Form 3160-3
(March 2012)

FORM APPROVED
OMB No. 1004-0137
Expires October 31, 2014

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.: COC052523

6. If Indian, Allotee or Tribe Name:

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.: MCELMO DOME / COC047653X

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☑ Other OTH ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.: CB 4

2. Name of Operator: KINDER MORGAN C02 COMPANY

9. API Well No.:

3a. Address: 17801 Hwy 491 Cortez CO 81321

3b. Phone No. *(include area code)*: (970)882-2464

10. Field and Pool, or Exploratory: MCELMO

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface: LOT 13 / 949 FSL / 906 FEL / LAT 37.56141 / LONG -108.92479

At proposed prod. zone: LOT 13 / 949 FSL / 906 FEL / LAT 37.56141 / LONG -108.92479

11. Sec., T. R. M. or Blk. and Survey or Area: SEC 10 / T38N / R19W / NMP

14. Distance in miles and direction from nearest town or post office*: 9 miles

12. County or Parish: MONTEZUMA

13. State: CO

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any): 283 feet

16. No. of acres in lease: 447.25

17. Spacing Unit dedicated to this well: 40

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.: 2922 feet

19. Proposed Depth: 8488 feet / 8488 feet

20. BLM/BIA Bond No. on file: FED: COB000223

21. Elevations (Show whether DF, KDB, RT, GL, etc.): 6633 feet

22. Approximate date work will start*: 07/16/2018

23. Estimated duration: 60 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

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

25. Signature: (Electronic Submission)

Name *(Printed/Typed)*: Chris Lopez / Ph: (970)882-5537

Date: 12/21/2017

Title: EHS

Approved by *(Signature)*: (Electronic Submission)

Name *(Printed/Typed)*: Connie Clementson / Ph: (970)882-6808

Date: 06/29/2018

Title: Field Office Manger

Office: DURANGO

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

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

(Continued on page 2)

*(Instructions on page 2)

APPROVED WITH CONDITIONS

Approval Date: 06/29/2018

INSTRUCTIONS

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

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

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

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

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

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

NOTICES

The Privacy Act of 1974 and regulation in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this application.
AUTHORITY: 30 U.S.C. 181 et seq., 25 U.S.C. 396; 43 CFR 3160
PRINCIPAL PURPOSES: The information will be used to: (1) process and evaluate your application for a permit to drill a new oil, gas, or service well or to reenter a plugged and abandoned well; and (2) document, for administrative use, information for the management, disposal and use of National Resource Lands and resources including (a) analyzing your proposal to discover and extract the Federal or Indian resources encountered; (b) reviewing procedures and equipment and the projected impact on the land involved; and (c) evaluating the effects of the proposed operation on the surface and subsurface water and other environmental impacts.
ROUTINE USE: Information from the record and/or the record will be transferred to appropriate Federal, State, and local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecution, in connection with congressional inquiries and for regulatory responsibilities.
EFFECT OF NOT PROVIDING INFORMATION: Filing of this application and disclosure of the information is mandatory only if you elect to initiate a drilling or reentry operation on an oil and gas lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:
The BLM collects this information to allow evaluation of the technical, safety, and environmental factors involved with drilling for oil and/or gas on Federal and Indian oil and gas leases. This information will be used to analyze and approve applications. Response to this request is mandatory only if the operator elects to initiate drilling or reentry operations on an oil and gas lease. The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

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

(Continued on page 3)

Additional Operator Remarks

Other description

CO2

Location of Well

1. SHL: LOT 13 / 949 FSL / 906 FEL / TWSP: 38N / RANGE: 19W / SECTION: 10 / LAT: 37.56141 / LONG: -108.92479 (TVD: 0 feet, MD: 0 feet)
   BHL: LOT 13 / 949 FSL / 906 FEL / TWSP: 38N / RANGE: 19W / SECTION: 10 / LAT: 37.56141 / LONG: -108.92479 (TVD: 8488 feet, MD: 8488 feet)

BLM Point of Contact

Name: Ashley Hitchell

Title: Student Trainee

Phone: 9703851304

Email: ahitchell@blm.gov

Review and Appeal Rights

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

Geologic Conditions of Approval

:

See attached Geologic Conditions of Approval (CB4_Geologic_COAs_20180312145053.pdf).

Kinder Morgan CO2 **3160**
Federal Lease: COC-52523
Well: CB #4
Surface Location: 949' FSL & 906' FEL
Sec. 10, T. 38 N., R. 19 W.
Montezuma County, Colorado

Conditions of Approval – Drilling Plan:

1. Notify this office at least **3 days** prior to:

    a. spudding the well

    b. running casing strings and cementing

    c. BOP tests

    d. Drill Stem Testing

For the above procedures, Operators must talk to BLM personnel directly. Do not leave messages on answering machines. Contact Dan Rabinowitz, BLM Petroleum Engineer: office: 970-385-1363, or Rod Brashear: office: 970-385-1347, and cell: 970-799-1244.

2. All BOP tests will be performed with a test plug in place. BOP will be tested to full stack working pressure and annular preventer to 50% maximum stack working pressure. All accumulators will be function tested as per Onshore Order #2. All 2M or greater systems require **adjustable** chokes as per Onshore Order #2.

3. If a BLM Inspector is not present during the initial BOP test, please provide chart record.

4. Submit copies of all logs to this office both paper and in Log ASCII Standard (LAS) format.

Continued on Page 2.

5. If any operations are to start over the weekend, notify this office by noon Friday. If any problems arise after hours or on weekends, call BLM personnel using the home phone or cell phone numbers listed on the following 'INFORMATIONAL NOTICE - APD's'. Do not leave messages on answering machines.

6. If cement is not circulated to the surface in 9-5/8" surface string, then the operator must run a CBL log in the 9-5/8" casing and obtain BLM approval PRIOR TO DRILLING AHEAD. The BLM must witness the topping-off of the Surface Casing Cement.

7. A CBL is required if cement is not circulated to the surface on the production casing string. BLM verbal approval will be required prior to squeezing.

8. The tops of all major identifiable geologic units (formations) from surface to TD will be logged and recorded.

9. Stabilized bottomhole pressure measurements and flowrates must be collected and submitted to the BLM. This data may be confidential and the operator may so specify upon submittal to the BLM.

10. **All operations must conform to Onshore Order #6, H2S Operations.**

COA #1 – SURFACE CASING SET DEPTH: If cement is not brought to ground level in the 9-5/8" surface casing string, then the operator must run a CBL log in the surface hole and submit the results to the BLM for approval PRIOR TO DRILLING AHEAD.

Pamela Leschak, BLM Fluids Geologist

Appendix A- Surface COAs (EA and APD Packet Surface Conditions)

NOTIFICATION:

- The BLM Minerals Division Physical Scientist/Natural Resources: (970) 385-1242 shall be notified 5 days prior to the onset of pad/road construction.

- The BLM Minerals Division Physical Scientist/Natural Resources Specialist: (970) 385-1242 shall be notified at least 48 hours prior to commencement of interim and/or final surface reclamation activities.

- NO SURFACE DISTURBANCE shall begin until the Edge of Disturbance Corners and Midline markers of the permitted area have been re-established and are clearly marked.

CONSTRUCTION:

Access

1. Operator shall install an adequately sized culvert, placed where the existing road will turn onto the new access road.
2. Operator shall place an adequately sized culvert, placed at the toe of the Western fill slope, where the access enters the well pad.
3. Operator will install an all-weather surface (gravel cap) to the crown and ditch design of the access road.
4. Operator will install an all-weather surface (gravel cap) to the crown and ditch design of the access road. This surface will consist of a minimum of 12'' of gravel, see BLM Gold Book Standards.
5. Additional stormwater mitigations may be installed as necessary. These stromwater mitigations may consist of silt fencing, straw wattles, river rock, check-dams. See BLM Gold Book Standards for additional guidance.

Pipeline

6. Operator will keep all construction activities within the pre-existing 50' pipeline disturbance (25' on either side of the center line).
7. Within previously disturbed areas, pipeline construction will consist of clearing and stockpiling vegetation as necessary.
8. Soil for surface reclamation will be stored within disturbance to be used immediately after installation.

9. Pipeline will be trenched to 5’-6’ deep, depending on operator needs.
10. Pipeline trench will be filled in using on-site material. Replacing topsoil stored for reclamation.
11. Operator will have an archeological monitor present during all pipeline construction activities to avoid cultural resources site 5MT.21477.
12. Mechanical seeding, pursuant to BLM ID Team (landowner approved) native seed mixes and quantities will be utilized.
13. Crimped straw mulch will be used to help hold soils and moisture, after mechanical seeding has taken place.
14. Additional stormwater mitigations may be installed as necessary. These stromwater mitigations may consist of silt fencing, straw wattles, river rock, check-dams. See BLM Gold Book Standards for additional guidance.

Well Pad

15. Operator shall armor the ditch before and after the pad access culvert to prevent erosion.
16. Operator shall install an armored ditch, running betwean the pad and the topsoil storage area, allowing stormwater to flow into a rock rundown entering a drainage off of corner E’.
17. Operator shall install an armored ditch, running from the West side of the access road entering the pad, rounding the flat pad a corner 3, running along to corner 4, daylighting at a rock rundown where the pad switches from cut to fill between corners 4 and 1.
18. Operator will utilize a closed-loop drilling system. Earthen pits will not be used at any point during drilling, completion, production, or workover of the subject well.
19. Operator will place all liquids used for drilling or completing the well, in secondary containment, capable of handling 125% of the contained liquid volumes.
20. Operator will install tackifiers with an appropriate native seed mix (approved by the BLM ID Team and landowner), on all fill and cut slopes to prevent weed growth, as well as erosion.
21. The topsoil will be stored with a base layer of straw to denote the topsoil horizon. The topsoil will be stored in a height not greater than 3’ tall. Additionally, continuous excelsior wattles will surround the stockpile to protect the topsoil from surface water erosion. A sign will be placed at the base of all topsoil storage areas, facing the pad production zone to denote the presence of topsoil.
22. Construction shall cease when surface conditions are such that equipment is creating ruts greater than 4 inches.

23. All ruts, depressions and surface scaring caused during the construction, drilling or production of this project shall be reclaimed by the Operator.
24. All spills will be promptly reported to the BLM pursuant to the requirements of NTL-3A.

Equipment/Drilling Facilities

25. A geotextile material may be used in lieu of bedding materials if it fits with manufacturer instructions for installation of all liners.
26. Spoil dirt shall be used for site leveling as much as possible. The extra spoil dirt will be incorporated in the berms associated with stormwater control for the pad.
27. All flow back tanks used to collect completion and drilling fluids will be manifold together within secondary containment to provide for isolation in the event of tank or line failure.
28. Only fresh water may be used for dust abatement purposes. No produced water or water that has previously been used to test, drill, or complete any part of the wellbore, pipeline, completion or production equipment may be used.
29. Washing equipment used to drill or complete the well, is prohibited on BLM land or any permitted BLM project.
30. During drilling operations, all drilling muds will be mixed and contained in a separate mud tank with liners and secondary containment.
31. All fluid (flow back fluids) used in the completion of the well will be contained in steal frac tanks with 35 mil liners, traction matts, and berms of 125% of contained volumes.
32. Catchment technologies will be utilized on the drain pipes and fittings going to and from all liquid storage tanks on-pad.
33. All produced water will be piped off location during production.
34. All facilities will be painted using BLM approved natural colors for visual resources management.

Interim Reclamation:

35. Operator must reclaim portions of the drilling pad designated for interim reclamation, within 6 months pursuant to the approved APD (see SUPO).
36. Reclamation will require re-contouring of soil, to match surrounding topography, pursuant to the approved APD (see SUPO).
37. Topsoil, stored along the northern cut slope, will be re-distributed on all reclaimed areas, roughened, and prepared for re-seeding.
38. Operator will mechanically drill seed using a BLM ID Team (landowner approved) native seed mix and rate.

39. Operator will use crimped mulch or another appropriate form of tackifier to provide for both soil erosion mitigation, as well as soil moisture storage.
40. Production areas will be graveled pursuant to BLM Gold Book Standards.

Final Reclamation:

41. Operator must contact BLM for a reclamation onsite to asses current pad status and additional reclamation needs.
42. Operator will identify areas of potential contamination. Potential areas include surface staining, production equipment base, production catchment base, pumpjack locations, and glycol skid treatment locations.
43. Confirmation sampling pursuant to COGCC Table 910-1 or current equivalent, will be used as a standard for clean or safe soils.
44. Operator will remove all non-native material (soil and rock) will be removed.
45. Operator will re-contour soil to match surrounding topography, pursuant to the approved APD (see SUPO)
46. Operator will mechanically drill seed using a BLM ID Team (landowner approved) native seed mix and rate.
47. Operator will use crimped mulch or another appropriate form of tackifier to provide for both soil erosion mitigation, as well as soil moisture storage.

Air Quality

48. Operator shall use appropriate quantities of fresh water to control fugitive dust from off-site transport.

Special Status Animal Species

49. Surveys for MBTA species must conducted if construction takes place between May 15th- June 30th.
50. A Timing Limitation for Golden Eagles (TRFO RMP Appendix H 3.9.2): no surface use from February 1st to July 15th during documented breeding season.

Terrestrial Wildlife

51. All produced liquids and chemicals used for production and completion will be stored in secondary containment devices which are exclusionary to wildlife.
52. If produced water is encountered, Operator may install a glycol skid on location during winter months (November to April) annually.

Soils and Water:

53. Additional stormwater mitigations may be installed as necessary. These stromwater mitigations may consist of silt fencing, straw wattles, river rock, check-dams. See BLM Gold Book Standards for additional guidance.

54. The topsoil will be stored with a base layer of straw to denote the topsoil horizon. The topsoil will be stored in a height not greater than 3' tall. Additionally, continuous excelsior wattles will surround the stockpile to protect the topsoil from surface water erosion. A sign will be placed at the base of all topsoil storage areas, facing the pad production zone to denote the presence of topsoil.

55. Reclamation will require re-contouring of soil, to match surrounding topography, pursuant to the approved APD (see SUPO).

56. All ruts, depressions and surface scaring caused during the construction, drilling or production of this project shall be reclaimed by the Operator.

57. All spills will be promptly reported to the BLM pursuant to the requirements of NTL-3A.

Operator Certification Data Report

07/02/2018

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. 1001 for the filing of false statements.

