



# ***WELL PLUGGING HANDBOOK***

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## I. Introduction

The New Mexico State Engineer is authorized by 72-2-8 NMSA to adopt rules establishing requirements for the plugging of wells. The State Engineer adopted an updated version of such rules effective June 30, 2017. We received comments during the public hearing process requesting ways to expedite approval to plug a well. Therefore a goal of this handbook is in part to provide an expedited alternative. Public input on improvements to the handbook is appreciated and helpful when selecting additions to future versions. Public input may be emailed to [nm.driller@state.nm.us](mailto:nm.driller@state.nm.us).

The purpose of this handbook is also to provide a step-by-step guide to the plugging of a well in a manner that complies with 19.27.4 NMAC. The handbook describes the plugging process and provides a table of approved sealants and placement methods. Anticipated additions to future versions of the handbook include a FAQ section, definitions, and additional figures with detailed plugging methods for specific well and site characteristics.

The rules regarding well driller licensing; construction, repair and plugging of wells may be accessed via the Office of the State Engineer (“OSE”) website at <http://www.ose.state.nm.us/STST/wdRules.php>. The rule is published in the New Mexico Administrative Code (“NMAC”) as 19.27.4 NMAC. Rule requires the State Engineer give approval prior to plugging a well either by issuing a condition to plug on an OSE permit to drill a replacement well or by approval of a submitted plugging plan of operations (“plugging plan”). The entity filing the plan to plug the well must be the owner of record on file with the OSE.

## II. The Well Plugging Process

Approval from the New Mexico State Engineer to plug a **non-artesian** well may be obtained only two ways, A) with a condition to plug on a replacement well permit or B) an approved well plugging plan (see Appendix A for the potential permit conditions you should be looking for on the permit). Every **artesian** well requires a plugging plan which must be signed by a well driller (see “Steps for filing a plugging plan of operations:” below).

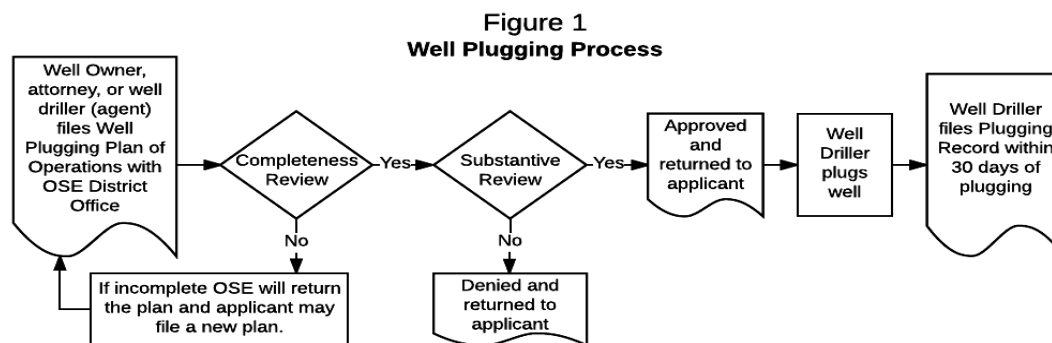
### A. **Pre-Approved Condition to Plug on a Replacement Well Permit (Condition 6D):**

This is the most expedited process for receiving an approval to plug a well. The OSE may have already given approval to plug the replaced well, by placing this condition of approval on the permit to plug the well using the most stringent method which is located in the rule. When you are hired to replace a non-artesian well, ask to see the permit from the OSE before giving any quotations, as there may already be a permit condition to plug the replaced well that is pre-approved using the most stringent method. Condition 6D may not be granted if the OSE has construction concerns or if the well is located in areas of known contamination. Those wells will require the submittal of a plugging plan. If the driller wishes to use alternative methods or materials, they must submit a plugging plan requesting a variance. The plugging plan must be approved by the OSE prior to plugging the well. The plugging record will have the same due date as the well log for a replacement well or an Application for Permit to Change Location of a Well.

This pre-approved plugging condition does not affect the requirement to submit a plugging plan nor does it change the existing conditions for artesian wells, those wells at risk, replaced wells with a condition requiring submittal of a plugging plan or wells that may penetrate more than one aquifer that require a plugging plan, but it is an option for those smaller diameter wells or shallow wells that need to be plugged.

**B. Approved Plugging Plan:** You may need to plug a well that is not being replaced, or you have a permit that is lacking a pre-approved plugging condition 6D, and instead the permit has a Condition 6C requiring the submittal of a plugging plan of operations to be approved. The process to obtain approval to plug a well begins with the filing of a plugging plan (see Figure 1). Table 1 provides OSE guidelines that may be helpful when completing the form. When permitting a temporary use or short term well (most wells on form WR-07), consider submitting your plugging plan with the well permit application. Then when you are ready to begin the plugging you will already have an approved plugging plan saving you time.

