Appendix A

New Mexico Office of the State Engineer Plugging Plans of Operation and Plugging Records (on CD included with this document)



Tom Blaine, 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 1, 2016

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

Re: Plugging Plans of Operation, LANL Wells RG-96311 through RG-96320

Greetings:

After a review of the Well Plugging Plan of Operations submitted on June 21, 2016, 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 Water Rights Division

Office of the State Engineer

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Enclosure cc: file





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

City:	ng address: PO Box 1663 Los Alamos	- New Mexico	
	Los Alamos	- New Mexico	
Phone		State: INEW MEXICO	_ Zip code: 87545
	number: 505-667-5931	E-mail: meverett@lanl.gov	
Well I	VELL DRILLER INFORMATION: Driller contracted to provide plugging services:	Yellow Jacket Drilling Services Expiration Date: 1	0-31-2016
New Iv	Mexico Well Driller License No.: 100	Expiration Date:	0 0 1 20 10
4 ====	GPS Well Location: Latitude: 35 Longitude: -106	o be plugged should be attached to this plan. deg, 50 min, 23.198 se deg, 15 min, 29.736 sec	c ;, NAD 83
2)	Reason(s) for plugging well:		
	No longer needed.		
3)	Was well used for any type of monitoring prograwhat hydrogeologic parameters were monitore water, authorization from the New Mexico Environment	ed. If the well was used to monitor contain	ninated or poor quality
4)	Does the well tap brackish, saline, or otherwise	poor quality water? No If yes, pr	ovide additional detail,
	including analytical results and/or laboratory rep-	ort(s):	277 90
5) :	Static water level: Dry feet below lar	nd surface / feet above land surface (circle o	ne)

7)	Inside diameter of innermost casing:inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s):
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? No If yes, is the annulus surrounding the surface casing grouted o 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.
<u>V. D</u>	ESCRIPTION OF PLANNED WELL PLUGGING:
pipe,	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional ical 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 shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 14.42' then regrouted 14.42'.
2)	Will well head be cut-off below land surface after plugging? Yes
VI. PI	LUGGING 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix 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
	IIIIXCU UII SIIC

7)	Grout additives requested, and percent by dry weight relative to cement:	
	5% Bentonite	30
	enchante Chierchan considerate	
8)	Additional notes and calculations:	
	N/A	
		1907
VII. A	DDITIONAL INFORMATION: List additional information below, or on separate sheet(s):	
CD	120 - 1 Was used for groundwater doservation to longer needed.	2 Our
ic	to language receded	1 CIVEC
11>1	10 TOT IGENE VIEWERE.	
Ì	v	
<u> </u>		
VIII. SI	GNATURE:	
I, Antho	ny Burgess , say that I have carefully read the foregoing Well Plu	ugging Plan of
	s and any attachments, which are a part hereof; that I am familiar with the rules and regulations of	
	pertaining to the plugging of wells and will comply with them, and that each and all of the statem Plan of Operations and attachments are true to the best of my knowledge and belief.	ents in the Well
	Meleston	6/9/16
	Signature of Applicant	Date
IX ACT	ON OF THE STATE ENGINEER:	
IAL ACT		
This Well	Plugging Plan of Operations is:	
_	Approved subject to the attached conditions. Not approved for the reasons provided on the attached letter.	
w	itness my hand and official seal this 31 day of August, 2011	2
	Tom Blaine P.E., New Mexico State Engineer	
	D W	
	By: Jamong Hauting	
	X	

Well Plugging Plan Version: August 11, 2015 Page 3 of 5

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		N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	Orto 8.5 gallos
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
dditive 2 percent by dry eight relative to cement	N/A	N/A	N/A

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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E.
District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96311

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 14.42 feet below ground surface (bgs) via tremie pipe. The well will then be overdrilled with a 9- inch (outside diameter) 4 ¼ (inside diameter) auger. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for groundwater observation and is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside_diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96311 (CDBO-1)	4	14.42	35°50′23.198	-106°15′29.736

Specific Plugging Conditions of Approval for 1 monitoring well for the U.S. Department of Energy / Los Alamos National Laboratory, Los Alamos County, New Mexico

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or

the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 4-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 4-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 4-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO- 1 (Auger Boring)	4	14.42	1.3	9.4
Totals:			1.3	9.4

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 4-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

Date: 3/3//16

The NMOSE Well Plugging Plan of Operations dated May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSE District 6, Water Rights Division





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

IVIAL	ing address: PO Box 1663		
City	Los Alamos	State: New Mexico	Zip code: 87545
Phor	e number: 505-667-5931	E-mail: meverett@lanl.gov	
	WELL DRILLER INFORMATION: Driller contracted to provide plugging services	s: Yellow Jacket Drilling Services	
New	Mexico Well Driller License No.: WD-1458	Expiration Date:	10-31-2016
1)	GPS Well Location: Latitude: 3c Longitude: -1 Reason(s) for plugging well:	5 deg, <u>80</u> min, <u>24.773</u> 106 deg, <u>15</u> min, <u>27.909</u> s	ec, NAD 83
2)	No longer needed.		
3)	what hydrogeologic parameters were moni	rogram? Yes If yes, please use section itored. If the well was used to monitor cont Environment Department may be required prior	aminated or poor quality
3)4)	what hydrogeologic parameters were moni water, authorization from the New Mexico E	itored. If the well was used to monitor cont	aminated or poor quality to plugging.

7)	Inside diameter of innermost casing:inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval:
	a well screen or perforated pipe, state the screened interval(s): UNKNOWN
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? No If yes, is the annulus surrounding the surface casing grouted on otherwise sealed? No If yes, please describe:
12)	Has all pumping equipment and associated piping been removed from the well? YesIf not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.
V. D	ESCRIPTION OF PLANNED WELL PLUGGING:
pipe, a	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional cal 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 shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 19.25' then regrouted for the 19.25'.
2)	Will well head be cut-off below land surface after plugging? Yes
VI. PI	JUGGING AND SEALING MATERIALS:
	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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix. 8.5 gallons of water per 94 pound sack of Portland cement.
6)	Will the grout be:batch-mixed and delivered to the sitex mixed on site

