

HOBBS OCL

APR 16 2019

FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018

F/6
(17)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
APPLICATION FOR PERMIT TO DRILL OR REENTER

RECEIVED

1a. Type of work: ☒ DRILL ☐ REENTER		5. Lease Serial No. NMNM108973
1b. Type of Well: ☒ Oil Well ☐ Gas Well ☐ Other		6. If Indian, Allottee or Tribe Name
1c. Type of Completion: ☐ Hydraulic Fracturing ☒ Single Zone ☐ Multiple Zone		7. If Unit or CA Agreement, Name and No.
2. Name of Operator COG OPERATING LLC (229137)		8. Lease Name and Well No. HARRIER FEDERAL COM 301H (325390)
3a. Address 600 West Illinois Ave Midland TX 79701	3b. Phone No. (include area code) (432)683-7443	9. API Well No. 30-025-45832
4. Location of Well (Report location clearly and in accordance with any State requirements. *) At surface SESW / 375 FSL / 1910 FWL / LAT 32.06604 / LONG -103.64808 At proposed prod. zone NENW / 50 FNL / 2310 FWL / LAT 32.094114 / LONG -103.646776		10. Field and Pool, or Exploratory JENNINGS / UPPER BONE SPRING SH (97838)
11. Sec., T. R. M. or Blk. and Survey or Area SEC 2 / T26S / R32E / NMP		12. County or Parish LEA
13. State NM		14. Distance in miles and direction from nearest town or post office* 24 miles
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 50 feet	16. No of acres in lease 640	17. Spacing Unit dedicated to this well 320
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 274 feet	19. Proposed Depth 9715 feet / 19920 feet	20. BLM/BIA Bond No. in file FED: NMB000215
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 3253 feet	22. Approximate date work will start* 05/01/2019	23. Estimated duration 30 days
24. Attachments		

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

- | | |
|--|---|
| 1. Well plat certified by a registered surveyor. | 4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above). |
| 2. A Drilling Plan. | 5. Operator certification. |
| 3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office). | 6. Such other site specific information and/or plans as may be requested by the BLM. |

25. Signature (Electronic Submission)	Name (Printed/Typed) Mayte Reyes / Ph: (575)748-6945	Date 01/17/2019
Title Regulatory Analyst		
Approved by (Signature) (Electronic Submission)	Name (Printed/Typed) Cody Layton / Ph: (575)234-5959	Date 04/05/2019
Title Assistant Field Manager Lands & Minerals		

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

GCP Rec 04/16/19

Ka
04/18/19

APPROVED WITH CONDITIONS
Approval Date: 04/05/2019

INSTRUCTIONS

GENERAL: This form is designed for submitting proposals to perform certain well operations, as indicated on Federal and Indian lands and leases for action by appropriate Federal agencies, pursuant to applicable Federal laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from local Federal offices.

ITEM 1: If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable Federal regulations concerning subsequent work proposals or reports on the well.

ITEM 4: Locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local Federal offices for specific instructions.

ITEM 14: Needed only when location of well cannot readily be found by road from the land or lease description. A plat, or plats, separate or on the reverse side, showing the roads to, and the surveyed location of, the well, and any other required information, should be furnished when required by Federal agency offices.

ITEMS 15 AND 18: If well is to be, or has been directionally drilled, give distances for subsurface location of hole in any present or objective productive zone.

ITEM 22: Consult applicable Federal regulations, or appropriate officials, concerning approval of the proposal before operations are started.

ITEM 24: If the proposal will involve hydraulic fracturing operations, you must comply with 43 CFR 3162.3-3, including providing information about the protection of usable water. Operators should provide the best available information about all formations containing water and their depths. This information could include data and interpretation of resistivity logs run on nearby wells. Information may also be obtained from state or tribal regulatory agencies and from local BLM offices.

NOTICES

The Privacy Act of 1974 and regulation in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this application.

AUTHORITY: 30 U.S.C. 181 et seq., 25 U.S.C. 396; 43 CFR 3160

PRINCIPAL PURPOSES: The information will be used to: (1) process and evaluate your application for a permit to drill a new oil, gas, or service well or to reenter a plugged and abandoned well; and (2) document, for administrative use, information for the management, disposal and use of National Resource Lands and resources including (a) analyzing your proposal to discover and extract the Federal or Indian resources encountered; (b) reviewing procedures and equipment and the projected impact on the land involved; and (c) evaluating the effects of the proposed operation on the surface and subsurface water and other environmental impacts.

ROUTINE USE: Information from the record and/or the record will be transferred to appropriate Federal, State, and local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecution, in connection with congressional inquiries and for regulatory responsibilities.

EFFECT OF NOT PROVIDING INFORMATION: Filing of this application and disclosure of the information is mandatory only if you elect to initiate a drilling or reentry operation on an oil and gas lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM collects this information to allow evaluation of the technical, safety, and environmental factors involved with drilling for oil and/or gas on Federal and Indian oil and gas leases. This information will be used to analyze and approve applications. Response to this request is mandatory only if the operator elects to initiate drilling or reentry operations on an oil and gas lease. The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

BURDEN HOURS STATEMENT: Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0137), Bureau Information Connection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington, D.C. 20240.

Additional Operator Remarks

Location of Well

1. SHL: SESW / 375 FSL / 1910 FWL / TWSP: 26S / RANGE: 32E / SECTION: 2 / LAT: 32.06604 / LONG: -103.64808 (TVD: 0 feet, MD: 0 feet)
PPP: SESW / 0 FSL / 2310 FWL / TWSP: 25S / RANGE: 32E / SECTION: 35 / LAT: 32.079711 / LONG: -103.646781 (TVD: 9680 feet, MD: 14900 feet)
PPP: SESW / 100 FSL / 2310 FWL / TWSP: 26S / RANGE: 32E / SECTION: 2 / LAT: 32.065285 / LONG: -103.646783 (TVD: 9656 feet, MD: 9800 feet)
BHL: NENW / 50 FNL / 2310 FWL / TWSP: 25S / RANGE: 32E / SECTION: 35 / LAT: 32.094114 / LONG: -103.646776 (TVD: 9715 feet, MD: 19920 feet)

BLM Point of Contact

Name: Tanja Baca

Title: Admin Support Assistant

Phone: 5752345940

Email: tabaca@blm.gov

CONFIDENTIAL

Review and Appeal Rights

A person contesting a decision shall request a State Director review. This request must be filed within 20 working days of receipt of the Notice with the appropriate State Director (see 43 CFR 3165.3). The State Director review decision may be appealed to the Interior Board of Land Appeals, 801 North Quincy Street, Suite 300, Arlington, VA 22203 (see 43 CFR 3165.4). Contact the above listed Bureau of Land Management office for further information.

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U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT



APD Print Report

04/08/2019

APD ID: 10400037737

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Type: OIL WELL

Submission Date: 01/17/2019

Federal/Indian APD: FED

Well Number: 301H

Well Work Type: Drill

[Show Final Text](#)

Application

Section 1 - General

APD ID: 10400037737

BLM Office: CARLSBAD

Federal/Indian APD: FED

Lease number: NMNM108973

Surface access agreement in place?

Agreement in place? NO

Agreement number:

Agreement name:

Keep application confidential? YES

Permitting Agent? NO

Operator letter of designation:

Tie to previous NOS?

User: Mayte Reyes

Is the first lease penetrated for production Federal or Indian? FED

Lease Acres: 640

Allotted?

Reservation:

Federal or Indian agreement:

Submission Date: 01/17/2019

Title: Regulatory Analyst

APD Operator: COG OPERATING LLC

Operator Info

Operator Organization Name: COG OPERATING LLC

Operator Address: 600 West Illinois Ave

Operator PO Box:

Operator City: Midland

State: TX

Operator Phone: (432)683-7443

Operator Internet Address: RODOM@CONCHO.COM

Zip: 79701

Section 2 - Well Information

Well in Master Development Plan? NO

Well in Master SUPO? NO

Well in Master Drilling Plan? NO

Master Development Plan name:

Master SUPO name:

Master Drilling Plan name:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Well API Number:

Field/Pool or Exploratory? Field and Pool

Field Name: JENNINGS

Pool Name: UPPER BONE
SPRING SHALE

Is the proposed well in an area containing other mineral resources? USEABLE WATER

Describe other minerals:

Is the proposed well in a Helium production area? N

Use Existing Well Pad? NO

New surface disturbance?

Type of Well Pad: MULTIPLE WELL

Multiple Well Pad Name:
HARRIER FEDERAL COM

Number: 301H AND 302H

Well Class: HORIZONTAL

Number of Legs:

Well Work Type: Drill

Well Type: OIL WELL

Describe Well Type:

Well sub-Type: EXPLORATORY (WILDCAT)

Describe sub-type:

Distance to town: 24 Miles

Distance to nearest well: 274 FT

Distance to lease line: 50 FT

Reservoir well spacing assigned acres Measurement: 320 Acres

Well plat: COH_Harrier_301H_C102_20190111090813.pdf

Well work start Date: 05/01/2019

Duration: 30 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83

Vertical Datum: NAVD88

Survey number:

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
SHL Leg #1	375	FSL	191 0	FWL	26S	32E	2	Aliquot SESW	32.06604	- 103.6480 8	LEA	NEW MEXI CO	NEW MEXI CO	S	STATE	325 3	0	0
KOP Leg #1	375	FSL	191 0	FWL	26S	32E	2	Aliquot SESW	32.06604	- 103.6480 8	LEA	NEW MEXI CO	NEW MEXI CO	S	STATE	325 3	0	0

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
PPP Leg #1	100	FSL	231 0	FWL	26S	32E	2	Aliquot SESW 5	32.06528 5	- 103.6467 85	LEA	NEW MEXI CO	NEW MEXI CO	S	STATE	- 640 3	980 0	965 6
PPP Leg #1	0	FSL	231 0	FWL	25S	32E	35	Aliquot SESW 1	32.07971 1	- 103.6467 81	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 108973	- 642 7	149 00	968 0
EXIT Leg #1	100	FNL	231 0	FWL	25S	32E	35	Aliquot NENW 7	32.09397 7	- 103.6467 76	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 108973	- 639 2	199 19	964 5
BHL Leg #1	50	FNL	231 0	FWL	25S	32E	35	Aliquot NENW 4	32.09411 4	- 103.6467 76	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 108973	- 646 2	199 20	971 5

Drilling Plan

Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	UNKNOWN	3253	0	0		NONE	No
2	RUSTLER	2555	698	698		NONE	No
3	TOP SALT	2197	1056	1056		NONE	No
4	BASE OF SALT	-1130	4383	4383		NONE	No
5	LAMAR	-1337	4590	4590		NONE	No
6	BELL CANYON	-1375	4628	4628		NONE	No
7	CHERRY CANYON	-2393	5646	5646		NATURAL GAS,OIL	No
8	BRUSHY CANYON	-4000	7253	7253		NATURAL GAS,OIL	No
9	BONE SPRING LIME	-5565	8818	8818		NATURAL GAS,OIL	No
10	—	-5874	9127	9127		NATURAL GAS,OIL	No

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
11	—	-6183	9436	9436		NATURAL GAS,OIL	Yes
12	BONE SPRING 1ST	-6202	9455	9755		NATURAL GAS,OIL	No

Section 2 - Blowout Prevention

Pressure Rating (PSI): 2M

Rating Depth: 4610

Equipment: Annular. The BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold.

Requesting Variance? NO

Variance request: A variance is requested for the use of a flexible choke line from the BOP to choke manifold. See attached for specs and hydrostatic test chart.

Testing Procedure: BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all of the components installed will be functional and tested.

Choke Diagram Attachment:

COG_Harrier_301H_2M_Choke_20190108084731.pdf

BOP Diagram Attachment:

COG_Harrier_301H_2M_BOP_20190108084743.pdf

COG_Harrier_301H_Flex_Hose_20190108085030.pdf

Pressure Rating (PSI): 3M

Rating Depth: 9715

Equipment: Annular. The BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold.

Requesting Variance? YES

Variance request: A variance is requested for the use of a flexible choke line from the BOP to choke manifold. See attached for specs and hydrostatic test chart.

Testing Procedure: BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all of the components installed will be functional and tested.

Choke Diagram Attachment:

COG_Harrier_301H_3M_Choke_20190108085326.pdf

BOP Diagram Attachment:

COG_Harrier_301H_3M_BOP_20190108085333.pdf

COG_Harrier_301H_Flex_Hose_20190108085342.pdf

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	17.5	13.375	NEW	API	N	0	725	0	725	-9530	-10415	725	J-55	54.5	STC	3.41	1.36	DRY	13.01	DRY	13.01
2	INTERMEDIATE	12.25	9.625	NEW	API	Y	0	4610	0	4610	-9530	-21730	4610	L-80	40	LTC	1.28	1.54	DRY	5.73	DRY	5.73
3	PRODUCTION	8.75	5.5	NEW	API	N	0	19920	0	19920	-9530	-32300	19920	P-110	17	LTC	1.59	2.86	DRY	2.69	DRY	2.69

Casing Attachments

Casing ID: 1 String Type: SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

COG_Harrier_301H_Casing_Prog_20190108085443.pdf

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Casing Attachments

Casing ID: 2 String Type: INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

COG_Harrier_301H_Casing_Prog_20190108085433.pdf

Casing Design Assumptions and Worksheet(s):

COG_Harrier_301H_Casing_Prog_20190108085424.pdf

Casing ID: 3 String Type: PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

COG_Harrier_301H_Casing_Prog_20190108085409.pdf

Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	725	250	1.75	13.5	437	50	Class C	4% Gel + 1 % CaCl2
SURFACE	Tail		0	725	250	1.34	14.8	335	50	Class C	2% CaCl2
INTERMEDIATE	Lead		0	4610	880	2	12.7	1760	50	35:65:6 C Blend	No Additives
INTERMEDIATE	Tail		0	4610	250	1.34	14.8	335	50	Class C	2% CaCl

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
PRODUCTION	Lead		0	1992 0	710	2.5	11.9	1775	25	Lead: 50:50:10 H Blend	No additives
PRODUCTION	Tail		0	1992 0	2730	1.24	14.4	3385	25	Tail: 50:50:2 Class H Blend	No additives

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

Description of the equipment for the circulating system in accordance with Onshore Order #2:

Diagram of the equipment for the circulating system in accordance with Onshore Order #2:

Describe what will be on location to control well or mitigate other conditions: Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times

Describe the mud monitoring system utilized: PVT/Pason/Visual Monitoring

Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
725	4610	OTHER : Saturated Brine	10	10.1							Saturated Brine
4610	1992 0	OTHER : CUT BRINE	8.6	9.3							Cut Brine
0	725	OTHER : Fresh water gel	8.6	8.8							Fresh water gel

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Section 6 - Test, Logging, Coring

List of production tests including testing procedures, equipment and safety measures:

None planned

List of open and cased hole logs run in the well:

CNL,GR

Coring operation description for the well:

None planned

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 4700

Anticipated Surface Pressure: 2562.69

Anticipated Bottom Hole Temperature(F): 155

Anticipated abnormal pressures, temperatures, or potential geologic hazards? NO

Describe:

Contingency Plans geohazards description:

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

COG_Harrier_301H_H2S_Schem_20190108090206.pdf

COG_Harrier_301H_H2S_SUP_20190108090213.pdf

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

COG_Harrier_301H_Direct_Plan_20190108090228.pdf

COG_Harrier_301H_AC_Rpt_20190108090236.pdf

Other proposed operations facets description:

GCP Attached.

Other proposed operations facets attachment:

COG_Harrier_301H_GCP_20190108090249.pdf

COG_Harrier_301H_Drill_Prog_20190108090257.pdf

Other Variance attachment:

SUPO

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Section 1 - Existing Roads

Will existing roads be used? YES

Existing Road Map:

COG_Harrier_301H_Existing_Rd._20190108081812.pdf

Existing Road Purpose: ACCESS,FLUID TRANSPORT

Row(s) Exist? NO

ROW ID(s)

ID:

Do the existing roads need to be improved? NO

Existing Road Improvement Description:

Existing Road Improvement Attachment:

Section 2 - New or Reconstructed Access Roads

Will new roads be needed? YES

New Road Map:

COG_Harrier_301H_MapsPlat_20190108081835.pdf

New road type: RESOURCE

Length: 0 Feet

Width (ft.): 30

Max slope (%): 33

Max grade (%): 1

Army Corp of Engineers (ACOE) permit required? NO

ACOE Permit Number(s):

New road travel width: 14

New road access erosion control: Water will be diverted where necessary to avoid ponding, prevent erosion, maintain good drainage, and to be consistent with local drainage patterns.

New road access plan or profile prepared? NO

New road access plan attachment:

Access road engineering design? NO

Access road engineering design attachment:

Access surfacing type: OTHER

Access topsoil source: ONSITE

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Access surfacing type description: Caliche

Access onsite topsoil source depth: 6

Offsite topsoil source description:

Onsite topsoil removal process: Blading

Access other construction information: No turnouts are planned. Re-routing access road around proposed well location.

Access miscellaneous information:

Number of access turnouts:

Access turnout map:

Drainage Control

New road drainage crossing: OTHER

Drainage Control comments: None necessary

Road Drainage Control Structures (DCS) description: None needed.

Road Drainage Control Structures (DCS) attachment:

Access Additional Attachments

Additional Attachment(s):

Section 3 - Location of Existing Wells

Existing Wells Map? YES

Attach Well map:

COG_Harrier_301H_1Mile_data_20190108081853.pdf

Existing Wells description:

Section 4 - Location of Existing and/or Proposed Production Facilities

Submit or defer a Proposed Production Facilities plan? DEFER

Estimated Production Facilities description: A Central Tank Battery and facilities will be permitted and constructed at a later date, once the well is completed. The battery and facilities will be installed according to API specifications.

Section 5 - Location and Types of Water Supply

Water Source Table

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Water source use type: ICE PAD CONSTRUCTION & MAINTENANCE, STIMULATION, SURFACE CASING
Describe type: Fresh Water.

Water source type: OTHER

Source latitude:

Source longitude:

Source datum:

Water source permit type: PRIVATE CONTRACT

Source land ownership: PRIVATE

Water source transport method: PIPELINE

Source transportation land ownership: PRIVATE

Water source volume (barrels): 450000

Source volume (acre-feet): 58.001892

Source volume (gal): 18900000

Water source use type: INTERMEDIATE/PRODUCTION CASING

Water source type: OTHER

Describe type: Brine Water

Source latitude:

Source longitude:

Source datum:

Water source permit type: PRIVATE CONTRACT

Source land ownership: COMMERCIAL

Water source transport method: TRUCKING

Source transportation land ownership: COMMERCIAL

Water source volume (barrels): 30000

Source volume (acre-feet): 3.866793

Source volume (gal): 1260000

Water source and transportation map:

COG_Harrier_301H_Brine_H2O_20190115065932.pdf

COG_Harrier_301H_Fresh_H2O_20190115065940.pdf

Water source comments: Fresh water will be obtained from Airacuda Frac Pond located in Section 31. T25S, R33E. Brine water will be obtained from the Malaga Brine Station II, located in Section 12. T23S. R28E.

New water well? NO

New Water Well Info

Well latitude:

Well Longitude:

Well datum:

Well target aquifer:

Est. depth to top of aquifer(ft):

Est thickness of aquifer:

Aquifer comments:

Aquifer documentation:

Well depth (ft):

Well casing type:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Well casing outside diameter (in.):

New water well casing?

Drilling method:

Grout material:

Casing length (ft.):

Well Production type:

Water well additional information:

State appropriation permit:

Additional information attachment:

Well casing inside diameter (in.):

Used casing source:

Drill material:

Grout depth:

Casing top depth (ft.):

Completion Method:

Section 6 - Construction Materials

Construction Materials description: Caliche will be obtained from the actual well site if available. If not available onsite, caliche will be obtained from Oliver Kiehne Ranch and Cattle Co., caliche pit located in Section 4, T26S, R32E. P O Box 135, Orla, TX 79770. Phone (432) 448-6337.

Construction Materials source location attachment:

Section 7 - Methods for Handling Waste

Waste type: SEWAGE

Waste content description: Human waste and gray water

Amount of waste: 1000 gallons

Waste disposal frequency : One Time Only

Safe containment description: Waste will be properly contained and disposed of properly at a state approved disposal facility.

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** PRIVATE

Disposal type description:

Disposal location description: Trucked to an approved disposal facility

Waste type: DRILLING

Waste content description: Drilling fluids and produced oil land water while drilling and completion operations

Amount of waste: 6000 barrels

Waste disposal frequency : One Time Only

Safe containment description: All drilling waste will be stored safely and disposed of properly

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Disposal type description:

Disposal location description: Trucked to an approved disposal facility

Waste type: GARBAGE

Waste content description: Garbage and trash produced during drilling and completion operations.

Amount of waste: 500 pounds

Waste disposal frequency : One Time Only

Safe containment description: Garbage and trash produced during drilling and completion operations will be collected in a trash container and disposed of properly at a state approved disposal facility

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Disposal type description:

Disposal location description: Trucked to an approved disposal facility.

Reserve Pit

Reserve Pit being used? NO

Temporary disposal of produced water into reserve pit?

Reserve pit length (ft.) **Reserve pit width (ft.)**

Reserve pit depth (ft.) **Reserve pit volume (cu. yd.)**

Is at least 50% of the reserve pit in cut?

Reserve pit liner

Reserve pit liner specifications and installation description

Cuttings Area

Cuttings Area being used? NO

Are you storing cuttings on location? YES

Description of cuttings location Roll off cutting containers on tracks

Cuttings area length (ft.) **Cuttings area width (ft.)**

Cuttings area depth (ft.) **Cuttings area volume (cu. yd.)**

Is at least 50% of the cuttings area in cut?

WCuttings area liner

Cuttings area liner specifications and installation description

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Section 8 - Ancillary Facilities

Are you requesting any Ancillary Facilities?: NO

Ancillary Facilities attachment:

Comments:

Section 9 - Well Site Layout

Well Site Layout Diagram:

COG_Harrier_301H_Layout_20190108081931.pdf

Comments: A Central Tank Battery and facilities will be permitted and constructed at a later date, once the well is completed. The battery and facilities will be installed according to API specifications.

Section 10 - Plans for Surface Reclamation

Type of disturbance: New Surface Disturbance

Multiple Well Pad Name: HARRIER FEDERAL COM

Multiple Well Pad Number: 301H AND 302H

Recontouring attachment:

Drainage/Erosion control construction: Approximately 400' of straw waddles will be placed on the North side and approximately 257' from the northeast corner of the Harrier Federal Com 301H and 302H well pad to the northeast corner of the Zapata well pad will be placed to reduce sediment impacts to fragile/sensitive soils.

Drainage/Erosion control reclamation: North 50'

Well pad proposed disturbance (acres): 3.67	Well pad interim reclamation (acres): 0.15	Well pad long term disturbance (acres): 2.35
Road proposed disturbance (acres): 0	Road interim reclamation (acres): 0	Road long term disturbance (acres): 0
Powerline proposed disturbance (acres): 0	Powerline interim reclamation (acres): 0	Powerline long term disturbance (acres): 0
Pipeline proposed disturbance (acres): 0	Pipeline interim reclamation (acres): 0	Pipeline long term disturbance (acres): 0
Other proposed disturbance (acres): 0	Other interim reclamation (acres): 0	Other long term disturbance (acres): 0
Total proposed disturbance: 3.67	Total interim reclamation: 0.15	Total long term disturbance: 2.35

Disturbance Comments:

Reconstruction method: If needed, portions of the pad not needed for production operations will be re-contoured to its original state as much as possible. The caliche that is removed will be reused. The stockpiled topsoil will be spread out over reclaimed area and reseeded with BLM approved seed mixture.

Topsoil redistribution: North 50'

Soil treatment: None

Existing Vegetation at the well pad: Shinnery Oak/Mesquite grassland

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Existing Vegetation at the well pad attachment:

Existing Vegetation Community at the road: Shinnery Oak/Mesquite grassland

Existing Vegetation Community at the road attachment:

Existing Vegetation Community at the pipeline: Shinnery Oak/Mesquite grassland

Existing Vegetation Community at the pipeline attachment:

Existing Vegetation Community at other disturbances: N/A

Existing Vegetation Community at other disturbances attachment:

Non native seed used? NO

Non native seed description:

Seedling transplant description:

Will seedlings be transplanted for this project? NO

Seedling transplant description attachment:

Will seed be harvested for use in site reclamation? NO

Seed harvest description:

Seed harvest description attachment:

Seed Management

Seed Table

Seed type:

Seed source:

Seed name:

Source name:

Source address:

Source phone:

Seed cultivar:

Seed use location:

PLS pounds per acre:

Proposed seeding season:

Seed Summary

Total pounds/Acre:

Seed Type	Pounds/Acre
-----------	-------------

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Seed reclamation attachment:

Operator Contact/Responsible Official Contact Info

First Name: Gerald

Last Name: Herrera

Phone: (432)260-7399

Email: gherrera@concho.com

Seedbed prep:

Seed BMP:

Seed method:

Existing invasive species? NO

Existing invasive species treatment description:

Existing invasive species treatment attachment:

Weed treatment plan description: N/A

Weed treatment plan attachment:

Monitoring plan description: N/A

Monitoring plan attachment:

Success standards: N/A

Pit closure description: N/A

Pit closure attachment:

COG_Harrier_301H_Closed_Loop_20190108082048.pdf

Section 11 - Surface Ownership

Disturbance type: WELL PAD

Describe:

Surface Owner: STATE GOVERNMENT

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office: STATE OF NEW MEXICO

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland:

USFS Ranger District:

Section 12 - Other Information

Right of Way needed? NO

Use APD as ROW?

ROW Type(s):

ROW Applications

SUPO Additional Information: Surface Use & Operating Plan.

Use a previously conducted onsite? YES

Previous Onsite information: Onsite completed on 4/26/2018 by Rand French (COG); Gerald Herrera (COG) and Jeff Robertson (BLM).

Other SUPO Attachment

COG_Harrier_301H_1Mile_data_20190108082153.pdf
COG_Harrier_301H_Brine_H2O_20190108082207.pdf
COG_Harrier_301H_C102_20190108082217.pdf
COG_Harrier_301H_Certification_20190108082252.pdf
COG_Harrier_301H_Closed_Loop_20190108082300.pdf
COG_Harrier_301H_Existing_Rd._20190108082323.pdf
COG_Harrier_301H_Layout_20190108082335.pdf
COG_Harrier_301H_MapsPlat_20190108082347.pdf
COG_Harrier_301H_Fresh_H2O_20190115070001.pdf
COG_Harrier_301H_Reclamation_20190115070009.pdf
COG_Harrier_301H_SUP_20190117093520.pdf

PWD

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Section 1 - General

Would you like to address long-term produced water disposal? NO

Section 2 - Lined Pits

Would you like to utilize Lined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Lined pit PWD on or off channel:

Lined pit PWD discharge volume (bbl/day):

Lined pit specifications:

Pit liner description:

Pit liner manufacturers information:

Precipitated solids disposal:

Describe precipitated solids disposal:

Precipitated solids disposal permit:

Lined pit precipitated solids disposal schedule:

Lined pit precipitated solids disposal schedule attachment:

Lined pit reclamation description:

Lined pit reclamation attachment:

Leak detection system description:

Leak detection system attachment:

Lined pit Monitor description:

Lined pit Monitor attachment:

Lined pit: do you have a reclamation bond for the pit?

Is the reclamation bond a rider under the BLM bond?

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Lined pit bond number:

Lined pit bond amount:

Additional bond information attachment:

Section 3 - Unlined Pits

Would you like to utilize Unlined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Unlined pit PWD on or off channel:

Unlined pit PWD discharge volume (bbl/day):

Unlined pit specifications:

Precipitated solids disposal:

Describe precipitated solids disposal:

Precipitated solids disposal permit:

Unlined pit precipitated solids disposal schedule:

Unlined pit precipitated solids disposal schedule attachment:

Unlined pit reclamation description:

Unlined pit reclamation attachment:

Unlined pit Monitor description:

Unlined pit Monitor attachment:

Do you propose to put the produced water to beneficial use?

Beneficial use user confirmation:

Estimated depth of the shallowest aquifer (feet):

Does the produced water have an annual average Total Dissolved Solids (TDS) concentration equal to or less than that of the existing water to be protected?

TDS lab results:

Geologic and hydrologic evidence:

State authorization:

Unlined Produced Water Pit Estimated percolation:

Unlined pit: do you have a reclamation bond for the pit?

Is the reclamation bond a rider under the BLM bond?

Unlined pit bond number:

Unlined pit bond amount:

Additional bond information attachment:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Section 4 - Injection

Would you like to utilize Injection PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Injection PWD discharge volume (bbl/day):

Injection well mineral owner:

Injection well type:

Injection well number:

Injection well name:

Assigned injection well API number?

Injection well API number:

Injection well new surface disturbance (acres):

Minerals protection information:

Mineral protection attachment:

Underground Injection Control (UIC) Permit?

UIC Permit attachment:

Section 5 - Surface Discharge

Would you like to utilize Surface Discharge PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Surface discharge PWD discharge volume (bbl/day):

Surface Discharge NPDES Permit?

Surface Discharge NPDES Permit attachment:

Surface Discharge site facilities information:

Surface discharge site facilities map:

Section 6 - Other

Would you like to utilize Other PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Other PWD discharge volume (bbl/day):

Other PWD type description:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Other PWD type attachment:

Have other regulatory requirements been met?

Other regulatory requirements attachment:

Bond Info

Bond Information

Federal/Indian APD: FED

BLM Bond number: NMB000215

BIA Bond number:

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond attachment:

Reclamation bond number:

Reclamation bond amount:

Reclamation bond rider amount:

Additional reclamation bond information attachment:

Operator Certification

Operator Certification

I hereby certify that I, or someone under my direct supervision, have inspected the drill site and access route proposed herein; that I am familiar with the conditions which currently exist; that I have full knowledge of state and Federal laws applicable to this operation; that the statements made in this APD package are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed in conformity with this APD package and the terms and conditions under which it is approved. I also certify that I, or the company I represent, am responsible for the operations conducted under this application. These statements are subject to the provisions of 18 U.S.C. 1001 for the filing of false statements.

NAME: Mayte Reyes

Signed on: 12/27/2018

Title: Regulatory Analyst

Street Address: 2208 W Main Street

City: Artesia

State: NM

Zip: 88210

Phone: (575)748-6945

Email address: Mreyes1@concho.com

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 301H

Field Representative

Representative Name: Gerald Herrera

Street Address: 2208 West Main Street

City: Artesia

State: NM

Zip: 88210

Phone: (575)748-6940

Email address: gherrera@concho.com

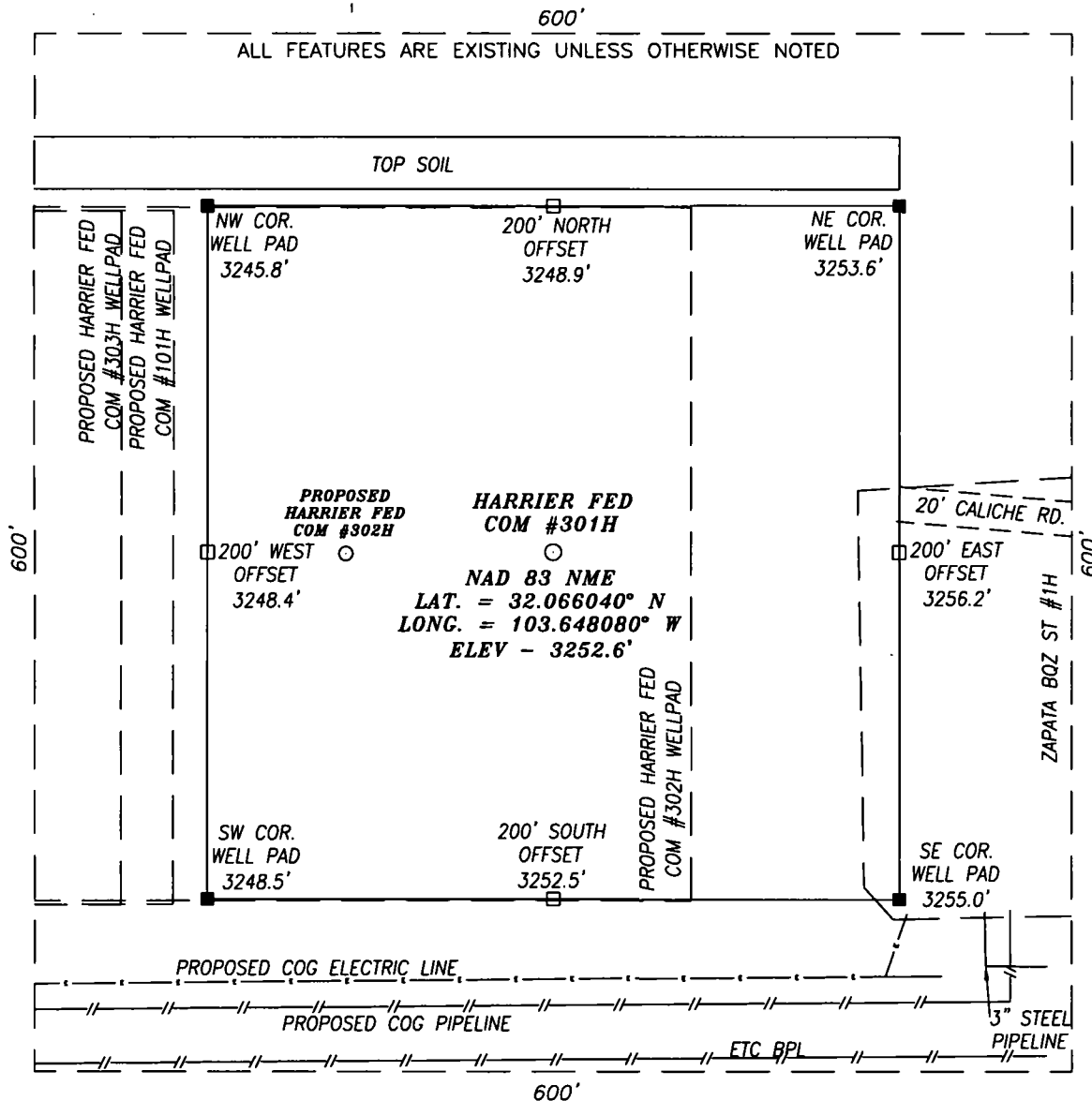
Payment Info

Payment

APD Fee Payment Method: PAY.GOV

pay.gov Tracking ID: 26EM7ROK

SECTION 2, TOWNSHIP 26 SOUTH, RANGE 32 EAST, N.M.P.M.,
LEA COUNTY NEW MEXICO

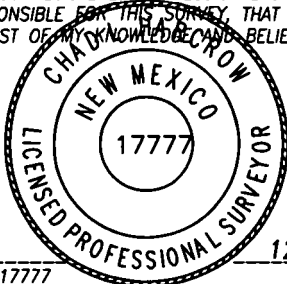


DIRECTIONS TO LOCATION

FROM THE INTERSECTION OF ST. HWY. 128 AND ORLA RD. (CR. 1) GO SOUTH ON ORLA RD. (CR. 1) FOR APPROX. 10.4 MILES; THEN TURN LEFT (EAST) ON PIPELINE RD. AND GO APPROX. 1.6 MILES; THEN TURN LEFT (NORTH) AND GO APPROX. 0.1 MILES TO THE ZAPATA BQZ STATE #1H; THE PROPOSED WELL IS APPROX. 179 FEET WEST FROM THE NORTHWEST CORNER OF EXISTING PAD.

CERTIFICATION

I, CHAD HARCROW, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR CERTIFY THAT I DIRECTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.



Chad Harcrow
CHAD HARCROW N.M.P.S. NO. 17777

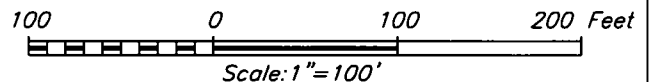
12/17/18
DATE

HARCROW SURVEYING, LLC

2314 W. MAIN ST, ARTESIA, N.M. 88210

PH: (575) 746-2158

c.harcrow@harcrowsurveying.com

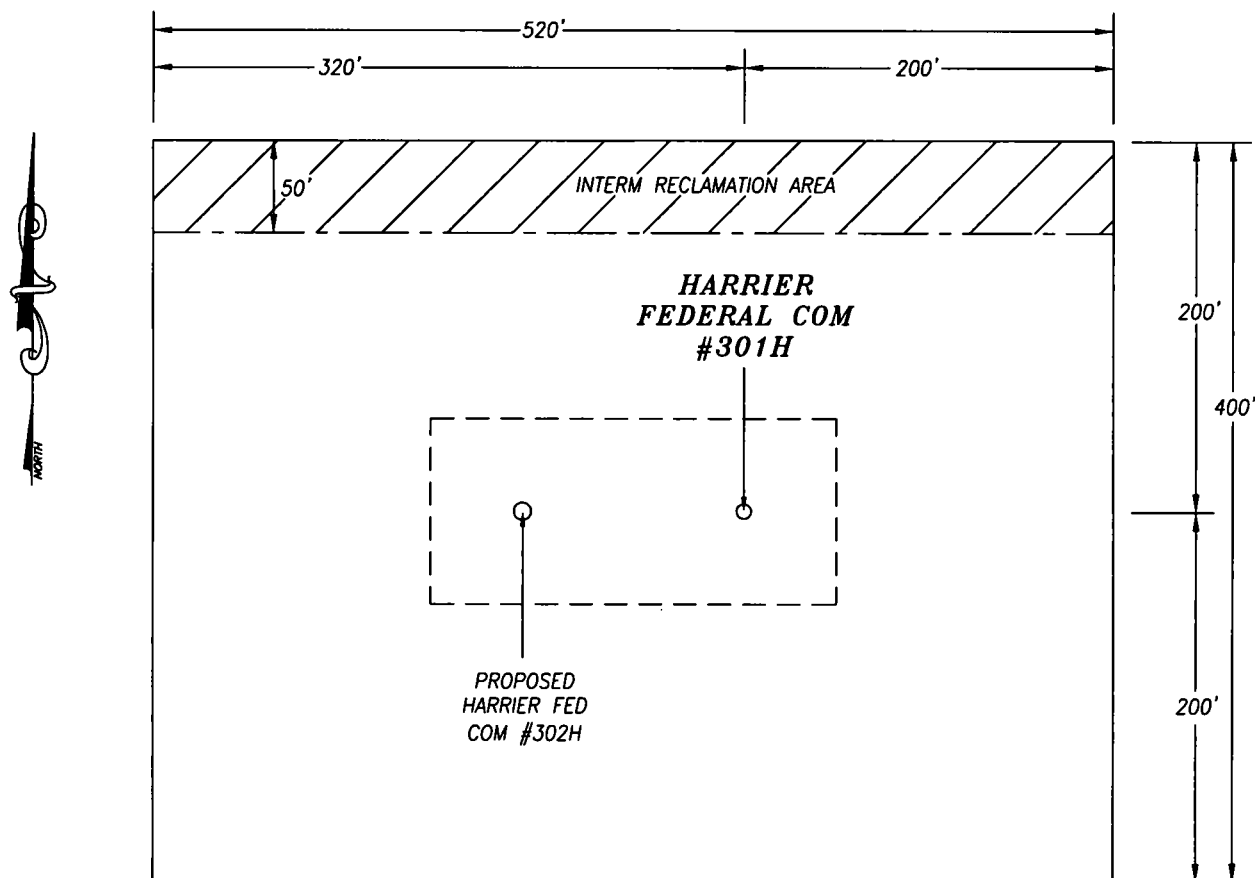


COG OPERATING, LLC

HARRIER FEDERAL COM #301H WELL
LOCATED 375 FEET FROM THE SOUTH LINE
AND 1910 FEET FROM THE WEST LINE OF SECTION 2,
TOWNSHIP 26 SOUTH, RANGE 32 EAST, N.M.P.M.,
LEA COUNTY, NEW MEXICO

SURVEY DATE: DECEMBER 12, 2018	600
DRAFTING DATE: DECEMBER 16, 2018	PAGE: 1 OF 1
APPROVED BY: CH	DRAWN BY: AM
FILE: 18-1709	

RECLAMATION AND FACILITY DIAGRAM – PRODUCTION FACILITIES DIAGRAM
 COG OPERATING, LLC
 SECTION 2, TOWNSHIP 26 SOUTH, RANGE 32 EAST, N.M.P.M.,
 LEA COUNTY, NEW MEXICO.



