

PECOS DISTRICT DRILLING CONDITIONS OF APPROVAL

HOBBS OCD
APR 03 2018
RECEIVED

OPERATOR'S NAME:	COG Production LLC
LEASE NO.:	NMNM120907
WELL NAME & NO.:	102H-Eider Federal
SURFACE HOLE FOOTAGE:	240'/S & 1080'/W
BOTTOM HOLE FOOTAGE:	2410'/S & 990'/W
LOCATION:	Section 35, R32 E, T24S. 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 **980** feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface.
 - 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.
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.
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.**

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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. Operator shall perform the intermediate casing integrity test to 70% of the casing burst. This will test the multi-bowl seals.
 - 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.

**PECOS DISTRICT
SURFACE USE
CONDITIONS OF APPROVAL**

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WELL NAME & NO.:	102H-Eider Federal
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COUNTY:	Lea County. New Mexico.

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Standard Conditions of Approval (COA) apply to this APD. If any deviations to these standards exist or special COAs are required, the section with the deviation or requirement will be checked below.

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I. GENERAL PROVISIONS

The approval of the Application For Permit To Drill (APD) is in compliance with all applicable laws and regulations: 43 Code of Federal Regulations 3160, the lease terms, Onshore Oil and Gas Orders, Notices To Lessees, New Mexico Oil Conservation Division (NMOCD) Rules, National Historical Preservation Act As Amended, and instructions and orders of the Authorized Officer. Any request for a variance shall be submitted to the Authorized Officer on Form 3160-5, Sundry Notices and Report on Wells.

II. PERMIT EXPIRATION

If the permit terminates prior to drilling and drilling cannot be commenced within 60 days after expiration, an operator is required to submit Form 3160-5, Sundry Notices and Reports on Wells, requesting surface reclamation requirements for any surface disturbance. However, if the operator will be able to initiate drilling within 60 days after the expiration of the permit, the operator must have set the conductor pipe in order to allow for an extension of 60 days beyond the expiration date of the APD. (Filing of a Sundry Notice is required for this 60 day extension.)

III. ARCHAEOLOGICAL, PALEONTOLOGY & HISTORICAL SITES

Any cultural and/or paleontological resource discovered by the operator or by any person working on the operator's behalf shall immediately report such findings to the Authorized Officer. The operator is fully accountable for the actions of their contractors and subcontractors. The operator shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery shall be made by the Authorized Officer to determine the appropriate actions that shall be required to prevent the loss of significant cultural or scientific values of the discovery. The operator shall be held responsible for the cost of the proper mitigation measures that the Authorized Officer assesses after consultation with the operator on the evaluation and decisions of the discovery. Any unauthorized collection or disturbance of cultural or paleontological resources may result in a shutdown order by the Authorized Officer.

IV. NOXIOUS WEEDS

The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, pads, associated pipeline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

V. SPECIAL REQUIREMENT(S)

Timing Limitation Stipulation / Condition of Approval for lesser prairie-chicken:

Oil and gas activities including 3-D geophysical exploration, and drilling will not be allowed in lesser prairie-chicken habitat during the period from March 1st through June 15th annually. During that period, other activities that produce noise or involve human activity, such as the maintenance of oil and gas facilities, pipeline, road, and well pad construction, will be allowed except between 3:00 am and 9:00 am. The 3:00 am to 9:00 am restriction will not apply to normal, around-the-clock operations, such as venting, flaring, or pumping, which do not require a human presence during this period. Additionally, no new drilling will be allowed within up to 200 meters of leks known at the time of permitting. Normal vehicle use on existing roads will not be restricted. Exhaust noise from pump jack engines must be muffled or otherwise controlled so as not to exceed 75 db measured at 30 feet from the source of the noise.

Below Ground-level Abandoned Well Marker to avoid raptor perching: Upon the plugging and subsequent abandonment of the well, the well marker will be installed at ground level on a plate containing the pertinent information for the plugged well. For more installation details, contact the Carlsbad Field Office at 575-234-5972.

Range

The operator must contact the allotment holder prior to construction to identify the location of the pipeline. The operator must take measures to protect the pipeline from compression or other damages. If the pipeline is damaged or compromised in any way near the proposed project as a result of oil and gas activity, the operator is responsible for repairing the pipeline immediately. The operator must notify the BLM office (575-234-5972) and the private surface landowner or the grazing allotment holder if any damage occurs to structures that provide water to livestock.

Tank Battery (CTB): Any water erosion that may occur due to the construction of the well pad during the life of the well will be quickly corrected and proper measures will be taken to prevent future erosion. Tank battery locations will be lined and bermed. A 20 mil permanent liner will be installed with a 4 oz. felt backing to prevent tears or punctures. Tank battery berms must be large enough to contain 1 ½ times the content of the largest tank or 24 hour production, whichever is greater. Automatic shut off, check valves, or similar systems will be installed for tanks to minimize the effects of catastrophic line failures used in production or drilling.

VI. CONSTRUCTION

A. NOTIFICATION

The BLM shall administer compliance and monitor construction of the access road and well pad. Notify the Carlsbad Field Office at (575) 234-5909 at least 3 working days prior to commencing construction of the access road and/or well pad.

When construction operations are being conducted on this well, the operator shall have the approved APD and Conditions of Approval (COA) on the well site and they shall be made available upon request by the Authorized Officer.

B. TOPSOIL

The operator shall strip the top portion of the soil (root zone) from the entire well pad area and stockpile the topsoil along the edge of the well pad as depicted in the APD. The root zone is typically six (6) inches in depth. All the stockpiled topsoil will be redistributed over the interim reclamation areas. Topsoil shall not be used for berming the pad or facilities. For final reclamation, the topsoil shall be spread over the entire pad area for seeding preparation.

Other subsoil (below six inches) stockpiles must be completely segregated from the topsoil stockpile. Large rocks or subsoil clods (not evident in the surrounding terrain) must be buried within the approved area for interim and final reclamation.

C. CLOSED LOOP SYSTEM

Tanks are required for drilling operations: No Pits.

The operator shall properly dispose of drilling contents at an authorized disposal site.

D. FEDERAL MINERAL MATERIALS PIT

Payment shall be made to the BLM prior to removal of any federal mineral materials. Call the Carlsbad Field Office at (575) 234-5972.

E. WELL PAD SURFACING

Surfacing of the well pad is not required.

If the operator elects to surface the well pad, the surfacing material may be required to be removed at the time of reclamation. The well pad shall be constructed in a manner which creates the smallest possible surface disturbance, consistent with safety and operational needs.

F. EXCLOSURE FENCING (CELLARS & PITS)

Exclosure Fencing

The operator will install and maintain exclosure fencing for all open well cellars to prevent access to public, livestock, and large forms of wildlife before and after drilling operations until the pit is free of fluids and the operator initiates backfilling. (For examples of exclosure fencing design, refer to BLM's Oil and Gas Gold Book, Exclosure Fence Illustrations, Figure 1, Page 18.)

G. ON LEASE ACCESS ROADS**Road Width**

The access road shall have a driving surface that creates the smallest possible surface disturbance and does not exceed fourteen (14) feet in width. The maximum width of surface disturbance, when constructing the access road, shall not exceed twenty-five (25) feet.

Surfacing

Surfacing material is not required on the new access road driving surface. If the operator elects to surface the new access road or pad, the surfacing material may be required to be removed at the time of reclamation.

Where possible, no improvements should be made on the unsurfaced access road other than to remove vegetation as necessary, road irregularities, safety issues, or to fill low areas that may sustain standing water.

The Authorized Officer reserves the right to require surfacing of any portion of the access road at any time deemed necessary. Surfacing may be required in the event the road deteriorates, erodes, road traffic increases, or it is determined to be beneficial for future field development. The surfacing depth and type of material will be determined at the time of notification.

Crowning

Crowning shall be done on the access road driving surface. The road crown shall have a grade of approximately 2% (i.e., a 1" crown on a 14' wide road). The road shall conform to Figure 1; cross section and plans for typical road construction.

Ditching

Ditching shall be required on both sides of the road.

Turnouts

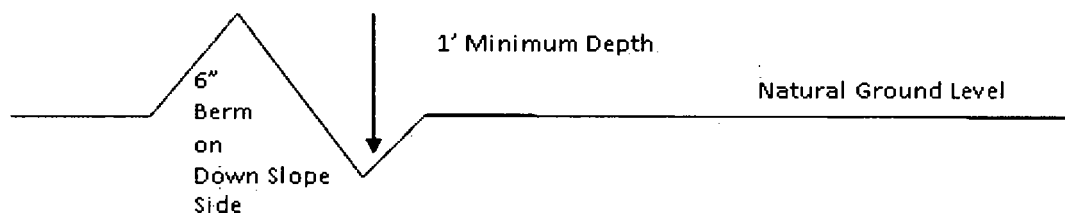
Vehicle turnouts shall be constructed on the road. Turnouts shall be intervisible with interval spacing distance less than 1000 feet. Turnouts shall conform to Figure 1; cross section and plans for typical road construction.

Drainage

Drainage control systems shall be constructed on the entire length of road (e.g. ditches, sidehill outslowing and insloping, lead-off ditches, culvert installation, and low water crossings).

A typical lead-off ditch has a minimum depth of 1 foot below and a berm of 6 inches above natural ground level. The berm shall be on the down-slope side of the lead-off ditch.

Cross Section of a Typical Lead-off Ditch



All lead-off ditches shall be graded to drain water with a 1 percent minimum to 3 percent maximum ditch slope. The spacing interval are variable for lead-off ditches and shall be determined according to the formula for spacing intervals of lead-off ditches, but may be amended depending upon existing soil types and centerline road slope (in %);

Formula for Spacing Interval of Lead-off Ditches

Example - On a 4% road slope that is 400 feet long, the water flow shall drain water into a lead-off ditch. Spacing interval shall be determined by the following formula:

$$400 \text{ foot road with } 4\% \text{ road slope: } \frac{400'}{4\%} + 100' = 200' \text{ lead-off ditch interval}$$

Cattle guards

An appropriately sized cattle guard sufficient to carry out the project shall be installed and maintained at fence/road crossings. Any existing cattle guards on the access road route shall be repaired or replaced if they are damaged or have deteriorated beyond practical use. The operator shall be responsible for the condition of the existing cattle guards that are in place and are utilized during lease operations.

Fence Requirement

Where entry is granted across a fence line, the fence shall be braced and tied off on both sides of the passageway prior to cutting. The operator shall notify the private surface landowner or the grazing allotment holder prior to crossing any fences.

Public Access

Public access on this road shall not be restricted by the operator without specific written approval granted by the Authorized Officer.

Construction Steps

1. Salvage topsoil
2. Construct road

3. Redistribute topsoil
4. Revegetate slopes

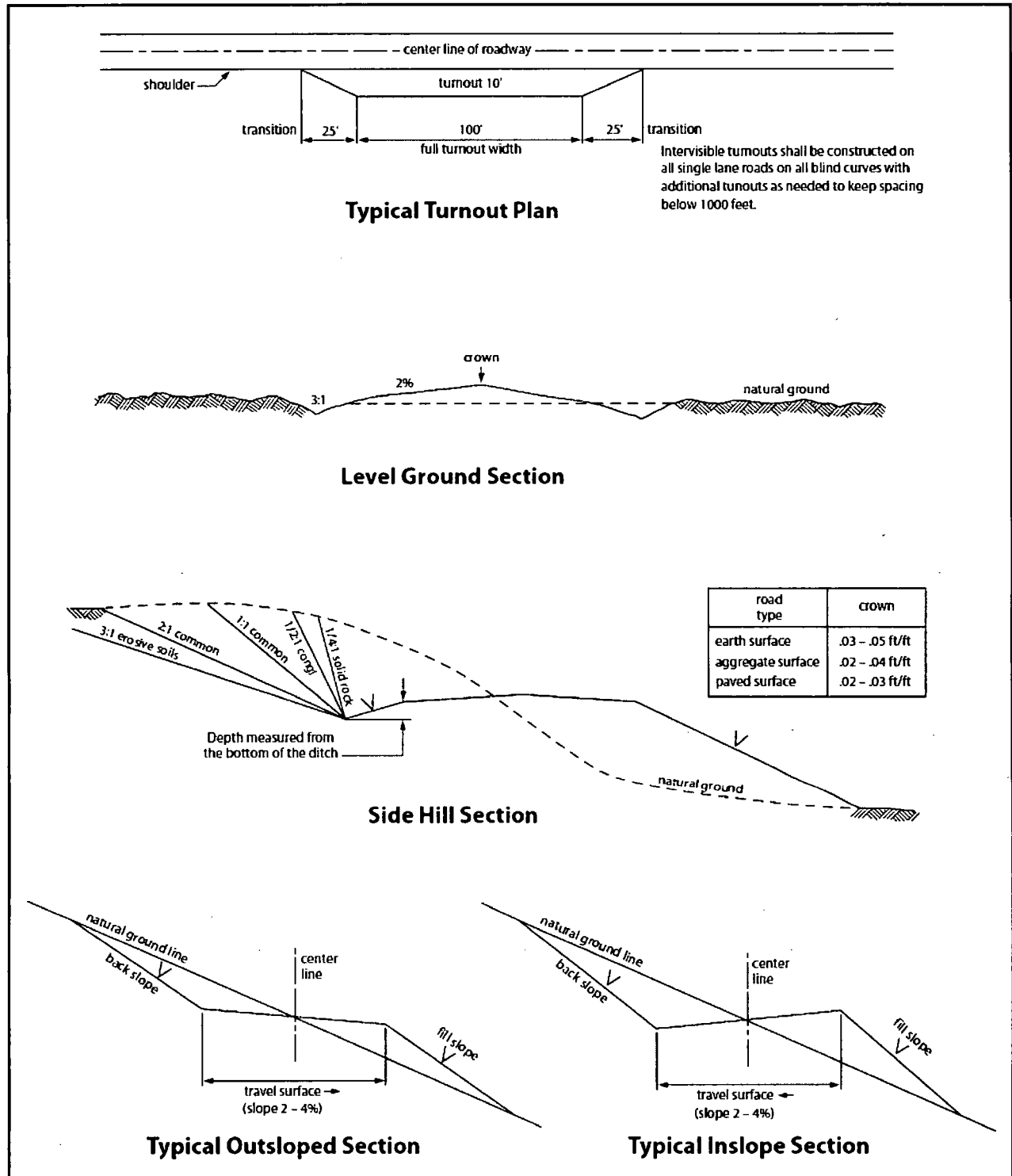


Figure 1. Cross-sections and plans for typical road sections representative of BLM resource or FS local and higher-class roads.

VII. PRODUCTION (POST DRILLING)

A. WELL STRUCTURES & FACILITIES

Placement of Production Facilities

Production facilities should be placed on the well pad to allow for maximum interim recontouring and revegetation of the well location.

Exclosure Netting (Open-top Tanks)

Immediately following active drilling or completion operations, the operator will take actions necessary to prevent wildlife and livestock access, including avian wildlife, to all open-topped tanks that contain or have the potential to contain salinity sufficient to cause harm to wildlife or livestock, hydrocarbons, or Resource Conservation and Recovery Act of 1976-exempt hazardous substances. At a minimum, the operator will net, screen, or cover open-topped tanks to exclude wildlife and livestock and prevent mortality. If the operator uses netting, the operator will cover and secure the open portion of the tank to prevent wildlife entry. The operator will net, screen, or cover the tanks until the operator removes the tanks from the location or the tanks no longer contain substances that could be harmful to wildlife or livestock. Use a maximum netting mesh size of 1 ½ inches. The netting must not be in contact with fluids and must not have holes or gaps.

Chemical and Fuel Secondary Containment and Exclosure Screening

The operator will prevent all hazardous, poisonous, flammable, and toxic substances from coming into contact with soil and water. At a minimum, the operator will install and maintain an impervious secondary containment system for any tank or barrel containing hazardous, poisonous, flammable, or toxic substances sufficient to contain the contents of the tank or barrel and any drips, leaks, and anticipated precipitation. The operator will dispose of fluids within the containment system that do not meet applicable state or U. S. Environmental Protection Agency livestock water standards in accordance with state law; the operator must not drain the fluids to the soil or ground. The operator will design, construct, and maintain all secondary containment systems to prevent wildlife and livestock exposure to harmful substances. At a minimum, the operator will install effective wildlife and livestock exclosure systems such as fencing, netting, expanded metal mesh, lids, and grate covers. Use a maximum netting mesh size of 1 ½ inches.

Open-Vent Exhaust Stack Exclosures

The operator will construct, modify, equip, and maintain all open-vent exhaust stacks on production equipment to prevent birds and bats from entering, and to discourage perching, roosting, and nesting. (*Recommended exclosure structures on open-vent exhaust stacks are in the shape of a cone.*) Production equipment includes, but may not be limited to, tanks, heater-treaters, separators, dehydrators, flare stacks, in-line units, and compressor mufflers.

Containment Structures

Proposed production facilities such as storage tanks and other vessels will have a secondary containment structure that is constructed to hold the capacity of 1.5 times the largest tank, plus freeboard to account for precipitation, unless more stringent protective requirements are deemed necessary.

Painting Requirement

All above-ground structures including meter housing that are not subject to safety requirements shall be painted a flat non-reflective paint color, **Shale Green** from the BLM Standard Environmental Color Chart (CC-001: June 2008).

B. PIPELINES

STANDARD STIPULATIONS FOR SURFACE INSTALLED PIPELINES

A copy of the Grant and attachments, including stipulations, survey plat(s) and/or map(s), shall be on location during construction. BLM personnel may request to review a copy of your permit during construction to ensure compliance with all stipulations.

