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**19.15.39.9.B Application for Exploration and Development Plan.**

**(7)(b) a drilling program describing the air drilling program or mud program to be used;**

This section of the rule is asking the applicant to be detailed as to its drilling method or drilling fluid to be used.

Deep holes are typically drilled with rotary rigs, circulating either "mud" or compressed "air". Air drilling is a drilling technique whereby gases (typically compressed air or nitrogen) are used to cool the drill bit and lift cuttings out of the wellbore. Some advantages of air drilling are (i) the hole is drilled much faster than with mud, (ii) it reduces lost circulation problems, and (iii) formation damage is minimized. Some disadvantages to air drilling are the inability to control the influx of formation fluid into the wellbore and the destabilization of the borehole wall.

Mud drilling with a rotary rig is the most versatile and dependable method of drilling and is necessary in many basins. The advantages seen in mud rotary drilling are that mud characteristics can be controlled so that formations are stabilized, pressures are controlled, and inflow, invasion, or cross-flow are minimized.

Detection and protection of "fresh" water is important and a carefully planned drilling program will help do this by preventing invasion or formation crossflow. If mud drilling is necessary, fresh water intervals are better protected by drilling with "fresh water" based muds, and preferably not with "salt water" based muds.

Normally operators use Form C-101 to submit proposed APD details. The details of the mud program envisioned here would be similar to the detail required for drilling on federal lands.

**(7)(c) a mudlogging program, including a copy of the mudlog sheet and a description of the mudlogger's daily report, which shall include at a minimum the total depth reached, the footage drilled in the preceding 24 hours, oil and gas intervals, fresh water zones, and mud parameters including mud weight, chlorides, funnel viscosity and filtrate properties;**

This section asks the operator to disclose the details of its intended mudlog program – including an example "description". This is requested to ensure the operator (i) has a geologist watching the details of the drilling and (ii) reports these details to the State. This proposed regulation is needed to prompt the operator to gather valuable, interpreted information while the well is drilled in order to better ensure potential oil, gas, and water intervals are detected and recorded.

91

92           The Mud Logger (normally a geologist) samples rock cuttings and writes an  
93 interpretation of the rocks drilled. The mud log also includes formation tops, oil and gas  
94 "shows", and drilling rate-of-penetration. Mud parameters such as weight, chlorides and  
95 viscosity are often added to this rock description. The mudlog is used in combination  
96 with the electric logs run on the well to make a decision about whether to complete the  
97 hole (try to produce oil or gas from it) or "plug" the well. The mudlog accurately  
98 identifies the lithology or type of rocks which is needed when interpreting the electric  
99 logs. Running mudlogs will aide in interpretation of electric logs and will aide in  
100 identifying thick, clean, high porosity intervals that may contain water and will ensure  
101 hydrocarbons are not bypassed - causing "waste".

102

103 **19.15.39.10 Additional requirements for applications to drill, re-enter, or deepen**  
104 **wells subject to an Exploration and Development Plan:**

105

106           Division Rules, Part 14 contain the requirements to obtain approvals to drill,  
107 including reference to the required forms C-101 and C-102. In addition, the rules allow  
108 the Division the "impose conditions" on drilling. The approvals to drill are normally  
109 processed in the district offices by district personnel. Each district has standardized  
110 practices of permitting wells that is unique to that district because of the unique nature of  
111 the geology, protectable water, or other conditions in that district.

112

113           These proposed rules for the Galisteo Basin are intended to be more specific in  
114 order to prevent waste and protect the environment.

115

116 **B. Unless otherwise specified in an approved exploration and development plan,**  
117 **an application for permit to drill, re-enter, or deepen a well that requires an**  
118 **Exploration and Development Plan shall be subject to the following conditions:**

119

120           **(3) the operator shall run logs from total depth to surface that will**  
121 **determine porosity and water saturation;**

122

123           This section requires the operator to design and run an electric logging program  
124 ("logs") with the purpose of determining critical parameters such as porosity and water  
125 saturation from the well's total-depth to the surface. The intent is to not only detect the  
126 presence and extent of hydrocarbons, but to detect all waters, water bearing sands, and  
127 (geologic) lithology or rock types and thicknesses.