NAME: Chris Lopez **Signed on:** 12/21/2017

Title: EHS

Street Address: 17801 Hwy 491

City: Cortez **State:** CO **Zip:** 81321

Phone: (970)882-5537

Email address: christopher_lopez@kindermorgan.com

Field Representative

Representative Name:

Street Address:

City: **State:** **Zip:**

Phone:

Email address:

APD ID: 10400025105 **Submission Date:** 12/21/2017

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Well Type: OTHER **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - General

APD ID: 10400025105 **Tie to previous NOS?** **Submission Date:** 12/21/2017

BLM Office: DURANGO **User:** Chris Lopez **Title:** EHS

Federal/Indian APD: FED **Is the first lease penetrated for production Federal or Indian?** FED

Lease number: COC052523 **Lease Acres:** 447.25

Surface access agreement in place? **Allotted?** **Reservation:**

Agreement in place? YES **Federal or Indian agreement:** FEDERAL

Agreement number: COC047653X

Agreement name:

Keep application confidential? YES

Permitting Agent? NO **APD Operator:** KINDER MORGAN C02 COMPANY

Operator letter of designation:

Operator Info

Operator Organization Name: KINDER MORGAN C02 COMPANY

Operator Address: 17801 Hwy 491

Zip: 81321

Operator PO Box:

Operator City: Cortez **State:** CO

Operator Phone: (970)882-2464

Operator Internet Address:

Section 2 - Well Information

Well in Master Development Plan? NO **Mater Development Plan name:**

Well in Master SUPO? NO **Master SUPO name:**

Well in Master Drilling Plan? NO **Master Drilling Plan name:**

Well Name: CB **Well Number:** 4 **Well API Number:**

Field/Pool or Exploratory? Field and Pool **Field Name:** MCELMO **Pool Name:**

Is the proposed well in an area containing other mineral resources? CO2

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Describe other minerals:

Is the proposed well in a Helium production area? N **Use Existing Well Pad?** NO **New surface disturbance?**

Type of Well Pad: SINGLE WELL **Multiple Well Pad Name:** **Number:**

Well Class: VERTICAL **Number of Legs:** 1

Well Work Type: Drill

Well Type: OTHER

Describe Well Type: CO2

Well sub-Type: OTHER

Describe sub-type: CO2

Distance to town: 9 Miles **Distance to nearest well:** 2922 FT **Distance to lease line:** 283 FT

Reservoir well spacing assigned acres Measurement: 40 Acres

Well plat: CB_4_Well_Plat_20171130090657.pdf

Well work start Date: 07/16/2018 **Duration:** 60 DAYS

Section 3 - Well Location Table

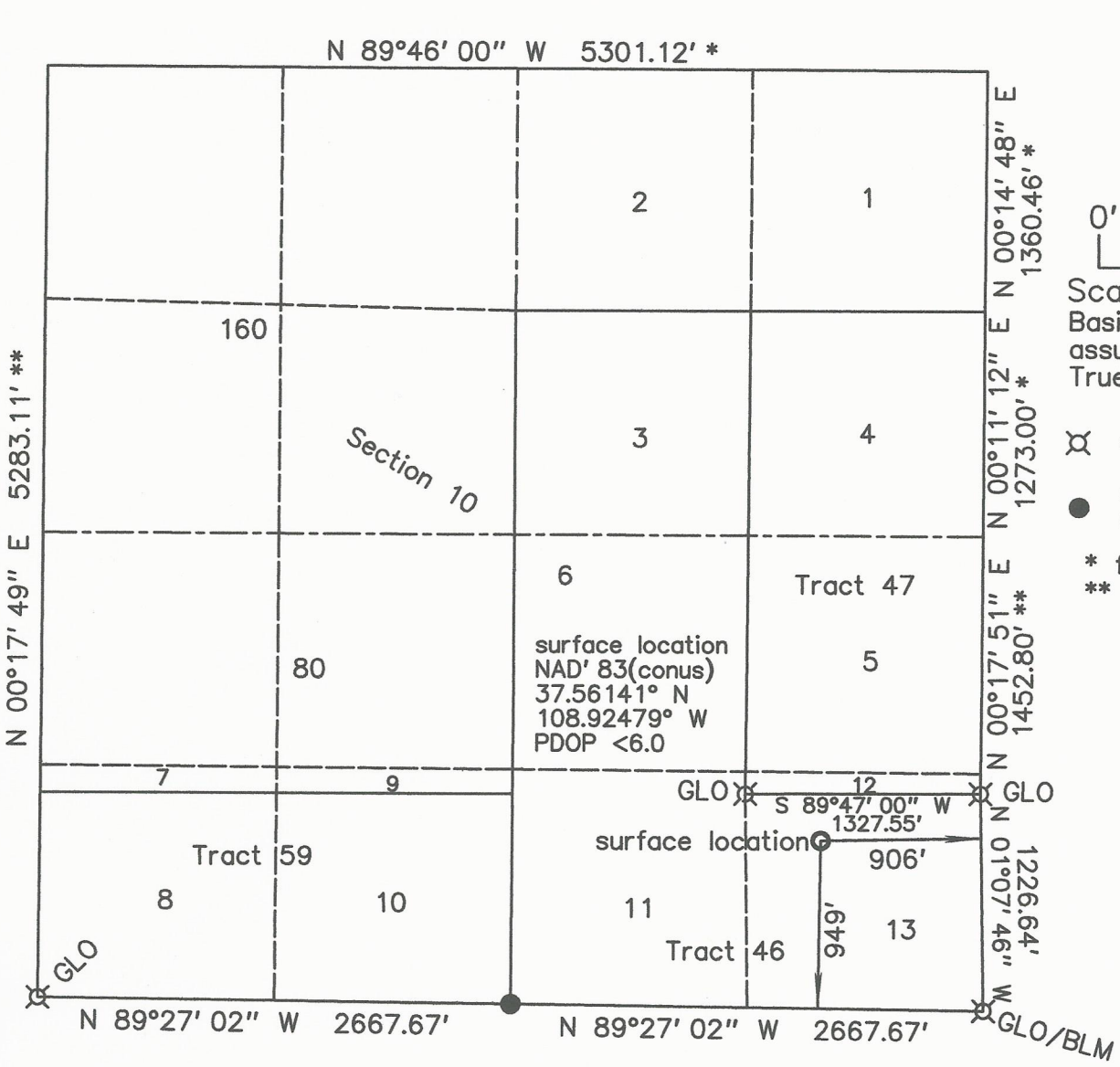
Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number:

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
SHL Leg #1	949	FSL	906	FEL	38N	19W	10	Lot 13	37.56141	-108.92479	MONTEZUMA	COLORADO	NEW MEXICO	F	COC052523	6633	0	0
BHL Leg #1	949	FSL	906	FEL	38N	19W	10	Lot 13	37.56141	-108.92479	MONTEZUMA	COLORADO	NEW MEXICO	F	COC052523	-1855	8488	8488



Scale: 1" = 1000'
Basis of bearing is assumed from GPS True North as shown.

⌘ standard monument

● set standard monument

* from record plat
** calculated

KINDER MORGAN CO2 COMPANY, LP
CB–4
949' FSL & 906' FEL (surface location)
6633.4' grd. el. NAVD '88 (from OPUS)
Section 10, T.38 N., R.19 W., NMPM
Montezuma County, CO

Notes:
1)Distances/dimensions are perpendicular to section/aliquot lines.
2)Surface use is dryland farming.
3)GPS was corrected with OPUS, GPS operator was R.J. Caffey, CO LS 36562.
4)There are no dwellings 1000 feet.

date of survey : 12/02/2014
date of plat : 12/03/2014
& 12/04/2014 & 08/29/2017

KNOW ALL MEN BY THESE PRESENTS that I, GERALD G. HUDDLESTON, do hereby certify that this plat was prepared from field notes of an actual survey made by me or under my supervision and that the same is true and accurate to the best of my knowledge and belief.

APD ID: 10400025105 **Submission Date:** 12/21/2017

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Well Type: OTHER **Well Work Type:** Drill

Highlighted data reflects the most recent changes

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Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	DAKOTA	6633	0	0	SHALE,SANDSTONE	OTHER : Water	No
2	MORRISON	6185	448	448	SHALE,SANDSTONE	NONE	No
3	ENTRADA	5581	1052	1052	SANDSTONE	USEABLE WATER	No
4	CHINLE	4973	1660	1660	SANDSTONE	USEABLE WATER	No
5	CUTLER	3947	2686	2686	SHALE	NONE	No
6	HERMOSA UPR	1991	4642	4642	OTHER : Carbonate	NONE	No
7	PARADOX	1058	5575	5575	ANHYDRITE,OTHER : Carbonate	NONE	No
8	DESERT CREEK	652	5981	5981	OTHER : Carbonate	NATURAL GAS	No
9	PARADOX SALT TOP	543	6090	6090	SALT,ANHYDRITE,OTHER : Carbonate	NATURAL GAS,OTHER : H2S	No
10	PARADOX SALT BASE	-1188	7821	7821	SALT,ANHYDRITE,OTHER : Carbonate	OTHER : H2S	No
11	HERMOSA LWR	-1325	7958	7958	SHALE,OTHER : Carbonate & Siltstone	NATURAL GAS,CO2	No
12	LEADVILLE	-1534	8167	8167	SHALE,OTHER : Carbonate	CO2,OTHER : Water	Yes
13	OURAY FORMATION	-1810	8443	8443	SHALE,OTHER : Carbonate	NATURAL GAS,CO2,OTHER : Water	No

Section 2 - Blowout Prevention

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Pressure Rating (PSI): 3M **Rating Depth:** 9083

Equipment: 3M System: Annular preventers; Double ram with blind rams and pipe rams; Drilling spool, or blowout preventer with 2 side outlets (choke side shall be a 3-inch minimum diameter, kill side shall be at least 2-inch diameter); Kill line (2-inch minimum); a minimum of 2 choke line valves (3-inch minimum); 3-inch diameter choke line; 2 kill line valves, one of which shall be a check valve (2-inch minimum); 2 chokes (refer to diagram in Permit Prognosis); Pressure gauge on choke manifold; Upper Kelly cock valve with handle available; Safety valve and subs to fit all drill string connections in use; All BOPE connections subjected to well pressure shall be flanged, welded, or clamped; Fill-up line above the uppermost preventer; along with Kinder Morgan's trailer mounted test separator and a flow back tank on the CB-4 well pad.
Requesting Variance? NO

Variance request:

Testing Procedure: While drilling the surface hole, a 13 3/8" 3M annular preventer with a diverter will be used. 1. Nipple up on a 9 5/8" x 11" 3000# screw on wellhead; 2. Install 11" x 11" 3000# spool w/ two side outlet (4" outlet and 2" outlet); 3. Install 11" 3000# single hydraulic BOP (no ram block installed); 4. Install 11" x 11" 3000# spacer spool (8" to 10" long); 5. Install 11" 3000# double ram BOP (blind rams on bottom, pipe rams on top); 6. Install 11" 3000# hydril annular BOP; 7. Install 11" 3000# rotating head; 8. Nipple up flowlines to rotating head; 9. Install 4" 3000# manual valve on side of spool; 10. Install 4" 3000# HCR valve on side of manual valve; 11. Nipple up HCR valve to 3000# choke manifold (if H2S is expected a hydraulic super choke should be installed); 12. Function test blind rams, pipe rams, HCR valve (use clear water to test and make sure all BOP's are hooked up to accumulator and all rams, hydril and HCR valve function properly); 13. Close blind rams and test 9 5/8" casing and blind rams to 300# and 1000# for 30 minutes for a test not utilizing a test plug (if a decline of more than 10% in 30 minutes occurs, the test shall be considered failed); 14. Install test plug in 9 5/8" x 11" 3000# wellhead (with all valves open below test plug); 15. Make sure BOP's are full of water and valves shall be tested from working pressure side during BOP test; 16. Close pipe rams (test to 300# for 10 minutes and 1000# for 10 minutes with no pressure lost); 17. Remove drill pipe with test plug in place; 18. Close blind rams (test blind rams, HCR valve, manual valve and choke manifold to 300# and 3000# for 10 minutes); 19. Open blind rams, install drill pipe; 20. Close hydril (test hydril to 300# and; 1500# for 10 minutes each with no lost pressure). Email Kinder Morgan Regulatory Rep 24-hours prior to BOP test. All tests must be charted for COGCC and BLM.

Choke Diagram Attachment:

CB_4_Choke_Manifold_Diagram_11_28_17_20171130105605.pdf

BOP Diagram Attachment:

CB_4_BOP_Diagram_11_28_17_20171130105630.pdf

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	CONDUCTOR	20	16.0	NEW	API	N	0	80	0	80	6633	6553	80	C-75	92.68	BUTT						
2	SURFACE	12.25	9.875	NEW	API	N	0	2786	0	2786	6633	3847	2786	J-55	36	STC	1.24	1.64	BUOY	1.89	BUOY	1.89
3	INTERMEDIATE	8.75	7.0	NEW	API	N	0	5990	0	5990	6633	643	5990	OTHER	29	OTHER - Fox	2.57	2.7	BUOY	2.21	BUOY	2.21

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
4	INTERMEDIATE	8.75	7.0	NEW	API	N	5990	7921	5990	7921	643	-1288	1931	OTHER	32	OTHER - Fox	3.17	3.02	BUOY	3.62	BUOY	3.62
5	INTERMEDIATE	8.75	7.0	NEW	API	N	7921	8192	7921	8192	-1288	-1559	271	OTHER	29	OTHER - Fox	2.57	2.54	BUOY	3.23	BUOY	3.23
6	LINER	6	4.5	NEW	API	N	8042	8488	8042	8488	-1409	-1855	446	OTHER	12.6	OTHER - Vam Top	2.04	8.43	BUOY	2.61	BUOY	2.61

Casing Attachments

Casing ID: 1 **String Type:** CONDUCTOR

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Casing ID: 2 **String Type:** SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CB_4_9.625in_casing_design_20171130140723.pdf

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Casing Attachments

Casing ID: 3 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CB_4_7in_casing_design_20171130135849.pdf

Casing ID: 4 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CB_4_7in_casing_design_20171130140158.pdf

Casing ID: 5 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CB_4_7in_casing_design_20171130140329.pdf

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Casing Attachments

Casing ID: 6 **String Type:** LINER

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CB_4_4.5in_casing_design_20171130140654.pdf

Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
CONDUCTOR	Lead	80	0	80	100	1.92	13.1	192		Ready Mix	N/A
SURFACE	Lead	2786	0	2786	800	1.92	12.4	1536	100	VersaCem System	6% Bentonite + 5lbm/sk KOL-SEAL + 0.125 lbm/sk PLOY-E-FLAKE + 0.1% HALAD-9
SURFACE	Tail				300	1.16	15.8	348	100	HalCem System	0.125 lbm.sk PLOY-E-FLAKE + 0.1% Halad-9
INTERMEDIATE	Lead	8192	0	8192	900	2.32	12	2088	50	NeoCem System	0.125% PLOY-E-FLAKE + 0.125% Tuf Fiber 594
INTERMEDIATE	Tail		0	8192	590	1.46	13	859	50	HalCem System	0.25% POLY-E-FLAKE + 0.125% Tuf Fiber 594
INTERMEDIATE	Lead	8192	0	8192	900	2.32	12	2088	50	NeoCem System	0.125% POLY-E-FLAKE + 0.125% Tuf Fiber 594
INTERMEDIATE	Tail		0	8192	590	1.46	13	859	50	HalCem System	0.25% POLY-E-FLAKE + 0.125% Tuf Fiber 594
INTERMEDIATE	Lead	8192	0	8192	900	2.32	12	2088	50	NeoCem System	0.125% POLY-E-FLAKE + 0.125% Tuf Fiber 594
INTERMEDIATE	Tail		0	8192	590	1.46	13	859	50	HalCem System	0.25% PLOY-E-FLAKE + 0.125% Tuf Fiber 594

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
LINER	Lead	8488	8042	8488	100	1.45	13	144.9	50	HalCem System	0.3% Halad-9 + 0.1% HR-5 + 5lbm Kol-Seal +0.05% SA-1015

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

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

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

Describe what will be on location to control well or mitigate other conditions: Kinder Morgan will utilize the 3M system described earlier in Section 2 of this Drilling Plan (see Equipment, Testing Procedure and Choke Manifold/BOP Diagrams). In addition, Kinder Morgan will follow BLM 43 CFR 3160 Section III-A 3M specification for pressure control equipment including minimum requirements (see CB-4 Permit Prognosis) attached in Section 8).
Describe the mud monitoring system utilized: Mud engineer and mud logging with gas detection will be used from surface to TD (same system used during previous drilling program at McElmo Dome).

Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
8192	8488	WATER-BASED MUD	8.3	8.4			9		20000		During the production hole drill the fresh water will be treated so that the Cl2 content is @ 20,000ppm. This is for logging purposes. Acid soluble LCM will be added to mitigate lost circulation. If circulation is lost and unable to be regained, nitrogen (or air) will be added to the mud system to help lift the fluid for circulation and cuttings movement. A specific description of this process is discussed in "SECTION 8 - Other Items" in the attached

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
											'CB-4 Permit Prognosis', in Section 8 of this Drilling Plan.
0	2786	SPUD MUD	8.5	9			9.5		1200		(9 5/8" Casing Point) Spud the 12 1/4" surface hole with spud mud and circulate the closed loop system. Maintain the fluid as clean as possible to help prevent lost circulation. Use paper to control any seepage and pump LCM sweeps if lost circulation becomes a problem. Pump viscous sweeps if tight connections are encountered and prior to running the 9 5/8" casing.
2786	5881	SPUD MUD	8.5	9			9.5		1200		(100' TVD above the Desert Creek) Drill out of the 9 5/8" casing with clean spud mud. Circulate the closed loop system to keep solids to a minimum. Sweep the hole as required for hole cleaning and/or lost circulation problems. Use paper to control any seepage problems.
5881	8192	SALT SATURATED	10	10			11		190000		(25' TVD into the Leadville / 7 " Casing Point): Displace the fresh water system with salt saturated brine above the Desert Creek formation. Circulate through the closed loop system to maintain a clean fluid and to assist in breaking out any entrained gas. Pre-treat mud for H2S prior to drilling the P4 shale. Follow the attached guidelines for drilling the Paradox Salt Shales, titled "Appendix A: Paradox Salt Drilling Procedure", located in the attached CB-4 Permit Prognosis' in Section 8 of this Drilling Plan. The recommendations have proven to be very successful in recent drilling programs.