Holder agrees to comply with the following stipulations to the satisfaction of the Authorized Officer:

1. Holder shall indemnify the United States against any liability for damage to life or property arising from the occupancy or use of public lands under this grant.
2. Holder shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, Holder shall comply with the Toxic Substances Control Act of 1976 as amended, 15 USC § 2601 *et seq.* (1982) with regard to any toxic substances that are used, generated by or stored on the right-of-way or on facilities authorized under this right-of-way grant (*see* 40 CFR, Part 702-799 and in particular, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193). Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the Authorized Officer concurrent with the filing of the reports to the involved Federal agency or State government.
3. Holder agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. § 9601, *et seq.* or the Resource Conservation and Recovery Act, 42 U.S.C. 6901, *et seq.*) on the Right-of-Way (unless the release or threatened release is wholly unrelated to activity of the Right-of-Way Holder's activity on the Right-of-Way), or resulting from the activity of the Right-of-Way Holder on the Right-of-Way. This provision applies without regard to whether a release is caused by Holder, its agent, or unrelated third parties.

4. Holder shall be liable for damage or injury to the United States to the extent provided by 43 CFR Sec. 2883.1-4. Holder shall be held to a standard of strict liability for damage or injury to the United States resulting from pipe rupture, fire, or spills caused or substantially aggravated by any of the following within the right-of-way or permit area:

- a. Activities of Holder including, but not limited to: construction, operation, maintenance, and termination of the facility;
- b. Activities of other parties including, but not limited to:
 - (1) Land clearing
 - (2) Earth-disturbing and earth-moving work
 - (3) Blasting
 - (4) Vandalism and sabotage;

c. Acts of God.

The maximum limitation for such strict liability damages shall not exceed one million dollars (\$1,000,000) for any one event, and any liability in excess of such amount shall be determined by the ordinary rules of negligence of the jurisdiction in which the damage or injury occurred.

This section shall not impose strict liability for damage or injury resulting primarily from an act of war or from the negligent acts or omissions of the United States.

5. If, during any phase of the construction, operation, maintenance, or termination of the pipeline, any oil, salt water, or other pollutant should be discharged from the pipeline system, impacting Federal lands, the control and total removal, disposal, and cleaning up of such oil, salt water, or other pollutant, wherever found, shall be the responsibility of Holder, regardless of fault. Upon failure of Holder to control, dispose of, or clean up such discharge on or affecting Federal lands, or to repair all damages resulting therefrom, on the Federal lands, the Authorized Officer may take such measures as he/she deems necessary to control and clean up the discharge and restore the area, including, where appropriate, the aquatic environment and fish and wildlife habitats, at the full expense of Holder. Such action by the Authorized Officer shall not relieve Holder of any responsibility as provided herein.

6. All construction and maintenance activity shall be confined to the authorized right-of-way width of 20 feet. If the pipeline route follows an existing road or buried pipeline right-of-way, the surface pipeline shall be installed no farther than 10 feet from the edge of the road or buried pipeline right-of-way. If existing surface pipelines prevent this distance, the proposed surface pipeline shall be installed immediately adjacent to the outer surface pipeline. All construction and maintenance activity shall be confined to existing roads or right-of-ways.

7. No blading or clearing of any vegetation shall be allowed unless approved in writing by the Authorized Officer.

8. Holder shall install the pipeline on the surface in such a manner that will minimize suspension of the pipeline across low areas in the terrain. In hummocky or dune areas, the pipeline shall be "snaked" around hummocks and dunes rather than suspended across these features.

9. The pipeline shall be buried with a minimum of 24 inches under all roads, "two-tracks," and trails. Burial of the pipe will continue for 20 feet on each side of each crossing. The condition of the road, upon completion of construction, shall be returned to at least its former state with no bumps or dips remaining in the road surface.

10. The holder shall minimize disturbance to existing fences and other improvements on public lands. The holder is required to promptly repair improvements to at least their former state. Functional use of these improvements will be maintained at all times. The holder will contact the owner of any improvements prior to disturbing them. When necessary to pass through a fence line, the fence shall be braced on both sides of the passageway prior to cutting of the fence. No permanent gates will be allowed unless approved by the Authorized Officer.

11. In those areas where erosion control structures are required to stabilize soil conditions, the holder will install such structures as are suitable for the specific soil conditions being encountered and which are in accordance with sound resource management practices.

12. Excluding the pipe, all above-ground structures not subject to safety requirement shall be painted by the holder to blend with the natural color of the landscape. The paint used shall be a color which simulates "Standard Environmental Colors" – **Shale Green**, Munsell Soil Color No. 5Y 4/2; designated by the Rocky Mountain Five State Interagency Committee.

13. The pipeline will be identified by signs at the point of origin and completion of the right-of-way and at all road crossings. At a minimum, signs will state the holder's name, BLM serial number, and the product being transported. Signs will be maintained in a legible condition for the life of the pipeline.

14. The holder shall not use the pipeline route as a road for purposes other than routine maintenance as determined necessary by the Authorized Officer in consultation with the holder. The holder will take whatever steps are necessary to ensure that the pipeline route is not used as a roadway.

15. Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made

by the authorized officer after consulting with the holder.

16. The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, powerline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

17. Surface pipelines shall be less than or equal to 4 inches and a working pressure below 125 psi.

18. Special Stipulations:

- a. **Lesser Prairie-Chicken:** Oil and gas activities will not be allowed in lesser prairie-chicken habitat during the period from March 1st through June 15th annually. During that period, other activities that produce noise or involve human activity, such as the maintenance of oil and gas facilities and pipeline, road, and well pad construction, will be allowed except between 3:00 am and 9:00 am. The 3:00 am to 9:00 am restriction will not apply to normal, around-the-clock operations, such as venting, flaring, or pumping, which do not require a human presence during this period. Normal vehicle use on existing roads will not be restricted.

VIII. INTERIM RECLAMATION

During the life of the development, all disturbed areas not needed for active support of production operations should undergo interim reclamation in order to minimize the environmental impacts of development on other resources and uses.

Within six (6) months of well completion, operators should work with BLM surface management specialists (Jim Amos: 575-234-5909) to devise the best strategies to reduce the size of the location. Interim reclamation should allow for remedial well operations, as well as safe and efficient removal of oil and gas.

During reclamation, the removal of caliche is important to increasing the success of revegetating the site. Removed caliche that is free of contaminants may be used for road repairs, fire walls or for building other roads and locations. In order to operate the well or complete workover operations, it may be necessary to drive, park and operate on restored interim vegetation within the previously disturbed area. Disturbing revegetated areas for production or workover operations will be allowed. If there is significant disturbance and loss of vegetation, the area will need to be revegetated. Communicate with the appropriate BLM office for any exceptions/exemptions if needed.

All disturbed areas after they have been satisfactorily prepared need to be reseeded with the seed mixture provided below.

Upon completion of interim reclamation, the operator shall submit a Sundry Notices and Reports on Wells, Subsequent Report of Reclamation (Form 3160-5).

IX. FINAL ABANDONMENT & RECLAMATION

At final abandonment, well locations, production facilities, and access roads must undergo "final" reclamation so that the character and productivity of the land are restored.

Earthwork for final reclamation must be completed within six (6) months of well plugging. All pads, pits, facility locations and roads must be reclaimed to a satisfactory revegetated, safe, and stable condition, unless an agreement is made with the landowner or BLM to keep the road and/or pad intact.

After all disturbed areas have been satisfactorily prepared, these areas need to be revegetated with the seed mixture provided below. Seeding should be accomplished by drilling on the contour whenever practical or by other approved methods. Seeding may need to be repeated until revegetation is successful, as determined by the BLM.

Operators shall contact a BLM surface protection specialist prior to surface abandonment operations for site specific objectives (Jim Amos: 575-234-5909).

Below Ground-level Abandoned Well Marker to avoid raptor perching: Upon the plugging and subsequent abandonment of the well, the well marker will be installed at ground level on a plate containing the pertinent information for the plugged well.

Seed Mixture for LPC Sand/Shinnery Sites

Holder shall seed all disturbed areas with the seed mixture listed below. The seed mixture shall be planted in the amounts specified in pounds of pure live seed (PLS)* per acre. There shall be no primary or secondary noxious weeds in the seed mixture. Seed will be tested and the viability testing of seed shall be done in accordance with State law(s) and within nine (9) months prior to purchase. Commercial seed shall be either certified or registered seed. The seed container shall be tagged in accordance with State law(s) and available for inspection by the Authorized Officer.

Seed will be planted using a drill equipped with a depth regulator to ensure proper depth of planting where drilling is possible. The seed mixture will be evenly and uniformly planted over the disturbed area (smaller/heavier seeds have a tendency to drop the bottom of the drill and are planted first). Holder shall take appropriate measures to ensure this does not occur. Where drilling is not possible, seed will be broadcast and the area shall be raked or chained to cover the seed. When broadcasting the seed, the pounds per acre are to be doubled. Seeding shall be repeated until a satisfactory stand is established as determined by the Authorized Officer. Evaluation of growth may not be made before completion of at least one full growing season after seeding.

Species to be planted in pounds of pure live seed* per acre:

<u>Species</u>	<u>lb/acre</u>
Plains Bristlegrass	5lbs/A
Sand Bluestem	5lbs/A
Little Bluestem	3lbs/A
Big Bluestem	6lbs/A
Plains Coreopsis	2lbs/A
Sand Dropseed	1lbs/A

*Pounds of pure live seed:

Pounds of seed x percent purity x percent germination = pounds pure live seed



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

Operator Certification Data Report

03/26/2018

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.

NAME: Mayte Reyes

Signed on: 10/16/2017

Title: Regulatory Analyst

Street Address: 2208 W Main Street

City: Artesia

State: NM

Zip: 88210

Phone: (575)748-6945

Email address: Mreyes1@concho.com

Field Representative

Representative Name: Rand French

Street Address: 2208 West Main Street

City: Artesia

State: NM

Zip: 88210

Phone: (575)748-6940

Email address: rfrench@concho.com

COG PRODUCTION 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.

Casing Program

Hole Size	Casing		Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
	From	To							
17.5"	0	960	13.375"	54.5	J55	STC	2.57	1.35	9.82
12.25"	0	4000	9.625"	40	J55	LTC	1.22	1.12	3.25
12.25"	4000	4625	9.625"	40	L80	LTC	1.27	1.62	5.73
8.75"	0	16,480	5.5"	17	P110	LTC	1.68	3.01	2.84
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

- 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 PRODUCTION 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 PRODUCTION LLC

1-575-748-6940

EMERGENCY CALL LIST

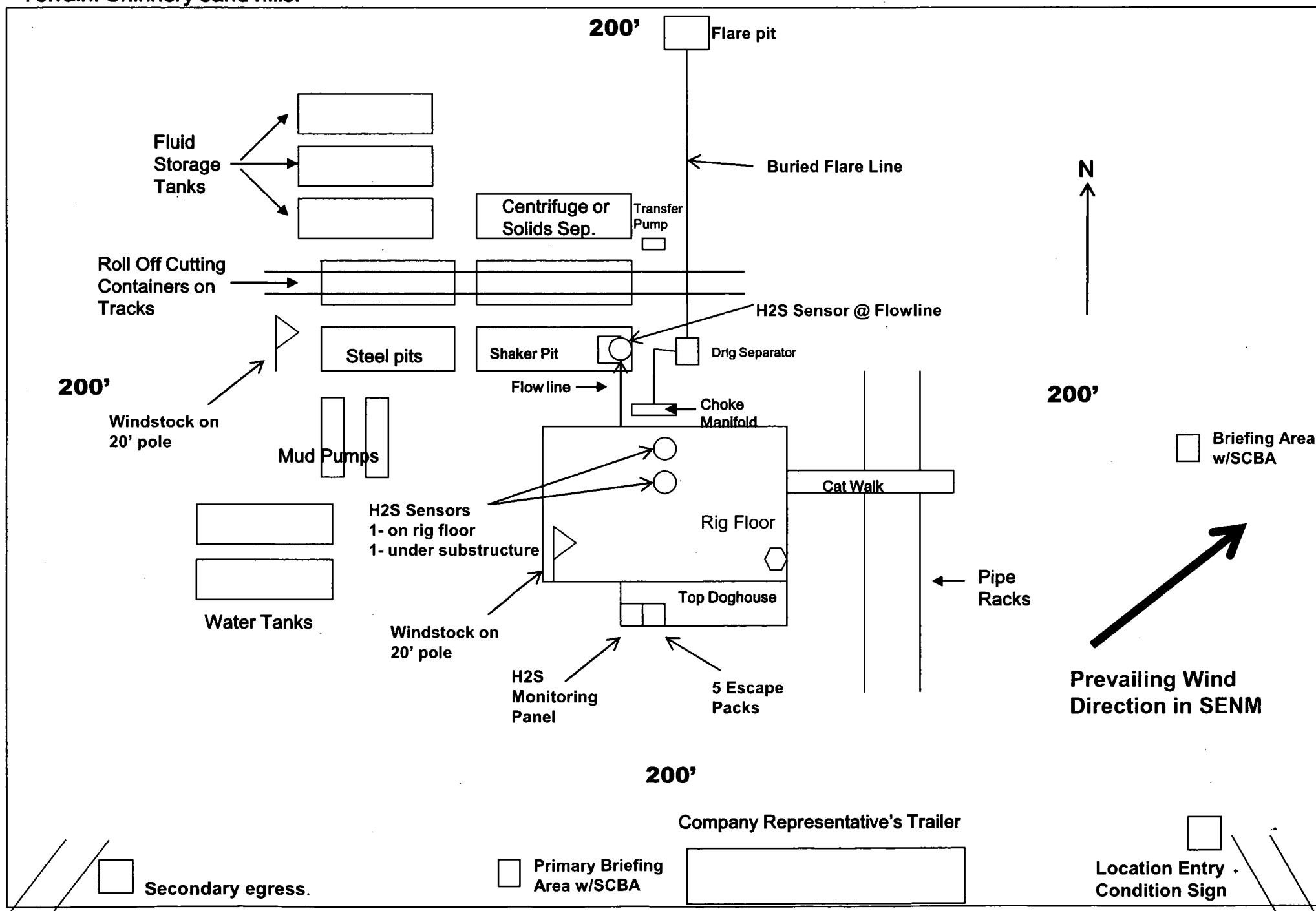
	<u>OFFICE</u>	<u>MOBILE</u>
COG PRODUCTION LLC OFFICE	575-748-6940	
SETH WILD	432-683-7443	432-528-3633
WALTER ROYE	575-748-6940	432-934-1886

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

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

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





COG Production, LLC

Lea County, NM (NAD27 NME)

Eider Federal

102H

OH

Plan 1 10-11-17

Anticollision Report

16 October, 2017





Phoenix Technology Services LP

Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Reference	Plan 1 10-11-17
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria
Interpolation Method:	MD Interval 100.00usft
Depth Range:	Unlimited
Results Limited by:	Maximum center-center distance of 10,000.00 u
Warning Levels Evaluated at:	2.00 Sigma
Error Model:	ISCWSA
Scan Method:	Closest Approach 3D
Error Surface:	Circular Conic
Casing Method:	Not applied

Survey Tool Program		Date	10/11/2017		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.00	8,742.54	Plan 1 10-11-17 (OH)	Scientific Gyro	Scientific Drilling Intl. Standard Wireline Keeper	
8,742.54	16,479.71	Plan 1 10-11-17 (OH)	MWD+IFR1+MS	OWSG Rev. 2 MWD + IFR1 + Multi-Station Corre	

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						
Eider Federal						
101H - OH - Plan 1 10-11-17	4,600.00	4,599.40	59.90	47.91	4.995	CC, ES, SF
201H - OH - Plan 1 10-11-17	5,600.00	5,599.40	30.00	15.75	2.105	CC, ES, SF
302H - OH - Plan 1 10-11-17	4,600.00	4,599.10	42.50	30.51	3.544	CC, ES
302H - OH - Plan 1 10-11-17	16,479.71	17,030.36	283.90	164.00	2.368	SF

Offset Design Eider Federal - 101H - OH - Plan 1 10-11-17													Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 8768-MWD+IFR1+MS													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)				
0.00	0.00	0.00	0.60	0.00	0.00	-90.48	-0.50	-59.90	59.91					
100.00	100.00	99.40	100.00	0.07	0.07	-90.48	-0.50	-59.90	59.90	59.77	0.14	441.909		
200.00	200.00	199.40	200.00	0.20	0.20	-90.48	-0.50	-59.90	59.90	59.51	0.39	152.122		
300.00	300.00	299.40	300.00	0.33	0.33	-90.48	-0.50	-59.90	59.90	59.25	0.66	91.257		
400.00	400.00	399.40	400.00	0.46	0.46	-90.48	-0.50	-59.90	59.90	58.98	0.92	65.136		
500.00	500.00	499.40	500.00	0.59	0.59	-90.48	-0.50	-59.90	59.90	58.72	1.18	50.632		
600.00	600.00	599.40	600.00	0.72	0.72	-90.48	-0.50	-59.90	59.90	58.46	1.45	41.409		
700.00	700.00	699.40	700.00	0.86	0.85	-90.48	-0.50	-59.90	59.90	58.19	1.71	35.027		
800.00	800.00	799.40	800.00	0.99	0.99	-90.48	-0.50	-59.90	59.90	57.93	1.97	30.349		
900.00	900.00	899.40	900.00	1.12	1.12	-90.48	-0.50	-59.90	59.90	57.66	2.24	26.773		
1,000.00	1,000.00	999.40	1,000.00	1.25	1.25	-90.48	-0.50	-59.90	59.90	57.40	2.50	23.951		
1,100.00	1,100.00	1,099.40	1,100.00	1.38	1.38	-90.48	-0.50	-59.90	59.90	57.14	2.76	21.667		
1,200.00	1,200.00	1,199.40	1,200.00	1.51	1.51	-90.48	-0.50	-59.90	59.90	56.87	3.03	19.781		
1,300.00	1,300.00	1,299.40	1,300.00	1.65	1.65	-90.48	-0.50	-59.90	59.90	56.61	3.29	18.196		
1,400.00	1,400.00	1,399.40	1,400.00	1.78	1.78	-90.48	-0.50	-59.90	59.90	56.35	3.56	16.847		
1,500.00	1,500.00	1,499.40	1,500.00	1.91	1.91	-90.48	-0.50	-59.90	59.90	56.08	3.82	15.684		
1,600.00	1,600.00	1,599.40	1,600.00	2.04	2.04	-90.48	-0.50	-59.90	59.90	55.82	4.08	14.671		
1,700.00	1,700.00	1,699.40	1,700.00	2.17	2.17	-90.48	-0.50	-59.90	59.90	55.56	4.35	13.781		
1,800.00	1,800.00	1,799.40	1,800.00	2.31	2.30	-90.48	-0.50	-59.90	59.90	55.29	4.61	12.993		
1,900.00	1,900.00	1,899.40	1,900.00	2.44	2.44	-90.48	-0.50	-59.90	59.90	55.03	4.87	12.290		
2,000.00	2,000.00	1,999.40	2,000.00	2.57	2.57	-90.48	-0.50	-59.90	59.90	54.76	5.14	11.659		
2,100.00	2,100.00	2,099.40	2,100.00	2.70	2.70	-90.48	-0.50	-59.90	59.90	54.50	5.40	11.090		

