

**STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION**

**APPLICATION OF THE NEW MEXICO OIL CONSERVATION DIVISION
THROUGH THE SUPERVISOR OF DISTRICT II FOR AN EMERGENCY ORDER
SUSPENDING CERTAIN APPROVED APPLICATIONS FOR PERMITS TO DRILL,
AND FOR ADOPTION OF SPECIAL RULES FOR DRILLING IN CERTAIN AREAS
FOR THE PROTECTION OF FRESH WATER, CHAVES AND EDDY COUNTIES,
NEW MEXICO**

CASE NO. 15487

SECOND AMENDED PRE-HEARING STATEMENT OF COG , FASKEN, AND OXY

COG Operating, LLC, ("COG"), Fasken Oil and Ranch, Ltd. ("Fasken"), and OXY USA Inc. ("OXY"), jointly submit this Pre-Hearing Statement pursuant to the rules of the Oil Conservation Division.

APPEARANCES

APPLICANT

Oil Conservation Division

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Fasken Oil & Ranch, Ltd. and
Oxy USA Inc.

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STATEMENT OF CASE

Applicant has filed a Fifth Amended Application for Rulemaking that seeks adoption of "Special Provisions" for drilling oil and gas wells in a large geographic area in Eddy and Chaves counties identified as the "Designated Area." The intended effect of the proposed rules "is to require two strings of surface protection casing in any well drilled through both the artesian aquifer and the shallow aquifer in the Roswell artesian basin..." See Fifth Amended Application

at ¶ [5]. Drilling in the Designated Area has been successfully done for decades using a single protective string through both aquifers that is cemented to surface. Neither the Fifth Amended Application nor any prior application indicates why two protective strings through the aquifers are suddenly necessary to adequately protect them.

Testimony from the prehearing conference in this matter establishes that the Division's initial application for an Emergency Order was filed after it was discovered certain applications to drill were approved that did not comply with existing Division rules. These existing Division rules require at least one protective string cemented to surface to seal off and protect all water bearing strata. *See 19.15.16.10 NMAC.* Existing Division rules further provide for a second protective string cemented to surface "as may be necessary," such as when drilling hazards or other circumstance exist that indicate a single protective string will not provide a reasonable level of protection for underground aquifers. *See 19.15.16.10.A NMAC.*

Any concerns over whether approved APDs adequately protect the fresh water aquifers in the Designated Area can be and should be addressed by reviewing those APDs to determine whether they conform with existing Division rules. No factual basis or demonstrated need exists that warrants "Special Provisions" for this "Designated Area" that suddenly mandates two protective strings instead of the standard single protective string set at the proper depth and cemented to surface.

In addition, the proposed "Special Provisions" will unnecessarily and substantially increase the cost of drilling oil and gas wells in the Designated Area. Decades of drilling in the Designated Area has shown that absent a drilling hazard (such as a salt section) or problems encountered during drilling, a single protective string extending through the lower aquifer and cemented to surface effectively seals off the aquifers. Mandating the additional cost of two

protective strings is not warranted. *See* Proposed Rule C(3). Further requiring Division approval of cement bond logs for each protective string before the continuation of drilling is not practical and serves no purpose where the cement is circulated to surface. *See* Proposed Rule C(4). Increasing the size of the annular space between the protective casing string and the diameter of the hole unnecessarily conflicts with what has proven over decades to be the proper spacing for drilling, equipping, servicing, and cementing the annular space in a safe, reliable and protective manner. *See* Proposed Rule F.

In the event the Commission determines that "Special Provisions" are appropriate for some or all of the subject area, COG, Oxy, Fasken and the other affected parties have jointly submitted modifications to the proposed Special Provisions. These modifications seek to maintain for the "Designated Area" the drilling and casing requirements that have proven over decades to be protective of the aquifers at issue without imposing on oil and gas operators unnecessary and excessive costs and drilling risks. As with the existing rules, the proposed modifications authorize the District Supervisor to require a second protective string where drilling hazards or other conditions indicate a single protective casing is not sufficient to provide a reasonable level of protection of the aquifers.

PROPOSED EVIDENCE

Witness: **Carl Bird** **Estimated Time:** 1 hour

Petroleum and Drilling Engineer
COG Operating, LLC

Mr. Bird has a Natural Gas Engineering degree from Texas A&I and has been an Operations and Drilling Engineer in the Permian Basin for 39 years. Mr. Bird will address and offer opinions on the following topics:

(a) the historical two-string design incorporated in the proposed modifications and how it compares with the three-string designed mandated by the Division's proposed rules, that the historical two-string design has been utilized to drill oil and gas wells in the Designated Area for decades without incident, why the two-string design adequately protects the aquifers, and when it is appropriate to require a three-string design;

(b) the additional cost imposed by proposed Rule C(4), which requires submission of cement bond logs to the Division for approval for each protective string prior to the continuation of drilling;

(c) the general purpose and use of cement bond logs, the effect that cement curing has on the quality of the acoustic readings from cement bond logs, and that cement bond logs serve no purpose where cement is circulated to surface;

(d) the typical two inch annular space between the nominal outer diameter of the casing and the diameter of the hole, why it is important to maintain that typical annular space, and the operational problems imposed by the Division's proposal in Rule F to increase the annular space by measuring from the outer diameter of "the couplings;" and

(e) any other topics raised at the hearing by the Division or other parties.

Potential Rebuttal Witness: Harvin Broughton

Estimated Time: Unknown

Petroleum Geologist
COG Operating, LLC

Mr. Broughton has a bachelor of science degree in Petroleum Engineering from Oklahoma State University and a master of science degree in Geology from the University of Texas of the Permian Basin. Mr. Broughton was employed by Schlumberger for 25 years in various engineering and geological capacities, and has been employed by COG for 8 years as a Geologist and Lead Geologist. Mr. Broughton may be called as a rebuttal witness to address topics within his area of expertise that are raised by the Division or other parties.