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Section 6 - Test, Logging, Coring

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

Mud Logging services will be used from surface to TD. Samples will be collected in 10' intervals.
A measure while drilling (MWD) tool with gamma ray (GR) capability will be run from around 8000' TVD to 7" casing point. GR response, mud logs, and penetration rate will be used to determine the top of the Leadville formation and final casing point.
The 6" production hole will be logged with 2 runs as follows: 1st run dual laterolog; 2nd run triple combo, monopole sonic.
The vertical wellbore will logged to the surface casing shoe through casing with 3 runs as follows (COGCC Rule 317.p.): 1st run GR, pulsed neutron from 7" casing shoe to surface casing shoe; 2nd run CBL over 7" casing shoe to surface; 3rd run CBL from TD to top of 4 1/2" liner.
The well will be completed by perforating the 4 ½" liner in the Leadville formation. Log analysis will determine the placement of the perforations and whether the perforations will be acidized. A static pressure test may be collected prior to the well being tested for CO2 production. If the production flow line is not available at the time of the well completion, a test separator and auxiliary equipment will be mobilized to the location to separate and accurately measure produced fluids, and the well will then be shut in until production facilities are ready. The flow back tank would capture the water that is unloaded from the well. The test separator would measure the productivity of the well.

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

CALIPER,CBL,CNL,DLL,FDC,GR,MWD,MUDLOG,SONIC

Coring operation description for the well:

No conventional coring or sidewall coring is being planned for this well.

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 2100 **Anticipated Surface Pressure:** 232.64

Anticipated Bottom Hole Temperature(F): 180

Anticipated abnormal pressures, temperatures, or potential geologic hazards? YES

Describe:

BOTTOM HOLE PRESSURE
The Leadville/Ouray formation is approximately 325' thick in the Doe Canyon and McElmo Dome area. This vertical hole will be
drilled through the Leadville and Ouray formations. The expected bottom-hole pressure is currently about 2100 psi in the McElmo
Dome area. Original field pressures were in the range of 2500 psi; 2500 psi would be the maximum pressure expected should there to
be compartmentalization within the reservoir. This reservoir is under pressured; given the well depth of approximately 8500' TVD, a
fresh water column provides approximately 3680 psi for well control. During drilling/well stimulation operations, the drill pipe/workstring will have double float valves installed to prevent kicks from coming up the string.
H2S POTENTIAL
H2S is expected to be circulated to the surface during the drilling of the Paradox Salt Shales located at 6090' – 7821' TVD. The H2S
contingency plan that was used in the previous programs has been updated and revised and will be in force. This plan is located in
Appendix A of this prognosis. All the necessary precautions, drills, and training will be done to protect personnel on location. H2S
monitors and safety equipment will be on location and operational prior to drilling the section and remain until rig release.
Contingency Plans geoharzards description:

Circulation may be lost in the 6” production hole. In this situation, managed pressure drilling techniques will be implemented. A
normal fresh water fluid column of water is approximately 3680 psi downhole pressure, and the reservoir pressure is 2500 psi -
therefore an overbalanced condition exists. The fracture gradient of the formation is estimated at 0.6 to 0.7 psi/ft, which equates to
approximately 5100 to 5950 psi downhole pressure, which indicates fractures are not being induced; however, when a high porosity
zone is encountered in the Leadville, and the pore volume exists to take the fluid. At this point, there is a high probability of sticking
drill pipe as the cuttings flowing up the annulus immediately fallback.
A nitrogen managed pressure drilling package can be brought out to location while drilling the production hole should this situation
occur. The nitrogen will be added into the mud system to lighten the hydrostatic pressure and regain circulation in a managed pressure scenario. Managed pressure drilling equipment will be used to handle the return flow of nitrogen and any influx of CO2 gas
through a separator and vent stack. Well control is maintained by reducing or stopping the flow of nitrogen, which will kill the well.
A dedicated rig pump and kill line are also hooked up and ready to boost the water flow if needed.

Contingency Plans geohazards attachment:

CB_4_Paradox_Salt_Drilling_Procedure_11_28_17_20171130150453.pdf

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

CB_4_H2S_CONTINGENCY_PLAN_12_4_17_20180215075527.pdf

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

Other proposed operations facets description:

The well will be completed by perforating the 4-1/2” liner in the Leadville formation. Log analysis will determine placement of the perforations and whether the perforations will be acidized. A static pressure test may be collected prior to the well being tested for CO2 production. The well will then be shut in until the flowline is constructed to the existing production facilities.
The current Kinder Morgan '3402 - WO and Comp - CO2 Venting and Monitoring' procedure is attached. Dispersion modeling of CO2 specific to the CB-4 is conducted prior to any CO2 venting activities to determine critical distances where monitoring will be required. Based upon field reconnaissance and real time atmospheric data taken from a weather station on the CB-4 location, critical exposure areas for CO2 venting (such as residences in low lying valleys) are identified. Weather data is continually monitored during venting operations and critical areas are subject to change based upon changing atmospheric conditions.

Other proposed operations facets attachment:

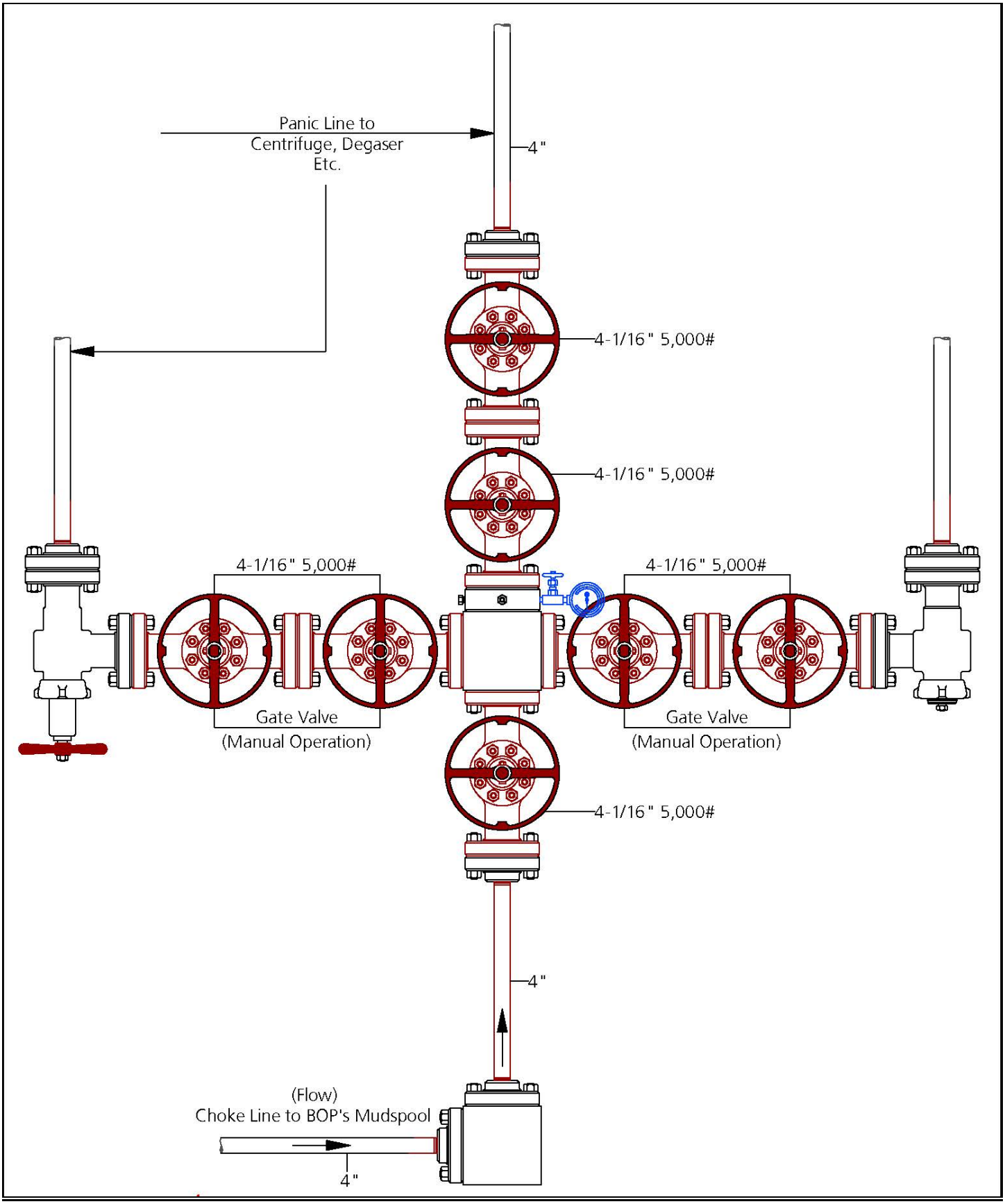
CB_4_Well_Bore_Diagram_11_28_17_20171130150608.pdf

CB_4_Permit_Prognosis_11_28_17_20171130150618.pdf

3402___WO_and_Comp___CO2_Venting_and_Monitoring_20180129160550.pdf

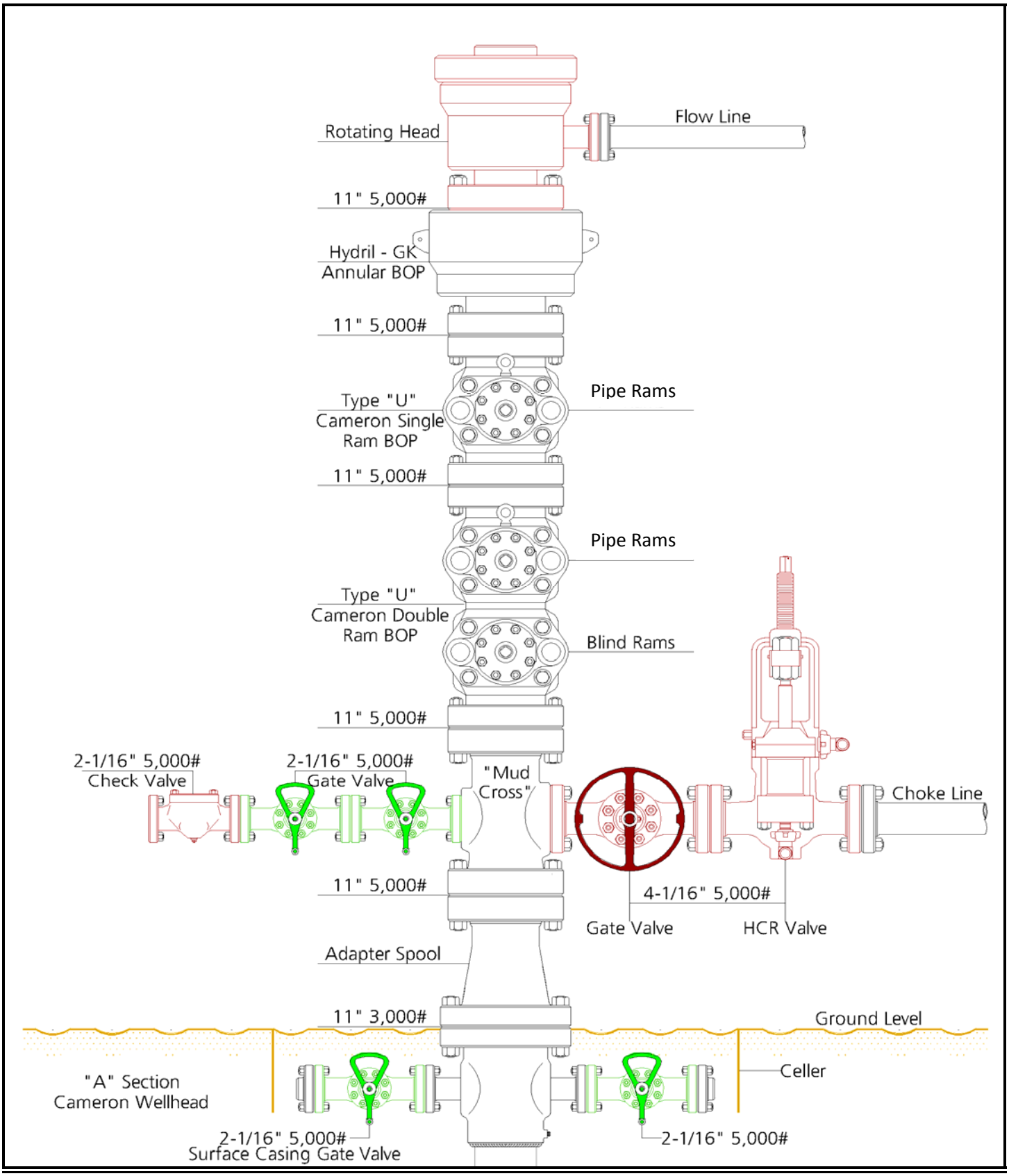
Other Variance attachment:

CHOKE MANIFOLD



Note: 3000# equipment is minimum requirement

BOP CONFIGURATION



Note: 3000# equipment is minimum requirement

WELL SUMMARY

	String	OD/Weight/Grade	Connection	MD Interval (ft)	Drift Dia. (in)	Minimum Safety Factor (Abs) Burst	Collapse	Axial	Triaxial	Design Cost ($)
1	Conductor Casing	16", 65.000 ppf, H-40	N/A	0.0-80.0	15.063	N/A	18.41	4.07	2.11	1,820
2										Total = 1,820
3										
4	Surface Casing	9 5/8", 36.000 ppf, J-55	STC, J-55	0.0-3786.0	8.765	1.64	1.24	1.79 J	1.89	52,133
5										Total = 52,133
6										
7	Intermediate Casing	7", 29.000 ppf, 13CR85	BEAR	0.0-5990.0	6.059	2.70 C	2.57	2.21 C	2.34	132,953
8		7", 32.000 ppf, 13CR85	BEAR	5990.0-7921.0	6.000 A	3.02	3.17	4.98	3.62	46,449
9		7", 29.000 ppf, 13CR85	BEAR	7921.0-8192.0	6.059	2.54 C	2.57	6.34 C	3.23	6,015
10										Total = 185,417
11										
12	Production Liner	4 1/2", 12.600 ppf, 13CR80	Vam Top	8042.0-8488.0	3.833	8.43 C	2.04	5.24 C	2.61	4,708
13										Total = 4,708
14										
15										Total = 244,078
16	J Conn Jump Out									
17	C Conn Critical									

DEVIATION PROFILE

	MD (ft)	INC (°)	AZ (°)	TVD (ft)	DLS (°/100ft)	Max DLS (°/100ft)	Vsection (ft)	Departure (ft)
1	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.0
2	80.0	0.00	0.00	80.0	0.00	0.00	0.0	0.0
3	3786.0	0.00	0.00	3786.0	0.00	0.00	0.0	0.0
4	5827.0	0.00	0.00	5827.0	0.00	0.00	0.0	0.0
5	5990.0	0.00	0.00	5990.0	0.00	0.00	0.0	0.0
6	7921.0	0.00	0.00	7921.0	0.00	0.00	0.0	0.0
7	8042.0	0.00	0.00	8042.0	0.00	0.00	0.0	0.0
8	8127.0	0.00	0.00	8127.0	0.00	0.00	0.0	0.0
9	8192.0	0.00	0.00	8192.0	0.00	0.00	0.0	0.0
10	8477.0	0.00	0.00	8477.0	0.00	0.00	0.0	0.0
11	8488.0	0.00	0.00	8488.0	0.00	0.00	0.0	0.0
12	8500.0	0.00	0.00	8500.0	0.00	0.00	0.0	0.0

BURST PRESSURE PROFILES (9 5/8" Surface Casing)

	Depth (MD) (ft)	Lost Returns (psi)	Gas Kick (psi)	Pressure Test (psi)	Fracture @ Shoe w/ Gas Gradient Above	Green Cement Pres.Test (Int) (psi)	Green Cement Pres. Test (Ext) (psi)	Drill Ahead (Burst) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	867.23	0.00	500.00	2127.02	1000.00	0.00	0.00	0.00
2	80.0	901.84	0.00	534.49	2135.02	1034.49	65.65	42.80	34.61
3	80.0	901.85	0.00	534.50	2135.02	1034.50	65.67	42.81	0.00
4	136.9	926.47	0.00	559.03	2140.71	1059.03	112.36	73.25	0.00
5	1474.8	1505.41	0.00	1135.88	2274.47	1635.88	1210.48	789.11	714.54

COLLAPSE PRESSURE PROFILES (9 5/8" Surface Casing)

	Depth (MD) (ft)	Full/Partial Evacuation (psi)	Cementing (Int) (psi)	Cementing (Ext) (psi)	Lost Returns (psi)	Drill Ahead (Collapse) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	0.00	0.00	0.00	0.00	0.00	0.00
2	80.0	0.04	34.49	65.65	0.00	42.80	34.49
3	80.0	0.04	34.50	65.67	0.00	42.81	34.50

AXIAL LOADS TABLE (9 5/8" Surface Casing)