7)	Grout additives requested, and percent by dry weight relative to cement:	
	5% Bentonite	
8)	Additional notes and calculations:	
5.0 = 0	N/A	
VII.	ADDITIONAL INFORMATION: List additional information below, or on separate sheet	(s):
	DRA-2 UNCUSED FOR appoint inter about	2: 1 = 1
110 =	DBO-2 Was Used for grandwater observa	nur and is
Pro	longer needed.	
1	V	
1		
1		
VIII. S	IGNATURE:	
I. Anth	ony Burgess , say that I have carefully read the foregoing \	Well Plugging Plan of
	ons and any attachments, which are a part hereof; that I am familiar with the rules and regula	ations of the State
	r pertaining to the plugging of wells and will comply with them, and that each and all of the g Plan of Operations and attachments are true to the best of my knowledge and belief.	statements in the Well
I lugging	s Tien of operations and attachments are use to the best of the be	
	Makella	6/9/16
	Signature of Applicant	Date
		24.0
TV AC	tion of the crate encireer.	
IA. AL	TION OF THE STATE ENGINEER:	
This We	Il Plugging Plan of Operations is:	
9	Approved subject to the attached conditions. Not approved for the reasons provided on the attached letter.	
9	1401 approved for the reasons provided on the attached letter.	
,	Witness my hand and official seal this 3/ day of August,	20/6
	Tom Blaine P.E., New Mexico State En	gineer
	B. h	
	By:	7
		Well Plugging Plan

Well Plugging Plan Version: August 11, 2015 Page 3 of 5

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

SERVICE SERVICES	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)	N/A	N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	85 gal. Upto 8.5 g.l.
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
dditive 2 percent by dry reight relative to cement	N/A	N/A	N/A

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

OUT OF THE PERSON OF THE PERSO	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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96312

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 19.25 feet below ground surface (bgs) via tremie pipe. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for groundwater observation and is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	<u>Latitude North</u>	Longitude West
RG-96312 (CDBO-2)	4	19.25	35°50′24.773	-106°15′27.909

Specific Plugging Conditions of Approval for 1 monitoring well for the U.S. Department of Energy / Los Alamos National Laboratory, Los Alamos County, New Mexico

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the

cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 4-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 4-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 4-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO-2 (Auger Boring)	4	19.25	1.7	12.6
Totals:			1.7	12.6

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 4-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with scalant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

Date: 8/3//4

The NMOSE Well Plugging Plan of Operations dated May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSE District 6, Water Rights Division





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

I. F	LING FEE: There is no filing fee for this form.
П. С	GENERAL/WELLOWNERSHIP:
Exist	ing Office of the State Engineer POD Number (Well Number) for well to be plugged: N/A RG-96313(CDB
Name	e of well owner: Los Alamos National Laboratory
Maili	ng address: PO Box 1663
City:	Los Alamos State: New Mexico Zip code: 87545
Phone	Los Alamos State: New Mexico Zip code: 87545 e number: 505-667-5931 E-mail: meverett@lanl.gov
III. V	VELL DRILLER INFORMATION: Driller contracted to provide plugging services: Yellow Jacket Drilling Services
New I	Mexico Well Driller License No.: WD-1458 Expiration Date: 10-31-2016
	A copy of the existing Well Record for the well to be plugged should be attached to this plan. GPS Well Location: Latitude: 35 deg, 50 min, 10.016 sec Longitude: -106 deg, 14 min, 56.837 sec, NAD 83
2)	Reason(s) for plugging well:
	No longer needed.
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: Deu_feet below land surface / feet above land surface (circle one)
6)	Depth of the well: 13.55 feet

7)	Inside diameter of innermost casing:inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s):
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? No 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.
pipe,	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional ical information, such as geophysical logs, that are necessary to adequately describe the proposal. Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology
	proposed for the well: Cement grout shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 13.55° then regrouted 10.13.55°.
2)	Will well head be cut-off below land surface after plugging? Yes
,	LUGGING AND SEALING MATERIALS: 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix 8.5 gallons of water per 94 pound sack of Portland cement.
6)	Will the grout be: batch-mixed and delivered to the site

7)	Grout additives requested, and percent by dry we	ight relative to cement:	
	5% Bentonite		**************************************
	o / Demonite		
	1		
	ł		
8)	Additional notes and calculations:		
13.6	N/A		
	17/4		
VII. AD	DITIONAL INFORMATION: List additional in	nformation below, or on separate sheet(s):	
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- 01	100ger needed.	DIGUIDATER OBSERVATION	andlis
no	longer needed.		
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VIII. SIG	NATURE:		
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,	and any attachments, which are a part hereof; that	at I have carefully read the foregoing Well Plant I am familiar with the rules and regulations of	
	pertaining to the plugging of wells and will comply		
	lan of Operations and attachments are true to the b		oms in the wen
00 0			
	/47.	Mello	6/9/16
	-	. / 1	
		Signature of Applicant	Date
		()	
TV ACTI	ON OF THE STATE ENGINEER:		
IA. ACII	OCCUPATION OF SECOND SE		
This Well I	Plugging Plan of Operations is:		
	Approved subject to the attached conditions	•	
-	Not approved for the reasons provided on the		
_	1 tot approved for and remote provided on an	io medical access.	
397	turns much and and afficial and although	1 1 1	1
Wi	tness my hand and official seal this	day of Ungust , 2d	<u>u</u>
		Tom Blaine P.E., New Mexico State Engineer	
		R IN-	
		By: Tomon Man	

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

MANAGETTERS OF RE	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)	N/A	N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	8.5 gal. Up to y.s gallons
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
Additive 2 percent by dry veight relative to cement	N/A	N/A	N/A

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

Land Charles and Additional	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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96313

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 13.55 feet below ground surface (bgs) via tremie pipe. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for groundwater observation and is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96313 (CDBO-3)	4	13.55	35°50′10.016	-106°14′56.837

Specific Plugging Conditions of Approval for 1 monitoring well for the U.S. Department of Energy / Los Alamos National Laboratory, Los Alamos County, New Mexico

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the

cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 4-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 4-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 4-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO-3 (Auger Boring)	4	13.55	1.2	8.8
Totals:			1.2	8.8

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 4-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

Date: 8/51/16

The NMOSE Well Plugging Plan of Operations dated May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSE District 6, Water Rights Division