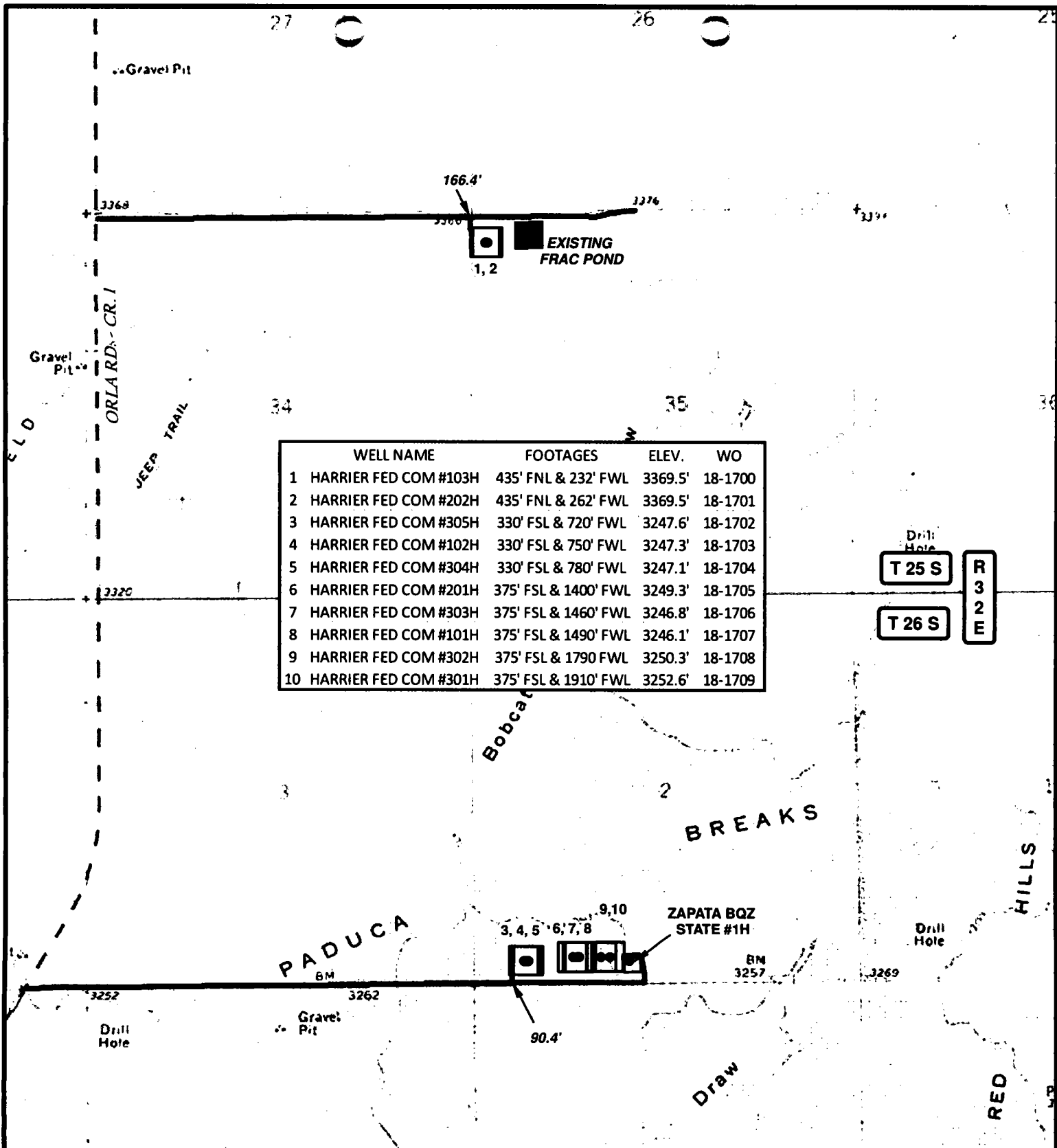
LEASE NAME WELL & WELL NUMBER: HARRIER FEDERAL COM #301H
 LATITUDE: 32.066040° N
 LONGITUDE: 103.648080° W

HARCROW SURVEYING, LLC
 2314 W. MAIN ST, ARTESIA, N.M. 88210
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 c.harcrow@harcrowsurveying.com



100 0 100 200 Feet
 Scale: 1" = 100'

COG OPERATING, LLC	
SURVEY DATE: DECEMBER 12, 2018	RECLAMATION
REV. DRAFTING DATE: JAN 14, 2019	PAGE: 1 OF 1
APPROVED BY: CH	DRAWN BY: VD
	FILE: 18-1709

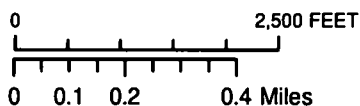


LEGEND

- WELL
- WELLPAD
- FRAC POND
- EXISTING ROAD
- - - PROPOSED ROAD

HARRIER FEDERAL COM WELLS

SECTIONS: 35 & 2 TOWNSHIP: 25 & 26 S. RANGE: 32 E.
 STATE: NEW MEXICO COUNTY: LEA SURVEY: N.M.P.M.
 W.O. # 18-1700-1709 LEASE: HARRIER FED



1 IN = 1,750 FT

LOCATION MAP

TOPO

12/20/2018

A.M.

CONCHO

COG OPERATING, LLC



HARCROW SURVEYING, LLC.
 2314 W. MAIN ST, ARTESIA, NM 88210
 PH: (575) 746-2158 FAX: (575) 746-2158
 TEXAS FIRM NO. 10194089
 c.harcrow@harcrowsurveying.com

28 27 26 25

166.4°

EXISTING
FRAC POND

1,2

ORLANDO - CR.1

33 34 35 36

	WELL NAME	FOOTAGES	ELEV.	WO
1	HARRIER FED COM #103H	435' FNL & 232' FWL	3369.5'	18-1700
2	HARRIER FED COM #202H	435' FNL & 262' FWL	3369.5'	18-1701
3	HARRIER FED COM #305H	330' FSL & 720' FWL	3247.6'	18-1702
4	HARRIER FED COM #102H	330' FSL & 750' FWL	3247.3'	18-1703
5	HARRIER FED COM #304H	330' FSL & 780' FWL	3247.1'	18-1704
6	HARRIER FED COM #201H	375' FSL & 1400' FWL	3249.3'	18-1705
7	HARRIER FED COM #303H	375' FSL & 1460' FWL	3246.8'	18-1706
8	HARRIER FED COM #101H	375' FSL & 1490' FWL	3246.1'	18-1707
9	HARRIER FED COM #302H	375' FSL & 1790' FWL	3250.3'	18-1708
10	HARRIER FED COM #301H	375' FSL & 1910' FWL	3252.6'	18-1709

T 25 S

R
3
2
E

T 26 S

04 03 02 01

3,4,5 6,7,8 9,10
ZAPATA BQZ
STATE #1H

90.4°

LEGEND

- WELL
- WELLPAD
- FRAC POND
- EXISTING ROAD
- PROPOSED ROAD

HARRIER FEDERAL COM WELLS

SECTIONS: 35 & 2 TOWNSHIP: 25 & 26 S. RANGE: 32 E.
STATE: NEW MEXICO COUNTY: LEA SURVEY: N.M.P.M
W.O. # 18-1700-1709 LEASE: HARRIER FED

0 2,500 FEET

0 0.1 0.2 0.4 Miles

1 IN = 1,750 FT

LOCATION MAP

IMAGERY

12/20/2018

A.M.

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COG OPERATING, LLC



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TEXAS FIRM NO. 10194089
c.harcrow@harcrowsurveying.com

Gravel Pit

166.4'



1,2

EXISTING
FRAC POND

ORLANDO-CR-1

NEED TRAIL

	WELL NAME	FOOTAGES	ELEV.	WO
1	HARRIER FED COM #103H	435' FNL & 232' FWL	3369.5'	18-1700
2	HARRIER FED COM #202H	435' FNL & 262' FWL	3369.5'	18-1701
3	HARRIER FED COM #305H	330' FSL & 720' FWL	3247.6'	18-1702
4	HARRIER FED COM #102H	330' FSL & 750' FWL	3247.3'	18-1703
5	HARRIER FED COM #304H	330' FSL & 780' FWL	3247.1'	18-1704
6	HARRIER FED COM #201H	375' FSL & 1400' FWL	3249.3'	18-1705
7	HARRIER FED COM #303H	375' FSL & 1460' FWL	3246.8'	18-1706
8	HARRIER FED COM #101H	375' FSL & 1490' FWL	3246.1'	18-1707
9	HARRIER FED COM #302H	375' FSL & 1790' FWL	3250.3'	18-1708
10	HARRIER FED COM #301H	375' FSL & 1910' FWL	3252.6'	18-1709

T 25 S

R 3

T 26 S

E 2

Bobcat

BREAKS

PADUCA

3,4,5

6,7,8

9,10

ZAPATA BQZ
STATE #1H



90.4'

Drill
Hole

Gravel
Pit

Drill
Hole

HILLS

RED

LEGEND

- WELL
- WELLPAD
- FRAC POND
- EXISTING ROAD
- PROPOSED ROAD
- PRIVATE
- STATE OF NM
- US BLM

HARRIER FEDERAL COM WELLS

SECTIONS: 35 & 2 TOWNSHIP: 25 & 26 S. RANGE: 32 E.

STATE: NEW MEXICO COUNTY: LEA SURVEY: N.M.P.M

W.O. # 18-1700-1709

LEASE: HARRIER FED

0 2,500 FEET

0 0.1 0.2 0.4 Miles

1 IN = 1,750 FT

LOCATION MAP

LAND STATUS

12/20/2018

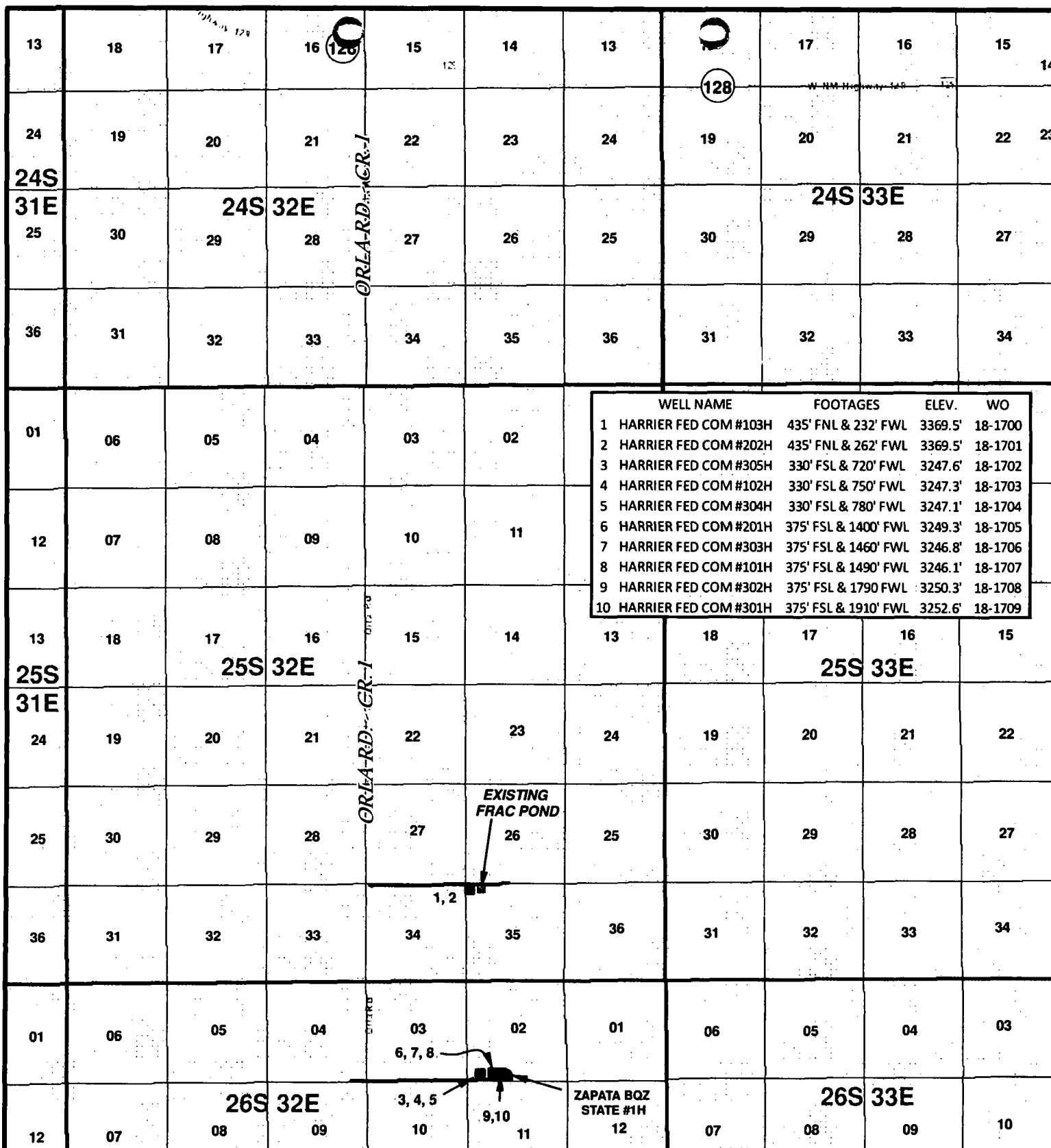
A.M.

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charcrow@harcrowsurveying.com



LEGEND

- WELL
- WELLPAD
- FRAC POND
- EXISTING ROAD
- PROPOSED ROAD

HARRIER FEDERAL COM WELLS

SECTIONS: 35 & 2 TOWNSHIP: 25 & 26 S. RANGE: 32 E.
 STATE: NEW MEXICO COUNTY: LEA SURVEY: N.M.P.M.
 W.O. # 18-1700-1709 LEASE: HARRIER FED

0 2,500 5,000 7,500 10,000 12,500 15,000 17,500 FEET

0 0.475 0.95 1.9 Miles

1 IN = 6,750 FT

LOCATION MAP

VICINITY MAP

12/20/2018

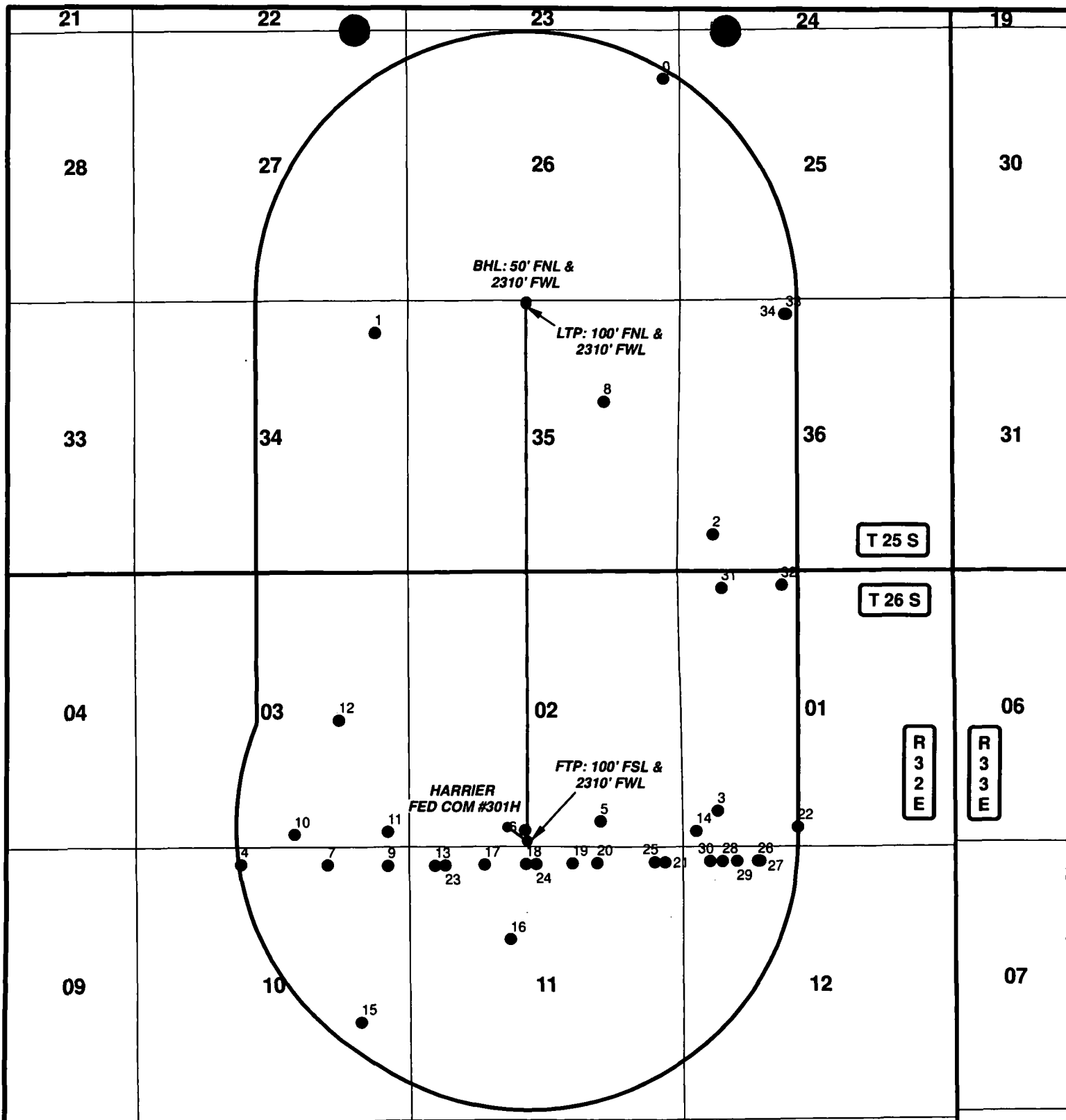
A.M.

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 TEXAS FIRM NO. 10194089
 c.harcrow@harcrowsurveying.com



DATA FOR "WELLS WITHIN 1 MI." IS TAKEN FROM THE NEW MEXICO EMNRD WEBSITE. THE DATA HAS BEEN UPDATED THROUGH SEPTEMBER 16, 2018.

LEGEND

- WELL
- BOTTOMHOLE
- WELLS WITHIN 1 MI.
- 1 MI. BUFFER

HARRIER FEDERAL COM #301H

SEC: 2	TWP: 26 S.	RGE: 32 E.	ELEVATION: 3252.6'
STATE: NEW MEXICO		COUNTY: LEA	375' FSL & 1910' FWL
W.O. # 18-1709		LEASE: HARRIER FED COM	SURVEY: N.M.P.M

0 2,500 5,000 FEET

0 0.175 0.35 0.7 Miles

1 IN = 2,500 FT

1 MILE MAP

12/15/2018

V.D.

CONCHO

COG OPERATING, LLC



HARCROW SURVEYING, LLC.
 2314 W. MAIN ST, ARTESIA, NM 88210
 PH: (575) 746-2158 FAX: (575) 746-2158
 TEXAS FIRM NO. 10194089
 c.harcrow@harcrowsurveying.com

HARRIER FEDERAL COM #301H 1 MILE DATA

FID	Shape *	API	OPERATOR	RANGE	SECTION	TOWNSHIP	WELL NAME	COMPL_STAT	EW_CD	FTG_EW	FTG_NS	LATITUDE	LONGITUDE	NS_CD
0	Point	3002508225	RECTOR OIL CO	32E	26	25.0S	KING 001	Plugged	E	330	990	32.106062	-103.638088	N
1	Point	3002508245	W K BYROM	32E	34	25.0S	SUNSHINE ROYALTY FED 001	Plugged	E	660	660	32.092455	-103.656324	N
2	Point	3002508248	FULLERTON OIL CO	32E	36	25.0S	BRADLEY STATE 001	Plugged	W	660	660	32.081655	-103.635074	S
3	Point	3002521861	ROBERT L WOOD	32E	1	26.0S	RICHARDSON FEDERAL 001	Plugged	W	660	660	32.066905	-103.634804	S
4	Point	3002539911	MEWBOURNE OIL CO	32E	10	26.0S	RED HILLS WEST UNIT 002H	New (Not drilled or compl)	W	1980	330	32.064044	-103.664856	N
5	Point	3002539947	EOG Y RESOURCES, INC.	32E	2	26.0S	QUIJOTE BQJ STATE COM 001H	New (Not drilled or compl)	E	1650	480	32.066338	-103.64219	S
6	Point	3002540001	EOG Y RESOURCES, INC.	32E	2	26.0S	ZAPATA BQZ STATE COM 001H	New (Not drilled or compl)	W	2180	330	32.065869	-103.646979	S
7	Point	3002540423	COG PRODUCTION, LLC	32E	10	26.0S	BUFFLEHEAD 10 FEDERAL 001H	New (Not drilled or compl)	E	1650	330	32.064007	-103.659394	N
8	Point	3002540572	COG OPERATING LLC	32E	35	25.0S	HARRIER 35 FEDERAL COM 001H	New (Not drilled or compl)	E	1500	1980	32.088756	-103.641915	N
9	Point	3002540594	COG PRODUCTION, LLC	32E	10	26.0S	BUFFLEHEAD 10 FEDERAL 002H	New (Not drilled or compl)	E	480	330	32.063981	-103.655599	N
10	Point	3002540684	COG PRODUCTION, LLC	32E	3	26.0S	PINTAIL 3 FEDERAL 001H	New (Not drilled or compl)	E	2290	260	32.065643	-103.661478	S
11	Point	3002540685	COG PRODUCTION, LLC	32E	3	26.0S	PINTAIL 3 FEDERAL 002H	New (Not drilled or compl)	E	480	330	32.065795	-103.655608	S
12	Point	3002541208	COG OPERATING LLC	32E	3	26.0S	PINTAIL 3 FEDERAL SWD 001	New (Not drilled or compl)	E	1400	2500	32.071782	-103.65869	S
13	Point	3002541289	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 002H	New (Not drilled or compl)	W	430	330	32.063986	-103.652648	N
14	Point	3002541290	BTA OIL PRODUCERS, LLC	32E	1	26.0S	MESA 8105 JV-P 003H	New (Not drilled or compl)	W	205	265	32.065819	-103.636155	S
15	Point	3002541325	COG OPERATING LLC	32E	10	26.0S	BUFFLEHEAD 10 FEDERAL SWD 001C	New (Not drilled or compl)	E	990	1981	32.055559	-103.657301	S
16	Point	3002542841	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA SWD 8105 JV-P 001	New (Not drilled or compl)	W	1900	1800	32.060002	-103.647902	N
17	Point	3002542842	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 004H	New (Not drilled or compl)	W	1399	330	32.064024	-103.649504	N
18	Point	3002542843	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 005H	New (Not drilled or compl)	W	2198	330	32.064055	-103.646913	N
19	Point	3002542844	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 006H	New (Not drilled or compl)	E	2198	330	32.064091	-103.643941	N
20	Point	3002542845	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 007H	New (Not drilled or compl)	E	1720	330	32.064109	-103.642391	N
21	Point	3002542846	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 008H	New (Not drilled or compl)	E	400	330	32.06416	-103.638108	N
22	Point	3002542847	BTA OIL PRODUCERS, LLC	32E	1	26.0S	MESA 8105 JV-P 011H	New (Not drilled or compl)	W	2178	310	32.066018	-103.629758	S
23	Point	3002542855	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 020H	New (Not drilled or compl)	W	630	330	32.063994	-103.651999	N
24	Point	3002542856	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 021H	New (Not drilled or compl)	W	2398	330	32.064063	-103.646264	N
25	Point	3002542857	BTA OIL PRODUCERS, LLC	32E	11	26.0S	MESA 8105 JV-P 022H	New (Not drilled or compl)	E	600	330	32.064153	-103.638757	N
26	Point	3002542960	BTA OIL PRODUCERS, LLC	32E	12	26.0S	MESA 8105 JV-P 010H	New (Not drilled or compl)	W	1400	330	32.064229	-103.632269	N
27	Point	3002542961	BTA OIL PRODUCERS, LLC	32E	12	26.0S	MESA 8105 JV-P 015H	New (Not drilled or compl)	W	1440	330	32.064231	-103.632139	N
28	Point	3002542962	BTA OIL PRODUCERS, LLC	32E	12	26.0S	MESA 8105 JV-P 023H	New (Not drilled or compl)	W	710	330	32.064203	-103.634508	N
29	Point	3002542963	BTA OIL PRODUCERS, LLC	32E	12	26.0S	MESA 8105 JV-P 026H	New (Not drilled or compl)	W	990	330	32.064214	-103.633599	N
30	Point	3002543079	BTA OIL PRODUCERS, LLC	32E	12	26.0S	MESA 8105 JV-P 009H	New (Not drilled or compl)	W	470	330	32.064194	-103.635286	N
31	Point	3002543723	BTA OIL PRODUCERS, LLC	32E	1	26.0S	MESA 8105 JV-P 029H	New (Not drilled or compl)	W	810	330	32.078792	-103.634554	N
32	Point	3002543726	BTA OIL PRODUCERS, LLC	32E	1	26.0S	MESA 8105 JV-P 032H	New (Not drilled or compl)	W	1980	285	32.078947	-103.630761	N
33	Point	3002543784	EOG RESOURCES INC	32E	36	25.0S	GEM 36 STATE COM 705H	New (Not drilled or compl)	W	2017	330	32.093421	-103.630411	N
34	Point	3002543785	EOG RESOURCES INC	32E	36	25.0S	GEM 36 STATE COM 706H	New (Not drilled or compl)	W	1982	330	32.093419	-103.630524	N

COG Production, LLC - Harrier Federal Com #301H

1. Geologic Formations

TVD of target	9,715' EOL	Pilot hole depth	NA
MD at TD:	19,920'	Deepest expected fresh water:	405'

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	698	Water	
Top of Salt	1056	Salt	
Base of Salt	4383	Salt	
Lamar	4590	Salt Water	
Bell Canyon	4628	Salt Water	
Cherry Canyon	5646	Oil/Gas	
Brushy Canyon	7253	Oil/Gas	
Bone Spring Lime	8818	Oil/Gas	
M. Avalon Shale	9127	Oil/Gas	
L. Avalon Shale	9436	Target Zone	
1st Bone Spring Sand	9755	Not Penetrated	
2nd Bone Spring Sand	X	Not Penetrated	
3rd Bone Spring Sand	X	Not Penetrated	

2. Casing Program

Hole Size	Casing Interval		Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
	From	To							
17.5"	0	725	13.375"	54.5	J55	STC	3.41	1.36	13.01
12.25"	0	4000	9.625"	40	J55	LTC	1.22	1.06	3.25
12.25"	4000	4610	9.625"	40	L80	LTC	1.28	1.54	5.73
8.75"	0	19,920	5.5"	17	P110	LTC	1.59	2.86	2.69
BLM Minimum Safety Factor							1.125	1	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing to mitigate collapse. Intermediate burst based on 0.7 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.

All casing strings will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.h

	Y or N
Is casing new? If used, attach certification as required in Onshore Order #1	Y
Does casing meet API specifications? If no, attach casing specification sheet.	Y
Is premium or uncommon casing planned? If yes attach casing specification sheet.	N
Does the above casing design meet or exceed BLM's minimum standards? If not provide justification (loading assumptions, casing design criteria).	Y
Will the intermediate pipe be kept at a minimum 1/3 fluid filled to avoid approaching the collapse pressure rating of the casing?	Y
Is well located within Capitan Reef?	N
If yes, does production casing cement tie back a minimum of 50' above the Reef?	
Is well within the designated 4 string boundary?	
Is well located in SOPA but not in R-111-P?	N
If yes, are the first 2 strings cemented to surface and 3 rd string cement tied back 500' into previous casing?	
Is well located in R-111-P and SOPA?	N
If yes, are the first three strings cemented to surface?	
Is 2 nd string set 100' to 600' below the base of salt?	
Is well located in high Cave/Karst?	N
If yes, are there two strings cemented to surface?	
(For 2 string wells) If yes, is there a contingency casing if lost circulation occurs?	
Is well located in critical Cave/Karst?	N
If yes, are there three strings cemented to surface?	

3. Cementing Program

Casing	# Sks	Wt. lb/ gal	Yld ft3/ sack	H ₂ O gal/sk	500# Comp. Strength (hours)	Slurry Description
Surf.	250	13.5	1.75	9	12	Lead: Class C + 4% Gel + 1% CaCl ₂
	250	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl ₂
Inter.	880	12.7	2.0	9.6	16	Lead: 35:65:6 C Blend
	250	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl
5.5 Prod	710	11.9	2.5	19	72	Lead: 50:50:10 H Blend
	2730	14.4	1.24	5.7	19	Tail: 50:50:2 Class H Blend

Volumes Subject to Observed Hole Conditions and/or Fluid Caliper Results

Lab reports with the 500 psi compressive strength time for the cement will be onsite for review.

Casing String	TOC	% Excess
Surface	0'	50%
1 st Intermediate	0'	50%
Production	4,110'	25% OH in Lateral (KOP to EOL) – 40% OH in Vertical

COG Production, LLC - Harrier Federal Com #301H

4. Pressure Control Equipment

N	A variance is requested for the use of a diverter on the surface casing. See attached for schematic.
---	---

BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	x	Tested to:
12-1/4"	13-5/8"	2M	Annular	x	2000 psi
			Blind Ram		2M
			Pipe Ram		
			Double Ram		
			Other*		
8-3/4"	13-5/8"	3M	Annular	x	50% testing pressure
			Blind Ram	x	3M
			Pipe Ram	x	
			Double Ram		
			Other*		

BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all the components installed will be functional and tested.

Pipe rams will be operationally checked each 24 hour period. Blind rams will be operationally checked on each trip out of the hole. These checks will be noted on the daily tour sheets. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold. See attached schematics.

X	Formation integrity test will be performed per Onshore Order #2. On Exploratory wells or on that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.i.
Y	A variance is requested for the use of a flexible choke line from the BOP to Choke Manifold. See attached for specs and hydrostatic test chart.
N	Are anchors required by manufacturer?
N	A multibowl wellhead is being used. The BOP will be tested per Onshore Order #2 after installation on the surface casing which will cover testing requirements for a maximum of 30 days. If any seal subject to test pressure is broken the system must be tested.

5. Mud Program

Depth		Type	Weight (ppg)	Viscosity	Water Loss
From	To				
0	Surf. Shoe	FW Gel	8.6 - 8.8	28-34	N/C
Surf csg	9-5/8" Int shoe	Saturated Brine	10 - 10.1	28-34	N/C
9-5/8" Int shoe	Lateral TD	Cut Brine	8.6 - 9.3	28-34	N/C

Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times.

What will be used to monitor the loss or gain of fluid?	PVT/Pason/Visual Monitoring
---	-----------------------------

6. Logging and Testing Procedures

Logging, Coring and Testing.

Y	Will run GR/CNL from TD to surface (horizontal well – vertical portion of hole). Stated logs run will be in the Completion Report and submitted to the BLM.
Y	No Logs are planned based on well control or offset log information.
N	Drill stem test? If yes, explain.
N	Coring? If yes, explain.

Additional logs planned		Interval
N	Resistivity	Pilot Hole TD to ICP
N	Density	Pilot Hole TD to ICP
Y	CBL	Production casing (If cement not circulated to surface)
Y	Mud log	Intermediate shoe to TD
N	PEX	

7. Drilling Conditions

Condition	Specify what type and where?
BH Pressure at deepest TVD	4700 psi at 9715' TVD
Abnormal Temperature	NO 155 Deg. F.

No abnormal pressure or temperature conditions are anticipated. Sufficient mud materials to maintain mud properties and weight increase requirements will be kept on location at all times.

Sufficient supplies of Paper/LCM for periodic sweeps to control seepage and losses will be maintained on location.

Hydrogen Sulfide (H₂S) monitors will be installed prior to drilling out the surface shoe. If H₂S is detected in concentrations greater than 100 ppm, the operator will comply with the provisions of Onshore Oil and Gas Order #6. If Hydrogen Sulfide is encountered, measured values and formations will be provided to the BLM.

N H₂S is present

Y H₂S Plan attached

8. Other Facets of Operation

Y	Is it a walking operation?
N	Is casing pre-set?

x	H ₂ S Plan.
x	BOP & Choke Schematics.
x	Directional Plan



CONCHO

COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 02, T 26-S, R 32-E

Harrier Federal Com 301H

Wellbore #1

Plan: Plan #1

Standard Survey Report

24 December, 2018





Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 301H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandrift Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandrift Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Project	Lea County, NM (NAD27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Sec. 02, T 26-S, R 32-E				
Site Position:		Northing:	388,376.40 usft	Latitude:	32.06592
From:	Map	Easting:	712,001.00 usft	Longitude:	-103.64897
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.36 °

Well	Harrier Federal Com 301H					
Well Position	+N/-S	0.00 usft	Northing:	388,379.40 usft	Latitude:	32.06592
	+E/-W	0.00 usft	Easting:	712,420.90 usft	Longitude:	-103.64761
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	3,253.00 usft	

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/24/2018	6.72	59.70	47,772

Design	Plan #1			
Audit Notes:				
Version:	Phase: PLAN	Tie On Depth:	0.00	
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	1.90

Survey Tool Program Date 12/24/2018

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	19,919.37	Plan #1 (Wellbore #1)	MWD	MWD - Standard

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00



Survey Report



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Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00
2,300.00	0.00	0.00	2,300.00	0.00	0.00	0.00	0.00	0.00	0.00
2,400.00	0.00	0.00	2,400.00	0.00	0.00	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,600.00	0.00	0.00	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,700.00	0.00	0.00	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,800.00	0.00	0.00	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,900.00	0.00	0.00	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	3,000.00	0.00	0.00	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,100.00	0.00	0.00	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,200.00	0.00	0.00	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,300.00	0.00	0.00	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,400.00	0.00	0.00	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,500.00	0.00	0.00	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,600.00	0.00	0.00	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,700.00	0.00	0.00	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,800.00	0.00	0.00	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,900.00	0.00	0.00	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	4,000.00	0.00	0.00	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,100.00	0.00	0.00	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,200.00	0.00	0.00	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,300.00	0.00	0.00	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,400.00	0.00	0.00	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,500.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 2.00									
4,600.00	2.00	121.30	4,599.98	-0.91	1.49	-0.86	2.00	2.00	0.00
4,700.00	4.00	121.30	4,699.84	-3.63	5.96	-3.43	2.00	2.00	0.00
4,762.40	5.25	121.30	4,762.03	-6.24	10.26	-5.89	2.00	2.00	0.00
Start 4372.73 hold at 4762.40 MD									
4,800.00	5.25	121.30	4,799.48	-8.03	13.20	-7.58	0.00	0.00	0.00
4,900.00	5.25	121.30	4,899.06	-12.78	21.01	-12.07	0.00	0.00	0.00
5,000.00	5.25	121.30	4,998.64	-17.53	28.83	-16.56	0.00	0.00	0.00



Survey Report



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5,100.00	5.25	121.30	5,098.22	-22.28	36.65	-21.05	0.00	0.00	0.00
5,200.00	5.25	121.30	5,197.80	-27.03	44.46	-25.54	0.00	0.00	0.00
5,300.00	5.25	121.30	5,297.38	-31.79	52.28	-30.03	0.00	0.00	0.00
5,400.00	5.25	121.30	5,396.96	-36.54	60.09	-34.52	0.00	0.00	0.00
5,500.00	5.25	121.30	5,496.54	-41.29	67.91	-39.01	0.00	0.00	0.00
5,600.00	5.25	121.30	5,596.12	-46.04	75.72	-43.50	0.00	0.00	0.00
5,700.00	5.25	121.30	5,695.70	-50.79	83.54	-47.99	0.00	0.00	0.00
5,800.00	5.25	121.30	5,795.28	-55.55	91.35	-52.48	0.00	0.00	0.00
5,900.00	5.25	121.30	5,894.86	-60.30	99.17	-56.97	0.00	0.00	0.00
6,000.00	5.25	121.30	5,994.45	-65.05	106.98	-61.46	0.00	0.00	0.00
6,100.00	5.25	121.30	6,094.03	-69.80	114.80	-65.95	0.00	0.00	0.00
6,200.00	5.25	121.30	6,193.61	-74.55	122.61	-70.44	0.00	0.00	0.00
6,300.00	5.25	121.30	6,293.19	-79.31	130.43	-74.93	0.00	0.00	0.00
6,400.00	5.25	121.30	6,392.77	-84.06	138.24	-79.42	0.00	0.00	0.00
6,500.00	5.25	121.30	6,492.35	-88.81	146.06	-83.91	0.00	0.00	0.00
6,600.00	5.25	121.30	6,591.93	-93.56	153.87	-88.40	0.00	0.00	0.00
6,700.00	5.25	121.30	6,691.51	-98.31	161.69	-92.89	0.00	0.00	0.00
6,800.00	5.25	121.30	6,791.09	-103.07	169.50	-97.38	0.00	0.00	0.00
6,900.00	5.25	121.30	6,890.67	-107.82	177.32	-101.87	0.00	0.00	0.00
7,000.00	5.25	121.30	6,990.25	-112.57	185.13	-106.36	0.00	0.00	0.00
7,100.00	5.25	121.30	7,089.83	-117.32	192.95	-110.85	0.00	0.00	0.00
7,200.00	5.25	121.30	7,189.42	-122.07	200.77	-115.34	0.00	0.00	0.00
7,300.00	5.25	121.30	7,289.00	-126.83	208.58	-119.83	0.00	0.00	0.00
7,400.00	5.25	121.30	7,388.58	-131.58	216.40	-124.32	0.00	0.00	0.00
7,500.00	5.25	121.30	7,488.16	-136.33	224.21	-128.81	0.00	0.00	0.00
7,600.00	5.25	121.30	7,587.74	-141.08	232.03	-133.30	0.00	0.00	0.00
7,700.00	5.25	121.30	7,687.32	-145.83	239.84	-137.79	0.00	0.00	0.00
7,800.00	5.25	121.30	7,786.90	-150.59	247.66	-142.28	0.00	0.00	0.00
7,900.00	5.25	121.30	7,886.48	-155.34	255.47	-146.77	0.00	0.00	0.00
8,000.00	5.25	121.30	7,986.06	-160.09	263.29	-151.26	0.00	0.00	0.00
8,100.00	5.25	121.30	8,085.64	-164.84	271.10	-155.75	0.00	0.00	0.00
8,200.00	5.25	121.30	8,185.22	-169.59	278.92	-160.24	0.00	0.00	0.00
8,300.00	5.25	121.30	8,284.80	-174.35	286.73	-164.73	0.00	0.00	0.00
8,400.00	5.25	121.30	8,384.39	-179.10	294.55	-169.22	0.00	0.00	0.00
8,500.00	5.25	121.30	8,483.97	-183.85	302.36	-173.71	0.00	0.00	0.00
8,600.00	5.25	121.30	8,583.55	-188.60	310.18	-178.20	0.00	0.00	0.00
8,700.00	5.25	121.30	8,683.13	-193.35	317.99	-182.69	0.00	0.00	0.00
8,800.00	5.25	121.30	8,782.71	-198.10	325.81	-187.18	0.00	0.00	0.00
8,900.00	5.25	121.30	8,882.29	-202.86	333.62	-191.67	0.00	0.00	0.00
9,000.00	5.25	121.30	8,981.87	-207.61	341.44	-196.16	0.00	0.00	0.00
9,100.00	5.25	121.30	9,081.45	-212.36	349.25	-200.65	0.00	0.00	0.00
9,135.13	5.25	121.30	9,116.43	-214.03	352.00	-202.23	0.00	0.00	0.00
Start DLS 10.00 TFO -121.49									
9,200.00	5.83	49.73	9,181.07	-213.44	357.05	-201.47	10.00	0.90	-110.32