	Depth (MD) (ft)	Running in Hole (lbf)		Overpull Force (lbf)		Pre-Cement Static Load (		Post-Cement Static Load		Green Cement Pressure		Service Loads (lbf)	
		Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)
1	0.0	202618	202618	219557	219557	119557	119557	12231	12231	74737	74737	74737	74737
2	80.0	200092	200092	217031	217031	116677	116677	9352	9352	71857	71857	71857	71857
3	80.0	200091	200091	217030	217030	116676	116676	9351	9351	71856	71856	71856	71856
4	136.9	198295	198295	215234	215234	114628	114628	7303	7303	69808	69808	69808	69808
5	1474.8	156046	156046	172985	172985	66464	66464	-40861	-40861	21644	21644	21644	21644
6	1474.8	156046	156046	172985	172985	66464	66464	-40861	-40861	21644	21644	21644	-97726
7	1703.9	148812	148812	165751	165751	58217	58217	-49108	-49108	13397	13397	-97569	-97569

MINIMUM SAFETY FACTORS (9 5/8" Surface Casing)

	Depth (MD) (ft)	OD/Weight/Grade	Connection	Minimum Safety Factor (Abs)			
				Burst	Collapse	Axial	Triaxial
1	0	9 5/8", 36.000 ppf, J-55	STC, J-55	1.65 B10	46.13 C2	1.79 A4 J	1.90 B10
2	80			1.68 B10	42.49 C2	1.81 A4 J	1.93 B10
3	80			1.65 B10	42.49 C2	1.81 A4 J	1.90 B10
4	137			1.64 B10	31.62 C2	1.83 A4 J	1.89 B10
5	1475			2.26 B10	3.18 C4	2.28 A4 J	2.54 B10
6	3706			5.95 B10	1.27 C4	(3.12) C4 J	2.73 C4
7	3773			6.26 B10	1.24 C4	(3.09) C4 J	2.74 C4
8	3785			6.32 B10	1.24 C4	(3.09) C4 J	2.74 C4
9	3786			6.32 B2	1.24 C4	(3.09) C4 J	2.74 C4
10							
11	J	Connection Jump Out					
12	B2	Lost Returns with Water					
13	B10	Fracture @ Shoe w/ Gas Gradient Above					
14	C2	Cementing					
15	C4	Lost Returns with Mud Drop					
16	A4	Overpull Force					

MAXIMUM ALLOWABLE WEAR (9 5/8" Surface Casing)

	Depth (MD)	OD/Weight/Grade	Remaining Wall Thickness (in)			Max. Wear (% of Wall Thick.)			Max. Wear (in)		
			Burst	Collapse	Triaxial	Burst	Collapse	Triaxial	Burst	Collapse	Triaxial
1	0.0	9 5/8", 36.000 ppf, J-5	0.281 B10	0.007 C2	0.231 B10	20.2	97.9	34.5	0.071	0.345	0.121
2	80.0		0.277 B10	0.086 C4	0.228 B10	21.2	75.5	35.2	0.075	0.266	0.124
3	80.0		0.282 B10	0.086 C4	0.231 B10	19.9	75.5	34.3	0.070	0.266	0.121
4	136.9		0.283 B10	0.103 C4	0.232 B10	19.7	70.7	34.2	0.069	0.249	0.120
5	1474.8		0.206 B10	0.226 C4	0.174 B10	41.5	35.8	50.6	0.146	0.126	0.178
6	3705.5		0.078 B2	0.315 C4	0.154 C4	77.8	10.6	56.3	0.274	0.037	0.198
7	3772.8		0.074 B2	0.317 C4	0.157 C4	78.9	9.9	55.5	0.278	0.035	0.195
8	3785.1		0.074 B2	0.318 C4	0.157 C4	79.1	9.8	55.3	0.278	0.034	0.195
9	3786.0		0.073 B2	0.318 C4	0.157 C4	79.1	9.8	55.3	0.279	0.034	0.195
10											
11	B2	Lost Returns with Wat									
12	B10	Fracture @ Shoe w/									
13	C2	Cementing									

MAXIMUM ALLOWABLE OVERPULL (9 5/8" Surface Casing)

	Running Depth (MD) (ft)	Max. Overpull (lbf)
1	0	245985
2	757	222074
3	1000	214407
4	1262	206133
5	1514	198163
6	1767	190192
7	2000	182828
8	2019	182222
9	2272	174251
10	2524	166281
11	2776	158310
12	3000	151249
13	3029	150340
14	3281	142370
15	3534	134399

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Gas Kick Profile

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	-73195	-73195	0.0	7.71	N/A	N/A	(5.38) J	100.24	0.00	0.00	N/A	N/A
2	80	-74345	-74345	0.0	7.84	N/A	N/A	(5.29) J	100.59	0.00	34.61		
3	80	-72833	-72833	0.0	7.74	N/A	N/A	(5.40) J	100.59	0.00	0.00		
4	137	-72576	-72576	0.0	7.77	N/A	N/A	(5.42) J	100.83	0.00	0.00		
5	1475	-97726	-97726	0.0	5.58	N/A	N/A	(4.03) J	106.57	0.00	714.54		
6	3786	-96145	-96145	0.0	5.71	N/A	N/A	(4.09) J	116.50	1200.63	1948.90		
7													
8	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Lost Returns with Water

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	44755	44755	0.0	5.14	4.06	N/A	8.79 J	60.00	867.23	0.00	N/A	N/A
2	80	45632	45632	0.0	5.15	4.06	N/A	8.62 J	60.00	901.84	34.61		
3	80	47144	47144	0.0	4.95	3.90	N/A	8.35 J	60.00	901.85	0.00		
4	137	48843	48843	0.0	4.82	3.80	N/A	8.06 J	60.00	926.47	0.00		
5	1475	57595	57595	0.0	5.59	4.45	N/A	6.83 J	60.00	1505.41	714.54		
6	3786	72714	72714	0.0	6.20	6.32	N/A	5.41 J	60.00	2505.53	1948.90		
7													

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	30983	30983	0.0	8.95	7.04	N/A	12.70 J	60.00	500.00	0.00	N/A	N/A
2	80	29458	29458	0.0	8.95	7.04	N/A	13.36 J	61.13	534.49	34.61		
3	80	30969	30969	0.0	8.37	6.59	N/A	12.71 J	61.13	534.50	0.00		
4	137	30960	30960	0.0	7.99	6.30	N/A	12.71 J	61.93	559.03	0.00		
5	1455	0	0	0.0	9.94	8.31	N/A	+ 100.00	80.54	1127.45	704.09		
6	1455	-0	-0	0.0	9.94	8.31	N/A	(+ 100.00)	80.54	1127.46	704.11		
7	1475	-459	-459	0.0	9.97	8.35	N/A	(+ 100.00)	80.82	1135.88	714.54		
8	3786	-54735	-54735	0.0	10.91	19.18	N/A	(7.19) J	113.45	2132.40	1948.90		
9													
10	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Drill Ahead (Burst)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	-73195	-73195	0.0	7.71	N/A	N/A	(5.38) J	100.24	0.00	0.00	N/A	N/A
2	80	-72739	-72739	0.0	7.74	+ 100.00	N/A	(5.41) J	100.59	42.80	34.61		
3	80	-71228	-71228	0.0	7.61	82.22	N/A	(5.53) J	100.59	42.81	0.00		
4	137	-69829	-69829	0.0	7.52	48.05	N/A	(5.64) J	100.83	73.25	0.00		
5	1475	-68132	-68132	0.0	8.53	47.20	N/A	(5.78) J	106.57	789.11	714.54		
6	3786	-65200	-65200	0.0	11.07	45.80	N/A	(6.04) J	116.50	2025.75	1948.90		
7													
8	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Fracture @ Shoe w/ Gas Gradient Above

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	6575	6575	0.0	1.90	1.65	N/A	59.86 J	100.24	2127.02	0.00	N/A	N/A
2	80	5725	5725	0.0	1.93	1.68	N/A	68.74 J	100.59	2135.02	34.61		
3	80	7237	7237	0.0	1.90	1.65	N/A	54.39 J	100.59	2135.02	0.00		
4	137	7707	7707	0.0	1.89	1.64	N/A	51.07 J	100.83	2140.71	0.00		
5	649	0	0	0.0	2.10	1.83	N/A	+ 100.00	103.03	2191.91	273.52		
6	649	-0	-0	0.0	2.10	1.83	N/A	(+ 100.00)	103.03	2191.91	273.53		
7	1475	-12426	-12426	0.0	2.54	2.26	N/A	(31.67) J	106.57	2274.47	714.54		
8	3786	-47207	-47207	0.0	6.02	6.32	N/A	(8.34) J	116.50	2505.53	1948.90		
9													
10	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	0	74737	74737	0.0	4.45	3.52	N/A	5.27 J	83.91	1000.00	0.00	N/A	N/A
2	80	71857	71857	0.0	4.60	3.63	N/A	5.48 J	84.03	1034.49	65.65		
3	80	71856	71856	0.0	4.60	3.63	N/A	5.48 J	84.03	1034.50	65.67		
4	137	69808	69808	0.0	4.70	3.72	N/A	5.64 J	84.11	1059.03	112.36		
5	1475	21644	21644	0.0	10.42	8.27	N/A	18.18 J	86.10	1635.88	1210.48		
6	2076	0	0	0.0	22.82	18.41	N/A	+ 100.00	87.00	1895.11	1703.95		
7	2077	-33	-33	0.0	22.86	18.45	N/A	(+ 100.00)	87.00	1895.51	1704.71		
8	3786	-61559	-61559	0.0	9.42	N/A	N/A	(6.39) J	89.54	2632.40	3107.47		
9													
10	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Full/Partial Evacuation

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	0	-73195	-73195	0.0	7.71	N/A	+ 100.00	(5.38) J	100.24	0.00	0.00	N/A	N/A
2	80	-74338	-74338	0.0	7.84	N/A	58.75	(5.29) J	100.59	0.04	34.49		
3	80	-74338	-74338	0.0	7.84	N/A	58.74	(5.29) J	100.59	0.04	34.50		
4	137	-75151	-75151	0.0	7.92	N/A	34.33	(5.24) J	100.83	0.07	59.03		
5	1475	-94264	-94264	0.0	6.04	N/A	3.19	(4.18) J	106.57	0.75	635.88		
6	3786	-127280	-127280	0.0	2.74	N/A	1.24	(3.09) J	116.50	2.00	1632.40		
7													
8	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Lost Returns with Mud Drop

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	0	-73195	-73195	0.0	7.71	N/A	+ 100.00	(5.38) J	100.24	0.00	0.00	N/A	N/A
2	80	-74339	-74339	0.0	7.84	N/A	58.68	(5.29) J	100.59	0.00	34.49		
3	80	-74339	-74339	0.0	7.84	N/A	58.67	(5.29) J	100.59	0.00	34.50		
4	137	-75153	-75153	0.0	7.92	N/A	34.29	(5.24) J	100.83	0.00	59.03		
5	1475	-94292	-94292	0.0	6.04	N/A	3.18	(4.17) J	106.57	0.00	635.88		
6	3786	-127355	-127355	0.0	2.74	N/A	1.24	(3.09) J	116.50	0.00	1632.40		
7													
8	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Cementing

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	0	12231	12231	0.0	46.11	N/A	46.13	32.18 J	83.91	0.00	0.00	N/A	N/A
2	80	9352	9352	0.0	44.76	N/A	42.49	42.09 J	84.03	34.49	65.65		
3	80	9351	9351	0.0	44.76	N/A	42.49	42.09 J	84.03	34.50	65.67		
4	137	7303	7303	0.0	41.56	N/A	31.62	53.89 J	84.11	59.03	112.36		
5	339	19	19	0.0	28.15	N/A	15.15	+ 100.00	84.41	146.26	278.43		
6	340	-14	-14	0.0	28.10	N/A	15.12	(+ 100.00)	84.42	146.66	279.19		
7	1475	-40861	-40861	0.0	7.75	N/A	3.52	(9.63) J	86.10	635.88	1210.48		
8	3786	-124065	-124065	0.0	3.03	N/A	1.37	(3.17) J	89.54	1632.40	3107.47		
9													
10	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Drill Ahead (Collapse)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	-73195	-73195	0.0	7.71	N/A	+ 100.00	(5.38) J	100.24	0.00	0.00	N/A	N/A
2	80	-72734	-72734	0.0	7.74	+ 100.00	N/A	(5.41) J	100.59	42.80	34.49		
3	80	-72734	-72734	0.0	7.74	+ 100.00	N/A	(5.41) J	100.59	42.81	34.50		
4	137	-72406	-72406	0.0	7.76	+ 100.00	N/A	(5.44) J	100.83	73.25	59.03		
5	1475	-64698	-64698	0.0	8.01	22.97	N/A	(6.08) J	106.57	789.11	635.88		
6	3786	-51383	-51383	0.0	7.30	8.95	N/A	(7.66) J	116.50	2025.75	1632.40		
7													
8	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Running in Hole

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	202618	202618	0.0	2.78	N/A	N/A	1.94 J	83.91	0.00	0.00	N/A	N/A
2	80	200092	200092	0.0	2.81	N/A	N/A	1.97 J	84.03	34.49	34.49		
3	80	200091	200091	0.0	2.81	N/A	N/A	1.97 J	84.03	34.50	34.50		
4	137	198295	198295	0.0	2.84	N/A	N/A	1.98 J	84.11	59.03	59.03		
5	1475	156046	156046	0.0	3.47	N/A	N/A	2.52 J	86.10	635.88	635.88		
6	3785	83090	83090	0.0	5.65	N/A	N/A	4.74 J	89.54	1632.00	1632.00		
7	3786	83061	83061	0.0	5.65	N/A	N/A	4.74 J	89.54	1632.40	1632.40		
8													

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Overpull Force

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	219557	219557	0.0	2.57	N/A	N/A	1.79 J	83.91	0.00	0.00	N/A	N/A
2	80	217031	217031	0.0	2.59	N/A	N/A	1.81 J	84.03	34.49	34.49		
3	80	217030	217030	0.0	2.59	N/A	N/A	1.81 J	84.03	34.50	34.50		
4	137	215234	215234	0.0	2.61	N/A	N/A	1.83 J	84.11	59.03	59.03		
5	1475	172985	172985	0.0	3.14	N/A	N/A	2.28 J	86.10	635.88	635.88		
6	3785	100029	100029	0.0	4.83	N/A	N/A	3.93 J	89.54	1632.00	1632.00		
7	3786	100000	100000	0.0	4.83	N/A	N/A	3.94 J	89.54	1632.40	1632.40		
8													

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Pre-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending)		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	119557	119557	0.0	4.72	N/A	N/A	3.29 J	83.91	0.00	0.00	N/A	N/A
2	80	116677	116677	0.0	4.82	N/A	N/A	3.37 J	84.03	34.49	34.49		
3	80	116676	116676	0.0	4.82	N/A	N/A	3.37 J	84.03	34.50	34.50		
4	137	114628	114628	0.0	4.89	N/A	N/A	3.43 J	84.11	59.03	59.03		
5	1475	66464	66464	0.0	7.73	N/A	N/A	5.92 J	86.10	635.88	635.88		
6	3320	31	31	0.0	38.34	N/A	N/A	+ 100.00	88.85	1431.54	1431.54		
7	3321	-2	-2	0.0	38.41	N/A	N/A	(+ 100.00)	88.85	1431.94	1431.94		
8	3786	-16739	-16739	0.0	+ 100.00	N/A	N/A	(23.51) J	89.54	1632.40	1632.40		
9													
10	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Post-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	12231	12231	0.0	46.11	N/A	N/A	32.18 J	60.00	0.00	0.00	N/A	N/A
2	80	9352	9352	0.0	44.76	N/A	N/A	42.09 J	61.13	34.49	65.65		
3	80	9351	9351	0.0	44.76	N/A	N/A	42.09 J	61.13	34.50	65.67		
4	137	7303	7303	0.0	41.56	N/A	N/A	53.89 J	61.93	59.03	112.36		
5	339	19	19	0.0	28.15	N/A	N/A	+ 100.00	64.79	146.26	278.43		
6	340	-14	-14	0.0	28.10	N/A	N/A	(+ 100.00)	64.80	146.66	279.19		
7	1475	-40861	-40861	0.0	7.75	N/A	N/A	(9.63) J	80.82	635.88	1210.48		
8	3786	-124065	-124065	0.0	3.03	N/A	N/A	(3.17) J	113.45	1632.40	3107.47		
9													
10	J	Conn Jump											