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



Phoenix Technology Services LP
Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore:	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 101H - OH - Plan 1 10-11-17													Offset Site Error: 0.00 usft	
Survey Program: 0-Scientific Gyro, 8768-MWD+IFR1+MS													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		
2,200.00	2,200.00	2,199.40	2,200.00	2.83	2.83	-90.48	-0.50	-59.90	59.90	54.24	5.66	10.574		
2,300.00	2,300.00	2,299.40	2,300.00	2.96	2.96	-90.48	-0.50	-59.90	59.90	53.97	5.93	10.104		
2,400.00	2,400.00	2,399.40	2,400.00	3.10	3.10	-90.48	-0.50	-59.90	59.90	53.71	6.19	9.674		
2,500.00	2,500.00	2,499.40	2,500.00	3.23	3.23	-90.48	-0.50	-59.90	59.90	53.45	6.46	9.278		
2,600.00	2,600.00	2,599.40	2,600.00	3.36	3.36	-90.48	-0.50	-59.90	59.90	53.18	6.72	8.914		
2,700.00	2,700.00	2,699.40	2,700.00	3.49	3.49	-90.48	-0.50	-59.90	59.90	52.92	6.98	8.578		
2,800.00	2,800.00	2,799.40	2,800.00	3.62	3.62	-90.48	-0.50	-59.90	59.90	52.66	7.25	8.266		
2,900.00	2,900.00	2,899.40	2,900.00	3.76	3.75	-90.48	-0.50	-59.90	59.90	52.39	7.51	7.976		
3,000.00	3,000.00	2,999.40	3,000.00	3.89	3.89	-90.48	-0.50	-59.90	59.90	52.13	7.77	7.705		
3,100.00	3,100.00	3,099.40	3,100.00	4.02	4.02	-90.48	-0.50	-59.90	59.90	51.86	8.04	7.452		
3,200.00	3,200.00	3,199.40	3,200.00	4.15	4.15	-90.48	-0.50	-59.90	59.90	51.60	8.30	7.216		
3,300.00	3,300.00	3,299.40	3,300.00	4.28	4.28	-90.48	-0.50	-59.90	59.90	51.34	8.57	6.993		
3,400.00	3,400.00	3,399.40	3,400.00	4.41	4.41	-90.48	-0.50	-59.90	59.90	51.07	8.83	6.785		
3,500.00	3,500.00	3,499.40	3,500.00	4.55	4.55	-90.48	-0.50	-59.90	59.90	50.81	9.09	6.588		
3,600.00	3,600.00	3,599.40	3,600.00	4.68	4.68	-90.48	-0.50	-59.90	59.90	50.55	9.36	6.402		
3,700.00	3,700.00	3,699.40	3,700.00	4.81	4.81	-90.48	-0.50	-59.90	59.90	50.28	9.62	6.227		
3,800.00	3,800.00	3,799.40	3,800.00	4.94	4.94	-90.48	-0.50	-59.90	59.90	50.02	9.88	6.061		
3,900.00	3,900.00	3,899.40	3,900.00	5.07	5.07	-90.48	-0.50	-59.90	59.90	49.75	10.15	5.903		
4,000.00	4,000.00	3,999.40	4,000.00	5.21	5.21	-90.48	-0.50	-59.90	59.90	49.49	10.41	5.754		
4,100.00	4,100.00	4,099.40	4,100.00	5.34	5.34	-90.48	-0.50	-59.90	59.90	49.23	10.67	5.612		
4,200.00	4,200.00	4,199.40	4,200.00	5.47	5.47	-90.48	-0.50	-59.90	59.90	48.96	10.94	5.476		
4,300.00	4,300.00	4,299.40	4,300.00	5.60	5.60	-90.48	-0.50	-59.90	59.90	48.70	11.20	5.347		
4,400.00	4,400.00	4,399.40	4,400.00	5.73	5.73	-90.48	-0.50	-59.90	59.90	48.44	11.47	5.224		
4,500.00	4,500.00	4,499.40	4,500.00	5.87	5.86	-90.48	-0.50	-59.90	59.90	48.17	11.73	5.107		
4,600.00	4,600.00	4,599.40	4,600.00	6.00	6.00	-90.48	-0.50	-59.90	59.90	47.91	11.99	4.995 CC, ES, SF		
4,700.00	4,700.00	4,697.33	4,697.91	6.13	6.08	-90.47	-0.50	-61.55	61.59	49.38	12.21	5.045		
4,800.00	4,800.00	4,795.01	4,795.46	6.26	6.12	-90.43	-0.50	-66.54	66.69	54.31	12.38	5.387		
4,900.00	4,900.00	4,892.25	4,892.34	6.39	6.16	-90.38	-0.50	-74.79	75.19	62.63	12.55	5.990		
5,000.00	5,000.00	4,991.50	4,991.05	6.52	6.20	-90.34	-0.50	-85.16	85.63	72.90	12.73	6.727		
5,100.00	5,100.00	5,090.95	5,089.96	6.66	6.25	-90.30	-0.50	-95.55	96.08	83.17	12.91	7.444		
5,200.00	5,200.00	5,190.40	5,188.86	6.79	6.30	-90.27	-0.50	-105.95	106.53	93.45	13.09	8.140		
5,300.00	5,300.00	5,289.86	5,287.77	6.92	6.35	-90.25	-0.50	-116.34	116.99	103.72	13.27	8.815		
5,400.00	5,400.00	5,389.31	5,386.68	7.05	6.40	-90.23	-0.50	-126.74	127.44	113.98	13.46	9.470		
5,500.00	5,500.00	5,488.76	5,485.59	7.18	6.46	-90.21	-0.50	-137.14	137.89	124.25	13.64	10.106		
5,600.00	5,600.00	5,588.21	5,584.49	7.32	6.52	-90.19	-0.50	-147.53	148.34	134.51	13.83	10.723		
5,700.00	5,700.00	5,687.66	5,683.40	7.45	6.58	-90.18	-0.50	-157.93	158.80	144.77	14.03	11.320		
5,800.00	5,800.00	5,787.12	5,782.31	7.58	6.64	-90.17	-0.50	-168.32	169.25	155.03	14.22	11.900		
5,900.00	5,900.00	5,886.57	5,881.22	7.71	6.71	-90.16	-0.50	-178.72	179.70	165.28	14.42	12.463		
6,000.00	6,000.00	5,986.02	5,980.12	7.84	6.78	-90.15	-0.50	-189.11	190.16	175.54	14.62	13.008		
6,100.00	6,100.00	6,085.47	6,079.03	7.97	6.85	-90.14	-0.50	-199.51	200.61	185.79	14.82	13.536		
6,200.00	6,200.00	6,184.93	6,177.94	8.11	6.92	-90.14	-0.50	-209.90	211.06	196.04	15.02	14.049		
6,300.00	6,300.00	6,284.38	6,276.85	8.24	6.99	-90.13	-0.50	-220.30	221.51	206.29	15.23	14.546		
6,400.00	6,400.00	6,383.83	6,375.75	8.37	7.07	-90.12	-0.50	-230.70	231.97	216.53	15.44	15.028		
6,500.00	6,500.00	6,483.28	6,474.66	8.50	7.14	-90.12	-0.50	-241.09	242.42	226.77	15.65	15.495		
6,600.00	6,600.00	6,582.73	6,573.57	8.63	7.22	-90.11	-0.50	-251.49	252.87	237.02	15.86	15.948		
6,700.00	6,700.00	6,682.19	6,672.48	8.77	7.30	-90.11	-0.50	-261.88	263.33	247.26	16.07	16.387		
6,800.00	6,800.00	6,781.64	6,771.38	8.90	7.39	-90.11	-0.50	-272.28	273.78	257.50	16.28	16.813		
6,900.00	6,900.00	6,881.09	6,870.29	9.03	7.47	-90.10	-0.50	-282.67	284.23	267.73	16.50	17.227		
7,000.00	7,000.00	6,980.54	6,969.20	9.16	7.56	-90.10	-0.50	-293.07	294.68	277.97	16.72	17.628		
7,100.00	7,100.00	7,079.99	7,068.10	9.29	7.64	-90.09	-0.50	-303.47	305.14	288.20	16.94	18.017		
7,200.00	7,200.00	7,179.45	7,167.01	9.42	7.73	-90.09	-0.50	-313.86	315.59	298.43	17.16	18.394		
7,300.00	7,300.00	7,278.90	7,265.92	9.56	7.82	-90.09	-0.50	-324.26	326.04	308.66	17.38	18.760		

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



Phoenix Technology Services LP

Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 101H - OH - Plan 1 10-11-17														Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 8768-MWD+IFR1+MS														Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	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)							
7,400.00	7,400.00	7,378.35	7,364.83	9.69	7.91	-90.09	-0.50	-334.65	336.50	318.89	17.60	19.116			
7,500.00	7,500.00	7,477.80	7,463.73	9.82	8.01	-90.08	-0.50	-345.05	346.95	329.12	17.83	19.461			
7,600.00	7,600.00	7,577.26	7,562.64	9.95	8.10	-90.08	-0.50	-355.44	357.40	339.35	18.05	19.796			
7,700.00	7,700.00	7,676.71	7,661.55	10.08	8.20	-90.08	-0.50	-365.84	367.85	349.57	18.28	20.122			
7,800.00	7,800.00	7,776.16	7,760.46	10.22	8.29	-90.08	-0.50	-376.23	378.31	359.80	18.51	20.438			
7,900.00	7,900.00	7,875.61	7,859.36	10.35	8.39	-90.07	-0.50	-386.63	388.76	370.02	18.74	20.746			
8,000.00	8,000.00	7,975.06	7,958.27	10.48	8.49	-90.07	-0.50	-397.03	399.21	380.24	18.97	21.044			
8,100.00	8,100.00	8,074.52	8,057.18	10.61	8.59	-90.07	-0.50	-407.42	409.67	390.46	19.20	21.334			
8,200.00	8,200.00	8,173.97	8,156.09	10.74	8.69	-90.07	-0.50	-417.82	420.12	400.68	19.44	21.616			
8,300.00	8,300.00	8,273.42	8,254.99	10.88	8.79	-90.07	-0.50	-428.21	430.57	410.90	19.67	21.891			
8,400.00	8,400.00	8,372.87	8,353.90	11.01	8.90	-90.07	-0.50	-438.61	441.02	421.12	19.90	22.158			
8,500.00	8,500.00	8,472.33	8,452.81	11.14	9.00	-90.06	-0.50	-449.00	451.48	431.34	20.14	22.417			
8,600.00	8,600.00	8,571.78	8,551.72	11.27	9.11	-90.06	-0.50	-459.40	461.93	441.55	20.38	22.670			
8,700.00	8,700.00	8,671.23	8,650.62	11.40	9.21	-90.06	-0.50	-469.79	472.38	451.77	20.61	22.916			
8,800.00	8,799.86	8,769.92	8,748.77	11.47	9.28	-80.56	-0.50	-480.11	482.29	461.54	20.74	23.251			
8,900.00	8,897.16	8,845.17	8,823.07	11.50	9.30	-80.68	5.42	-489.96	491.85	471.05	20.80	23.650			
9,000.00	8,987.70	8,921.21	8,895.79	11.56	9.34	-81.05	22.63	-503.52	503.08	482.18	20.90	24.066			
9,100.00	9,067.53	9,000.00	8,966.72	11.65	9.41	-81.68	51.89	-521.05	515.93	494.87	21.06	24.495			
9,200.00	9,133.15	9,077.87	9,030.51	11.76	9.50	-82.41	91.47	-541.37	530.29	509.03	21.26	24.946			
9,300.00	9,181.71	9,160.04	9,089.17	11.86	9.60	-83.33	143.57	-565.47	546.02	524.41	21.60	25.277			
9,400.00	9,211.07	9,246.22	9,139.28	11.94	9.72	-84.40	207.95	-592.89	562.85	540.88	21.97	25.622			
9,500.00	9,220.01	9,337.90	9,177.97	11.98	9.83	-85.79	285.06	-623.49	580.41	558.13	22.28	26.045			
9,600.00	9,220.13	9,438.76	9,201.50	12.01	9.93	-88.19	376.82	-657.54	602.40	579.91	22.49	26.782			
9,700.00	9,220.25	9,571.45	9,205.72	12.04	10.01	-88.65	502.53	-699.40	629.36	606.53	22.82	27.573			
9,800.00	9,220.37	9,748.17	9,206.03	12.06	10.19	-88.73	674.86	-738.03	650.60	627.22	23.38	27.829			
9,900.00	9,220.48	9,931.80	9,206.35	12.09	10.65	-88.77	857.54	-755.39	659.47	635.38	24.09	27.375			
10,000.00	9,220.59	10,047.97	9,206.55	12.13	11.14	-88.78	973.70	-756.53	659.71	634.92	24.79	26.607			
10,100.00	9,220.71	10,147.97	9,206.72	12.17	11.63	-88.78	1,073.70	-757.14	659.72	634.00	25.72	25.651			
10,200.00	9,220.82	10,247.97	9,206.89	12.23	12.18	-88.79	1,173.70	-757.76	659.72	633.02	26.70	24.705			
10,300.00	9,220.94	10,347.97	9,207.06	12.32	12.75	-88.79	1,273.69	-758.37	659.73	631.98	27.74	23.779			
10,400.00	9,221.05	10,447.97	9,207.23	12.59	13.35	-88.80	1,373.69	-758.98	659.73	630.90	28.83	22.882			
10,500.00	9,221.17	10,547.97	9,207.40	13.12	13.97	-88.80	1,473.69	-759.59	659.74	629.77	29.96	22.017			
10,600.00	9,221.28	10,647.97	9,207.57	13.75	14.60	-88.81	1,573.69	-760.20	659.75	628.61	31.14	21.189			
10,700.00	9,221.39	10,747.97	9,207.74	14.42	15.25	-88.81	1,673.69	-760.82	659.75	627.41	32.34	20.399			
10,800.00	9,221.51	10,847.97	9,207.91	15.10	15.91	-88.82	1,773.68	-761.43	659.76	626.18	33.58	19.648			
10,900.00	9,221.62	10,947.97	9,208.08	15.79	16.57	-88.82	1,873.68	-762.04	659.76	624.92	34.84	18.936			
11,000.00	9,221.74	11,047.97	9,208.25	16.49	17.25	-88.83	1,973.68	-762.65	659.77	623.64	36.13	18.260			
11,100.00	9,221.85	11,147.97	9,208.42	17.20	17.93	-88.83	2,073.68	-763.27	659.77	622.33	37.44	17.621			
11,200.00	9,221.97	11,247.97	9,208.59	17.91	18.62	-88.84	2,173.68	-763.88	659.78	621.01	38.77	17.017			
11,300.00	9,222.08	11,347.97	9,208.76	18.63	19.32	-88.84	2,273.67	-764.49	659.79	619.67	40.12	16.445			
11,400.00	9,222.19	11,447.97	9,208.94	19.35	20.02	-88.85	2,373.67	-765.10	659.79	618.31	41.48	15.904			
11,500.00	9,222.31	11,547.97	9,209.11	20.07	20.72	-88.85	2,473.67	-765.72	659.80	616.94	42.86	15.393			
11,600.00	9,222.42	11,647.97	9,209.28	20.80	21.43	-88.86	2,573.67	-766.33	659.80	615.55	44.25	14.909			
11,700.00	9,222.54	11,747.97	9,209.45	21.53	22.14	-88.86	2,673.67	-766.94	659.81	614.15	45.66	14.451			
11,800.00	9,222.65	11,847.97	9,209.62	22.26	22.86	-88.87	2,773.66	-767.55	659.82	612.74	47.07	14.017			
11,900.00	9,222.77	11,947.97	9,209.79	22.99	23.58	-88.87	2,873.66	-768.16	659.82	611.33	48.50	13.606			
12,000.00	9,222.88	12,047.97	9,209.96	23.73	24.30	-88.88	2,973.66	-768.78	659.83	609.90	49.93	13.215			
12,100.00	9,222.99	12,147.97	9,210.13	24.46	25.03	-88.88	3,073.66	-769.39	659.83	608.46	51.37	12.845			
12,200.00	9,223.11	12,247.97	9,210.30	25.20	25.75	-88.89	3,173.66	-770.00	659.84	607.02	52.82	12.493			
12,300.00	9,223.22	12,347.97	9,210.47	25.94	26.48	-88.89	3,273.65	-770.61	659.85	605.57	54.27	12.158			
12,400.00	9,223.34	12,447.97	9,210.64	26.68	27.21	-88.90	3,373.65	-771.23	659.85	604.12	55.73	11.839			
12,500.00	9,223.45	12,547.97	9,210.81	27.43	27.94	-88.90	3,473.65	-771.84	659.86	602.66	57.20	11.536			