Potential Rebuttal Witness: Timothy Reed

Estimated Time: Unknown

Hydrologist
COG Operating, LLC

Mr. Reed has a Bachelor of Science degree in Geology from the University of Texas of the Permian Basin and has worked as a hydrologist in the environmental and oil and gas industry for 30 years. Mr. Reed may be called as a rebuttal witness to address topics within his area of expertise that are raised by the Division or other parties.

EXHIBITS

Attached to this prehearing statement are the exhibits COG, Fasken, and Oxy anticipate using at the Commission hearing.

PROCEDURAL MATTERS

None at this time.

Respectfully submitted,

HOLLAND & HART LLP



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CERTIFICATE OF SERVICE

I hereby certify that on this 21st day of November, 2016, I served a true and correct copy of the foregoing *Second Amended Pre-Hearing Statement of COG, Fasken and OXY* via email to:

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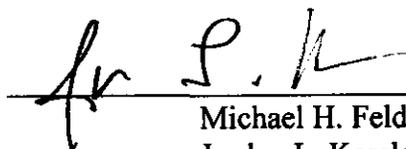
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CASE NO. 15487

RESPONDENTS' EXHIBITS



(1) one or more complete, contiguous spacing units (in one section or in more than one section) that are developed by the horizontal well; or

(2) an entire voluntary or statutory unit for an approved enhanced recovery or pressure maintenance project, an approved state exploratory unit, or a participating area in a federal unit.

M. "Standard project area" means a project area that;

(1) is described in Paragraph (2) of Subsection L of 19.15.16.7 NMAC;

(2) consists of a single spacing unit;

(3) consists of two or more spacing units within a single section that collectively comprise:

(a) the entire section, a half-section or half-section equivalent, or a quarter section or quarter-section equivalent; or

(b) the north, south, east or west half of a half-section or half-section equivalent or of a quarter section or quarter-section equivalent; or

(4) consists of a combination of two or more otherwise standard project areas, if the resulting area is substantially in the form of a rectangle; provided that a project area consisting of three 40-acre units within a single section and excluding the fourth spacing unit is not a standard project area.

N. "Terminus" means the farthest point attained along the well bore or lateral.

O. "Vertical well" means a well that does not have an intentional departure or course deviation from the vertical.

[19.15.16.7 NMAC - Rp, 19.15.3.111 NMAC, 12/1/08; A, 2/15/12]

19.15.16.8 SIGN ON WELLS:

A. An operator shall identify wells and related facilities the division regulates by a sign, which shall remain in place until the operator plugs and abandons the well and closes the related facilities.

B. For drilling wells, the operator shall post the sign on the derrick or not more than 20 feet from the well.

C. The sign shall be of durable construction and the lettering shall be legible and large enough to be read under normal conditions at a distance of 50 feet.

D. The wells on each lease or property shall be numbered in non-repetitive, logical and distinctive sequence.

E. An operator shall have 90 days from the effective date of an operator name change to change the operator name on the well sign unless the division grants an extension of time, for good cause shown along with a schedule for making the changes.

F. Each sign shall show the:

(1) well number;

(2) property name;

(3) operator's name;

(4) location by footage, quarter-quarter section, township and range (or unit letter can be substituted for the quarter-quarter section); and

(5) API number.

[19.15.16.8 NMAC - Rp, 19.15.3.103 NMAC, 12/1/08]

19.15.16.9 SEALING OFF STRATA:

A. During the drilling of an oil well, injection well or other service well, the operator shall seal and separate the oil, gas and water strata above the producing or injection horizon to prevent their contents from passing into other strata.

B. The operator shall ensure that fresh waters and waters of present or probable value for domestic, commercial or stock purposes are confined to their respective strata and are adequately protected by division-approved methods. The operator shall take special precautions by methods satisfactory to the division in drilling and abandoning wells to guard against loss of artesian water from the strata in which it occurs, and the contamination of artesian water by objectionable water, oil or gas.

C. The operator shall ensure that water is shut off and excluded from the various oil- and gas-bearing strata that are penetrated. The operator shall ordinarily make water shut-offs by cementing casing.

[19.15.16.9 NMAC - Rp, 19.15.3.106 NMAC, 12/1/08]

19.15.16.10 CASING AND TUBING REQUIREMENTS:

A. The operator shall equip a well drilled for oil or gas with surface and intermediate casing strings

and cement as may be necessary to effectively seal off and isolate all water-, oil- and gas-bearing strata and other strata encountered in the well down to the casing point. In addition, the operator shall equip a well completed for oil or gas production with a string of properly cemented production casing at sufficient depth to ensure protection of oil- and gas-bearing strata encountered in the well, including the strata to be produced.

B. The operator shall use sufficient cement on surface casing to fill the annular space behind the casing to the top of the hole, provided that authorized division field personnel may allow exceptions to this requirement when known conditions in a given area render compliance impracticable.

C. Cementing shall be by pump and plug method unless the division expressly authorizes some other method.

D. Cementing shall be with conventional-type hard-setting cements to which the operator has added additives (lighteners, densifiers, extenders, accelerators, retarders, etc.) to suit conditions in the well.

E. Authorized division field personnel may, when conditions warrant, allow exceptions to Subsection D of 19.15.16.10 NMAC and permit the operator to use oil-base casing packing material in lieu of hard-setting cements on intermediate and production casing strings; provided that when the operator uses such materials on the intermediate casing string, the operator places conventional-type hard-setting cements throughout all oil- and gas-bearing zones and throughout at least the lowermost 300 feet of the intermediate casing string. When the operator uses such materials on the production casing string, the operator shall place conventional-type hard-setting cements throughout all oil- and gas-bearing zones that shall extend upward a minimum of 500 feet above the uppermost perforation or, in the case of an open-hole completion, 500 feet above the production casing shoe.