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 301H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandrill Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandrill Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,300.00	14.44	17.39	9,279.48	-198.23	364.67	-186.01	10.00	8.61	-32.34
9,400.00	24.13	9.76	9,373.77	-166.10	371.88	-153.66	10.00	9.70	-7.63
9,500.00	34.00	6.36	9,461.07	-118.04	378.47	-105.41	10.00	9.87	-3.40
9,600.00	43.92	4.36	9,538.74	-55.51	384.22	-42.73	10.00	9.92	-2.00
9,700.00	53.87	2.98	9,604.40	19.59	388.97	32.49	10.00	9.95	-1.39
9,800.00	63.83	1.91	9,656.07	104.99	392.56	117.96	10.00	9.96	-1.07
9,900.00	73.79	1.01	9,692.17	198.08	394.91	211.08	10.00	9.96	-0.90
10,000.00	83.76	0.19	9,711.61	296.03	395.92	309.01	10.00	9.97	-0.81
10,066.68	90.41	359.67	9,715.00	362.59	395.84	375.53	10.00	9.97	-0.78
Start 9853.12 hold at 10066.68 MD									
10,100.00	90.41	359.67	9,714.77	395.91	395.65	408.82	0.00	0.00	0.00
10,200.00	90.41	359.67	9,714.06	495.90	395.08	508.75	0.00	0.00	0.00
10,300.00	90.41	359.67	9,713.35	595.90	394.50	608.67	0.00	0.00	0.00
10,400.00	90.41	359.67	9,712.63	695.90	393.93	708.59	0.00	0.00	0.00
10,500.00	90.41	359.67	9,711.92	795.89	393.35	808.51	0.00	0.00	0.00
10,600.00	90.41	359.67	9,711.21	895.89	392.78	908.43	0.00	0.00	0.00
10,700.00	90.41	359.67	9,710.50	995.88	392.21	1,008.35	0.00	0.00	0.00
10,800.00	90.41	359.67	9,709.79	1,095.88	391.63	1,108.28	0.00	0.00	0.00
10,900.00	90.41	359.67	9,709.08	1,195.87	391.06	1,208.20	0.00	0.00	0.00
11,000.00	90.41	359.67	9,708.37	1,295.87	390.48	1,308.12	0.00	0.00	0.00
11,100.00	90.41	359.67	9,707.66	1,395.87	389.91	1,408.04	0.00	0.00	0.00
11,200.00	90.41	359.67	9,706.95	1,495.86	389.34	1,507.96	0.00	0.00	0.00
11,300.00	90.41	359.67	9,706.24	1,595.86	388.76	1,607.88	0.00	0.00	0.00
11,400.00	90.41	359.67	9,705.53	1,695.85	388.19	1,707.81	0.00	0.00	0.00
11,500.00	90.41	359.67	9,704.82	1,795.85	387.62	1,807.73	0.00	0.00	0.00
11,600.00	90.41	359.67	9,704.11	1,895.85	387.04	1,907.65	0.00	0.00	0.00
11,700.00	90.41	359.67	9,703.40	1,995.84	386.47	2,007.57	0.00	0.00	0.00
11,800.00	90.41	359.67	9,702.69	2,095.84	385.89	2,107.49	0.00	0.00	0.00
11,900.00	90.41	359.67	9,701.98	2,195.83	385.32	2,207.41	0.00	0.00	0.00
12,000.00	90.41	359.67	9,701.27	2,295.83	384.75	2,307.34	0.00	0.00	0.00
12,100.00	90.41	359.67	9,700.56	2,395.82	384.17	2,407.26	0.00	0.00	0.00
12,200.00	90.41	359.67	9,699.85	2,495.82	383.60	2,507.18	0.00	0.00	0.00
12,300.00	90.41	359.67	9,699.14	2,595.82	383.02	2,607.10	0.00	0.00	0.00
12,400.00	90.41	359.67	9,698.43	2,695.81	382.45	2,707.02	0.00	0.00	0.00
12,500.00	90.41	359.67	9,697.72	2,795.81	381.88	2,806.94	0.00	0.00	0.00
12,600.00	90.41	359.67	9,697.00	2,895.80	381.30	2,906.87	0.00	0.00	0.00
12,700.00	90.41	359.67	9,696.29	2,995.80	380.73	3,006.79	0.00	0.00	0.00
12,800.00	90.41	359.67	9,695.58	3,095.80	380.16	3,106.71	0.00	0.00	0.00
12,900.00	90.41	359.67	9,694.87	3,195.79	379.58	3,206.63	0.00	0.00	0.00
13,000.00	90.41	359.67	9,694.16	3,295.79	379.01	3,306.55	0.00	0.00	0.00
13,100.00	90.41	359.67	9,693.45	3,395.78	378.43	3,406.47	0.00	0.00	0.00
13,200.00	90.41	359.67	9,692.74	3,495.78	377.86	3,506.40	0.00	0.00	0.00
13,300.00	90.41	359.67	9,692.03	3,595.77	377.29	3,606.32	0.00	0.00	0.00



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 301H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,400.00	90.41	359.67	9,691.32	3,695.77	376.71	3,706.24	0.00	0.00	0.00
13,500.00	90.41	359.67	9,690.61	3,795.77	376.14	3,806.16	0.00	0.00	0.00
13,600.00	90.41	359.67	9,689.90	3,895.76	375.57	3,906.08	0.00	0.00	0.00
13,700.00	90.41	359.67	9,689.19	3,995.76	374.99	4,006.00	0.00	0.00	0.00
13,800.00	90.41	359.67	9,688.48	4,095.75	374.42	4,105.93	0.00	0.00	0.00
13,900.00	90.41	359.67	9,687.77	4,195.75	373.84	4,205.85	0.00	0.00	0.00
14,000.00	90.41	359.67	9,687.06	4,295.75	373.27	4,305.77	0.00	0.00	0.00
14,100.00	90.41	359.67	9,686.35	4,395.74	372.70	4,405.69	0.00	0.00	0.00
14,200.00	90.41	359.67	9,685.64	4,495.74	372.12	4,505.61	0.00	0.00	0.00
14,300.00	90.41	359.67	9,684.93	4,595.73	371.55	4,605.53	0.00	0.00	0.00
14,400.00	90.41	359.67	9,684.22	4,695.73	370.97	4,705.46	0.00	0.00	0.00
14,500.00	90.41	359.67	9,683.51	4,795.72	370.40	4,805.38	0.00	0.00	0.00
14,600.00	90.41	359.67	9,682.80	4,895.72	369.83	4,905.30	0.00	0.00	0.00
14,700.00	90.41	359.67	9,682.08	4,995.72	369.25	5,005.22	0.00	0.00	0.00
14,800.00	90.41	359.67	9,681.37	5,095.71	368.68	5,105.14	0.00	0.00	0.00
14,900.00	90.41	359.67	9,680.66	5,195.71	368.11	5,205.06	0.00	0.00	0.00
15,000.00	90.41	359.67	9,679.95	5,295.70	367.53	5,304.99	0.00	0.00	0.00
15,100.00	90.41	359.67	9,679.24	5,395.70	366.96	5,404.91	0.00	0.00	0.00
15,200.00	90.41	359.67	9,678.53	5,495.70	366.38	5,504.83	0.00	0.00	0.00
15,300.00	90.41	359.67	9,677.82	5,595.69	365.81	5,604.75	0.00	0.00	0.00
15,400.00	90.41	359.67	9,677.11	5,695.69	365.24	5,704.67	0.00	0.00	0.00
15,500.00	90.41	359.67	9,676.40	5,795.68	364.66	5,804.59	0.00	0.00	0.00
15,600.00	90.41	359.67	9,675.69	5,895.68	364.09	5,904.52	0.00	0.00	0.00
15,700.00	90.41	359.67	9,674.98	5,995.67	363.51	6,004.44	0.00	0.00	0.00
15,800.00	90.41	359.67	9,674.27	6,095.67	362.94	6,104.36	0.00	0.00	0.00
15,900.00	90.41	359.67	9,673.56	6,195.67	362.37	6,204.28	0.00	0.00	0.00
16,000.00	90.41	359.67	9,672.85	6,295.66	361.79	6,304.20	0.00	0.00	0.00
16,100.00	90.41	359.67	9,672.14	6,395.66	361.22	6,404.12	0.00	0.00	0.00
16,200.00	90.41	359.67	9,671.43	6,495.65	360.65	6,504.05	0.00	0.00	0.00
16,300.00	90.41	359.67	9,670.72	6,595.65	360.07	6,603.97	0.00	0.00	0.00
16,400.00	90.41	359.67	9,670.01	6,695.65	359.50	6,703.89	0.00	0.00	0.00
16,500.00	90.41	359.67	9,669.30	6,795.64	358.92	6,803.81	0.00	0.00	0.00
16,600.00	90.41	359.67	9,668.59	6,895.64	358.35	6,903.73	0.00	0.00	0.00
16,700.00	90.41	359.67	9,667.88	6,995.63	357.78	7,003.65	0.00	0.00	0.00
16,800.00	90.41	359.67	9,667.17	7,095.63	357.20	7,103.58	0.00	0.00	0.00
16,900.00	90.41	359.67	9,666.45	7,195.62	356.63	7,203.50	0.00	0.00	0.00
17,000.00	90.41	359.67	9,665.74	7,295.62	356.05	7,303.42	0.00	0.00	0.00
17,100.00	90.41	359.67	9,665.03	7,395.62	355.48	7,403.34	0.00	0.00	0.00
17,200.00	90.41	359.67	9,664.32	7,495.61	354.91	7,503.26	0.00	0.00	0.00
17,300.00	90.41	359.67	9,663.61	7,595.61	354.33	7,603.18	0.00	0.00	0.00
17,400.00	90.41	359.67	9,662.90	7,695.60	353.76	7,703.11	0.00	0.00	0.00
17,500.00	90.41	359.67	9,662.19	7,795.60	353.19	7,803.03	0.00	0.00	0.00
17,600.00	90.41	359.67	9,661.48	7,895.60	352.61	7,902.95	0.00	0.00	0.00



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 301H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandrill Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandrill Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
17,700.00	90.41	359.67	9,660.77	7,995.59	352.04	8,002.87	0.00	0.00	0.00
17,800.00	90.41	359.67	9,660.06	8,095.59	351.46	8,102.79	0.00	0.00	0.00
17,900.00	90.41	359.67	9,659.35	8,195.58	350.89	8,202.71	0.00	0.00	0.00
18,000.00	90.41	359.67	9,658.64	8,295.58	350.32	8,302.64	0.00	0.00	0.00
18,100.00	90.41	359.67	9,657.93	8,395.57	349.74	8,402.56	0.00	0.00	0.00
18,200.00	90.41	359.67	9,657.22	8,495.57	349.17	8,502.48	0.00	0.00	0.00
18,300.00	90.41	359.67	9,656.51	8,595.57	348.59	8,602.40	0.00	0.00	0.00
18,400.00	90.41	359.67	9,655.80	8,695.56	348.02	8,702.32	0.00	0.00	0.00
18,500.00	90.41	359.67	9,655.09	8,795.56	347.45	8,802.24	0.00	0.00	0.00
18,600.00	90.41	359.67	9,654.38	8,895.55	346.87	8,902.17	0.00	0.00	0.00
18,700.00	90.41	359.67	9,653.67	8,995.55	346.30	9,002.09	0.00	0.00	0.00
18,800.00	90.41	359.67	9,652.96	9,095.55	345.73	9,102.01	0.00	0.00	0.00
18,900.00	90.41	359.67	9,652.25	9,195.54	345.15	9,201.93	0.00	0.00	0.00
19,000.00	90.41	359.67	9,651.54	9,295.54	344.58	9,301.85	0.00	0.00	0.00
19,100.00	90.41	359.67	9,650.82	9,395.53	344.00	9,401.77	0.00	0.00	0.00
19,200.00	90.41	359.67	9,650.11	9,495.53	343.43	9,501.70	0.00	0.00	0.00
19,300.00	90.41	359.67	9,649.40	9,595.52	342.86	9,601.62	0.00	0.00	0.00
19,400.00	90.41	359.67	9,648.69	9,695.52	342.28	9,701.54	0.00	0.00	0.00
19,500.00	90.41	359.67	9,647.98	9,795.52	341.71	9,801.46	0.00	0.00	0.00
19,600.00	90.41	359.67	9,647.27	9,895.51	341.14	9,901.38	0.00	0.00	0.00
19,700.00	90.41	359.67	9,646.56	9,995.51	340.56	10,001.30	0.00	0.00	0.00
19,800.00	90.41	359.67	9,645.85	10,095.50	339.99	10,101.23	0.00	0.00	0.00
19,900.00	90.41	359.67	9,645.14	10,195.50	339.41	10,201.15	0.00	0.00	0.00
19,919.80	90.41	359.67	9,645.00	10,215.30	339.30	10,220.93	0.00	0.00	0.00
TD at 19919.80									

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Harrier Federal Com 3	0.00	0.00	0.00	-272.10	402.90	388,107.30	712,823.80	32.06516	-103.64632
- plan misses target center by 486.18usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Harrier Federal Com 3	0.00	0.01	0.00	10,165.30	339.60	398,544.70	712,760.50	32.09385	-103.64631
- plan misses target center by 9645.13usft at 19919.80usft MD (9645.00 TVD, 10215.30 N, 339.30 E)									
- Point									
Harrier Federal Com 3	0.00	0.00	9,645.00	10,215.30	339.30	398,594.70	712,760.20	32.09399	-103.64631
- plan hits target center									
- Point									



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 301H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
697.00	697.00	Rustler		0.00	
1,055.00	1,055.00	TOS		0.00	
4,382.00	4,382.00	BOS (Fletcher)			
4,589.01	4,589.00	LMAR (Top Delaware)			
4,627.04	4,627.00	BLCN			
5,649.08	5,645.00	CYCN			
7,262.85	7,252.00	BYCN			
8,834.44	8,817.00	Bone Sprg (BSGL)			
9,144.73	9,126.00	M Avalon Sh			
9,469.09	9,435.00	L Avalon Sh			

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4500	4500	0	0	Start Build 2.00
4762	4762	-6	10	Start 4372.73 hold at 4762.40 MD
9135	9116	-214	352	Start DLS 10.00 TFO -121.49
10,067	9715	363	396	Start 9853.12 hold at 10066.68 MD
19,920	9645	10,215	339	TD at 19919.80

Checked By: _____ Approved By: _____ Date: _____



COG Operating L L C
 Project: Lea County, NM (NAD27 NME)
 Site: Sec. 02, T 26-S, R 32-E
 Well: Harrier Federal Com 301H
 Wellbore: Wellbore #1
 Plan: Plan #1 (Harrier Federal Com 301H/Wellbore #1)
 Scandrift Freedom

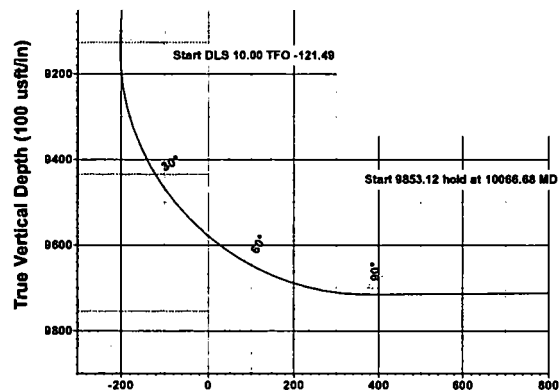
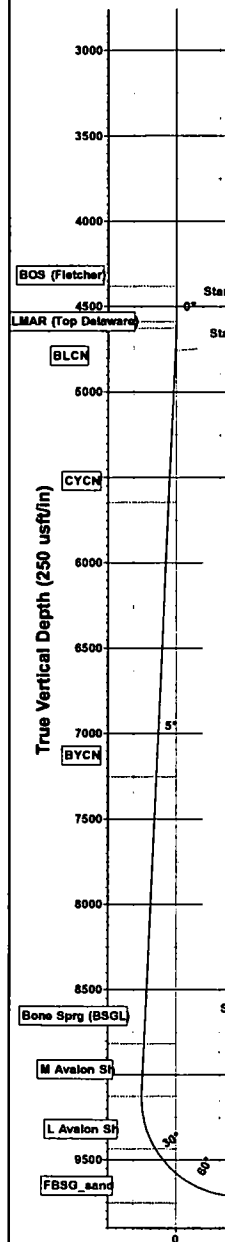
WELL DETAILS: Harrier Federal Com 301H

Ground Elevation:: 3253.00
 RKB Elevation: KB=26' @ 3279.00usft (Scandrift Freedom)
 Rig Name: Scandrift Freedom

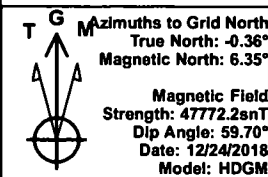
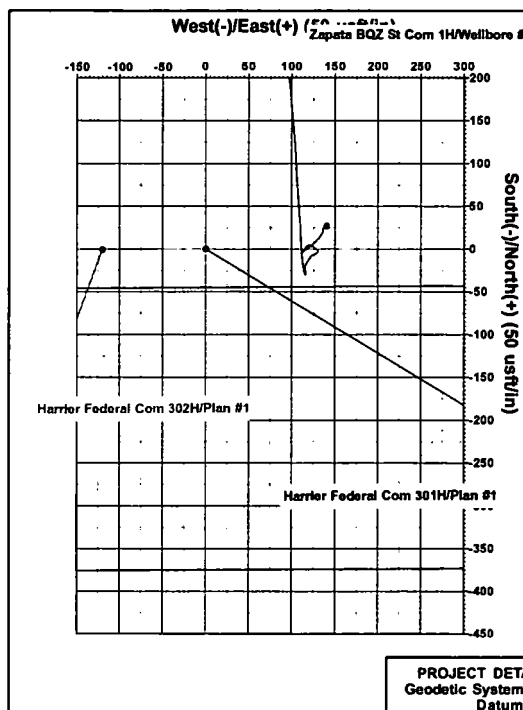
Northing 388379.40 Easting 712420.90 Latitude 32.06592 Longitude -103.64761

Planned Section Details

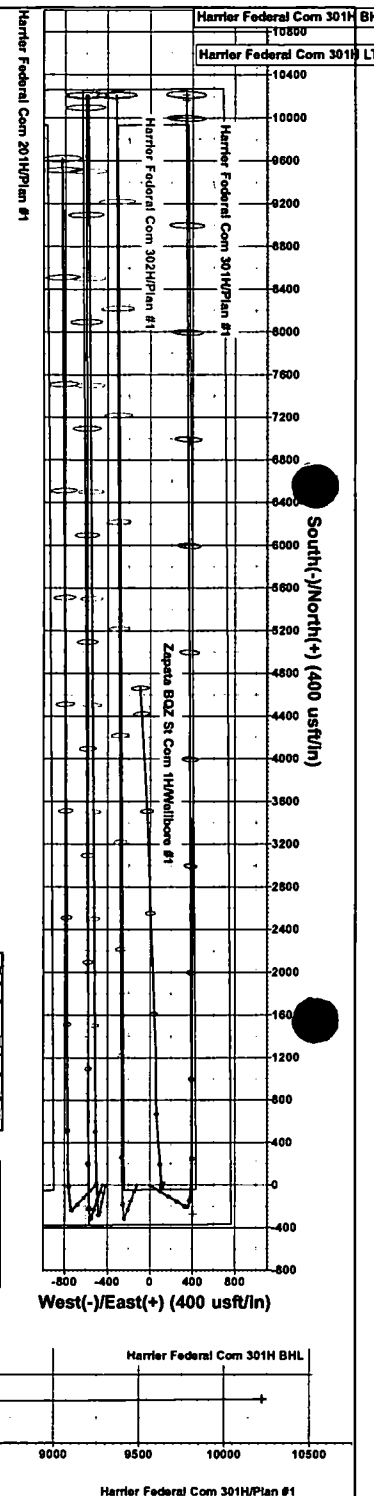
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Start Build 2.00
2	4500.00	0.00	0.00	4500.00	0.00	0.00	0.00	0.00	0.00	Start 4372.73 hold at 4762.40 MD
3	4762.40	5.25	121.30	4762.03	-6.24	10.26	2.00	121.30	-5.89	Start DLS 10.00 TFO -121.49
4	9135.13	5.25	121.30	9116.43	-214.03	352.00	0.00	0.00	-202.23	Start 9853.12 hold at 10066.68 MD
5	10066.68	90.41	359.67	9715.00	362.59	395.84	10.00	-121.49	375.53	TD at 19919.80
6	19919.80	90.41	359.67	9645.00	10215.30	339.30	0.00	0.00	10220.93	



Vertical Section at 1.90° (100 usf/in)



PROJECT DETAILS: Lea County, NM (NAD27 NME)
 Geodetic System: US State Plane 1927 (Exact solution)
 Datum: NAD 1927 (NADCON CONUS)
 Ellipsoid: Clarke 1866
 Zone: New Mexico East 3001
 System Datum: Mean Sea Level
 Local North: Grid



Vertical Section at 1.90° (250 usf/in)



CONCHO

COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 02, T 26-S, R 32-E

Harrier Federal Com 301H

Wellbore #1

Plan #1

Anticollision Report

24 December, 2018



INTEGRITY
DIRECTIONAL



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Reference	Plan #1		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISWWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 19,999.96 u	Error Surface:	Circular Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program Date 12/24/2018

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	19,919.37	Plan #1 (Wellbore #1)	MWD	MWD - Standard

Summary

Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Sec. 02, T 26-S, R 32-E						
Harrier Federal Com 101H - Wellbore #1 - Plan #1	4,500.00	4,493.00	419.91	399.98	21.069	CC, ES
Harrier Federal Com 101H - Wellbore #1 - Plan #1	19,919.80	19,301.88	1,149.14	772.98	3.055	SF
Harrier Federal Com 201H - Wellbore #1 - Plan #1	4,500.00	4,496.00	510.01	490.08	25.582	CC, ES
Harrier Federal Com 201H - Wellbore #1 - Plan #1	19,400.00	18,906.29	1,252.65	897.00	3.522	SF
Harrier Federal Com 302H - Wellbore #1 - Plan #1	4,500.00	4,497.00	120.00	100.06	6.018	CC, ES
Harrier Federal Com 302H - Wellbore #1 - Plan #1	19,919.80	19,790.52	702.29	325.78	1.865	SF
Harrier Federal Com 303H - Wellbore #1 - Plan #1	4,500.00	4,494.00	450.01	430.08	22.577	CC, ES
Harrier Federal Com 303H - Wellbore #1 - Plan #1	19,919.80	20,014.60	950.67	574.14	2.525	SF
Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1	5,845.52	5,840.04	58.29	34.36	2.435	CC
Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1	5,900.00	5,894.31	58.50	34.33	2.420	ES, SF

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 101H - Wellbore #1 - Plan #1												Offset Site Error:	0.00 usft
Survey Program: 0-MWD												Offset Well Error:	0.00 usft
Reference	Offset	Semi Major Axis		Distance		Minimum Separation		Warning					
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
0.00	0.00	0.00	0.00	0.00	0.00	-90.41	-3.00	-419.90	419.97				
100.00	100.00	93.00	93.00	0.08	0.08	-90.41	-3.00	-419.90	419.91	419.75	0.16	2,616.174	
200.00	200.00	193.00	193.00	0.31	0.29	-90.41	-3.00	-419.90	419.91	419.31	0.60	699.705	
300.00	300.00	293.00	293.00	0.53	0.52	-90.41	-3.00	-419.90	419.91	418.86	1.05	400.045	
400.00	400.00	393.00	393.00	0.76	0.74	-90.41	-3.00	-419.90	419.91	418.41	1.50	280.092	
500.00	500.00	493.00	493.00	0.98	0.97	-90.41	-3.00	-419.90	419.91	417.96	1.95	215.480	
600.00	600.00	593.00	593.00	1.21	1.19	-90.41	-3.00	-419.90	419.91	417.51	2.40	175.090	
700.00	700.00	693.00	693.00	1.43	1.42	-90.41	-3.00	-419.90	419.91	417.06	2.85	147.452	
800.00	800.00	793.00	793.00	1.66	1.64	-90.41	-3.00	-419.90	419.91	416.61	3.30	127.349	
900.00	900.00	893.00	893.00	1.88	1.87	-90.41	-3.00	-419.90	419.91	416.16	3.75	112.070	
1,000.00	1,000.00	993.00	993.00	2.11	2.09	-90.41	-3.00	-419.90	419.91	415.71	4.20	100.065	
1,100.00	1,100.00	1,093.00	1,093.00	2.33	2.32	-90.41	-3.00	-419.90	419.91	415.26	4.65	90.383	
1,200.00	1,200.00	1,193.00	1,193.00	2.56	2.54	-90.41	-3.00	-419.90	419.91	414.82	5.10	82.409	
1,300.00	1,300.00	1,293.00	1,293.00	2.78	2.76	-90.41	-3.00	-419.90	419.91	414.37	5.54	75.728	
1,400.00	1,400.00	1,393.00	1,393.00	3.01	2.99	-90.41	-3.00	-419.90	419.91	413.92	5.99	70.049	
1,500.00	1,500.00	1,493.00	1,493.00	3.23	3.21	-90.41	-3.00	-419.90	419.91	413.47	6.44	65.163	
1,600.00	1,600.00	1,593.00	1,593.00	3.45	3.44	-90.41	-3.00	-419.90	419.91	413.02	6.89	60.913	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 101H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
1,700.00	1,700.00	1,693.00	1,693.00	3.68	3.66	-90.41	-3.00	-419.90	419.91	412.57	7.34	57.184	
1,800.00	1,800.00	1,793.00	1,793.00	3.90	3.89	-90.41	-3.00	-419.90	419.91	412.12	7.79	53.888	
1,900.00	1,900.00	1,893.00	1,893.00	4.13	4.11	-90.41	-3.00	-419.90	419.91	411.87	8.24	50.947	
2,000.00	2,000.00	1,993.00	1,993.00	4.35	4.34	-90.41	-3.00	-419.90	419.91	411.22	8.69	48.312	
2,100.00	2,100.00	2,093.00	2,093.00	4.58	4.56	-90.41	-3.00	-419.90	419.91	410.77	9.14	45.936	
2,200.00	2,200.00	2,193.00	2,193.00	4.80	4.79	-90.41	-3.00	-419.90	419.91	410.32	9.59	43.783	
2,300.00	2,300.00	2,293.00	2,293.00	5.03	5.01	-90.41	-3.00	-419.90	419.91	409.87	10.04	41.823	
2,400.00	2,400.00	2,393.00	2,393.00	5.25	5.24	-90.41	-3.00	-419.90	419.91	409.42	10.49	40.030	
2,500.00	2,500.00	2,493.00	2,493.00	5.48	5.48	-90.41	-3.00	-419.90	419.91	408.97	10.94	38.385	
2,600.00	2,600.00	2,593.00	2,593.00	5.70	5.69	-90.41	-3.00	-419.90	419.91	408.52	11.39	36.870	
2,700.00	2,700.00	2,693.00	2,693.00	5.93	5.91	-90.41	-3.00	-419.90	419.91	408.07	11.84	35.470	
2,800.00	2,800.00	2,793.00	2,793.00	6.15	6.14	-90.41	-3.00	-419.90	419.91	407.62	12.29	34.173	
2,900.00	2,900.00	2,893.00	2,893.00	6.38	6.36	-90.41	-3.00	-419.90	419.91	407.17	12.74	32.967	
3,000.00	3,000.00	2,993.00	2,993.00	6.60	6.59	-90.41	-3.00	-419.90	419.91	406.72	13.19	31.843	
3,100.00	3,100.00	3,093.00	3,093.00	6.83	6.81	-90.41	-3.00	-419.90	419.91	406.27	13.64	30.793	
3,200.00	3,200.00	3,193.00	3,193.00	7.05	7.04	-90.41	-3.00	-419.90	419.91	405.82	14.09	29.810	
3,300.00	3,300.00	3,293.00	3,293.00	7.28	7.26	-90.41	-3.00	-419.90	419.91	405.38	14.54	28.888	
3,400.00	3,400.00	3,393.00	3,393.00	7.50	7.48	-90.41	-3.00	-419.90	419.91	404.93	14.99	28.022	
3,500.00	3,500.00	3,493.00	3,493.00	7.73	7.71	-90.41	-3.00	-419.90	419.91	404.48	15.43	27.208	
3,600.00	3,600.00	3,593.00	3,593.00	7.95	7.93	-90.41	-3.00	-419.90	419.91	404.03	15.88	26.436	
3,700.00	3,700.00	3,693.00	3,693.00	8.17	8.16	-90.41	-3.00	-419.90	419.91	403.58	16.33	25.708	
3,800.00	3,800.00	3,793.00	3,793.00	8.40	8.38	-90.41	-3.00	-419.90	419.91	403.13	16.78	25.020	
3,900.00	3,900.00	3,893.00	3,893.00	8.62	8.61	-90.41	-3.00	-419.90	419.91	402.68	17.23	24.387	
4,000.00	4,000.00	3,993.00	3,993.00	8.85	8.83	-90.41	-3.00	-419.90	419.91	402.23	17.68	23.747	
4,100.00	4,100.00	4,093.00	4,093.00	9.07	9.06	-90.41	-3.00	-419.90	419.91	401.78	18.13	23.159	
4,200.00	4,200.00	4,193.00	4,193.00	9.30	9.28	-90.41	-3.00	-419.90	419.91	401.33	18.58	22.598	
4,300.00	4,300.00	4,293.00	4,293.00	9.52	9.51	-90.41	-3.00	-419.90	419.91	400.88	19.03	22.065	
4,400.00	4,400.00	4,393.00	4,393.00	9.75	9.73	-90.41	-3.00	-419.90	419.91	400.43	19.48	21.555	
4,500.00	4,500.00	4,493.00	4,493.00	9.97	9.96	-90.41	-3.00	-419.90	419.91	399.98	19.93	21.069 CC, ES	
4,600.00	4,599.98	4,592.98	4,592.98	10.18	10.18	148.40	-3.00	-419.90	421.40	401.04	20.36	20.699	
4,700.00	4,699.84	4,692.84	4,692.84	10.36	10.41	148.72	-3.00	-419.90	425.86	405.10	20.77	20.507	
4,762.40	4,762.03	4,755.03	4,755.03	10.48	10.55	149.02	-3.00	-419.90	430.17	409.15	21.02	20.462	
4,800.00	4,799.48	4,792.48	4,792.48	10.55	10.63	149.26	-3.00	-419.90	433.13	411.95	21.18	20.451	
4,900.00	4,899.06	4,892.06	4,892.06	10.74	10.85	149.86	-3.00	-419.90	441.02	419.43	21.59	20.423	
5,000.00	4,998.64	4,991.64	4,991.64	10.94	11.08	150.45	-3.00	-419.90	448.97	426.95	22.01	20.394	
5,100.00	5,098.22	5,088.92	5,088.91	11.14	11.27	150.83	-4.35	-420.18	457.18	434.77	22.41	20.403	
5,200.00	5,197.80	5,185.99	5,185.86	11.34	11.44	150.80	-8.91	-421.12	465.95	443.18	22.78	20.457	
5,300.00	5,297.38	5,283.49	5,283.04	11.55	11.60	150.38	-16.63	-422.70	475.28	452.13	23.15	20.531	
5,400.00	5,396.96	5,382.94	5,382.08	11.76	11.77	149.86	-25.45	-424.51	484.80	461.27	23.53	20.604	
5,500.00	5,496.54	5,482.39	5,481.13	11.97	11.95	149.36	-34.26	-426.33	494.35	470.44	23.91	20.671	
5,600.00	5,596.12	5,581.85	5,580.17	12.18	12.12	148.88	-43.08	-428.14	503.95	479.64	24.31	20.732	
5,700.00	5,695.70	5,681.30	5,679.21	12.40	12.31	148.42	-51.89	-429.95	513.57	488.87	24.71	20.787	
5,800.00	5,795.28	5,780.75	5,778.26	12.62	12.49	147.97	-60.70	-431.76	523.23	498.12	25.11	20.835	
5,900.00	5,894.86	5,880.20	5,877.30	12.84	12.68	147.54	-69.52	-433.57	532.92	507.40	25.53	20.878	
6,000.00	5,994.45	5,979.65	5,976.34	13.07	12.87	147.13	-78.33	-435.38	542.64	516.70	25.94	20.917	
6,100.00	6,094.03	6,079.10	6,075.38	13.29	13.07	146.73	-87.15	-437.20	552.39	526.02	26.37	20.951	
6,200.00	6,193.61	6,178.55	6,174.43	13.52	13.27	146.34	-95.96	-439.01	562.16	535.37	26.79	20.981	
6,300.00	6,293.19	6,278.00	6,273.47	13.75	13.47	145.97	-104.78	-440.82	571.96	544.73	27.23	21.008	
6,400.00	6,392.77	6,377.46	6,372.51	13.99	13.68	145.61	-113.59	-442.63	581.78	554.11	27.66	21.031	
6,500.00	6,492.35	6,476.91	6,471.56	14.22	13.88	145.26	-122.41	-444.44	591.62	563.51	28.11	21.050	
6,600.00	6,591.93	6,576.36	6,570.60	14.46	14.09	144.92	-131.22	-446.26	601.48	572.93	28.55	21.067	
6,700.00	6,691.51	6,675.81	6,669.64	14.70	14.30	144.60	-140.04	-448.07	611.36	582.36	29.00	21.081	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
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Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design														Sec. 02, T 26-S, R 32-E - Harrier Federal Com 101H - Wellbore #1 - Plan #1		Offset Site Error: 0.00 usft	
Survey Program: 0-MWD														Offset Well Error: 0.00 usft			
Reference		Offset		Semi Major Axis			Distance							Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor					
6,800.00	6,791.09	6,775.26	6,768.69	14.93	14.52	144.28	-148.85	-449.88	621.26	591.81	29.45	21.093					
6,900.00	6,890.87	6,874.71	6,867.73	15.18	14.74	143.98	-157.67	-451.69	631.18	601.27	29.91	21.102					
7,000.00	6,990.25	6,974.16	6,966.77	15.42	14.95	143.68	-166.48	-453.50	641.12	610.75	30.37	21.109					
7,100.00	7,089.83	7,073.61	7,065.82	15.66	15.17	143.39	-175.29	-455.32	651.07	620.24	30.84	21.114					
7,200.00	7,189.42	7,173.06	7,164.86	15.91	15.40	143.11	-184.11	-457.13	661.04	629.74	31.30	21.118					
7,300.00	7,289.00	7,272.52	7,263.90	16.15	15.62	142.84	-192.92	-458.94	671.03	639.26	31.77	21.120					
7,400.00	7,388.58	7,371.97	7,362.95	16.40	15.85	142.58	-201.74	-460.75	681.03	648.78	32.25	21.120					
7,500.00	7,488.16	7,471.42	7,461.99	16.65	16.08	142.32	-210.55	-462.56	691.04	658.32	32.72	21.119					
7,600.00	7,587.74	7,570.87	7,561.03	16.90	16.30	142.08	-219.37	-464.37	701.06	667.86	33.20	21.117					
7,700.00	7,687.32	7,670.32	7,660.07	17.15	16.54	141.84	-228.18	-466.19	711.10	677.42	33.68	21.113					
7,800.00	7,786.90	7,769.77	7,759.12	17.40	16.77	141.60	-237.00	-468.00	721.15	686.99	34.16	21.109					
7,900.00	7,886.48	7,869.22	7,858.16	17.65	17.00	141.38	-245.81	-469.81	731.21	696.56	34.65	21.103					
8,000.00	7,986.06	7,968.67	7,957.20	17.90	17.24	141.15	-254.63	-471.62	741.29	706.15	35.14	21.097					
8,100.00	8,085.64	8,068.12	8,056.25	18.15	17.47	140.94	-263.44	-473.43	751.37	715.74	35.63	21.090					
8,200.00	8,185.22	8,167.58	8,155.29	18.41	17.71	140.73	-272.26	-475.25	761.46	725.34	36.12	21.082					
8,300.00	8,284.80	8,267.03	8,254.33	18.66	17.95	140.52	-281.07	-477.06	771.57	734.95	36.61	21.073					
8,400.00	8,384.39	8,366.48	8,353.38	18.92	18.19	140.33	-289.89	-478.87	781.68	744.57	37.11	21.064					
8,500.00	8,483.97	8,474.12	8,460.71	19.18	18.44	140.28	-297.16	-480.90	791.58	753.97	37.61	21.044					
8,600.00	8,583.55	8,569.53	8,575.31	19.43	18.63	141.61	-285.54	-483.61	799.68	761.62	38.06	21.009					
8,700.00	8,683.13	8,694.21	8,675.34	19.69	18.73	144.18	-255.34	-486.53	806.91	768.49	38.42	21.002					
8,800.00	8,782.71	8,783.81	8,755.40	19.95	18.77	147.30	-215.41	-489.32	815.57	776.84	38.72	21.061					
8,900.00	8,882.29	8,857.95	8,816.28	20.21	18.80	150.46	-173.25	-491.77	828.03	789.02	39.01	21.226					
9,000.00	8,981.87	8,918.41	8,881.55	20.47	18.83	153.37	-133.29	-493.83	846.19	806.90	39.30	21.534					
9,100.00	9,081.45	8,967.62	8,895.14	20.73	18.86	155.91	-97.37	-495.54	871.24	831.65	39.59	22.009					
9,135.13	9,116.43	8,982.68	8,904.79	20.82	18.87	156.71	-85.82	-496.07	881.78	842.09	39.69	22.217					
9,150.00	9,131.25	8,988.86	8,908.65	20.86	18.87	173.33	-81.01	-496.28	886.49	846.76	39.73	22.312					
9,200.00	9,181.07	9,009.88	8,921.42	20.97	18.89	-128.35	-64.33	-497.01	903.05	863.18	39.86	22.653					
9,250.00	9,230.61	9,031.24	8,933.76	21.07	18.92	-102.59	-46.91	-497.76	920.46	880.47	39.99	23.016					
9,300.00	9,279.48	9,050.00	8,944.06	21.16	18.94	-90.90	-31.24	-498.41	938.44	898.33	40.11	23.399					
9,350.00	9,327.33	9,074.80	8,956.87	21.24	18.98	-83.49	-10.03	-499.28	956.67	916.44	40.23	23.782					
9,400.00	9,373.77	9,100.00	8,968.94	21.31	19.03	-78.07	12.07	-500.15	974.91	934.58	40.34	24.168					
9,450.00	9,418.47	9,119.21	8,977.48	21.37	19.07	-73.92	29.27	-500.81	992.91	952.47	40.44	24.552					
9,500.00	9,461.07	9,150.00	8,989.95	21.42	19.15	-70.13	57.40	-501.86	1,010.53	969.96	40.56	24.912					
9,550.00	9,501.27	9,164.28	8,995.21	21.46	19.19	-67.31	70.65	-502.34	1,027.36	986.71	40.65	25.274					
9,600.00	9,538.74	9,186.98	9,002.90	21.49	19.26	-64.67	92.00	-503.10	1,043.44	1,002.68	40.76	25.602					
9,650.00	9,573.20	9,200.00	9,006.92	21.52	19.30	-62.54	104.38	-503.53	1,058.62	1,017.79	40.83	25.928					
9,700.00	9,604.40	9,232.71	9,015.78	21.56	19.43	-60.38	135.84	-504.60	1,072.49	1,031.51	40.98	26.169					
9,750.00	9,632.09	9,250.00	9,019.74	21.59	19.49	-58.74	152.67	-505.15	1,085.25	1,044.16	41.09	26.414					
9,800.00	9,656.07	9,278.75	9,025.18	21.64	19.62	-57.21	180.88	-506.06	1,096.59	1,055.33	41.26	26.576					
9,850.00	9,676.15	9,300.00	9,028.30	21.71	19.72	-56.01	201.89	-506.71	1,106.53	1,065.10	41.43	26.709					
9,900.00	9,692.17	9,325.02	9,030.96	21.83	19.85	-55.01	226.75	-507.47	1,114.94	1,073.27	41.67	26.755					
9,950.00	9,704.02	9,350.00	9,032.53	21.99	19.97	-54.24	251.67	-508.20	1,121.78	1,079.82	41.97	26.731					
10,000.00	9,711.61	9,377.69	9,033.00	22.21	20.13	-53.67	279.34	-508.99	1,127.03	1,084.69	42.34	26.619					
10,050.00	9,714.88	9,431.10	9,032.62	22.47	20.40	-53.32	332.74	-509.98	1,129.95	1,087.08	42.87	26.356					
10,066.68	9,715.00	9,448.78	9,032.49	22.57	20.51	-53.29	350.42	-510.12	1,130.15	1,087.07	43.08	26.236					
10,100.00	9,714.77	9,482.10	9,032.26	22.77	20.72	-53.29	383.74	-510.40	1,130.21	1,086.72	43.49	25.989					
10,200.00	9,714.06	9,582.10	9,031.55	23.46	21.49	-53.30	483.73	-511.21	1,130.40	1,085.45	44.95	25.148					
10,300.00	9,713.35	9,682.10	9,030.85	24.27	22.38	-53.31	583.73	-512.03	1,130.59	1,083.94	46.66	24.232					
10,400.00	9,712.63	9,782.10	9,030.15	25.19	23.39	-53.32	683.72	-512.85	1,130.79	1,082.21	48.58	23.278					
10,500.00	9,711.92	9,882.10	9,029.44	26.20	24.49	-53.32	783.72	-513.67	1,130.98	1,080.29	50.69	22.313					
10,600.00	9,711.21	9,982.10	9,028.74	27.29	25.67	-53.33	883.71	-514.48	1,131.17	1,078.21	52.96	21.359					
10,700.00	9,710.50	10,082.10	9,028.03	28.46	26.92	-53.34	983.70	-515.30	1,131.36	1,075.98	55.38	20.429					