TRIAXIAL RESULTS (9 5/8" Surface Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	74737	74737	0.0	4.45	3.52	N/A	5.27 J	83.91	1000.00	0.00	N/A	N/A
2	80	71857	71857	0.0	4.60	3.63	N/A	5.48 J	84.03	1034.49	65.65		
3	80	71856	71856	0.0	4.60	3.63	N/A	5.48 J	84.03	1034.50	65.67		
4	137	69808	69808	0.0	4.70	3.72	N/A	5.64 J	84.11	1059.03	112.36		
5	1475	21644	21644	0.0	10.42	8.27	N/A	18.18 J	86.10	1635.88	1210.48		
6	2076	0	0	0.0	22.82	18.41	N/A	+ 100.00	87.00	1895.11	1703.95		
7	2077	-33	-33	0.0	22.86	18.45	N/A	(+ 100.00)	87.00	1895.51	1704.71		
8	3786	-61559	-61559	0.0	9.42	N/A	N/A	(6.39) J	89.54	2632.40	3107.47		
9													
10	J	Conn Jump											

WELL SUMMARY

	String	OD/Weight/Grade	Connection	MD Interval (ft)	Drift Dia. (in)	Minimum Safety Factor (Abs)				Design Cost ($)
						Burst	Collapse	Axial	Triaxial	
1	Conductor Casing	16", 65.000 ppf, H-40	N/A	0.0-80.0	15.063	N/A	18.41	4.07	2.11	1,820
2										Total = 1,820
3										
4	Surface Casing	9 5/8", 36.000 ppf, J-55	STC, J-55	0.0-3786.0	8.765	1.64	1.24	1.79 J	1.89	52,133
5										Total = 52,133
6										
7	Intermediate Casing	7", 29.000 ppf, 13CR85	BEAR	0.0-5990.0	6.059	2.70 C	2.57	2.21 C	2.34	132,953
8		7", 32.000 ppf, 13CR85	BEAR	5990.0-7921.0	6.000 A	3.02	3.17	4.98	3.62	46,449
9		7", 29.000 ppf, 13CR85	BEAR	7921.0-8192.0	6.059	2.54 C	2.57	6.34 C	3.23	6,015
10										Total = 185,417
11										
12	Production Liner	4 1/2", 12.600 ppf, 13CR80	Vam Top	8042.0-8488.0	3.833	8.43 C	2.04	5.24 C	2.61	4,708
13										Total = 4,708
14										
15										Total = 244,078
16	J Conn Jump Out									
17	C Conn Critical									

DEVIATION PROFILE

	MD (ft)	INC (°)	AZ (°)	TVD (ft)	DLS (°/100ft)	Max DLS (°/100ft)	Vsection (ft)	Departure (ft)
1	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.0
2	80.0	0.00	0.00	80.0	0.00	0.00	0.0	0.0
3	3786.0	0.00	0.00	3786.0	0.00	0.00	0.0	0.0
4	5827.0	0.00	0.00	5827.0	0.00	0.00	0.0	0.0
5	5990.0	0.00	0.00	5990.0	0.00	0.00	0.0	0.0
6	7921.0	0.00	0.00	7921.0	0.00	0.00	0.0	0.0
7	8042.0	0.00	0.00	8042.0	0.00	0.00	0.0	0.0
8	8127.0	0.00	0.00	8127.0	0.00	0.00	0.0	0.0
9	8192.0	0.00	0.00	8192.0	0.00	0.00	0.0	0.0
10	8477.0	0.00	0.00	8477.0	0.00	0.00	0.0	0.0
11	8488.0	0.00	0.00	8488.0	0.00	0.00	0.0	0.0
12	8500.0	0.00	0.00	8500.0	0.00	0.00	0.0	0.0

BURST PRESSURE PROFILES (7" Intermediate Casing)

	Depth (MD) (ft)	Pressure Test (psi)	Green Cement Pres.Test (Int) (psi)	Green Cement Pres. Test (Ext) (psi)	Drill Ahead (Burst) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	2500.00	1000.00	0.00	0.00	0.00
2	3786.0	4466.75	2966.75	2458.43	2025.75	1638.30
3	3786.0	4466.76	2966.76	2458.45	2025.76	1638.31
4	5990.0	5611.68	4111.68	3889.60	3205.03	2592.03
5	5990.0	5611.69	4111.69	3889.61	3205.04	2592.04
6	7921.0	6614.80	5114.80	5143.49	4238.24	3427.62
7	7921.0	6614.81	5114.81	5143.51	4238.25	3427.63

COLLAPSE PRESSURE PROFILES (7" Intermediate Casing)

	Depth (MD) (ft)	Full/Partial Evacuation (psi)	Cementing (Int) (psi)	Cementing (Ext) (psi)	Drill Ahead (Collapse) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	0.00	0.00	0.00	0.00	0.00
2	3786.0	2.00	1966.75	2458.43	1697.30	1966.75
3	3786.0	2.00	1966.76	2458.45	1697.31	1966.76
4	5477.0	2.95	2845.19	3556.49	2455.40	2845.19
5	5827.0	184.95	3027.00	3783.76	2612.31	3027.00
6	5827.0	184.96	3027.02	3783.77	2612.31	3027.02
7	5990.0	269.72	3111.68	3889.60	2685.38	3111.68
8	5990.0	269.73	3111.69	3889.61	2685.39	3111.69
9	7921.0	1273.87	4114.80	5143.49	3551.07	4114.80
10	7921.0	1273.88	4114.81	5143.51	3551.08	4114.81
11	8127.0	1381.00	4221.81	5277.26	3643.42	4221.81
12	8127.0	1381.01	4221.82	5277.27	3643.43	4221.82

AXIAL LOADS TABLE (7" Intermediate Casing)

	Depth (MD) (ft)	Running in Hole (lbf)		Overpull Force (lbf)		Pre-Cement Static Load (lbf)		Post-Cement Static Load (lbf)		Green Cement Pressure Test	
		Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)
1	0.0	274974	274974	306533	306533	206533	206533	165590	165590	195625	195625
2	3786.0	181798	181798	213357	213357	96740	96740	55796	55796	85831	85831
3	3786.0	181797	181797	213357	213357	96739	96739	55795	55795	85831	85831
4	5477.0	140181	140181	171740	171740	47700	47700	6757	6757	36792	36792
5	5827.0	131567	131567	163127	163127	37550	37550	-3393	-3393	26642	26642
6	5827.0	131567	131567	163126	163126	37550	37550	-3394	-3394	26642	26642
7	5990.0	127556	127556	159115	159115	32823	32823	-8120	-8120	21915	21915
8	5990.0	134585	134585	159115	159115	30122	30122	-10821	-10821	18346	18346
9	6563.0	119023	119023	143553	143553	11787	11787	-29157	-29157	10	10
10	6564.0	118996	118996	143525	143525	11755	11755	-29189	-29189	-22	-22
11	7921.0	82140	82140	106670	106670	-31669	-31669	-72613	-72613	-43445	-43445
12	7921.0	75110	75110	106669	106669	-28099	-28099	-69042	-69042	-39007	-39007
13	8127.0	70040	70040	101600	101600	-34072	-34072	-75015	-75015	-44980	-44980

MINIMUM SAFETY FACTORS (7" Intermediate Casing)

	Depth (MD) (ft)	OD/Weight/Grade	Connection	Minimum Safety Factor (Abs)			
				Burst	Collapse	Axial	Triaxial
1	0	7", 29.000 ppf, 13CR85	BEAR	3.26 B5 C	4.34 C2	2.21 A4 C	2.34 A4
2	3786			2.88 B5 C	3.55 C1	3.17 A4 C	3.12 A4
3	5477			2.74 B5 C	2.57 C1	3.94 A4 C	3.35 C1
4	5827			2.72 B5 C	2.57 C1	4.14 A4 C	3.37 C1
5	5990			2.70 B5 C	2.57 C1	4.25 A4 C	3.38 C1
6	5990	7", 32.000 ppf, 13CR85	BEAR	3.19 B5	3.17 C1	4.98 A4	3.71 C1
7	7921			3.02 B5	3.17 C1	7.42 A4	3.62 B5
8	7921	7", 29.000 ppf, 13CR85	BEAR	2.56 B5 C	2.57 C1	6.34 A4 C	3.28 B5
9	8127			2.55 B5 C	2.57 C1	6.65 A4 C	3.24 B5
10	8191			2.54 B5 C	2.57 C1	6.76 A4 C	3.23 B5
11	8192			2.54 B5 C	2.57 C1	6.76 A4 C	3.23 B5
12							
13	C	Connection Critical					
14	B5	Pressure Test					
15	C1	Full/Partial Evacuation					
16	C2	Cementing					

MAXIMUM ALLOWABLE WEAR (7" Intermediate Casing)

	Depth (MD)	OD/Weight/Grade	Remaining Wall Thickness (in)			Max. Wear (% of Wall Thick.)			Max. Wear (in)		
			Burst	Collapse	Triaxial	Burst	Collapse	Triaxial	Burst	Collapse	Triaxial
1	0.0	7", 29.000 ppf, 13CR8	0.155 B5	0.090 C2	0.211 A4	61.9	78.0	48.2	0.253	0.318	0.197
2	3786.0		0.176 B5	0.238 C1	0.150 A4	56.9	41.7	63.2	0.232	0.170	0.258
3	5477.0		0.185 B5	0.274 C1	0.146 C1	54.7	32.9	64.1	0.223	0.134	0.262
4	5827.0		0.187 B5	0.274 C1	0.145 C1	54.2	32.9	64.4	0.221	0.134	0.263
5	5990.0		0.188 B5	0.274 C1	0.145 C1	54.0	32.9	64.5	0.220	0.134	0.263
6	5990.0	7", 32.000 ppf, 13CR8	0.188 B5	0.274 C1	0.145 C1	58.6	39.6	68.0	0.265	0.179	0.308
7	7921.0		0.198 B5	0.274 C1	0.158 B5	56.3	39.6	65.0	0.255	0.179	0.295
8	7921.0	7", 29.000 ppf, 13CR8	0.198 B5	0.274 C1	0.157 B5	51.5	33.0	61.5	0.210	0.134	0.251
9	8127.0		0.199 B5	0.274 C1	0.159 B5	51.2	33.0	61.0	0.209	0.134	0.249
10	8191.0		0.199 B5	0.274 C1	0.160 B5	51.1	33.0	60.8	0.209	0.134	0.248
11	8192.0		0.199 B5	0.274 C1	0.160 B5	51.1	33.0	60.8	0.209	0.134	0.248
12											
13	B5	Pressure Test									
14	C1	Full/Partial Evacuatio									
15	C2	Cementing									

MAXIMUM ALLOWABLE OVERPULL (7" Intermediate Casing)

	Running Depth (MD) (ft)	Max. Overpull (lbf)
1	0	422500
2	271	415831
3	1000	419031
4	1536	421383
5	1792	447002
6	2000	441353
7	2202	435867
8	2202	363385
9	3000	343746
10	4000	319135
11	5000	294524
12	5990	270160
13	5990	270159
14	6000	269913
15	7000	245303
16	7921	222637
17	7921	222636
18	8000	220692

TRIAXIAL RESULTS (7" Intermediate Casing) - Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	209141	209141	0.0	3.36	3.26 C	N/A	3.23 C	60.00	2500.00	0.00	N/A	N/A
2	3786	117653	117653	0.0	3.70	2.88 C	N/A	5.75 C	113.45	4466.75	1638.30		
3	3786	117653	117653	0.0	3.70	2.88 C	N/A	5.75 C	113.45	4466.76	1638.31		
4	5477	76790	76790	0.0	3.62	2.74 C	N/A	8.80 C	137.32	5345.19	2370.04		
5	5827	68333	68333	0.0	3.58	2.72 C	N/A	9.89 C	142.26	5527.00	2521.49		
6	5827	68332	68332	0.0	3.58	2.72 C	N/A	9.89 C	142.26	5527.02	2521.50		
7	5990	64394	64394	0.0	3.57	2.70 C	N/A	10.50 C	144.56	5611.68	2592.03		
8	5990	60434	60434	0.0	3.93	3.19	N/A	13.10	144.56	5611.69	2592.04		
9	7921	7980	7980	0.0	3.62	3.02	N/A	99.25	171.83	6614.80	3427.62		
10	7921	12809	12809	0.0	3.28	2.56 C	N/A	52.78 C	171.83	6614.81	3427.63		
11	8127	7831	7831	0.0	3.24	2.55 C	N/A	86.32 C	174.73	6721.81	3516.77		
12	8127	7831	7831	0.0	3.24	2.55 C	N/A	86.32 C	174.73	6721.82	3516.78		
13	8192	6261	6261	0.0	3.23	2.54 C	N/A	+ 100.00	175.65	6755.58	3544.90		
14													
15	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Drill Ahead (Burst)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	N/A	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	68417	68417	0.0	9.55	21.06 C	N/A	9.88 C	117.94	2025.75	1638.30		
3	3786	68417	68417	0.0	9.55	21.06 C	N/A	9.88 C	117.94	2025.76	1638.31		
4	5477	52478	52478	0.0	10.71	14.56 C	N/A	12.88 C	125.45	2930.55	2370.04		
5	5827	49179	49179	0.0	10.90	13.68 C	N/A	13.75 C	127.00	3117.81	2521.49		
6	5827	49179	49179	0.0	10.90	13.68 C	N/A	13.75 C	127.00	3117.83	2521.50		
7	5990	47643	47643	0.0	10.97	13.31 C	N/A	14.19 C	127.72	3205.03	2592.03		
8	5990	47481	47481	0.0	11.73	15.70	N/A	16.68	127.72	3205.04	2592.04		
9	7921	26341	26341	0.0	12.34	11.88	N/A	30.07	136.29	4238.24	3427.62		
10	7921	24519	24519	0.0	11.70	10.07 C	N/A	27.57 C	136.29	4238.25	3427.63		
11	8127	22578	22578	0.0	11.62	9.81 C	N/A	29.94 C	137.21	4348.46	3516.77		
12	8127	22577	22577	0.0	11.62	9.81 C	N/A	29.94 C	137.21	4348.47	3516.78		
13	8192	21965	21965	0.0	11.59	9.73 C	N/A	30.78 C	137.50	4383.25	3544.90		
14													

TRIAXIAL RESULTS (7" Intermediate Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	195625	195625	0.0	4.02	8.16 C	N/A	3.46 C	100.24	1000.00	0.00	N/A	N/A
2	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.75	2458.43		
3	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.76	2458.45		
4	5477	36792	36792	0.0	11.72	28.26 C	N/A	18.37 C	123.75	3845.19	3556.49		
5	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.00	3783.76		
6	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.02	3783.77		
7	5990	21915	21915	0.0	14.27	36.74 C	N/A	30.85 C	125.96	4111.68	3889.60		
8	5990	18346	18346	0.0	15.73	43.35	N/A	43.17	125.96	4111.69	3889.61		
9	6563	10	10	0.0	21.55	65.19	N/A	+ 100.00	128.42	4409.35	4261.68		
10	6564	-22	-22	0.0	21.56	65.25	N/A	(+ 100.00)	128.42	4409.87	4262.33		
11	7921	-43445	-43445	0.0	+ 100.00	N/A	N/A	(14.59) C	134.24	5114.80	5143.49		
12	7921	-39007	-39007	0.0	+ 100.00	N/A	N/A	(13.87) C	134.24	5114.81	5143.51		
13	8127	-44980	-44980	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.81	5277.26		
14	8127	-44981	-44981	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.82	5277.27		
15	8192	-46866	-46866	0.0	+ 100.00	N/A	N/A	(11.54) C	135.41	5255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Full/Partial Evacuation

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	6.90	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	25831	25831	0.0	4.34	N/A	3.55	26.17 C	117.94	2.00	1966.75		
3	3786	25831	25831	0.0	4.34	N/A	3.55	26.17 C	117.94	2.00	1966.76		
4	5035	0	0	0.0	3.57	N/A	2.80	+ 100.00	123.49	2.70	2615.83		
5	5035	-0	-0	0.0	3.57	N/A	2.80	(+ 100.00)	123.49	2.70	2615.84		
6	5477	-9128	-9128	0.0	3.35	N/A	2.57	(59.27) C	125.45	2.95	2845.19		
7	5827	-13196	-13196	0.0	3.37	N/A	2.57	(41.00) C	127.00	184.95	3027.00		
8	5827	-13196	-13196	0.0	3.37	N/A	2.57	(41.00) C	127.00	184.96	3027.02		
9	5990	-15091	-15091	0.0	3.38	N/A	2.57	(35.85) C	127.72	269.72	3111.68		
10	5990	-13775	-13775	0.0	3.71	N/A	3.17	(46.02) C	127.72	269.73	3111.69		
11	7921	-39145	-39145	0.0	3.84	N/A	3.17	(16.20) C	136.29	1273.87	4114.80		
12	7921	-42460	-42460	0.0	3.51	N/A	2.57	(12.74) C	136.29	1273.88	4114.81		
13	8127	-44854	-44854	0.0	3.52	N/A	2.57	(12.06) C	137.21	1381.00	4221.81		
14	8127	-44854	-44854	0.0	3.52	N/A	2.57	(12.06) C	137.21	1381.01	4221.82		
15	8192	-45610	-45610	0.0	3.52	N/A	2.57	(11.86) C	137.50	1414.80	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Cementing