F. The operator shall test casing strings and prove satisfactory as provided in Subsection I of 19.15.16.10 NMAC.

G. After cementing, but before commencing tests Subsection I of 19.15.16.10 NMAC requires, all casing strings shall stand cemented in accordance with one of the options in Paragraphs (1) and (2) of Subsection G of 19.15.16.10 NMAC. Regardless of which option the operator chooses, the casing shall remain stationary and under pressure for at least eight hours after the operator places the cement. Casing shall be under pressure if the operator uses some acceptable means of holding pressure or if the operator employs one or more float valves to hold the cement in place. The operator shall either

(1) allow casing strings to stand cemented a minimum of 18 hours prior to commencing tests; an operator using this option shall report on form C-103 the actual time the cement was in place before the operator initiated tests; or

(2) in the counties of San Juan, Rio Arriba, McKinley, Sandoval, Lea, Eddy, Chaves and Roosevelt only, allow casing strings to stand cemented until the cement reaches a compressive strength of at least 500 psi in the "zone of interest" before commencing tests; provided however, that the operator shall not commence tests until the cement is in place for at least eight hours.

(a) The "zone of interest" for surface and intermediate casing strings is the bottom 20 percent of the casing string, but is no more than 1000 feet nor less than 300 feet of the bottom-part of the casing unless the casing is set at less than 300 feet. The "zone of interest" for production casing strings includes the interval or intervals where immediate completion is contemplated.

(b) To determine that a minimum compressive strength of 500 psi has been attained, the operator shall use the typical performance data for the particular cement mix used in the well, at the minimum temperature indicated for the zone of interest by Figure 107-A, Temperature Gradient Curves. Typical performance data used shall be that data the cement manufacturer or a competent materials testing agency furnishes, as determined in accordance with the latest edition of API publication Recommended Practice for Testing Well Cements, RP 10B-2.

(See Temperature Gradient - Page 17A)

H. An operator using the compressive strength criterion in Paragraph (2) of Subsection G of 19.15.16.10 NMAC shall report the following information on form C-103:

(1) volume of cement slurry in cubic feet and brand name of cement and additives, percent additives used and sequence of placement if the operator uses more than one type cement slurry;

(2) approximate temperature of cement slurry when mixed;

(3) estimated minimum formation temperature in zone of interest;

(4) estimate of cement strength at time of casing test; and

(5) actual time cement in place prior to starting test.

I. The operator shall test casing strings except conductor pipe after cementing and before commencing other operations on the well. The operator shall file form C-103 with the division for each casing string reporting the grade and weight of pipe used. In the case of combination strings utilizing pipe of varied grades

or weights, the operator shall report the footage of each grade and weight used. The operator shall also report results of the casing test, including actual pressure held on pipe and the pressure drop observed on the same form C-103.

(1) The operator shall pressure test casing strings in wells drilled with rotary tools. Minimum casing test pressure shall be approximately one-third of the manufacturer's rated internal yield pressure except that the test pressure shall not be less than 600 psi and need not be greater than 1500 psi. In cases where combination strings are involved, the above test pressure shall apply to the lowest pressure rated casing used. The operator shall apply test pressures for a period of 30 minutes. If a drop of more than 10 percent of the test pressure occurs the casing shall be considered defective and the operator shall apply corrective measures.

(2) The operator may test casing strings in wells drilled with cable tools as outlined in Paragraph (1) of Subsection I of 19.15.16.10 NMAC, or by bailing the well dry in which case the hole shall remain satisfactorily dry for a period of at least one hour before the operator commences further operations on the well.

J. Well tubing requirements.

(1) The operator shall tube flowing oil wells equipped with casing larger in size than 2 7/8-inch OD.

(2) The operator shall tube gas wells equipped with casing larger in size than 3 1/2-inch OD.

(3) The operator shall set tubing as near the bottom as practical and tubing perforations shall not be more than 250 feet above top of pay zone.

(4) The district supervisor of the appropriate division district office, upon application, may grant exceptions to these requirements, provided waste will not be caused.

(5) The district supervisor may request that the director review an application. The operator shall submit information and give notice as the director requests. The division may approve un-protested applications after 20 days of receipt of the application and supporting information. If a person protests the application, or the director decides, the division shall set the application for hearing.

[19.15.16.10 NMAC - Rp, 19.15.3.107 NMAC, 12/1/08]

19.15.16.11 DEFECTIVE CASING OR CEMENTING: If a well appears to have a defective casing program or faultily cemented or corroded casing that will permit or may create underground waste or contamination of fresh waters, the operator shall give written notice to the division within five working days and proceed with diligence to use the appropriate method and means to eliminate the hazard. If the hazard of waste or contamination of fresh water cannot be eliminated, the operator shall properly plug and abandon the well.

[19.15.16.11 NMAC - Rp, 19.15.3.108 NMAC, 12/1/08]

19.15.16.12 BLOWOUT PREVENTION: (See Subsection B of 19.15.10 NMAC also)

A. The operator shall install and maintain blowout preventers in good working order on drilling rigs operating in areas of known high pressures at or above the projected depth of the well and in areas where pressures that will be encountered are unknown, and on workover rigs working on wells in which high pressures are known to exist.

B. The operator shall install and maintain blowout preventers in good working order on drilling rigs and workover rigs operating within the corporate limits of a city, town or village, or within 1320 feet of habitation, a school or a church, wherever located.

C. An operator, when filing form C-101 or form C-103 for an operation requiring blowout prevention equipment in accordance with Subsections A and B of 19.15.16.12 NMAC, shall submit a proposed blowout prevention program for the well. The district supervisor may modify the program as submitted if, in the district supervisor's judgment, modification is necessary.

[19.15.16.12 NMAC - Rp, 19.15.3.109 NMAC, 12/1/08]

19.15.16.13 PULLING OUTSIDE STRINGS OF CASING: In pulling outside strings of casing from an oil or gas well, the operator shall keep and leave the space outside the casing left in the hole full of mud-laden fluid or cement of adequate specific gravity to seal off fresh and salt water strata and strata bearing oil or gas not producing.