128

129           Currently, the Division does not require electric logs to be run, but does require  
130 these to be submitted to the Division if they are run - Division Rule 7.16 (Form C-105).

131

132           Porosity is the percentage of void space or pore volume within a rock. Effective  
133 porosity is the interconnected pore volume in a rock that contributes to fluid flow in a  
134 reservoir. The porosity or "voids" contain fluids such as various gases or liquids (water

135 or hydrocarbons). Porosity is estimated by the mudlogger, and measured in cores, but the  
136 preferred measurement of porosity in the reservoir is from running and interpreting  
137 modern electric logs.

138 Water saturation is the fraction of the pore volume occupied by formation water  
139 and  $(1-S_w)$  is the fraction of the pore volume occupied by hydrocarbons. Water  
140 saturation determinations are done using data from mud properties and formation  
141 resistivity logs.

142 Electric wireline logging gives the best understanding of the reservoir or what's  
143 below ground. Both open hole and cased hole logging tools and techniques are available  
144 and provide state-of-the-art formation evaluation.

145 Wireline logs are normally run by an operator, focused on the potential  
146 hydrocarbon pay interval. Requiring these logs to be run from the bottom to the top in  
147 these wells in the Galesteo Basin will help determine the location and extent of fresh  
148 water intervals; which can then be protected. The requirement to run a well designed and  
149 thorough electric logging suite will ensure the reservoir and reservoir fluids are  
150 understood and will prevent waste and protect potential sources of drinking water.

151 **(4) a mud-logger shall be on site during drilling from surface to total-**  
152 **depth and shall submit the logs and a written report daily to the supervisor of**  
153 **the appropriate district office;**

154  
155 This section requiring the mud-logging of the entire well and the daily report from  
156 that mud-logger is intended to ensure geological and drilling data are gathered and  
157 available to both the company paying for the well and to the Division. Mudlog  
158 information is used to make decisions on the well, such as where to stop and set  
159 protective casing, or even whether to complete a well and where to complete it.

160  
161 Currently mudlogging is not required and if it is done, the reports are not required  
162 to be submitted to the Division. If they are voluntarily submitted to the Division, it is  
163 after the well is finished drilling.

164  
165 **(5) the operator shall isolate all fresh water zones and aquifers**  
166 **throughout their vertical extent with at least two cemented casing strings;**

167  
168 This section puts the responsibility on the operator to protect all fresh waters with  
169 at least two cemented casing strings. The two casing strings are a best practice in the  
170 Division or a normal result of drilling a well and casing off fresh water as it normally  
171 occurs above any hydrocarbon bearing interval. However, sometimes fresh "protectable"  
172 water occurs below hydrocarbon intervals. Requiring a double cement sheath or cement  
173 to be circulated on two casings covering "fresh water", no matter where this water occurs,  
174 is a necessary protective measure.

175

176 "Fresh Water" is defined by the Division in Rule 7F.(3) and is to be protected  
177 from oil production operations by casing wells as described above. Waters defined as  
178 "fresh", even if deep in a well or of low capacity (yield) for production are to be  
179 protected (see Rule 7F.(3)) "except for which, after notice and hearing, it is found there is  
180 no present or reasonably foreseeable beneficial use which would be impaired by  
181 contamination of such waters."

182  
183 Division Rules Part 16.9 requires the well to be designed to prevent movement of  
184 fluids, confine and prevent downhole contamination of water, and seal off water with  
185 cement.

186  
187 **(6) the operator shall circulate cement to surface on all casing strings,**  
188 **except that the smallest diameter casing shall have cement to at least 100 feet above**  
189 **the casing shoe of the next larger diameter casing;**

190  
191 This section requires the operator to design a cement job in order to protect all  
192 installed casing from total-depth of the well to the surface with a cement sheath in order  
193 to prevent casing corrosion and vertical migration of fluids from one formation into  
194 another; preventing waste and protecting fresh waters.

195  
196 Division Rules 16.10 provides details as to the method and extent of cementing.  
197 This rule requires cement coverage but allows exceptions so cement is only placed over  
198 the lowermost portions of intermediate and production casing.

