



west virginia department of environmental protection

Office of Oil and Gas
601 57th Street, S.E.
Charleston, WV 25304
(304) 926-0450
fax: (304) 926-0452

Jim Justice, Governor
Austin Caperton, Cabinet Secretary
www.dep.wv.gov

PERMIT MODIFICATION APPROVAL
Horizontal 6A / Horizontal 6A Well

EQT PRODUCTION COMPANY
120 PROFESSIONAL PLACE
BUILDING II
BRIDGEPORT, WV 26330


Re: Permit Modification Approval for BLIZZARD 2H
47-095-02216-00-00

Changing casing program to set 13-3/8" casing at 747' KB and the 9-5/8" casing at 2797' KB

EQT PRODUCTION COMPANY

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.



James A. Martin
Chief

Operator's Well Number: BLIZZARD 2H
Farm Name: BLIZZARD, ROGER D. & SPENCER, RUTH E
U.S. WELL NUMBER: 47-095-02216-00-00
Horizontal 6A / Horizontal 6A Well
Date Issued: 1/20/2017

Promoting a healthy environment.

01/27/2017

11/5

WW-6B
(04/15)

API NO. 47-095 - 02218
OPERATOR WELL NO. Blizzard 2H
Well Pad Name: Blizzard

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WELL WORK PERMIT APPLICATION

1) Well Operator: EQT Production Company 306686 Tyler Ellsworth Shirley
Operator ID County District Quadrangle

2) Operator's Well Number: Blizzard 2H Well Pad Name: Blizzard

3) Farm Name/Surface Owner: Roger D. Blizzard and Ruth E Spencer Public Road Access: Co. Rt. 34

4) Elevation, current ground: 1004' Elevation, proposed post-construction: 1004'

5) Well Type (a) Gas Oil Underground Storage
Other

(b) If Gas Shallow Deep
Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus, 6531', 51', 2747 PSI

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DMH
11-14-16

8) Proposed Total Vertical Depth: 6531

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 15499

11) Proposed Horizontal Leg Length: 7773

12) Approximate Fresh Water Strata Depths: 234,289,571,647

13) Method to Determine Fresh Water Depths: From offset wells

14) Approximate Saltwater Depths: 1443,1670,2074

15) Approximate Coal Seam Depths: None reported

16) Approximate Depth to Possible Void (coal mine, karst, other): None reported

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes No

(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____

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18)

CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	20	New	A-500	78.6	40	40	60 ft ³ / CTS
Fresh Water	13 3/8	New	J-55	54.5	747	747	666 ft ³ / CTS
Coal							
Intermediate	9 5/8	New	A-500	40	2102	2102	824 ft ³ / CTS
Production	5 1/2	New	P-110	20	15499	15499	500' above top producing zone
Tubing	2 3/8		J-55	4.7		May not be run, if run set 40' above top perf or 80° inclination	
Liners							

Dmit 11-14-16 *JPS 11/14/16*

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	20	26	.375	1378	1102	Class A	1.18
Fresh Water	13 3/8	17 1/2	.38	2700	2160	See Variance	1.19
Coal							
Intermediate	9 5/8	12 3/8	.395	3950	3160	See Variance	1.19
Production	5 1/2	8 1/2	.361	12640	10112	Class A/H	1.123/2.098
Tubing	2 3/8	NA	.19	7700			
Liners							

PACKERS

Kind:				
Sizes:				
Depths Set:				

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19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill and complete a new horizontal well in the Marcellus Formation. Drill the vertical to an approximate depth of 3547'. Kick off and drill curve. Drill the lateral in the Marcellus. Cement casing.

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20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

Hydraulic fracturing is completed in accordance with state regulations using water recycled from previously fractured wells and obtained from freshwater sources. This water is mixed with sand and a small percentage (less than 0.3%) of chemicals (including 15% Hydrochloric acid, friction reducer, biocide, and scale inhibitor), referred to in the industry as a "slickwater" completion. Maximum anticipated internal casing pressure is expected to be approximately 10000 psi, maximum anticipated treating rates are expected to average approximately 100 bpm. Stage lengths vary from 150 to 300 feet. Average approximately 250,000 gallons of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 250,000 pounds of sand per stage.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): no additional

22) Area to be disturbed for well pad only, less access road (acres): no additional

23) Describe centralizer placement for each casing string:

- Surface: Bow spring centralizers – One centralizer at the shoe and one spaced every 500'.
- Intermediate: Bow spring centralizers– One centralizer at the shoe and one spaced every 500'.
- Production: One solid body centralizer spaced every joint from production casing shoe to KOP

24) Describe all cement additives associated with each cement type:

Conductor: Class A no additives
Surface (Type 1 Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries
Intermediate (Type 1 Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries.
Production:
Lead (Class A Cement): 0.2% CD-20 (dispersant makes cement easier to mix). .15% SuperFL-300 (fluid loss/lengthens thickening time) .15% SEC-10 (fluid loss) 50:50 POZ (extender)
Tail (Class H Cement): 0.2% Super CR-1 (Retarder). Lengthens thickening time. .3% Super FL-200 (fluid loss) .2% SEC-10 (Fluid loss). 2% SuperFL-350 (fluid loss) Reduces amount of water lost to formation. 80 % Calcium Carbonate. Acid solubility.

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25) Proposed borehole conditioning procedures:

Surface: Circulate hole clean while rotating & reciprocating the drill string until cuttings diminish at surface.
Intermediate: Circulate hole clean while rotating & reciprocating the drill string until cuttings diminish at surface.

Production: Pump marker sweep with nut plug to determine actual hole washout. Calculate a gauge holes bottoms up volume. Perform a cleanup cycle by pumping 3-5 bottoms up or until the shakers are clean. Check volume of cuttings coming across the shakers every 15 minutes.

*Note: Attach additional sheets as needed.

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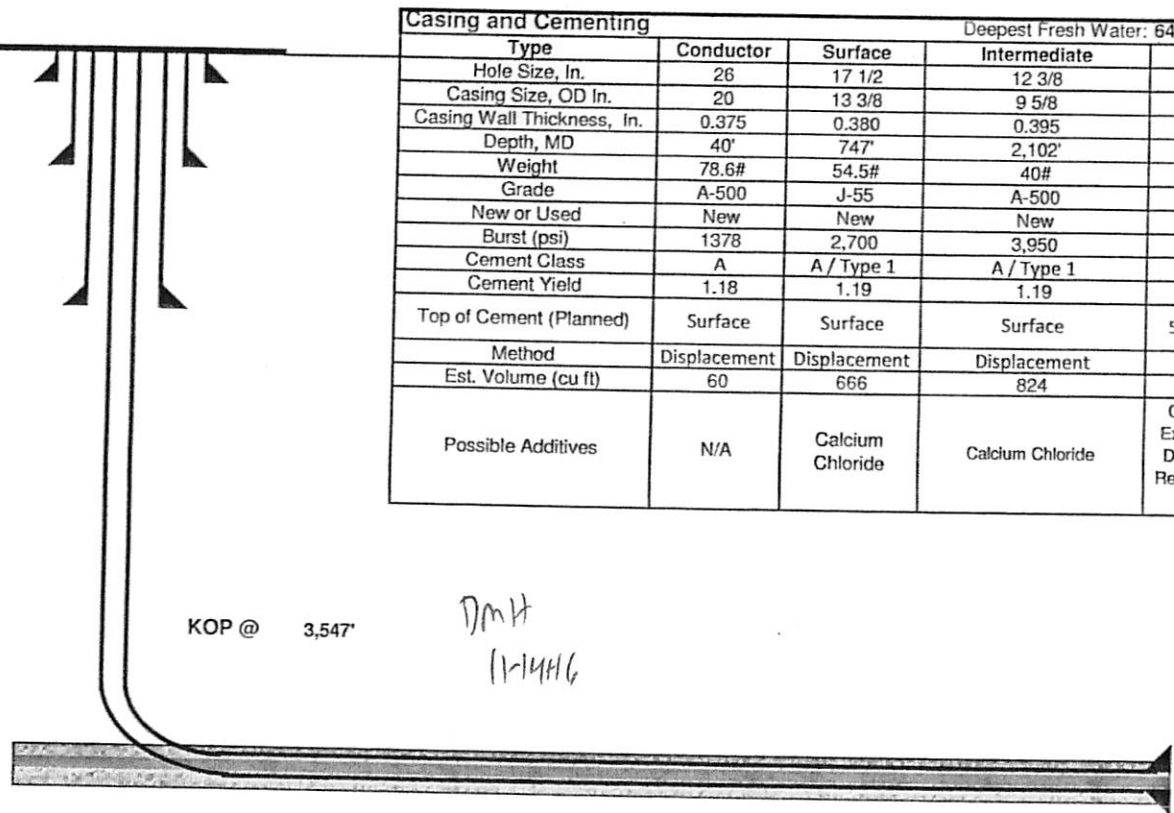
9/11/11
SDR