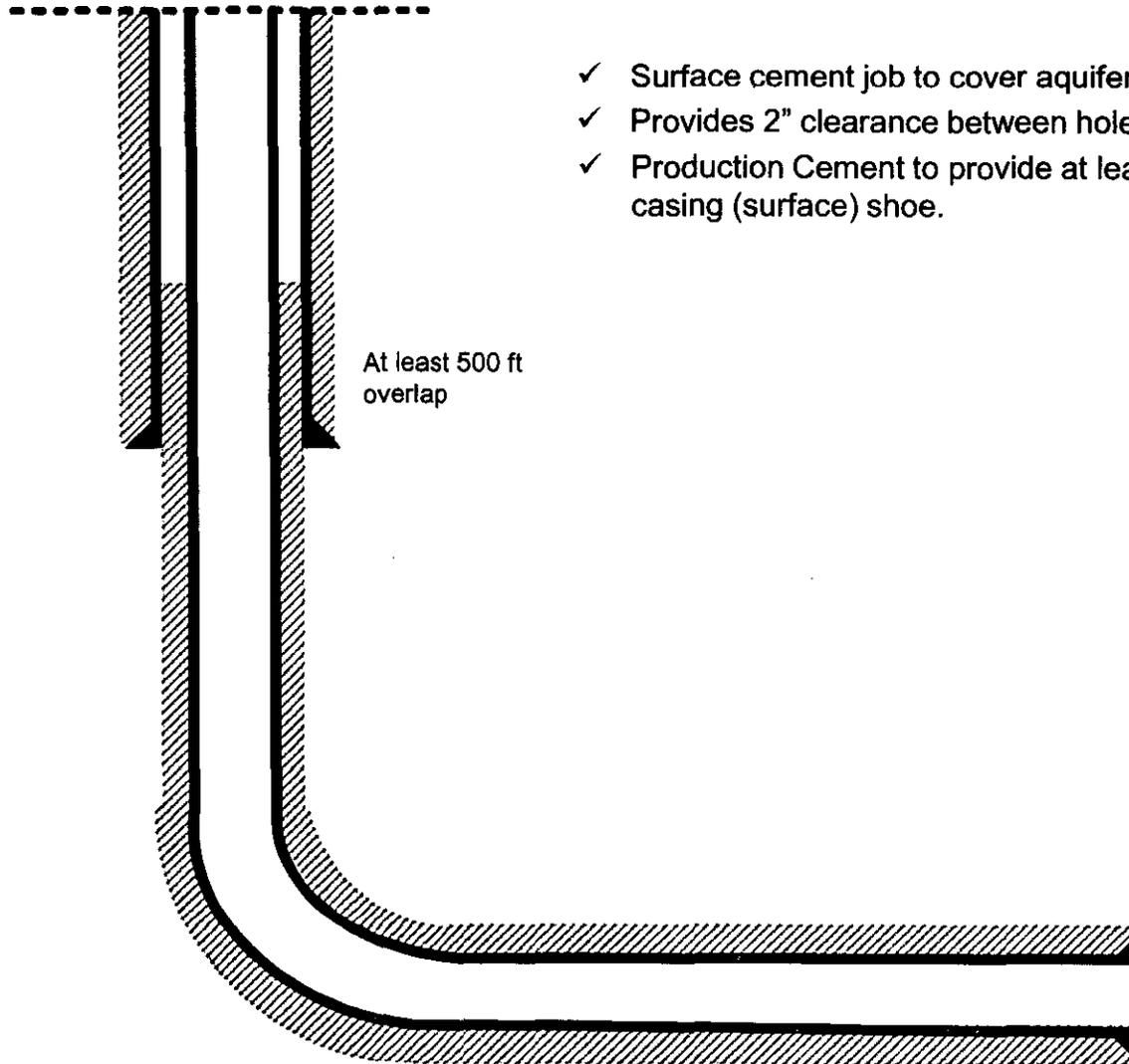
[19.15.16.13 NMAC - Rp, 19.15.3.110 NMAC, 12/1/08]

19.15.16.14 DEVIATION TESTS; DEVIATED, DIRECTIONAL AND HORIZONTAL WELLS:

A. Deviated well bores.

(1) Deviation tests required. An operator shall test a vertical or deviated well that is drilled or deepened at reasonably frequent intervals to determine the deviation from the vertical. The operator shall make the tests at least once each 500 feet or at the first bit change succeeding 500 feet. The operator shall file with the division a tabulation of deviation tests run, that is sworn to and notarized, with form C-104.