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 101H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
10,800.00	9,709.79	10,182.10	9,027.33	29.69	28.24	-53.35	1,083.70	-516.12	1,131.55	1,073.63	57.93	19.534	
10,900.00	9,709.08	10,282.10	9,026.62	30.98	29.61	-53.35	1,183.69	-516.94	1,131.75	1,071.16	60.58	18.680	
11,000.00	9,708.37	10,382.10	9,025.92	32.31	31.03	-53.36	1,283.69	-517.75	1,131.94	1,068.60	63.34	17.871	
11,100.00	9,707.66	10,482.10	9,025.21	33.70	32.48	-53.37	1,383.68	-518.57	1,132.13	1,065.95	66.18	17.106	
11,200.00	9,706.95	10,582.10	9,024.51	35.12	33.98	-53.38	1,483.67	-519.39	1,132.32	1,063.22	69.10	16.387	
11,300.00	9,706.24	10,682.10	9,023.80	36.58	35.50	-53.38	1,583.67	-520.20	1,132.51	1,060.43	72.08	15.711	
11,400.00	9,705.53	10,782.10	9,023.10	38.07	37.05	-53.39	1,683.66	-521.02	1,132.71	1,057.58	75.12	15.078	
11,500.00	9,704.82	10,882.10	9,022.39	39.59	38.63	-53.40	1,783.66	-521.84	1,132.90	1,054.68	78.22	14.484	
11,600.00	9,704.11	10,982.10	9,021.69	41.13	40.22	-53.41	1,883.65	-522.66	1,133.09	1,051.73	81.36	13.927	
11,700.00	9,703.40	11,082.10	9,020.98	42.70	41.84	-53.42	1,983.64	-523.47	1,133.28	1,048.75	84.54	13.408	
11,800.00	9,702.69	11,182.10	9,020.28	44.28	43.47	-53.42	2,083.64	-524.29	1,133.47	1,045.72	87.75	12.917	
11,900.00	9,701.98	11,282.10	9,019.57	45.88	45.12	-53.43	2,183.63	-525.11	1,133.67	1,042.67	91.00	12.458	
12,000.00	9,701.27	11,382.10	9,018.87	47.50	46.78	-53.44	2,283.62	-525.93	1,133.86	1,039.58	94.28	12.027	
12,100.00	9,700.56	11,482.10	9,018.16	49.13	48.45	-53.45	2,383.62	-526.74	1,134.05	1,036.47	97.58	11.621	
12,200.00	9,699.85	11,582.10	9,017.46	50.78	50.13	-53.45	2,483.61	-527.56	1,134.24	1,033.33	100.91	11.240	
12,300.00	9,699.14	11,682.10	9,016.75	52.44	51.82	-53.46	2,583.61	-528.38	1,134.44	1,030.18	104.26	10.881	
12,400.00	9,698.43	11,782.10	9,016.05	54.10	53.52	-53.47	2,683.60	-529.19	1,134.63	1,027.00	107.63	10.542	
12,500.00	9,697.72	11,882.10	9,015.34	55.78	55.23	-53.48	2,783.59	-530.01	1,134.82	1,023.81	111.01	10.222	
12,600.00	9,697.00	11,982.10	9,014.64	57.47	56.95	-53.48	2,883.59	-530.83	1,135.01	1,020.60	114.42	9.920	
12,700.00	9,696.29	12,082.10	9,013.93	59.16	58.67	-53.49	2,983.58	-531.65	1,135.21	1,017.37	117.83	9.634	
12,800.00	9,695.58	12,182.10	9,013.23	60.87	60.40	-53.50	3,083.58	-532.46	1,135.40	1,014.13	121.26	9.363	
12,900.00	9,694.87	12,282.09	9,012.52	62.57	62.13	-53.51	3,183.57	-533.28	1,135.59	1,010.88	124.71	9.106	
13,000.00	9,694.16	12,382.09	9,011.82	64.29	63.87	-53.51	3,283.56	-534.10	1,135.78	1,007.62	128.16	8.862	
13,100.00	9,693.45	12,482.09	9,011.11	66.01	65.62	-53.52	3,383.56	-534.91	1,135.97	1,004.35	131.63	8.630	
13,200.00	9,692.74	12,582.09	9,010.41	67.74	67.36	-53.53	3,483.55	-535.73	1,136.17	1,001.07	135.10	8.410	
13,300.00	9,692.03	12,682.09	9,009.70	69.47	69.12	-53.54	3,583.55	-536.55	1,136.36	997.78	138.58	8.200	
13,400.00	9,691.32	12,782.09	9,009.00	71.20	70.87	-53.54	3,683.54	-537.37	1,136.55	994.48	142.07	8.000	
13,500.00	9,690.61	12,882.09	9,008.29	72.94	72.63	-53.55	3,783.53	-538.18	1,136.74	991.17	145.57	7.809	
13,600.00	9,689.90	12,982.09	9,007.59	74.69	74.39	-53.56	3,883.53	-539.00	1,136.94	987.86	149.08	7.626	
13,700.00	9,689.19	13,082.09	9,006.88	76.44	76.16	-53.57	3,983.52	-539.82	1,137.13	984.54	152.59	7.452	
13,800.00	9,688.48	13,182.09	9,006.18	78.19	77.93	-53.57	4,083.51	-540.64	1,137.32	981.21	156.11	7.285	
13,900.00	9,687.77	13,282.09	9,005.47	79.94	79.70	-53.58	4,183.51	-541.45	1,137.51	977.88	159.64	7.126	
14,000.00	9,687.06	13,382.09	9,004.77	81.70	81.47	-53.59	4,283.50	-542.27	1,137.71	974.54	163.17	6.973	
14,100.00	9,686.35	13,482.09	9,004.07	83.46	83.24	-53.60	4,383.50	-543.09	1,137.90	971.19	166.70	6.826	
14,200.00	9,685.64	13,582.09	9,003.36	85.22	85.02	-53.60	4,483.49	-543.90	1,138.09	967.85	170.25	6.685	
14,300.00	9,684.93	13,682.09	9,002.66	86.99	86.80	-53.61	4,583.48	-544.72	1,138.28	964.49	173.79	6.550	
14,400.00	9,684.22	13,782.09	9,001.95	88.76	88.58	-53.62	4,683.48	-545.54	1,138.48	961.14	177.34	6.420	
14,500.00	9,683.51	13,882.09	9,001.25	90.53	90.36	-53.63	4,783.47	-546.36	1,138.67	957.78	180.89	6.295	
14,600.00	9,682.80	13,982.09	9,000.54	92.30	92.15	-53.63	4,883.47	-547.17	1,138.86	954.41	184.45	6.174	
14,700.00	9,682.08	14,082.09	8,999.84	94.08	93.94	-53.64	4,983.46	-547.99	1,139.06	951.05	188.01	6.058	
14,800.00	9,681.37	14,182.09	8,999.13	95.85	95.72	-53.65	5,083.45	-548.81	1,139.25	947.67	191.57	5.947	
14,900.00	9,680.66	14,282.09	8,998.43	97.63	97.51	-53.66	5,183.45	-549.63	1,139.44	944.30	195.14	5.839	
15,000.00	9,679.95	14,382.09	8,997.72	99.41	99.30	-53.66	5,283.44	-550.44	1,139.63	940.92	198.71	5.735	
15,100.00	9,679.24	14,482.09	8,997.02	101.19	101.09	-53.67	5,383.44	-551.26	1,139.83	937.54	202.28	5.635	
15,200.00	9,678.53	14,582.09	8,996.31	102.97	102.89	-53.68	5,483.43	-552.08	1,140.02	934.16	205.86	5.538	
15,300.00	9,677.82	14,682.09	8,995.61	104.76	104.68	-53.69	5,583.42	-552.89	1,140.21	930.77	209.44	5.444	
15,400.00	9,677.11	14,782.09	8,994.90	106.54	106.47	-53.69	5,683.42	-553.71	1,140.40	927.39	213.02	5.354	
15,500.00	9,676.40	14,882.09	8,994.20	108.33	108.27	-53.70	5,783.41	-554.53	1,140.60	924.00	216.60	5.266	
15,600.00	9,675.69	14,982.09	8,993.49	110.12	110.07	-53.71	5,883.40	-555.35	1,140.79	920.61	220.19	5.181	
15,700.00	9,674.98	15,082.09	8,992.79	111.91	111.86	-53.72	5,983.40	-556.16	1,140.98	917.21	223.77	5.099	
15,800.00	9,674.27	15,182.09	8,992.08	113.70	113.66	-53.72	6,083.39	-556.98	1,141.18	913.82	227.36	5.019	
15,900.00	9,673.56	15,282.09	8,991.38	115.49	115.46	-53.73	6,183.39	-557.80	1,141.37	910.42	230.95	4.942	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 101H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
16,000.00	9,672.85	15,382.09	8,990.67	117.28	117.26	-53.74	6,283.38	-558.62	1,141.56	907.02	234.54	4.867	
16,100.00	9,672.14	15,482.09	8,989.97	119.07	119.06	-53.75	6,383.37	-559.43	1,141.76	903.62	238.14	4.794	
16,200.00	9,671.43	15,582.09	8,989.26	120.87	120.87	-53.75	6,483.37	-560.25	1,141.95	900.21	241.73	4.724	
16,300.00	9,670.72	15,682.08	8,988.56	122.66	122.67	-53.76	6,583.36	-561.07	1,142.14	896.81	245.33	4.655	
16,400.00	9,670.01	15,782.08	8,987.85	124.46	124.47	-53.77	6,683.36	-561.88	1,142.33	893.40	248.93	4.589	
16,500.00	9,669.30	15,882.08	8,987.15	126.26	126.27	-53.78	6,783.35	-562.70	1,142.53	890.00	252.53	4.524	
16,600.00	9,668.59	15,982.08	8,986.44	128.05	128.08	-53.78	6,883.34	-563.52	1,142.72	886.59	256.13	4.461	
16,700.00	9,667.88	16,082.08	8,985.74	129.85	129.88	-53.79	6,983.34	-564.34	1,142.91	883.18	259.74	4.400	
16,800.00	9,667.17	16,182.08	8,985.03	131.65	131.69	-53.80	7,083.33	-565.15	1,143.11	879.77	263.34	4.341	
16,900.00	9,666.45	16,282.08	8,984.33	133.45	133.50	-53.80	7,183.32	-565.97	1,143.30	876.35	266.95	4.283	
17,000.00	9,665.74	16,382.08	8,983.62	135.25	135.30	-53.81	7,283.32	-566.79	1,143.49	872.94	270.55	4.226	
17,100.00	9,665.03	16,482.08	8,982.92	137.05	137.11	-53.82	7,383.31	-567.60	1,143.69	869.52	274.16	4.172	
17,200.00	9,664.32	16,582.08	8,982.21	138.85	138.92	-53.83	7,483.31	-568.42	1,143.88	866.11	277.77	4.118	
17,300.00	9,663.61	16,682.08	8,981.51	140.66	140.72	-53.83	7,583.30	-569.24	1,144.07	862.69	281.38	4.066	
17,400.00	9,662.90	16,782.08	8,980.80	142.46	142.53	-53.84	7,683.29	-570.06	1,144.27	859.27	284.99	4.015	
17,500.00	9,662.19	16,882.08	8,980.10	144.26	144.34	-53.85	7,783.29	-570.87	1,144.46	855.86	288.60	3.966	
17,600.00	9,661.48	16,982.08	8,979.40	146.07	146.15	-53.86	7,883.28	-571.69	1,144.65	852.44	292.22	3.917	
17,700.00	9,660.77	17,082.08	8,978.69	147.87	147.96	-53.86	7,983.28	-572.51	1,144.85	849.02	295.83	3.870	
17,800.00	9,660.06	17,182.08	8,977.99	149.68	149.77	-53.87	8,083.27	-573.33	1,145.04	845.59	299.45	3.824	
17,900.00	9,659.35	17,282.08	8,977.28	151.48	151.58	-53.88	8,183.26	-574.14	1,145.23	842.17	303.06	3.779	
18,000.00	9,658.64	17,382.08	8,976.58	153.29	153.39	-53.89	8,283.26	-574.96	1,145.43	838.75	306.68	3.735	
18,100.00	9,657.93	17,482.08	8,975.87	155.09	155.20	-53.89	8,383.25	-575.78	1,145.62	835.33	310.29	3.692	
18,200.00	9,657.22	17,582.08	8,975.17	156.90	157.01	-53.90	8,483.25	-576.59	1,145.81	831.90	313.91	3.650	
18,300.00	9,656.51	17,682.08	8,974.46	158.71	158.82	-53.91	8,583.24	-577.41	1,146.01	828.48	317.53	3.609	
18,400.00	9,655.80	17,782.08	8,973.76	160.51	160.64	-53.92	8,683.23	-578.23	1,146.20	825.05	321.15	3.569	
18,500.00	9,655.09	17,882.08	8,973.05	162.32	162.45	-53.92	8,783.23	-579.05	1,146.39	821.62	324.77	3.530	
18,600.00	9,654.38	17,982.08	8,972.35	164.13	164.26	-53.93	8,883.22	-579.86	1,146.59	818.20	328.39	3.492	
18,700.00	9,653.67	18,082.08	8,971.64	165.94	166.07	-53.94	8,983.21	-580.68	1,146.78	814.77	332.01	3.454	
18,800.00	9,652.96	18,182.08	8,970.94	167.75	167.89	-53.95	9,083.21	-581.50	1,146.97	811.34	335.63	3.417	
18,900.00	9,652.25	18,282.08	8,970.23	169.56	169.70	-53.95	9,183.20	-582.32	1,147.17	807.91	339.26	3.381	
19,000.00	9,651.54	18,382.08	8,969.53	171.37	171.51	-53.96	9,283.20	-583.13	1,147.36	804.48	342.88	3.346	
19,100.00	9,650.82	18,482.08	8,968.82	173.18	173.33	-53.97	9,383.19	-583.95	1,147.55	801.05	346.50	3.312	
19,200.00	9,650.11	18,582.08	8,968.12	174.99	175.14	-53.98	9,483.18	-584.77	1,147.75	797.62	350.13	3.278	
19,300.00	9,649.40	18,682.08	8,967.41	176.80	176.95	-53.98	9,583.18	-585.58	1,147.94	794.19	353.75	3.245	
19,400.00	9,648.69	18,782.08	8,966.71	178.61	178.77	-53.99	9,683.17	-586.40	1,148.13	790.76	357.38	3.213	
19,500.00	9,647.98	18,882.08	8,966.00	180.42	180.58	-54.00	9,783.17	-587.22	1,148.33	787.33	361.00	3.181	
19,600.00	9,647.27	18,982.08	8,965.30	182.23	182.40	-54.00	9,883.16	-588.04	1,148.52	783.89	364.63	3.150	
19,700.00	9,646.56	19,082.07	8,964.59	184.04	184.21	-54.01	9,983.15	-588.85	1,148.72	780.46	368.25	3.119	
19,800.00	9,645.85	19,182.07	8,963.89	185.85	186.03	-54.02	10,083.15	-589.67	1,148.91	777.03	371.88	3.089	
19,900.00	9,645.14	19,282.07	8,963.18	187.66	187.84	-54.03	10,183.14	-590.49	1,149.10	773.60	375.51	3.060	
19,919.80	9,645.00	19,301.88	8,963.04	187.96	188.20	-54.03	10,202.94	-590.65	1,149.14	772.98	376.16	3.055 SF	



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design													Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1	Offset Site Error:	0.00 usft
Survey Program: 0-MWD														Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance				Warning				
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (")	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)		Minimum Separation (usft)	Separation Factor		
0.00	0.00	0.00	0.00	0.00	0.00	-90.40	-3.60	-510.00	510.03						
100.00	100.00	96.00	96.00	0.08	0.08	-90.40	-3.60	-510.00	510.01	509.85	0.16	3,128.902			
200.00	200.00	196.00	196.00	0.31	0.30	-90.40	-3.60	-510.00	510.01	509.41	0.61	840.401			
300.00	300.00	296.00	296.00	0.53	0.52	-90.40	-3.60	-510.00	510.01	508.96	1.06	482.783			
400.00	400.00	396.00	396.00	0.76	0.75	-90.40	-3.60	-510.00	510.01	508.51	1.51	338.669			
500.00	500.00	496.00	496.00	0.98	0.97	-90.40	-3.60	-510.00	510.01	508.06	1.96	260.814			
600.00	600.00	596.00	596.00	1.21	1.20	-90.40	-3.60	-510.00	510.01	507.61	2.40	212.064			
700.00	700.00	696.00	696.00	1.43	1.42	-90.40	-3.60	-510.00	510.01	507.16	2.85	178.668			
800.00	800.00	796.00	796.00	1.66	1.65	-90.40	-3.60	-510.00	510.01	506.71	3.30	154.359			
900.00	900.00	896.00	896.00	1.88	1.87	-90.40	-3.60	-510.00	510.01	506.26	3.75	135.873			
1,000.00	1,000.00	996.00	996.00	2.11	2.10	-90.40	-3.60	-510.00	510.01	505.81	4.20	121.341			
1,100.00	1,100.00	1,096.00	1,096.00	2.33	2.32	-90.40	-3.60	-510.00	510.01	505.36	4.65	109.618			
1,200.00	1,200.00	1,196.00	1,196.00	2.56	2.55	-90.40	-3.60	-510.00	510.01	504.91	5.10	99.960			
1,300.00	1,300.00	1,296.00	1,296.00	2.78	2.77	-90.40	-3.60	-510.00	510.01	504.46	5.55	91.866			
1,400.00	1,400.00	1,396.00	1,396.00	3.01	3.00	-90.40	-3.60	-510.00	510.01	504.01	6.00	84.984			
1,500.00	1,500.00	1,496.00	1,496.00	3.23	3.22	-90.40	-3.60	-510.00	510.01	503.56	6.45	79.062			
1,600.00	1,600.00	1,596.00	1,596.00	3.45	3.45	-90.40	-3.60	-510.00	510.01	503.11	6.90	73.911			
1,700.00	1,700.00	1,696.00	1,696.00	3.68	3.67	-90.40	-3.60	-510.00	510.01	502.66	7.35	69.391			
1,800.00	1,800.00	1,796.00	1,796.00	3.90	3.90	-90.40	-3.60	-510.00	510.01	502.21	7.80	65.391			
1,900.00	1,900.00	1,896.00	1,896.00	4.13	4.12	-90.40	-3.60	-510.00	510.01	501.76	8.25	61.828			
2,000.00	2,000.00	1,996.00	1,996.00	4.35	4.34	-90.40	-3.60	-510.00	510.01	501.31	8.70	58.633			
2,100.00	2,100.00	2,096.00	2,096.00	4.58	4.57	-90.40	-3.60	-510.00	510.01	500.86	9.15	55.751			
2,200.00	2,200.00	2,196.00	2,196.00	4.80	4.79	-90.40	-3.60	-510.00	510.01	500.42	9.60	53.140			
2,300.00	2,300.00	2,296.00	2,296.00	5.03	5.02	-90.40	-3.60	-510.00	510.01	499.97	10.05	50.762			
2,400.00	2,400.00	2,396.00	2,396.00	5.25	5.24	-90.40	-3.60	-510.00	510.01	499.52	10.50	48.588			
2,500.00	2,500.00	2,496.00	2,496.00	5.48	5.47	-90.40	-3.60	-510.00	510.01	499.07	10.95	46.593			
2,600.00	2,600.00	2,596.00	2,596.00	5.70	5.69	-90.40	-3.60	-510.00	510.01	498.62	11.40	44.755			
2,700.00	2,700.00	2,696.00	2,696.00	5.93	5.92	-90.40	-3.60	-510.00	510.01	498.17	11.85	43.057			
2,800.00	2,800.00	2,796.00	2,796.00	6.15	6.14	-90.40	-3.60	-510.00	510.01	497.72	12.29	41.482			
2,900.00	2,900.00	2,896.00	2,896.00	6.38	6.37	-90.40	-3.60	-510.00	510.01	497.27	12.74	40.019			
3,000.00	3,000.00	2,996.00	2,996.00	6.60	6.59	-90.40	-3.60	-510.00	510.01	496.82	13.19	38.656			
3,100.00	3,100.00	3,096.00	3,096.00	6.83	6.82	-90.40	-3.60	-510.00	510.01	496.37	13.64	37.382			
3,200.00	3,200.00	3,196.00	3,196.00	7.05	7.04	-90.40	-3.60	-510.00	510.01	495.92	14.09	36.190			
3,300.00	3,300.00	3,296.00	3,296.00	7.28	7.27	-90.40	-3.60	-510.00	510.01	495.47	14.54	35.071			
3,400.00	3,400.00	3,396.00	3,396.00	7.50	7.49	-90.40	-3.60	-510.00	510.01	495.02	14.99	34.019			
3,500.00	3,500.00	3,496.00	3,496.00	7.73	7.72	-90.40	-3.60	-510.00	510.01	494.57	15.44	33.029			
3,600.00	3,600.00	3,596.00	3,596.00	7.95	7.94	-90.40	-3.60	-510.00	510.01	494.12	15.89	32.095			
3,700.00	3,700.00	3,696.00	3,696.00	8.17	8.17	-90.40	-3.60	-510.00	510.01	493.67	16.34	31.212			
3,800.00	3,800.00	3,796.00	3,796.00	8.40	8.39	-90.40	-3.60	-510.00	510.01	493.22	16.79	30.376			
3,900.00	3,900.00	3,896.00	3,896.00	8.62	8.62	-90.40	-3.60	-510.00	510.01	492.77	17.24	29.584			
4,000.00	4,000.00	3,996.00	3,996.00	8.85	8.84	-90.40	-3.60	-510.00	510.01	492.32	17.69	28.832			
4,100.00	4,100.00	4,096.00	4,096.00	9.07	9.06	-90.40	-3.60	-510.00	510.01	491.87	18.14	28.118			
4,200.00	4,200.00	4,196.00	4,196.00	9.30	9.29	-90.40	-3.60	-510.00	510.01	491.42	18.59	27.438			
4,300.00	4,300.00	4,296.00	4,296.00	9.52	9.51	-90.40	-3.60	-510.00	510.01	490.98	19.04	26.790			
4,400.00	4,400.00	4,396.00	4,396.00	9.75	9.74	-90.40	-3.60	-510.00	510.01	490.53	19.49	26.172			
4,500.00	4,500.00	4,496.00	4,496.00	9.97	9.96	-90.40	-3.60	-510.00	510.01	490.08	19.94	25.582 CC, ES			
4,600.00	4,599.98	4,595.98	4,595.98	10.18	10.19	148.38	-3.60	-510.00	511.50	491.13	20.36	25.117			
4,700.00	4,699.84	4,695.84	4,695.84	10.36	10.41	148.64	-3.60	-510.00	515.98	495.19	20.77	24.838			
4,762.40	4,762.03	4,758.03	4,758.03	10.48	10.55	148.88	-3.60	-510.00	520.27	499.24	21.03	24.739			
4,800.00	4,799.48	4,795.48	4,795.48	10.55	10.64	149.08	-3.60	-510.00	523.22	502.03	21.19	24.697			
4,900.00	4,899.06	4,895.06	4,895.06	10.74	10.86	149.58	-3.60	-510.00	531.09	509.49	21.60	24.586			
5,000.00	4,998.64	4,994.64	4,994.64	10.94	11.08	150.08	-3.60	-510.00	539.01	516.99	22.02	24.477			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1														Offset Site Error:	0.00 usft
Survey Program: 0-MWD														Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Distance									
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning		
5,100.00	5,098.22	5,083.61	5,083.59	11.14	11.26	150.41	-4.48	-510.84	547.88	525.48	22.40	24.459			
5,200.00	5,197.80	5,171.71	5,171.61	11.34	11.42	150.52	-7.33	-513.54	558.79	536.03	22.76	24.548			
5,300.00	5,297.38	5,259.47	5,259.12	11.55	11.58	150.42	-12.12	-518.08	571.73	548.60	23.13	24.722			
5,400.00	5,396.98	5,358.47	5,357.71	11.76	11.76	150.20	-18.59	-524.23	585.66	562.14	23.52	24.905			
5,500.00	5,496.54	5,457.47	5,456.31	11.97	11.94	149.99	-25.07	-530.38	599.60	575.69	23.91	25.076			
5,600.00	5,596.12	5,556.47	5,554.91	12.18	12.13	149.79	-31.55	-536.52	613.54	589.23	24.31	25.235			
5,700.00	5,695.70	5,655.47	5,653.50	12.40	12.32	149.60	-38.03	-542.67	627.50	602.78	24.72	25.384			
5,800.00	5,795.28	5,754.47	5,752.10	12.62	12.51	149.42	-44.50	-548.82	641.46	616.33	25.13	25.522			
5,900.00	5,894.86	5,853.47	5,850.70	12.84	12.71	149.24	-50.98	-554.96	655.43	629.87	25.55	25.650			
6,000.00	5,994.45	5,952.48	5,949.30	13.07	12.91	149.08	-57.46	-561.11	669.40	643.42	25.98	25.769			
6,100.00	6,094.03	6,051.48	6,047.89	13.29	13.11	148.92	-63.93	-567.25	683.38	656.97	26.41	25.879			
6,200.00	6,193.61	6,150.48	6,146.49	13.52	13.32	148.76	-70.41	-573.40	697.36	670.52	26.84	25.982			
6,300.00	6,293.19	6,249.48	6,245.09	13.75	13.52	148.62	-76.89	-579.55	711.35	684.07	27.28	26.077			
6,400.00	6,392.77	6,348.48	6,343.68	13.99	13.73	148.48	-83.37	-585.69	725.34	697.62	27.72	26.165			
6,500.00	6,492.35	6,447.48	6,442.28	14.22	13.95	148.34	-89.84	-591.84	739.34	711.17	28.17	26.247			
6,600.00	6,591.93	6,546.48	6,540.88	14.46	14.16	148.21	-96.32	-597.99	753.34	724.72	28.62	26.322			
6,700.00	6,691.51	6,645.48	6,639.48	14.70	14.38	148.08	-102.80	-604.13	767.34	738.27	29.07	26.392			
6,800.00	6,791.09	6,744.48	6,738.07	14.93	14.60	147.96	-109.27	-610.28	781.35	751.82	29.53	26.457			
6,900.00	6,890.67	6,843.48	6,836.67	15.18	14.82	147.84	-115.75	-616.43	795.36	765.36	29.99	26.517			
7,000.00	6,990.25	6,942.48	6,935.27	15.42	15.04	147.73	-122.23	-622.57	809.37	778.91	30.46	26.572			
7,100.00	7,089.83	7,041.48	7,033.86	15.66	15.27	147.62	-128.71	-628.72	823.39	792.46	30.93	26.624			
7,200.00	7,189.42	7,140.48	7,132.46	15.91	15.49	147.51	-135.18	-634.87	837.41	806.01	31.40	26.671			
7,300.00	7,289.00	7,239.48	7,231.06	16.15	15.72	147.41	-141.66	-641.01	851.43	819.56	31.87	26.714			
7,400.00	7,388.58	7,338.48	7,329.66	16.40	15.95	147.31	-148.14	-647.16	865.46	833.11	32.35	26.754			
7,500.00	7,488.16	7,437.48	7,428.25	16.65	16.18	147.21	-154.61	-653.31	879.49	846.66	32.83	26.791			
7,600.00	7,587.74	7,536.49	7,526.85	16.90	16.41	147.12	-161.09	-659.45	893.52	860.21	33.31	26.825			
7,700.00	7,687.32	7,635.49	7,625.45	17.15	16.65	147.03	-167.57	-665.60	907.55	873.75	33.79	26.856			
7,800.00	7,786.90	7,734.49	7,724.04	17.40	16.88	146.94	-174.05	-671.74	921.58	887.30	34.28	26.884			
7,900.00	7,886.48	7,833.49	7,822.64	17.65	17.12	146.86	-180.52	-677.89	935.62	900.85	34.77	26.910			
8,000.00	7,986.06	7,932.49	7,921.24	17.90	17.36	146.78	-187.00	-684.04	949.66	914.40	35.26	26.934			
8,100.00	8,085.64	8,031.49	8,019.84	18.15	17.60	146.70	-193.48	-690.18	963.70	927.95	35.75	26.956			
8,200.00	8,185.22	8,130.49	8,118.43	18.41	17.84	146.62	-199.95	-696.33	977.74	941.49	36.25	26.975			
8,300.00	8,284.80	8,229.49	8,217.03	18.66	18.08	146.54	-206.43	-702.48	991.78	955.04	36.74	26.993			
8,400.00	8,384.39	8,328.49	8,315.63	18.92	18.32	146.47	-212.91	-708.62	1,005.83	968.59	37.24	27.009			
8,500.00	8,483.97	8,427.49	8,414.22	19.18	18.56	146.40	-219.39	-714.77	1,019.87	982.13	37.74	27.024			
8,600.00	8,583.55	8,526.49	8,512.82	19.43	18.81	146.33	-225.86	-720.92	1,033.92	995.68	38.24	27.037			
8,700.00	8,683.13	8,625.49	8,611.42	19.69	19.05	146.26	-232.34	-727.06	1,047.97	1,009.23	38.74	27.048			
8,800.00	8,782.71	8,726.81	8,712.39	19.95	19.30	146.27	-237.54	-733.37	1,061.98	1,022.74	39.25	27.059			
8,900.00	8,882.29	8,826.48	8,812.23	20.21	19.50	147.09	-242.84	-739.82	1,075.65	1,035.94	39.71	27.089			
9,000.00	8,981.87	8,924.13	8,905.26	20.47	19.64	148.66	-248.90	-745.71	1,089.58	1,049.47	40.10	27.168			
9,100.00	9,081.45	9,027.32	8,980.91	20.73	19.73	150.64	-254.84	-750.68	1,103.02	1,064.57	40.45	27.316			
9,135.13	9,116.43	9,033.59	9,003.69	20.82	19.75	151.37	-255.84	-752.20	1,111.06	1,070.50	40.57	27.388			
9,150.00	9,131.25	9,044.35	9,012.84	20.86	19.76	167.74	-250.22	-752.81	1,113.73	1,073.12	40.61	27.423			
9,200.00	9,181.07	9,079.96	9,042.35	20.97	19.78	-134.81	-230.40	-754.79	1,123.05	1,082.30	40.75	27.558			
9,250.00	9,230.81	9,114.81	9,069.98	21.07	19.80	-109.98	-109.26	-756.67	1,132.80	1,091.92	40.88	27.712			
9,300.00	9,279.48	9,150.00	9,096.53	21.16	19.83	-99.10	-86.24	-758.49	1,142.83	1,101.84	40.99	27.880			
9,350.00	9,327.33	9,182.66	9,119.87	21.24	19.84	-92.79	-63.45	-760.11	1,152.99	1,111.90	41.08	28.064			
9,400.00	9,373.77	9,215.84	9,142.21	21.31	19.86	-88.39	-38.98	-761.67	1,163.14	1,121.97	41.17	28.254			
9,450.00	9,418.47	9,250.00	9,163.70	21.37	19.87	-84.98	-12.47	-763.20	1,173.15	1,131.91	41.24	28.446			
9,500.00	9,461.07	9,281.05	9,181.83	21.42	19.88	-82.25	12.70	-764.50	1,182.89	1,141.59	41.30	28.641			
9,550.00	9,501.27	9,313.19	9,199.13	21.46	19.90	-79.93	39.75	-765.77	1,192.25	1,150.89	41.36	28.829			
9,600.00	9,538.74	9,350.00	9,217.05	21.49	19.93	-77.87	71.87	-767.11	1,201.13	1,159.70	41.42	28.997			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1														Offset Site Error: 0.00 usft	
Survey Program: 0-MWD														Offset Well Error: 0.00 usft	
Reference		Offset		Semi Major Axis			Distance								
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning		
9,650.00	9,573.20	9,376.73	9,228.75	21.52	19.96	-78.23	95.88	-768.00	1,209.38	1,167.89	41.49	29.150			
9,700.00	9,604.40	9,400.00	9,238.02	21.56	20.02	-74.84	117.21	-768.73	1,217.00	1,175.43	41.58	29.271			
9,750.00	9,632.09	9,439.52	9,251.76	21.59	20.15	-73.49	154.24	-769.84	1,223.78	1,182.03	41.75	29.315			
9,800.00	9,656.07	9,470.71	9,260.78	21.64	20.28	-72.43	184.09	-770.60	1,229.76	1,187.84	41.92	29.333			
9,850.00	9,676.15	9,500.00	9,267.76	21.71	20.42	-71.57	212.52	-771.23	1,234.85	1,192.72	42.13	29.310			
9,900.00	9,692.17	9,532.79	9,273.85	21.83	20.59	-70.86	244.72	-771.83	1,238.99	1,196.58	42.41	29.213			
9,950.00	9,704.02	9,563.71	9,277.90	21.99	20.75	-70.34	275.38	-772.28	1,242.15	1,199.40	42.75	29.058			
10,000.00	9,711.61	9,600.00	9,280.53	22.21	20.96	-69.98	311.56	-772.69	1,244.30	1,201.13	43.18	28.819			
10,050.00	9,714.88	9,627.94	9,281.00	22.47	21.14	-69.81	339.49	-772.91	1,245.38	1,201.77	43.61	28.557			
10,066.88	9,715.00	9,640.56	9,280.91	22.57	21.22	-69.80	352.11	-772.98	1,245.49	1,201.70	43.79	28.442			
10,100.00	9,714.77	9,673.88	9,280.65	22.77	21.45	-69.80	385.43	-773.19	1,245.51	1,201.29	44.22	28.167			
10,200.00	9,714.06	9,773.88	9,279.90	23.46	22.20	-69.80	485.43	-773.81	1,245.57	1,199.90	45.67	27.275			
10,300.00	9,713.35	9,873.88	9,279.15	24.27	23.07	-69.79	585.42	-774.43	1,245.62	1,198.28	47.34	26.310			
10,400.00	9,712.63	9,973.88	9,278.39	25.19	24.04	-69.79	685.42	-775.05	1,245.68	1,196.45	49.23	25.303			
10,500.00	9,711.92	10,073.88	9,277.64	26.20	25.10	-69.79	785.41	-775.66	1,245.74	1,194.43	51.30	24.282			
10,600.00	9,711.21	10,173.88	9,276.88	27.29	26.25	-69.79	885.41	-776.28	1,245.79	1,192.25	53.54	23.268			
10,700.00	9,710.50	10,273.88	9,276.13	28.46	27.47	-69.79	985.40	-776.90	1,245.85	1,189.93	55.92	22.278			
10,800.00	9,709.79	10,373.88	9,275.37	29.69	28.75	-69.79	1,085.40	-777.52	1,245.91	1,187.47	58.44	21.321			
10,900.00	9,709.08	10,473.88	9,274.62	30.98	30.09	-69.79	1,185.39	-778.14	1,245.97	1,184.90	61.06	20.405			
11,000.00	9,708.37	10,573.88	9,273.86	32.31	31.47	-69.79	1,285.39	-778.76	1,246.02	1,182.24	63.79	19.534			
11,100.00	9,707.66	10,673.88	9,273.11	33.70	32.90	-69.79	1,385.38	-779.38	1,246.08	1,179.48	66.60	18.710			
11,200.00	9,706.95	10,773.88	9,272.36	35.12	34.37	-69.78	1,485.38	-779.99	1,246.14	1,176.65	69.49	17.933			
11,300.00	9,706.24	10,873.88	9,271.60	36.58	35.86	-69.78	1,585.37	-780.61	1,246.19	1,173.75	72.45	17.202			
11,400.00	9,705.53	10,973.88	9,270.85	38.07	37.39	-69.78	1,685.37	-781.23	1,246.25	1,170.79	75.46	16.515			
11,500.00	9,704.82	11,073.88	9,270.09	39.59	38.94	-69.78	1,785.37	-781.85	1,246.31	1,167.77	78.53	15.870			
11,600.00	9,704.11	11,173.88	9,269.34	41.13	40.52	-69.78	1,885.36	-782.47	1,246.37	1,164.71	81.65	15.264			
11,700.00	9,703.40	11,273.88	9,268.58	42.70	42.11	-69.78	1,985.36	-783.09	1,246.42	1,161.61	84.81	14.696			
11,800.00	9,702.69	11,373.88	9,267.83	44.28	43.73	-69.78	2,085.35	-783.71	1,246.48	1,158.47	88.01	14.163			
11,900.00	9,701.98	11,473.88	9,267.07	45.88	45.36	-69.78	2,185.35	-784.32	1,246.54	1,155.30	91.24	13.662			
12,000.00	9,701.27	11,573.88	9,266.32	47.50	47.00	-69.77	2,285.34	-784.94	1,246.59	1,152.09	94.50	13.191			
12,100.00	9,700.56	11,673.88	9,265.57	49.13	48.65	-69.77	2,385.34	-785.56	1,246.65	1,148.86	97.79	12.748			
12,200.00	9,699.85	11,773.88	9,264.81	50.78	50.32	-69.77	2,485.33	-786.18	1,246.71	1,145.61	101.10	12.331			
12,300.00	9,699.14	11,873.88	9,264.06	52.44	52.00	-69.77	2,585.33	-786.80	1,246.77	1,142.33	104.44	11.938			
12,400.00	9,698.43	11,973.88	9,263.30	54.10	53.69	-69.77	2,685.32	-787.42	1,246.82	1,139.03	107.79	11.567			
12,500.00	9,697.72	12,073.88	9,262.55	55.78	55.38	-69.77	2,785.32	-788.04	1,246.88	1,135.71	111.17	11.216			
12,600.00	9,697.00	12,173.88	9,261.79	57.47	57.09	-69.77	2,885.31	-788.65	1,246.94	1,132.38	114.56	10.885			
12,700.00	9,696.29	12,273.88	9,261.04	59.16	58.80	-69.77	2,985.31	-789.27	1,247.00	1,129.03	117.96	10.571			
12,800.00	9,695.58	12,373.88	9,260.28	60.87	60.52	-69.77	3,085.30	-789.89	1,247.05	1,125.67	121.38	10.274			
12,900.00	9,694.87	12,473.88	9,259.53	62.57	62.24	-69.76	3,185.30	-790.51	1,247.11	1,122.29	124.82	9.992			
13,000.00	9,694.16	12,573.88	9,258.78	64.29	63.97	-69.76	3,285.29	-791.13	1,247.17	1,118.91	128.26	9.724			
13,100.00	9,693.45	12,673.88	9,258.02	66.01	65.71	-69.76	3,385.29	-791.75	1,247.22	1,115.51	131.72	9.469			
13,200.00	9,692.74	12,773.88	9,257.27	67.74	67.45	-69.76	3,485.28	-792.37	1,247.28	1,112.10	135.18	9.227			
13,300.00	9,692.03	12,873.88	9,256.51	69.47	69.19	-69.76	3,585.28	-792.98	1,247.34	1,108.68	138.66	8.996			
13,400.00	9,691.32	12,973.88	9,255.76	71.20	70.94	-69.76	3,685.27	-793.60	1,247.40	1,105.25	142.14	8.776			
13,500.00	9,690.61	13,073.88	9,255.00	72.94	72.69	-69.76	3,785.27	-794.22	1,247.45	1,101.82	145.63	8.566			
13,600.00	9,689.90	13,173.88	9,254.25	74.69	74.44	-69.76	3,885.26	-794.84	1,247.51	1,098.38	149.13	8.365			
13,700.00	9,689.19	13,273.88	9,253.49	76.44	76.20	-69.75	3,985.26	-795.46	1,247.57	1,094.93	152.64	8.173			
13,800.00	9,688.48	13,373.88	9,252.74	78.19	77.96	-69.75	4,085.26	-796.08	1,247.62	1,091.47	156.15	7.990			
13,900.00	9,687.77	13,473.88	9,251.99	79.94	79.73	-69.75	4,185.25	-796.70	1,247.68	1,088.01	159.67	7.814			
14,000.00	9,687.06	13,573.88	9,251.23	81.70	81.50	-69.75	4,285.25	-797.31	1,247.74	1,084.54	163.20	7.646			
14,100.00	9,686.35	13,673.88	9,250.48	83.46	83.26	-69.75	4,385.24	-797.93	1,247.80	1,081.07	166.73	7.484			
14,200.00	9,685.64	13,773.88	9,249.72	85.22	85.04	-69.75	4,485.24	-798.55	1,247.85	1,077.59	170.26	7.329			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1													Offset Site Error:	0.00 usft
Survey Program: 0-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Distance		Warning						
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Tooface (")	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
14,300.00	9,684.93	13,873.88	9,248.97	86.99	86.81	-69.75	4,585.23	-799.17	1,247.91	1,074.11	173.80	7.180		
14,400.00	9,684.22	13,973.88	9,248.21	88.76	88.59	-69.75	4,685.23	-799.79	1,247.97	1,070.62	177.34	7.037		
14,500.00	9,683.51	14,073.88	9,247.46	90.53	90.36	-69.75	4,785.22	-800.41	1,248.03	1,067.13	180.89	6.899		
14,600.00	9,682.80	14,173.88	9,246.70	92.30	92.14	-69.74	4,885.22	-801.03	1,248.08	1,063.64	184.44	6.767		
14,700.00	9,682.08	14,273.88	9,245.95	94.08	93.92	-69.74	4,985.21	-801.64	1,248.14	1,060.14	188.00	6.639		
14,800.00	9,681.37	14,373.88	9,245.20	95.85	95.71	-69.74	5,085.21	-802.26	1,248.20	1,056.64	191.56	6.516		
14,900.00	9,680.66	14,473.88	9,244.44	97.63	97.49	-69.74	5,185.20	-802.88	1,248.25	1,053.13	195.12	6.397		
15,000.00	9,679.95	14,573.88	9,243.69	99.41	99.28	-69.74	5,285.20	-803.50	1,248.31	1,049.62	198.69	6.283		
15,100.00	9,679.24	14,673.88	9,242.93	101.19	101.07	-69.74	5,385.19	-804.12	1,248.37	1,046.11	202.26	6.172		
15,200.00	9,678.53	14,773.88	9,242.18	102.97	102.85	-69.74	5,485.19	-804.74	1,248.43	1,042.60	205.83	6.065		
15,300.00	9,677.82	14,873.88	9,241.42	104.76	104.64	-69.74	5,585.18	-805.36	1,248.48	1,039.08	209.40	5.962		
15,400.00	9,677.11	14,973.88	9,240.67	106.54	106.43	-69.73	5,685.18	-805.97	1,248.54	1,035.56	212.98	5.862		
15,500.00	9,676.40	15,073.88	9,239.91	108.33	108.23	-69.73	5,785.17	-806.59	1,248.60	1,032.04	216.56	5.766		
15,600.00	9,675.69	15,173.88	9,239.16	110.12	110.02	-69.73	5,885.17	-807.21	1,248.65	1,028.52	220.14	5.672		
15,700.00	9,674.98	15,273.88	9,238.40	111.91	111.81	-69.73	5,985.16	-807.83	1,248.71	1,024.99	223.72	5.582		
15,800.00	9,674.27	15,373.88	9,237.65	113.70	113.61	-69.73	6,085.16	-808.45	1,248.77	1,021.46	227.31	5.494		
15,900.00	9,673.56	15,473.88	9,236.90	115.49	115.41	-69.73	6,185.15	-809.07	1,248.83	1,017.93	230.89	5.409		
16,000.00	9,672.85	15,573.88	9,236.14	117.28	117.20	-69.73	6,285.15	-809.69	1,248.88	1,014.40	234.48	5.326		
16,100.00	9,672.14	15,673.88	9,235.39	119.07	119.00	-69.73	6,385.15	-810.30	1,248.94	1,010.87	238.07	5.246		
16,200.00	9,671.43	15,773.88	9,234.63	120.87	120.80	-69.72	6,485.14	-810.92	1,249.00	1,007.33	241.67	5.168		
16,300.00	9,670.72	15,873.88	9,233.88	122.66	122.60	-69.72	6,585.14	-811.54	1,249.06	1,003.79	245.26	5.093		
16,400.00	9,670.01	15,973.88	9,233.12	124.46	124.40	-69.72	6,685.13	-812.16	1,249.11	1,000.25	248.86	5.019		
16,500.00	9,669.30	16,073.88	9,232.37	126.26	126.20	-69.72	6,785.13	-812.78	1,249.17	996.71	252.46	4.948		
16,600.00	9,668.59	16,173.88	9,231.61	128.05	128.00	-69.72	6,885.12	-813.40	1,249.23	993.17	256.05	4.879		
16,700.00	9,667.88	16,273.88	9,230.86	129.85	129.80	-69.72	6,985.12	-814.02	1,249.28	989.63	259.66	4.811		
16,800.00	9,667.17	16,373.88	9,230.11	131.65	131.61	-69.72	7,085.11	-814.63	1,249.34	986.08	263.26	4.746		
16,900.00	9,666.45	16,473.88	9,229.35	133.45	133.41	-69.72	7,185.11	-815.25	1,249.40	982.54	266.86	4.682		
17,000.00	9,665.74	16,573.88	9,228.60	135.25	135.21	-69.72	7,285.10	-815.87	1,249.46	978.99	270.46	4.620		
17,100.00	9,665.03	16,673.88	9,227.84	137.05	137.02	-69.71	7,385.10	-816.49	1,249.51	975.44	274.07	4.559		
17,200.00	9,664.32	16,773.88	9,227.09	138.85	138.82	-69.71	7,485.09	-817.11	1,249.57	971.89	277.68	4.500		
17,300.00	9,663.61	16,873.88	9,226.33	140.66	140.63	-69.71	7,585.09	-817.73	1,249.63	968.34	281.28	4.443		
17,400.00	9,662.90	16,973.88	9,225.58	142.46	142.43	-69.71	7,685.08	-818.35	1,249.68	964.79	284.89	4.387		
17,500.00	9,662.19	17,073.88	9,224.82	144.26	144.24	-69.71	7,785.08	-818.96	1,249.74	961.24	288.50	4.332		
17,600.00	9,661.48	17,173.88	9,224.07	146.07	146.05	-69.71	7,885.07	-819.58	1,249.80	957.69	292.11	4.278		
17,700.00	9,660.77	17,273.88	9,223.32	147.87	147.85	-69.71	7,985.07	-820.20	1,249.86	954.13	295.72	4.226		
17,800.00	9,660.06	17,373.88	9,222.56	149.68	149.66	-69.71	8,085.06	-820.82	1,249.91	950.58	299.34	4.176		
17,900.00	9,659.35	17,473.88	9,221.81	151.48	151.47	-69.70	8,185.06	-821.44	1,249.97	947.02	302.95	4.126		
18,000.00	9,658.64	17,573.88	9,221.05	153.29	153.28	-69.70	8,285.05	-822.06	1,250.03	943.46	306.56	4.078		
18,100.00	9,657.93	17,673.88	9,220.30	155.09	155.09	-69.70	8,385.05	-822.68	1,250.09	939.91	310.18	4.030		
18,200.00	9,657.22	17,773.88	9,219.54	156.90	156.90	-69.70	8,485.05	-823.30	1,250.14	936.35	313.79	3.984		
18,300.00	9,656.51	17,873.88	9,218.79	158.71	158.70	-69.70	8,585.04	-823.91	1,250.20	932.79	317.41	3.939		
18,400.00	9,655.80	17,973.88	9,218.03	160.51	160.51	-69.70	8,685.04	-824.53	1,250.26	929.23	321.03	3.895		
18,500.00	9,655.09	18,073.88	9,217.28	162.32	162.32	-69.70	8,785.03	-825.15	1,250.31	925.67	324.65	3.851		
18,600.00	9,654.38	18,173.88	9,216.53	164.13	164.14	-69.70	8,885.03	-825.77	1,250.37	922.11	328.27	3.809		
18,700.00	9,653.67	18,273.88	9,215.77	165.94	165.95	-69.70	8,985.02	-826.39	1,250.43	918.54	331.88	3.768		
18,800.00	9,652.96	18,373.88	9,215.02	167.75	167.76	-69.69	9,085.02	-827.01	1,250.49	914.98	335.50	3.727		
18,900.00	9,652.25	18,473.88	9,214.26	169.56	169.57	-69.69	9,185.01	-827.63	1,250.54	911.42	339.12	3.688		
19,000.00	9,651.54	18,573.88	9,213.51	171.37	171.38	-69.69	9,285.01	-828.24	1,250.60	907.85	342.75	3.649		
19,100.00	9,650.82	18,673.88	9,212.75	173.18	173.19	-69.69	9,385.00	-828.86	1,250.66	904.29	346.37	3.611		
19,200.00	9,650.11	18,773.88	9,212.00	174.99	175.00	-69.69	9,485.00	-829.48	1,250.71	900.73	349.99	3.574		
19,300.00	9,649.40	18,873.88	9,211.24	176.80	176.57	-69.69	9,584.99	-830.10	1,250.77	897.41	353.37	3.540		
19,400.00	9,648.69	18,973.88	9,211.00	178.61	177.05	-69.69	9,617.40	-830.30	1,252.65	897.00	355.86	3.522 SF		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1													Offset Site Error:	0.00 usft
Survey Program: 0-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance						Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
19,500.00	9,647.98	18,906.29	9,211.00	180.42	177.05	-69.69	9,617.40	-830.30	1,262.06	904.60	357.47	3.531		
19,600.00	9,647.27	18,906.29	9,211.00	182.23	177.05	-69.69	9,617.40	-830.30	1,279.24	919.97	359.28	3.561		
19,700.00	9,646.56	18,906.29	9,211.00	184.04	177.05	-69.69	9,617.40	-830.30	1,303.89	942.80	361.09	3.611		
19,800.00	9,645.85	18,906.29	9,211.00	185.85	177.05	-69.69	9,617.40	-830.30	1,335.59	972.68	362.90	3.680		
19,900.00	9,645.14	18,906.29	9,211.00	187.66	177.05	-69.69	9,617.40	-830.30	1,373.84	1,009.13	364.71	3.767		
19,919.80	9,645.00	18,906.29	9,211.00	187.96	177.05	-69.69	9,617.40	-830.30	1,382.15	1,017.14	365.01	3.787		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report