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

II. C	EING FEE: There is no filing fee for this for		
Exist	ing Office of the State Engineer POD Number	er (Well Number) for well to be plugged:	WA RG- 96314 (c
Name	e of well owner: Los Alamos National La	boratory	
Maili	ng address: PO Box 1663		
City:	Los Alamos	State: New Mexico	Zip code: 87545
Phone	number: 505-667-5931	E-mail: meverett@lanl.gov	
Well I	WELL DRILLER INFORMATION: Driller contracted to provide plugging services: Mexico Well Driller License No.: WD-1458	Yellow Jacket Drilling Services Expiration Date:	10-31-2016
-	GPS Well Location: Latitude: 35 CDBO-4 Longitude: -10	to be plugged should be attached to this plan deg, 49 min, 59.457 s deg, 13 min, 58.565 s	
2)	Reason(s) for plugging well:		
	No longer needed.		
3)	Was well used for any type of monitoring programate what hydrogeologic parameters were monitor water, authorization from the New Mexico En	ored. If the well was used to monitor conta	aminated or poor quality
4)	Does the well tap brackish, saline, or otherwi	se poor quality water? No If yes,	provide additional detail,
	including analytical results and/or laboratory re	eport(s):	
5)	Static water level:feet below	land surface / feet above land surface (circle	one)
6)	Depth of the well: 13.4 feet		

7)	Inside diameter of innermost casing:inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s): 8-12
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? No If yes, is the annulus surrounding the surface casing grouted o 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.
pipe,	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional cal information, such as geophysical logs, that are necessary to adequately describe the proposal. Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology
	proposed for the well: Cement grout shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 13.4°, then regrouted to 13.4°.
2)	Will well head be cut-off below land surface after plugging? Yes
	LUGGING AND SEALING MATERIALS: 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix 8.5 gallons of water per 94 pound sack of Portland cement.
6)	Will the grout be:batch-mixed and delivered to the site mixed on site

7)	Grout additives requested, and percent by dry weight relative to cement:	
	5% Bentonite	
8)	Additional notes and calculations:	10.0
0)		
	N/A	
		,
	DDITIONAL INFORMATION: List additional information below, or on separate sheet(s):	
(1	1009ER needled.	on and is
100	longer needed	
11.0	101 g at 17 caster.	
}		
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1		
VIII. SI	GNATURE:	
1	ny Burgess , say that I have carefully read the foregoing Well	Plugging Plan of
	as and any attachments, which are a part hereof; that I am familiar with the rules and regulation	
Engineer	pertaining to the plugging of wells and will comply with them, and that each and all of the stat	
Plugging	Plan of Operations and attachments are true to the best of my knowledge and belief.	
	1. Notals	6/9/16
	- Morrell of	0/9/10
	Signature of Applicant	Date
IX. ACT	ION OF THE STATE ENGINEER:	
This Well	Plugging Plan of Operations is:	
	Approved subject to the attached conditions.	
_	Not approved for the reasons provided on the attached letter.	
	1 1	U.S.V.
W	itness my hand and official seal this3/day ofAugus +, 23	2/6
	Tom Blaine P.E., New Mexico State Engine	er
	B nt)
	By: I famous / any	_

Well Plugging Plan Version: August 11, 2015 Page 3 of 5

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

过度证据 支持等的数	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)		N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	85gal. Up to 8.5 gal
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive ! requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
dditive 2 percent by dry reight relative to cement	N/A	N/A	N/A

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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96314

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 13.4 feet below ground surface (bgs) via tremie pipe. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for groundwater observation and is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96314 (CDBO-4)	2	13.4'	35°49′59.487	-106°13′58.565

Specific Plugging Conditions of Approval for 1 monitoring well for the U.S. Department of Energy / Los Alamos National Laboratory, Los Alamos County, New Mexico

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the

cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO-4 (Auger Boring)	2	13.4	0.3	2.2
Totals:			0.3	2.2

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSE District 6, Water Rights Division





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

	to prugging.
L.F	ILING FEE: There is no filing fee for this form.
Exist	ting Office of the State Engineer POD Number (Well Number) for well to be plugged: N/A 36-96316 Cr e of well owner: Los Alamos National Laboratory
	ing address: PO Box 1663
Maill	
City:	Los Alamos State: New Mexico Zip code: 87545 e number: 505-667-5931 E-mail: meverett@lanl.gov
Phone	e number: E-mail:
Well I	WELL DRILLER INFORMATION: Driller contracted to provide plugging services: Mexico Well Driller License No.: WD-1458 Expiration Date: 10-31-2016
New I	Mexico Well Driller License No.: WB-1400 Expiration Date: 10-51-2010
Note:	A copy of the existing Well Record for the well to be plugged should be attached to this plan. GPS Well Location: Latitude: 35 deg, 51 min, 11.40 sec CDBO - 5 Longitude: -106 deg, 16 min, 23.01.5 sec, NAD 83
2)	Reason(s) for plugging well:
	No longer needed.
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:feet below land surface / feet above land surface (circle one)
6)	Depth of the well: 20.81 feet
	Well Plugging Plan

7)	Inside diameter of innermost casing:inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s): 7 - 17
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? No 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.
Note:	ESCRIPTION OF PLANNED WELL PLUGGING: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional cal information, such as geophysical logs, that are necessary to adequately describe the proposal. Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology
	proposed for the well: Cement grout shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 20.81° then regrouted †0 20.81°.
2)	Will well head be cut-off below land surface after plugging? Yes
Name and	LUGGING AND SEALING MATERIALS: 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix: 8.5 gallons of water per 94 pound sack of Portland cement.
6)	Will the grout be:batch-mixed and delivered to the site

7)	Grout additives requested, and percent by dry we	ight relative to cement:	
	5% Bentonite		
	070 Demonate		
	}		
	1		
8)	Additional notes and calculations:		
	N/A		27078
	i		
	4.1		
	H. Comments of the comments of		
	DITIONAL INFORMATION: List additional in		To the second
C	10 10 10 10 10 10 10 10 10 10 10 10 10 1	groundwater observat	ion and
ic	רפל בפני ומפרובו	0	
13	10 longer viceates.		
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		<u></u>	
VIII. SIG	GNATURE;		
	D	at I have carefully read the foregoing Well Pl	ugging Plan of
	as and any attachments, which are a part hereof; that		
	pertaining to the plugging of wells and will comply		
	Plan of Operations and attachments are true to the b		
	*	111	
		Melit	6/9/16
		Signature of Applicant	Date
		Signature of Appreaut	Date
IX. ACT	ON OF THE STATE ENGINEER:		
This Well	Plugging Plan of Operations is:		
-	Approved subject to the attached conditions		
-	Not approved for the reasons provided on the	ne attached letter.	
		A /	
W	itness my hand and official seal this	day of August 20	6
		Tom Blaine P.E., New Mexico State Engineer	
		Bu Bearing War	
		ny. I comon I com	