Historical 2-String Design Well Diagram

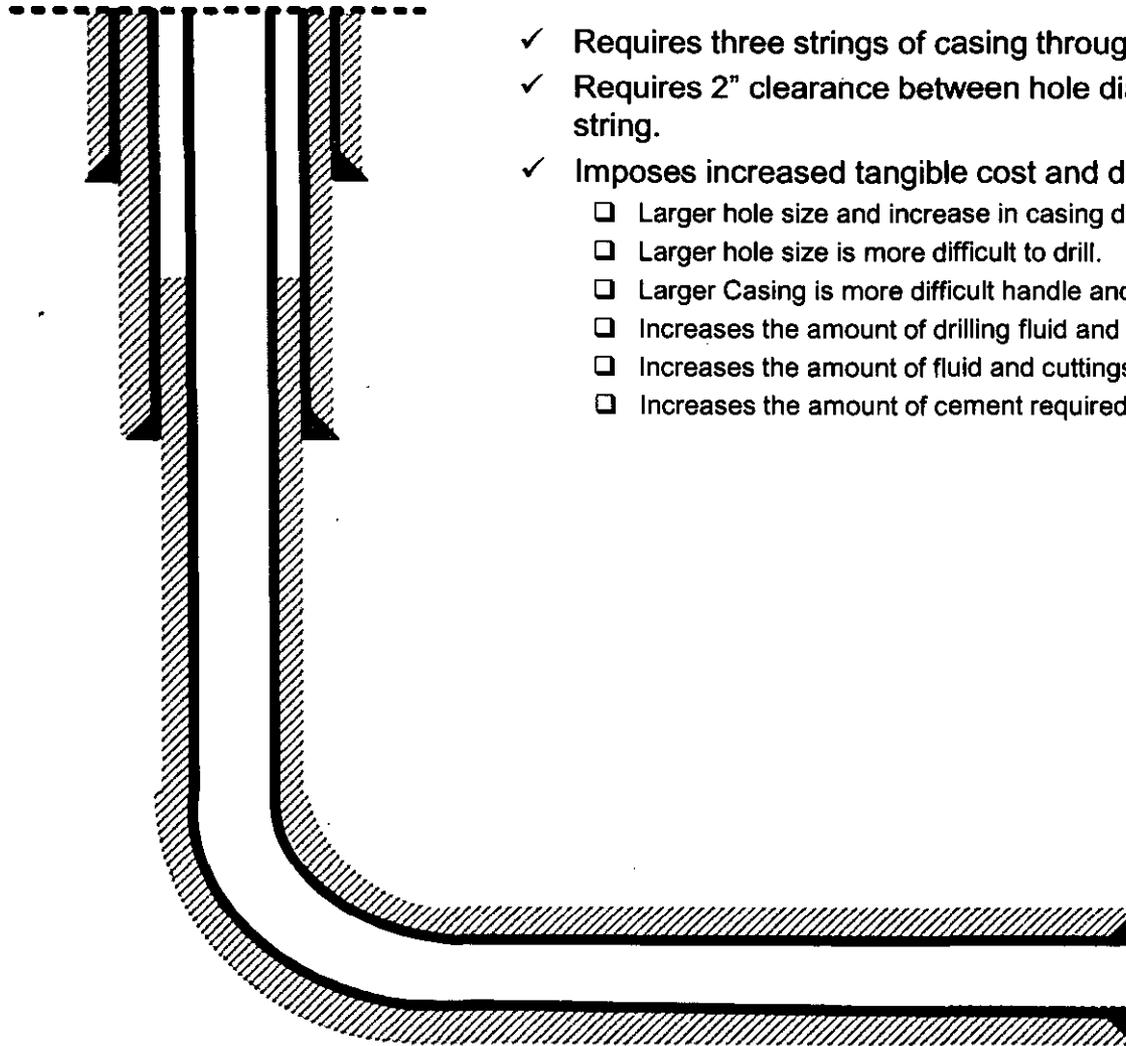


- ✓ Surface cement job to cover aquifers
- ✓ Provides 2" clearance between hole diameter and Nominal Casing OD.
- ✓ Production Cement to provide at least 500' of overlap with previous casing (surface) shoe.

At least 500 ft
overlap

BEFORE THE OIL CONSERVATION
COMMISSION
Santa Fe, New Mexico
Exhibit No. 2
Submitted by: **RESPONDENTS'**
Hearing Date: December 5, 2016

3-String Design Mandated by Proposed Rule C(3) & (4).



- ✓ Requires three strings of casing through aquifers
- ✓ Requires 2" clearance between hole diameter and "couplings" of casing string.
- ✓ Imposes increased tangible cost and drilling rig time:
 - Larger hole size and increase in casing diameter may require larger rigs.
 - Larger hole size is more difficult to drill.
 - Larger Casing is more difficult handle and takes longer to run.
 - Increases the amount of drilling fluid and cement required to drill the well.
 - Increases the amount of fluid and cuttings required to be hauled from location.
 - Increases the amount of cement required by ~160%.

BEFORE THE OIL CONSERVATION
COMMISSION
Santa Fe, New Mexico
Exhibit No. 3
Submitted by: **RESPONDENTS'**
Hearing Date: December 5, 2016

Emergency Order Map – Artesian Aquifer

Map Legend

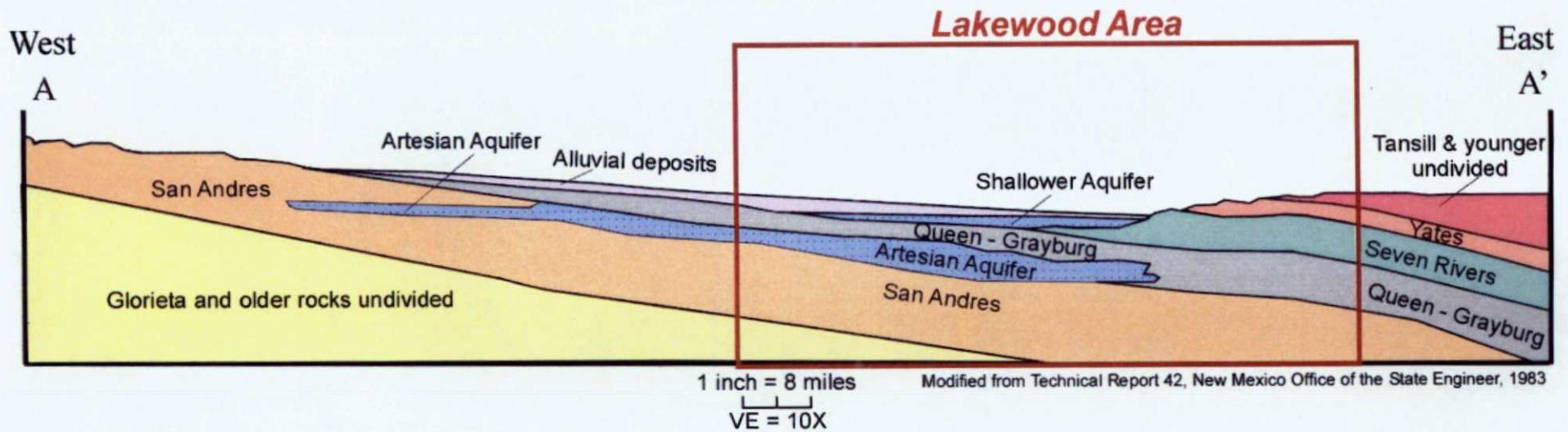
-  Emergency Order Area
-  Artesian Aquifer Outline *
-  Shallow Aquifer *
-  Geologic Section *



* From Technical Report 42 New Mexico State Engineer
Santa Fe, New Mexico by G. E. Welder 1983

BEFORE THE OIL CONSERVATION
COMMISSION
Santa Fe, New Mexico
Exhibit No. 4
Submitted by: **RESPONDENTS'**
Hearing Date: December 5, 2016

Geologic Section A – A' (D-D' from Technical Report 42)