Well **Blizzard 2H**
EQT Production
Porters Falls Quad
Tyler County, WV

Azimuth 157
Vertical Section 9372

Note: Diagram is not to scale

Formations	Top TVD	Base TVD
Conductor	40	
Base Fresh Water	647	
Surface Casing	747	
Base Red Rock	1076	
Maxton	1683 - 1727	
Big Lime	1809 - 2005	
Big Injun	2005 - 2052	
Intermediate Casing	2102	
Weir	2063 - 2173	
Gantz	2450 - 2491	
Fifty foot	2543 - 2603	
Gordon	2635 - 2747	
Bayard	2892 - 3075	
Warren	3333 - 3503	
Speechley	3536 - 3655	
Balltown A	3800 - 4039	
Riley	4568 - 4609	
Benson	4979 - 5046	
Alexander	5218 - 5274	
Sonyea	6207 - 6332	
Middlesex	6332 - 6361	
Genesee	6361 - 6428	
Genesee	6428 - 6455	
Tully	6455 - 6469	
Hamilton	6469 - 6501	
Marcellus	6501 - 6552	
Production Casing	15499 MD	
Onondaga	6552	



Casing and Cementing				
Deepest Fresh Water: 647'				
Type	Conductor	Surface	Intermediate	Production
Hole Size, In.	26	17 1/2	12 3/8	8 1/2
Casing Size, OD In.	20	13 3/8	9 5/8	5 1/2
Casing Wall Thickness, In.	0.375	0.380	0.395	0.361
Depth, MD	40'	747'	2,102'	15,499'
Weight	78.6#	54.5#	40#	20#
Grade	A-500	J-55	A-500	P-110
New or Used	New	New	New	New
Burst (psi)	1378	2,700	3,950	12,640
Cement Class	A	A / Type 1	A / Type 1	A / H
Cement Yield	1.18	1.19	1.19	1.123 / 2.098
Top of Cement (Planned)	Surface	Surface	Surface	500' above top Producing Zone
Method	Displacement	Displacement	Displacement	Displacement
Est. Volume (cu ft)	60	666	824	2,237
Possible Additives	N/A	Calcium Chloride	Calcium Chloride	Calcium Carbonate, Fluid Loss, Extender, Dispersant, Viscosifier, Defoamer, POZ, Bonding Agent, Retarder, Anti-Settling/Suspension Agent

KOP @ 3,547'

DMH
11-14-16

Proposed Well Work:
 Drill and complete a new horizontal well in the Marcellus formation.
 Drill the vertical to an approximate depth of 3547'.
 Kick off and drill curve. Drill lateral in the Marcellus. Cement casing.

Land curve @ 6,531' TVD
7,726' MD

Est. TD @ 6,531' TVD
15,499' MD

7,773' Lateral



October 31, 2016

Mr. Gene Smith
West Virginia Department of Environmental Protection
Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304

9/14/11
SJR

Re: Casing on Blizzard (2H, 4H)

Dear Mr. Smith,

EQT is requesting the 13-3/8" casing be set at 747' KB, 100' below the deepest fresh water.

For the 9 5/8" casing string, EQT is requesting that the first well set the 9 5/8" casing at 2797' KB, 50' below the Gordon formation. Prior to cementing the 9 5/8" casing, a test will be performed to determine if the 9 5/8" casing string may be shortened. If the test is successful, the remaining wells on the pad will have 9 5/8" casing set at a shallower depth of 2102' KB, 50' below the Big Injun formation. If the test is unsuccessful, the remaining wells on the pad will have 9 5/8" casing set at the original set depth of 2797' KB. Upon completion of the test, the WV DEP inspector will be notified of the test results and the casing depth for the remaining wells on the pad will be discussed.

If you have any questions, please do not hesitate to contact me at (304) 848-0076.

Sincerely,

Vicki Roark
Permitting Supervisor - WV

DMR
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Enc.