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	165590	165590	0.0	4.34	N/A	4.34	4.08 C	100.24	0.00	0.00	N/A	N/A
2	3786	55796	55796	0.0	7.40	N/A	7.40	12.12 C	116.50	1966.75	2458.43		
3	3786	55795	55795	0.0	7.40	N/A	7.40	12.12 C	116.50	1966.76	2458.45		
4	5477	6757	6757	0.0	9.57	N/A	8.57	+ 100.00	123.75	2845.19	3556.49		
5	5709	29	29	0.0	9.85	N/A	8.60	+ 100.00	124.75	2965.71	3707.14		
6	5710	-0	-0	0.0	9.85	N/A	8.60	(+ 100.00)	124.75	2966.23	3707.79		
7	5827	-3393	-3393	0.0	9.98	N/A	8.60	(+ 100.00)	125.26	3027.00	3783.76		
8	5827	-3394	-3394	0.0	9.98	N/A	8.60	(+ 100.00)	125.26	3027.02	3783.77		
9	5990	-8120	-8120	0.0	10.15	N/A	8.59	(66.63) C	125.96	3111.68	3889.60		
10	5990	-10821	-10821	0.0	11.20	N/A	10.34	(58.59) C	125.96	3111.69	3889.61		
11	7921	-72613	-72613	0.0	11.52	N/A	8.75	(8.73) C	134.24	4114.80	5143.49		
12	7921	-69042	-69042	0.0	10.44	N/A	7.11	(7.84) C	134.24	4114.81	5143.51		
13	8127	-75015	-75015	0.0	10.21	N/A	6.92	(7.21) C	135.13	4221.81	5277.26		
14	8127	-75016	-75016	0.0	10.21	N/A	6.92	(7.21) C	135.13	4221.82	5277.27		
15	8192	-76901	-76901	0.0	10.13	N/A	6.87	(7.04) C	135.41	4255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Drill Ahead (Collapse)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	6.90	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	55364	55364	0.0	8.75	N/A	8.75	12.21 C	117.94	1697.30	1966.75		
3	3786	55364	55364	0.0	8.75	N/A	8.75	12.21 C	117.94	1697.31	1966.76		
4	5477	33595	33595	0.0	9.70	N/A	9.70	20.12 C	125.45	2455.40	2845.19		
5	5827	29089	29089	0.0	9.89	N/A	9.84	23.24 C	127.00	2612.31	3027.00		
6	5827	29089	29089	0.0	9.89	N/A	9.84	23.24 C	127.00	2612.31	3027.02		
7	5990	26991	26991	0.0	9.98	N/A	9.89	25.05 C	127.72	2685.38	3111.68		
8	5990	27091	27091	0.0	10.68	N/A	10.68	29.23	127.72	2685.39	3111.69		
9	7878	0	0	0.0	11.99	N/A	11.74	+ 100.00	136.10	3531.63	4092.28		
10	7878	-0	-0	0.0	11.99	N/A	11.74	(+ 100.00)	136.10	3531.64	4092.29		
11	7921	-622	-622	0.0	12.01	N/A	11.75	(+ 100.00)	136.29	3551.07	4114.80		
12	7921	-2790	-2790	0.0	11.64	N/A	10.55	(+ 100.00)	136.29	3551.08	4114.81		
13	8127	-5442	-5442	0.0	11.72	N/A	10.51	(99.42) C	137.21	3643.42	4221.81		
14	8127	-5442	-5442	0.0	11.72	N/A	10.51	(99.41) C	137.21	3643.43	4221.82		
15	8192	-6279	-6279	0.0	11.75	N/A	10.50	(86.16) C	137.50	3672.57	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Running in Hole

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	274974	274974	0.0	2.61	N/A	N/A	2.46 C	100.24	0.00	0.00	N/A	N/A
2	3786	181798	181798	0.0	3.62	N/A	N/A	3.72 C	116.50	1966.75	1966.75		
3	3786	181797	181797	0.0	3.62	N/A	N/A	3.72 C	116.50	1966.76	1966.76		
4	5477	140181	140181	0.0	4.37	N/A	N/A	4.82 C	123.75	2845.19	2845.19		
5	5827	131567	131567	0.0	4.57	N/A	N/A	5.14 C	125.26	3027.00	3027.00		
6	5827	131567	131567	0.0	4.57	N/A	N/A	5.14 C	125.26	3027.02	3027.02		
7	5990	127556	127556	0.0	4.67	N/A	N/A	5.30 C	125.96	3111.68	3111.68		
8	5990	134585	134585	0.0	4.84	N/A	N/A	5.88	125.96	3111.69	3111.69		
9	7921	82140	82140	0.0	6.57	N/A	N/A	9.64	134.24	4114.80	4114.80		
10	7921	75110	75110	0.0	6.54	N/A	N/A	9.00 C	134.24	4114.81	4114.81		
11	8127	70040	70040	0.0	6.79	N/A	N/A	9.65 C	135.13	4221.81	4221.81		
12	8127	70040	70040	0.0	6.79	N/A	N/A	9.65 C	135.13	4221.82	4221.82		
13	8191	68465	68465	0.0	6.88	N/A	N/A	9.87 C	135.40	4255.06	4255.06		
14	8192	68440	68440	0.0	6.88	N/A	N/A	9.88 C	135.41	4255.58	4255.58		
15													

TRIAXIAL RESULTS (7" Intermediate Casing) - Overpull Force

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	306533	306533	0.0	2.34	N/A	N/A	2.21 C	100.24	0.00	0.00	N/A	N/A
2	3786	213357	213357	0.0	3.12	N/A	N/A	3.17 C	116.50	1966.75	1966.75		
3	3786	213357	213357	0.0	3.12	N/A	N/A	3.17 C	116.50	1966.76	1966.76		
4	5477	171740	171740	0.0	3.67	N/A	N/A	3.94 C	123.75	2845.19	2845.19		
5	5827	163127	163127	0.0	3.81	N/A	N/A	4.14 C	125.26	3027.00	3027.00		
6	5827	163126	163126	0.0	3.81	N/A	N/A	4.14 C	125.26	3027.02	3027.02		
7	5990	159115	159115	0.0	3.87	N/A	N/A	4.25 C	125.96	3111.68	3111.68		
8	5990	159115	159115	0.0	4.21	N/A	N/A	4.98	125.96	3111.69	3111.69		
9	7921	106670	106670	0.0	5.46	N/A	N/A	7.42	134.24	4114.80	4114.80		
10	7921	106669	106669	0.0	5.08	N/A	N/A	6.34 C	134.24	4114.81	4114.81		
11	8127	101600	101600	0.0	5.23	N/A	N/A	6.65 C	135.13	4221.81	4221.81		
12	8127	101599	101599	0.0	5.23	N/A	N/A	6.65 C	135.13	4221.82	4221.82		
13	8191	100025	100025	0.0	5.28	N/A	N/A	6.76 C	135.40	4255.06	4255.06		
14	8192	100000	100000	0.0	5.28	N/A	N/A	6.76 C	135.41	4255.58	4255.58		
15													

TRIAXIAL RESULTS (7" Intermediate Casing) - Pre-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	206533	206533	0.0	3.48	N/A	N/A	3.27 C	100.24	0.00	0.00	N/A	N/A
2	3786	96740	96740	0.0	6.34	N/A	N/A	6.99 C	116.50	1966.75	1966.75		
3	3786	96739	96739	0.0	6.34	N/A	N/A	6.99 C	116.50	1966.76	1966.76		
4	5477	47700	47700	0.0	10.01	N/A	N/A	14.17 C	123.75	2845.19	2845.19		
5	5827	37550	37550	0.0	11.38	N/A	N/A	18.00 C	125.26	3027.00	3027.00		
6	5827	37550	37550	0.0	11.38	N/A	N/A	18.00 C	125.26	3027.02	3027.02		
7	5990	32823	32823	0.0	12.15	N/A	N/A	20.60 C	125.96	3111.68	3111.68		
8	5990	30122	30122	0.0	13.40	N/A	N/A	26.29	125.96	3111.69	3111.69		
9	6931	11	11	0.0	23.60	N/A	N/A	+ 100.00	129.99	3600.52	3600.52		
10	6932	-21	-21	0.0	23.62	N/A	N/A	(+ 100.00)	130.00	3601.04	3601.04		
11	7921	-31669	-31669	0.0	+ 100.00	N/A	N/A	(20.02) C	134.24	4114.80	4114.80		
12	7921	-28099	-28099	0.0	+ 100.00	N/A	N/A	(19.25) C	134.24	4114.81	4114.81		
13	8127	-34072	-34072	0.0	+ 100.00	N/A	N/A	(15.88) C	135.13	4221.81	4221.81		
14	8127	-34073	-34073	0.0	+ 100.00	N/A	N/A	(15.88) C	135.13	4221.82	4221.82		
15	8192	-35957	-35957	0.0	+ 100.00	N/A	N/A	(15.05) C	135.41	4255.58	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Post-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	165590	165590	0.0	4.34	N/A	N/A	4.08 C	60.00	0.00	0.00	N/A	N/A
2	3786	55796	55796	0.0	7.40	N/A	N/A	12.12 C	113.45	1966.75	2458.43		
3	3786	55795	55795	0.0	7.40	N/A	N/A	12.12 C	113.45	1966.76	2458.45		
4	5477	6757	6757	0.0	9.57	N/A	N/A	+ 100.00	137.32	2845.19	3556.49		
5	5709	29	29	0.0	9.85	N/A	N/A	+ 100.00	140.60	2965.71	3707.14		
6	5710	-0	-0	0.0	9.85	N/A	N/A	(+ 100.00)	140.61	2966.23	3707.79		
7	5827	-3393	-3393	0.0	9.98	N/A	N/A	(+ 100.00)	142.26	3027.00	3783.76		
8	5827	-3394	-3394	0.0	9.98	N/A	N/A	(+ 100.00)	142.26	3027.02	3783.77		
9	5990	-8120	-8120	0.0	10.15	N/A	N/A	(66.63) C	144.56	3111.68	3889.60		
10	5990	-10821	-10821	0.0	11.20	N/A	N/A	(58.59) C	144.56	3111.69	3889.61		
11	7921	-72613	-72613	0.0	11.52	N/A	N/A	(8.73) C	171.83	4114.80	5143.49		
12	7921	-69042	-69042	0.0	10.44	N/A	N/A	(7.84) C	171.83	4114.81	5143.51		
13	8127	-75015	-75015	0.0	10.21	N/A	N/A	(7.21) C	174.73	4221.81	5277.26		
14	8127	-75016	-75016	0.0	10.21	N/A	N/A	(7.21) C	174.73	4221.82	5277.27		
15	8192	-76901	-76901	0.0	10.13	N/A	N/A	(7.04) C	175.65	4255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	195625	195625	0.0	4.02	8.16 C	N/A	3.46 C	100.24	1000.00	0.00	N/A	N/A
2	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.75	2458.43		
3	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.76	2458.45		
4	5477	36792	36792	0.0	11.72	28.26 C	N/A	18.37 C	123.75	3845.19	3556.49		
5	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.00	3783.76		
6	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.02	3783.77		
7	5990	21915	21915	0.0	14.27	36.74 C	N/A	30.85 C	125.96	4111.68	3889.60		
8	5990	18346	18346	0.0	15.73	43.35	N/A	43.17	125.96	4111.69	3889.61		
9	6563	10	10	0.0	21.55	65.19	N/A	+ 100.00	128.42	4409.35	4261.68		
10	6564	-22	-22	0.0	21.56	65.25	N/A	(+ 100.00)	128.42	4409.87	4262.33		
11	7921	-43445	-43445	0.0	+ 100.00	N/A	N/A	(14.59) C	134.24	5114.80	5143.49		
12	7921	-39007	-39007	0.0	+ 100.00	N/A	N/A	(13.87) C	134.24	5114.81	5143.51		
13	8127	-44980	-44980	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.81	5277.26		
14	8127	-44981	-44981	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.82	5277.27		
15	8192	-46866	-46866	0.0	+ 100.00	N/A	N/A	(11.54) C	135.41	5255.58	5319.48		
16													
17	C	Conn Critical											

WELL SUMMARY

	String	OD/Weight/Grade	Connection	MD Interval (ft)	Drift Dia. (in)	Minimum Safety Factor (Abs)				Design Cost ($)
						Burst	Collapse	Axial	Triaxial	
1	Conductor Casing	16", 65.000 ppf, H-40	N/A	0.0-80.0	15.063	N/A	18.41	4.07	2.11	1,820
2										Total = 1,820
3										
4	Surface Casing	9 5/8", 36.000 ppf, J-55	STC, J-55	0.0-3786.0	8.765	1.64	1.24	1.79 J	1.89	52,133
5										Total = 52,133
6										
7	Intermediate Casing	7", 29.000 ppf, 13CR85	BEAR	0.0-5990.0	6.059	2.70 C	2.57	2.21 C	2.34	132,953
8		7", 32.000 ppf, 13CR85	BEAR	5990.0-7921.0	6.000 A	3.02	3.17	4.98	3.62	46,449
9		7", 29.000 ppf, 13CR85	BEAR	7921.0-8192.0	6.059	2.54 C	2.57	6.34 C	3.23	6,015
10										Total = 185,417
11										
12	Production Liner	4 1/2", 12.600 ppf, 13CR80	Vam Top	8042.0-8488.0	3.833	8.43 C	2.04	5.24 C	2.61	4,708
13										Total = 4,708
14										
15										Total = 244,078
16	J Conn Jump Out									
17	C Conn Critical									

DEVIATION PROFILE

	MD (ft)	INC (°)	AZ (°)	TVD (ft)	DLS (°/100ft)	Max DLS (°/100ft)	Vsection (ft)	Departure (ft)
1	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.0
2	80.0	0.00	0.00	80.0	0.00	0.00	0.0	0.0
3	3786.0	0.00	0.00	3786.0	0.00	0.00	0.0	0.0
4	5827.0	0.00	0.00	5827.0	0.00	0.00	0.0	0.0
5	5990.0	0.00	0.00	5990.0	0.00	0.00	0.0	0.0
6	7921.0	0.00	0.00	7921.0	0.00	0.00	0.0	0.0
7	8042.0	0.00	0.00	8042.0	0.00	0.00	0.0	0.0
8	8127.0	0.00	0.00	8127.0	0.00	0.00	0.0	0.0
9	8192.0	0.00	0.00	8192.0	0.00	0.00	0.0	0.0
10	8477.0	0.00	0.00	8477.0	0.00	0.00	0.0	0.0
11	8488.0	0.00	0.00	8488.0	0.00	0.00	0.0	0.0
12	8500.0	0.00	0.00	8500.0	0.00	0.00	0.0	0.0

BURST PRESSURE PROFILES (7" Intermediate Casing)

	Depth (MD) (ft)	Pressure Test (psi)	Green Cement Pres.Test (Int) (psi)	Green Cement Pres. Test (Ext) (psi)	Drill Ahead (Burst) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	2500.00	1000.00	0.00	0.00	0.00
2	3786.0	4466.75	2966.75	2458.43	2025.75	1638.30
3	3786.0	4466.76	2966.76	2458.45	2025.76	1638.31
4	5990.0	5611.68	4111.68	3889.60	3205.03	2592.03
5	5990.0	5611.69	4111.69	3889.61	3205.04	2592.04
6	7921.0	6614.80	5114.80	5143.49	4238.24	3427.62
7	7921.0	6614.81	5114.81	5143.51	4238.25	3427.63

COLLAPSE PRESSURE PROFILES (7" Intermediate Casing)

	Depth (MD) (ft)	Full/Partial Evacuation (psi)	Cementing (Int) (psi)	Cementing (Ext) (psi)	Drill Ahead (Collapse) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	0.00	0.00	0.00	0.00	0.00
2	3786.0	2.00	1966.75	2458.43	1697.30	1966.75
3	3786.0	2.00	1966.76	2458.45	1697.31	1966.76
4	5477.0	2.95	2845.19	3556.49	2455.40	2845.19
5	5827.0	184.95	3027.00	3783.76	2612.31	3027.00
6	5827.0	184.96	3027.02	3783.77	2612.31	3027.02
7	5990.0	269.72	3111.68	3889.60	2685.38	3111.68
8	5990.0	269.73	3111.69	3889.61	2685.39	3111.69
9	7921.0	1273.87	4114.80	5143.49	3551.07	4114.80
10	7921.0	1273.88	4114.81	5143.51	3551.08	4114.81
11	8127.0	1381.00	4221.81	5277.26	3643.42	4221.81
12	8127.0	1381.01	4221.82	5277.27	3643.43	4221.82