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



Phoenix Technology Services LP

Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 101H - OH - Plan 1 10-11-17													Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 8768-MWD+IFR1+MS													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		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)				Between Centres (usft)	Between Ellipses (usft)	
12,600.00	9,223.57	12,647.97	9,210.98	28.17	28.68	-88.91	3,573.65	-772.45	659.86	601.19	11.246			
12,700.00	9,223.68	12,747.97	9,211.15	28.92	29.41	-88.91	3,673.65	-773.06	659.87	599.72	10.970			
12,800.00	9,223.79	12,847.97	9,211.32	29.66	30.15	-88.92	3,773.64	-773.67	659.88	598.24	10.707			
12,900.00	9,223.91	12,947.97	9,211.49	30.41	30.89	-88.92	3,873.64	-774.29	659.88	596.76	10.455			
13,000.00	9,224.02	13,047.97	9,211.66	31.16	31.63	-88.93	3,973.64	-774.90	659.89	595.28	10.214			
13,100.00	9,224.14	13,147.97	9,211.84	31.91	32.37	-88.93	4,073.64	-775.51	659.89	593.79	9.983			
13,200.00	9,224.25	13,247.97	9,212.01	32.65	33.11	-88.94	4,173.64	-776.12	659.90	592.30	9.762			
13,300.00	9,224.37	13,347.97	9,212.18	33.40	33.85	-88.94	4,273.63	-776.74	659.91	590.81	9.550			
13,400.00	9,224.48	13,447.97	9,212.35	34.16	34.59	-88.95	4,373.63	-777.35	659.91	589.31	9.347			
13,500.00	9,224.59	13,547.97	9,212.52	34.91	35.34	-88.95	4,473.63	-777.96	659.92	587.81	9.152			
13,600.00	9,224.71	13,647.97	9,212.69	35.66	36.08	-88.96	4,573.63	-778.57	659.92	586.31	8.965			
13,700.00	9,224.82	13,747.97	9,212.86	36.41	36.83	-88.96	4,673.63	-779.19	659.93	584.81	8.785			
13,800.00	9,224.94	13,847.97	9,213.03	37.16	37.58	-88.97	4,773.62	-779.80	659.94	583.30	8.611			
13,900.00	9,225.05	13,947.97	9,213.20	37.92	38.32	-88.97	4,873.62	-780.41	659.94	581.79	8.444			
14,000.00	9,225.17	14,047.97	9,213.37	38.67	39.07	-88.98	4,973.62	-781.02	659.95	580.28	8.284			
14,100.00	9,225.28	14,147.97	9,213.54	39.42	39.82	-88.98	5,073.62	-781.63	659.95	578.77	8.129			
14,200.00	9,225.39	14,247.97	9,213.71	40.18	40.57	-88.99	5,173.62	-782.25	659.96	577.25	7.979			
14,300.00	9,225.51	14,347.97	9,213.88	40.93	41.32	-88.99	5,273.61	-782.86	659.97	575.73	7.835			
14,400.00	9,225.62	14,447.97	9,214.05	41.69	42.07	-89.00	5,373.61	-783.47	659.97	574.22	7.696			
14,500.00	9,225.74	14,547.97	9,214.22	42.44	42.82	-89.00	5,473.61	-784.08	659.98	572.70	7.561			
14,600.00	9,225.85	14,647.97	9,214.39	43.20	43.57	-89.01	5,573.61	-784.70	659.98	571.18	7.432			
14,700.00	9,225.97	14,747.97	9,214.57	43.96	44.32	-89.01	5,673.60	-785.31	659.99	569.65	7.306			
14,800.00	9,226.08	14,847.97	9,214.74	44.71	45.07	-89.02	5,773.60	-785.92	660.00	568.13	7.184			
14,900.00	9,226.19	14,947.97	9,214.91	45.47	45.83	-89.02	5,873.60	-786.53	660.00	566.60	7.067			
15,000.00	9,226.31	15,047.97	9,215.08	46.23	46.58	-89.02	5,973.60	-787.14	660.01	565.08	6.953			
15,100.00	9,226.42	15,147.97	9,215.25	46.98	47.33	-89.03	6,073.60	-787.76	660.01	563.55	6.842			
15,200.00	9,226.54	15,247.97	9,215.42	47.74	48.09	-89.03	6,173.59	-788.37	660.02	562.02	6.735			
15,300.00	9,226.65	15,347.97	9,215.59	48.50	48.84	-89.04	6,273.59	-788.98	660.03	560.49	6.631			
15,400.00	9,226.77	15,447.97	9,215.76	49.26	49.59	-89.04	6,373.59	-789.59	660.03	558.96	6.530			
15,500.00	9,226.88	15,547.97	9,215.93	50.01	50.35	-89.05	6,473.59	-790.21	660.04	557.43	6.433			
15,600.00	9,226.99	15,647.97	9,216.10	50.77	51.10	-89.05	6,573.59	-790.82	660.04	555.90	6.338			
15,700.00	9,227.11	15,747.97	9,216.27	51.53	51.86	-89.06	6,673.58	-791.43	660.05	554.36	6.245			
15,800.00	9,227.22	15,847.97	9,216.44	52.29	52.61	-89.06	6,773.58	-792.04	660.06	552.83	6.156			
15,900.00	9,227.34	15,947.97	9,216.61	53.05	53.37	-89.07	6,873.58	-792.66	660.06	551.29	6.069			
16,000.00	9,227.45	16,047.97	9,216.78	53.81	54.12	-89.07	6,973.58	-793.27	660.07	549.76	5.984			
16,100.00	9,227.57	16,147.97	9,216.95	54.57	54.88	-89.08	7,073.58	-793.88	660.08	548.22	5.901			
16,200.00	9,227.68	16,247.97	9,217.12	55.32	55.64	-89.08	7,173.57	-794.49	660.08	546.69	5.821			
16,300.00	9,227.79	16,347.97	9,217.29	56.08	56.39	-89.09	7,273.57	-795.10	660.09	545.15	5.743			
16,400.00	9,227.91	16,447.97	9,217.47	56.84	57.15	-89.09	7,373.57	-795.72	660.09	543.61	5.667			
16,445.11	9,227.96	16,493.08	9,217.54	57.19	57.49	-89.10	7,418.68	-795.99	660.10	542.91	5.633			
16,479.71	9,228.00	16,526.90	9,217.60	57.45	57.75	-89.10	7,452.50	-796.20	660.10	542.39	5.608			

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



Phoenix Technology Services LP
Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 201H - OH - Plan 1 10-11-17													Offset Site Error: 0.00 usft	
Survey Program: 0-Scientific Gyro, 4600-MWD+IFR1+MS													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		
0.00	0.00	0.00	0.60	0.00	0.00	-90.57	-0.30	-30.00	30.01					
100.00	100.00	99.40	100.00	0.07	0.07	-90.57	-0.30	-30.00	30.00	29.87	0.14	221.327		
200.00	200.00	199.40	200.00	0.20	0.20	-90.57	-0.30	-30.00	30.00	29.61	0.39	76.189		
300.00	300.00	299.40	300.00	0.33	0.33	-90.57	-0.30	-30.00	30.00	29.35	0.66	45.705		
400.00	400.00	399.40	400.00	0.46	0.46	-90.57	-0.30	-30.00	30.00	29.08	0.92	32.623		
500.00	500.00	499.40	500.00	0.59	0.59	-90.57	-0.30	-30.00	30.00	28.82	1.18	25.359		
600.00	600.00	599.40	600.00	0.72	0.72	-90.57	-0.30	-30.00	30.00	28.55	1.45	20.739		
700.00	700.00	699.40	700.00	0.86	0.85	-90.57	-0.30	-30.00	30.00	28.29	1.71	17.543		
800.00	800.00	799.40	800.00	0.99	0.99	-90.57	-0.30	-30.00	30.00	28.03	1.97	15.200		
900.00	900.00	899.40	900.00	1.12	1.12	-90.57	-0.30	-30.00	30.00	27.76	2.24	13.409		
1,000.00	1,000.00	999.40	1,000.00	1.25	1.25	-90.57	-0.30	-30.00	30.00	27.50	2.50	11.996		
1,100.00	1,100.00	1,099.40	1,100.00	1.38	1.38	-90.57	-0.30	-30.00	30.00	27.24	2.76	10.852		
1,200.00	1,200.00	1,199.40	1,200.00	1.51	1.51	-90.57	-0.30	-30.00	30.00	26.97	3.03	9.907		
1,300.00	1,300.00	1,299.40	1,300.00	1.65	1.65	-90.57	-0.30	-30.00	30.00	26.71	3.29	9.113		
1,400.00	1,400.00	1,399.40	1,400.00	1.78	1.78	-90.57	-0.30	-30.00	30.00	26.45	3.56	8.438		
1,500.00	1,500.00	1,499.40	1,500.00	1.91	1.91	-90.57	-0.30	-30.00	30.00	26.18	3.82	7.855		
1,600.00	1,600.00	1,599.40	1,600.00	2.04	2.04	-90.57	-0.30	-30.00	30.00	25.92	4.08	7.348		
1,700.00	1,700.00	1,699.40	1,700.00	2.17	2.17	-90.57	-0.30	-30.00	30.00	25.65	4.35	6.902		
1,800.00	1,800.00	1,799.40	1,800.00	2.31	2.30	-90.57	-0.30	-30.00	30.00	25.39	4.61	6.507		
1,900.00	1,900.00	1,899.40	1,900.00	2.44	2.44	-90.57	-0.30	-30.00	30.00	25.13	4.87	6.155		
2,000.00	2,000.00	1,999.40	2,000.00	2.57	2.57	-90.57	-0.30	-30.00	30.00	24.86	5.14	5.840		
2,100.00	2,100.00	2,099.40	2,100.00	2.70	2.70	-90.57	-0.30	-30.00	30.00	24.60	5.40	5.554		
2,200.00	2,200.00	2,199.40	2,200.00	2.83	2.83	-90.57	-0.30	-30.00	30.00	24.34	5.66	5.296		
2,300.00	2,300.00	2,299.40	2,300.00	2.96	2.96	-90.57	-0.30	-30.00	30.00	24.07	5.93	5.060		
2,400.00	2,400.00	2,399.40	2,400.00	3.10	3.10	-90.57	-0.30	-30.00	30.00	23.81	6.19	4.845		
2,500.00	2,500.00	2,499.40	2,500.00	3.23	3.23	-90.57	-0.30	-30.00	30.00	23.55	6.46	4.647		
2,600.00	2,600.00	2,599.40	2,600.00	3.36	3.36	-90.57	-0.30	-30.00	30.00	23.28	6.72	4.465		
2,700.00	2,700.00	2,699.40	2,700.00	3.49	3.49	-90.57	-0.30	-30.00	30.00	23.02	6.98	4.296		
2,800.00	2,800.00	2,799.40	2,800.00	3.62	3.62	-90.57	-0.30	-30.00	30.00	22.75	7.25	4.140		
2,900.00	2,900.00	2,899.40	2,900.00	3.76	3.75	-90.57	-0.30	-30.00	30.00	22.49	7.51	3.994		
3,000.00	3,000.00	2,999.40	3,000.00	3.89	3.89	-90.57	-0.30	-30.00	30.00	22.23	7.77	3.859		
3,100.00	3,100.00	3,099.40	3,100.00	4.02	4.02	-90.57	-0.30	-30.00	30.00	21.96	8.04	3.732		
3,200.00	3,200.00	3,199.40	3,200.00	4.15	4.15	-90.57	-0.30	-30.00	30.00	21.70	8.30	3.614		
3,300.00	3,300.00	3,299.40	3,300.00	4.28	4.28	-90.57	-0.30	-30.00	30.00	21.44	8.57	3.503		
3,400.00	3,400.00	3,399.40	3,400.00	4.41	4.41	-90.57	-0.30	-30.00	30.00	21.17	8.83	3.398		
3,500.00	3,500.00	3,499.40	3,500.00	4.55	4.55	-90.57	-0.30	-30.00	30.00	20.91	9.09	3.299		
3,600.00	3,600.00	3,599.40	3,600.00	4.68	4.68	-90.57	-0.30	-30.00	30.00	20.65	9.36	3.207		
3,700.00	3,700.00	3,699.40	3,700.00	4.81	4.81	-90.57	-0.30	-30.00	30.00	20.38	9.62	3.119		
3,800.00	3,800.00	3,799.40	3,800.00	4.94	4.94	-90.57	-0.30	-30.00	30.00	20.12	9.88	3.035		
3,900.00	3,900.00	3,899.40	3,900.00	5.07	5.07	-90.57	-0.30	-30.00	30.00	19.85	10.15	2.957		
4,000.00	4,000.00	3,999.40	4,000.00	5.21	5.21	-90.57	-0.30	-30.00	30.00	19.59	10.41	2.882		
4,100.00	4,100.00	4,099.40	4,100.00	5.34	5.34	-90.57	-0.30	-30.00	30.00	19.33	10.67	2.810		
4,200.00	4,200.00	4,199.40	4,200.00	5.47	5.47	-90.57	-0.30	-30.00	30.00	19.06	10.94	2.743		
4,300.00	4,300.00	4,299.40	4,300.00	5.60	5.60	-90.57	-0.30	-30.00	30.00	18.80	11.20	2.678		
4,400.00	4,400.00	4,399.40	4,400.00	5.73	5.73	-90.57	-0.30	-30.00	30.00	18.54	11.47	2.617		
4,500.00	4,500.00	4,499.40	4,500.00	5.87	5.86	-90.57	-0.30	-30.00	30.00	18.27	11.73	2.558		
4,600.00	4,600.00	4,599.40	4,600.00	6.00	6.00	-90.57	-0.30	-30.00	30.00	18.01	11.99	2.502		
4,700.00	4,700.00	4,699.40	4,700.00	6.13	6.05	-90.57	-0.30	-30.00	30.00	17.83	12.18	2.464		
4,800.00	4,800.00	4,799.40	4,800.00	6.26	6.07	-90.57	-0.30	-30.00	30.00	17.67	12.33	2.433		
4,900.00	4,900.00	4,899.40	4,900.00	6.39	6.11	-90.57	-0.30	-30.00	30.00	17.50	12.50	2.400		
5,000.00	5,000.00	4,999.40	5,000.00	6.52	6.17	-90.57	-0.30	-30.00	30.00	17.30	12.70	2.363		
5,100.00	5,100.00	5,099.40	5,100.00	6.66	6.26	-90.57	-0.30	-30.00	30.00	17.09	12.91	2.324		

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



Phoenix Technology Services LP
Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design - Eider Federal - 201H - OH - Plan 1 10-11-17													Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 4600-MWD+IFR1+MS													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		
5,200.00	5,200.00	5,199.40	5,200.00	6.79	6.36	-90.57	-0.30	-30.00	30.00	16.86	13.15	2.282		
5,300.00	5,300.00	5,299.40	5,300.00	6.92	6.48	-90.57	-0.30	-30.00	30.00	16.60	13.40	2.239		
5,400.00	5,400.00	5,399.40	5,400.00	7.05	6.61	-90.57	-0.30	-30.00	30.00	16.34	13.67	2.195		
5,500.00	5,500.00	5,499.40	5,500.00	7.18	6.77	-90.57	-0.30	-30.00	30.00	16.05	13.95	2.150		
5,600.00	5,600.00	5,599.40	5,600.00	7.32	6.94	-90.57	-0.30	-30.00	30.00	15.75	14.25	2.105 CC, ES, SF		
5,700.00	5,700.00	5,698.94	5,699.52	7.45	7.12	-87.66	1.25	-30.71	30.74	16.17	14.57	2.110		
5,800.00	5,800.00	5,798.56	5,799.02	7.58	7.31	-80.30	5.59	-32.68	33.17	18.28	14.89	2.227		
5,900.00	5,900.00	5,898.42	5,898.75	7.71	7.52	-73.47	10.34	-34.85	36.37	21.14	15.23	2.388		
6,000.00	6,000.00	5,998.28	5,998.48	7.84	7.74	-67.81	15.10	-37.02	40.01	24.43	15.58	2.568		
6,100.00	6,100.00	6,098.15	6,098.20	7.97	7.97	-63.13	19.85	-39.18	43.96	28.02	15.94	2.758		
6,200.00	6,200.00	6,198.01	6,197.93	8.11	8.20	-59.24	24.61	-41.35	48.16	31.85	16.31	2.953		
6,300.00	6,300.00	6,297.87	6,297.65	8.24	8.45	-55.99	29.36	-43.52	52.55	35.86	16.69	3.149		
6,400.00	6,400.00	6,397.74	6,397.38	8.37	8.70	-53.25	34.12	-45.69	57.08	40.01	17.07	3.343		
6,500.00	6,500.00	6,497.60	6,497.11	8.50	8.96	-50.91	38.88	-47.85	61.72	44.26	17.47	3.534		
6,600.00	6,600.00	6,597.46	6,596.83	8.63	9.23	-48.90	43.63	-50.02	66.45	48.59	17.87	3.719		
6,700.00	6,700.00	6,697.33	6,696.56	8.77	9.51	-47.16	48.39	-52.19	71.25	52.98	18.27	3.899		
6,800.00	6,800.00	6,797.19	6,796.28	8.90	9.79	-45.65	53.14	-54.36	76.11	57.43	18.68	4.074		
6,900.00	6,900.00	6,897.05	6,896.01	9.03	10.07	-44.31	57.90	-56.52	81.01	61.91	19.10	4.242		
7,000.00	7,000.00	6,896.91	6,895.74	9.16	10.36	-43.13	62.66	-58.69	85.96	66.43	19.52	4.403		
7,100.00	7,100.00	7,096.78	7,095.46	9.29	10.65	-42.08	67.41	-60.86	90.93	70.98	19.95	4.559		
7,200.00	7,200.00	7,196.64	7,195.19	9.42	10.95	-41.13	72.17	-63.03	95.93	75.56	20.38	4.708		
7,300.00	7,300.00	7,296.50	7,294.91	9.56	11.25	-40.28	76.92	-65.19	100.96	80.15	20.81	4.852		
7,400.00	7,400.00	7,396.37	7,394.64	9.69	11.56	-39.51	81.68	-67.36	106.01	84.76	21.25	4.990		
7,500.00	7,500.00	7,496.23	7,494.37	9.82	11.86	-38.81	86.43	-69.53	111.07	89.39	21.68	5.122		
7,600.00	7,600.00	7,596.09	7,594.09	9.95	12.17	-38.17	91.19	-71.69	116.15	94.02	22.13	5.249		
7,700.00	7,700.00	7,695.95	7,693.82	10.08	12.49	-37.59	95.95	-73.86	121.24	98.67	22.57	5.371		
7,800.00	7,800.00	7,795.82	7,793.55	10.22	12.80	-37.05	100.70	-76.03	126.34	103.33	23.02	5.489		
7,900.00	7,900.00	7,895.68	7,893.27	10.35	13.12	-36.56	105.46	-78.20	131.46	107.99	23.47	5.601		
8,000.00	8,000.00	7,995.54	7,993.00	10.48	13.44	-36.10	110.21	-80.36	136.58	112.66	23.92	5.710		
8,100.00	8,100.00	8,095.41	8,092.72	10.61	13.76	-35.67	114.97	-82.53	141.71	117.34	24.37	5.814		
8,200.00	8,200.00	8,195.27	8,192.45	10.74	14.09	-35.28	119.73	-84.70	146.85	122.02	24.83	5.914		
8,300.00	8,300.00	8,295.13	8,292.18	10.88	14.41	-34.91	124.48	-86.87	152.00	126.71	25.29	6.011		
8,400.00	8,400.00	8,395.00	8,391.90	11.01	14.74	-34.56	129.24	-89.03	157.15	131.40	25.75	6.104		
8,500.00	8,500.00	8,494.86	8,491.63	11.14	15.07	-34.24	133.99	-91.20	162.30	136.10	26.21	6.193		
8,600.00	8,600.00	8,594.72	8,591.35	11.27	15.40	-33.94	138.75	-93.37	167.46	140.79	26.67	6.280		
8,700.00	8,700.00	8,694.58	8,691.08	11.40	15.73	-33.65	143.50	-95.54	172.63	145.50	27.13	6.363		
8,800.00	8,799.86	8,794.48	8,790.84	11.47	16.06	-24.61	148.26	-97.70	174.65	147.12	27.53	6.344		
8,900.00	8,897.16	8,892.77	8,889.00	11.50	16.39	-28.48	152.94	-99.84	159.67	131.78	27.89	5.725		
9,000.00	8,987.70	8,975.00	8,970.94	11.56	16.67	-37.36	158.73	-102.47	130.80	102.56	28.23	4.633		
9,100.00	9,067.53	9,050.00	9,043.99	11.65	16.93	-52.64	173.87	-109.37	103.62	75.05	28.58	3.626		
9,200.00	9,133.15	9,126.61	9,114.99	11.76	17.18	-75.38	199.87	-121.22	90.45	61.51	28.94	3.125		
9,203.44	9,135.12	9,129.37	9,117.45	11.76	17.19	-76.25	200.99	-121.73	90.44	61.48	28.95	3.123		
9,300.00	9,181.71	9,209.05	9,185.22	11.86	17.44	-99.05	238.98	-139.05	103.90	74.59	29.30	3.546		
9,400.00	9,211.07	9,298.07	9,251.53	11.94	17.69	-114.95	292.85	-163.59	140.17	110.54	29.63	4.731		
9,500.00	9,220.01	9,396.93	9,310.88	11.98	17.92	-124.05	364.58	-196.29	187.81	157.91	29.90	6.281		
9,600.00	9,220.13	9,515.48	9,358.84	12.01	18.12	-130.87	462.94	-241.11	235.13	205.01	30.13	7.805		
9,700.00	9,220.25	9,650.77	9,379.23	12.04	18.28	-128.12	584.22	-296.38	273.01	242.69	30.32	9.005		
9,800.00	9,220.37	9,763.63	9,378.79	12.06	18.44	-122.97	688.46	-339.58	304.15	273.65	30.50	9.972		
9,900.00	9,220.48	9,881.64	9,378.27	12.09	18.67	-119.42	800.72	-375.85	330.04	299.28	30.76	10.729		
10,000.00	9,220.59	10,005.16	9,377.72	12.13	18.97	-117.10	921.00	-403.77	349.32	318.05	31.27	11.171		
10,100.00	9,220.71	10,132.65	9,377.16	12.17	19.33	-115.76	1,047.19	-421.62	361.12	329.03	32.08	11.255		
10,200.00	9,220.82	10,262.06	9,376.59	12.23	19.72	-115.27	1,176.38	-428.20	364.92	331.96	32.97	11.070		