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

Miles I was a february	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)	N/A	N/A	0,
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	8.50gal. Up to 8.5gal
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
dditive 2 percent by dry reight relative to cement	N/A	N/A	N/A

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

STREET STREET	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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96316

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 20.81 feet below ground surface (bgs) via tremie pipe. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for groundwater observation and is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96316 (CDBO-5)	2	20.81'	35°51′11.401	-106°16′23.015

Specific Plugging Conditions of Approval for 1 monitoring well for the U.S. Department of Energy / Los Alamos National Laboratory, Los Alamos County, New Mexico

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the

cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO-45 (Auger			T	- 5/5 **
Boring)	2	20.81	0.5	3.4
Totals:	•		0.5	3.4

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSE District 6, Water Rights Division



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. F	ILING FEE: There is no filing fee for this form.
	ENERAL/WELLOWNERSHIP:
Exist	ing Office of the State Engineer POD Number (Well Number) for well to be plugged: N/A RG-96315 CDE
Name	e of well owner: Los Alamos National Laboratory
Maili	ng address: PO Box 1663
City:	Los Alamos State: New Mexico Zip code: 87545 e number: 505-667-5931 E-mail: meverett@lanl.gov
Phone	e number: 505-667-5931 E-mail: meverett@lanl.gov
Well	WELL DRILLER INFORMATION: Driller contracted to provide plugging services: Mexico Well Driller License No.: WD-1458 Expiration Date: 10-31-2016
IV. V	VELL 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: Latitude: <u>35</u> deg, <u>50</u> min, <u>46.510</u> sec CD60-7 Longitude: <u>-106</u> deg, <u>15</u> min, <u>36.645</u> sec, NAD 83
2)	Reason(s) for plugging well:
	No longer needed.
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:feet below land surface / feet above land surface (circle one)
6)	Depth of the well: 46.02 feet

7)	Inside diameter of innermost casing:inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s): 29 - 39
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? NoIf yes, is the annulus surrounding the surface casing grouted or otherwise sealed? NoIf 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.
Note:	ESCRIPTION OF PLANNED WELL PLUGGING: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional cal 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 shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 20' bgs., then regrouted for the upper 20'.
2)	Will well head be cut-off below land surface after plugging? Yes
	LUGGING AND SEALING MATERIALS: 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix 85 8.5 gallons of water per 94 pound sack of Portland cement.
6)	Will the grout be:batch-mixed and delivered to the site

7)	Grout additives requested, and percent by dry weight relative to cer	nent:	
	5% Bentonite	an:	
	1		
8)	Additional notes and calculations:		
6)			
	N/A		
	DITIONAL INFORMATION: List additional information below,		
CD	1009EP needed.	R observation	n and is
100	langer med ed	Social Metal (Metal State of the State of t	
no	loriges recenta.		
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1			
VIII CIA	GNATURE:		
THE WAY THE THE PERSON			
	ny Burgess, say that I have carefully s and any attachments, which are a part hereof; that I am familiar with	read the foregoing Well	Plugging Plan of
	pertaining to the plugging of wells and will comply with them, and the		
	Plan of Operations and attachments are true to the best of my knowled		
	· // // //	7	
	- Mickell	<i>Y</i>	6/9/16
	Signature of App	licant	Date
	7		
IX. ACTI	ON OF THE STATE ENGINEER:		
This Well I	Plugging Plan of Operations is:		
	Approved subject to the attached conditions.		
_	Not approved for the reasons provided on the attached letter.		
		7	
W	itness my hand and official seal this3/day of	cut 2	0/6_
	Tom Blaine P.E., N	ew Mexico State Engine	er
	By: Ham	an Mant	
		/	

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

PROPERTY OF THE PARTY OF THE PA	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)	N/A	N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	65 gal. 4 to 8.5 gal.
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
Additive 2 percent by dry reight relative to cement	N/A	N/A	N/A

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

25年20年2月1日	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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96315

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 20 feet below ground surface (bgs) via tremie pipe. The well will then be overdrilled with a 9- inch (outside diameter) 4 ¼ (inside diameter) auger to a minimum of 20 feet bgs. 5% bentonite enriched cement will be used to fill the boring from 20 feet up to 2 feet bgs. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for measuring groundwater as part of a water balance study. The study is complete and the well is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96315 (CDBO-7)	2	46.02'	35°50′46.510	-106°15′36.645

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO-7	2	26.02	0.57	4.25
CDBO-7 (Auger Boring)	9	20	8.84	66.10
Totals:			9.40	70.34

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

6	Date:	
Ramona Martinez NMOSE District 6 Water Rights Division		



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. FI	LINGHEE: There is no filing fee for this form.
	ENERAL/WELLOWNERSHIP:
Exist	ing Office of the State Engineer POD Number (Well Number) for well to be plugged: N/A RG- 96317 CDB
Name	of well owner: Los Alamos National Laboratory
Maili	ng address: PO Box 1663
City:	Los Alamos State: New Mexico Zip code: 87545 number: 505-667-5931 E-mail: meverett@lanl.gov
Phone	number: 505-667-5931 E-mail: meverett@lanl.gov
Well I	VELL DRILLER INFORMATION: Oriller contracted to provide plugging services: Yellow Jacket Drilling Services
New N	Mexico Well Driller License No.: WD-1458 Expiration Date: 10-31-2016
	A copy of the existing Well Record for the well to be plugged should be attached to this plan. GPS Well Location: Latitude: 35 deg, 50 min, 37.24Asec Longitude: -106 deg, 15 min, 13.637 sec, NAD 83
2)	Reason(s) for plugging well:
	No longer needed.
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:feet below land surface / feet above land surface (circle one)
6)	Depth of the well: 25.66 feet

7)	Inside diameter of innermost casing: inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s): 13-23
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? NoIf yes, is the annulus surrounding the surface casing grouted of otherwise sealed? NoIf 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.
pipe,	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional ical information, such as geophysical logs, that are necessary to adequately describe the proposal. Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology
	Cement grout shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 20' bgs., then regrouted for the upper 20'.
2)	Will well head be cut-off below land surface after plugging? Yes
	LUGGING AND SEALING MATERIALS: 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix. 8.5 gallons of water per 94 pound sack of Portland cement.
6)	Will the grout be:batch-mixed and delivered to the site