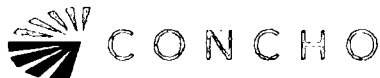


Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design													Offset Site Error:	0.00 usft
Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1													Offset Well Error:	0.00 usft
Survey Program: 0-MWD														
Reference		Offset		Semi Major Axis			Distance				Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)		Minimum Separation (usft)	Separation Factor	
0.00	0.00	0.00	0.00	0.00	0.00	-90.38	-0.80	-120.00	120.04					
100.00	100.00	97.00	97.00	0.08	0.08	-90.38	-0.80	-120.00	120.00	119.84	0.16	732.473		
200.00	200.00	197.00	197.00	0.31	0.30	-90.38	-0.80	-120.00	120.00	119.39	0.61	197.011		
300.00	300.00	297.00	297.00	0.53	0.53	-90.38	-0.80	-120.00	120.00	118.94	1.06	113.355		
400.00	400.00	397.00	397.00	0.76	0.75	-90.38	-0.80	-120.00	120.00	118.49	1.51	79.568		
500.00	500.00	497.00	497.00	0.98	0.98	-90.38	-0.80	-120.00	120.00	118.04	1.96	61.297		
600.00	600.00	597.00	597.00	1.21	1.20	-90.38	-0.80	-120.00	120.00	117.60	2.41	49.851		
700.00	700.00	697.00	697.00	1.43	1.43	-90.38	-0.80	-120.00	120.00	117.15	2.86	42.006		
800.00	800.00	797.00	797.00	1.66	1.65	-90.38	-0.80	-120.00	120.00	116.70	3.31	36.295		
900.00	900.00	897.00	897.00	1.88	1.87	-90.38	-0.80	-120.00	120.00	116.25	3.76	31.951		
1,000.00	1,000.00	997.00	997.00	2.11	2.10	-90.38	-0.80	-120.00	120.00	115.80	4.21	28.536		
1,100.00	1,100.00	1,097.00	1,097.00	2.33	2.32	-90.38	-0.80	-120.00	120.00	115.35	4.65	25.780		
1,200.00	1,200.00	1,197.00	1,197.00	2.56	2.55	-90.38	-0.80	-120.00	120.00	114.90	5.10	23.509		
1,300.00	1,300.00	1,297.00	1,297.00	2.78	2.77	-90.38	-0.80	-120.00	120.00	114.45	5.55	21.607		
1,400.00	1,400.00	1,397.00	1,397.00	3.01	3.00	-90.38	-0.80	-120.00	120.00	114.00	6.00	19.989		
1,500.00	1,500.00	1,497.00	1,497.00	3.23	3.22	-90.38	-0.80	-120.00	120.00	113.55	6.45	18.596		
1,600.00	1,600.00	1,597.00	1,597.00	3.45	3.45	-90.38	-0.80	-120.00	120.00	113.10	6.90	17.385		
1,700.00	1,700.00	1,697.00	1,697.00	3.68	3.67	-90.38	-0.80	-120.00	120.00	112.65	7.35	16.322		
1,800.00	1,800.00	1,797.00	1,797.00	3.90	3.90	-90.38	-0.80	-120.00	120.00	112.20	7.80	15.382		
1,900.00	1,900.00	1,897.00	1,897.00	4.13	4.12	-90.38	-0.80	-120.00	120.00	111.75	8.25	14.544		
2,000.00	2,000.00	1,997.00	1,997.00	4.35	4.35	-90.38	-0.80	-120.00	120.00	111.30	8.70	13.792		
2,100.00	2,100.00	2,097.00	2,097.00	4.58	4.57	-90.38	-0.80	-120.00	120.00	110.85	9.15	13.115		
2,200.00	2,200.00	2,197.00	2,197.00	4.80	4.80	-90.38	-0.80	-120.00	120.00	110.40	9.60	12.501		
2,300.00	2,300.00	2,297.00	2,297.00	5.03	5.02	-90.38	-0.80	-120.00	120.00	109.95	10.05	11.941		
2,400.00	2,400.00	2,397.00	2,397.00	5.25	5.25	-90.38	-0.80	-120.00	120.00	109.50	10.50	11.430		
2,500.00	2,500.00	2,497.00	2,497.00	5.48	5.47	-90.38	-0.80	-120.00	120.00	109.05	10.95	10.961		
2,600.00	2,600.00	2,597.00	2,597.00	5.70	5.70	-90.38	-0.80	-120.00	120.00	108.60	11.40	10.529		
2,700.00	2,700.00	2,697.00	2,697.00	5.93	5.92	-90.38	-0.80	-120.00	120.00	108.16	11.85	10.129		
2,800.00	2,800.00	2,797.00	2,797.00	6.15	6.15	-90.38	-0.80	-120.00	120.00	107.71	12.30	9.759		
2,900.00	2,900.00	2,897.00	2,897.00	6.38	6.37	-90.38	-0.80	-120.00	120.00	107.26	12.75	9.415		
3,000.00	3,000.00	2,997.00	2,997.00	6.60	6.59	-90.38	-0.80	-120.00	120.00	106.81	13.20	9.094		
3,100.00	3,100.00	3,097.00	3,097.00	6.83	6.82	-90.38	-0.80	-120.00	120.00	106.36	13.65	8.794		
3,200.00	3,200.00	3,197.00	3,197.00	7.05	7.04	-90.38	-0.80	-120.00	120.00	105.91	14.10	8.514		
3,300.00	3,300.00	3,297.00	3,297.00	7.28	7.27	-90.38	-0.80	-120.00	120.00	105.46	14.54	8.251		
3,400.00	3,400.00	3,397.00	3,397.00	7.50	7.49	-90.38	-0.80	-120.00	120.00	105.01	14.99	8.003		
3,500.00	3,500.00	3,497.00	3,497.00	7.73	7.72	-90.38	-0.80	-120.00	120.00	104.56	15.44	7.770		
3,600.00	3,600.00	3,597.00	3,597.00	7.95	7.94	-90.38	-0.80	-120.00	120.00	104.11	15.89	7.551		
3,700.00	3,700.00	3,697.00	3,697.00	8.17	8.17	-90.38	-0.80	-120.00	120.00	103.66	16.34	7.343		
3,800.00	3,800.00	3,797.00	3,797.00	8.40	8.39	-90.38	-0.80	-120.00	120.00	103.21	16.79	7.148		
3,900.00	3,900.00	3,897.00	3,897.00	8.62	8.62	-90.38	-0.80	-120.00	120.00	102.76	17.24	6.960		
4,000.00	4,000.00	3,997.00	3,997.00	8.85	8.84	-90.38	-0.80	-120.00	120.00	102.31	17.69	6.783		
4,100.00	4,100.00	4,097.00	4,097.00	9.07	9.07	-90.38	-0.80	-120.00	120.00	101.86	18.14	6.615		
4,200.00	4,200.00	4,197.00	4,197.00	9.30	9.29	-90.38	-0.80	-120.00	120.00	101.41	18.59	6.455		
4,300.00	4,300.00	4,297.00	4,297.00	9.52	9.52	-90.38	-0.80	-120.00	120.00	100.96	19.04	6.303		
4,400.00	4,400.00	4,397.00	4,397.00	9.75	9.74	-90.38	-0.80	-120.00	120.00	100.51	19.49	6.157		
4,500.00	4,500.00	4,497.00	4,497.00	9.97	9.97	-90.38	-0.80	-120.00	120.00	100.06	19.94	6.018 CC, ES		
4,600.00	4,599.98	4,596.98	4,596.98	10.18	10.19	148.73	-0.80	-120.00	121.49	101.12	20.37	5.965		
4,700.00	4,699.84	4,696.84	4,696.84	10.36	10.42	149.92	-0.80	-120.00	125.99	105.22	20.78	6.065		
4,762.40	4,762.03	4,759.03	4,759.03	10.48	10.56	150.99	-0.80	-120.00	130.37	109.34	21.03	6.199		
4,800.00	4,799.48	4,796.48	4,796.48	10.55	10.64	151.70	-0.80	-120.00	133.40	112.21	21.19	6.296		
4,900.00	4,899.06	4,896.06	4,896.06	10.74	10.86	153.46	-0.80	-120.00	141.52	119.92	21.60	6.551		
5,000.00	4,998.64	4,995.64	4,995.64	10.94	11.09	155.02	-0.80	-120.00	149.77	127.74	22.02	6.800		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Distance							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
5,100.00	5,098.22	5,094.06	5,094.04	11.14	11.28	155.86	-2.25	-120.54	158.46	136.04	22.42	7.068	
5,200.00	5,197.80	5,192.33	5,192.18	11.34	11.45	155.48	-6.85	-122.24	167.94	145.15	22.79	7.369	
5,300.00	5,297.38	5,290.78	5,290.30	11.55	11.62	154.14	-14.45	-125.05	178.22	155.05	23.17	7.693	
5,400.00	5,396.96	5,390.12	5,389.23	11.76	11.79	152.71	-22.81	-128.14	188.79	165.25	23.55	8.018	
5,500.00	5,496.54	5,489.45	5,488.17	11.97	11.97	151.44	-31.18	-131.24	199.47	175.54	23.94	8.334	
5,600.00	5,596.12	5,588.79	5,587.10	12.18	12.15	150.29	-39.54	-134.33	210.24	185.91	24.33	8.641	
5,700.00	5,695.70	5,688.12	5,686.04	12.40	12.33	149.26	-47.90	-137.42	221.08	196.35	24.73	8.939	
5,800.00	5,795.28	5,787.46	5,784.97	12.62	12.52	148.33	-56.26	-140.52	231.99	206.85	25.14	9.228	
5,900.00	5,894.86	5,886.79	5,883.91	12.84	12.71	147.48	-64.63	-143.61	242.95	217.40	25.55	9.508	
6,000.00	5,994.45	5,986.13	5,982.84	13.07	12.90	146.70	-72.99	-146.71	253.96	227.99	25.97	9.779	
6,100.00	6,094.03	6,085.46	6,081.78	13.29	13.10	145.98	-81.35	-149.80	265.01	238.62	26.39	10.041	
6,200.00	6,193.61	6,184.80	6,180.71	13.52	13.30	145.33	-89.72	-152.89	276.10	249.28	26.82	10.293	
6,300.00	6,293.19	6,284.14	6,279.64	13.75	13.50	144.72	-98.08	-155.99	287.22	259.97	27.26	10.538	
6,400.00	6,392.77	6,383.47	6,378.58	13.99	13.71	144.16	-106.44	-159.08	298.38	270.68	27.69	10.774	
6,500.00	6,492.35	6,482.81	6,477.51	14.22	13.92	143.64	-114.81	-162.17	309.55	281.42	28.14	11.002	
6,600.00	6,591.93	6,582.14	6,576.45	14.46	14.13	143.16	-123.17	-165.27	320.76	292.17	28.58	11.222	
6,700.00	6,691.51	6,681.48	6,675.38	14.70	14.34	142.71	-131.53	-168.36	331.98	302.94	29.03	11.434	
6,800.00	6,791.09	6,780.81	6,774.32	14.93	14.55	142.29	-139.90	-171.46	343.22	313.73	29.49	11.639	
6,900.00	6,890.67	6,880.15	6,873.25	15.18	14.77	141.89	-148.26	-174.55	354.48	324.53	29.95	11.837	
7,000.00	6,990.25	6,979.48	6,972.19	15.42	14.99	141.52	-156.62	-177.64	365.75	335.35	30.41	12.029	
7,100.00	7,089.83	7,078.82	7,071.12	15.66	15.21	141.17	-164.99	-180.74	377.04	346.17	30.87	12.213	
7,200.00	7,189.42	7,178.16	7,170.05	15.91	15.43	140.85	-173.35	-183.83	388.34	357.01	31.34	12.392	
7,300.00	7,289.00	7,277.49	7,268.99	16.15	15.66	140.54	-181.71	-186.92	399.66	367.85	31.81	12.564	
7,400.00	7,388.58	7,376.83	7,367.92	16.40	15.88	140.25	-190.08	-190.02	410.98	378.70	32.28	12.731	
7,500.00	7,488.16	7,476.16	7,466.86	16.65	16.11	139.97	-198.44	-193.11	422.32	389.56	32.76	12.892	
7,600.00	7,587.74	7,575.50	7,565.79	16.90	16.34	139.71	-206.80	-196.21	433.66	400.42	33.24	13.048	
7,700.00	7,687.32	7,674.83	7,664.73	17.15	16.57	139.46	-215.17	-199.30	445.01	411.30	33.72	13.198	
7,800.00	7,786.90	7,774.17	7,763.66	17.40	16.80	139.22	-223.53	-202.39	456.37	422.17	34.20	13.344	
7,900.00	7,886.48	7,873.50	7,862.59	17.65	17.04	139.00	-231.89	-205.49	467.74	433.05	34.69	13.485	
8,000.00	7,986.06	7,972.84	7,961.53	17.90	17.27	138.78	-240.26	-208.58	479.11	443.94	35.17	13.621	
8,100.00	8,085.64	8,072.17	8,060.46	18.15	17.51	138.58	-248.62	-211.68	490.49	454.83	35.66	13.753	
8,200.00	8,185.22	8,171.51	8,159.40	18.41	17.75	138.38	-256.98	-214.77	501.88	465.73	36.16	13.881	
8,300.00	8,284.80	8,270.85	8,258.33	18.66	17.99	138.20	-265.35	-217.86	513.27	476.62	36.65	14.005	
8,400.00	8,384.39	8,370.18	8,357.27	18.92	18.23	138.02	-273.71	-220.96	524.67	487.52	37.15	14.125	
8,500.00	8,483.97	8,469.52	8,456.20	19.18	18.47	137.85	-282.07	-224.05	536.07	498.43	37.64	14.241	
8,600.00	8,583.55	8,568.85	8,555.14	19.43	18.71	137.68	-290.44	-227.14	547.48	509.34	38.14	14.353	
8,700.00	8,683.13	8,668.19	8,654.07	19.69	18.95	137.53	-298.80	-230.24	558.89	520.25	38.64	14.463	
8,800.00	8,782.71	8,767.52	8,753.00	19.95	19.20	137.38	-307.16	-233.33	570.30	531.16	39.15	14.569	
8,900.00	8,882.29	8,866.86	8,851.94	20.21	19.44	137.23	-315.53	-236.43	581.72	542.07	39.65	14.671	
9,000.00	8,981.87	8,964.85	8,949.68	20.47	19.69	137.07	-316.99	-240.16	591.87	551.71	40.16	14.738	
9,100.00	9,081.45	9,100.70	9,083.21	20.73	19.84	140.65	-295.27	-243.91	598.95	558.38	40.57	14.763	
9,135.13	9,116.43	9,138.24	9,118.79	20.82	19.87	141.99	-283.37	-245.12	601.15	560.46	40.69	14.773	
9,150.00	9,131.25	9,153.63	9,133.14	20.86	19.88	158.47	-277.82	-245.61	602.13	561.38	40.74	14.780	
9,200.00	9,181.07	9,204.09	9,179.04	20.97	19.91	-143.72	-256.96	-247.20	605.82	564.94	40.88	14.819	
9,250.00	9,230.61	9,252.75	9,221.40	21.07	19.93	-118.52	-233.09	-248.70	610.15	569.15	41.00	14.882	
9,300.00	9,279.48	9,299.81	9,260.29	21.16	19.94	-107.28	-206.66	-250.11	615.05	573.95	41.10	14.965	
9,350.00	9,327.33	9,345.44	9,295.82	21.24	19.94	-100.57	-178.08	-251.42	620.45	579.26	41.19	15.065	
9,400.00	9,373.77	9,389.80	9,328.07	21.31	19.95	-95.77	-147.65	-252.64	626.25	584.99	41.26	15.178	
9,450.00	9,418.47	9,433.05	9,357.16	21.37	19.96	-91.99	-115.68	-253.76	632.36	591.03	41.33	15.302	
9,500.00	9,461.07	9,475.30	9,383.17	21.42	19.97	-88.82	-82.41	-254.80	638.68	597.29	41.39	15.431	
9,550.00	9,501.27	9,516.68	9,406.19	21.46	20.00	-86.07	-48.06	-255.75	645.09	603.64	41.45	15.562	
9,600.00	9,538.74	9,557.28	9,426.32	21.49	20.04	-83.65	-12.82	-256.62	651.51	609.98	41.53	15.689	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
9,650.00	9,573.20	9,600.00	9,444.76	21.52	20.10	-81.42	25.70	-257.45	657.82	616.19	41.63	15.803	
9,700.00	9,604.40	9,636.48	9,458.19	21.56	20.19	-79.56	59.61	-258.09	663.92	622.17	41.75	15.904	
9,750.00	9,632.09	9,675.24	9,470.06	21.59	20.30	-77.84	96.49	-258.70	669.73	627.84	41.89	15.987	
9,800.00	9,656.07	9,713.52	9,479.32	21.64	20.43	-76.30	133.62	-259.23	675.16	633.09	42.07	16.048	
9,850.00	9,676.15	9,750.00	9,485.82	21.71	20.57	-74.98	169.51	-259.66	680.14	637.85	42.28	16.085	
9,900.00	9,692.17	9,788.86	9,490.22	21.83	20.75	-73.77	208.11	-260.05	684.58	642.01	42.57	16.080	
9,950.00	9,704.02	9,826.03	9,491.97	21.99	20.93	-72.77	245.23	-260.34	688.43	645.51	42.92	16.039	
10,000.00	9,711.61	9,870.90	9,491.72	22.21	21.18	-71.89	290.10	-260.62	691.46	648.07	43.39	15.936	
10,050.00	9,714.88	9,920.74	9,491.27	22.47	21.48	-71.45	339.94	-260.92	692.92	648.96	43.96	15.764	
10,066.68	9,715.00	9,937.42	9,491.12	22.57	21.60	-71.41	356.61	-261.02	693.03	648.86	44.17	15.692	
10,100.00	9,714.77	9,970.74	9,490.82	22.77	21.82	-71.41	389.93	-261.22	693.06	648.47	44.59	15.542	
10,200.00	9,714.06	10,070.74	9,489.92	23.46	22.59	-71.39	489.93	-261.83	693.15	647.10	46.05	15.051	
10,300.00	9,713.35	10,170.74	9,489.01	24.27	23.47	-71.38	589.92	-262.43	693.24	645.50	47.75	14.520	
10,400.00	9,712.63	10,270.74	9,488.11	25.19	24.46	-71.37	689.91	-263.04	693.34	643.69	49.65	13.966	
10,500.00	9,711.92	10,370.74	9,487.20	26.20	25.53	-71.35	789.91	-263.64	693.43	641.70	51.73	13.405	
10,600.00	9,711.21	10,470.74	9,486.30	27.29	26.69	-71.34	889.90	-264.25	693.52	639.54	53.98	12.848	
10,700.00	9,710.50	10,570.74	9,485.39	28.46	27.92	-71.32	989.89	-264.86	693.61	637.24	56.37	12.304	
10,800.00	9,709.79	10,670.74	9,484.49	29.69	29.21	-71.31	1,089.89	-265.46	693.71	634.81	58.89	11.779	
10,900.00	9,709.08	10,770.74	9,483.58	30.98	30.55	-71.29	1,189.88	-266.07	693.80	632.27	61.53	11.276	
11,000.00	9,708.37	10,870.74	9,482.68	32.31	31.94	-71.28	1,289.88	-266.67	693.89	629.63	64.26	10.798	
11,100.00	9,707.66	10,970.74	9,481.78	33.70	33.38	-71.27	1,389.87	-267.28	693.98	626.91	67.08	10.346	
11,200.00	9,706.95	11,070.74	9,480.87	35.12	34.85	-71.25	1,489.86	-267.88	694.07	624.10	69.97	9.919	
11,300.00	9,706.24	11,170.74	9,479.97	36.58	36.35	-71.24	1,589.86	-268.49	694.17	621.23	72.93	9.518	
11,400.00	9,705.53	11,270.74	9,479.06	38.07	37.88	-71.22	1,689.85	-269.09	694.26	618.31	75.95	9.141	
11,500.00	9,704.82	11,370.74	9,478.16	39.59	39.44	-71.21	1,789.85	-269.70	694.35	615.33	79.03	8.786	
11,600.00	9,704.11	11,470.74	9,477.25	41.13	41.01	-71.19	1,889.84	-270.31	694.44	612.30	82.15	8.454	
11,700.00	9,703.40	11,570.74	9,476.35	42.70	42.61	-71.18	1,989.83	-270.91	694.54	609.23	85.31	8.141	
11,800.00	9,702.69	11,670.74	9,475.45	44.28	44.23	-71.17	2,089.83	-271.52	694.63	606.12	88.51	7.848	
11,900.00	9,701.98	11,770.74	9,474.54	45.88	45.86	-71.15	2,189.82	-272.12	694.72	602.98	91.74	7.573	
12,000.00	9,701.27	11,870.74	9,473.64	47.50	47.50	-71.14	2,289.82	-272.73	694.82	599.81	95.00	7.314	
12,100.00	9,700.56	11,970.74	9,472.73	49.13	49.16	-71.12	2,389.81	-273.33	694.91	596.61	98.29	7.070	
12,200.00	9,699.85	12,070.74	9,471.83	50.78	50.83	-71.11	2,489.80	-273.94	695.00	593.39	101.61	6.840	
12,300.00	9,699.14	12,170.74	9,470.92	52.44	52.51	-71.09	2,589.80	-274.55	695.09	590.15	104.94	6.624	
12,400.00	9,698.43	12,270.74	9,470.02	54.10	54.19	-71.08	2,689.79	-275.15	695.19	586.89	108.30	6.419	
12,500.00	9,697.72	12,370.74	9,469.12	55.78	55.89	-71.07	2,789.78	-275.76	695.28	583.61	111.67	6.226	
12,600.00	9,697.00	12,470.74	9,468.21	57.47	57.60	-71.05	2,889.78	-276.36	695.37	580.31	115.07	6.043	
12,700.00	9,696.29	12,570.74	9,467.31	59.16	59.31	-71.04	2,989.77	-276.97	695.47	576.99	118.47	5.870	
12,800.00	9,695.58	12,670.74	9,466.40	60.87	61.03	-71.02	3,089.77	-277.57	695.56	573.67	121.89	5.706	
12,900.00	9,694.87	12,770.74	9,465.50	62.57	62.75	-71.01	3,189.76	-278.18	695.65	570.33	125.33	5.551	
13,000.00	9,694.16	12,870.74	9,464.59	64.29	64.48	-70.99	3,289.75	-278.78	695.74	566.97	128.77	5.403	
13,100.00	9,693.45	12,970.74	9,463.69	66.01	66.22	-70.98	3,389.75	-279.39	695.84	563.61	132.23	5.262	
13,200.00	9,692.74	13,070.74	9,462.79	67.74	67.96	-70.97	3,489.74	-280.00	695.93	560.24	135.69	5.129	
13,300.00	9,692.03	13,170.74	9,461.88	69.47	69.70	-70.95	3,589.74	-280.60	696.02	556.86	139.17	5.001	
13,400.00	9,691.32	13,270.74	9,460.98	71.20	71.45	-70.94	3,689.73	-281.21	696.12	553.47	142.65	4.880	
13,500.00	9,690.61	13,370.74	9,460.07	72.94	73.20	-70.92	3,789.72	-281.81	696.21	550.07	146.14	4.764	
13,600.00	9,689.90	13,470.73	9,459.17	74.69	74.95	-70.91	3,889.72	-282.42	696.30	546.66	149.64	4.653	
13,700.00	9,689.19	13,570.73	9,458.26	76.44	76.71	-70.89	3,989.71	-283.02	696.40	543.25	153.15	4.547	
13,800.00	9,688.48	13,670.73	9,457.36	78.19	78.47	-70.88	4,089.71	-283.63	696.49	539.83	156.66	4.446	
13,900.00	9,687.77	13,770.73	9,456.45	79.94	80.24	-70.87	4,189.70	-284.23	696.58	536.40	160.18	4.349	
14,000.00	9,687.06	13,870.73	9,455.55	81.70	82.00	-70.85	4,289.69	-284.84	696.68	532.97	163.71	4.256	
14,100.00	9,686.35	13,970.73	9,454.65	83.46	83.77	-70.84	4,389.69	-285.45	696.77	529.54	167.23	4.166	
14,200.00	9,685.64	14,070.73	9,453.74	85.22	85.55	-70.82	4,489.68	-286.05	696.87	526.10	170.77	4.081	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
14,300.00	9,684.93	14,170.73	9,452.84	86.99	87.32	-70.81	4,589.67	-286.66	696.96	522.65	174.31	3.998	
14,400.00	9,684.22	14,270.73	9,451.93	88.76	89.10	-70.80	4,689.67	-287.26	697.05	519.20	177.85	3.919	
14,500.00	9,683.51	14,370.73	9,451.03	90.53	90.87	-70.78	4,789.66	-287.87	697.15	515.75	181.40	3.843	
14,600.00	9,682.80	14,470.73	9,450.12	92.30	92.65	-70.77	4,889.66	-288.47	697.24	512.29	184.95	3.770	
14,700.00	9,682.08	14,570.73	9,449.22	94.08	94.43	-70.75	4,989.65	-289.08	697.33	508.83	188.51	3.699	
14,800.00	9,681.37	14,670.73	9,448.32	95.85	96.22	-70.74	5,089.64	-289.68	697.43	505.36	192.07	3.631	
14,900.00	9,680.66	14,770.73	9,447.41	97.63	98.00	-70.72	5,189.64	-290.29	697.52	501.89	195.63	3.566	
15,000.00	9,679.95	14,870.73	9,446.51	99.41	99.79	-70.71	5,289.63	-290.90	697.62	498.42	199.20	3.502	
15,100.00	9,679.24	14,970.73	9,445.60	101.19	101.57	-70.70	5,389.63	-291.50	697.71	494.95	202.76	3.441	
15,200.00	9,678.53	15,070.73	9,444.70	102.97	103.36	-70.68	5,489.62	-292.11	697.80	491.47	206.34	3.382	
15,300.00	9,677.82	15,170.73	9,443.79	104.76	105.15	-70.67	5,589.61	-292.71	697.90	487.99	209.91	3.325	
15,400.00	9,677.11	15,270.73	9,442.89	106.54	106.94	-70.65	5,689.61	-293.32	697.99	484.51	213.49	3.270	
15,500.00	9,676.40	15,370.73	9,441.99	108.33	108.73	-70.64	5,789.60	-293.92	698.09	481.02	217.06	3.216	
15,600.00	9,675.69	15,470.73	9,441.08	110.12	110.53	-70.63	5,889.60	-294.53	698.18	477.54	220.65	3.164	
15,700.00	9,674.98	15,570.73	9,440.18	111.91	112.32	-70.61	5,989.59	-295.13	698.28	474.05	224.23	3.114	
15,800.00	9,674.27	15,670.73	9,439.27	113.70	114.12	-70.60	6,089.58	-295.74	698.37	470.56	227.81	3.066	
15,900.00	9,673.56	15,770.73	9,438.37	115.49	115.91	-70.58	6,189.58	-296.35	698.46	467.06	231.40	3.018	
16,000.00	9,672.85	15,870.73	9,437.46	117.28	117.71	-70.57	6,289.57	-296.95	698.56	463.57	234.99	2.973	
16,100.00	9,672.14	15,970.73	9,436.56	119.07	119.51	-70.55	6,389.56	-297.56	698.65	460.07	238.58	2.928	
16,200.00	9,671.43	16,070.73	9,435.66	120.87	121.31	-70.54	6,489.56	-298.16	698.75	456.57	242.17	2.885	
16,300.00	9,670.72	16,170.73	9,434.75	122.66	123.11	-70.53	6,589.55	-298.77	698.84	453.07	245.77	2.843	
16,400.00	9,670.01	16,270.73	9,433.85	124.46	124.90	-70.51	6,689.55	-299.37	698.94	449.57	249.37	2.803	
16,500.00	9,669.30	16,370.73	9,432.94	126.26	126.71	-70.50	6,789.54	-299.98	699.03	446.07	252.96	2.763	
16,600.00	9,668.59	16,470.73	9,432.04	128.05	128.51	-70.48	6,889.53	-300.59	699.13	442.56	256.56	2.725	
16,700.00	9,667.88	16,570.73	9,431.13	129.85	130.31	-70.47	6,989.53	-301.19	699.22	439.06	260.16	2.688	
16,800.00	9,667.17	16,670.73	9,430.23	131.65	132.11	-70.46	7,089.52	-301.80	699.32	435.55	263.76	2.651	
16,900.00	9,666.45	16,770.73	9,429.33	133.45	133.91	-70.44	7,189.52	-302.40	699.41	432.04	267.37	2.616	
17,000.00	9,665.74	16,870.73	9,428.42	135.25	135.72	-70.43	7,289.51	-303.01	699.51	428.54	270.97	2.581	
17,100.00	9,665.03	16,970.73	9,427.52	137.05	137.52	-70.41	7,389.50	-303.61	699.60	425.02	274.58	2.548	
17,200.00	9,664.32	17,070.73	9,426.61	138.85	139.33	-70.40	7,489.50	-304.22	699.70	421.51	278.18	2.515	
17,300.00	9,663.61	17,170.73	9,425.71	140.66	141.13	-70.39	7,589.49	-304.82	699.79	418.00	281.79	2.483	
17,400.00	9,662.90	17,270.73	9,424.80	142.46	142.94	-70.37	7,689.49	-305.43	699.89	414.49	285.40	2.452	
17,500.00	9,662.19	17,370.73	9,423.90	144.26	144.74	-70.36	7,789.48	-306.04	699.98	410.97	289.01	2.422	
17,600.00	9,661.48	17,470.73	9,422.99	146.07	146.55	-70.34	7,889.47	-306.64	700.08	407.46	292.62	2.392	
17,700.00	9,660.77	17,570.73	9,422.09	147.87	148.36	-70.33	7,989.47	-307.25	700.17	403.94	296.23	2.364	
17,800.00	9,660.06	17,670.73	9,421.19	149.68	150.17	-70.31	8,089.46	-307.85	700.27	400.42	299.84	2.335	
17,900.00	9,659.35	17,770.73	9,420.28	151.48	151.97	-70.30	8,189.45	-308.46	700.36	396.91	303.45	2.308	
18,000.00	9,658.64	17,870.73	9,419.38	153.29	153.78	-70.29	8,289.45	-309.06	700.46	393.39	307.07	2.281	
18,100.00	9,657.93	17,970.73	9,418.47	155.09	155.59	-70.27	8,389.44	-309.67	700.55	389.87	310.68	2.255	
18,200.00	9,657.22	18,070.73	9,417.57	156.90	157.40	-70.26	8,489.44	-310.27	700.65	386.35	314.30	2.229	
18,300.00	9,656.51	18,170.73	9,416.66	158.71	159.21	-70.24	8,589.43	-310.88	700.74	382.83	317.92	2.204	
18,400.00	9,655.80	18,270.73	9,415.76	160.51	161.02	-70.23	8,689.42	-311.49	700.84	379.31	321.53	2.180	
18,500.00	9,655.09	18,370.73	9,414.86	162.32	162.83	-70.22	8,789.42	-312.09	700.93	375.78	325.15	2.156	
18,600.00	9,654.38	18,470.73	9,413.95	164.13	164.64	-70.20	8,889.41	-312.70	701.03	372.26	328.77	2.132	
18,700.00	9,653.67	18,570.73	9,413.05	165.94	166.45	-70.19	8,989.41	-313.30	701.12	368.74	332.39	2.109	
18,800.00	9,652.96	18,670.72	9,412.14	167.75	168.26	-70.17	9,089.40	-313.91	701.22	365.21	336.01	2.087	
18,900.00	9,652.25	18,770.72	9,411.24	169.56	170.07	-70.16	9,189.39	-314.51	701.32	361.69	339.63	2.065	
19,000.00	9,651.54	18,870.72	9,410.33	171.37	171.88	-70.15	9,289.39	-315.12	701.41	358.16	343.25	2.043	
19,100.00	9,650.82	18,970.72	9,409.43	173.18	173.70	-70.13	9,389.38	-315.72	701.51	354.64	346.87	2.022	
19,200.00	9,650.11	19,070.72	9,408.53	174.99	175.51	-70.12	9,489.38	-316.33	701.60	351.11	350.49	2.002	
19,300.00	9,649.40	19,170.72	9,407.62	176.80	177.32	-70.10	9,589.37	-316.94	701.70	347.58	354.12	1.982	
19,400.00	9,648.69	19,270.72	9,406.72	178.61	179.13	-70.09	9,689.36	-317.54	701.79	344.06	357.74	1.962	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report