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



Phoenix Technology Services LP

Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 201H - OH - Plan 1 10-11-17													Offset Site Error:	0.00 usft
Survey Program: O-Scientific Gyro, 4600-MWD+IFR1+MS													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)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
10,300.00	9,220.94	10,362.05	9,376.16	12.32	20.04	-115.19	1,276.38	-428.80	364.69	330.89	33.80	10.789		
10,400.00	9,221.05	10,462.05	9,375.73	12.59	20.39	-115.11	1,376.37	-429.41	364.46	329.77	34.69	10.506		
10,500.00	9,221.17	10,562.05	9,375.30	13.12	20.76	-115.04	1,476.37	-430.01	364.23	328.60	35.63	10.223		
10,600.00	9,221.28	10,662.05	9,374.88	13.75	21.16	-114.96	1,576.37	-430.62	364.00	327.39	36.61	9.943		
10,700.00	9,221.39	10,762.05	9,374.45	14.42	21.58	-114.88	1,676.36	-431.22	363.77	326.14	37.63	9.668		
10,800.00	9,221.51	10,862.05	9,374.02	15.10	22.02	-114.80	1,776.36	-431.83	363.54	324.86	38.68	9.398		
10,900.00	9,221.62	10,962.05	9,373.59	15.79	22.48	-114.73	1,876.35	-432.43	363.31	323.54	39.77	9.135		
11,000.00	9,221.74	11,062.04	9,373.16	16.49	22.95	-114.65	1,976.35	-433.04	363.09	322.20	40.89	8.880		
11,100.00	9,221.85	11,162.04	9,372.73	17.20	23.45	-114.57	2,076.35	-433.64	362.86	320.83	42.03	8.633		
11,200.00	9,221.97	11,262.04	9,372.30	17.91	23.95	-114.49	2,176.34	-434.25	362.63	319.43	43.20	8.394		
11,300.00	9,222.08	11,362.04	9,371.87	18.63	24.47	-114.41	2,276.34	-434.86	362.41	318.02	44.39	8.164		
11,400.00	9,222.19	11,462.04	9,371.44	19.35	25.01	-114.33	2,376.33	-435.46	362.18	316.58	45.60	7.942		
11,500.00	9,222.31	11,562.04	9,371.01	20.07	25.55	-114.26	2,476.33	-436.07	361.96	315.12	46.84	7.728		
11,600.00	9,222.42	11,662.04	9,370.58	20.80	26.11	-114.18	2,576.32	-436.67	361.74	313.65	48.09	7.523		
11,700.00	9,222.54	11,762.03	9,370.15	21.53	26.68	-114.10	2,676.32	-437.28	361.51	312.16	49.35	7.325		
11,800.00	9,222.65	11,862.03	9,369.72	22.26	27.25	-114.02	2,776.32	-437.88	361.29	310.66	50.63	7.135		
11,900.00	9,222.77	11,962.03	9,369.29	22.99	27.84	-113.94	2,876.31	-438.49	361.07	309.14	51.93	6.953		
12,000.00	9,222.88	12,062.03	9,368.86	23.73	28.44	-113.86	2,976.31	-439.09	360.85	307.61	53.24	6.778		
12,100.00	9,222.99	12,162.03	9,368.43	24.46	29.04	-113.78	3,076.30	-439.70	360.63	306.07	54.56	6.610		
12,200.00	9,223.11	12,262.03	9,368.00	25.20	29.65	-113.70	3,176.30	-440.30	360.41	304.52	55.89	6.448		
12,300.00	9,223.22	12,362.02	9,367.57	25.94	30.27	-113.62	3,276.29	-440.91	360.19	302.96	57.24	6.293		
12,400.00	9,223.34	12,462.02	9,367.14	26.68	30.89	-113.54	3,376.29	-441.51	359.98	301.39	58.59	6.144		
12,500.00	9,223.45	12,562.02	9,366.71	27.43	31.52	-113.47	3,476.29	-442.12	359.76	299.81	59.95	6.001		
12,600.00	9,223.57	12,662.02	9,366.28	28.17	32.16	-113.39	3,576.28	-442.72	359.54	298.22	61.32	5.863		
12,700.00	9,223.68	12,762.02	9,365.85	28.92	32.80	-113.31	3,676.28	-443.33	359.33	296.63	62.70	5.731		
12,800.00	9,223.79	12,862.02	9,365.42	29.66	33.45	-113.23	3,776.27	-443.93	359.11	295.03	64.09	5.604		
12,900.00	9,223.91	12,962.02	9,364.99	30.41	34.10	-113.15	3,876.27	-444.54	358.90	293.42	65.48	5.481		
13,000.00	9,224.02	13,062.01	9,364.56	31.16	34.75	-113.07	3,976.26	-445.14	358.68	291.80	66.88	5.363		
13,100.00	9,224.14	13,162.01	9,364.13	31.91	35.42	-112.99	4,076.26	-445.75	358.47	290.19	68.29	5.250		
13,200.00	9,224.25	13,262.01	9,363.70	32.65	36.08	-112.91	4,176.26	-446.36	358.26	288.56	69.70	5.140		
13,300.00	9,224.37	13,362.01	9,363.27	33.40	36.75	-112.83	4,276.25	-446.96	358.05	286.93	71.12	5.035		
13,400.00	9,224.48	13,462.01	9,362.84	34.16	37.42	-112.75	4,376.25	-447.57	357.84	285.30	72.54	4.933		
13,500.00	9,224.59	13,562.01	9,362.41	34.91	38.10	-112.67	4,476.24	-448.17	357.63	283.65	73.98	4.834		
13,600.00	9,224.71	13,662.01	9,361.98	35.66	38.78	-112.58	4,576.24	-448.78	357.42	282.00	75.41	4.739		
13,700.00	9,224.82	13,762.00	9,361.55	36.41	39.46	-112.50	4,676.24	-449.38	357.21	280.35	76.86	4.648		
13,800.00	9,224.94	13,862.00	9,361.12	37.16	40.15	-112.42	4,776.23	-449.99	357.00	278.70	78.30	4.559		
13,900.00	9,225.05	13,962.00	9,360.69	37.92	40.83	-112.34	4,876.23	-450.59	356.79	277.04	79.75	4.474		
14,000.00	9,225.17	14,062.00	9,360.26	38.67	41.52	-112.26	4,976.22	-451.20	356.59	275.38	81.21	4.391		
14,100.00	9,225.28	14,162.00	9,359.83	39.42	42.22	-112.18	5,076.22	-451.80	356.38	273.72	82.66	4.311		
14,200.00	9,225.39	14,262.00	9,359.40	40.18	42.91	-112.10	5,176.21	-452.41	356.18	272.05	84.13	4.234		
14,300.00	9,225.51	14,362.00	9,358.97	40.93	43.61	-112.02	5,276.21	-453.01	355.97	270.38	85.59	4.159		
14,400.00	9,225.62	14,461.99	9,358.54	41.69	44.31	-111.94	5,376.21	-453.62	355.77	268.71	87.06	4.087		
14,500.00	9,225.74	14,561.99	9,358.11	42.44	45.02	-111.86	5,476.20	-454.22	355.57	267.04	88.53	4.016		
14,600.00	9,225.85	14,661.99	9,357.68	43.20	45.72	-111.77	5,576.20	-454.83	355.36	265.36	90.00	3.949		
14,700.00	9,225.97	14,761.99	9,357.25	43.96	46.43	-111.69	5,676.19	-455.43	355.16	263.69	91.47	3.883		
14,800.00	9,226.08	14,861.99	9,356.82	44.71	47.13	-111.61	5,776.19	-456.04	354.96	262.01	92.95	3.819		
14,900.00	9,226.19	14,961.99	9,356.39	45.47	47.84	-111.53	5,876.18	-456.64	354.76	260.33	94.43	3.757		
15,000.00	9,226.31	15,061.98	9,355.96	46.23	48.56	-111.45	5,976.18	-457.25	354.56	258.65	95.92	3.697		
15,100.00	9,226.42	15,161.98	9,355.53	46.98	49.27	-111.37	6,076.18	-457.85	354.36	256.96	97.40	3.638		
15,200.00	9,226.54	15,261.98	9,355.10	47.74	49.98	-111.28	6,176.17	-458.46	354.17	255.28	98.89	3.581		
15,300.00	9,226.65	15,361.98	9,354.67	48.50	50.70	-111.20	6,276.17	-459.07	353.97	253.59	100.38	3.526		
15,400.00	9,226.77	15,461.98	9,354.24	49.26	51.42	-111.12	6,376.16	-459.67	353.77	251.90	101.87	3.473		

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



Phoenix Technology Services LP
Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 201H - OH - Plan 1 10-11-17													Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 4600-MWD+IFR1+MS													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		
15,500.00	9,226.88	15,561.98	9,353.81	50.01	52.14	-111.04	6,476.16	-460.28	353.58	250.21	103.36	3.421		
15,600.00	9,226.99	15,661.98	9,353.38	50.77	52.86	-110.96	6,576.15	-460.88	353.38	248.53	104.86	3.370		
15,700.00	9,227.11	15,761.97	9,352.95	51.53	53.58	-110.87	6,676.15	-461.49	353.19	246.83	106.35	3.321		
15,800.00	9,227.22	15,861.97	9,352.52	52.29	54.30	-110.79	6,776.15	-462.09	352.99	245.14	107.85	3.273		
15,900.00	9,227.34	15,961.97	9,352.09	53.05	55.02	-110.71	6,876.14	-462.70	352.80	243.45	109.35	3.226		
16,000.00	9,227.45	16,061.97	9,351.66	53.81	55.75	-110.62	6,976.14	-463.30	352.61	241.76	110.85	3.181		
16,100.00	9,227.57	16,161.97	9,351.23	54.57	56.47	-110.54	7,076.13	-463.91	352.42	240.06	112.36	3.137		
16,200.00	9,227.68	16,261.97	9,350.80	55.32	57.20	-110.46	7,176.13	-464.51	352.23	238.37	113.86	3.093		
16,300.00	9,227.79	16,361.97	9,350.37	56.08	57.93	-110.38	7,276.13	-465.12	352.04	236.67	115.37	3.051		
16,400.00	9,227.91	16,461.96	9,349.94	56.84	58.66	-110.29	7,376.12	-465.72	351.85	234.97	116.87	3.010		
16,473.64	9,227.99	16,535.60	9,349.62	57.40	59.19	-110.23	7,449.75	-466.17	351.71	233.73	117.98	2.981		
16,479.71	9,228.00	16,540.75	9,349.60	57.45	59.23	-110.23	7,454.90	-466.20	351.70	233.63	118.07	2.979		

