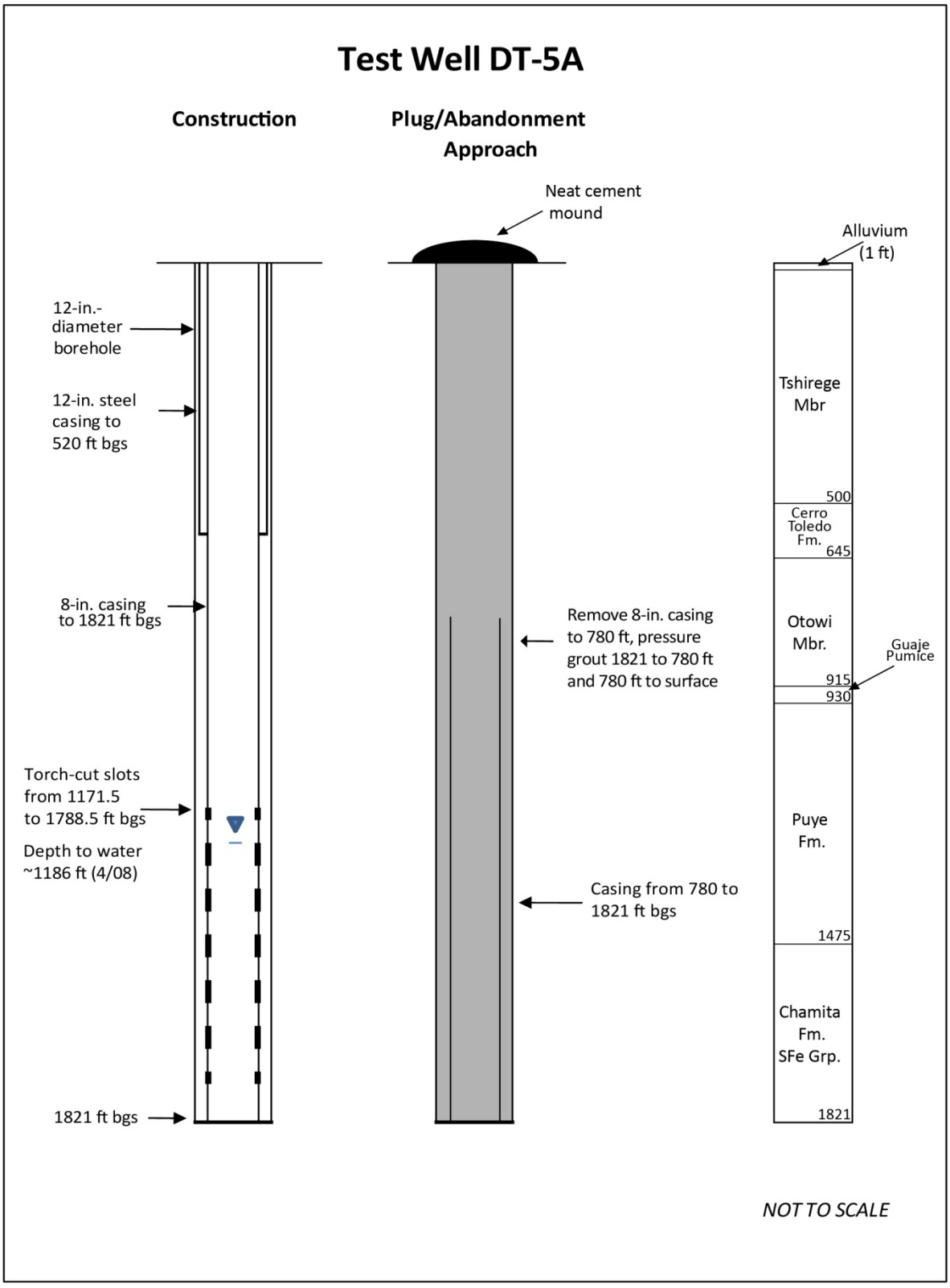

Figure 3.3-1 DT-5A abandonment schematic