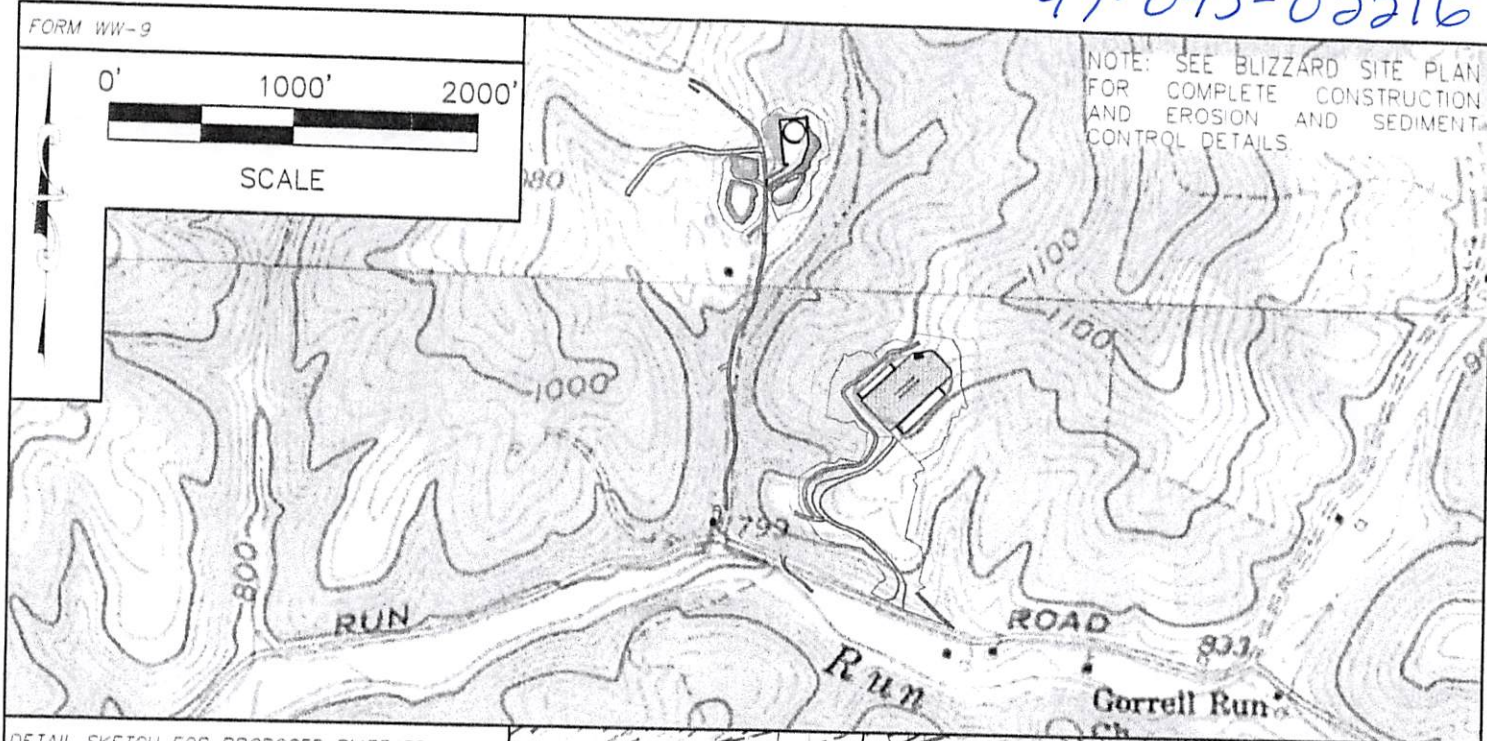
47-095-02216

FORM WW-9

0' 1000' 2000'