When plugging shallow wells with no construction or environmental concerns, and if the well record on a well to be plugged shows a proper 20 foot annular seal, a plugging plan can propose the use of clean fill material to a nominal 30 feet bgs, then placing an OSE approved sealant to surface. Lacking that information, we would always assume no annular seal which would require an excavation and applying sealant to extend beyond the OD of the casing by approximately 2 feet.



**Steps for filing a plugging plan of operations:**

1. After the well plugging plan of operations is filed, the OSE will perform a completeness review of the plan. The completeness review determines whether all required information has been submitted. If the plan is incomplete, the OSE will contact the applicant or the driller to attempt to resolve the deficiencies. If the OSE does not receive the needed information, the plan may be returned un-approved or deny the plan.
2. If the plan is complete, the OSE will perform a substantive review to determine whether the proposed plugging methods and sealants are appropriate for the well and site characteristics. During this review process the OSE may contact the well owner or the well driller to request additional information or discuss modifications to the proposed

plugging plan, if necessary.

3. Once the plugging plan is approved and the driller receives a copy, the well plugging may commence.
4. Within 30 days after a well is plugged, the well driller is required to file a complete plugging record with the OSE and the permit holder. The plugging record describes the actual methods and sealants used to plug the well. If the well owner or well driller has any questions it is recommended that they contact the OSE. OSE staff will answer any questions.

The current version of the form must be used. If the well owner is not the landowner, then prior access approval from the owner of the land may be required. Plugging plan forms may be obtained from the OSE District Offices located in Albuquerque, Roswell, Deming, Las Cruces, Aztec, Santa Fe and Cimarron or on the OSE website at <http://www.ose.state.nm.us/STST/wdForms.php>.

***Bluewater, Estancia, Gallup, Middle Rio Grande, Northern Tularosa, and Sandia Basins***

District 1: 5550 San Antonio Dr. NE , Albuquerque, NM 87109 Phone # 505-383-4000

***Capitan, Carlsbad, Casey Lingo, Curry County, Fort Sumner, Hagerman Canal, Hondo, Jal, Lea County, Peñasco, Roswell-Artesian, and Portales Basins***

District 2: 1900 West Second St., Roswell, NM 88201 Phone # 575-622-6521

***Animas, Cloverdale, Gila-San Francisco, Hachita, Lordsburg Valley, Mimbres, Mount Riley, Nutt-Hockett, Playas, San Simon, Virden Valley, and Yaqui Basins***

District 3: 321 W. Spruce St., Deming, NM 88030, P.O. Box 844, Deming, NM 88031 Phone # 575-546-2851

***Lower Rio Grande, Southern Tularosa, Hueco, Las Animas Creek, Salt, and Hot Springs Basins***

District 4: 1680 Hickory Loop, Suite J, Las Cruces, NM 88005. Phone # 575-524-6161

***San Juan Basin***

District 5: 100 Gossett Drive, Suite A, Aztec, NM 87410 Phone # 505-334-4571

***Northern Rio Grande and Upper Pecos Basins***

District 6: P.O. Box 25102, Santa Fe, NM 87504-5102 Phone # 505-827-6120

***Canadian River, Clayton, and Tucumcari Basins***

District 7: P.O. Box 481, 301 East 9th Street, Cimarron, NM 87714 Phone # 575-376-2918

### **III. Highly Mineralized Water:**

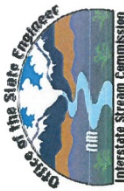

Mixing your sealants using highly mineralized groundwater will inhibit the sealant's hydration process. Mixing water needs to be cool, clean fresh water, free of oil soluble chemicals, organic material, alkalis, sulphates and other contaminants. Select sealants that are appropriate when plugging a well that has a standing column of mineralized groundwater. Cement based sealants can be altered with additives to reduce hydration time, strengthen the sealant, compensate for shrinkage, and have higher resistance to sulphate rich environments. Consult your supplier to assist with the sealant selection when plugging wells in areas of highly mineralized water.\*

### **IV. Mixing and Placing Sealants:**

When mixing a grout, it is important to follow the manufacturer's specifications using clean water, so as not to interfere with the reaction needed to make a slurry. If excess hardness is present in mixing water, the polymers or bentonite may clump and adhere to paddles during mixing phase. If the mixing water has a high pH or high level of total dissolved solids, it may cause cement based sealants to hydrate slowly and/or fail to set. Improper water to cement ratios may also cause excessive shrinkage of the sealant.

Bentonite grout products are available in various forms such as powder, granules, pellets and chips. Powder or granules should not be poured or dropped dry through a column of standing water. Pellets and chips hydrate more slowly so may be poured or dropped through a column of standing water; pellets may be poured or dropped dry through a column of standing water up to 150 feet or so, and chips up to 500 feet.