7)	Grout additives requested, and percent by dry weight relative to cement:	
	5% Bentonite	
	1	
	1	
8)	Additional notes and calculations:	***
	N/A	
		*
VII. AI	DDITIONAL INFORMATION: List additional information below, or on separate	sheet(s):
	CDRO-8 was used for also includitive observe	ation and is
	CDBO-8 was used for grandwater observed tonger needed.	MIDIT CITIC IS
1001	longer needed.	
1	O	
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1		
VIII. SI	GNATURE:	
I. Antho	ony Burgess , say that I have carefully read the forego	oing Well Plugging Plan of
	ns and any attachments, which are a part hereof; that I am familiar with the rules and	regulations of the State
	pertaining to the plugging of wells and will comply with them, and that each and all can be specified by Plan of Operations and attachments are true to the best of my knowledge and belief.	of the statements in the Well
1 10661116	, That of operations and attachments are true to the best of the landwicego and benefit	
	Marlet	6/9/16
	Signature of Applicant	Date
	S. B. S. T. F. T. S.	2000
***	MON OF THE CALLED PROPERTY.	
IX. ACT	TION OF THE STATE ENGINEER:	
This Well	l Plugging Plan of Operations is:	
	Approved subject to the attached conditions.	
_	Not approved for the reasons provided on the attached letter.	
		32
W	Witness my hand and official seal this	20/6
	Tom Blaine P.E., New Mexico Sta	te Engineer
	B. B. h	1-11
	By: James M	1

Well Plugging Plan Version: August 11, 2015 Page 3 of 5

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

Park Carlo	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)	N/A	N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	8.5 gal en
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
dditive 2 percent by dry veight relative to cement	N/A	N/A	N/A

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

SELECTION DESCRIPTION	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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96317

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 20 feet below ground surface (bgs) via tremie pipe. The well will then be overdrilled with a 9- inch (outside diameter) 4 ¼ (inside diameter) auger to a minimum of 20 feet bgs. 5% bentonite enriched cement will be used to fill the boring from 20 feet up to 2 feet bgs. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for measuring groundwater as part of a water balance study. The study is complete and the well is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96317 (CDBO-8)	2	25.66'	35°50′37.264	-106°15′13.637

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO-8	2	5.66	0.12	0.92
CDBO-8 (Auger Boring)	9	20	8.84	66.10
Totals:			8.96	67.02

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Damona Martinez, NMOSE District 6, Water Rights Division

Date: 8/31/16



5)

6)

Depth of the well: 33.59

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. L. FILING FEE: There is no filing fee for this form. II. GENERAL/WELLOWNERSHIP: Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: N/ARG-96318 COBS Name of well owner: Los Alamos National Laboratory Mailing address: PO Box 1663 State: New Mexico Zip code: 87545 City: Los Alamos Phone number: 505-667-5931 E-mail: meverett@lanl.gov III. WELL DRILLER INFORMATION: Well Driller contracted to provide plugging services: Yellow Jacket Drilling Services Expiration Date: 10-31-2016 New Mexico Well Driller License No.: WD-1458 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: Longitude: -106 deg, 14 min, 39.322 sec, NAD 83 CDBO-9 2) Reason(s) for plugging well: No longer needed. Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail 3) 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. Does the well tap brackish, saline, or otherwise poor quality water? No _____ If yes, provide additional detail, 4) including analytical results and/or laboratory report(s): Static water level: _____feet below land surface / feet above land surface (circle one)

7)	Inside diameter of innermost casing:inches.
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s):
10)	What annular interval surrounding the artesian casing of this well is cement-grouted?
11)	Was the well built with surface casing? No If yes, is the annulus surrounding the surface casing grouted of 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.
pipe,	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional cal information, such as geophysical logs, that are necessary to adequately describe the proposal. Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology
	proposed for the well: Cement grout shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 20' bgs., then regrouted for the upper 20'.
2)	Will well head be cut-off below land surface after plugging? Yes
	LUGGING AND SEALING MATERIALS: 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)	
3)	For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
4)	Theoretical volume of grout required to plug the well to land surface:
5)	Theoretical volume of grout required to plug the well to land surface:

7)	Grout additives requested, and percent by dry we	eight relative to cement:	
	5% Bentonite		
	and the second s		
8)	Additional notes and calculations:		
	N/A		
	1		

VII. AI	DDITIONAL INFORMATION: List additional in	nformation below, or on separate sheet(s):	
C	DBO-9 was used for Op-	andwater observation	and is
100	10nger needed.	551 641 -61161 - 666651 - 617 617	000 13
110	Toriga- Matata.		
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1	GNATURE:		
	ny Burgess, say the sand any attachments, which are a part hereof; that	nat I have carefully read the foregoing Well P	lugging Plan of
	pertaining to the plugging of wells and will comply		
Plugging !	Plan of Operations and attachments are true to the b	est of my knowledge and belief.	
	¥0.	Milato -	6/9/16
		The state of the s	
		Sighature of Applicant	Date
IX. ACT	ION OF THE STATE ENGINEER:		
Th:- 377-11	Plussias Plan of Occastions in		
Inis weii	Plugging Plan of Operations is:		
	Approved subject to the attached conditions		
-	Not approved for the reasons provided on the	ne attached letter.	
w	Vitness my hand and official seal this	day of September, 20	16
**	my mand and omivita sout this		7_0
		Tom Blaine P.E., New Mexico State Engineer	1
		By: Hamon Man	2/
			X

Well Plugging Plan Version: August 11, 2015 Page 3 of 5

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

Marian Carlo Rega	Interval 1 - deepest	Interval 2	Interval 3 - most shallow
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			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)		N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	8.5gal. 4 to 8.5gal.
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive I requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
additive 2 percent by dry veight relative to cement	N/A	N/A	N/A

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

Editor Control	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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96318

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 20 feet below ground surface (bgs) via tremie pipe. The well will then be overdrilled with a 9- inch (outside diameter) 4 ¼ (inside diameter) auger to a minimum of 20 feet bgs. 5% bentonite enriched cement will be used to fill the boring from 20 feet up to 2 feet bgs. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for measuring groundwater as part of a water balance study. The study is complete and the well is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96318 (CDBO-9)	2	33.59'	35°50′10.924	-106°14′39.322

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBO-9	2	13.59	0.30	2.22
CDBO-9 (Auger Boring)	9	20	8.84	66.10
Totals:			9.13	68.31

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSP District 6, Water Rights Division