SCALE

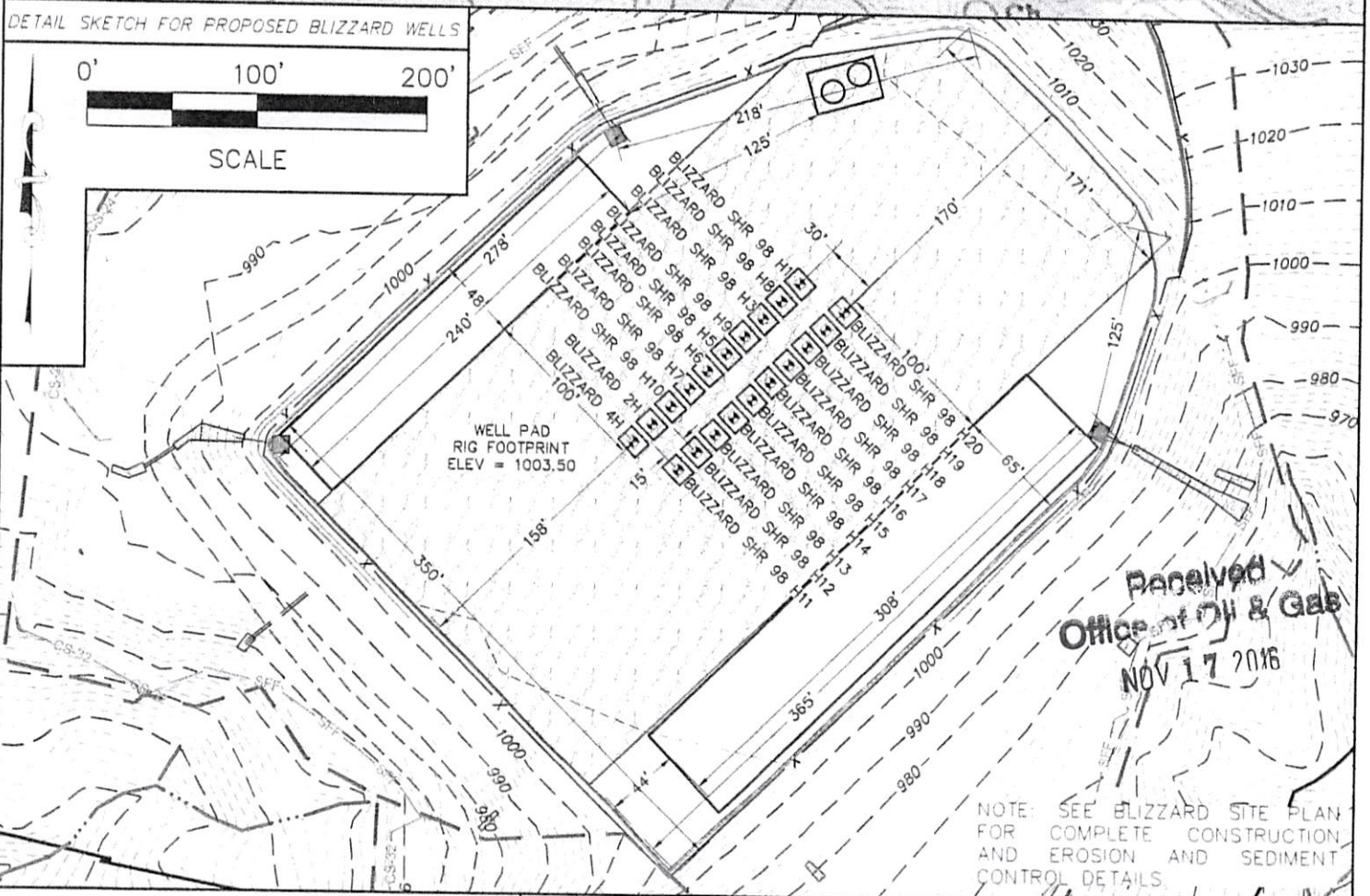
NOTE: SEE BLIZZARD SITE PLAN FOR COMPLETE CONSTRUCTION AND EROSION AND SEDIMENT CONTROL DETAILS.



DETAIL SKETCH FOR PROPOSED BLIZZARD WELLS

0' 100' 200'

SCALE



NOTE: SEE BLIZZARD SITE PLAN FOR COMPLETE CONSTRUCTION AND EROSION AND SEDIMENT CONTROL DETAILS.

Architects Engineers Surveyors
 2502 Cranberry Square
 Morgantown, WV 26508
 PHONE 304.777.2940
 TOLL FREE 877.323.6603
 FAX 570.323.9902
 www.larsondesigngroup.com

RECLAMATION PLAN

EQT BLIZZARD WELL SITE
ELLSWORTH DISTRICT - TYLER COUNTY, WV

FOR
 EQT

DATE	11-2-2016
SHEET NO	EXH
PROJECT NO	7936-009
	01/27/2017
	JWD

Handwritten notes: MS, DMF, 11-14-16



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SPS
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Site Specific Safety Plan

EQT
Blizzard Unit Pad

Middlebourne
Tyler County, WV

For Wells:

Blizzard 2H Blizzard 4H _____

Date Prepared: October 12, 2016

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[Signature]
 EQT Production
Permitting Supervisor
 Title
11-2-16
 Date

[Signature]
 WV Oil and Gas Inspector
Oil & Gas Inspector
 Title
11-14-16
 Date