**Table 1**

OFFICE OF THE STATE ENGINEER SEALANT GUIDELINES FOR WELL CONSTRUCTION AND PLUGGING (FOR USE IN NON-CONTAMINATED CONDITIONS)		APPLICATION													
SEALANT	HYDRATION REQUIREMENT	PLACEMENT METHOD	Non-Artesian (Unconfined) Well			Artesian (Confined) Well				Special Conditions					
			Plugging	Annular Seal	Surface Casing	Plugging (Non-flowing)	Plugging (Flowing)	Annular Seal (Non-flowing)	Annular Seal (Flowing)	Surface Casing	(Upper 10 feet sealant; drill cutstings or clean native fill below)	Ground Source Heat Pump			
Bentonite Chips*	Fresh water to be added above water column at rate of 5 gallons per 50-lb. sack/bucket	Pour < 20' and dry Tremie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bentonite Pellets*	Fresh water to be added above water column at rate of 5 gallons per 50-lb. sack/bucket	Pour < 20' and dry Tremie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time Release Bentonite Pellets*	Fresh water to be added above water column at rate of 5 gallons per 50-lb. sack/bucket	Pour < 20' and wet Tremie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
High-Solids Bentonite Grout	Manufacturers' mixing ratios to attain minimum 20% active solids by weight	Tremie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Neat Cement Slurry** (type I or II portland cement)	No more than 6.0 gallons water per 94-lb. sack portland cement	Tremie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cement-Bentonite Slurry** (type I or II portland cement plus bentonite powder)	Maximum 5.2 gallons water per 94-lb. sack portland cement PLUS 0.6 gallon per 1% increase in bentonite up to maximum 6% bentonite by dry weight ratio. Bentonite must be hydrated separately and then mixed.	Pressure Grout	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand-Cement Grout** (max 1 part sand to 1 part portland cement by dry weight ratio)	No more than 6.0 gallons water to 94-lb. sack portland cement. Ok to moisten sand before mixing.	Tremie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thermally-Enhanced Grout	Manufacturers' mixing ratios to attain minimum 20% active solids by weight. Addition of fine sand not in excess of 400-lb per 50-lb sack of bentonite. Permeability must remain less than 10 <sup>-6</sup> cm/sec.	Pressure Grout	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MATERIALS & METHODS		Stratified Additives													
Request Variance												Describe and Request on Plan			
												I hereby approve the above sealant guidelines for well construction and plugging this <u>18</u> day of <u>MAY</u> <u>2016</u> .			
												 Tom Blaine, New Mexico State Engineer			

\*Groundwater concentrations of chloride and hardness are limited. \*\*Groundwater concentrations of sulfates are limited.

## References

1. Arizona Department of Water Resources, 2008, Well Abandonment Handbook, 32 pp.
2. Ontario Canada Environmental Monitoring and Reporting Branch, Revised April 2015 Water Supply Wells: Requirements and Best Practices, Chapter 7

## Appendix A – Possible Permit Conditions on Replacement Wells

### **(Pre-approved plugging condition) Permit Condition 6D:**

Well \_\_\_\_\_ shall be plugged completely using the following method per Rules and Regulations Governing Well Driller Licensing, Construction, Repair and Plugging of Wells; 19.27.4.30.C unless an alternative plugging method is proposed by the well owner and approved by the State Engineer.

All pumping appurtenance shall be removed from the well prior to plugging.

To plug a well, the entire well shall be filled from the bottom upwards to ground surface using a tremie pipe. The bottom of the tremie shall remain submerged in the sealant throughout the entire sealing process; other placement methods may be acceptable and approved by the state engineer. The well shall be plugged with an office of the state engineer approved sealant for use in the plugging of non-artesian wells.

The well driller shall cut the casing off at least four (4) feet below ground surface and fill the open hole with at least two vertical feet of approved sealant. The driller must fill or cover any open annulus with sealant. Once the sealant has cured, the well driller or well owner may cover the seal with soil.

A plugging record for said well shall be filed with the Office of the State Engineer in a District Office within 30 days of completion of the plugging, but no later than the date set forth on the permit to drill.

### **(Plugging Plan of Operations required) Permit Condition 6C:**

Upon completion of the new well, the replaced well shall be plugged. The well driller shall file a plugging plan for the replaced well with and it shall be approved by the Office of the State Engineer prior to plugging. The well driller shall file the Plugging Record with the appropriate district office and the applicant within 30 days of completion of plugging of the well but no later than the date set forth on the permit to drill

### **(For Wells that do not encounter water) Permit Condition 6E:**

Wells that do not encounter a water bearing stratum shall be immediately plugged by filling the well with drill cuttings or clean native fill to within ten (10) feet of land surface and by plugging the remaining ten (10) feet of the well to land surface with a plug of a sealing material approved by the State Engineer.