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 E	II INC EEE. There is no filing for for this form
	LING FEE; There is no filing fee for this form.
	ENERAL / WELL OWNERSHIP:
Existi	ing Office of the State Engineer POD Number (Well Number) for well to be plugged: N/ARG-96319 CD
Name	of well owner: Los Alamos National Laboratory
	ng address: PO Box 1663
City:	Los Alamos State: New Mexico Zip code: 87545
Phone	number: 505-667-5931 E-mail: meverett@lanl.gov
	VELL DRILLER INFORMATION:
Well I	Driller contracted to provide plugging services: Yellow Jacket Drilling Services
New M	Mexico Well Driller License No.: WD-1458 Expiration Date: 10-31-2016
IV. W	TELL INFORMATION:
Note:	A copy of the existing Well Record for the well to be plugged should be attached to this plan.
NATION.	25
1)	GPS Well Location: Latitude: <u>35</u> deg, <u>50</u> min, <u>37.155</u> sec CD GM - 1 Longitude: <u>-106</u> deg, <u>15</u> min, <u>13.613</u> sec, NAD 83
2)	Reason(s) for plugging well:
	No longer needed.
	Von
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:feet below land surface / feet above land surface (circle one)
	0
6)	Depth of the well: 190.11 feet

7)	Inside diameter of innermost casing:inches.
8)	Casing material:
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s): UNEDOWN
10)	What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
11)	Was the well built with surface casing? No If yes, is the annulus surrounding the surface casing grouted o otherwise sealed? No If yes, please describe:
12)	Has all pumping equipment and associated piping been removed from the well?YesIf not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.
pipe,	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional cal information, such as geophysical logs, that are necessary to adequately describe the proposal. Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology
	Cement grout shall be tremie pumped from bottom to top of well casing. Well will then be over-drilled to 20' bgs., then regrouted for the upper 20'.
2)	Will well head be cut-off below land surface after plugging? Yes
	LUGGING AND SEALING MATERIALS: 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix: 6.5 8.5 gallons of water per 94 pound sack of Portland cement.
6)	Will the grout be:batch-mixed and delivered to the site

7)	Grout additives requested, and percent by dry weight relative to cement:	
	5% Bentonite	
8)	Additional notes and calculations:	
	N/A	
		¥7
	v.	
<u>УП.</u>	ADDITIONAL INFORMATION: List additional information below, or on sep	arate sheet(s):
	DBha - 1 was used for an and when dotted	applica lis 100
	CDBm - 1 was used for grandwater obser	station and is no
110	inger needed.	
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3/7777	SIGNATURE:	
	th	
7 00-00-00-0	thony Burgess , say that I have carefully read the tions and any attachments, which are a part hereof; that I am familiar with the rules	
Engine	eer pertaining to the plugging of wells and will comply with them, and that each ar	od all of the statements in the Well
	ng Plan of Operations and attachments are true to the best of my knowledge and be	
	11/2	
	/M.Ky// 2/	6/9/16
	Signature of Applicant	Date
	pignatury of Applicant	Date
IX. AC	CTION OF THE STATE ENGINEER:	
This W	'ell Plugging Plan of Operations is:	
	Approved subject to the attached conditions Not approved for the reasons provided on the attached letter.	
	140t approved for the reasons provided on the attached letter.	
	Witness my hand and official seal thisday of	. 2016
	Tom Blaine P.E., New Mexi	co State Engineer
	B	mt
	By: / amone	(and)

Well Plugging Plan Version: August 11, 2015 Page 3 of 5

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

2611 CA FORE A	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)	N/A	N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	15 gal. Up to 8.5 gal.
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
additive 2 percent by dry veight relative to cement	N/A	N/A	N/A

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

William Africa (2016)	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 scalant placement (ft bgl)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96319

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 20 feet below ground surface (bgs) via tremie pipe. The well will then be overdrilled with a 9- inch (outside diameter) 4 ¼ (inside diameter) auger to a minimum of 20 feet bgs. 5% bentonite enriched cement will be used to fill the boring from 20 feet up to 2 feet bgs. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for measuring groundwater as part of a water balance study. The study is complete and the well is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96319 (CDBM-1)	2	190.11'	35°50′37.155	-106°15′13.613

- 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. Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 4" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 1/4" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBM-1	2	170.11	3.71	27.76
CDBM-1 (Auger				
Boring)	9	20	8.84	66.10
Totals:			12.55	93.86

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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 morestringent 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.
- 9. 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 - 407 Galisteo Street - Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSE District 6, Water Rights Division

Date: 8/31/16



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. F	ILING FEE: There is no filing fee for this form.
	GENERAL / WELL OWNERSHIP:
Exist	ing Office of the State Engineer POD Number (Well Number) for well to be plugged: N/A RG - 96320 (CC
Name	e of well owner: Los Alamos National Laboratory
Maili	ing address: PO Box 1663
City:	Los Alamos State: New Mexico Zip code: 87545 e number: 505-667-5931 E-mail: meverett@lanl.gov
Phone	e number: 505-667-5931 E-mail: meverett@lanl.gov
Well	WELL DRILLER INFORMATION: Driller contracted to provide plugging services: Mexico Well Driller License No.: WD-1458 Expiration Date: 10-31-2016
Note:	A copy of the existing Well Record for the well to be plugged should be attached to this plan. GPS Well Location: Latitude: 35 deg, 50 min, 10.866 sec Longitude: -106 deg, 14 min, 39.238 sec, NAD 83
2)	Reason(s) for plugging well:
	No longer needed.
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:feet below land surface / feet above land surface (circle one)
6)	Depth of the well: 98.63 feet

7)	Inside diameter of innermost casing: inches.		
8)	Casing material: WSTAL		
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s): UNKNOWN		
10)	What annular interval surrounding the artesian casing of this well is cement-grouted?		
11)	Was the well built with surface casing? No If yes, is the annulus surrounding the surface casing grouted o otherwise sealed? No If yes, please describe:		
12)	Has all pumping equipment and associated piping been removed from the well? YesIf not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.		
pipe,	If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional ical information, such as geophysical logs, that are necessary to adequately describe the proposal. Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: Cement grout shall be tremie pumped from bottom to top of well casing. Well will then		
2)	be over-drilled to 20' bgs., then regrouted for the upper 20'. Will well head be cut-off below land surface after plugging? Yes		
	LUGGING AND SEALING MATERIALS: 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:		
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)		
5)	Proposed cement grout mix. 8, 5 gallons of water per 94 pound sack of Portland cement.		
6)	Will the grout be:batch-mixed and delivered to the sitex mixed on site		