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



Phoenix Technology Services LP
Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 302H - OH - Plan 1 10-11-17												Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 4600-MWD+IFR1+MS												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
0.00	0.00	0.00	0.90	0.00	0.00	-135.48	-30.30	-29.80	42.51				
100.00	100.00	99.10	100.00	0.07	0.07	-135.48	-30.30	-29.80	42.50	42.36	0.14	313.993	
200.00	200.00	199.10	200.00	0.20	0.20	-135.48	-30.30	-29.80	42.50	42.11	0.39	108.032	
300.00	300.00	299.10	300.00	0.33	0.33	-135.48	-30.30	-29.80	42.50	41.84	0.66	64.783	
400.00	400.00	399.10	400.00	0.46	0.46	-135.48	-30.30	-29.80	42.50	41.58	0.92	46.232	
500.00	500.00	499.10	500.00	0.59	0.59	-135.48	-30.30	-29.80	42.50	41.32	1.18	35.934	
600.00	600.00	599.10	600.00	0.72	0.72	-135.48	-30.30	-29.80	42.50	41.05	1.45	29.386	
700.00	700.00	699.10	700.00	0.86	0.85	-135.48	-30.30	-29.80	42.50	40.79	1.71	24.856	
800.00	800.00	799.10	800.00	0.99	0.99	-135.48	-30.30	-29.80	42.50	40.53	1.97	21.536	
900.00	900.00	899.10	900.00	1.12	1.12	-135.48	-30.30	-29.80	42.50	40.26	2.24	18.998	
1,000.00	1,000.00	999.10	1,000.00	1.25	1.25	-135.48	-30.30	-29.80	42.50	40.00	2.50	16.995	
1,100.00	1,100.00	1,099.10	1,100.00	1.38	1.38	-135.48	-30.30	-29.80	42.50	39.73	2.76	15.374	
1,200.00	1,200.00	1,199.10	1,200.00	1.51	1.51	-135.48	-30.30	-29.80	42.50	39.47	3.03	14.035	
1,300.00	1,300.00	1,299.10	1,300.00	1.65	1.65	-135.48	-30.30	-29.80	42.50	39.21	3.29	12.911	
1,400.00	1,400.00	1,399.10	1,400.00	1.78	1.78	-135.48	-30.30	-29.80	42.50	38.94	3.56	11.954	
1,500.00	1,500.00	1,499.10	1,500.00	1.91	1.91	-135.48	-30.30	-29.80	42.50	38.68	3.82	11.128	
1,600.00	1,600.00	1,599.10	1,600.00	2.04	2.04	-135.48	-30.30	-29.80	42.50	38.42	4.08	10.410	
1,700.00	1,700.00	1,699.10	1,700.00	2.17	2.17	-135.48	-30.30	-29.80	42.50	38.15	4.35	9.778	
1,800.00	1,800.00	1,799.10	1,800.00	2.31	2.30	-135.48	-30.30	-29.80	42.50	37.89	4.61	9.219	
1,900.00	1,900.00	1,899.10	1,900.00	2.44	2.44	-135.48	-30.30	-29.80	42.50	37.63	4.87	8.720	
2,000.00	2,000.00	1,999.10	2,000.00	2.57	2.57	-135.48	-30.30	-29.80	42.50	37.36	5.14	8.273	
2,100.00	2,100.00	2,099.10	2,100.00	2.70	2.70	-135.48	-30.30	-29.80	42.50	37.10	5.40	7.869	
2,200.00	2,200.00	2,199.10	2,200.00	2.83	2.83	-135.48	-30.30	-29.80	42.50	36.83	5.66	7.502	
2,300.00	2,300.00	2,299.10	2,300.00	2.96	2.96	-135.48	-30.30	-29.80	42.50	36.57	5.93	7.169	
2,400.00	2,400.00	2,399.10	2,400.00	3.10	3.10	-135.48	-30.30	-29.80	42.50	36.31	6.19	6.864	
2,500.00	2,500.00	2,499.10	2,500.00	3.23	3.23	-135.48	-30.30	-29.80	42.50	36.04	6.46	6.583	
2,600.00	2,600.00	2,599.10	2,600.00	3.36	3.36	-135.48	-30.30	-29.80	42.50	35.78	6.72	6.325	
2,700.00	2,700.00	2,699.10	2,700.00	3.49	3.49	-135.48	-30.30	-29.80	42.50	35.52	6.98	6.086	
2,800.00	2,800.00	2,799.10	2,800.00	3.62	3.62	-135.48	-30.30	-29.80	42.50	35.25	7.25	5.865	
2,900.00	2,900.00	2,899.10	2,900.00	3.76	3.75	-135.48	-30.30	-29.80	42.50	34.99	7.51	5.659	
3,000.00	3,000.00	2,999.10	3,000.00	3.89	3.89	-135.48	-30.30	-29.80	42.50	34.72	7.77	5.467	
3,100.00	3,100.00	3,099.10	3,100.00	4.02	4.02	-135.48	-30.30	-29.80	42.50	34.46	8.04	5.287	
3,200.00	3,200.00	3,199.10	3,200.00	4.15	4.15	-135.48	-30.30	-29.80	42.50	34.20	8.30	5.119	
3,300.00	3,300.00	3,299.10	3,300.00	4.28	4.28	-135.48	-30.30	-29.80	42.50	33.93	8.57	4.962	
3,400.00	3,400.00	3,399.10	3,400.00	4.41	4.41	-135.48	-30.30	-29.80	42.50	33.67	8.83	4.814	
3,500.00	3,500.00	3,499.10	3,500.00	4.55	4.55	-135.48	-30.30	-29.80	42.50	33.41	9.09	4.674	
3,600.00	3,600.00	3,599.10	3,600.00	4.68	4.68	-135.48	-30.30	-29.80	42.50	33.14	9.36	4.542	
3,700.00	3,700.00	3,699.10	3,700.00	4.81	4.81	-135.48	-30.30	-29.80	42.50	32.88	9.62	4.418	
3,800.00	3,800.00	3,799.10	3,800.00	4.94	4.94	-135.48	-30.30	-29.80	42.50	32.62	9.88	4.300	
3,900.00	3,900.00	3,899.10	3,900.00	5.07	5.07	-135.48	-30.30	-29.80	42.50	32.35	10.15	4.188	
4,000.00	4,000.00	3,999.10	4,000.00	5.21	5.20	-135.48	-30.30	-29.80	42.50	32.09	10.41	4.082	
4,100.00	4,100.00	4,099.10	4,100.00	5.34	5.34	-135.48	-30.30	-29.80	42.50	31.82	10.67	3.981	
4,200.00	4,200.00	4,199.10	4,200.00	5.47	5.47	-135.48	-30.30	-29.80	42.50	31.56	10.94	3.885	
4,300.00	4,300.00	4,299.10	4,300.00	5.60	5.60	-135.48	-30.30	-29.80	42.50	31.30	11.20	3.794	
4,400.00	4,400.00	4,399.10	4,400.00	5.73	5.73	-135.48	-30.30	-29.80	42.50	31.03	11.47	3.707	
4,500.00	4,500.00	4,499.10	4,500.00	5.87	5.86	-135.48	-30.30	-29.80	42.50	30.77	11.73	3.623	
4,600.00	4,600.00	4,599.10	4,600.00	6.00	6.00	-135.48	-30.30	-29.80	42.50	30.51	11.99	3.544 CC, ES	
4,700.00	4,700.00	4,697.76	4,698.64	6.13	6.05	-136.44	-31.88	-30.32	44.02	31.85	12.18	3.616	
4,800.00	4,800.00	4,797.53	4,798.34	6.26	6.07	-138.39	-35.47	-31.51	47.47	35.14	12.33	3.850	
4,900.00	4,900.00	4,897.46	4,898.19	6.39	6.11	-140.08	-39.09	-32.70	51.00	38.49	12.51	4.078	
5,000.00	5,000.00	4,997.38	4,998.05	6.52	6.17	-141.56	-42.70	-33.89	54.56	41.86	12.70	4.296	
5,100.00	5,100.00	5,097.31	5,097.90	6.66	6.26	-142.86	-46.32	-35.09	58.15	45.24	12.91	4.503	

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



Phoenix Technology Services LP

Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 302H - OH - Plan 1 10-11-17													Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 4600-MWD+IFR1+MS													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	
5,200.00	5,200.00	5,197.24	5,197.76	6.79	6.36	-144.00	-49.94	-36.28	61.77	48.62	13.14	4.699		
5,300.00	5,300.00	5,297.17	5,297.61	6.92	6.48	-145.02	-53.55	-37.48	65.41	52.01	13.40	4.883		
5,400.00	5,400.00	5,397.09	5,397.47	7.05	6.61	-145.93	-57.17	-38.67	69.07	55.40	13.66	5.055		
5,500.00	5,500.00	5,497.02	5,497.32	7.18	6.77	-146.74	-60.79	-39.86	72.74	58.79	13.95	5.215		
5,600.00	5,600.00	5,596.95	5,597.18	7.32	6.93	-147.48	-64.40	-41.06	76.43	62.18	14.25	5.364		
5,700.00	5,700.00	5,696.88	5,697.03	7.45	7.12	-148.15	-68.02	-42.25	80.13	65.56	14.56	5.502		
5,800.00	5,800.00	5,796.80	5,796.89	7.58	7.31	-148.76	-71.63	-43.44	83.84	68.95	14.89	5.630		
5,900.00	5,900.00	5,896.73	5,896.74	7.71	7.52	-149.32	-75.25	-44.64	87.55	72.32	15.23	5.749		
6,000.00	6,000.00	5,996.66	5,996.60	7.84	7.74	-149.84	-78.87	-45.83	91.28	75.70	15.58	5.859		
6,100.00	6,100.00	6,096.59	6,096.45	7.97	7.97	-150.31	-82.48	-47.02	95.01	79.07	15.94	5.960		
6,200.00	6,200.00	6,196.51	6,196.31	8.11	8.20	-150.75	-86.10	-48.22	98.75	82.44	16.31	6.054		
6,300.00	6,300.00	6,296.44	6,296.16	8.24	8.45	-151.16	-89.71	-49.41	102.49	85.81	16.69	6.142		
6,400.00	6,400.00	6,396.37	6,396.02	8.37	8.70	-151.53	-93.33	-50.61	106.24	89.17	17.08	6.222		
6,500.00	6,500.00	6,496.29	6,495.87	8.50	8.97	-151.88	-96.95	-51.80	110.00	92.53	17.47	6.297		
6,600.00	6,600.00	6,596.22	6,595.72	8.63	9.23	-152.21	-100.56	-52.99	113.75	95.88	17.87	6.366		
6,700.00	6,700.00	6,696.15	6,695.58	8.77	9.51	-152.52	-104.18	-54.19	117.51	99.24	18.27	6.430		
6,800.00	6,800.00	6,796.08	6,795.43	8.90	9.79	-152.81	-107.80	-55.38	121.28	102.59	18.69	6.490		
6,900.00	6,900.00	6,896.00	6,895.29	9.03	10.07	-153.08	-111.41	-56.57	125.04	105.94	19.10	6.546		
7,000.00	7,000.00	6,995.93	6,995.14	9.16	10.36	-153.33	-115.03	-57.77	128.81	109.29	19.52	6.598		
7,100.00	7,100.00	7,095.86	7,095.00	9.29	10.66	-153.57	-118.64	-58.96	132.58	112.63	19.95	6.646		
7,200.00	7,200.00	7,195.79	7,194.85	9.42	10.95	-153.80	-122.26	-60.15	136.36	115.98	20.38	6.691		
7,300.00	7,300.00	7,295.71	7,294.71	9.56	11.26	-154.02	-125.88	-61.35	140.13	119.32	20.81	6.733		
7,400.00	7,400.00	7,395.64	7,394.56	9.69	11.56	-154.22	-129.49	-62.54	143.91	122.66	21.25	6.773		
7,500.00	7,500.00	7,495.57	7,494.42	9.82	11.87	-154.41	-133.11	-63.74	147.69	126.00	21.69	6.810		
7,600.00	7,600.00	7,595.50	7,594.27	9.95	12.18	-154.60	-136.73	-64.93	151.47	129.34	22.13	6.845		
7,700.00	7,700.00	7,695.42	7,694.13	10.08	12.49	-154.77	-140.34	-66.12	155.25	132.68	22.57	6.877		
7,800.00	7,800.00	7,795.35	7,793.98	10.22	12.81	-154.94	-143.96	-67.32	159.03	136.01	23.02	6.908		
7,900.00	7,900.00	7,895.28	7,893.84	10.35	13.12	-155.10	-147.57	-68.51	162.82	139.35	23.47	6.937		
8,000.00	8,000.00	7,995.21	7,993.69	10.48	13.44	-155.25	-151.19	-69.70	166.60	142.68	23.92	6.964		
8,100.00	8,100.00	8,095.13	8,093.55	10.61	13.76	-155.39	-154.81	-70.90	170.39	146.01	24.38	6.990		
8,200.00	8,200.00	8,195.06	8,193.40	10.74	14.09	-155.53	-158.42	-72.09	174.18	149.35	24.83	7.014		
8,300.00	8,300.00	8,294.99	8,293.26	10.88	14.41	-155.66	-162.04	-73.28	177.97	152.68	25.29	7.038		
8,400.00	8,400.00	8,394.91	8,393.11	11.01	14.74	-155.79	-165.65	-74.48	181.76	156.01	25.75	7.059		
8,500.00	8,500.00	8,494.84	8,492.97	11.14	15.07	-155.91	-169.27	-75.67	185.55	159.34	26.21	7.080		
8,600.00	8,600.00	8,594.77	8,592.82	11.27	15.40	-156.03	-172.89	-76.87	189.34	162.67	26.67	7.100		
8,700.00	8,700.00	8,694.70	8,692.68	11.40	15.73	-156.14	-176.50	-78.06	193.13	166.00	27.13	7.118		
8,800.00	8,799.86	8,794.37	8,792.27	11.47	16.06	-147.21	-180.11	-79.25	199.82	172.30	27.53	7.259		
8,900.00	8,897.16	8,890.85	8,888.68	11.50	16.38	-148.95	-183.60	-80.40	222.64	194.76	27.88	7.985		
9,000.00	8,987.70	8,979.90	8,977.67	11.56	16.68	-151.09	-186.82	-81.47	263.52	235.27	28.24	9.330		
9,100.00	9,067.53	9,057.65	9,055.36	11.65	16.94	-152.27	-189.64	-82.39	321.89	293.29	28.59	11.257		
9,200.00	9,133.15	9,248.52	9,244.21	11.76	17.52	-159.46	-170.89	-84.81	390.90	361.62	29.28	13.349		
9,300.00	9,181.71	9,857.54	9,583.92	11.86	18.39	-173.05	284.98	-91.83	404.75	374.50	30.25	13.382		
9,400.00	9,211.07	9,956.61	9,582.96	11.94	18.41	-175.36	384.04	-92.44	373.16	342.81	30.35	12.295		
9,500.00	9,220.01	10,054.74	9,581.98	11.98	18.59	-177.72	482.17	-93.05	362.29	331.73	30.57	11.853		
9,600.00	9,220.13	10,154.06	9,580.98	12.01	18.81	-179.47	581.47	-93.66	360.88	330.06	30.82	11.710		
9,700.00	9,220.25	10,253.93	9,579.98	12.04	19.07	179.86	681.34	-94.28	359.74	328.64	31.10	11.566		
9,800.00	9,220.37	10,353.93	9,578.97	12.06	19.35	179.86	781.33	-94.90	358.62	327.21	31.42	11.416		
9,900.00	9,220.48	10,453.92	9,577.97	12.09	19.66	179.86	881.31	-95.52	357.50	325.75	31.75	11.258		
10,000.00	9,220.59	10,553.91	9,576.96	12.13	19.99	179.86	981.30	-96.14	356.39	324.09	32.29	11.037		
10,100.00	9,220.71	10,653.91	9,575.96	12.17	20.35	179.86	1,081.29	-96.76	355.27	322.16	33.11	10.731		
10,200.00	9,220.82	10,753.90	9,574.95	12.23	20.73	179.86	1,181.27	-97.37	354.15	320.17	33.98	10.424		
10,300.00	9,220.94	10,853.89	9,573.95	12.32	21.13	179.87	1,281.26	-97.99	353.03	318.14	34.89	10.118		

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



Phoenix Technology Services LP

Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 302H - OH - Plan 1 10-11-17													Offset Site Error:	0.00 usft
Survey Program: 0-Scientific Gyro, 4600-MWD+IFR1+MS													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)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
10,400.00	9,221.05	10,953.89	9,572.94	12.59	21.54	179.87	1,381.25	-98.61	351.91	316.06	35.85	9.815		
10,500.00	9,221.17	11,053.88	9,571.94	13.12	21.98	179.87	1,481.23	-99.23	350.79	313.94	36.85	9.518		
10,600.00	9,221.28	11,153.88	9,570.93	13.75	22.44	179.87	1,581.22	-99.85	349.67	311.78	37.89	9.228		
10,700.00	9,221.39	11,253.87	9,569.93	14.42	22.91	179.87	1,681.21	-100.47	348.55	309.59	38.96	8.945		
10,800.00	9,221.51	11,353.86	9,568.93	15.10	23.40	179.87	1,781.19	-101.08	347.43	307.37	40.07	8.671		
10,900.00	9,221.62	11,453.86	9,567.92	15.79	23.90	179.88	1,881.18	-101.70	346.32	305.12	41.20	8.406		
11,000.00	9,221.74	11,553.85	9,566.92	16.49	24.41	179.88	1,981.17	-102.32	345.20	302.84	42.36	8.150		
11,100.00	9,221.85	11,653.84	9,565.91	17.20	24.94	179.88	2,081.16	-102.94	344.08	300.54	43.54	7.903		
11,200.00	9,221.97	11,753.84	9,564.91	17.91	25.48	179.88	2,181.14	-103.56	342.96	298.22	44.74	7.666		
11,300.00	9,222.08	11,853.83	9,563.90	18.63	26.03	179.88	2,281.13	-104.18	341.84	295.88	45.96	7.437		
11,400.00	9,222.19	11,953.83	9,562.90	19.35	26.60	179.89	2,381.12	-104.80	340.72	293.52	47.20	7.218		
11,500.00	9,222.31	12,053.82	9,561.89	20.07	27.17	179.89	2,481.10	-105.41	339.60	291.14	48.46	7.008		
11,600.00	9,222.42	12,153.81	9,560.89	20.80	27.75	179.89	2,581.09	-106.03	338.48	288.75	49.74	6.805		
11,700.00	9,222.54	12,253.81	9,559.88	21.53	28.34	179.89	2,681.08	-106.65	337.36	286.34	51.03	6.612		
11,800.00	9,222.65	12,353.80	9,558.88	22.26	28.94	179.89	2,781.06	-107.27	336.25	283.92	52.33	6.426		
11,900.00	9,222.77	12,453.79	9,557.88	22.99	29.54	179.90	2,881.05	-107.89	335.13	281.48	53.64	6.247		
12,000.00	9,222.88	12,553.79	9,556.87	23.73	30.16	179.90	2,981.04	-108.51	334.01	279.04	54.97	6.076		
12,100.00	9,222.99	12,653.78	9,555.87	24.46	30.78	179.90	3,081.02	-109.13	332.89	276.58	56.31	5.912		
12,200.00	9,223.11	12,753.78	9,554.86	25.20	31.40	179.90	3,181.01	-109.74	331.77	274.11	57.66	5.754		
12,300.00	9,223.22	12,853.77	9,553.86	25.94	32.03	179.90	3,281.00	-110.36	330.65	271.64	59.02	5.603		
12,400.00	9,223.34	12,953.76	9,552.85	26.68	32.67	179.90	3,380.98	-110.98	329.53	269.15	60.38	5.457		
12,500.00	9,223.45	13,053.76	9,551.85	27.43	33.31	179.91	3,480.97	-111.60	328.41	266.66	61.76	5.318		
12,600.00	9,223.57	13,153.75	9,550.84	28.17	33.96	179.91	3,580.96	-112.22	327.29	264.15	63.14	5.184		
12,700.00	9,223.68	13,253.74	9,549.84	28.92	34.62	179.91	3,680.94	-112.84	326.18	261.64	64.53	5.055		
12,800.00	9,223.79	13,353.74	9,548.84	29.66	35.27	179.91	3,780.93	-113.46	325.06	259.13	65.93	4.930		
12,900.00	9,223.91	13,453.73	9,547.83	30.41	35.93	179.92	3,880.92	-114.07	323.94	256.61	67.33	4.811		
13,000.00	9,224.02	13,553.73	9,546.83	31.16	36.60	179.92	3,980.90	-114.69	322.82	254.08	68.74	4.696		
13,100.00	9,224.14	13,653.72	9,545.82	31.91	37.27	179.92	4,080.89	-115.31	321.70	251.54	70.16	4.585		
13,200.00	9,224.25	13,753.71	9,544.82	32.65	37.94	179.92	4,180.88	-115.93	320.58	249.00	71.58	4.479		
13,300.00	9,224.37	13,853.71	9,543.81	33.40	38.62	179.92	4,280.86	-116.55	319.46	246.46	73.00	4.376		
13,400.00	9,224.48	13,953.70	9,542.81	34.16	39.30	179.93	4,380.85	-117.17	318.34	243.91	74.43	4.277		
13,500.00	9,224.59	14,053.69	9,541.80	34.91	39.98	179.93	4,480.84	-117.79	317.22	241.36	75.87	4.181		
13,600.00	9,224.71	14,153.69	9,540.80	35.66	40.67	179.93	4,580.82	-118.40	316.11	238.80	77.31	4.089		
13,700.00	9,224.82	14,253.68	9,539.79	36.41	41.36	179.93	4,680.81	-119.02	314.99	236.24	78.75	4.000		
13,800.00	9,224.94	14,353.68	9,538.79	37.16	42.05	179.93	4,780.80	-119.64	313.87	233.67	80.20	3.914		
13,900.00	9,225.05	14,453.67	9,537.79	37.92	42.74	179.94	4,880.78	-120.26	312.75	231.10	81.65	3.830		
14,000.00	9,225.17	14,553.66	9,536.78	38.67	43.44	179.94	4,980.77	-120.88	311.63	228.53	83.10	3.750		
14,100.00	9,225.28	14,653.66	9,535.78	39.42	44.13	179.94	5,080.76	-121.50	310.51	225.95	84.56	3.672		
14,200.00	9,225.39	14,753.65	9,534.77	40.18	44.83	179.94	5,180.75	-122.12	309.39	223.37	86.02	3.597		
14,300.00	9,225.51	14,853.64	9,533.77	40.93	45.54	179.95	5,280.73	-122.73	308.27	220.79	87.48	3.524		
14,400.00	9,225.62	14,953.64	9,532.76	41.69	46.24	179.95	5,380.72	-123.35	307.15	218.20	88.95	3.453		
14,500.00	9,225.74	15,053.63	9,531.76	42.44	46.95	179.95	5,480.71	-123.97	306.04	215.62	90.42	3.385		
14,600.00	9,225.85	15,153.63	9,530.75	43.20	47.66	179.95	5,580.69	-124.59	304.92	213.02	91.89	3.318		
14,700.00	9,225.97	15,253.62	9,529.75	43.96	48.36	179.96	5,680.68	-125.21	303.80	210.43	93.37	3.254		
14,800.00	9,226.08	15,353.61	9,528.74	44.71	49.08	179.96	5,780.67	-125.83	302.68	207.84	94.84	3.191		
14,900.00	9,226.19	15,453.61	9,527.74	45.47	49.79	179.96	5,880.65	-126.45	301.56	205.24	96.32	3.131		
15,000.00	9,226.31	15,553.60	9,526.74	46.23	50.50	179.96	5,980.64	-127.06	300.44	202.64	97.80	3.072		
15,100.00	9,226.42	15,653.59	9,525.73	46.98	51.22	179.96	6,080.63	-127.68	299.32	200.04	99.29	3.015		
15,200.00	9,226.54	15,753.59	9,524.73	47.74	51.94	179.97	6,180.61	-128.30	298.20	197.43	100.77	2.959		
15,300.00	9,226.65	15,853.58	9,523.72	48.50	52.66	179.97	6,280.60	-128.92	297.09	194.83	102.26	2.905		
15,400.00	9,226.77	15,953.58	9,522.72	49.26	53.38	179.97	6,380.59	-129.54	295.97	192.22	103.75	2.853		
15,500.00	9,226.88	16,053.57	9,521.71	50.01	54.10	179.97	6,480.57	-130.16	294.85	189.61	105.24	2.802		

