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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

July 3, 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 LAWS-01, LAWS-02, LAWS-03, Los Alamos, NM.

Greetings:

After a review of the Well Plugging Plan of Operations submitted on July 3, 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.

Sincerely,

Ramona Martinez
Upper Pecos Basin Supervisor

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Enclosure
CC: File

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Office of the State Engineer 1907-2007
Interstate Stream Commission
A Century of Service to New Mexico

DISTRICT 6

SCOTT A. VERHINES, P.E.

NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of three wells (LAWS-01, LAWS-02 and LAWS-03). As summarized in the table below, one vertical well (LAWS-01)has total depth of 281.5 feet, and two angled wells with a length of 157 and 137 feet. Vertical well has 4-inch ID diameter PVC casing and angle wells have 6-inch ID scalloped PVC casing. Completion report shows shall water zone(s) at approximately 80, 135, and 264 feet b.g.s.. Shallow water has been reported at 174 feet below ground surface at LAWS-01. The wells 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).

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.)
LAWS-01 (LA-10135)	unknown	1649524.5	1770854.0	278 b.g.s.	10.75 4	174
LAWS-02 (LA-10136)	unknown	1649536.9	1770848.3	156 (length) 106 b.g.s.	10.75 6	Dry above 80
LAWS-03 (LA-10137)	unknown	1649542.9	1770848.8	136 (length) 76 b.g.s.	10.75 6	Dry above 80

b.g.s. = below ground surface

Contacted Michael Dale (NMED-HWB, 505-661-2673) on July 3, 2014.

Specific Plugging Conditions of Approval for LANL wells LAWS-01, LAWS-02 and LAWS-03, 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 0.65 gallons per foot for 4-inch ID casing to 1.47 gallons per foot for 6-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. Angled boreholes may be 8-inch to 10-inch diameter, which may require additional volume of cement (1 to 2.5 gallons per foot additional sealant) for any open annular spaces. 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 (278 to 136 feet, length of borehole) 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. 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.

5. 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, contaminant remediation, inspection, pulling/perforating of casing, or prohibition of free discharge of any fluid from the borehole during or related to the plugging process.

6. 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.

7. 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 July 3, 2014, without annotation, is hereby approved with the aforesaid conditions applied.

Ramona Martinez, NMOSE District 6 Date: 7/3/14

Kevin Myers, NMOSE Hydrology Bureau Date: 7/3/14

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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: LAWS-02

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: 1649536.9
North: 1770848.3
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983[NAD 1983]).

2) Reason(s) for plugging well: Well LAWS-02 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: Dry, according to well completion report.

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

6) Depth of the well: 156 feet (length), 106 feet (depth bgs).

7) Inside diameter of innermost casing: 6.0 inches.

8) Casing material: Scalloped polyvinyl chloride

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): Near ground surface to T.D.

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? Not according to well completion report If yes, please describe: _____

_____

12) Has all pumping equipment and associated piping been removed from the well? No 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: Cement grout will be placed from bottom to top 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 230 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

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):

Well LAWS-02 is a angle hole drilled in 2001 to a length of 156 ft and completed as a vadose zone moisture monitoring well in the Cerros Del Rio Basalt to monitor the vadose zone below the Los Alamos Canyon weir site. The well is 6-in. I.D. schedule 80 PVC with scallops cut into the PVC. A FLUTe ™ monitoring system was deployed with transducers and sampling ports. Monitoring is no longer being performed at this well. All surface and subsurface appurtenances, including the FLUTe ™ system, will be removed from the well before abandonment. The well will be grouted from 156 ft (total length) to the surface.

VIII. SIGNATURE:

I, Theodore Ball, 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.

Theodore Ball — Signature of Applicant

7/2/14 — Date

IX. ACTION OF THE STATE ENGINEER:

NMOSE Hydrology 7/3/14
Reviewed by

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 3rd day of July, 2014

Scott A. Verhines, State Engineer

By: Ramona Montoya

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

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			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)			156 (length)
Theoretical volume of grout required per interval (gallons)			230
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.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			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)			