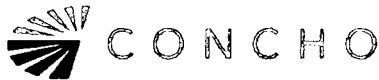


Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
19,500.00	9,647.98	19,370.72	9,405.81	180.42	180.65	-70.08	9,789.36	-318.15	701.89	340.53	361.36	1.942	
19,600.00	9,647.27	19,470.72	9,404.91	182.23	182.76	-70.06	9,889.35	-318.75	701.99	337.00	364.99	1.923	
19,700.00	9,646.56	19,570.72	9,404.00	184.04	184.57	-70.05	9,989.34	-319.36	702.08	333.47	368.61	1.905	
19,800.00	9,645.85	19,670.72	9,403.10	185.85	186.38	-70.03	10,089.34	-319.96	702.18	329.94	372.24	1.886	
19,900.00	9,645.14	19,770.72	9,402.20	187.66	188.20	-70.02	10,189.33	-320.57	702.27	326.41	375.86	1.868	
19,919.80	9,645.00	19,790.52	9,402.02	187.96	188.56	-70.02	10,209.13	-320.69	702.29	325.78	376.52	1.865 SF	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error:	0.00 usft
Survey Program: 0-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside		Distance		Minimum		Separation	Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Toolface (°)	+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Separation (usft)			
0.00	0.00	0.00	0.00	0.00	0.00	-90.41	-3.20	-450.00	450.05					
100.00	100.00	94.00	94.00	0.08	0.08	-90.41	-3.20	-450.00	450.01	449.85	0.16	2,789.259		
200.00	200.00	194.00	194.00	0.31	0.29	-90.41	-3.20	-450.00	450.01	449.41	0.60	747.064		
300.00	300.00	294.00	294.00	0.53	0.52	-90.41	-3.20	-450.00	450.01	448.96	1.05	427.806		
400.00	400.00	394.00	394.00	0.76	0.74	-90.41	-3.20	-450.00	450.01	448.51	1.50	299.720		
500.00	500.00	494.00	494.00	0.98	0.97	-90.41	-3.20	-450.00	450.01	448.06	1.95	230.660		
600.00	600.00	594.00	594.00	1.21	1.19	-90.41	-3.20	-450.00	450.01	447.61	2.40	187.466		
700.00	700.00	694.00	694.00	1.43	1.42	-90.41	-3.20	-450.00	450.01	447.16	2.85	157.897		
800.00	800.00	794.00	794.00	1.66	1.64	-90.41	-3.20	-450.00	450.01	446.71	3.30	136.385		
900.00	900.00	894.00	894.00	1.88	1.87	-90.41	-3.20	-450.00	450.01	446.26	3.75	120.032		
1,000.00	1,000.00	994.00	994.00	2.11	2.09	-90.41	-3.20	-450.00	450.01	445.81	4.20	107.181		
1,100.00	1,100.00	1,094.00	1,094.00	2.33	2.32	-90.41	-3.20	-450.00	450.01	445.36	4.65	96.815		
1,200.00	1,200.00	1,194.00	1,194.00	2.56	2.54	-90.41	-3.20	-450.00	450.01	444.91	5.10	88.277		
1,300.00	1,300.00	1,294.00	1,294.00	2.78	2.77	-90.41	-3.20	-450.00	450.01	444.46	5.55	81.124		
1,400.00	1,400.00	1,394.00	1,394.00	3.01	2.99	-90.41	-3.20	-450.00	450.01	444.01	6.00	75.042		
1,500.00	1,500.00	1,494.00	1,494.00	3.23	3.22	-90.41	-3.20	-450.00	450.01	443.57	6.45	69.809		
1,600.00	1,600.00	1,594.00	1,594.00	3.45	3.44	-90.41	-3.20	-450.00	450.01	443.12	6.90	65.259		
1,700.00	1,700.00	1,694.00	1,694.00	3.68	3.67	-90.41	-3.20	-450.00	450.01	442.67	7.35	61.265		
1,800.00	1,800.00	1,794.00	1,794.00	3.90	3.89	-90.41	-3.20	-450.00	450.01	442.22	7.79	57.732		
1,900.00	1,900.00	1,894.00	1,894.00	4.13	4.12	-90.41	-3.20	-450.00	450.01	441.77	8.24	54.584		
2,000.00	2,000.00	1,994.00	1,994.00	4.35	4.34	-90.41	-3.20	-450.00	450.01	441.32	8.69	51.761		
2,100.00	2,100.00	2,094.00	2,094.00	4.58	4.56	-90.41	-3.20	-450.00	450.01	440.87	9.14	49.217		
2,200.00	2,200.00	2,194.00	2,194.00	4.80	4.79	-90.41	-3.20	-450.00	450.01	440.42	9.59	46.910		
2,300.00	2,300.00	2,294.00	2,294.00	5.03	5.01	-90.41	-3.20	-450.00	450.01	439.97	10.04	44.810		
2,400.00	2,400.00	2,394.00	2,394.00	5.25	5.24	-90.41	-3.20	-450.00	450.01	439.52	10.49	42.891		
2,500.00	2,500.00	2,494.00	2,494.00	5.48	5.46	-90.41	-3.20	-450.00	450.01	439.07	10.94	41.128		
2,600.00	2,600.00	2,594.00	2,594.00	5.70	5.69	-90.41	-3.20	-450.00	450.01	438.62	11.39	39.505		
2,700.00	2,700.00	2,694.00	2,694.00	5.93	5.91	-90.41	-3.20	-450.00	450.01	438.17	11.84	38.006		
2,800.00	2,800.00	2,794.00	2,794.00	6.15	6.14	-90.41	-3.20	-450.00	450.01	437.72	12.29	36.615		
2,900.00	2,900.00	2,894.00	2,894.00	6.38	6.36	-90.41	-3.20	-450.00	450.01	437.27	12.74	35.323		
3,000.00	3,000.00	2,994.00	2,994.00	6.60	6.59	-90.41	-3.20	-450.00	450.01	436.82	13.19	34.120		
3,100.00	3,100.00	3,094.00	3,094.00	6.83	6.81	-90.41	-3.20	-450.00	450.01	436.37	13.64	32.995		
3,200.00	3,200.00	3,194.00	3,194.00	7.05	7.04	-90.41	-3.20	-450.00	450.01	435.92	14.09	31.942		
3,300.00	3,300.00	3,294.00	3,294.00	7.28	7.26	-90.41	-3.20	-450.00	450.01	435.47	14.54	30.954		
3,400.00	3,400.00	3,394.00	3,394.00	7.50	7.49	-90.41	-3.20	-450.00	450.01	435.02	14.99	30.026		
3,500.00	3,500.00	3,494.00	3,494.00	7.73	7.71	-90.41	-3.20	-450.00	450.01	434.57	15.44	29.152		
3,600.00	3,600.00	3,594.00	3,594.00	7.95	7.94	-90.41	-3.20	-450.00	450.01	434.12	15.89	28.327		
3,700.00	3,700.00	3,694.00	3,694.00	8.17	8.16	-90.41	-3.20	-450.00	450.01	433.68	16.34	27.547		
3,800.00	3,800.00	3,794.00	3,794.00	8.40	8.39	-90.41	-3.20	-450.00	450.01	433.23	16.79	26.809		
3,900.00	3,900.00	3,894.00	3,894.00	8.62	8.61	-90.41	-3.20	-450.00	450.01	432.78	17.24	26.110		
4,000.00	4,000.00	3,994.00	3,994.00	8.85	8.84	-90.41	-3.20	-450.00	450.01	432.33	17.68	25.447		
4,100.00	4,100.00	4,094.00	4,094.00	9.07	9.06	-90.41	-3.20	-450.00	450.01	431.88	18.13	24.816		
4,200.00	4,200.00	4,194.00	4,194.00	9.30	9.29	-90.41	-3.20	-450.00	450.01	431.43	18.58	24.215		
4,300.00	4,300.00	4,294.00	4,294.00	9.52	9.51	-90.41	-3.20	-450.00	450.01	430.98	19.03	23.644		
4,400.00	4,400.00	4,394.00	4,394.00	9.75	9.73	-90.41	-3.20	-450.00	450.01	430.53	19.48	23.098		
4,500.00	4,500.00	4,494.00	4,494.00	9.97	9.96	-90.41	-3.20	-450.00	450.01	430.08	19.93	22.577 CC, ES		
4,600.00	4,599.98	4,593.98	4,593.98	10.18	10.18	148.39	-3.20	-450.00	451.50	431.14	20.36	22.176		
4,700.00	4,699.84	4,693.84	4,693.84	10.36	10.41	148.69	-3.20	-450.00	455.96	435.19	20.77	21.954		
4,762.40	4,762.03	4,756.03	4,756.03	10.48	10.55	148.97	-3.20	-450.00	460.27	439.25	21.03	21.891		
4,800.00	4,799.48	4,793.48	4,793.48	10.55	10.63	149.19	-3.20	-450.00	463.22	442.04	21.18	21.870		
4,900.00	4,899.06	4,893.06	4,893.06	10.74	10.86	149.76	-3.20	-450.00	471.11	449.52	21.60	21.814		
5,000.00	4,998.64	4,992.64	4,992.64	10.94	11.08	150.31	-3.20	-450.00	479.04	457.03	22.02	21.758		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error:	0.00 usft
Survey Program: 0-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Tooface (')	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)						
5,100.00	5,098.22	5,087.98	5,087.96	11.14	11.27	150.67	-4.48	-450.43	487.42	465.01	22.41	21.754		
5,200.00	5,197.80	5,182.91	5,182.78	11.34	11.43	150.66	-8.73	-451.86	496.74	473.97	22.77	21.813		
5,300.00	5,297.38	5,279.04	5,278.62	11.55	11.60	150.32	-15.92	-454.28	506.97	483.82	23.14	21.905		
5,400.00	5,396.96	5,378.42	5,377.62	11.76	11.77	149.91	-24.09	-457.03	517.45	493.92	23.53	21.995		
5,500.00	5,496.54	5,477.80	5,476.63	11.97	11.94	149.50	-32.26	-459.78	527.95	504.04	23.91	22.078		
5,600.00	5,596.12	5,577.18	5,575.63	12.18	12.12	149.12	-40.43	-462.53	538.48	514.17	24.31	22.154		
5,700.00	5,695.70	5,676.56	5,674.64	12.40	12.31	148.75	-48.59	-465.28	549.03	524.33	24.71	22.223		
5,800.00	5,795.28	5,775.94	5,773.64	12.62	12.49	148.39	-56.76	-468.03	559.61	534.49	25.11	22.284		
5,900.00	5,894.86	5,875.32	5,872.65	12.84	12.68	148.05	-64.93	-470.78	570.20	544.68	25.52	22.340		
6,000.00	5,994.45	5,974.70	5,971.66	13.07	12.87	147.71	-73.10	-473.53	580.82	554.87	25.94	22.390		
6,100.00	6,094.03	6,074.08	6,070.66	13.29	13.07	147.40	-81.27	-476.28	591.45	565.08	26.36	22.434		
6,200.00	6,193.61	6,173.46	6,169.67	13.52	13.27	147.09	-89.44	-479.03	602.10	575.31	26.79	22.474		
6,300.00	6,293.19	6,272.84	6,268.67	13.75	13.47	146.79	-97.61	-481.79	612.77	585.54	27.22	22.509		
6,400.00	6,392.77	6,372.22	6,367.68	13.99	13.67	146.50	-105.78	-484.54	623.45	595.79	27.66	22.541		
6,500.00	6,492.35	6,471.60	6,466.68	14.22	13.88	146.22	-113.94	-487.29	634.15	606.05	28.10	22.568		
6,600.00	6,591.93	6,570.98	6,565.69	14.46	14.09	145.96	-122.11	-490.04	644.86	616.32	28.54	22.592		
6,700.00	6,691.51	6,670.36	6,664.69	14.70	14.30	145.70	-130.28	-492.79	655.59	626.59	28.99	22.612		
6,800.00	6,791.09	6,769.74	6,763.70	14.93	14.51	145.45	-138.45	-495.54	666.33	636.88	29.44	22.630		
6,900.00	6,890.67	6,869.12	6,862.70	15.18	14.72	145.20	-146.62	-498.29	677.08	647.18	29.90	22.644		
7,000.00	6,990.25	6,968.50	6,961.71	15.42	14.94	144.97	-154.79	-501.04	687.84	657.48	30.36	22.657		
7,100.00	7,089.83	7,067.88	7,060.71	15.66	15.16	144.74	-162.96	-503.79	698.61	667.79	30.82	22.666		
7,200.00	7,189.42	7,167.26	7,159.72	15.91	15.38	144.52	-171.13	-506.54	709.40	678.11	31.29	22.674		
7,300.00	7,289.00	7,266.64	7,258.73	16.15	15.60	144.30	-179.30	-509.29	720.19	688.44	31.75	22.680		
7,400.00	7,388.58	7,366.02	7,357.73	16.40	15.83	144.09	-187.46	-512.04	731.00	698.77	32.23	22.684		
7,500.00	7,488.16	7,465.40	7,456.74	16.65	16.05	143.89	-195.63	-514.79	741.81	709.11	32.70	22.686		
7,600.00	7,587.74	7,564.78	7,555.74	16.90	16.28	143.69	-203.80	-517.54	752.63	719.46	33.18	22.686		
7,700.00	7,687.32	7,664.16	7,654.75	17.15	16.51	143.50	-211.97	-520.29	763.46	729.81	33.65	22.686		
7,800.00	7,786.90	7,763.54	7,753.75	17.40	16.74	143.32	-220.14	-523.04	774.30	740.17	34.14	22.684		
7,900.00	7,886.48	7,862.92	7,852.76	17.65	16.97	143.14	-228.31	-525.79	785.15	750.53	34.62	22.680		
8,000.00	7,986.06	7,962.30	7,951.76	17.90	17.20	142.96	-236.48	-528.54	796.01	760.90	35.10	22.676		
8,100.00	8,085.64	8,061.68	8,050.77	18.15	17.44	142.79	-244.65	-531.29	806.87	771.28	35.59	22.670		
8,200.00	8,185.22	8,161.08	8,149.77	18.41	17.67	142.62	-252.82	-534.04	817.74	781.66	36.08	22.664		
8,300.00	8,284.80	8,260.44	8,248.78	18.66	17.91	142.46	-260.98	-536.79	828.61	792.04	36.57	22.657		
8,400.00	8,384.39	8,359.82	8,347.78	18.92	18.15	142.30	-269.15	-539.54	839.49	802.43	37.07	22.649		
8,500.00	8,483.97	8,459.20	8,446.79	19.18	18.38	142.15	-277.32	-542.29	850.38	812.82	37.56	22.641		
8,600.00	8,583.55	8,558.58	8,545.80	19.43	18.62	142.00	-285.49	-545.04	861.28	823.22	38.06	22.631		
8,700.00	8,683.13	8,657.96	8,644.80	19.69	18.86	141.85	-293.66	-547.79	872.18	833.62	38.56	22.622		
8,800.00	8,782.71	8,757.34	8,743.81	19.95	19.11	141.71	-301.83	-550.54	883.08	844.03	39.05	22.611		
8,900.00	8,882.29	8,856.72	8,842.81	20.21	19.35	141.57	-310.00	-553.29	893.99	854.44	39.56	22.601		
9,000.00	8,981.87	8,956.10	8,941.82	20.47	19.59	141.44	-318.17	-556.04	904.91	864.85	40.06	22.589		
9,100.00	9,081.45	9,055.48	9,040.82	20.73	19.83	141.30	-326.34	-558.79	915.83	875.26	40.56	22.578		
9,135.13	9,116.43	9,090.39	9,075.60	20.82	19.92	141.26	-329.20	-559.76	919.66	878.92	40.74	22.574		
9,150.00	9,131.25	9,106.65	9,091.81	20.86	19.96	157.19	-330.49	-560.21	921.31	880.49	40.82	22.572		
9,200.00	9,181.07	9,168.69	9,153.78	20.97	20.09	-146.84	-331.42	-561.95	926.79	885.72	41.06	22.571		
9,250.00	9,230.61	9,230.95	9,215.71	21.07	20.19	-123.38	-325.61	-563.70	932.10	890.83	41.27	22.571		
9,300.00	9,279.48	9,293.26	9,276.70	21.16	20.27	-113.79	-313.10	-565.46	937.20	895.77	41.44	22.619		
9,350.00	9,327.33	9,355.46	9,335.86	21.24	20.32	-108.62	-294.08	-567.18	942.07	900.50	41.57	22.665		
9,400.00	9,373.77	9,417.39	9,392.38	21.31	20.35	-105.25	-268.89	-568.86	946.66	905.00	41.66	22.722		
9,450.00	9,418.47	9,478.89	9,445.49	21.37	20.37	-102.78	-237.98	-570.45	950.95	909.21	41.74	22.784		
9,500.00	9,461.07	9,539.83	9,494.55	21.42	20.38	-100.81	-201.91	-571.95	954.93	913.13	41.80	22.848		
9,550.00	9,501.27	9,600.08	9,539.02	21.46	20.39	-99.14	-161.32	-573.34	958.57	916.73	41.84	22.908		
9,600.00	9,538.74	9,659.53	9,578.49	21.49	20.40	-97.68	-116.91	-574.60	961.87	919.98	41.89	22.960		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
9,650.00	9,573.20	9,718.10	9,612.66	21.52	20.43	-96.38	-69.40	-575.72	964.82	922.86	41.95	22.997	
9,700.00	9,604.40	9,775.72	9,641.39	21.56	20.48	-95.18	-19.49	-576.70	967.41	925.37	42.04	23.011	
9,750.00	9,632.09	9,832.34	9,664.60	21.59	20.58	-94.09	32.13	-577.53	969.64	927.47	42.17	22.991	
9,800.00	9,656.07	9,887.94	9,682.32	21.64	20.72	-93.08	84.80	-578.20	971.51	929.15	42.37	22.932	
9,850.00	9,676.15	9,942.51	9,694.67	21.71	20.91	-92.14	137.93	-578.73	973.02	930.41	42.62	22.831	
9,900.00	9,692.17	9,996.05	9,701.83	21.83	21.12	-91.28	190.97	-579.12	974.17	931.22	42.95	22.682	
9,950.00	9,704.02	10,048.57	9,704.02	21.99	21.37	-90.50	243.43	-579.36	974.96	931.60	43.36	22.483	
10,000.00	9,711.61	10,098.09	9,703.53	22.21	21.64	-89.92	292.94	-579.51	975.44	931.59	43.85	22.246	
10,050.00	9,714.88	10,147.93	9,703.03	22.47	21.95	-89.66	342.78	-579.67	975.61	931.18	44.43	21.960	
10,066.68	9,715.00	10,164.61	9,702.87	22.57	22.06	-89.64	359.46	-579.72	975.59	930.96	44.63	21.860	
10,100.00	9,714.77	10,197.93	9,702.53	22.77	22.27	-89.63	392.78	-579.83	975.50	930.46	45.04	21.657	
10,200.00	9,714.06	10,297.93	9,701.53	23.46	23.04	-89.62	492.77	-580.14	975.24	928.74	46.50	20.973	
10,300.00	9,713.35	10,397.93	9,700.52	24.27	23.91	-89.60	592.76	-580.46	974.99	926.80	48.19	20.233	
10,400.00	9,712.63	10,497.93	9,699.52	25.19	24.89	-89.58	692.76	-580.77	974.73	924.65	50.08	19.463	
10,500.00	9,711.92	10,597.93	9,698.52	26.20	25.96	-89.57	792.75	-581.08	974.47	922.31	52.16	18.683	
10,600.00	9,711.21	10,697.93	9,697.51	27.29	27.11	-89.55	892.75	-581.40	974.21	919.81	54.40	17.909	
10,700.00	9,710.50	10,797.93	9,696.51	28.46	28.33	-89.53	992.74	-581.71	973.96	917.17	56.78	17.152	
10,800.00	9,709.79	10,897.93	9,695.51	29.69	29.61	-89.51	1,092.73	-582.03	973.70	914.40	59.30	16.421	
10,900.00	9,709.08	10,997.93	9,694.50	30.98	30.95	-89.50	1,192.73	-582.34	973.44	911.52	61.92	15.721	
11,000.00	9,708.37	11,097.92	9,693.50	32.31	32.33	-89.48	1,292.72	-582.66	973.19	908.54	64.64	15.055	
11,100.00	9,707.66	11,197.92	9,692.49	33.70	33.75	-89.46	1,392.71	-582.97	972.93	905.48	67.45	14.424	
11,200.00	9,706.95	11,297.92	9,691.49	35.12	35.21	-89.44	1,492.71	-583.29	972.67	902.34	70.34	13.829	
11,300.00	9,706.24	11,397.92	9,690.49	36.58	36.71	-89.43	1,592.70	-583.60	972.42	899.13	73.29	13.268	
11,400.00	9,705.53	11,497.92	9,689.48	38.07	38.23	-89.41	1,692.70	-583.91	972.16	895.86	76.30	12.741	
11,500.00	9,704.82	11,597.92	9,688.48	39.59	39.78	-89.39	1,792.69	-584.23	971.90	892.54	79.37	12.245	
11,600.00	9,704.11	11,697.92	9,687.48	41.13	41.35	-89.37	1,892.68	-584.54	971.65	889.17	82.48	11.780	
11,700.00	9,703.40	11,797.92	9,686.47	42.70	42.94	-89.36	1,992.68	-584.86	971.39	885.76	85.64	11.343	
11,800.00	9,702.69	11,897.92	9,685.47	44.28	44.55	-89.34	2,092.67	-585.17	971.14	882.31	88.83	10.933	
11,900.00	9,701.98	11,997.92	9,684.46	45.88	46.17	-89.32	2,192.66	-585.49	970.88	878.83	92.06	10.547	
12,000.00	9,701.27	12,097.92	9,683.46	47.50	47.81	-89.30	2,292.66	-585.80	970.63	875.31	95.31	10.184	
12,100.00	9,700.56	12,197.92	9,682.46	49.13	49.46	-89.29	2,392.65	-586.12	970.37	871.77	98.60	9.842	
12,200.00	9,699.85	12,297.92	9,681.45	50.78	51.12	-89.27	2,492.64	-586.43	970.11	868.21	101.90	9.520	
12,300.00	9,699.14	12,397.91	9,680.45	52.44	52.80	-89.25	2,592.64	-586.75	969.86	864.62	105.23	9.216	
12,400.00	9,698.43	12,497.91	9,679.45	54.10	54.48	-89.23	2,692.63	-587.06	969.60	861.02	108.59	8.929	
12,500.00	9,697.72	12,597.91	9,678.44	55.78	56.17	-89.22	2,792.63	-587.37	969.35	857.39	111.95	8.658	
12,600.00	9,697.00	12,697.91	9,677.44	57.47	57.87	-89.20	2,892.62	-587.69	969.09	853.75	115.34	8.402	
12,700.00	9,696.29	12,797.91	9,676.44	59.16	59.58	-89.18	2,992.61	-588.00	968.84	850.09	118.74	8.159	
12,800.00	9,695.58	12,897.91	9,675.43	60.87	61.29	-89.16	3,092.61	-588.32	968.58	846.42	122.16	7.929	
12,900.00	9,694.87	12,997.91	9,674.43	62.57	63.01	-89.15	3,192.60	-588.63	968.33	842.74	125.59	7.710	
13,000.00	9,694.16	13,097.91	9,673.42	64.29	64.74	-89.13	3,292.59	-588.95	968.07	839.04	129.03	7.503	
13,100.00	9,693.45	13,197.91	9,672.42	66.01	66.47	-89.11	3,392.59	-589.26	967.82	835.34	132.48	7.305	
13,200.00	9,692.74	13,297.91	9,671.42	67.74	68.21	-89.09	3,492.58	-589.58	967.56	831.62	135.94	7.117	
13,300.00	9,692.03	13,397.91	9,670.41	69.47	69.95	-89.08	3,592.58	-589.89	967.31	827.89	139.41	6.938	
13,400.00	9,691.32	13,497.91	9,669.41	71.20	71.69	-89.06	3,692.57	-590.20	967.05	824.16	142.89	6.768	
13,500.00	9,690.61	13,597.91	9,668.41	72.94	73.44	-89.04	3,792.56	-590.52	966.80	820.42	146.38	6.605	
13,600.00	9,689.90	13,697.90	9,667.40	74.69	75.19	-89.02	3,892.56	-590.83	966.54	816.67	149.88	6.449	
13,700.00	9,689.19	13,797.90	9,666.40	76.44	76.95	-89.01	3,992.55	-591.15	966.29	812.91	153.38	6.300	
13,800.00	9,688.48	13,897.90	9,665.39	78.19	78.70	-88.99	4,092.54	-591.46	966.04	809.14	156.89	6.157	
13,900.00	9,687.77	13,997.90	9,664.39	79.94	80.46	-88.97	4,192.54	-591.78	965.78	805.37	160.41	6.021	
14,000.00	9,687.06	14,097.90	9,663.39	81.70	82.23	-88.95	4,292.53	-592.09	965.53	801.60	163.93	5.890	
14,100.00	9,686.35	14,197.90	9,662.38	83.46	84.00	-88.93	4,392.53	-592.41	965.27	797.82	167.46	5.764	
14,200.00	9,685.64	14,297.90	9,661.38	85.22	85.76	-88.92	4,492.52	-592.72	965.02	794.03	170.99	5.644	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
14,300.00	9,684.93	14,397.90	9,660.38	86.99	87.53	-88.90	4,592.51	-593.04	964.77	790.24	174.52	5.528	
14,400.00	9,684.22	14,497.90	9,659.37	88.76	89.31	-88.88	4,692.51	-593.35	964.51	786.45	178.07	5.417	
14,500.00	9,683.51	14,597.90	9,658.37	90.53	91.08	-88.86	4,792.50	-593.66	964.26	782.65	181.61	5.309	
14,600.00	9,682.80	14,697.90	9,657.36	92.30	92.86	-88.85	4,892.49	-593.98	964.01	778.85	185.16	5.206	
14,700.00	9,682.08	14,797.90	9,656.36	94.08	94.64	-88.83	4,992.49	-594.29	963.75	775.04	188.71	5.107	
14,800.00	9,681.37	14,897.90	9,655.36	95.85	96.42	-88.81	5,092.48	-594.61	963.50	771.23	192.27	5.011	
14,900.00	9,680.66	14,997.89	9,654.35	97.63	98.20	-88.79	5,192.47	-594.92	963.25	767.42	195.83	4.919	
15,000.00	9,679.95	15,097.89	9,653.35	99.41	99.98	-88.78	5,292.47	-595.24	962.99	763.60	199.39	4.830	
15,100.00	9,679.24	15,197.89	9,652.35	101.19	101.77	-88.76	5,392.46	-595.55	962.74	759.78	202.96	4.744	
15,200.00	9,678.53	15,297.89	9,651.34	102.97	103.56	-88.74	5,492.46	-595.87	962.49	755.96	206.53	4.660	
15,300.00	9,677.82	15,397.89	9,650.34	104.76	105.34	-88.72	5,592.45	-596.18	962.24	752.13	210.10	4.580	
15,400.00	9,677.11	15,497.89	9,649.33	106.54	107.13	-88.70	5,692.44	-596.49	961.98	748.31	213.67	4.502	
15,500.00	9,676.40	15,597.89	9,648.33	108.33	108.92	-88.69	5,792.44	-596.81	961.73	744.48	217.25	4.427	
15,600.00	9,675.69	15,697.89	9,647.33	110.12	110.71	-88.67	5,892.43	-597.12	961.48	740.65	220.83	4.354	
15,700.00	9,674.98	15,797.89	9,646.32	111.91	112.50	-88.65	5,992.42	-597.44	961.23	736.81	224.41	4.283	
15,800.00	9,674.27	15,897.89	9,645.32	113.70	114.30	-88.63	6,092.42	-597.75	960.97	732.98	228.00	4.215	
15,900.00	9,673.56	15,997.89	9,644.32	115.49	116.09	-88.61	6,192.41	-598.07	960.72	729.14	231.58	4.149	
16,000.00	9,672.85	16,097.89	9,643.31	117.28	117.89	-88.60	6,292.41	-598.38	960.47	725.30	235.17	4.084	
16,100.00	9,672.14	16,197.89	9,642.31	119.07	119.68	-88.58	6,392.40	-598.70	960.22	721.46	238.76	4.022	
16,200.00	9,671.43	16,297.88	9,641.31	120.87	121.48	-88.56	6,492.39	-599.01	959.96	717.62	242.35	3.961	
16,300.00	9,670.72	16,397.88	9,640.30	122.66	123.28	-88.54	6,592.39	-599.33	959.71	713.77	245.94	3.902	
16,400.00	9,670.01	16,497.88	9,639.30	124.46	125.07	-88.53	6,692.38	-599.64	959.46	709.93	249.53	3.845	
16,500.00	9,669.30	16,597.88	9,638.29	126.26	126.87	-88.51	6,792.37	-599.95	959.21	706.08	253.13	3.789	
16,600.00	9,668.59	16,697.88	9,637.29	128.05	128.67	-88.49	6,892.37	-600.27	958.96	702.23	256.73	3.735	
16,700.00	9,667.88	16,797.88	9,636.29	129.85	130.47	-88.47	6,992.36	-600.58	958.71	698.38	260.33	3.683	
16,800.00	9,667.17	16,897.88	9,635.28	131.65	132.27	-88.45	7,092.36	-600.90	958.46	694.53	263.93	3.632	
16,900.00	9,666.45	16,997.88	9,634.28	133.45	134.08	-88.44	7,192.35	-601.21	958.20	690.68	267.53	3.582	
17,000.00	9,665.74	17,097.88	9,633.28	135.25	135.88	-88.42	7,292.34	-601.53	957.95	686.82	271.13	3.533	
17,100.00	9,665.03	17,197.88	9,632.27	137.05	137.68	-88.40	7,392.34	-601.84	957.70	682.97	274.73	3.486	
17,200.00	9,664.32	17,297.88	9,631.27	138.85	139.48	-88.38	7,492.33	-602.16	957.45	679.11	278.34	3.440	
17,300.00	9,663.61	17,397.88	9,630.26	140.66	141.29	-88.36	7,592.32	-602.47	957.20	675.26	281.94	3.395	
17,400.00	9,662.90	17,497.88	9,629.26	142.46	143.09	-88.35	7,692.32	-602.78	956.95	671.40	285.55	3.351	
17,500.00	9,662.19	17,597.87	9,628.26	144.26	144.90	-88.33	7,792.31	-603.10	956.70	667.54	289.16	3.309	
17,600.00	9,661.48	17,697.87	9,627.25	146.07	146.70	-88.31	7,892.30	-603.41	956.45	663.68	292.77	3.267	
17,700.00	9,660.77	17,797.87	9,626.25	147.87	148.51	-88.29	7,992.30	-603.73	956.20	659.82	296.38	3.226	
17,800.00	9,660.06	17,897.87	9,625.25	149.68	150.31	-88.27	8,092.29	-604.04	955.95	655.96	299.99	3.187	
17,900.00	9,659.35	17,997.87	9,624.24	151.48	152.12	-88.26	8,192.29	-604.36	955.70	652.10	303.60	3.148	
18,000.00	9,658.64	18,097.87	9,623.24	153.29	153.92	-88.24	8,292.28	-604.67	955.45	648.23	307.21	3.110	
18,100.00	9,657.93	18,197.87	9,622.23	155.09	155.73	-88.22	8,392.27	-604.99	955.20	644.37	310.83	3.073	
18,200.00	9,657.22	18,297.87	9,621.23	156.90	157.54	-88.20	8,492.27	-605.30	954.95	640.51	314.44	3.037	
18,300.00	9,656.51	18,397.87	9,620.23	158.71	159.35	-88.18	8,592.26	-605.62	954.70	636.64	318.05	3.002	
18,400.00	9,655.80	18,497.87	9,619.22	160.51	161.16	-88.17	8,692.25	-605.93	954.45	632.78	321.67	2.967	
18,500.00	9,655.09	18,597.87	9,618.22	162.32	162.96	-88.15	8,792.25	-606.24	954.20	628.91	325.29	2.933	
18,600.00	9,654.38	18,697.87	9,617.22	164.13	164.77	-88.13	8,892.24	-606.56	953.95	625.04	328.90	2.900	
18,700.00	9,653.67	18,797.87	9,616.21	165.94	166.58	-88.11	8,992.24	-606.87	953.70	621.18	332.52	2.868	
18,800.00	9,652.96	18,897.86	9,615.21	167.75	168.39	-88.09	9,092.23	-607.19	953.45	617.31	336.14	2.836	
18,900.00	9,652.25	18,997.86	9,614.21	169.56	170.20	-88.07	9,192.22	-607.50	953.20	613.44	339.76	2.806	
19,000.00	9,651.54	19,097.86	9,613.20	171.37	172.01	-88.06	9,292.22	-607.82	952.95	609.57	343.38	2.775	
19,100.00	9,650.82	19,197.86	9,612.20	173.18	173.82	-88.04	9,392.21	-608.13	952.70	605.70	347.00	2.746	
19,200.00	9,650.11	19,297.86	9,611.19	174.99	175.63	-88.02	9,492.20	-608.45	952.45	601.83	350.62	2.716	
19,300.00	9,649.40	19,397.86	9,610.19	176.80	177.44	-88.00	9,592.20	-608.76	952.20	597.96	354.24	2.688	
19,400.00	9,648.69	19,497.86	9,609.19	178.61	179.26	-87.98	9,692.19	-609.07	951.95	594.09	357.86	2.660	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error:	0.00 usft
Survey Program: 0-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
19,500.00	9,647.98	19,597.86	9,608.18	180.42	181.07	-87.97	9,792.19	-609.39	951.70	590.22	361.48	2.633		
19,600.00	9,647.27	19,697.86	9,607.18	182.23	182.88	-87.95	9,892.18	-609.70	951.46	586.35	365.11	2.606		
19,700.00	9,646.56	19,797.86	9,606.18	184.04	184.69	-87.93	9,992.17	-610.02	951.21	582.48	368.73	2.580		
19,800.00	9,645.85	19,897.86	9,605.17	185.85	186.50	-87.91	10,092.17	-610.33	950.96	578.60	372.35	2.554		
19,900.00	9,645.14	19,997.86	9,604.17	187.66	188.32	-87.89	10,192.16	-610.65	950.71	574.73	375.98	2.529		
19,918.96	9,645.01	20,014.60	9,604.00	187.95	188.57	-87.89	10,208.90	-610.70	950.67	574.15	376.52	2.525		
19,919.80	9,645.00	20,014.60	9,604.00	187.96	188.57	-87.89	10,208.90	-610.70	950.67	574.14	376.53	2.525 SF		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Distance							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
0.00	0.00	0.00	0.00	0.00	0.00	79.15	26.89	140.25	142.81				
100.00	100.00	98.37	98.37	0.08	0.12	79.11	26.99	140.27	142.84	142.64	0.20	715.192	
200.00	200.00	198.25	198.25	0.31	0.23	78.99	27.31	140.34	142.98	142.43	0.54	263.391	
300.00	300.00	298.90	298.90	0.53	0.40	78.91	27.49	140.26	142.93	142.00	0.93	153.736	
400.00	400.00	399.57	399.57	0.76	0.56	79.00	27.16	139.80	142.42	141.10	1.32	108.105	
500.00	500.00	499.35	499.34	0.98	0.75	79.14	26.70	139.20	141.74	140.01	1.73	81.752	
600.00	600.00	599.12	599.11	1.21	0.94	79.20	26.45	138.73	141.23	139.08	2.15	65.677	
700.00	700.00	699.39	699.38	1.43	1.19	79.25	26.24	138.23	140.70	138.08	2.62	53.737	
800.00	800.00	799.66	799.65	1.66	1.43	79.35	25.88	137.56	139.98	136.89	3.09	45.347	
900.00	900.00	899.25	899.23	1.88	1.66	79.47	25.45	136.96	139.30	135.76	3.54	39.320	
1,000.00	1,000.00	998.83	998.82	2.11	1.89	79.62	25.03	136.65	138.93	134.93	4.00	34.742	
1,100.00	1,100.00	1,099.06	1,099.04	2.33	2.13	79.81	24.53	136.43	138.62	134.16	4.46	31.088	
1,200.00	1,200.00	1,199.29	1,199.27	2.56	2.36	80.05	23.86	136.07	138.15	133.23	4.92	28.084	
1,300.00	1,300.00	1,298.67	1,298.65	2.78	2.57	80.39	23.01	135.88	137.82	132.46	5.35	25.751	
1,323.07	1,323.07	1,321.60	1,321.57	2.83	2.62	80.49	22.78	135.91	137.80	132.35	5.45	25.277	
1,400.00	1,400.00	1,398.04	1,398.01	3.01	2.78	80.85	21.94	136.18	137.94	132.16	5.78	23.847	
1,500.00	1,500.00	1,499.11	1,499.07	3.23	3.00	81.37	20.69	136.36	137.92	131.69	6.23	22.129	
1,600.00	1,600.00	1,600.00	1,599.95	3.45	3.23	81.90	19.32	135.73	137.11	130.43	6.68	20.523	
1,700.00	1,700.00	1,699.87	1,699.81	3.68	3.48	82.41	17.96	134.82	136.02	128.86	7.16	18.988	
1,800.00	1,800.00	1,799.54	1,799.46	3.90	3.74	82.89	16.73	134.14	135.19	127.54	7.65	17.681	
1,900.00	1,900.00	1,900.38	1,900.29	4.13	4.00	83.43	15.35	133.27	134.16	126.03	8.13	16.496	
2,000.00	2,000.00	2,001.19	2,001.07	4.35	4.27	84.12	13.57	131.80	132.52	123.90	8.62	15.374	
2,100.00	2,100.00	2,101.56	2,101.40	4.58	4.53	84.96	11.45	129.90	130.44	121.33	9.11	14.321	
2,200.00	2,200.00	2,201.89	2,201.68	4.80	4.79	85.98	8.88	127.72	128.08	118.48	9.60	13.347	
2,300.00	2,300.00	2,301.86	2,301.59	5.03	5.05	87.01	6.54	125.40	125.61	115.53	10.08	12.458	
2,400.00	2,400.00	2,401.83	2,401.52	5.25	5.32	87.92	4.47	123.04	123.15	112.58	10.57	11.652	
2,500.00	2,500.00	2,501.42	2,501.07	5.48	5.58	88.70	2.74	120.81	120.87	109.82	11.05	10.935	
2,600.00	2,600.00	2,601.04	2,600.65	5.70	5.83	89.35	1.34	118.88	118.90	107.37	11.54	10.306	
2,700.00	2,700.00	2,700.95	2,700.54	5.93	6.10	89.97	0.07	117.11	117.13	105.11	12.02	9.742	
2,800.00	2,800.00	2,800.86	2,800.43	6.15	6.36	90.63	-1.28	115.40	115.42	102.92	12.51	9.228	
2,900.00	2,900.00	2,900.87	2,900.42	6.38	6.62	91.33	-2.64	113.70	113.75	100.75	13.00	8.753	
3,000.00	3,000.00	3,000.00	2,999.52	6.60	6.88	92.02	-3.95	111.98	112.05	98.57	13.48	8.312	
3,100.00	3,100.00	3,099.73	3,099.24	6.83	7.01	92.52	-4.87	110.76	110.87	97.03	13.84	8.012	
3,164.83	3,164.83	3,163.83	3,163.33	6.97	7.10	92.62	-5.06	110.54	110.85	96.58	14.07	7.865	
3,200.00	3,200.00	3,198.59	3,198.10	7.05	7.14	92.61	-5.04	110.60	110.71	96.52	14.19	7.801	
3,300.00	3,300.00	3,298.14	3,297.65	7.28	7.16	92.29	-4.45	111.19	111.28	96.85	14.43	7.710	
3,400.00	3,400.00	3,397.68	3,397.17	7.50	7.17	91.57	-3.08	112.20	112.25	97.58	14.67	7.651	
3,500.00	3,500.00	3,497.65	3,497.11	7.73	7.20	90.65	-1.29	113.45	113.46	98.53	14.93	7.601	
3,600.00	3,600.00	3,597.62	3,597.06	7.95	7.23	89.75	0.50	114.69	114.70	99.52	15.18	7.555	
3,700.00	3,700.00	3,697.69	3,697.11	8.17	7.28	88.92	2.19	115.90	115.93	100.47	15.45	7.501	
3,800.00	3,800.00	3,797.76	3,797.17	8.40	7.33	88.20	3.67	117.03	117.10	101.37	15.73	7.445	
3,900.00	3,900.00	3,897.22	3,896.62	8.62	7.42	87.80	4.55	118.36	118.46	102.42	16.04	7.384	
4,000.00	4,000.00	3,996.66	3,996.04	8.85	7.51	87.88	4.44	120.17	120.28	103.92	16.36	7.353	
4,100.00	4,100.00	4,096.54	4,095.89	9.07	7.65	88.29	3.84	122.29	122.37	105.65	16.72	7.318	
4,200.00	4,200.00	4,196.43	4,195.74	9.30	7.79	88.86	2.49	124.49	124.55	107.46	17.09	7.289	
4,300.00	4,300.00	4,296.74	4,296.03	9.52	7.96	89.49	1.12	126.61	126.64	109.16	17.48	7.245	
4,400.00	4,400.00	4,397.08	4,396.34	9.75	8.12	90.12	-0.27	128.44	128.45	110.58	17.87	7.187	
4,500.00	4,500.00	4,497.90	4,497.15	9.97	8.31	90.62	-1.41	129.81	129.82	111.54	18.28	7.103	
4,600.00	4,599.98	4,598.75	4,597.99	10.18	8.49	-30.85	-1.95	130.52	129.03	110.37	18.66	6.914	
4,700.00	4,699.84	4,699.31	4,698.55	10.36	8.69	-31.93	-2.40	130.63	124.67	105.62	19.06	6.543	
4,762.40	4,762.03	4,761.92	4,761.15	10.48	8.83	-33.02	-2.90	130.42	120.21	100.91	19.30	6.228	
4,800.00	4,799.48	4,799.61	4,798.84	10.55	8.90	-33.75	-3.28	130.20	117.10	97.65	19.45	6.020	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1													Offset Site Error: 0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Tooface (")	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
4,900.00	4,899.06	4,899.23	4,898.46	10.74	9.12	-36.00	-4.13	129.46	108.79	88.94	19.86	5.479	
5,000.00	4,998.64	4,998.79	4,998.01	10.94	9.33	-38.91	-4.45	128.64	100.67	80.40	20.27	4.967	
5,100.00	5,098.22	5,098.04	5,097.26	11.14	9.55	-42.41	-4.59	127.93	92.99	72.30	20.68	4.496	
5,200.00	5,197.80	5,197.35	5,196.57	11.34	9.76	-46.37	-4.88	127.54	85.99	64.89	21.10	4.075	
5,300.00	5,297.38	5,297.09	5,296.30	11.55	10.00	-50.88	-5.32	127.24	79.50	57.96	21.55	3.690	
5,400.00	5,396.96	5,396.82	5,396.03	11.76	10.24	-56.11	-5.92	126.78	73.39	51.39	22.00	3.336	
5,500.00	5,496.54	5,496.40	5,495.61	11.97	10.47	-62.28	-6.50	126.17	67.86	45.42	22.44	3.024	
5,600.00	5,596.12	5,595.94	5,595.15	12.18	10.70	-69.64	-6.91	125.42	63.26	40.38	22.89	2.764	
5,700.00	5,695.70	5,695.32	5,694.53	12.40	10.91	-78.07	-7.13	124.70	60.01	36.70	23.31	2.574	
5,800.00	5,795.28	5,794.71	5,793.91	12.62	11.12	-87.17	-7.18	124.16	58.44	34.71	23.74	2.462	
5,845.52	5,840.61	5,840.04	5,839.24	12.72	11.21	-91.40	-7.18	123.97	58.29	34.36	23.94	2.435 CC	
5,900.00	5,894.86	5,894.31	5,893.52	12.84	11.33	-96.44	-7.21	123.75	58.50	34.33	24.18	2.420 ES, SF	
6,000.00	5,994.45	5,993.95	5,993.15	13.07	11.55	-105.39	-7.38	123.38	59.95	35.33	24.62	2.435	
6,100.00	6,094.03	6,093.41	6,092.60	13.29	11.76	-113.70	-7.56	123.01	62.79	37.73	25.05	2.506	
6,200.00	6,193.61	6,192.83	6,192.03	13.52	11.97	-121.18	-7.53	122.82	67.02	41.53	25.49	2.629	
6,300.00	6,293.19	6,292.68	6,291.88	13.75	12.18	-127.72	-7.60	122.23	72.17	46.23	25.94	2.782	
6,400.00	6,392.77	6,392.61	6,391.81	13.99	12.40	-133.37	-8.14	121.88	77.66	51.27	26.38	2.943	
6,500.00	6,492.35	6,492.25	6,491.44	14.22	12.64	-138.25	-8.96	121.59	83.52	56.66	26.86	3.109	
6,600.00	6,591.93	6,591.86	6,591.05	14.46	12.88	-142.44	-9.79	121.32	89.88	62.54	27.34	3.288	
6,700.00	6,691.51	6,691.26	6,690.44	14.70	13.12	-146.08	-10.56	120.99	96.73	68.91	27.82	3.477	
6,800.00	6,791.09	6,790.59	6,789.77	14.93	13.37	-149.30	-11.18	120.44	104.17	75.87	28.30	3.681	
6,900.00	6,890.67	6,890.20	6,889.38	15.18	13.61	-152.07	-11.69	119.86	111.99	83.21	28.79	3.890	
7,000.00	6,990.25	6,989.89	6,989.06	15.42	13.86	-154.36	-12.13	119.55	119.95	90.67	29.28	4.097	
7,100.00	7,089.83	7,089.59	7,088.77	15.66	14.11	-156.32	-12.62	119.37	127.97	98.20	29.77	4.299	
7,200.00	7,189.42	7,189.30	7,188.47	15.91	14.35	-158.13	-13.30	119.07	136.04	105.78	30.26	4.496	
7,300.00	7,289.00	7,288.75	7,287.91	16.15	14.60	-159.86	-14.17	118.54	144.22	113.46	30.75	4.689	
7,400.00	7,388.58	7,388.10	7,387.25	16.40	14.85	-161.58	-15.24	117.56	152.65	121.40	31.25	4.885	
7,500.00	7,488.16	7,488.13	7,487.27	16.65	15.10	-163.18	-16.48	116.50	161.16	129.41	31.75	5.076	
7,600.00	7,587.74	7,588.34	7,587.48	16.90	15.35	-164.51	-17.72	115.94	169.39	137.15	32.24	5.253	
7,700.00	7,687.32	7,688.00	7,687.13	17.15	15.59	-165.64	-19.00	115.69	177.48	144.74	32.74	5.421	
7,800.00	7,786.90	7,787.58	7,786.70	17.40	15.84	-166.68	-20.28	115.42	186.65	152.42	33.24	5.586	
7,900.00	7,886.48	7,887.01	7,886.11	17.65	16.09	-167.60	-21.47	115.16	193.93	160.20	33.73	5.749	
8,000.00	7,986.06	7,986.40	7,985.51	17.90	16.33	-168.40	-22.45	114.95	202.35	168.12	34.23	5.911	
8,100.00	8,085.64	8,087.03	8,086.13	18.15	16.56	-169.11	-23.46	114.94	210.66	175.95	34.72	6.068	
8,200.00	8,185.22	8,187.94	8,187.02	18.41	16.79	-169.76	-24.84	115.37	218.44	183.23	35.20	6.205	
8,300.00	8,284.80	8,286.96	8,286.04	18.66	17.02	-170.37	-26.36	115.89	226.04	190.36	35.68	6.335	
8,400.00	8,384.39	8,385.66	8,384.72	18.92	17.25	-170.98	-27.74	116.00	234.07	197.91	36.16	6.472	
8,500.00	8,483.97	8,485.18	8,484.23	19.18	17.38	-171.58	-29.04	115.86	242.39	205.83	36.56	6.630	
8,600.00	8,583.55	8,584.27	8,583.32	19.43	17.50	-172.12	-30.32	115.74	250.72	213.79	36.93	6.789	
8,700.00	8,683.13	8,674.00	8,673.04	19.69	17.50	-172.35	-29.80	115.31	260.58	223.39	37.19	7.007	
8,800.00	8,782.71	8,755.04	8,753.83	19.95	17.51	-171.82	-24.17	113.84	275.56	238.11	37.46	7.357	
8,900.00	8,882.29	8,825.91	8,823.31	20.21	17.52	-170.13	-10.60	112.11	298.89	261.16	37.73	7.923	
9,000.00	8,981.87	8,897.00	8,890.48	20.47	17.54	-167.30	12.49	110.53	331.43	293.42	38.01	8.720	
9,100.00	9,081.45	8,948.45	8,936.84	20.73	17.56	-164.82	34.72	109.37	372.93	334.64	38.29	9.740	
9,135.13	9,116.43	8,965.96	8,952.05	20.82	17.57	-163.95	43.37	108.78	389.80	351.41	38.39	10.153	
9,150.00	9,131.25	8,973.35	8,958.37	20.86	17.58	-147.23	47.18	108.50	397.15	358.72	38.44	10.333	
9,200.00	9,181.07	8,998.06	8,979.10	20.97	17.60	-88.90	60.60	107.48	421.39	382.82	38.57	10.925	
9,250.00	9,230.61	9,023.00	8,999.27	21.07	17.63	-63.54	75.22	106.42	444.74	406.03	38.70	11.491	
9,300.00	9,279.48	9,046.50	9,017.47	21.16	17.66	-52.45	90.06	105.55	467.03	428.20	38.83	12.028	
9,350.00	9,327.33	9,067.25	9,032.76	21.24	17.70	-46.14	104.06	104.90	488.26	449.32	38.94	12.538	
9,400.00	9,373.77	9,086.00	9,045.87	21.31	17.74	-41.96	117.44	104.07	508.58	469.53	39.05	13.025	
9,450.00	9,418.47	9,105.59	9,058.80	21.37	17.78	-38.90	132.11	102.94	527.89	488.74	39.15	13.484	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1													Offset Site Error: 0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
9,500.00	9,461.07	9,118.00	9,066.57	21.42	17.81	-36.61	141.75	102.09	546.19	506.96	39.23	13.924	
9,550.00	9,501.27	9,149.00	9,084.37	21.46	17.90	-34.69	167.01	99.80	563.17	523.82	39.36	14.309	
9,600.00	9,538.74	9,162.20	9,091.19	21.49	17.95	-33.22	178.27	98.82	578.85	539.41	39.44	14.677	
9,650.00	9,573.20	9,181.00	9,100.10	21.52	18.01	-31.99	194.77	97.47	593.25	553.72	39.54	15.006	
9,700.00	9,604.40	9,200.43	9,108.27	21.56	18.09	-30.96	212.35	96.20	606.24	566.59	39.65	15.291	
9,750.00	9,632.09	9,220.00	9,115.41	21.59	18.17	-30.11	230.53	95.14	617.73	577.97	39.76	15.535	
9,800.00	9,656.07	9,239.06	9,121.33	21.64	18.27	-29.41	248.62	94.21	627.69	587.78	39.90	15.730	
9,850.00	9,676.15	9,260.15	9,126.77	21.71	18.37	-28.86	268.97	93.18	636.06	595.98	40.08	15.868	
9,900.00	9,692.17	9,284.00	9,131.95	21.83	18.50	-28.48	292.22	91.96	642.50	602.17	40.33	15.932	
9,950.00	9,704.02	9,315.00	9,137.35	21.99	18.69	-28.31	322.68	90.07	646.95	606.27	40.68	15.903	
10,000.00	9,711.61	9,333.84	9,139.92	22.21	18.81	-28.27	341.29	88.64	649.29	608.27	41.02	15.828	
10,050.00	9,714.88	9,357.57	9,142.39	22.47	18.97	-28.43	364.80	86.54	649.69	608.25	41.44	15.676	
10,066.68	9,715.00	9,365.32	9,142.96	22.57	19.03	-28.52	372.49	85.85	649.39	607.80	41.59	15.613	
10,095.03	9,714.80	9,378.00	9,143.62	22.74	19.12	-28.63	385.11	84.74	649.04	607.19	41.85	15.507	
10,100.00	9,714.77	9,378.00	9,143.62	22.77	19.12	-28.63	385.11	84.74	649.06	607.17	41.89	15.496	
10,200.00	9,714.06	9,442.81	9,143.09	23.46	19.63	-29.03	449.65	79.09	652.90	609.81	43.09	15.152	
10,300.00	9,713.35	9,532.67	9,138.90	24.27	20.42	-29.41	539.10	71.65	660.10	615.41	44.69	14.769	
10,400.00	9,712.63	9,650.98	9,132.74	25.19	21.52	-29.71	657.00	63.94	667.05	620.34	46.70	14.282	
10,500.00	9,711.92	9,768.41	9,129.75	26.20	22.65	-29.97	774.25	58.50	670.65	621.80	48.85	13.729	
10,600.00	9,711.21	9,888.72	9,128.32	27.29	23.98	-29.97	894.55	57.55	671.11	619.84	51.27	13.090	
10,700.00	9,710.50	9,992.16	9,127.86	28.46	25.19	-29.85	997.98	58.76	670.02	616.36	53.65	12.488	
10,800.00	9,709.79	10,095.07	9,127.95	29.69	26.43	-29.79	1,100.89	59.43	668.71	612.59	56.12	11.915	
10,900.00	9,709.08	10,187.65	9,128.86	30.98	27.61	-29.85	1,193.45	58.98	667.23	608.65	58.58	11.389	
10,922.79	9,708.92	10,206.84	9,128.96	31.28	27.86	-29.88	1,212.64	58.58	667.17	608.03	59.14	11.282	
11,000.00	9,708.37	10,287.32	9,129.70	32.31	28.94	-30.12	1,293.06	55.61	667.29	606.03	61.26	10.894	
11,100.00	9,707.66	10,389.42	9,132.96	33.70	30.36	-30.66	1,394.96	50.08	666.37	602.31	64.06	10.402	
11,159.09	9,707.24	10,443.48	9,134.22	34.54	31.14	-30.90	1,448.94	47.54	666.08	600.40	65.68	10.141	
11,200.00	9,706.95	10,478.88	9,134.67	35.12	31.66	-31.04	1,484.30	45.89	666.25	599.46	66.78	9.976	
11,300.00	9,706.24	10,579.53	9,135.07	36.58	33.14	-31.40	1,584.84	41.13	667.45	597.73	69.72	9.573	
11,400.00	9,705.53	10,678.07	9,135.85	38.07	34.60	-31.73	1,683.28	36.94	668.11	595.44	72.67	9.193	
11,500.00	9,704.82	10,783.29	9,135.71	39.59	36.19	-31.94	1,788.46	33.85	668.87	593.09	75.78	8.826	
11,600.00	9,704.11	10,870.97	9,135.24	41.13	37.53	-32.07	1,876.10	31.55	669.83	591.16	78.67	8.515	
11,700.00	9,703.40	10,970.98	9,133.65	42.70	39.07	-32.24	1,976.04	28.11	672.10	590.34	81.77	8.220	
11,800.00	9,702.69	11,071.32	9,132.80	44.28	40.61	-32.47	2,076.30	24.19	674.00	589.11	84.89	7.939	
11,900.00	9,701.98	11,178.59	9,132.96	45.88	42.28	-32.83	2,183.45	19.20	675.48	587.32	88.17	7.662	
12,000.00	9,701.27	11,279.85	9,134.17	47.50	43.88	-33.23	2,284.58	14.27	676.22	584.84	91.38	7.400	
12,100.00	9,700.56	11,371.58	9,134.63	49.13	45.35	-33.56	2,376.20	9.76	677.61	583.12	94.48	7.172	
12,200.00	9,699.85	11,467.05	9,133.24	50.78	46.90	-33.75	2,471.58	5.98	680.09	582.41	97.68	6.963	
12,300.00	9,699.14	11,578.77	9,132.26	52.44	48.70	-33.93	2,583.25	2.72	681.50	580.36	101.14	6.738	
12,400.00	9,698.43	11,675.60	9,131.01	54.10	50.27	-34.00	2,680.05	0.71	682.81	578.44	104.38	6.542	
12,500.00	9,697.72	11,766.44	9,131.27	55.78	52.08	-34.21	2,790.85	-2.14	683.13	575.27	107.86	6.334	
12,538.94	9,697.44	11,824.15	9,131.70	56.44	52.69	-34.31	2,828.53	-3.33	683.09	573.96	109.13	6.260	
12,600.00	9,697.00	11,881.42	9,132.25	57.47	53.62	-34.46	2,885.77	-5.27	683.22	572.13	111.09	6.150	
12,700.00	9,696.29	11,974.85	9,132.60	59.16	55.16	-34.75	2,979.12	-9.21	684.40	570.07	114.32	5.986	
12,800.00	9,695.58	12,072.13	9,131.97	60.87	56.77	-34.94	3,076.33	-12.57	685.99	568.35	117.64	5.831	
12,900.00	9,694.87	12,170.35	9,130.35	62.57	58.41	-35.09	3,174.49	-15.93	688.39	567.41	120.98	5.690	
13,000.00	9,694.16	12,279.00	9,130.27	64.29	60.20	-35.36	3,283.05	-20.09	689.73	565.23	124.49	5.540	
13,100.00	9,693.45	12,375.94	9,130.41	66.01	61.82	-35.59	3,379.93	-23.37	690.67	562.85	127.83	5.403	
13,200.00	9,692.74	12,470.59	9,129.73	67.74	63.40	-35.80	3,474.51	-27.10	692.63	561.50	131.13	5.282	
13,300.00	9,692.03	12,573.75	9,129.52	69.47	65.12	-36.11	3,577.56	-31.89	694.62	560.03	134.58	5.161	
13,400.00	9,691.32	12,672.78	9,130.07	71.20	66.77	-36.47	3,676.45	-36.99	696.31	558.33	137.98	5.047	
13,500.00	9,690.61	12,770.33	9,130.51	72.94	68.42	-36.85	3,773.85	-42.42	698.36	556.99	141.37	4.940	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1													Offset Site Error: 0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Distance							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
13,600.00	9,689.90	12,866.45	9,130.25	74.69	70.06	-37.16	3,869.84	-47.50	700.85	556.10	144.75	4.842	
13,700.00	9,689.19	12,965.41	9,129.56	76.44	71.74	-37.47	3,968.65	-52.82	703.75	555.57	148.18	4.749	
13,800.00	9,688.48	13,069.46	9,129.53	78.19	73.51	-37.86	4,072.52	-58.90	706.44	554.75	151.69	4.657	
13,900.00	9,687.77	13,167.00	9,130.05	79.94	75.17	-38.29	4,169.86	-65.20	709.08	553.97	155.11	4.571	
14,000.00	9,687.06	13,268.41	9,130.79	81.70	76.90	-38.75	4,271.04	-72.00	711.79	553.19	158.60	4.488	
14,100.00	9,686.35	13,363.88	9,131.46	83.46	78.53	-39.20	4,366.27	-78.63	714.71	552.71	161.99	4.412	
14,200.00	9,685.64	13,462.12	9,131.53	85.22	80.22	-39.61	4,464.29	-85.16	717.97	552.52	165.45	4.340	
14,300.00	9,684.93	13,563.89	9,130.99	86.99	81.96	-39.98	4,565.85	-91.64	721.54	552.59	168.95	4.271	
14,400.00	9,684.22	13,660.00	9,130.72	88.76	83.60	-40.28	4,661.82	-96.89	724.39	552.04	172.36	4.203	
14,500.00	9,683.51	13,660.00	9,130.72	90.53	83.60	-40.28	4,661.82	-96.89	734.99	560.86	174.13	4.221	
14,600.00	9,682.80	13,660.00	9,130.72	92.30	83.60	-40.28	4,661.82	-96.89	758.73	582.83	175.90	4.313	
14,700.00	9,682.08	13,660.00	9,130.72	94.08	83.60	-40.28	4,661.82	-96.89	794.43	616.76	177.67	4.471	
14,800.00	9,681.37	13,660.00	9,130.72	95.85	83.60	-40.28	4,661.82	-96.89	840.59	661.14	179.45	4.684	
14,900.00	9,680.66	13,660.00	9,130.72	97.63	83.60	-40.28	4,661.82	-96.89	895.57	714.34	181.23	4.942	
15,000.00	9,679.95	13,660.00	9,130.72	99.41	83.60	-40.28	4,661.82	-96.89	957.86	774.86	183.01	5.234	
15,100.00	9,679.24	13,660.00	9,130.72	101.19	83.60	-40.28	4,661.82	-96.89	1,026.14	841.35	184.79	5.553	
15,200.00	9,678.53	13,660.00	9,130.72	102.97	83.60	-40.28	4,661.82	-96.89	1,099.28	912.71	186.57	5.892	
15,300.00	9,677.82	13,660.00	9,130.72	104.76	83.60	-40.28	4,661.82	-96.89	1,176.39	988.03	188.36	6.246	
15,400.00	9,677.11	13,660.00	9,130.72	106.54	83.60	-40.28	4,661.82	-96.89	1,256.72	1,066.58	190.14	6.609	
15,500.00	9,676.40	13,660.00	9,130.72	108.33	83.60	-40.28	4,661.82	-96.89	1,339.70	1,147.77	191.93	6.980	
15,600.00	9,675.69	13,660.00	9,130.72	110.12	83.60	-40.28	4,661.82	-96.89	1,424.87	1,231.16	193.72	7.355	
15,700.00	9,674.98	13,660.00	9,130.72	111.91	83.60	-40.28	4,661.82	-96.89	1,511.86	1,316.35	195.51	7.733	
15,800.00	9,674.27	13,660.00	9,130.72	113.70	83.60	-40.28	4,661.82	-96.89	1,600.37	1,403.07	197.30	8.112	
15,900.00	9,673.56	13,660.00	9,130.72	115.49	83.60	-40.28	4,661.82	-96.89	1,690.16	1,491.07	199.09	8.490	
16,000.00	9,672.85	13,660.00	9,130.72	117.28	83.60	-40.28	4,661.82	-96.89	1,781.04	1,580.16	200.88	8.866	
16,100.00	9,672.14	13,660.00	9,130.72	119.07	83.60	-40.28	4,661.82	-96.89	1,872.85	1,670.18	202.67	9.241	
16,200.00	9,671.43	13,660.00	9,130.72	120.87	83.60	-40.28	4,661.82	-96.89	1,965.46	1,760.99	204.47	9.613	
16,300.00	9,670.72	13,660.00	9,130.72	122.66	83.60	-40.28	4,661.82	-96.89	2,058.76	1,852.49	206.26	9.981	
16,400.00	9,670.01	13,660.00	9,130.72	124.46	83.60	-40.28	4,661.82	-96.89	2,152.66	1,944.60	208.06	10.346	
16,500.00	9,669.30	13,660.00	9,130.72	126.26	83.60	-40.28	4,661.82	-96.89	2,247.09	2,037.23	209.85	10.708	
16,600.00	9,668.59	13,660.00	9,130.72	128.05	83.60	-40.28	4,661.82	-96.89	2,341.98	2,130.32	211.65	11.065	
16,700.00	9,667.88	13,660.00	9,130.72	129.85	83.60	-40.28	4,661.82	-96.89	2,437.28	2,223.83	213.45	11.418	
16,800.00	9,667.17	13,660.00	9,130.72	131.65	83.60	-40.28	4,661.82	-96.89	2,532.94	2,317.69	215.25	11.767	
16,900.00	9,666.45	13,660.00	9,130.72	133.45	83.60	-40.28	4,661.82	-96.89	2,628.92	2,411.87	217.05	12.112	
17,000.00	9,665.74	13,660.00	9,130.72	135.25	83.60	-40.28	4,661.82	-96.89	2,725.20	2,506.35	218.85	12.452	
17,100.00	9,665.03	13,660.00	9,130.72	137.05	83.60	-40.28	4,661.82	-96.89	2,821.73	2,601.08	220.65	12.788	
17,200.00	9,664.32	13,660.00	9,130.72	138.85	83.60	-40.28	4,661.82	-96.89	2,918.50	2,696.04	222.45	13.120	
17,300.00	9,663.61	13,660.00	9,130.72	140.66	83.60	-40.28	4,661.82	-96.89	3,015.47	2,791.22	224.25	13.447	
17,400.00	9,662.90	13,660.00	9,130.72	142.46	83.60	-40.28	4,661.82	-96.89	3,112.64	2,886.58	226.06	13.769	
17,500.00	9,662.19	13,660.00	9,130.72	144.26	83.60	-40.28	4,661.82	-96.89	3,209.98	2,982.12	227.86	14.087	
17,600.00	9,661.48	13,660.00	9,130.72	146.07	83.60	-40.28	4,661.82	-96.89	3,307.48	3,077.82	229.66	14.401	
17,700.00	9,660.77	13,660.00	9,130.72	147.87	83.60	-40.28	4,661.82	-96.89	3,405.13	3,173.66	231.47	14.711	
17,800.00	9,660.06	13,660.00	9,130.72	149.68	83.60	-40.28	4,661.82	-96.89	3,502.91	3,269.63	233.27	15.016	
17,900.00	9,659.35	13,660.00	9,130.72	151.48	83.60	-40.28	4,661.82	-96.89	3,600.81	3,365.73	235.08	15.317	
18,000.00	9,658.64	13,660.00	9,130.72	153.29	83.60	-40.28	4,661.82	-96.89	3,698.82	3,461.94	236.88	15.614	
18,100.00	9,657.93	13,660.00	9,130.72	155.09	83.60	-40.28	4,661.82	-96.89	3,796.94	3,558.25	238.69	15.907	
18,200.00	9,657.22	13,660.00	9,130.72	156.90	83.60	-40.28	4,661.82	-96.89	3,895.15	3,654.65	240.50	16.196	
18,300.00	9,656.51	13,660.00	9,130.72	158.71	83.60	-40.28	4,661.82	-96.89	3,993.45	3,751.15	242.30	16.481	
18,400.00	9,655.80	13,660.00	9,130.72	160.51	83.60	-40.28	4,661.82	-96.89	4,091.84	3,847.72	244.11	16.762	
18,500.00	9,655.09	13,660.00	9,130.72	162.32	83.60	-40.28	4,661.82	-96.89	4,190.30	3,944.38	245.92	17.039	
18,600.00	9,654.38	13,660.00	9,130.72	164.13	83.60	-40.28	4,661.82	-96.89	4,288.83	4,041.10	247.73	17.313	
18,700.00	9,653.67	13,660.00	9,130.72	165.94	83.60	-40.28	4,661.82	-96.89	4,387.43	4,137.89	249.54	17.582	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Distance						Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)		Separation Factor
18,800.00	9,652.96	13,660.00	9,130.72	167.75	83.60	-40.28	4,661.82	-96.89	4,486.09	4,234.74	251.35	17.848	
18,900.00	9,652.25	13,660.00	9,130.72	169.56	83.60	-40.28	4,661.82	-96.89	4,584.80	4,331.65	253.15	18.111	
19,000.00	9,651.54	13,660.00	9,130.72	171.37	83.60	-40.28	4,661.82	-96.89	4,683.58	4,428.61	254.96	18.370	
19,100.00	9,650.82	13,660.00	9,130.72	173.18	83.60	-40.28	4,661.82	-96.89	4,782.40	4,525.63	256.77	18.625	
19,200.00	9,650.11	13,660.00	9,130.72	174.99	83.60	-40.28	4,661.82	-96.89	4,881.27	4,622.69	258.58	18.877	
19,300.00	9,649.40	13,660.00	9,130.72	176.80	83.60	-40.28	4,661.82	-96.89	4,980.19	4,719.79	260.39	19.126	
19,400.00	9,648.69	13,660.00	9,130.72	178.61	83.60	-40.28	4,661.82	-96.89	5,079.15	4,816.94	262.20	19.371	
19,500.00	9,647.98	13,660.00	9,130.72	180.42	83.60	-40.28	4,661.82	-96.89	5,178.14	4,914.13	264.02	19.613	
19,600.00	9,647.27	13,660.00	9,130.72	182.23	83.60	-40.28	4,661.82	-96.89	5,277.18	5,011.35	265.83	19.852	
19,700.00	9,646.56	13,660.00	9,130.72	184.04	83.60	-40.28	4,661.82	-96.89	5,376.25	5,108.62	267.64	20.088	
19,800.00	9,645.85	13,660.00	9,130.72	185.85	83.60	-40.28	4,661.82	-96.89	5,475.36	5,205.91	269.45	20.321	
19,900.00	9,645.14	13,660.00	9,130.72	187.66	83.60	-40.28	4,661.82	-96.89	5,574.50	5,303.24	271.26	20.550	
19,919.80	9,645.00	13,660.00	9,130.72	187.96	83.60	-40.28	4,661.82	-96.89	5,594.13	5,322.57	271.56	20.600	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandriil Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Reference Depths are relative to KB=26' @ 3279.00usft (Scandriil FreeCoordinates are relative to: Harrier Federal Com 301H