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



Phoenix Technology Services LP
Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Offset Design Eider Federal - 302H - OH - Plan 1 10-11-17													Offset Site Error: 0.00 usft	
Survey Program: 0-Scientific Gyro, 4600-MWD+IFR1+MS													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	
15,600.00	9,226.99	16,153.56	9,520.71	50.77	54.82	179.98	6,580.56	-130.78	293.73	187.00	106.73	2.752		
15,700.00	9,227.11	16,253.56	9,519.70	51.53	55.54	179.98	6,680.55	-131.39	292.61	184.39	108.22	2.704		
15,800.00	9,227.22	16,353.55	9,518.70	52.29	56.27	179.98	6,780.53	-132.01	291.49	181.77	109.72	2.657		
15,900.00	9,227.34	16,453.54	9,517.69	53.05	56.99	179.98	6,880.52	-132.63	290.37	179.16	111.22	2.611		
16,000.00	9,227.45	16,553.54	9,516.69	53.81	57.72	179.99	6,980.51	-133.25	289.25	176.54	112.71	2.566		
16,100.00	9,227.57	16,653.53	9,515.69	54.57	58.45	179.99	7,080.49	-133.87	288.13	173.92	114.21	2.523		
16,200.00	9,227.68	16,753.53	9,514.68	55.32	59.17	179.99	7,180.48	-134.49	287.02	171.30	115.71	2.480		
16,300.00	9,227.79	16,853.52	9,513.68	56.08	59.90	180.00	7,280.47	-135.11	285.90	168.68	117.22	2.439		
16,400.00	9,227.91	16,953.51	9,512.67	56.84	60.63	180.00	7,380.45	-135.72	284.78	166.06	118.72	2.399		
16,479.71	9,228.00	17,030.36	9,511.90	57.45	61.20	180.00	7,457.30	-136.20	283.90	164.00	119.90	2.368 SF		

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



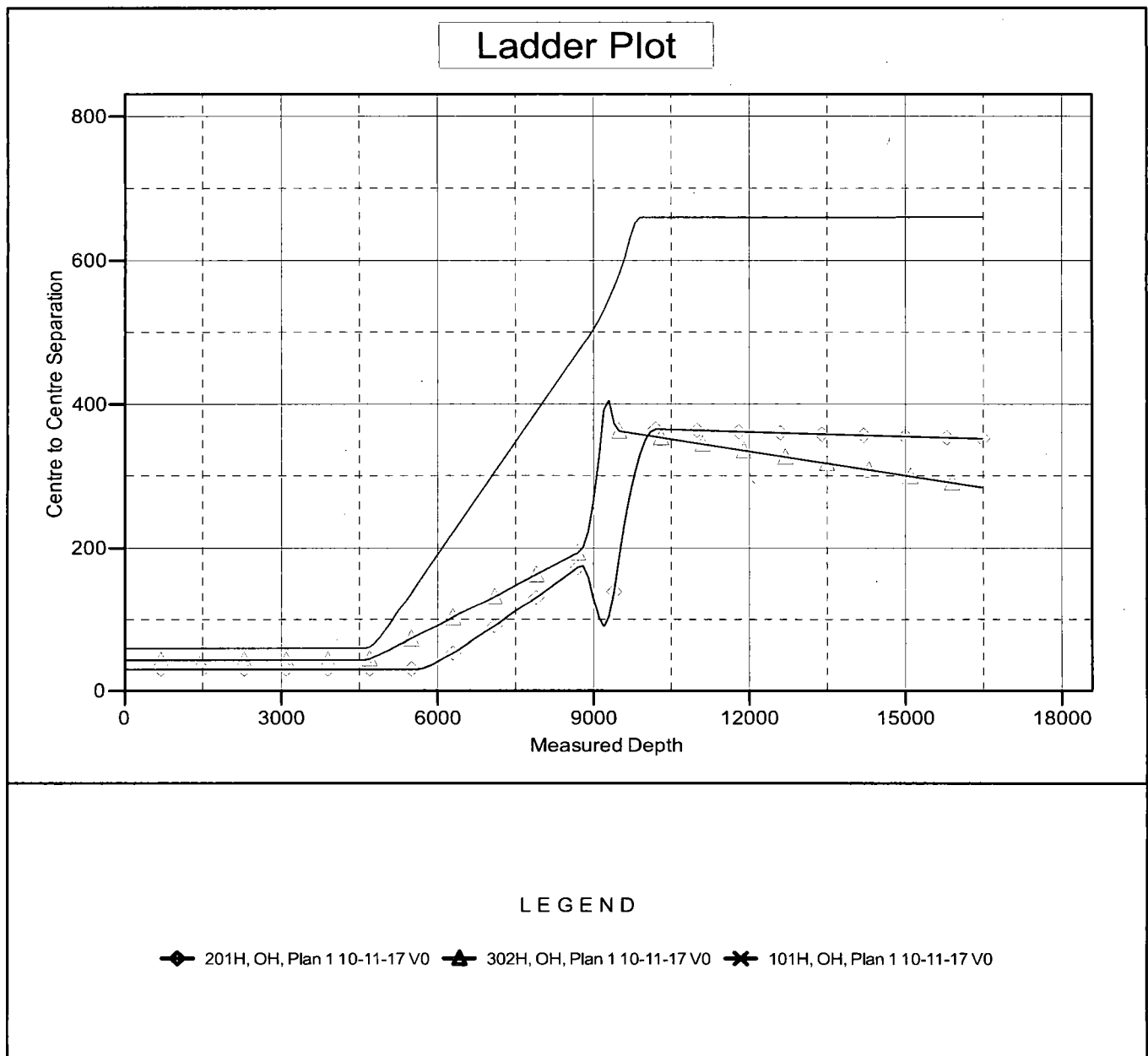
Phoenix Technology Services LP

Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Reference Depths are relative to GL+KB @ 3546.30usft (Ensign 155) Coordinates are relative to: 102H
Offset Depths are relative to Offset Datum Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30
Central Meridian is 104° 19' 60.00000 W Grid Convergence at Surface is: 0.36°



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



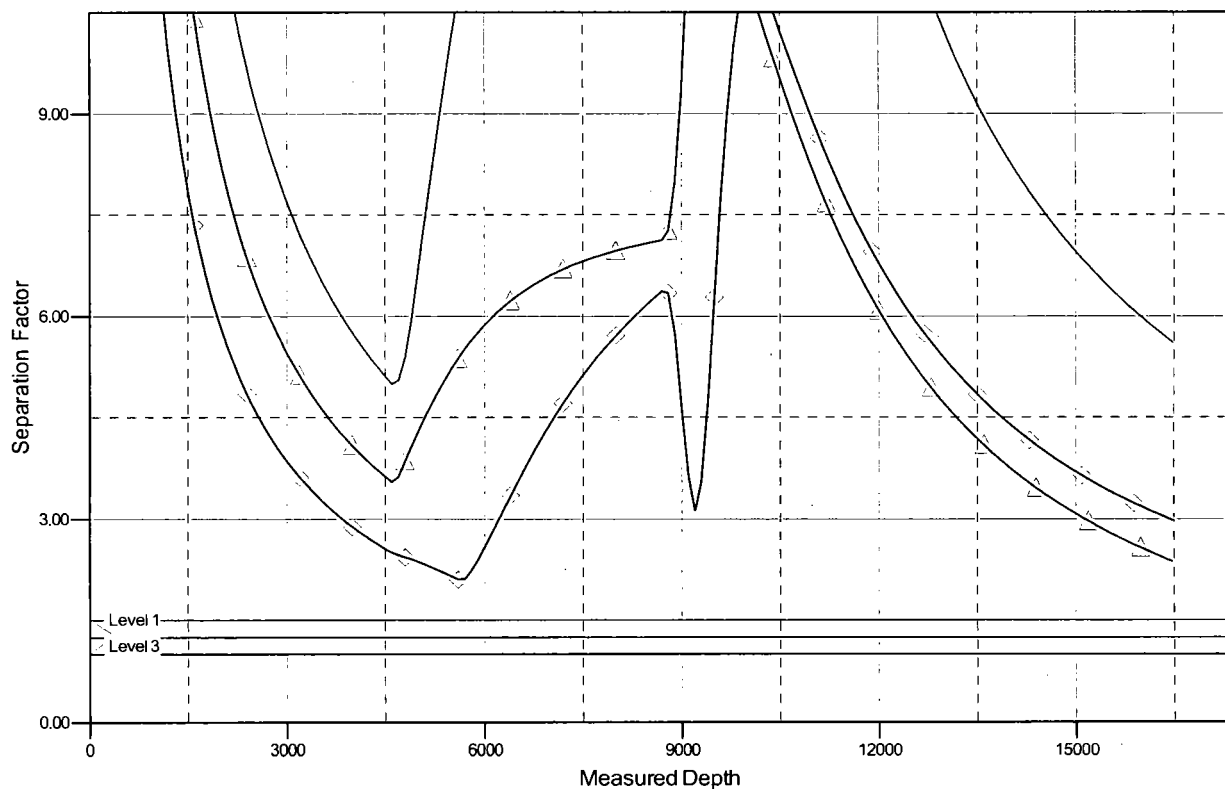
Phoenix Technology Services LP
Anticollision Report



Company:	COG Production, LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Reference Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	102H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Compass 5000 GCR
Reference Design:	Plan 1 10-11-17	Offset TVD Reference:	Reference Datum

Reference Depths are relative to GL+KB @ 3546.30usft (Ensign 155) Coordinates are relative to: 102H
Offset Depths are relative to Offset Datum Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30
Central Meridian is 104° 19' 60.00000 W Grid Convergence at Surface is: 0.36°

Separation Factor Plot



LEGEND

◆ 201H, OH, Plan 1 10-11-17 V0 ▲ 302H, OH, Plan 1 10-11-17 V0 ✕ 101H, OH, Plan 1 10-11-17 V0

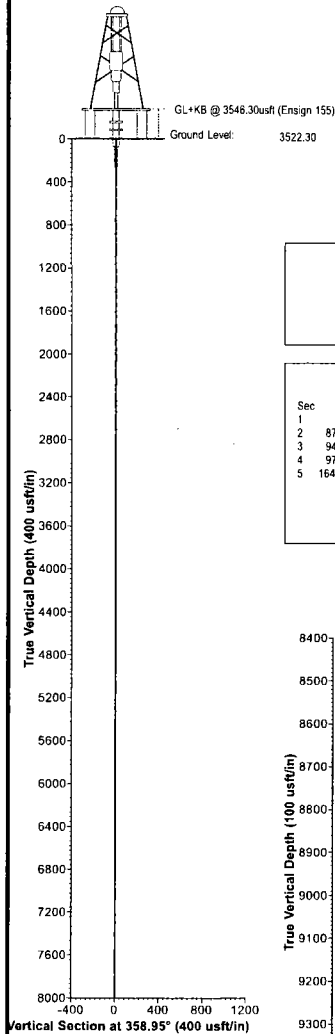
CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Project: Lea County, NM (NAD27 NME)
Site: Eider Federal
Well: 102H
Wellbore: OH
Design: Plan 1 10-11-17
Rig: Ensign 155



Azimuths to Grid North
True North: -0.36°
Magnetic North: 6.45°
Magnetic Field
Strength: 48014.2nT
Dip Angle: 59.90°
Date: 12/11/2017
Model: HDGM



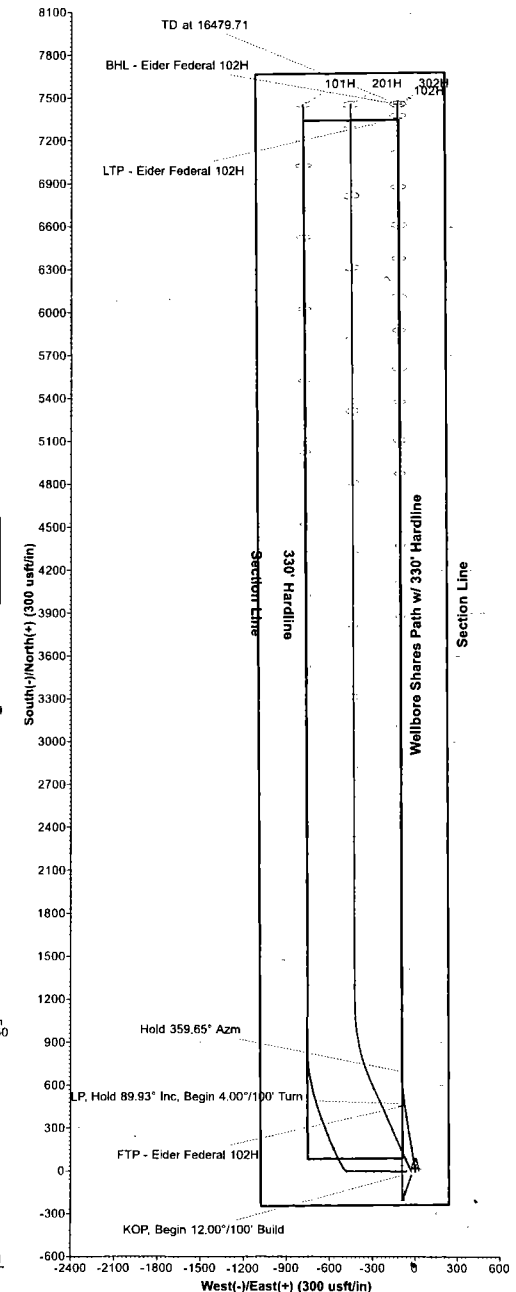
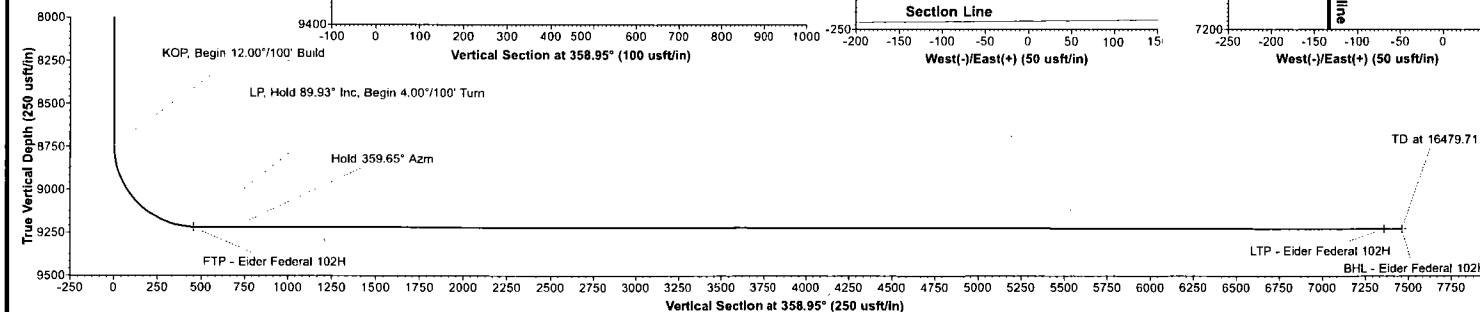
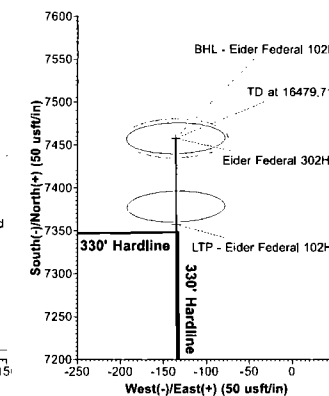
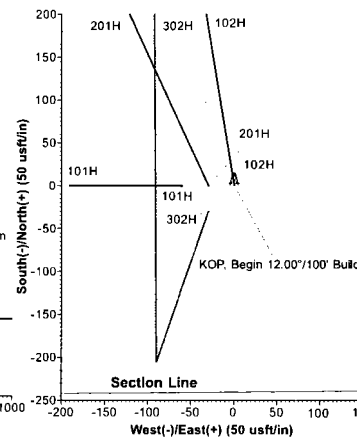
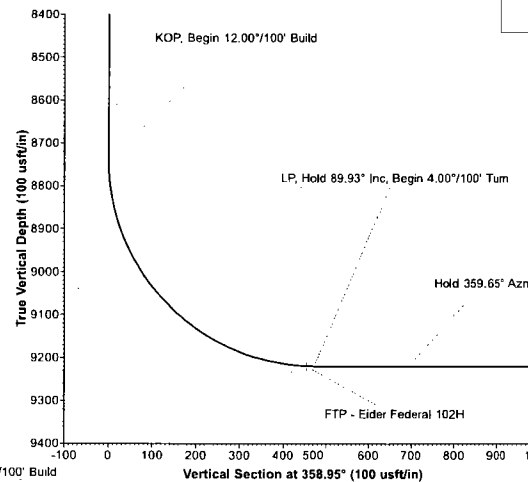
WELL DETAILS						
			Ground Level	3522.30		
+N-S	+E-W	North	East	Latitude	Longitude	
0.00	0.00	425274.50	711440.30	32° 10' 2.46428 N	103° 39' 0.06921 W	