7)	Grout additives requested, and percent by dry	weight relative to cement:	
	5% Bentonite		
	1		
-			
8)	Additional notes and calculations:		
	N/A		
	j		
			4
	To the second se		
VII.	DDITIONAL INFORMATION: List addition	nal information below, or on separate sheet(s):
(Dam - 2 was used for it	about of so chase patio	ین کسی در
	DBM-2was used for id	providual of desputio	rialecto
100	longer needed.	•	
	0		
1			
1			
VIII. S	IGNATURE:		
	D	short I bears are Ciller and she Corn in 19	/-!! Di' DiC
	ons and any attachments, which are a part hereof;	by that I have carefully read the foregoing W	
Enginee	r pertaining to the plugging of wells and will con	apply with them, and that each and all of the	statements in the Well
	Plan of Operations and attachments are true to the		
		11/16	CONTRACTOR AND THE
		Mikel	6/9/16
		Signature of Applicant	Date
		Digitate Coyrippineant)	Date
		,	
IX. AC	TION OF THE STATE ENGINEER:		
This We	l Plugging Plan of Operations is:		
		•	
	Approved subject to the attached condit Not approved for the reasons provided of		
	Not approved for the reasons provided to	on the attached letter.	
,	Witness my hand and official seal this	day of September,	2016
		Tom Blaine P.E., New Mexico State Eng	ineer
		B 5/1	
		By: Manon Mas	7
		/ /	
		4	5

Well Plugging Plan Version: August 11, 2015 Page 3 of 5

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

Constitution of the Consti	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)	N/A	N/A	0'
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interval (gallons)	N/A	N/A	62 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	45 gal. Up to 8.5 gal.
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive I percent by dry weight relative to cement	_	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
dditive 2 percent by dry reight relative to cement	N/A	N/A	N/A

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

Cherry For Carrie	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			ilon-artesian and oreaches
Top of proposed interval of sealant placement (ft bgl)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment sealant (manufacturer and trade name)	N/A	N/A	N/A



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96320

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 20 feet below ground surface (bgs) via tremie pipe. The well will then be overdrilled with a 9- inch (outside diameter) 4 ¼ (inside diameter) auger to a minimum of 20 feet bgs. 5% bentonite enriched cement will be used to fill the boring from 20 feet up to 2 feet bgs. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for measuring groundwater as part of a water balance study. The study is complete and the well is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96320 (CDBM-2)	2	98.63'	35°50′10.866	-106°14′39.238

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment. provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Scalant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the scalant to remain inside the auger at all times, thus providing displacement to prevent borchole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the scalant being placed.
- 6. Theoretical volume of scalant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of scalant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of scalant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required scalant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
CDBM-2	2	78.63	1.72	12.83
CDBM-2 (Auger				
Boring)	9	20	8.84	66.10
Totals:			10.55	78.93

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Ramona Martinez, NMOSE District 6, Water Rights Division



Tom Blaine, 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 7, 2016

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

Re: Plugging Plans of Operation, LANL Well RG-96330

Greetings:

After a review of the Well Plugging Plan of Operations submitted on June 21, 2016, 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
Water Rights Division

Office of the State Engineer

ENGINATION STATES

Enclosure cc: file



5)

6)

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.

L.	FILING FEE: There is no filing fee for	this form.	
Ex	GENERAL/WELL OWNERSHIP: isting Office of the State Engineer POD me of well owner: Los Alamos Natio	Number (Well Number) for well to be plugged nal Laboratory	NA RG- 96330 (
Ma	iling address- PO Box 1663		
Cit	: Los Alamos	State: New Mexico	Zip code: 87545
Pho	ne number. 505-667-5931	State: New Mexico E-mail: meverett@lanl.gov	
Wel		rvices: Yellow Jacket Drilling Services	10.21.2016
Nev	Mexico Well Driller License No.: WD-	1458 Expiration Date	10-31-2016
	•	the well to be plugged should be attached to this plugged. 35 deg. 51 min. 0.315 -106 deg. 19 min. 56.617	
2)	Reason(s) for plugging well:		
	No longer needed.		
3)	what hydrogeologic parameters were	ng program? Yes If yes, please use section monitored. If the well was used to monitor conico Environment Department may be required prior	ntaminated or poor quality
4)	Does the well tap brackish, saline, or c	therwise poor quality water? No If yes	s, provide additional detail,
	including analytical results and/or labora	atory report(s):	
5)	Static water level: Day feet	below land surface / feet above land surface (circ	le one)
)	Depth of the well: 31-89 feet	16 SEP - 6 AUT	20
		ATE ENGINEERS OFFICE	Sen: August 11, 2015 Page 1 of 5

7)	Inside diameter of innermost easing:
8)	Casing material: PVC
9)	The well was constructed with: an open-hole production interval, state the open interval: a well screen or perforated pipe, state the screened interval(s): _UNKYOWN
10)	What annular interval surrounding the artesian easing of this well is cement-grouted?
11)	Was the well built with surface casing? NoIf yes, is the annulus surrounding the surface casing grouted of otherwise scaled? NoIf yes, please describe:
12)	Has all pumping equipment and associated piping been removed from the well? YesIf not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.
Note pipe, techn	ESCRIPTION OF PLANNED WELL PLUGGING: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional ical 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 shall be tremie pumped from bottom to top of well casing. Well will then be suf off below ground surface.
2)	Will well head be cut-off below land surface after plugging? Yes
	LUGGING AND SEALING MATERIALS: 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:
4)	Type of Cement proposed: Bentonite cement grout (neat cement with 5% bentonite)
5)	Proposed cement grout mix 8.5 @ gallons of water per 94 pound sack of Portland cement
6)	Will the grout be:batch-mixed and delivered to the site mixed on site

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STATE ENGINEERS OFFICE SANTA FE, NEW MEXICO

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7)	Grout additives requested, and percent by dry weight relative to cement.	
	5% Bentonite	
8)	Additional notes and calculations:	
,	N/A	
VII. A	DDITIONAL INFORMATION: List additional information below, or on separate sh	icet(s):
16	no longer needed.	protion and
lis	no longer needed	
1,5	To To To Talaca.	1
ļ		
VIII. SI	GNATURE:	
1. Ja	Acob. Lagana ,, say that I have carefully read the foregoin	ng Well Plugging Plan of
Operation	ns and any attachments, which are a part hereof; that I am familiar with the rules and reg	rulations of the State
	pertaining to the plugging of wells and will comply with them, and that each and all of Plan of Operations and attachments are true to the best of my knowledge and belief.	the statements in the Well
Trugging	tale of Operations and anactiments are tale to the obst of my knowledge and belief.	
		9/1/16
	Signature of Applicant	Date
	agnaturot Applican	Date
IX. ACT	ION OF THE STATE ENGINEER;	
This Well	Plugging Plan of Operations is:	
	A second	₽
-	Approved subject to the attached conditions. Not approved for the reasons provided on the attached letter.	
-	1101 approved 101 and 1010 and	
W	itness my hand and official seal this 6 day of September	22/6
	Tom Blaine P.E., New Mexico State I	Engipeer/
	B bl	
	By / fagreer / for	4/
	2016 SEP -6 AM 11: 53	X
	SANTA FELKEY MEXICO	Well Plugging Plan asion: August 11, 2015
	10120 002266066	Page 3 of 5