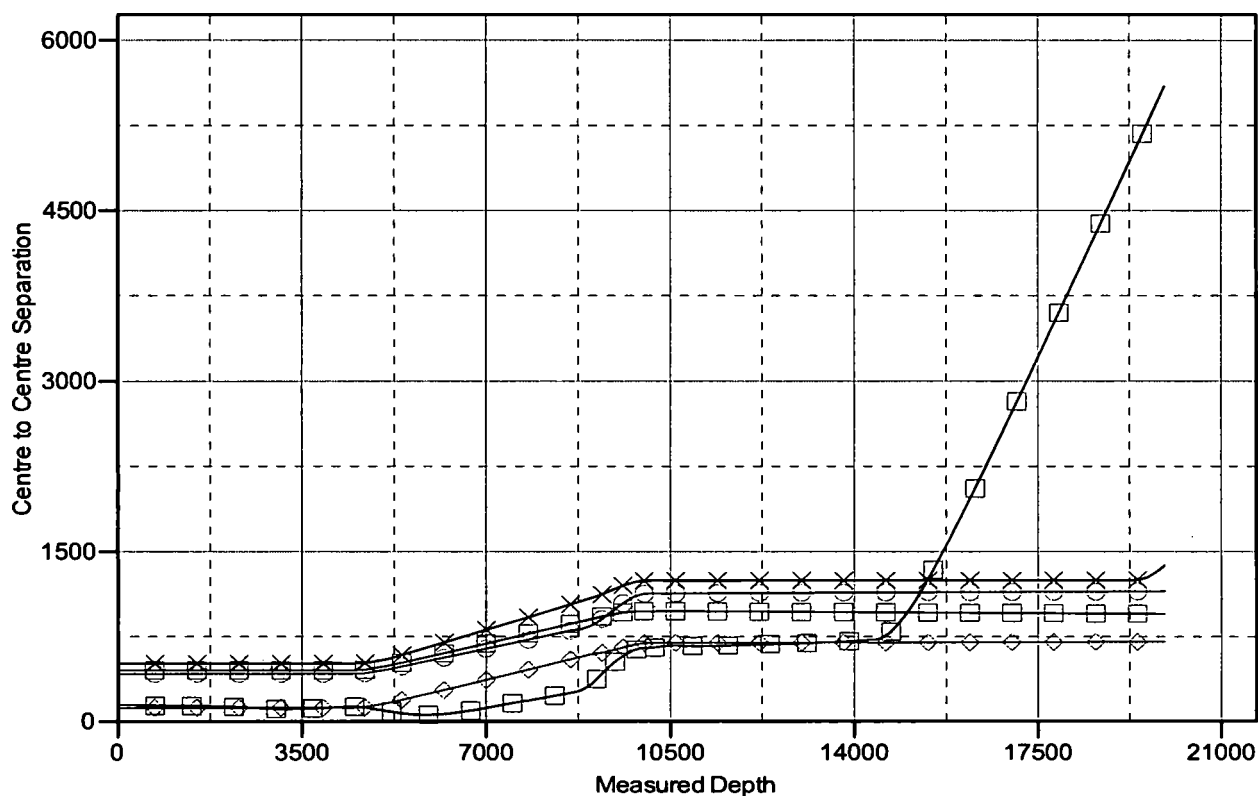
Offset Depths are relative to Offset Datum

Central Meridian is -104.33334

Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30

Grid Convergence at Surface is: 0.36°

Ladder Plot



LEGEND

Harrier Federal Com 303H, Wellbore #1, Plan #1 V0 Harrier Federal Com 302H, Wellbore #1, Plan #1 V0 Harrier Federal Com 201H, Wellbore #1, Plan #1 V0
Harrier Federal Com 101H, Wellbore #1, Plan #1 V0

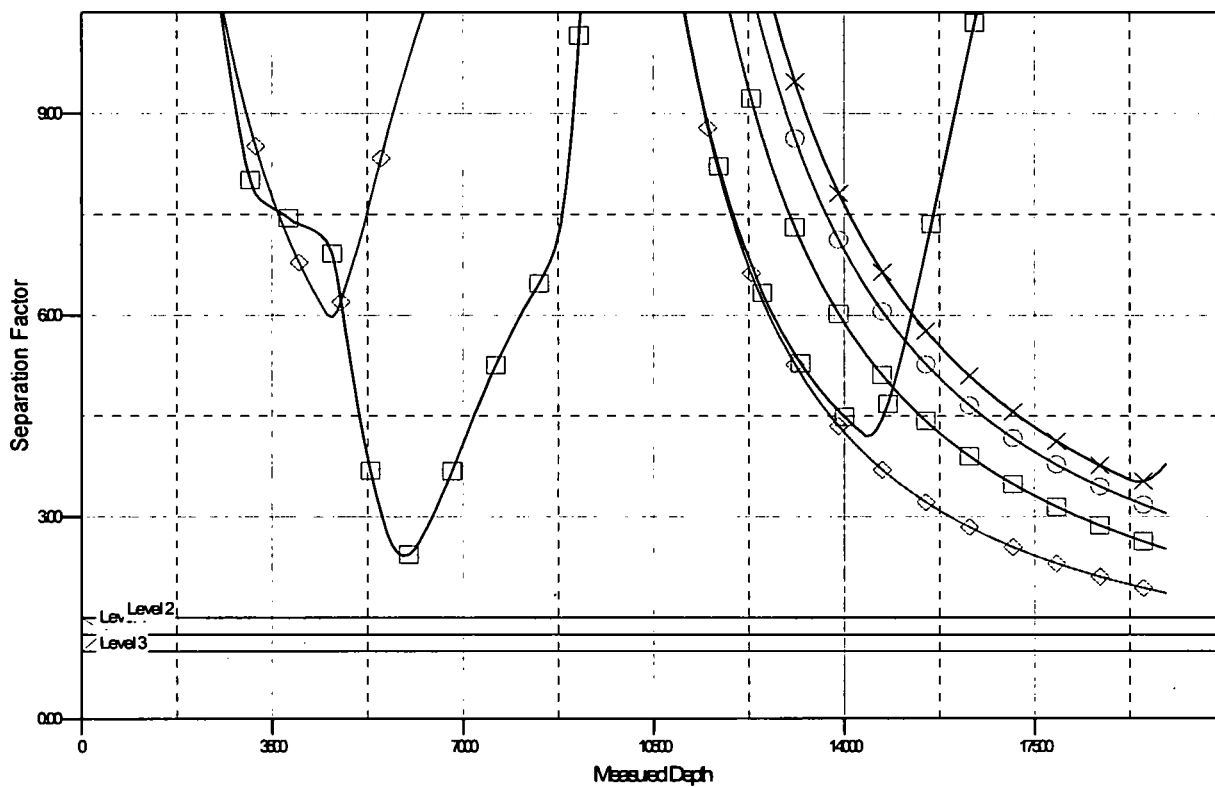
CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 301H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 301H
TVD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3279.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Reference Depths are relative to KB=26' @ 3279.00usft (Scandril FreeCoordinates are relative to: Harrier Federal Com 301H
 Offset Depths are relative to Offset Datum
 Central Meridian is -104.33334
 Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30
 Grid Convergence at Surface is: 0.36°