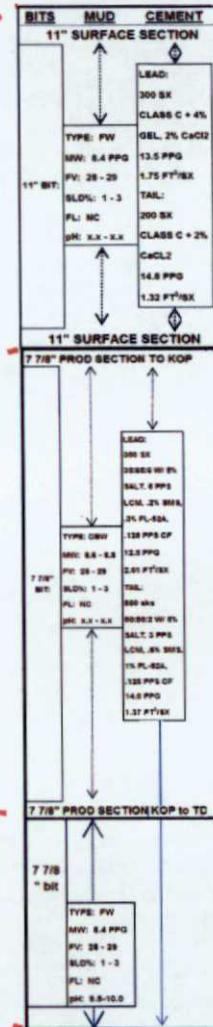
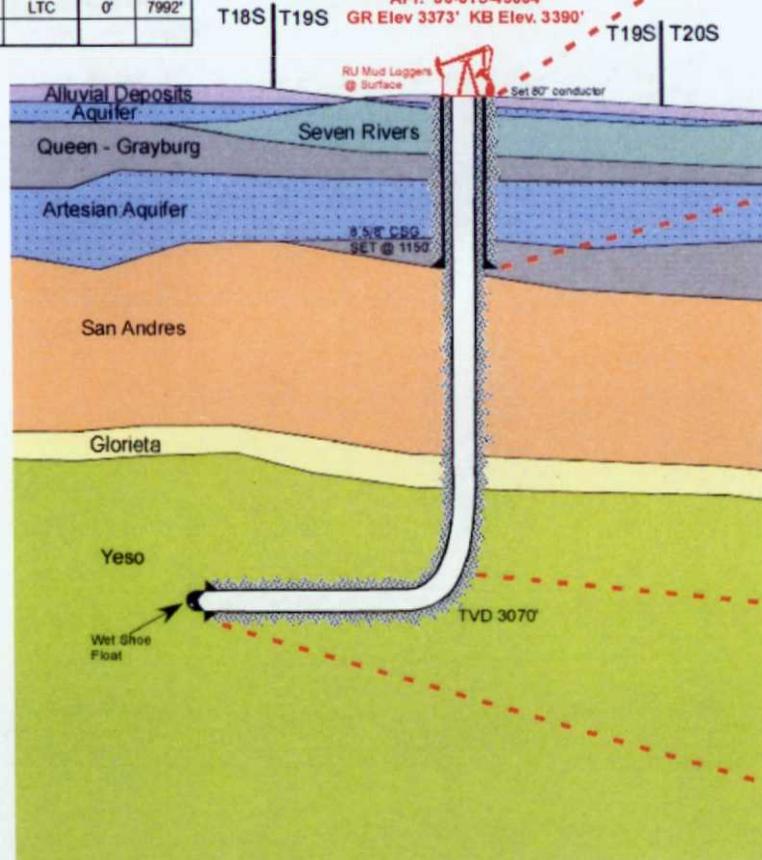
BEFORE THE OIL CONSERVATION
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Exhibit No. 5
Submitted by: **RESPONDENTS'**
Hearing Date: December 5, 2016

Wellbore Diagram, Bradley 8 Fee #5H

Bradley 8 Fee #5H Wellbore Diagram

WELLHEAD EQUIPMENT						
Tubing Spool	11" 5M X 7-1/16" 10M					
Casing Head	11" 5M X 8-5/8" 3M SOW					
TUBULAR DETAIL						
	SIZE	WT	Grd	CONN	DEPTH	
					FROM	TO
CONDUCTOR					0'	40'
SURFACE	8 5/8"	32#	J55	LTC	0'	1200'
PRODUCTION	5 1/2"	17#	L80	LTC	0'	7992'
PRODUCTION						

Well: COG Bradley 8 Fee #5H
Field: Lakewood
Eddy County, New Mexico
Sec. 8, T19S R26E
SHL: 150' FSL & 1157' FWL
BHL: 350' FNL & 157' FWL
API: 30-015-43004
GR Elev 3373' KB Elev. 3390'