DESIGN TARGET DETAILS						
Name	TVD	+N-S	+E-W	North	East	Latitude
FTP - Eider Federal 102H	9220.00	452.99	-92.86	425272.49	711347.44	32° 10' 6.95280 N
LTP - Eider Federal 102H	9227.87	7357.14	-135.45	432631.64	711304.85	32° 11' 15.27720 N
BHL - Eider Federal 102H	9228.00	7457.30	-136.20	432731.80	711304.10	32° 11' 16.26842 N

SECTION DETAILS												
Sec	MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	TFace	Vsect	Target	Annotation	
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	KOP: Begin 12.00°/100' Build	
2	8742.54	0.00	0.00	8742.54	0.00	0.00	0.00	0.00	0.00	0.00	LP: Hold 89.93° Inc. Begin 4.00°/100' Turn	
3	9491.96	89.93	350.75	9220.00	470.68	-76.66	12.00	350.75	472.00	472.00	Hold 359.65° Azm	
4	9714.54	89.93	359.65	9220.27	692.26	-95.26	4.00	89.98	693.88	693.88	TD at 16479.71	
5	16479.71	89.93	359.65	9228.00	7457.30	-136.20	0.00	0.00	7458.54	BHL - Eider Federal 102H		

CASING DETAILS
No casing data is available

FORMATION TOP DETAILS
No formation data is available





COG Production, LLC

Lea County, NM (NAD27 NME)

Eider Federal

102H

OH

Plan: Plan 1 10-11-17

Standard Planning Report

16 October, 2017





Phoenix Technology Services LP
Planning Report



Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 102H
Company:	COG Production, LLC	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Project:	Lea County, NM (NAD27 NME)	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	North Reference:	Grid
Well:	102H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 10-11-17		

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	Eider Federal		
Site Position:		Northing:	425,274.00 usft
From:	Map	Easting:	711,380.40 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 10' 2.46309 N
		Longitude:	103° 39' 0.76609 W
		Grid Convergence:	0.36 °

Well	102H		
Well Position	+N/-S	0.50 usft	Northing:
	+E/-W	59.90 usft	Easting:
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 10' 2.46428 N
		Longitude:	103° 39' 0.06921 W
		Ground Level:	3,522.30 usft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination (°)
	HDGM	12/11/2017	6.82
		Dip Angle (°)	59.90
		Field Strength (nT)	48,014

Design	Plan 1 10-11-17		
Audit Notes:			
Version:	Phase:	PROTOTYPE	Tie On Depth:
			0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)
	0.00	0.00	0.00
			Direction (°)
			358.95

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8,742.54	0.00	0.00	8,742.54	0.00	0.00	0.00	0.00	0.00	0.00	
9,491.96	89.93	350.75	9,220.00	470.68	-76.66	12.00	12.00	0.00	350.75	
9,714.54	89.93	359.65	9,220.27	692.26	-95.26	4.00	0.00	4.00	89.98	
16,479.71	89.93	359.65	9,228.00	7,457.30	-136.20	0.00	0.00	0.00	0.00	BHL - Eider Federa



Phoenix Technology Services LP

Planning Report



Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 102H
Company:	COG Production, LLC	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Project:	Lea County, NM (NAD27 NME)	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	North Reference:	Grid
Well:	102H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 10-11-17		

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
8,742.54	0.00	0.00	8,742.54	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Begin 12.00°/100' Build									
8,800.00	6.90	350.75	8,799.86	3.41	-0.56	3.42	12.00	12.00	0.00
8,900.00	18.90	350.75	8,897.16	25.39	-4.14	25.47	12.00	12.00	0.00
9,000.00	30.90	350.75	8,987.70	66.87	-10.89	67.06	12.00	12.00	0.00
9,100.00	42.90	350.75	9,067.53	126.01	-20.52	126.37	12.00	12.00	0.00
9,200.00	54.90	350.75	9,133.15	200.25	-32.61	200.81	12.00	12.00	0.00
9,300.00	66.90	350.75	9,181.71	286.33	-46.63	287.13	12.00	12.00	0.00
9,400.00	78.90	350.75	9,211.07	380.49	-61.97	381.56	12.00	12.00	0.00
9,491.96	89.93	350.75	9,220.00	470.68	-76.66	472.00	12.00	12.00	0.00
LP, Hold 89.93° Inc, Begin 4.00°/100' Turn									
9,500.00	89.93	351.07	9,220.01	478.62	-77.93	479.97	4.00	0.00	4.00
9,600.00	89.93	355.07	9,220.13	577.87	-89.99	579.42	4.00	0.00	4.00
9,700.00	89.93	359.07	9,220.25	677.72	-95.09	679.34	4.00	0.00	4.00
9,714.54	89.93	359.65	9,220.27	692.26	-95.26	693.88	4.00	0.00	4.00
Hold 359.65° Azm									
9,800.00	89.93	359.65	9,220.37	777.72	-95.77	779.34	0.00	0.00	0.00
9,900.00	89.93	359.65	9,220.48	877.72	-96.38	879.33	0.00	0.00	0.00
10,000.00	89.93	359.65	9,220.59	977.71	-96.98	979.32	0.00	0.00	0.00
10,100.00	89.93	359.65	9,220.71	1,077.71	-97.59	1,079.32	0.00	0.00	0.00
10,200.00	89.93	359.65	9,220.82	1,177.71	-98.19	1,179.31	0.00	0.00	0.00
10,300.00	89.93	359.65	9,220.94	1,277.71	-98.80	1,279.30	0.00	0.00	0.00
10,400.00	89.93	359.65	9,221.05	1,377.71	-99.40	1,379.29	0.00	0.00	0.00
10,500.00	89.93	359.65	9,221.17	1,477.71	-100.01	1,479.29	0.00	0.00	0.00
10,600.00	89.93	359.65	9,221.28	1,577.70	-100.61	1,579.28	0.00	0.00	0.00
10,700.00	89.93	359.65	9,221.39	1,677.70	-101.22	1,679.27	0.00	0.00	0.00
10,800.00	89.93	359.65	9,221.51	1,777.70	-101.82	1,779.26	0.00	0.00	0.00
10,900.00	89.93	359.65	9,221.62	1,877.70	-102.43	1,879.26	0.00	0.00	0.00
11,000.00	89.93	359.65	9,221.74	1,977.70	-103.04	1,979.25	0.00	0.00	0.00
11,100.00	89.93	359.65	9,221.85	2,077.69	-103.64	2,079.24	0.00	0.00	0.00
11,200.00	89.93	359.65	9,221.97	2,177.69	-104.25	2,179.23	0.00	0.00	0.00
11,300.00	89.93	359.65	9,222.08	2,277.69	-104.85	2,279.23	0.00	0.00	0.00
11,400.00	89.93	359.65	9,222.19	2,377.69	-105.46	2,379.22	0.00	0.00	0.00
11,500.00	89.93	359.65	9,222.31	2,477.69	-106.06	2,479.21	0.00	0.00	0.00
11,600.00	89.93	359.65	9,222.42	2,577.68	-106.67	2,579.20	0.00	0.00	0.00
11,700.00	89.93	359.65	9,222.54	2,677.68	-107.27	2,679.20	0.00	0.00	0.00
11,800.00	89.93	359.65	9,222.65	2,777.68	-107.88	2,779.19	0.00	0.00	0.00
11,900.00	89.93	359.65	9,222.77	2,877.68	-108.48	2,879.18	0.00	0.00	0.00
12,000.00	89.93	359.65	9,222.88	2,977.68	-109.09	2,979.17	0.00	0.00	0.00
12,100.00	89.93	359.65	9,222.99	3,077.68	-109.69	3,079.17	0.00	0.00	0.00
12,200.00	89.93	359.65	9,223.11	3,177.67	-110.30	3,179.16	0.00	0.00	0.00
12,300.00	89.93	359.65	9,223.22	3,277.67	-110.90	3,279.15	0.00	0.00	0.00
12,400.00	89.93	359.65	9,223.34	3,377.67	-111.51	3,379.14	0.00	0.00	0.00
12,500.00	89.93	359.65	9,223.45	3,477.67	-112.11	3,479.13	0.00	0.00	0.00
12,600.00	89.93	359.65	9,223.57	3,577.67	-112.72	3,579.13	0.00	0.00	0.00
12,700.00	89.93	359.65	9,223.68	3,677.66	-113.32	3,679.12	0.00	0.00	0.00
12,800.00	89.93	359.65	9,223.79	3,777.66	-113.93	3,779.11	0.00	0.00	0.00
12,900.00	89.93	359.65	9,223.91	3,877.66	-114.53	3,879.10	0.00	0.00	0.00
13,000.00	89.93	359.65	9,224.02	3,977.66	-115.14	3,979.10	0.00	0.00	0.00
13,100.00	89.93	359.65	9,224.14	4,077.66	-115.75	4,079.09	0.00	0.00	0.00
13,200.00	89.93	359.65	9,224.25	4,177.65	-116.35	4,179.08	0.00	0.00	0.00
13,300.00	89.93	359.65	9,224.37	4,277.65	-116.96	4,279.07	0.00	0.00	0.00



Phoenix Technology Services LP
Planning Report



Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 102H
Company:	COG Production, LLC	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Project:	Lea County, NM (NAD27 NME)	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	North Reference:	Grid
Well:	102H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 10-11-17		

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	89.93	359.65	9,224.48	4,377.65	-117.56	4,379.07	0.00	0.00	0.00
13,500.00	89.93	359.65	9,224.59	4,477.65	-118.17	4,479.06	0.00	0.00	0.00
13,600.00	89.93	359.65	9,224.71	4,577.65	-118.77	4,579.05	0.00	0.00	0.00
13,700.00	89.93	359.65	9,224.82	4,677.64	-119.38	4,679.04	0.00	0.00	0.00
13,800.00	89.93	359.65	9,224.94	4,777.64	-119.98	4,779.04	0.00	0.00	0.00
13,900.00	89.93	359.65	9,225.05	4,877.64	-120.59	4,879.03	0.00	0.00	0.00
14,000.00	89.93	359.65	9,225.17	4,977.64	-121.19	4,979.02	0.00	0.00	0.00
14,100.00	89.93	359.65	9,225.28	5,077.64	-121.80	5,079.01	0.00	0.00	0.00
14,200.00	89.93	359.65	9,225.39	5,177.64	-122.40	5,179.01	0.00	0.00	0.00
14,300.00	89.93	359.65	9,225.51	5,277.63	-123.01	5,279.00	0.00	0.00	0.00
14,400.00	89.93	359.65	9,225.62	5,377.63	-123.61	5,378.99	0.00	0.00	0.00
14,500.00	89.93	359.65	9,225.74	5,477.63	-124.22	5,478.98	0.00	0.00	0.00
14,600.00	89.93	359.65	9,225.85	5,577.63	-124.82	5,578.98	0.00	0.00	0.00
14,700.00	89.93	359.65	9,225.97	5,677.63	-125.43	5,678.97	0.00	0.00	0.00
14,800.00	89.93	359.65	9,226.08	5,777.62	-126.03	5,778.96	0.00	0.00	0.00
14,900.00	89.93	359.65	9,226.19	5,877.62	-126.64	5,878.95	0.00	0.00	0.00
15,000.00	89.93	359.65	9,226.31	5,977.62	-127.24	5,978.95	0.00	0.00	0.00
15,100.00	89.93	359.65	9,226.42	6,077.62	-127.85	6,078.94	0.00	0.00	0.00
15,200.00	89.93	359.65	9,226.54	6,177.62	-128.45	6,178.93	0.00	0.00	0.00
15,300.00	89.93	359.65	9,226.65	6,277.61	-129.06	6,278.92	0.00	0.00	0.00
15,400.00	89.93	359.65	9,226.77	6,377.61	-129.67	6,378.92	0.00	0.00	0.00
15,500.00	89.93	359.65	9,226.88	6,477.61	-130.27	6,478.91	0.00	0.00	0.00
15,600.00	89.93	359.65	9,226.99	6,577.61	-130.88	6,578.90	0.00	0.00	0.00
15,700.00	89.93	359.65	9,227.11	6,677.61	-131.48	6,678.89	0.00	0.00	0.00
15,800.00	89.93	359.65	9,227.22	6,777.61	-132.09	6,778.89	0.00	0.00	0.00
15,900.00	89.93	359.65	9,227.34	6,877.60	-132.69	6,878.88	0.00	0.00	0.00
16,000.00	89.93	359.65	9,227.45	6,977.60	-133.30	6,978.87	0.00	0.00	0.00
16,100.00	89.93	359.65	9,227.57	7,077.60	-133.90	7,078.86	0.00	0.00	0.00
16,200.00	89.93	359.65	9,227.68	7,177.60	-134.51	7,178.86	0.00	0.00	0.00
16,300.00	89.93	359.65	9,227.79	7,277.60	-135.11	7,278.85	0.00	0.00	0.00
16,400.00	89.93	359.65	9,227.91	7,377.59	-135.72	7,378.84	0.00	0.00	0.00
16,479.71	89.93	359.65	9,228.00	7,457.30	-136.20	7,458.54	0.00	0.00	0.00
TD at 16479.71									

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
FTP - Eider Federal 1	0.00	0.00	9,220.00	452.99	-92.86	425,727.49	711,347.44	32° 10' 6.95280 N	103° 39' 1.11600 W
- hit/miss target									
- plan misses target center by 18.84usft at 9477.15usft MD (9219.76 TVD, 456.07 N, -74.28 E)									
- Shape									
- Point									
LTP - Eider Federal 1	0.00	0.00	9,227.87	7,357.14	-135.45	432,631.64	711,304.84	32° 11' 15.27720 N	103° 39' 1.10160 W
- hit/miss target									
- plan misses target center by 0.14usft at 16379.54usft MD (9227.89 TVD, 7357.14 N, -135.59 E)									
- Shape									
- Point									
BHL - Eider Federal 1	0.00	0.00	9,228.00	7,457.30	-136.20	432,731.80	711,304.10	32° 11' 16.26842 N	103° 39' 1.10290 W
- hit/miss target									
- plan hits target center									
- Shape									
- Point									



Phoenix Technology Services LP
Planning Report



Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 102H
Company:	COG Production, LLC	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Project:	Lea County, NM (NAD27 NME)	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	North Reference:	Grid
Well:	102H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 10-11-17		

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
8,742.54	8,742.54	0.00	0.00	KOP, Begin 12.00°/100' Build
9,491.96	9,220.00	470.68	-76.66	LP, Hold 89.93° Inc, Begin 4.00°/100' Turn
9,714.54	9,220.27	692.26	-95.26	Hold 359.65° Azm
16,479.71	9,228.00	7,457.30	-136.20	TD at 16479.71

COG Production, LLC - Eider Federal #102H

1. Geologic Formations

TVD of target	9,228' EOL	Pilot hole depth	NA
MD at TD:	16,480'	Deepest expected fresh water:	380'

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	931	Water	
Top of Salt	1264	Salt	
Base of Salt	4598	Salt	
Lamar	4826	Salt Water	
Bell Canyon	4852	Salt Water	
Cherry Canyon	5761	Oil/Gas	
Brushy Canyon	7141	Oil/Gas	
Bone Spring Lime	8783	Oil/Gas	
U. Avalon Shale	9128	Target Oil/Gas	
L. Avalon Shale	9308	Not Penetrated	
Basal Avalon	9501	Not Penetrated	
1st Bone Spring Sand	9863	Not Penetrated	
2nd Bone Spring Sand	X	Not Penetrated	
3rd Bone Spring Sand	X	Not Penetrated	

2. Casing Program

Hole Size	Casing		Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
	From	To							
17.5"	0	960	13.375"	54.5	J55	STC	2.57	1.35	9.82
12.25"	0	4000	9.625"	40	J55	LTC	1.22	1.12	3.25
12.25"	4000	4625	9.625"	40	L80	LTC	1.27	1.62	5.73
8.75"	0	16,480	5.5"	17	P110	LTC	1.68	3.01	2.84
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