AXIAL LOADS TABLE (7" Intermediate Casing)

	Depth (MD) (ft)	Running in Hole (lbf)		Overpull Force (lbf)		Pre-Cement Static Load (lbf)		Post-Cement Static Load (lbf)		Green Cement Pressure Test	
		Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)
1	0.0	274974	274974	306533	306533	206533	206533	165590	165590	195625	195625
2	3786.0	181798	181798	213357	213357	96740	96740	55796	55796	85831	85831
3	3786.0	181797	181797	213357	213357	96739	96739	55795	55795	85831	85831
4	5477.0	140181	140181	171740	171740	47700	47700	6757	6757	36792	36792
5	5827.0	131567	131567	163127	163127	37550	37550	-3393	-3393	26642	26642
6	5827.0	131567	131567	163126	163126	37550	37550	-3394	-3394	26642	26642
7	5990.0	127556	127556	159115	159115	32823	32823	-8120	-8120	21915	21915
8	5990.0	134585	134585	159115	159115	30122	30122	-10821	-10821	18346	18346
9	6563.0	119023	119023	143553	143553	11787	11787	-29157	-29157	10	10
10	6564.0	118996	118996	143525	143525	11755	11755	-29189	-29189	-22	-22
11	7921.0	82140	82140	106670	106670	-31669	-31669	-72613	-72613	-43445	-43445
12	7921.0	75110	75110	106669	106669	-28099	-28099	-69042	-69042	-39007	-39007
13	8127.0	70040	70040	101600	101600	-34072	-34072	-75015	-75015	-44980	-44980

MINIMUM SAFETY FACTORS (7" Intermediate Casing)

	Depth (MD) (ft)	OD/Weight/Grade	Connection	Minimum Safety Factor (Abs)			
				Burst	Collapse	Axial	Triaxial
1	0	7", 29.000 ppf, 13CR85	BEAR	3.26 B5 C	4.34 C2	2.21 A4 C	2.34 A4
2	3786			2.88 B5 C	3.55 C1	3.17 A4 C	3.12 A4
3	5477			2.74 B5 C	2.57 C1	3.94 A4 C	3.35 C1
4	5827			2.72 B5 C	2.57 C1	4.14 A4 C	3.37 C1
5	5990			2.70 B5 C	2.57 C1	4.25 A4 C	3.38 C1
6	5990	7", 32.000 ppf, 13CR85	BEAR	3.19 B5	3.17 C1	4.98 A4	3.71 C1
7	7921			3.02 B5	3.17 C1	7.42 A4	3.62 B5
8	7921	7", 29.000 ppf, 13CR85	BEAR	2.56 B5 C	2.57 C1	6.34 A4 C	3.28 B5
9	8127			2.55 B5 C	2.57 C1	6.65 A4 C	3.24 B5
10	8191			2.54 B5 C	2.57 C1	6.76 A4 C	3.23 B5
11	8192			2.54 B5 C	2.57 C1	6.76 A4 C	3.23 B5
12							
13	C	Connection Critical					
14	B5	Pressure Test					
15	C1	Full/Partial Evacuation					
16	C2	Cementing					

MAXIMUM ALLOWABLE WEAR (7" Intermediate Casing)

	Depth (MD)	OD/Weight/Grade	Remaining Wall Thickness (in)			Max. Wear (% of Wall Thick.)			Max. Wear (in)		
			Burst	Collapse	Triaxial	Burst	Collapse	Triaxial	Burst	Collapse	Triaxial
1	0.0	7", 29.000 ppf, 13CR8	0.155 B5	0.090 C2	0.211 A4	61.9	78.0	48.2	0.253	0.318	0.197
2	3786.0		0.176 B5	0.238 C1	0.150 A4	56.9	41.7	63.2	0.232	0.170	0.258
3	5477.0		0.185 B5	0.274 C1	0.146 C1	54.7	32.9	64.1	0.223	0.134	0.262
4	5827.0		0.187 B5	0.274 C1	0.145 C1	54.2	32.9	64.4	0.221	0.134	0.263
5	5990.0		0.188 B5	0.274 C1	0.145 C1	54.0	32.9	64.5	0.220	0.134	0.263
6	5990.0	7", 32.000 ppf, 13CR8	0.188 B5	0.274 C1	0.145 C1	58.6	39.6	68.0	0.265	0.179	0.308
7	7921.0		0.198 B5	0.274 C1	0.158 B5	56.3	39.6	65.0	0.255	0.179	0.295
8	7921.0	7", 29.000 ppf, 13CR8	0.198 B5	0.274 C1	0.157 B5	51.5	33.0	61.5	0.210	0.134	0.251
9	8127.0		0.199 B5	0.274 C1	0.159 B5	51.2	33.0	61.0	0.209	0.134	0.249
10	8191.0		0.199 B5	0.274 C1	0.160 B5	51.1	33.0	60.8	0.209	0.134	0.248
11	8192.0		0.199 B5	0.274 C1	0.160 B5	51.1	33.0	60.8	0.209	0.134	0.248
12											
13	B5	Pressure Test									
14	C1	Full/Partial Evacuatio									
15	C2	Cementing									

MAXIMUM ALLOWABLE OVERPULL (7" Intermediate Casing)

	Running Depth (MD) (ft)	Max. Overpull (lbf)
1	0	422500
2	271	415831
3	1000	419031
4	1536	421383
5	1792	447002
6	2000	441353
7	2202	435867
8	2202	363385
9	3000	343746
10	4000	319135
11	5000	294524
12	5990	270160
13	5990	270159
14	6000	269913
15	7000	245303
16	7921	222637
17	7921	222636
18	8000	220692

TRIAXIAL RESULTS (7" Intermediate Casing) - Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	209141	209141	0.0	3.36	3.26 C	N/A	3.23 C	60.00	2500.00	0.00	N/A	N/A
2	3786	117653	117653	0.0	3.70	2.88 C	N/A	5.75 C	113.45	4466.75	1638.30		
3	3786	117653	117653	0.0	3.70	2.88 C	N/A	5.75 C	113.45	4466.76	1638.31		
4	5477	76790	76790	0.0	3.62	2.74 C	N/A	8.80 C	137.32	5345.19	2370.04		
5	5827	68333	68333	0.0	3.58	2.72 C	N/A	9.89 C	142.26	5527.00	2521.49		
6	5827	68332	68332	0.0	3.58	2.72 C	N/A	9.89 C	142.26	5527.02	2521.50		
7	5990	64394	64394	0.0	3.57	2.70 C	N/A	10.50 C	144.56	5611.68	2592.03		
8	5990	60434	60434	0.0	3.93	3.19	N/A	13.10	144.56	5611.69	2592.04		
9	7921	7980	7980	0.0	3.62	3.02	N/A	99.25	171.83	6614.80	3427.62		
10	7921	12809	12809	0.0	3.28	2.56 C	N/A	52.78 C	171.83	6614.81	3427.63		
11	8127	7831	7831	0.0	3.24	2.55 C	N/A	86.32 C	174.73	6721.81	3516.77		
12	8127	7831	7831	0.0	3.24	2.55 C	N/A	86.32 C	174.73	6721.82	3516.78		
13	8192	6261	6261	0.0	3.23	2.54 C	N/A	+ 100.00	175.65	6755.58	3544.90		
14													
15	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Drill Ahead (Burst)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	N/A	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	68417	68417	0.0	9.55	21.06 C	N/A	9.88 C	117.94	2025.75	1638.30		
3	3786	68417	68417	0.0	9.55	21.06 C	N/A	9.88 C	117.94	2025.76	1638.31		
4	5477	52478	52478	0.0	10.71	14.56 C	N/A	12.88 C	125.45	2930.55	2370.04		
5	5827	49179	49179	0.0	10.90	13.68 C	N/A	13.75 C	127.00	3117.81	2521.49		
6	5827	49179	49179	0.0	10.90	13.68 C	N/A	13.75 C	127.00	3117.83	2521.50		
7	5990	47643	47643	0.0	10.97	13.31 C	N/A	14.19 C	127.72	3205.03	2592.03		
8	5990	47481	47481	0.0	11.73	15.70	N/A	16.68	127.72	3205.04	2592.04		
9	7921	26341	26341	0.0	12.34	11.88	N/A	30.07	136.29	4238.24	3427.62		
10	7921	24519	24519	0.0	11.70	10.07 C	N/A	27.57 C	136.29	4238.25	3427.63		
11	8127	22578	22578	0.0	11.62	9.81 C	N/A	29.94 C	137.21	4348.46	3516.77		
12	8127	22577	22577	0.0	11.62	9.81 C	N/A	29.94 C	137.21	4348.47	3516.78		
13	8192	21965	21965	0.0	11.59	9.73 C	N/A	30.78 C	137.50	4383.25	3544.90		
14													

TRIAXIAL RESULTS (7" Intermediate Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	195625	195625	0.0	4.02	8.16 C	N/A	3.46 C	100.24	1000.00	0.00	N/A	N/A
2	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.75	2458.43		
3	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.76	2458.45		
4	5477	36792	36792	0.0	11.72	28.26 C	N/A	18.37 C	123.75	3845.19	3556.49		
5	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.00	3783.76		
6	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.02	3783.77		
7	5990	21915	21915	0.0	14.27	36.74 C	N/A	30.85 C	125.96	4111.68	3889.60		
8	5990	18346	18346	0.0	15.73	43.35	N/A	43.17	125.96	4111.69	3889.61		
9	6563	10	10	0.0	21.55	65.19	N/A	+ 100.00	128.42	4409.35	4261.68		
10	6564	-22	-22	0.0	21.56	65.25	N/A	(+ 100.00)	128.42	4409.87	4262.33		
11	7921	-43445	-43445	0.0	+ 100.00	N/A	N/A	(14.59) C	134.24	5114.80	5143.49		
12	7921	-39007	-39007	0.0	+ 100.00	N/A	N/A	(13.87) C	134.24	5114.81	5143.51		
13	8127	-44980	-44980	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.81	5277.26		
14	8127	-44981	-44981	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.82	5277.27		
15	8192	-46866	-46866	0.0	+ 100.00	N/A	N/A	(11.54) C	135.41	5255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Full/Partial Evacuation

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	6.90	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	25831	25831	0.0	4.34	N/A	3.55	26.17 C	117.94	2.00	1966.75		
3	3786	25831	25831	0.0	4.34	N/A	3.55	26.17 C	117.94	2.00	1966.76		
4	5035	0	0	0.0	3.57	N/A	2.80	+ 100.00	123.49	2.70	2615.83		
5	5035	-0	-0	0.0	3.57	N/A	2.80	(+ 100.00)	123.49	2.70	2615.84		
6	5477	-9128	-9128	0.0	3.35	N/A	2.57	(59.27) C	125.45	2.95	2845.19		
7	5827	-13196	-13196	0.0	3.37	N/A	2.57	(41.00) C	127.00	184.95	3027.00		
8	5827	-13196	-13196	0.0	3.37	N/A	2.57	(41.00) C	127.00	184.96	3027.02		
9	5990	-15091	-15091	0.0	3.38	N/A	2.57	(35.85) C	127.72	269.72	3111.68		
10	5990	-13775	-13775	0.0	3.71	N/A	3.17	(46.02) C	127.72	269.73	3111.69		
11	7921	-39145	-39145	0.0	3.84	N/A	3.17	(16.20) C	136.29	1273.87	4114.80		
12	7921	-42460	-42460	0.0	3.51	N/A	2.57	(12.74) C	136.29	1273.88	4114.81		
13	8127	-44854	-44854	0.0	3.52	N/A	2.57	(12.06) C	137.21	1381.00	4221.81		
14	8127	-44854	-44854	0.0	3.52	N/A	2.57	(12.06) C	137.21	1381.01	4221.82		
15	8192	-45610	-45610	0.0	3.52	N/A	2.57	(11.86) C	137.50	1414.80	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Cementing

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	165590	165590	0.0	4.34	N/A	4.34	4.08 C	100.24	0.00	0.00	N/A	N/A
2	3786	55796	55796	0.0	7.40	N/A	7.40	12.12 C	116.50	1966.75	2458.43		
3	3786	55795	55795	0.0	7.40	N/A	7.40	12.12 C	116.50	1966.76	2458.45		
4	5477	6757	6757	0.0	9.57	N/A	8.57	+ 100.00	123.75	2845.19	3556.49		
5	5709	29	29	0.0	9.85	N/A	8.60	+ 100.00	124.75	2965.71	3707.14		
6	5710	-0	-0	0.0	9.85	N/A	8.60	(+ 100.00)	124.75	2966.23	3707.79		
7	5827	-3393	-3393	0.0	9.98	N/A	8.60	(+ 100.00)	125.26	3027.00	3783.76		
8	5827	-3394	-3394	0.0	9.98	N/A	8.60	(+ 100.00)	125.26	3027.02	3783.77		
9	5990	-8120	-8120	0.0	10.15	N/A	8.59	(66.63) C	125.96	3111.68	3889.60		
10	5990	-10821	-10821	0.0	11.20	N/A	10.34	(58.59) C	125.96	3111.69	3889.61		
11	7921	-72613	-72613	0.0	11.52	N/A	8.75	(8.73) C	134.24	4114.80	5143.49		
12	7921	-69042	-69042	0.0	10.44	N/A	7.11	(7.84) C	134.24	4114.81	5143.51		
13	8127	-75015	-75015	0.0	10.21	N/A	6.92	(7.21) C	135.13	4221.81	5277.26		
14	8127	-75016	-75016	0.0	10.21	N/A	6.92	(7.21) C	135.13	4221.82	5277.27		
15	8192	-76901	-76901	0.0	10.13	N/A	6.87	(7.04) C	135.41	4255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Drill Ahead (Collapse)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	6.90	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	55364	55364	0.0	8.75	N/A	8.75	12.21 C	117.94	1697.30	1966.75		
3	3786	55364	55364	0.0	8.75	N/A	8.75	12.21 C	117.94	1697.31	1966.76		
4	5477	33595	33595	0.0	9.70	N/A	9.70	20.12 C	125.45	2455.40	2845.19		
5	5827	29089	29089	0.0	9.89	N/A	9.84	23.24 C	127.00	2612.31	3027.00		
6	5827	29089	29089	0.0	9.89	N/A	9.84	23.24 C	127.00	2612.31	3027.02		
7	5990	26991	26991	0.0	9.98	N/A	9.89	25.05 C	127.72	2685.38	3111.68		
8	5990	27091	27091	0.0	10.68	N/A	10.68	29.23	127.72	2685.39	3111.69		
9	7878	0	0	0.0	11.99	N/A	11.74	+ 100.00	136.10	3531.63	4092.28		
10	7878	-0	-0	0.0	11.99	N/A	11.74	(+ 100.00)	136.10	3531.64	4092.29		
11	7921	-622	-622	0.0	12.01	N/A	11.75	(+ 100.00)	136.29	3551.07	4114.80		
12	7921	-2790	-2790	0.0	11.64	N/A	10.55	(+ 100.00)	136.29	3551.08	4114.81		
13	8127	-5442	-5442	0.0	11.72	N/A	10.51	(99.42) C	137.21	3643.42	4221.81		
14	8127	-5442	-5442	0.0	11.72	N/A	10.51	(99.41) C	137.21	3643.43	4221.82		
15	8192	-6279	-6279	0.0	11.75	N/A	10.50	(86.16) C	137.50	3672.57	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Running in Hole

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	274974	274974	0.0	2.61	N/A	N/A	2.46 C	100.24	0.00	0.00	N/A	N/A
2	3786	181798	181798	0.0	3.62	N/A	N/A	3.72 C	116.50	1966.75	1966.75		
3	3786	181797	181797	0.0	3.62	N/A	N/A	3.72 C	116.50	1966.76	1966.76		
4	5477	140181	140181	0.0	4.37	N/A	N/A	4.82 C	123.75	2845.19	2845.19		
5	5827	131567	131567	0.0	4.57	N/A	N/A	5.14 C	125.26	3027.00	3027.00		
6	5827	131567	131567	0.0	4.57	N/A	N/A	5.14 C	125.26	3027.02	3027.02		
7	5990	127556	127556	0.0	4.67	N/A	N/A	5.30 C	125.96	3111.68	3111.68		
8	5990	134585	134585	0.0	4.84	N/A	N/A	5.88	125.96	3111.69	3111.69		
9	7921	82140	82140	0.0	6.57	N/A	N/A	9.64	134.24	4114.80	4114.80		
10	7921	75110	75110	0.0	6.54	N/A	N/A	9.00 C	134.24	4114.81	4114.81		
11	8127	70040	70040	0.0	6.79	N/A	N/A	9.65 C	135.13	4221.81	4221.81		
12	8127	70040	70040	0.0	6.79	N/A	N/A	9.65 C	135.13	4221.82	4221.82		
13	8191	68465	68465	0.0	6.88	N/A	N/A	9.87 C	135.40	4255.06	4255.06		
14	8192	68440	68440	0.0	6.88	N/A	N/A	9.88 C	135.41	4255.58	4255.58		
15													