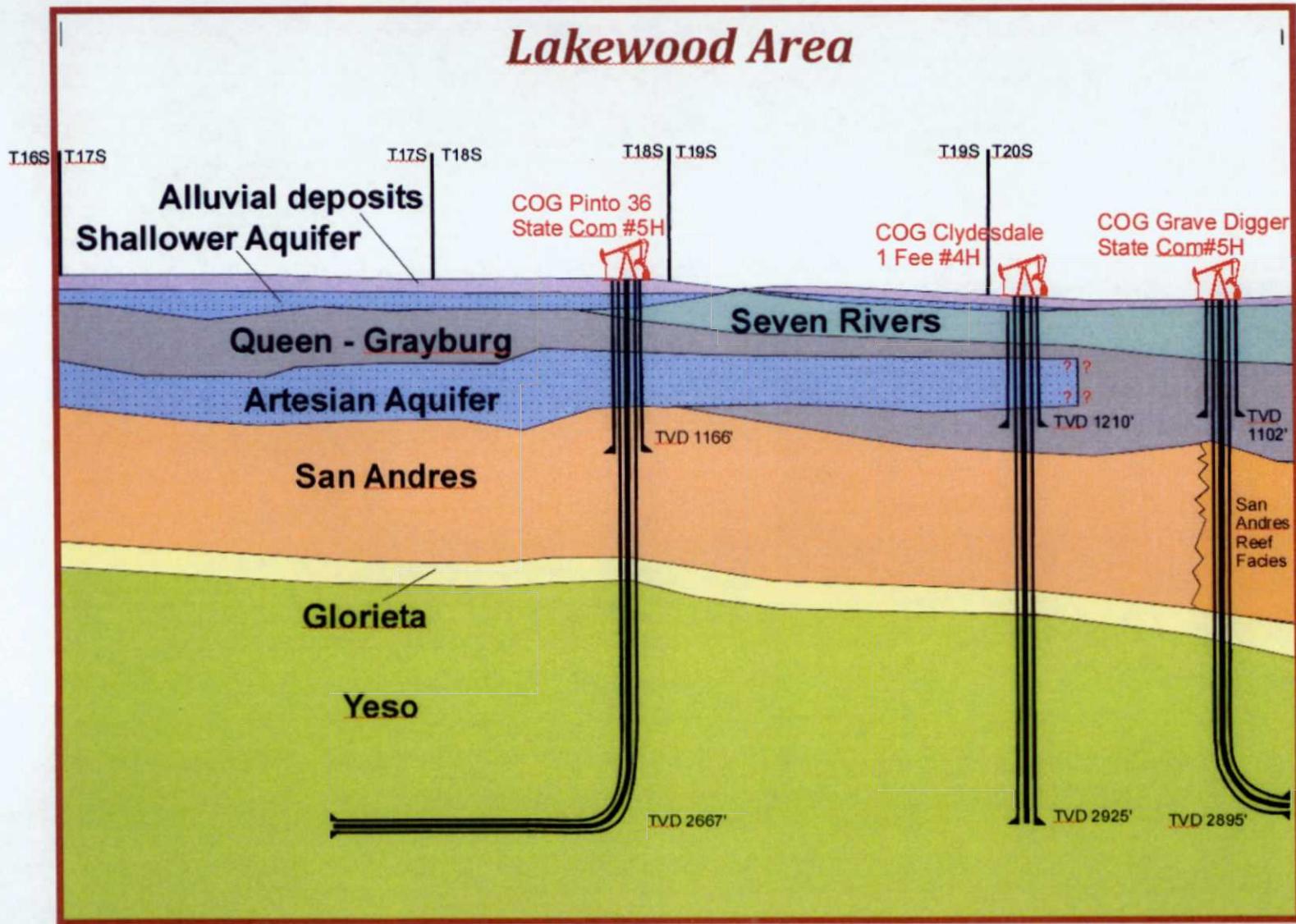


Modified from Technical Report 42 New Mexico State Engineer 1983

Wellbore Lateral Not to Scale

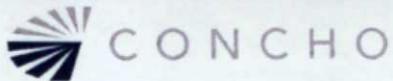
BEFORE THE OIL CONSERVATION
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Lakewood Area Wells



Wellbore Lateral Not to Scale

Modified from, Technical Report 42 New Mexico State Engineer 1983



BEFORE THE OIL CONSERVATION
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CBL Requirements Under Proposed Rule C(4)

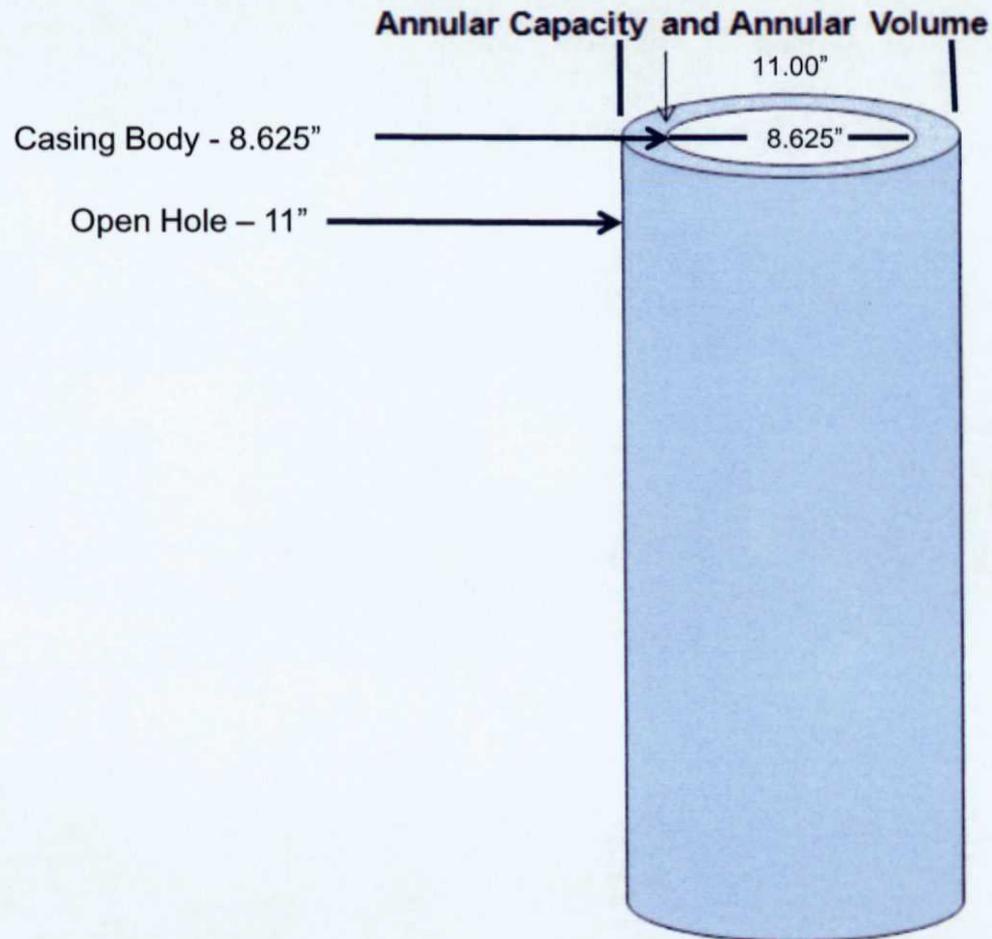
Proposed Rule C(4): After setting *each* string of water protection casing, the operator shall furnish a cement bond log to the division's Artesia office, and shall not continue drilling until the division approves the cement bond log and the corresponding casing completions.

