



**STATE OF NEW MEXICO**  
OFFICE OF THE STATE ENGINEER  
SANTA FE

Scott A. Verhines, P.E.  
State Engineer

CONCHA ORTIZ Y PINO BLDG.  
POST OFFICE BOX 25102  
130 SOUTH CAPITOL  
SANTA FE, NEW MEXICO 87504-5102  
(505) 827-6091  
FAX: (505) 827-3806

**September 18, 2014**

U.S Department of Energy/ Los Alamos National Laboratory  
C/O Steve White  
P.O Box 1663  
Los Alamos, NM 87545

**Re: Plugging Plan of Operation, LANL Wells DT-9**

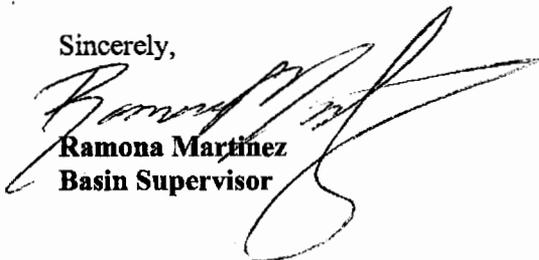
Greetings:

After a review of the Well Plugging Plan of Operations submitted on September 12, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

**Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at [Ramona.Martinez2@state.nm.us](mailto:Ramona.Martinez2@state.nm.us).**

Sincerely,

  
**Ramona Martinez**  
**Basin Supervisor**

Enclosure  
cc: file





**DISTRICT 6**  
**SCOTT A. VERHINES, P.E.**  
**NEW MEXICO STATE ENGINEER**

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of one well (DT-9). The well will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161). Based on logging, well casing bridged at approximately 1308 feet.

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
DT-9	Unknown	1628993.6	1751492.6	1501 b.g.s.	12 (0-1335 ft. b.g.s.) 8 (1315-1501ft b.g.s.) swage	1017

b.g.s. = below ground surface

Contacted Michael Dale (NMED-HWB, 505-661-2673) on September 10, 2014.

**Specific Plugging Conditions of Approval for LANL wells DT-9, Los Alamos, NM, Los Alamos County.**

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 2.61 gallons per foot for 8-inch ID casing to 5.88 gallons per foot for 12-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.
3. For multiple intervals from 1501 feet b.g.s. to surface (DT-9) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. If any intervals require use of bentonite chips in lieu of cement, applicant will use of bentonite chips (3/8-inch Hole Plug) as a sealant. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe. When a tremie is used, it shall extend to near total depth of the well at the initiation of the plugging. The tremie shall be incrementally removed to retain the tremie bottom a limited distance above the top of the rising column of bentonite chips throughout the plugging process.

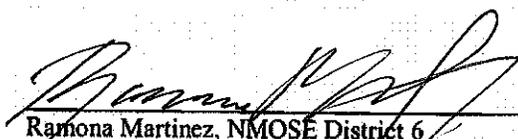
When placing bentonite chips above static water level, the chips shall be hydrated with sufficient potable water to allow the chips to yield. Options include: (A) use tremie for mixture of chips and water (as a carrier), or (B) use of dry-tremie for the chips in short intervals followed or preceded by addition of potable water increment sufficient for yielding of chips.

Potable water shall be added to the well in increments such that the chips are discharged into a column of standing water, if possible. If borehole lithology is too permeable to retain added water prior to chip placement, potable water shall be discharged into the borehole/well following placement of short intervals of chips to provide the bentonite sufficient available water to swell and seal the borehole/casing.

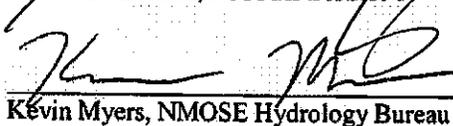
Alternately, a surface pour of the requested bentonite pellets is authorized, provided that the depth of the well be accurately determined prior to plugging, and that the top of the column of chips be sounded and column height / volume of sealant emplaced be recorded at approximate 25' intervals over the course of plugging to gauge appropriate progress of plugging and establish that the chips have not bridged inappropriately up-hole. If bridging occurs using any method of placement, the bridging shall be rectified before continuing with plugging. Sealant manufacturer's recommendations should be followed regarding screening fine particles from the chips and rate of pour to avoid bridging.