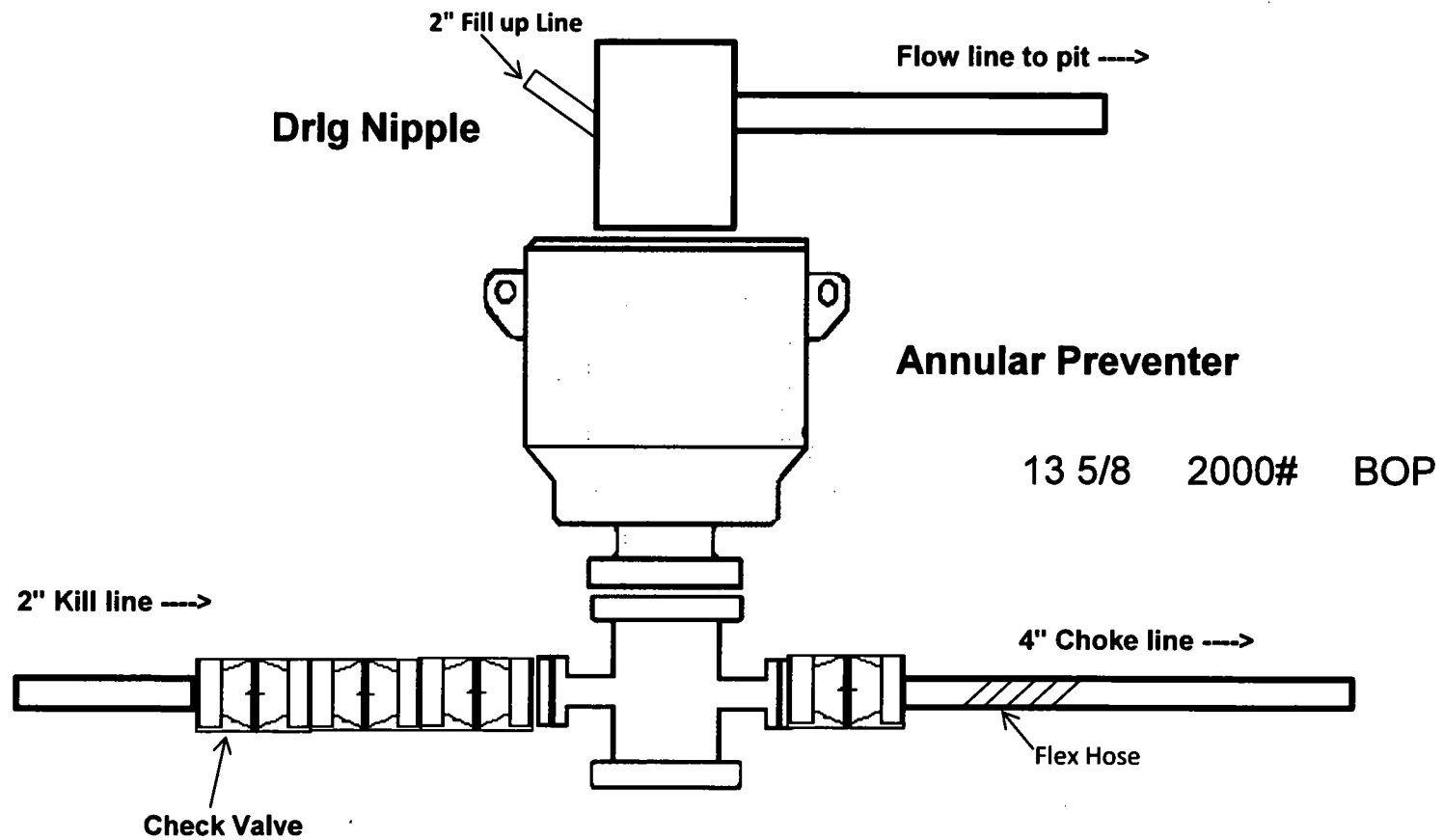
Separation Factor Plot



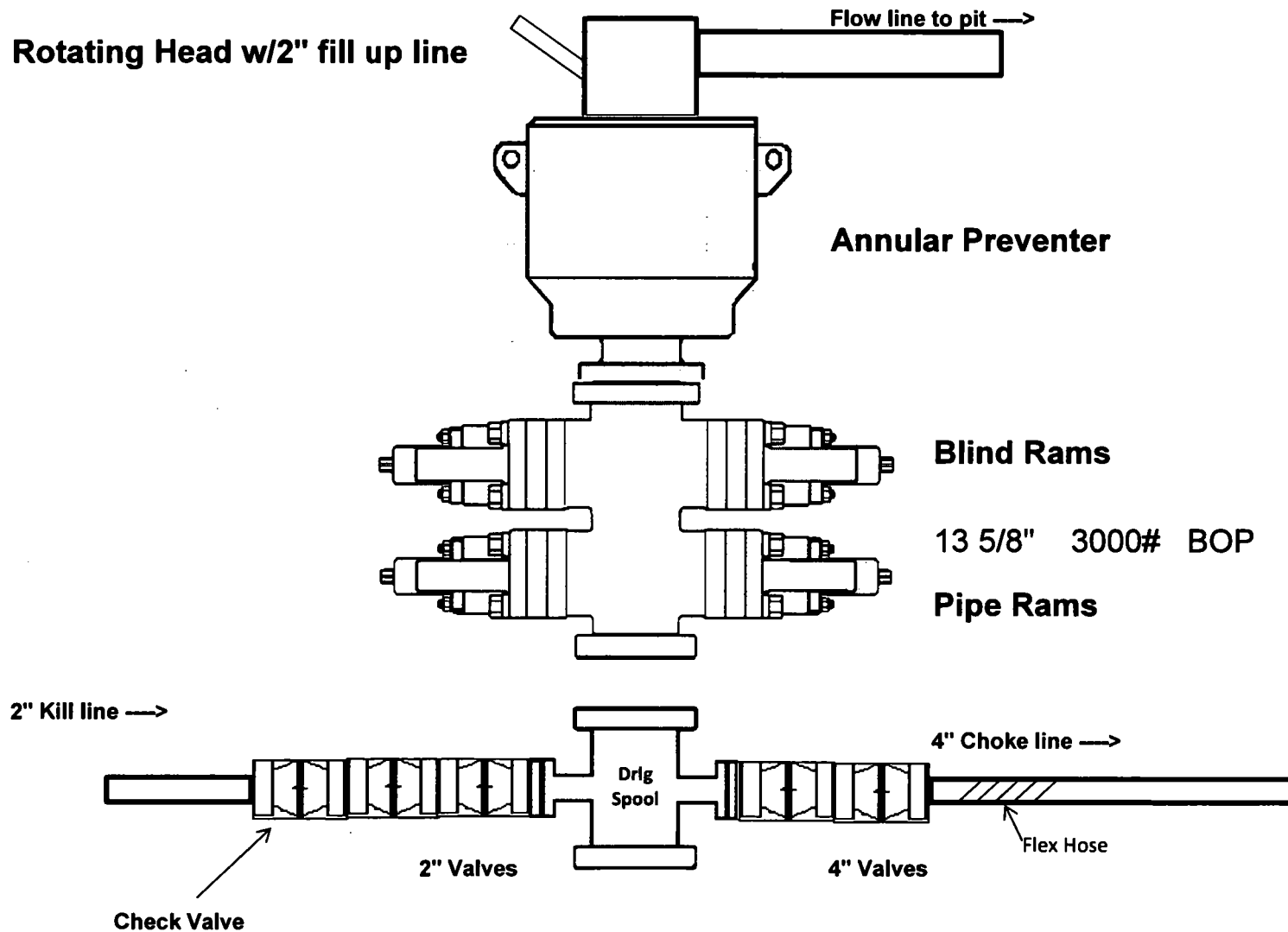
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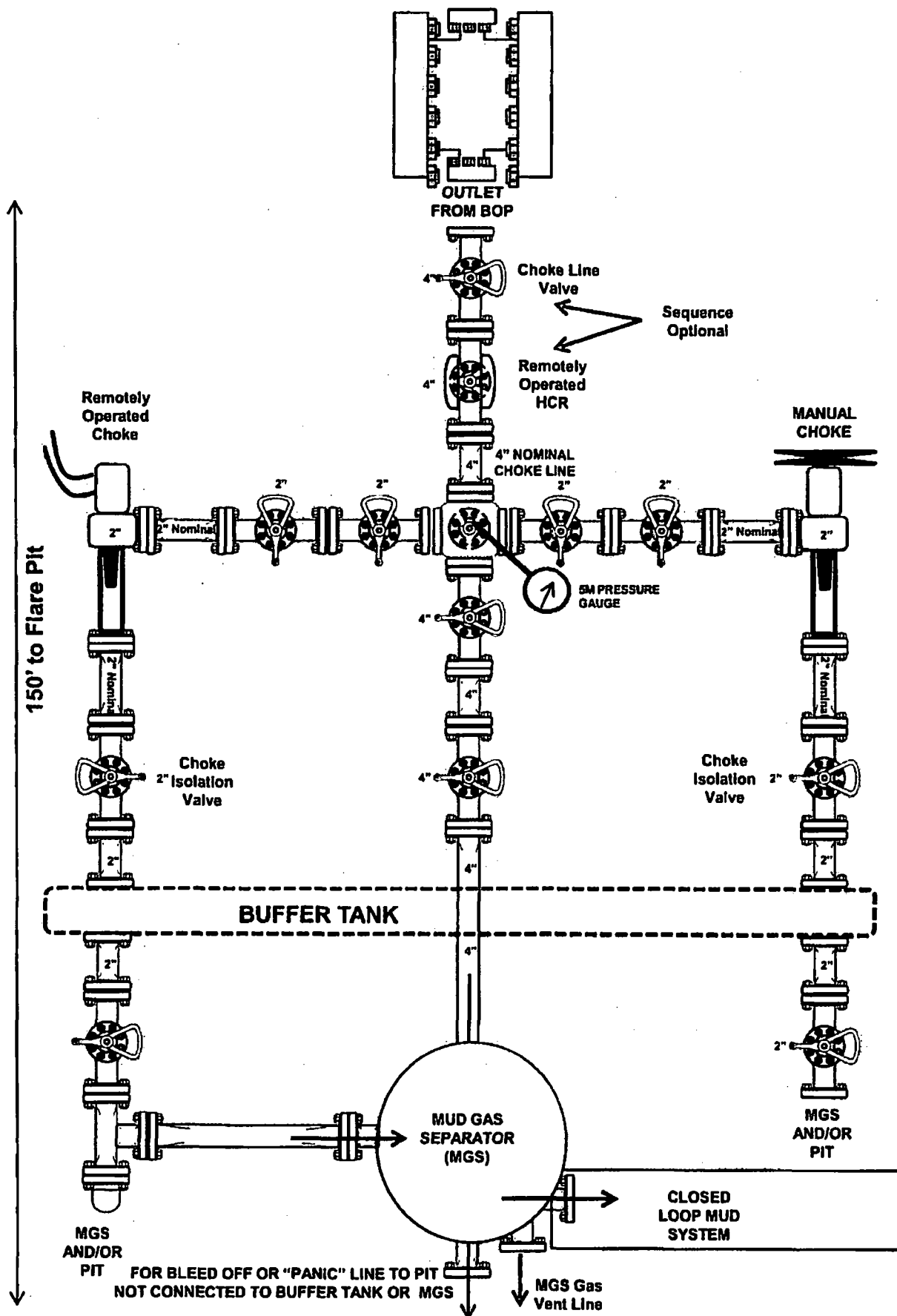
Federal Com 303H, Wellbore #1, Plan #1 V0 Harrier Federal Com 302H, Wellbore #1, Plan #1 V0 Harrier Federal Com 201H, Wellbore #1 P
 BQZ St Com 1H, Wellbore #1, Wellbore #1 V0 Harrier Federal Com 101H, Wellbore #1, Plan #1 V0

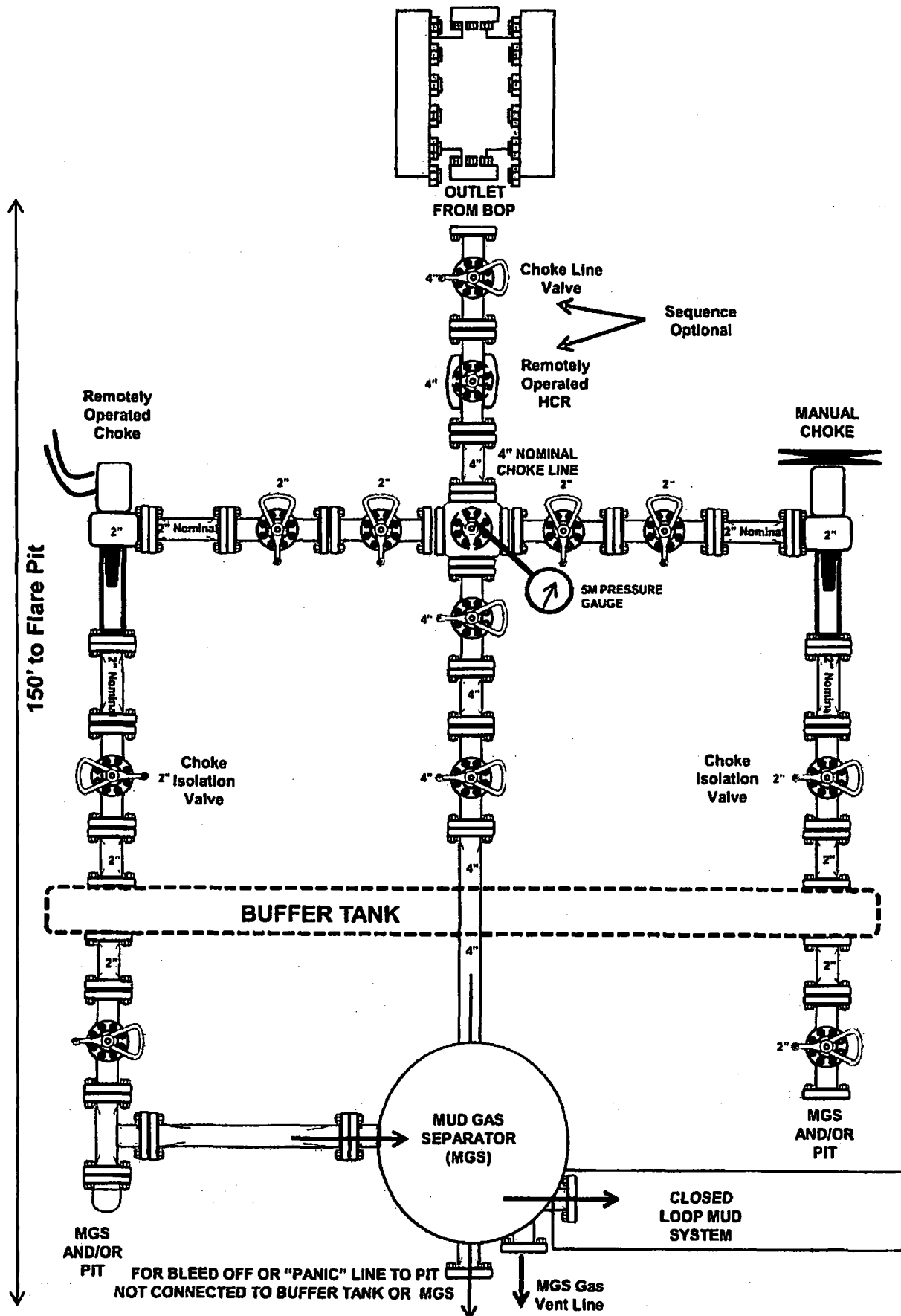
2,000 psi BOP Schematic



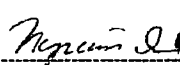
3,000 psi BOP Schematic







ContiTech

QUALITY CONTROL INSPECTION AND TEST CERTIFICATE		CERT. N°: 814	
PURCHASER: ContiTech Oil & Marine Corp.		P.O. N°: 4501005826	
CONTITECH RUBBER order N°: 1001224	HOSE TYPE: 3" ID Choke and Kill Hose		
HOSE SERIAL N°: 74077	NOMINAL / ACTUAL LENGTH: 12,19 m / 12,22 m		
W.P. 69,0 MPa 10000 psi	T.P. 103,5 MPa 15000 psi	Duration: 60 min.	
Pressure test with water at ambient temperature			
See attachment (1 page)			
COUPLINGS Type	Serial N°	Quality	Heat N°
3" coupling with 3 1/16" 10K API Swivel Flange end Hub	8183	AISI 4130 AISI 4130 AISI 4130	A0231W 85913 A0355Y
3" coupling with 3 1/16" 10K API b.w. Flange end	8182	AISI 4130 AISI 4130	A0231W 85913
Not Designed For Well Testing		API Spec 16 C 2nd Edition-- FSL2	
		Temperature rate: "B"	
All metal parts are flawless			
WE CERTIFY THAT THE ABOVE HOSE HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE TERMS OF THE ORDER INSPECTED AND PRESSURE TESTED AS ABOVE WITH SATISFACTORY RESULT.			
STATEMENT OF CONFORMITY: We hereby certify that the above items/equipment supplied by us are in conformity with the terms, conditions and specifications of the above Purchaser Order and that these items/equipment were fabricated inspected and tested in accordance with the referenced standards, codes and specifications and meet the relevant acceptance criteria and design requirements.			
COUNTRY OF ORIGIN HUNGARY/EU			
Date:	Inspector	Quality Control	ContiTech Rubber Industrial Kft. Quality Control Dept. (1)
17. November 2017.			

ATTACHMENT OF QUALITY CONTROL
INSPECTION AND TEST CERTIFICATE
No: 814, 817

C4042

CONTITECH RUBBER Industrial Kft.	No: QC-DB- 335 / 2017 Page: 6 / 83
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1/1

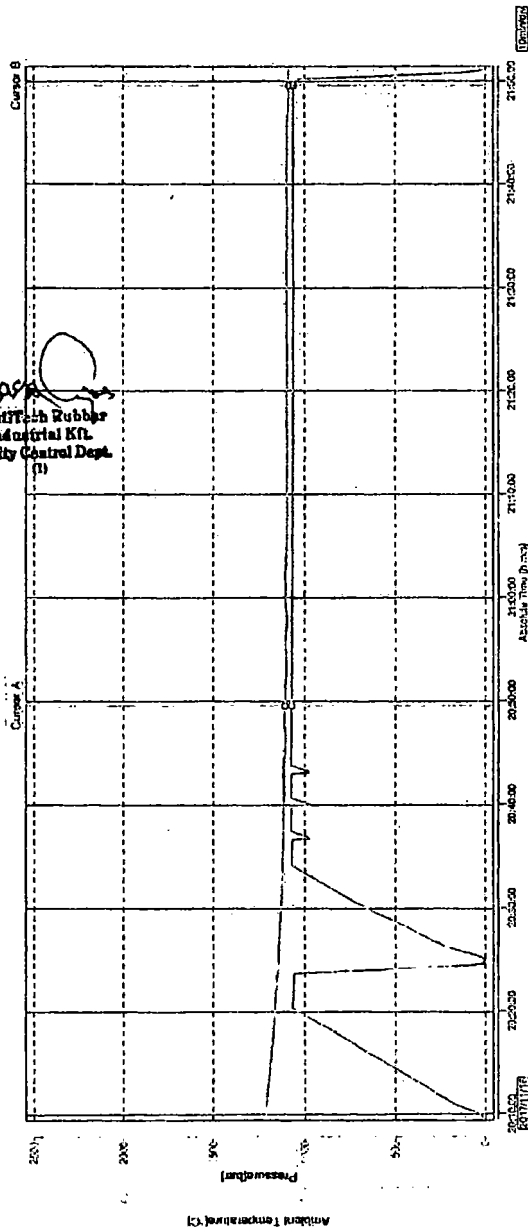
Sampling Int.
Start Time
Stop Time

5.000 sec
: 2017/11/18 20:09:25.000
: 2017/11/18 21:15:12.000

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File Message : 74077/74089
Device Type : GX10
Serial No. : S5P5000399
Data Count : 1235
Print Group :
Print Range :
Comment :
Press-Temp :
: 2017/11/18 20:09:25.000 - 2017/11/18 21:15:12.000
: 142056635

Data No.	Curve A	Curve B	Difference
421	2017/11/18 20:09:25.000	2017/11/18 21:15:12.000	016000.000
Value A	Value B	Value B-A	
1072.10	1053.27	-18.83	
22.19	21.74	-0.45	

Contitech Rubber
Industrial Kft.
Quality Control Dept.





CONTITECH RUBBER
Industrial Kft.

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ContiTech

Hose Data Sheet

CRI Order No.	1001224
Customer	ContiTech Oil & Marine Corp
Customer Order No	4501005826 CO1000284
Item No.	10
Hose Type	Flexible Hose
Standard	API SPEC 16C 2ND EDITION FSL2
Inside dia in inches	3
Length	40 ft
Type of coupling one end	FLANGE 3.1/16" 10K FLANGE API SPEC 6A TYPE 6BX MONOGRAMMED B.W.BX154ST/ST LINED RING GROOVE SOUR
Type of coupling other end	FLANGE 3.1/16" 10K FLANGE API SPEC 17D SV SWIVEL FLANGE BX154 ST/ST LINED RING GROOVE SOUR
H2S service NACE MR0175	Yes
Working Pressure	10 000 psi
Design Pressure	10 000 psi
Test Pressure	15 000 psi
Safety Factor	2,25
Marking	CONTINENTAL CONTITECH
Cover	NOT FIRE RESISTANT
Outside protection	St. steel outer wrap
Internal stripwound tube	No
Lining	OIL + GAS RESISTANT SOUR
Safety clamp	Yes
Lifting collar	Yes
Element C	Yes
Safety chain	Yes
Safety wire rope	No
Max. design temperature [°C]	100
Min. design temperature [°C]	-20
Min. Bend Radius operating [m]	0,90
Min. Bend Radius storage [m]	0,90
Calculated Gross / Net weight of hose assembly [kg]	
Electrical continuity	The Hose is electrically continuous
Type of packing	WOODEN CRATE ISPM-15

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ContiTech Rubber
Industrial Kft.
QC 2



ContiTech Fluid Technology

ContiTech Oil & Marine Corp. # 11535 Brittonmore Park Dr., Houston, TX 77041-6916 USA		Delivery Note	
ScanDrill Inc. 9395 HWY 2767 TYLER TX 75708		Document No.	85367700
		Document Date	12/20/2017
		Customer Number	15483
		Customer VAT No.	
		Supplier Number	
		N° EORI:	FR41027953300021
		Purchase Order No.	149618
		Purchase Order Date	09/26/2017
		Sales Order Number	1000284
		Sales Order Date	09/26/2017
		Unloading Point	
		Page 1 of 2	
Transport-Details - Shipping			
Conditions			
Shipping Conditions		0 days	
Inco Terms		EXW Houston, TX	
		Ex Works	
Buyer: Joe Ward E-mail: jward@scandrift.com Tel: 903.597.5368			
Item	Material/Description	Quantity	Weight
10	HCK3FA40IPSIVS 3" 40R API 16C C&K Hose WP 10K Temp B End A: 3.1/16" 10K Flange, API Spec. 8A Type 6BX, Butt Welded, BX154 Stainless Steel 316 Lined Ring Groove - Sour End B: 3.1/16" 10K API Spec 17D SV Swivel Flange, BX154 Stainless Steel 316 Lined Ring Groove - Sour Hose metallic parts NACE MR 0175 latest edition Hose is suitable for H2S Service Standard: API Spec 16C - 2nd Edition - FSL Level 2 - Monogrammed Working Pressure: 10000 psi Test Pressure: 15000 psi Fire Rated: No Armoured: Yes - Stainless Steel 316L Interlock Design Temperature: -20 to 100°C High Temperature Exposure / Survival @ 177 Deg C (internal in a kick situation) Brand Name: Continental ContiTech Supplied with: 2 x Safety Clamps 2 x Lifting Collars Double Eyed 2 x Safety Chains c/w Shackles Each End x 8ft Packing to ISPM-15 Heat Treated	1 PC	2,219.000 LB

ContiTech Oil & Marine Corp.
11535 Brittonmore Park Drive
Houston, TX 77041
USAPhone: (832)-327-0141
Fax: (832)-327-0148
www.contitech-oil-gas.comManaging Director
(President)
Zuzana CizekBank: Wells Fargo Bank, N.A.
420 Montgomery Street, San Francisco, CA 94103
Account #: 4942682294
ABA/Routing #: 121000248, SWIFT #: WFB1US33

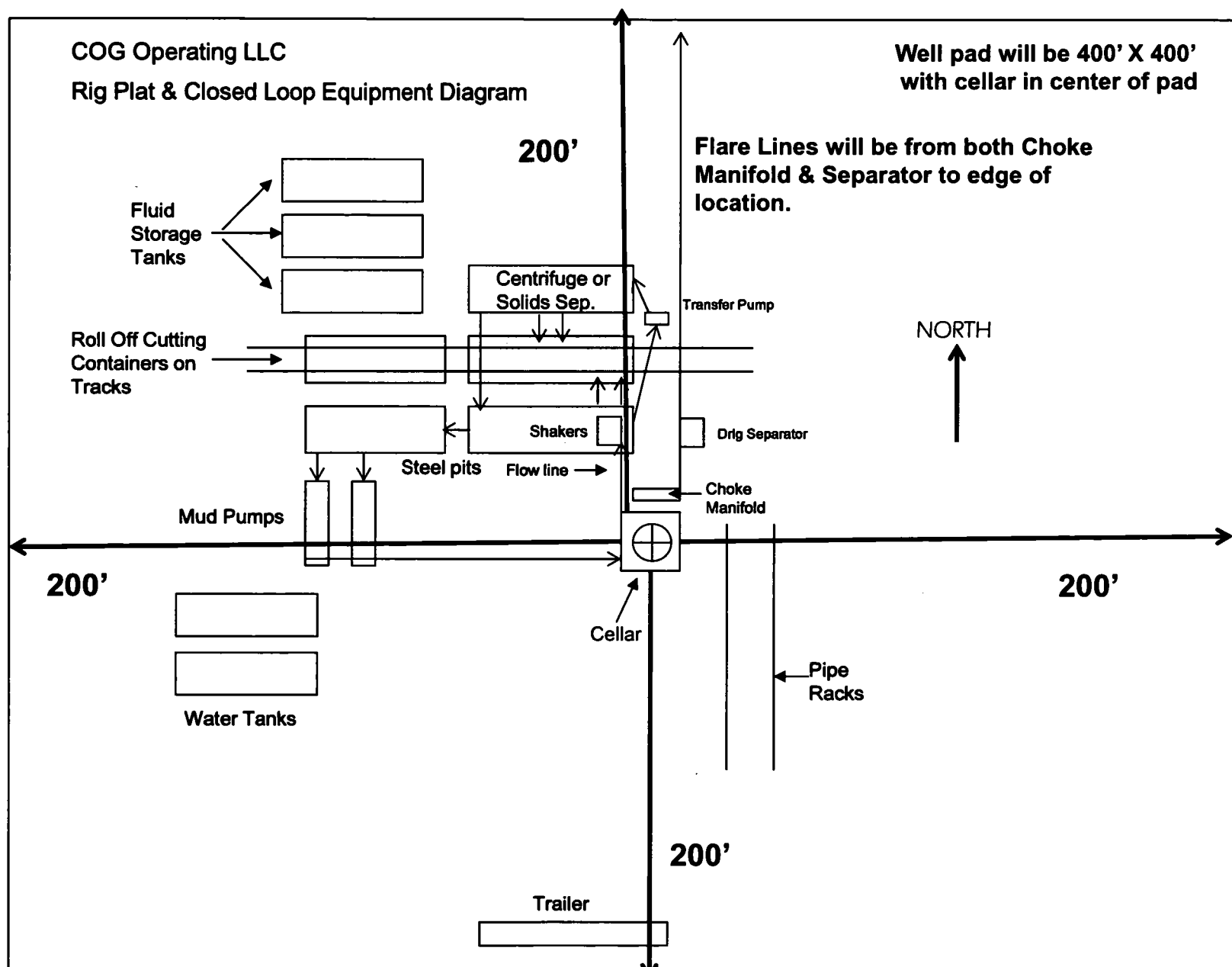
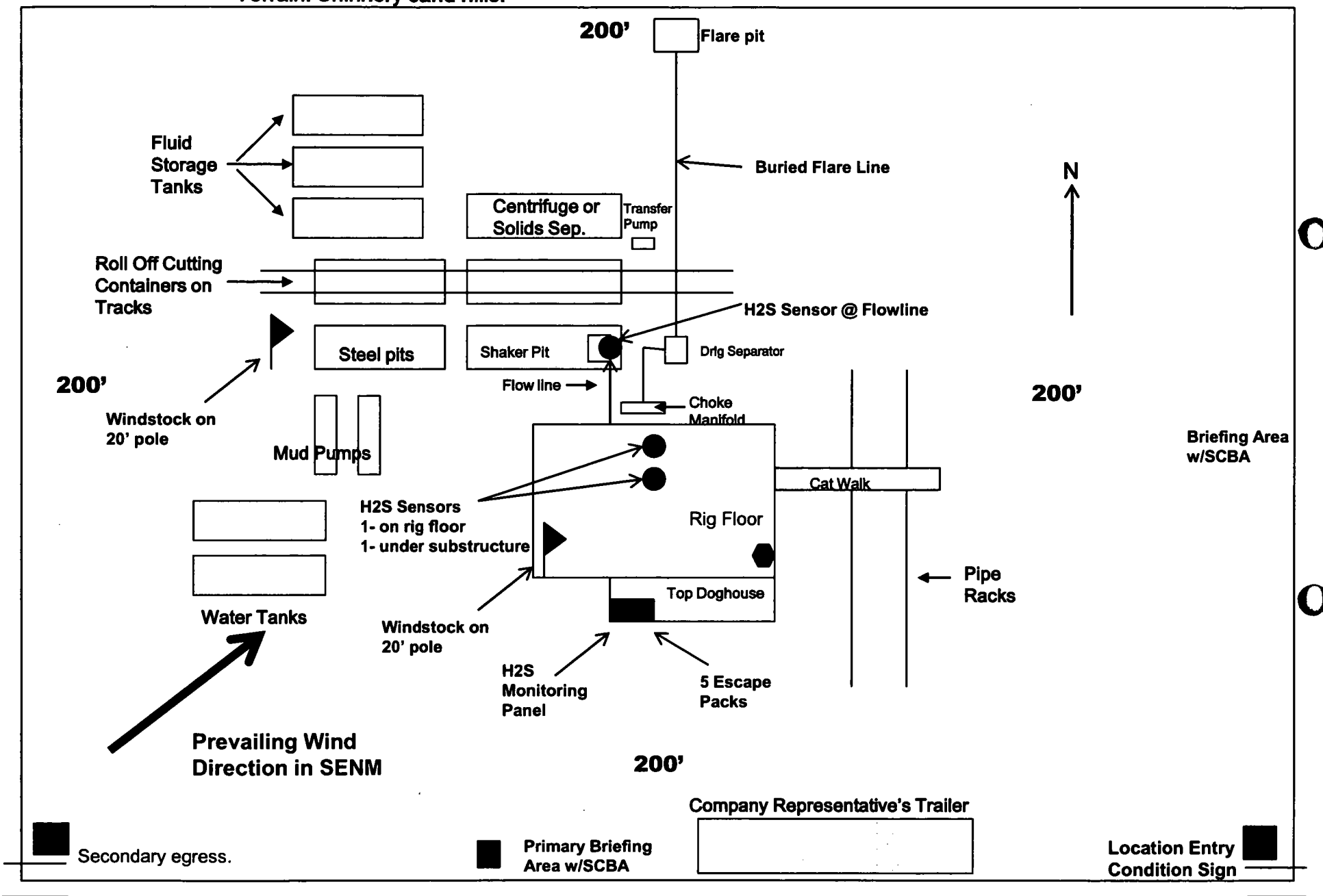


Exhibit 1

"I further certify that COG will comply with Rule 19.15.17 NMAC by using a Closed Loop System."

COG Operating LLC
H₂S Equipment Schematic
Terrain: Shinnery sand hills.

Well pad will be 400' x 400'
with cellar in center of pad



COG OPERATING LLC
HYDROGEN SULFIDE DRILLING OPERATIONS PLAN

1. HYDROGEN SULFIDE TRAINING

All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis, will receive training from a qualified instructor in the following areas prior to commencing drilling operations on this well:

- a. The hazards and characteristics of hydrogen sulfide (H₂S).
- b. The proper use and maintenance of personal protective equipment and life support systems.
- c. The proper use of H₂S detectors, alarms, warning systems, briefing areas, evacuation procedures, and prevailing winds.
- d. The proper techniques for first aid and rescue procedures.

In addition, supervisory personnel will be trained in the following areas:

- a. The effects of H₂S on metal components. If high tensile tubulars are to be used, personnel will be trained in their special maintenance requirements.
- b. Corrective action and shut-in procedures when drilling or reworking a well and blowout prevention and well control procedures.
- c. The contents and requirements of the H₂S Drilling Operations Plan and the Public Protection Plan.

There will be an initial training session just prior to encountering a known or probable H₂S zone (within 3 days or 500 feet) and weekly H₂S and well control drills for all personnel in each crew. The initial training session shall include a review of the site specific H₂S Drilling Operations Plan and the Public Protection Plan. This plan shall be available at the well site. All personnel will be required to carry documentation that they have received the proper training.

2. H₂S SAFETY EQUIPMENT AND SYSTEMS

Note: All H₂S safety equipment and systems will be installed, tested, and operational when drilling reaches a depth of 500 feet above, or three days prior to penetrating the first zone containing or reasonably expected to contain H₂S. If H₂S greater than 100 ppm is encountered in the gas stream we will shut in and install H₂S equipment.

- a. Well Control Equipment:
 - Flare line.
 - Choke manifold with remotely operated choke.
 - Blind rams and pipe rams to accommodate all pipe sizes with properly sized closing unit.
 - Auxiliary equipment to include: annular preventer, mud-gas separator, rotating head.

- b. Protective equipment for essential personnel:
Mark II Surviveair 30-minute units located in the dog house and at briefing areas.
- c. H2S detection and monitoring equipment:
2 - portable H2S monitor positioned on location for best coverage and response. These units have warning lights and audible sirens when H2S levels of 20 ppm are reached.
- d. Visual warning systems:
Caution/Danger signs shall be posted on roads providing direct access to location. Signs will be painted a high visibility yellow with black lettering of sufficient size to be readable at a reasonable distance from the immediate location. Bilingual signs will be used, when appropriate. See example attached.
- e. Mud Program:
The mud program has been designed to minimize the volume of H2S circulated to the surface.
- f. Metallurgy:
All drill strings, casings, tubing, wellhead, blowout preventers, drilling spool, kill lines, choke manifold and lines, and valves shall be suitable for H2S service.
- g. Communication:
Company vehicles equipped with cellular telephone.

COG OPERATING LLC has conducted a review to determine if an H2S contingency plan is required for the above referenced well. We were able to conclude that any potential hazardous volume would be minimal. H2S concentrations of wells in this area from surface to TD are low enough; therefore, we do not believe that an H2S contingency plan is necessary.

W A R N I N G

**YOU ARE ENTERING AN H₂S AREA
AUTHORIZED PERSONNEL ONLY**

- 1. BEARDS OR CONTACT LENSES NOT ALLOWED***
- 2. HARD HATS REQUIRED***
- 3. SMOKING IN DESIGNATED AREAS ONLY***
- 4. BE WIND CONSCIOUS AT ALL TIMES***
- 5. CK WITH COG OPERATING LLC FOREMAN AT MAIN OFFICE***

COG OPERATING LLC

1-575-748-6940

EMERGENCY CALL LIST

	<u>OFFICE</u>	<u>MOBILE</u>
COG OPERATING LLC OFFICE	575-748-6940	
SETH WILD	432-683-7443	432-528-3633
WALTER ROYE	575-748-6940	432-934-1886

EMERGENCY RESPONSE NUMBERS

	<u>OFFICE</u>
STATE POLICE	575-748-9718
EDDY COUNTY SHERIFF	575-746-2701
EMERGENCY MEDICAL SERVICES (AMBULANCE)	911 or 575-746-2701
EDDY COUNTY EMERGENCY MANAGEMENT (HARRY BURGESS)	575-887-9511
STATE EMERGENCY RESPONSE CENTER (SERC)	575-476-9620
CARLSBAD POLICE DEPARTMENT	575-885-2111
CARLSBAD FIRE DEPARTMENT	575-885-3125
NEW MEXICO OIL CONSERVATION DIVISION	575-748-1283
INDIAN FIRE & SAFETY	800-530-8693
HALLIBURTON SERVICES	800-844-8451

PECOS DISTRICT DRILLING CONDITIONS OF APPROVAL

OPERATOR'S NAME:	COG Operating LLC
WELL NAME & NO.:	Harrier Federal Com 301H
SURFACE HOLE FOOTAGE:	375'/S & 1910'/W
BOTTOM HOLE FOOTAGE:	50'/N & 2310'/W
LOCATION:	Section 2, T.26 S., R.32 E., NMPM
COUNTY:	Lea County, New Mexico

Potash	☒ None	☐ Secretary	☐ R-111-P
Cave/Karst Potential	☐ Low	☒ Medium	☐ High
Variance	☐ None	☒ Flex Hose	☐ Other
Wellhead	☒ Conventional	☐ Multibowl	
Other	☐ 4 String Area	☐ Capitan Reef	☐ WIPP

A. HYDROGEN SULFIDE

1. Hydrogen Sulfide (H₂S) monitors shall be installed prior to drilling out the surface shoe. If H₂S is detected in concentrations greater than 100 ppm, the Hydrogen Sulfide area shall meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, provide measured values and formations to the BLM.

B. CASING

1. The 13 3/8 inch surface casing shall be set at approximately 825 feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface. **Excess calculates to 23% - additional cement might be required.**
 - a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.
 - b. Wait on cement (WOC) time for a primary cement job will be a minimum of 8 hours or 500 pounds compressive strength, whichever is greater. (This is to include the lead cement)
 - c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength,

whichever is greater.

- d. If cement falls back, remedial cementing will be done prior to drilling out that string.
- ❖ In **Medium/Karst Areas** if cement does not circulate to surface on the first two casing strings, the cement on the 3rd casing string must come to surface.
2. The minimum required fill of cement behind the 9 5/8 inch intermediate casing is:
 - Cement to surface. If cement does not circulate see B.1.a, c-d above. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to cave/karst.**
3. The minimum required fill of cement behind the 5 1/2 inch production casing is:
 - Cement should tie-back at least **200** feet into previous casing string. Operator shall provide method of verification.

C. PRESSURE CONTROL

1. Variance approved to use flex line from BOP to choke manifold. Manufacturer's specification to be readily available. No external damage to flex line. Flex line to be installed as straight as possible (no hard bends).
2. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **2000 (2M) psi Annular. In the case where the only BOP installed is an annular preventer, it shall be tested to a minimum of 2000 psi (which may require upgrading to 3M or 5M annular)**
3. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the 9 5/8 inch intermediate casing shoe shall be **3000 (3M) psi.**

D. SPECIAL REQUIREMENT (S)

Communitization Agreement

- The operator will submit a Communitization Agreement to the Carlsbad Field Office, 620 E Greene St. Carlsbad, New Mexico 88220, at least 90 days before the anticipated date of first production from a well subject to a spacing order issued by the New Mexico Oil Conservation Division. The Communitization Agreement will include the signatures of all working interest owners in all Federal and Indian leases subject to the Communitization Agreement (i.e., operating rights owners and lessees).

of record), or certification that the operator has obtained the written signatures of all such owners and will make those signatures available to the BLM immediately upon request.

- If the operator does not comply with this condition of approval, the BLM may take enforcement actions that include, but are not limited to, those specified in 43 CFR 3163.1.
- In addition, the well sign shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

MHH 03202019

GENERAL REQUIREMENTS

The BLM is to be notified in advance for a representative to witness:

- a. Spudding well (minimum of 24 hours)
- b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
- c. BOPE tests (minimum of 4 hours)

☒ Chaves and Roosevelt Counties

Call the Roswell Field Office, 2909 West Second St., Roswell NM 88201.

During office hours call (575) 627-0272.

After office hours call (575)

☒ Eddy County

Call the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220,
(575) 361-2822

☒ Lea County

Call the Hobbs Field Station, 414 West Taylor, Hobbs NM 88240, (575)
393-3612

1. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval.
 - a. In the event the operator has proposed to drill multiple wells utilizing a skid/walking rig. Operator shall secure the wellbore on the current well, after installing and testing the wellhead, by installing a blind flange of like pressure rating to the wellhead and a pressure gauge that can be monitored while drilling is performed on the other well(s).
 - b. When the operator proposes to set surface casing with Spudder Rig
 - Notify the BLM when moving in and removing the Spudder Rig.
 - Notify the BLM when moving in the 2nd Rig. Rig to be moved in within 90 days of notification that Spudder Rig has left the location.
 - BOP/BOPE test to be conducted per Onshore Oil and Gas Order No. 2 as soon as 2nd Rig is rigged up on well.
2. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works are located, this does not include the dog house or stairway area.

3. The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) shall be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.

A. CASING

1. Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.). The initial wellhead installed on the well will remain on the well with spools used as needed.
2. Wait on cement (WOC) for Potash Areas: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi for all cement blends, 2) until cement has been in place at least 24 hours. WOC time will be recorded in the driller's log.
3. Wait on cement (WOC) for Water Basin: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements.
4. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. Have well specific cement details onsite prior to pumping the cement for each casing string.
5. No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.
6. On that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.
7. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.

8. Whenever a casing string is cemented in the R-111-P potash area, the NMOCD requirements shall be followed.

B. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.
2. If a variance is approved for a flexible hose to be installed from the BOP to the choke manifold, the following requirements apply: Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.
3. 5M or higher system requires an HCR valve, remote kill line and annular to match. The remote kill line is to be installed prior to testing the system and tested to stack pressure.
4. If the operator has proposed a multi-bowl wellhead assembly in the APD. The following requirements must be met:
 - a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
 - b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.
 - c. Manufacturer representative shall install the test plug for the initial BOP test.
 - d. Whenever any seal subject to test pressure is broken, all the tests in OOGO2.III.A.2.i must be followed.
 - e. If the cement does not circulate and one inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.
5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.
 - a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the

plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

- b. In potash areas, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. For all casing strings, casing cut-off and BOP installation can be initiated at twelve hours after bumping the plug. However, **no tests** shall commence until the cement has had a minimum of 24 hours setup time.
- c. The tests shall be done by an independent service company utilizing a test plug not a cup or J-packer. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (8 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).
- d. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock. If a twelve hour or twenty-four hour chart is used, tester shall make a notation that it is run with a two hour clock.
- e. The results of the test shall be reported to the appropriate BLM office.
- f. All tests are required to be recorded on a calibrated test chart. A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.
- g. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.
- h. BOP/BOPE must be tested by an independent service company within 500 feet of the top of the Wolfcamp formation if the time between the setting of the intermediate casing and reaching this depth exceeds 20 days. This test does not exclude the test prior to drilling out the casing shoe as per Onshore Order No. 2.

C. DRILLING MUD

Mud system monitoring equipment, with derrick floor indicators and visual and audio alarms, shall be operating before drilling into the Wolfcamp formation, and shall be used until production casing is run and cemented.

D. WASTE MATERIAL AND FLUIDS

All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.

Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.