The proposal will increase the cost to drill wells as follows:

Additional Item(s)	Qty	Rate	Cost
"Minimum" of 72 hrs wait-on-cement prior to running CBL	72 hrs	\$ 2,000 /hr	\$ 144,000
Cost of bond log	1	\$ 10,000	\$ 10,000
Operational time to rig up and run log	4 hrs	\$ 2,000 /hr	\$8,000
District Office time to review and approve CBL	? hrs	\$ 2,000/hr	\$ _____
Total for "each" casing string required			\$162,000 - \$ _____



Typical Annular Space



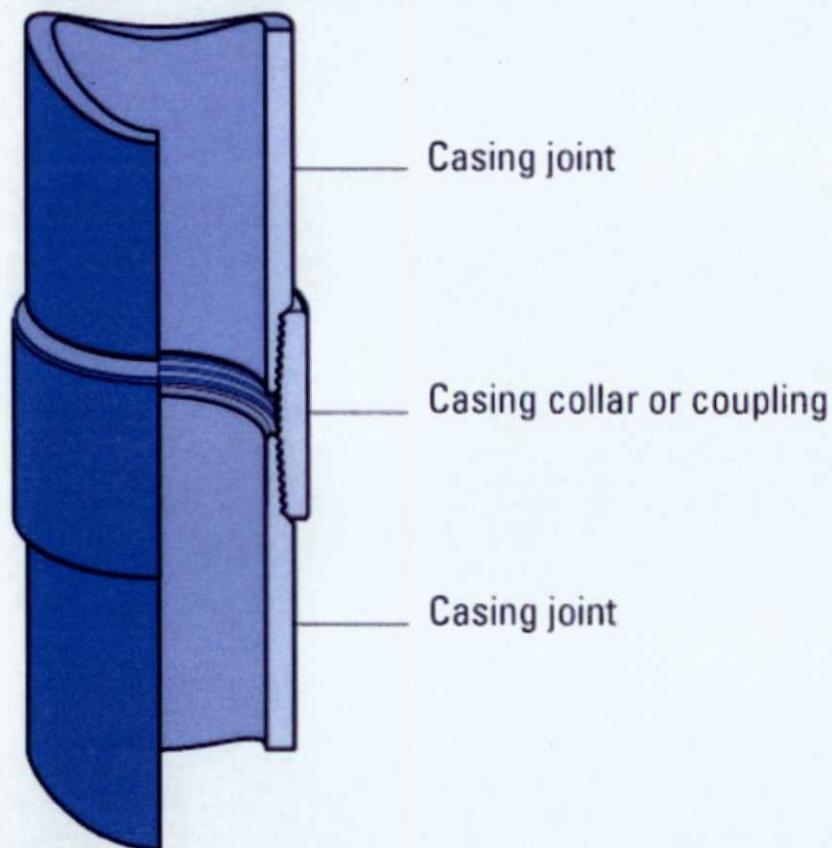
$$11.0" - 8.625" = 2.375" \text{ Diameter Difference}$$

$$2.375" / 2 = 1.1875"$$

2.375" is the difference in diameter between the OH and the OD of the casing. The thickness of the cement sheath between casing and OH is approx. 1.1875".

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Casing v. Coupling



Surface Casing OD = 8.625"
Coupling OD = 9.625"

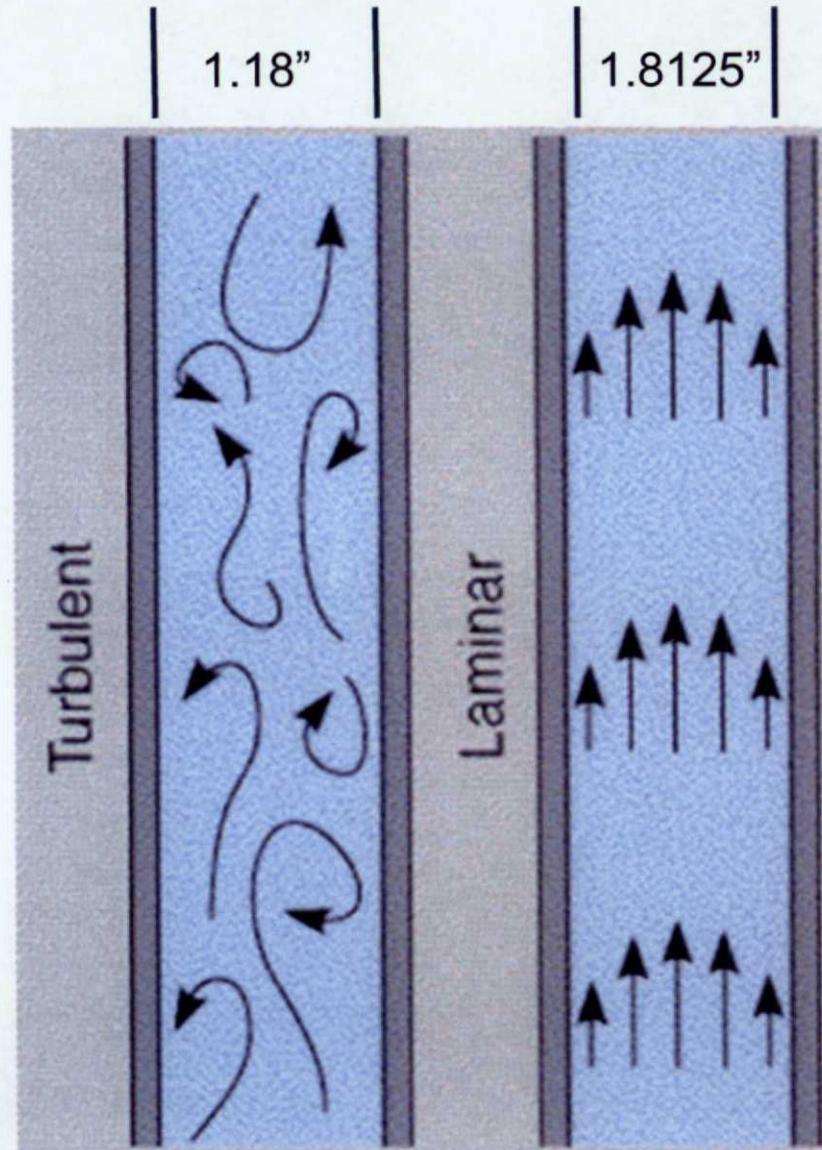
Measuring from "couplings"
adds at least 1" to hole size

Coupling
Source: Schlumberger

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Turbulent vs Laminar Flow in the Annulus

Turbulent Flow between the wellbore wall and the casing increases hole cleaning, provides better distribution of cement leading to better bond and more effective isolation.



Laminar flow in a too large annulus leads to poor hole cleaning, incomplete distribution of cement and greater chance of poor bond.

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