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 breache only one aquifer, use only this column.
Top of proposed interva of grout placement (n bg		N/A	0,
Bottom of proposed interval of grout placement (ft bgl)	N/A	N/A	15'
Theoretical volume of grout required per interva (gallons)	N/A	N/A	6 gal.
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement	N/A	N/A	Up to 8.5 g live
Mixed on-site or batch- mixed and delivered?	N/A	N/A	On site
Grout additive 1 requested	N/A	N/A	Bentonite
Additive 1 percent by dry weight relative to cement	-	N/A	5%
Grout additive 2 requested	N/A	N/A	N/A
dditive 2 percent by dry eight relative to cement	N/A	N/A	N/A

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

	Interval 1 – decpest	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)	N/A	N/A	N/A
Bottom of proposed sealant of grout placement (ft bgl)	N/A	N/A	N/A
Theoretical volume of sealant required per interval (gallons)	N/A	N/A	N/A
Proposed abandonment scalant (manufacturer and trade name)	N/A	N/A	N/A

3016 SEP -6 AM 11: 53



Tom Blaine, P.E. District 6 Office, Santa Fe, NM

Well Plugging Plan of Operations Conditions of Approval for RG-96330

The U.S. Department of Energy / Los Alamos National Laboratory has identified 1 alluvial well as tabulated below. On the Well Plugging Plan of Operations received May 13, 2016, the applicant stated that the well is no longer needed as the study is completed. The applicant states that the casing will be pressure grouted with 5% bentonite enriched cement from total depth to 20 feet below ground surface (bgs) via tremie pipe. The well will then be overdrilled with a 9- inch (outside diameter) 4 ¼ (inside diameter) auger to a minimum of 20 feet bgs. 5% bentonite enriched cement will be used to fill the boring from 20 feet up to 2 feet bgs. The top 2 feet will be filled with concrete and mounded above the existing grade. Static water level is dry, according to the applicant. There is no OSE record available for this test well. This test well was used for measuring groundwater as part of a water balance study. The study is complete and the well is no longer needed. Existing active wells that are in close proximity to the well(s) that are to be abandoned could possibly have communication during cementing operations. To reduce the likelihood of this scenario, the water to cement ratio can be reduced to 5.2 gallons of water per 94 pound sack of Portland cement.

Location: Los Alamos, New Mexico.

Approximate well coordinates: See tabulated data.

Well Name	Inside diameter (inches)	Total depth (feet)	Latitude North	Longitude West
RG-96319 (16-P-1)	2	34.89'	35°51′0.315	-106°19′56.617

- 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.
- Placement of the sealant within the well shall be by pumping through a tremie pipe extended to near well bottom (based on sounding depth), and kept below top of the slurry column as the well is plugged from bottom-upwards in a manner that displaces the standing water column.
- 3. The use of up to 6% pure bentonite powder ("90 barrel yield") as an additive in cement is allowed under NMOSE/AWWA guidelines. Neither granular bentonite nor extended yield bentonite shall be mixed with cement. When supplementing a cement slurry with bentonite powder as requested, water demand for the mix increases at a rate of 0.65 gallons of water for each 1% increment of bentonite bdwc (by dry weight cement) above fundamental water demand of 5.2 gallons water per 94-lb. sack of cement. A 5% bentonite/cement slurry may therefore contain up to 8.5 gallons of water total per 94-lb. sack of cement / approximate 5-lb. bentonite increment, provided appropriate mixing order is maintained.

The bentonite shall be properly hydrated separately with its required increment of water, prior to being added into the cement mixture. If water is otherwise added to the combination of dry ingredients or the dry bentonite blended into wet cement, the hardness and alkalinity imparted to the mix water by the cement will restrict the ability of the bentonite powder to yield as expected, resulting in excess free water in the slurry and enhanced cement shrinkage upon curing.

- 4. Upon completion of plugging of the lower portion of the 2-inch well to the approximate 20-feet bags depth of actual overdrilling, the top of the 2-inch casing shall be severed within the bottom portion of the over-drilled hole prior to sealant being placed within the ID of the augers.
- 5. Sealant shall be kept up inside the augers during placement. The 4 ¼" x 9" augers shall be pulled out of the hole in such a manner that allows the sealant to remain inside the auger at all times, thus providing displacement to prevent borehole collapse. The 4 ¼" x 9" augers may not be pulled out of the hole prior to the sealant being placed.
- 6. Theoretical volume of sealant required for abandonment of the 2-inch (inside) diameter well is approximately .37 gallons per foot. Theoretical volume of sealant required for abandonment of the 9" (outside) diameter auger boring is 2.3 gallons per foot. Total theoretical volume of sealant required to fill the well is tabulated below. All cement mixture will contain no more than 5.2 gallons of water per 94 pound sack of cement. Total minimum amount of required sealant will be based on the sounding depth inside casing.

Well Name	Inside Diameter (Inches)	Total Depth (feet)	Volume (Cubic Feet)	Volume (Gallons)
16-P-1	2	14.89	0.32	2.43
16-P-1 (Auger Boring)	9	20	8.84	66.10
Totals:			9.16	68.53

- 7. All surface completions (vaults) will be removed, if applicable. The top of the 2-inch casing will be severed within the bottom of the overdrilled portion of the hole and will be backfilled with sealant to 2 feet bgs. The remaining 2-feet will be filled with concrete to surface.
- 8. 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.
- 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 505-827-6120, at least 48-hours in advance. NMOSE inspection will occur
 dependant on personnel availability.
- 10. A Well Plugging Record (available at: http://www.ose.state.nm.us/STST/Forms/WD-11.pdf) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, P.O. Box 25102 407 Galisteo Street Room 102, 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 May 13, 2016, with annotation, is hereby approved with the aforesaid conditions applied, when signed by an authorized designee of the State Engineer:

Remona Martinez, NMOSE District 6) Water Rights Division