199  
200 The proposed rule would prevent any casing to be exposed to the formation  
201 without coverage of a cement sheath.

202  
203 **(7) the operator shall run cement bond logs acceptable to the Division**  
204 **after each casing string is cemented and file the logs with the appropriate district**  
205 **office;**

206  
207 This section requires cement bond logs after all primary cementing jobs. This is  
208 intended to aid in identifying not only the cement top, but to identify thief zones and high  
209 and low permeability zones in the well. A Cement Bond Log ("CBL") is an electric  
210 wireline log run in casing after the casing has been cemented in place. The CBL is  
211 typically a variety of series of sonic-type tools and gives a detailed, 360-degree view of  
212 the integrity of the cement job. It is a representation of the cement job, and shows  
213 whether the cement is adhering to the outside of the casing and to the formation.

214  
215 Requiring cement bond logs after cement jobs will provide information as to not  
216 only the cement top, but also the cement quality and possible formation permeability;  
217 adding a level of protection to the well and protecting potential sources of drinking water.

218

219 Existing Division rules allow for flexibility in verifying cement tops. In practice,  
220 when cement does not circulate, the Division requires a survey to be done to determine  
221 the cement top. The survey could be a temperature survey or any type of cement bond  
222 log.

223  
224 **(8) the operator shall place a well that requires gas pipeline connection on**  
225 **approved temporary abandonment status while awaiting pipeline connection.**  
226

227 This portion of the proposed rule was intended to allow normal and necessary  
228 testing of wells but require inactive wells to be temporarily abandoned by placing bridge  
229 plugs above any perforations.

230  
231 I recommend that the Commission change the language in numbered paragraph  
232 (8) as follows:

233  
234 The operator shall place a well that requires gas pipeline connection on  
235 approved temporary abandonment status while awaiting pipeline connection with  
236 a bridge plug above any open perforations.

237  
238 The normal limits of 19.15.25.8 NMAC would apply; the operator would have to  
239 place an inactive well on approved temporary abandonment status within 150 days after  
240 suspension of drilling operations or plug and abandon.

241  
242 The existing rules allow wells to be approved for temporary abandonment without  
243 placing plugs above the perforations. Rule 25.14 allows the operator to demonstrate  
244 "internal mechanical integrity", which is necessary prior to approving temporary  
245 abandonment, by demonstrating that the well has been completed for less than five years  
246 and has not been connected to a pipeline.

247  
248 The existing rules clearly give the Division some discretion in methods of  
249 demonstrating mechanical integrity and therefore in approving temporary abandonment.  
250 This sometimes results in wells being approved for temporary abandonment without  
251 placing a bridge plug above the perforations and circulating the well with corrosion  
252 resistant fluid.

253  
254 As an example, the Black Ferrill Well No. 1 was "temporarily abandoned" for  
255 many years with the tubing in the hole and (probably) no plug set above the perforations.  
256 After twenty years, re-entry of the well was difficult and the 4-1/2 inch casing in the well  
257 was badly corroded. Tecton repaired the problem by running an internal "scab" liner.

258  
259 Division Rule 18.12 limits flaring or venting time to 60 days following the well's  
260 "completion", but allows application for exception to this time limit (form C-129).  
261 Flaring or venting hydrocarbon gases is a "waste" and exceptions to allow an operator to  
262 flare or vent for long periods of time should be minimized.

263 I, William V. Jones, swear that the foregoing is true and correct.

264

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272 Subscribed and sworn to before me this 3<sup>rd</sup> day of December 2008, by William V. Jones.

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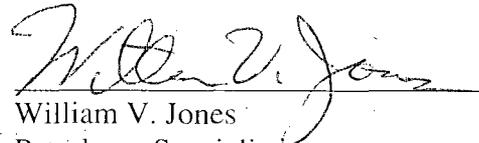
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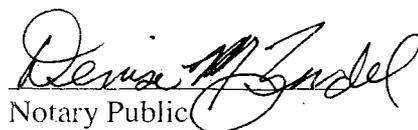
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William V. Jones  
Petroleum Specialist  
Oil Conservation Division

  
Notary Public

My commission expires:

1-09-2012