5. For DT-9, the sequence of plugging includes: 1) tremie set at approximately 1300 feet for cement placement inside 8-inch casing total depth to approximately 1315 feet b.g.s. (depending on severity of bridging); 2) tremie cement inside 12-inch casing to approximately 300 feet b.g.s. 3) cut 12-inch casing at approximately 280 feet b.g.s. and remove casing; and 3) tremie cement for any borehole and annular space from approximately 300 feet b.g.s. to surface. This sequence protects access to the 12-inch casing. If any significant cement losses to the formation for some porous intervals, bentonite chips may be used as described in the condition above.
6. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
7. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, remediate contaminants, inspect, pull/perforate of casing, or prohibit free discharge of any fluid from the borehole during or related to the plugging process.
8. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
9. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated September 10, 2014, with annotation, is hereby approved with the aforesaid conditions applied.

  
\_\_\_\_\_  
Ramona Martinez, NMOSE District 6

Date: 9/10/2014

  
\_\_\_\_\_  
Kevin Myers, NMOSE Hydrology Bureau

Date: 9/10/14



# WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

**I. FILING FEE:** There is no filing fee for this form.

**II. GENERAL / WELL OWNERSHIP:**

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: DT-9

Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

Phone number: 505-667-3005 E-mail: meverett@lanl.gov

**III. WELL DRILLER INFORMATION:**

Well Driller contracted to provide plugging services: Boart Longyear

New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

**IV. WELL INFORMATION:**

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

1) GPS Well Location (BRASS CAP): East: 1628993.6  
North: 1751492.6

*Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983[NAD 1983]).*

2) Reason(s) for plugging well: Well DT-9 is old and not used for its intended purpose. The borehole represents a conduit to subsurface.

3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.

4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s):

5) Static water level: 1017 ft bgs

2014 SEP 12 AM 11:26  
Well Plugging Plan  
Version 1.0  
December 2011  
OFFICE OF THE STATE ENGINEER  
NEW MEXICO

feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 1501 feet
- 7) Inside diameter of innermost casing: 8.0 inches.
- 8) Casing material: Carbon steel
- 9) The well was constructed with:  
\_\_\_\_\_ an open-hole production interval, state the open interval: \_\_\_\_\_  
X a well screen or perforated pipe, state the screened interval(s): 1040-1501
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? No If yes, please describe: \_\_\_\_\_
- 12) Has all pumping equipment and associated piping been removed from the well? Yes If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

#### **V. DESCRIPTION OF PLANNED WELL PLUGGING:**

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: On September 9, 2014, a LANL video log of the well recorded a bridged section of material at 1308 ft bgs. A tremie pipe will be installed to approximately 1300 ft bgs and cement grout will be placed to surface with a tremie pipe.
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

#### **VI. PLUGGING AND SEALING MATERIALS:**

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 8312 gallons
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: \_\_\_\_\_ batch-mixed and delivered to the site  
X mixed on site

**TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.**

	<b>Interval 1 – deepest</b>	<b>Interval 2</b>	<b>Interval 3 – most shallow</b> Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			Surface
Bottom of proposed interval of grout placement (ft bgl)			1501
Theoretical volume of grout required per interval (gallons)			8312
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			6
Mixed on-site or batch-mixed and delivered?			On-site
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

**TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.**

	<b>Interval 1 – deepest</b>	<b>Interval 2</b>	<b>Interval 3 – most shallow</b>
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant of grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			

7) Grout additives requested, and percent by dry weight relative to cement: None

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8) Additional notes and calculations: None

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**VII. ADDITIONAL INFORMATION:** List additional information below, or on separate sheet(s):

*possibly 819-11335  
per email  
X*

Test well DT-9 was drilled to 1501 ft bgs in 1960 with rotary equipment. Water was encountered at 1003 ft bgs. The well is constructed with 1335 ft of 12-in.-diameter steel casing with torch-cut slots from 1040 to 1335 ft. Approximately 186 ft of 8-in.-diameter steel casing with torch cut slots (183 ft) was swaged into the 12-in. casing at 1315 ft. There is presumed to be no backfill in the well annulus. All surface and subsurface appurtenances will be removed from the well before it is abandoned. A tremie pipe will be installed and the well casing will be grouted to approximately 300 ft bgs. Then, a pneumatic casing cutter will be installed in the 12-in. casing to 280 ft bgs and the 12-in. casing will be cut off and removed as the remainder of the borehole is grouted to the surface. The 12-in. surface casing will be cut off level with the existing ground surface.

**VIII. SIGNATURE:**

I, \_\_\_\_\_, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

*Walter Muratt*

*9-11-14*

Signature of Applicant

Date

**IX. ACTION OF THE STATE ENGINEER:**

*Received by Tom M  
9/17/14 NMOSE Hydrology*

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 12 day of September, 2014

Scott A. Verhines, State Engineer

By: *[Signature]*