TRIAXIAL RESULTS (7" Intermediate Casing) - Overpull Force

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	306533	306533	0.0	2.34	N/A	N/A	2.21 C	100.24	0.00	0.00	N/A	N/A
2	3786	213357	213357	0.0	3.12	N/A	N/A	3.17 C	116.50	1966.75	1966.75		
3	3786	213357	213357	0.0	3.12	N/A	N/A	3.17 C	116.50	1966.76	1966.76		
4	5477	171740	171740	0.0	3.67	N/A	N/A	3.94 C	123.75	2845.19	2845.19		
5	5827	163127	163127	0.0	3.81	N/A	N/A	4.14 C	125.26	3027.00	3027.00		
6	5827	163126	163126	0.0	3.81	N/A	N/A	4.14 C	125.26	3027.02	3027.02		
7	5990	159115	159115	0.0	3.87	N/A	N/A	4.25 C	125.96	3111.68	3111.68		
8	5990	159115	159115	0.0	4.21	N/A	N/A	4.98	125.96	3111.69	3111.69		
9	7921	106670	106670	0.0	5.46	N/A	N/A	7.42	134.24	4114.80	4114.80		
10	7921	106669	106669	0.0	5.08	N/A	N/A	6.34 C	134.24	4114.81	4114.81		
11	8127	101600	101600	0.0	5.23	N/A	N/A	6.65 C	135.13	4221.81	4221.81		
12	8127	101599	101599	0.0	5.23	N/A	N/A	6.65 C	135.13	4221.82	4221.82		
13	8191	100025	100025	0.0	5.28	N/A	N/A	6.76 C	135.40	4255.06	4255.06		
14	8192	100000	100000	0.0	5.28	N/A	N/A	6.76 C	135.41	4255.58	4255.58		
15													

TRIAXIAL RESULTS (7" Intermediate Casing) - Pre-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	206533	206533	0.0	3.48	N/A	N/A	3.27 C	100.24	0.00	0.00	N/A	N/A
2	3786	96740	96740	0.0	6.34	N/A	N/A	6.99 C	116.50	1966.75	1966.75		
3	3786	96739	96739	0.0	6.34	N/A	N/A	6.99 C	116.50	1966.76	1966.76		
4	5477	47700	47700	0.0	10.01	N/A	N/A	14.17 C	123.75	2845.19	2845.19		
5	5827	37550	37550	0.0	11.38	N/A	N/A	18.00 C	125.26	3027.00	3027.00		
6	5827	37550	37550	0.0	11.38	N/A	N/A	18.00 C	125.26	3027.02	3027.02		
7	5990	32823	32823	0.0	12.15	N/A	N/A	20.60 C	125.96	3111.68	3111.68		
8	5990	30122	30122	0.0	13.40	N/A	N/A	26.29	125.96	3111.69	3111.69		
9	6931	11	11	0.0	23.60	N/A	N/A	+ 100.00	129.99	3600.52	3600.52		
10	6932	-21	-21	0.0	23.62	N/A	N/A	(+ 100.00)	130.00	3601.04	3601.04		
11	7921	-31669	-31669	0.0	+ 100.00	N/A	N/A	(20.02) C	134.24	4114.80	4114.80		
12	7921	-28099	-28099	0.0	+ 100.00	N/A	N/A	(19.25) C	134.24	4114.81	4114.81		
13	8127	-34072	-34072	0.0	+ 100.00	N/A	N/A	(15.88) C	135.13	4221.81	4221.81		
14	8127	-34073	-34073	0.0	+ 100.00	N/A	N/A	(15.88) C	135.13	4221.82	4221.82		
15	8192	-35957	-35957	0.0	+ 100.00	N/A	N/A	(15.05) C	135.41	4255.58	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Post-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	165590	165590	0.0	4.34	N/A	N/A	4.08 C	60.00	0.00	0.00	N/A	N/A
2	3786	55796	55796	0.0	7.40	N/A	N/A	12.12 C	113.45	1966.75	2458.43		
3	3786	55795	55795	0.0	7.40	N/A	N/A	12.12 C	113.45	1966.76	2458.45		
4	5477	6757	6757	0.0	9.57	N/A	N/A	+ 100.00	137.32	2845.19	3556.49		
5	5709	29	29	0.0	9.85	N/A	N/A	+ 100.00	140.60	2965.71	3707.14		
6	5710	-0	-0	0.0	9.85	N/A	N/A	(+ 100.00)	140.61	2966.23	3707.79		
7	5827	-3393	-3393	0.0	9.98	N/A	N/A	(+ 100.00)	142.26	3027.00	3783.76		
8	5827	-3394	-3394	0.0	9.98	N/A	N/A	(+ 100.00)	142.26	3027.02	3783.77		
9	5990	-8120	-8120	0.0	10.15	N/A	N/A	(66.63) C	144.56	3111.68	3889.60		
10	5990	-10821	-10821	0.0	11.20	N/A	N/A	(58.59) C	144.56	3111.69	3889.61		
11	7921	-72613	-72613	0.0	11.52	N/A	N/A	(8.73) C	171.83	4114.80	5143.49		
12	7921	-69042	-69042	0.0	10.44	N/A	N/A	(7.84) C	171.83	4114.81	5143.51		
13	8127	-75015	-75015	0.0	10.21	N/A	N/A	(7.21) C	174.73	4221.81	5277.26		
14	8127	-75016	-75016	0.0	10.21	N/A	N/A	(7.21) C	174.73	4221.82	5277.27		
15	8192	-76901	-76901	0.0	10.13	N/A	N/A	(7.04) C	175.65	4255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	195625	195625	0.0	4.02	8.16 C	N/A	3.46 C	100.24	1000.00	0.00	N/A	N/A
2	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.75	2458.43		
3	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.76	2458.45		
4	5477	36792	36792	0.0	11.72	28.26 C	N/A	18.37 C	123.75	3845.19	3556.49		
5	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.00	3783.76		
6	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.02	3783.77		
7	5990	21915	21915	0.0	14.27	36.74 C	N/A	30.85 C	125.96	4111.68	3889.60		
8	5990	18346	18346	0.0	15.73	43.35	N/A	43.17	125.96	4111.69	3889.61		
9	6563	10	10	0.0	21.55	65.19	N/A	+ 100.00	128.42	4409.35	4261.68		
10	6564	-22	-22	0.0	21.56	65.25	N/A	(+ 100.00)	128.42	4409.87	4262.33		
11	7921	-43445	-43445	0.0	+ 100.00	N/A	N/A	(14.59) C	134.24	5114.80	5143.49		
12	7921	-39007	-39007	0.0	+ 100.00	N/A	N/A	(13.87) C	134.24	5114.81	5143.51		
13	8127	-44980	-44980	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.81	5277.26		
14	8127	-44981	-44981	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.82	5277.27		
15	8192	-46866	-46866	0.0	+ 100.00	N/A	N/A	(11.54) C	135.41	5255.58	5319.48		
16													
17	C	Conn Critical											

WELL SUMMARY

	String	OD/Weight/Grade	Connection	MD Interval (ft)	Drift Dia. (in)	Minimum Safety Factor (Abs)				Design Cost ($)
						Burst	Collapse	Axial	Triaxial	
1	Conductor Casing	16", 65.000 ppf, H-40	N/A	0.0-80.0	15.063	N/A	18.41	4.07	2.11	1,820
2										Total = 1,820
3										
4	Surface Casing	9 5/8", 36.000 ppf, J-55	STC, J-55	0.0-3786.0	8.765	1.64	1.24	1.79 J	1.89	52,133
5										Total = 52,133
6										
7	Intermediate Casing	7", 29.000 ppf, 13CR85	BEAR	0.0-5990.0	6.059	2.70 C	2.57	2.21 C	2.34	132,953
8		7", 32.000 ppf, 13CR85	BEAR	5990.0-7921.0	6.000 A	3.02	3.17	4.98	3.62	46,449
9		7", 29.000 ppf, 13CR85	BEAR	7921.0-8192.0	6.059	2.54 C	2.57	6.34 C	3.23	6,015
10										Total = 185,417
11										
12	Production Liner	4 1/2", 12.600 ppf, 13CR80	Vam Top	8042.0-8488.0	3.833	8.43 C	2.04	5.24 C	2.61	4,708
13										Total = 4,708
14										
15										Total = 244,078
16	J Conn Jump Out									
17	C Conn Critical									

DEVIATION PROFILE

	MD (ft)	INC (°)	AZ (°)	TVD (ft)	DLS (°/100ft)	Max DLS (°/100ft)	Vsection (ft)	Departure (ft)
1	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.0
2	80.0	0.00	0.00	80.0	0.00	0.00	0.0	0.0
3	3786.0	0.00	0.00	3786.0	0.00	0.00	0.0	0.0
4	5827.0	0.00	0.00	5827.0	0.00	0.00	0.0	0.0
5	5990.0	0.00	0.00	5990.0	0.00	0.00	0.0	0.0
6	7921.0	0.00	0.00	7921.0	0.00	0.00	0.0	0.0
7	8042.0	0.00	0.00	8042.0	0.00	0.00	0.0	0.0
8	8127.0	0.00	0.00	8127.0	0.00	0.00	0.0	0.0
9	8192.0	0.00	0.00	8192.0	0.00	0.00	0.0	0.0
10	8477.0	0.00	0.00	8477.0	0.00	0.00	0.0	0.0
11	8488.0	0.00	0.00	8488.0	0.00	0.00	0.0	0.0
12	8500.0	0.00	0.00	8500.0	0.00	0.00	0.0	0.0

BURST PRESSURE PROFILES (7" Intermediate Casing)

	Depth (MD) (ft)	Pressure Test (psi)	Green Cement Pres.Test (Int) (psi)	Green Cement Pres. Test (Ext) (psi)	Drill Ahead (Burst) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	2500.00	1000.00	0.00	0.00	0.00
2	3786.0	4466.75	2966.75	2458.43	2025.75	1638.30
3	3786.0	4466.76	2966.76	2458.45	2025.76	1638.31
4	5990.0	5611.68	4111.68	3889.60	3205.03	2592.03
5	5990.0	5611.69	4111.69	3889.61	3205.04	2592.04
6	7921.0	6614.80	5114.80	5143.49	4238.24	3427.62
7	7921.0	6614.81	5114.81	5143.51	4238.25	3427.63

COLLAPSE PRESSURE PROFILES (7" Intermediate Casing)

	Depth (MD) (ft)	Full/Partial Evacuation (psi)	Cementing (Int) (psi)	Cementing (Ext) (psi)	Drill Ahead (Collapse) (psi)	Fluid Gradients w/ Pore Press (psi)
1	0.0	0.00	0.00	0.00	0.00	0.00
2	3786.0	2.00	1966.75	2458.43	1697.30	1966.75
3	3786.0	2.00	1966.76	2458.45	1697.31	1966.76
4	5477.0	2.95	2845.19	3556.49	2455.40	2845.19
5	5827.0	184.95	3027.00	3783.76	2612.31	3027.00
6	5827.0	184.96	3027.02	3783.77	2612.31	3027.02
7	5990.0	269.72	3111.68	3889.60	2685.38	3111.68
8	5990.0	269.73	3111.69	3889.61	2685.39	3111.69
9	7921.0	1273.87	4114.80	5143.49	3551.07	4114.80
10	7921.0	1273.88	4114.81	5143.51	3551.08	4114.81
11	8127.0	1381.00	4221.81	5277.26	3643.42	4221.81
12	8127.0	1381.01	4221.82	5277.27	3643.43	4221.82

AXIAL LOADS TABLE (7" Intermediate Casing)

	Depth (MD) (ft)	Running in Hole (lbf)		Overpull Force (lbf)		Pre-Cement Static Load (lbf)		Post-Cement Static Load (lbf)		Green Cement Pressure Test	
		Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)	Apparent (w/Bending)	Actual (w/o Bending)
1	0.0	274974	274974	306533	306533	206533	206533	165590	165590	195625	195625
2	3786.0	181798	181798	213357	213357	96740	96740	55796	55796	85831	85831
3	3786.0	181797	181797	213357	213357	96739	96739	55795	55795	85831	85831
4	5477.0	140181	140181	171740	171740	47700	47700	6757	6757	36792	36792
5	5827.0	131567	131567	163127	163127	37550	37550	-3393	-3393	26642	26642
6	5827.0	131567	131567	163126	163126	37550	37550	-3394	-3394	26642	26642
7	5990.0	127556	127556	159115	159115	32823	32823	-8120	-8120	21915	21915
8	5990.0	134585	134585	159115	159115	30122	30122	-10821	-10821	18346	18346
9	6563.0	119023	119023	143553	143553	11787	11787	-29157	-29157	10	10
10	6564.0	118996	118996	143525	143525	11755	11755	-29189	-29189	-22	-22
11	7921.0	82140	82140	106670	106670	-31669	-31669	-72613	-72613	-43445	-43445
12	7921.0	75110	75110	106669	106669	-28099	-28099	-69042	-69042	-39007	-39007
13	8127.0	70040	70040	101600	101600	-34072	-34072	-75015	-75015	-44980	-44980

MINIMUM SAFETY FACTORS (7" Intermediate Casing)

	Depth (MD) (ft)	OD/Weight/Grade	Connection	Minimum Safety Factor (Abs)			
				Burst	Collapse	Axial	Triaxial
1	0	7", 29.000 ppf, 13CR85	BEAR	3.26 B5 C	4.34 C2	2.21 A4 C	2.34 A4
2	3786			2.88 B5 C	3.55 C1	3.17 A4 C	3.12 A4
3	5477			2.74 B5 C	2.57 C1	3.94 A4 C	3.35 C1
4	5827			2.72 B5 C	2.57 C1	4.14 A4 C	3.37 C1
5	5990			2.70 B5 C	2.57 C1	4.25 A4 C	3.38 C1
6	5990	7", 32.000 ppf, 13CR85	BEAR	3.19 B5	3.17 C1	4.98 A4	3.71 C1
7	7921			3.02 B5	3.17 C1	7.42 A4	3.62 B5
8	7921	7", 29.000 ppf, 13CR85	BEAR	2.56 B5 C	2.57 C1	6.34 A4 C	3.28 B5
9	8127			2.55 B5 C	2.57 C1	6.65 A4 C	3.24 B5
10	8191			2.54 B5 C	2.57 C1	6.76 A4 C	3.23 B5
11	8192			2.54 B5 C	2.57 C1	6.76 A4 C	3.23 B5
12							
13	C	Connection Critical					
14	B5	Pressure Test					
15	C1	Full/Partial Evacuation					
16	C2	Cementing					

MAXIMUM ALLOWABLE WEAR (7" Intermediate Casing)

	Depth (MD)	OD/Weight/Grade	Remaining Wall Thickness (in)			Max. Wear (% of Wall Thick.)			Max. Wear (in)		
			Burst	Collapse	Triaxial	Burst	Collapse	Triaxial	Burst	Collapse	Triaxial
1	0.0	7", 29.000 ppf, 13CR8	0.155 B5	0.090 C2	0.211 A4	61.9	78.0	48.2	0.253	0.318	0.197
2	3786.0		0.176 B5	0.238 C1	0.150 A4	56.9	41.7	63.2	0.232	0.170	0.258
3	5477.0		0.185 B5	0.274 C1	0.146 C1	54.7	32.9	64.1	0.223	0.134	0.262
4	5827.0		0.187 B5	0.274 C1	0.145 C1	54.2	32.9	64.4	0.221	0.134	0.263
5	5990.0		0.188 B5	0.274 C1	0.145 C1	54.0	32.9	64.5	0.220	0.134	0.263
6	5990.0	7", 32.000 ppf, 13CR8	0.188 B5	0.274 C1	0.145 C1	58.6	39.6	68.0	0.265	0.179	0.308
7	7921.0		0.198 B5	0.274 C1	0.158 B5	56.3	39.6	65.0	0.255	0.179	0.295
8	7921.0	7", 29.000 ppf, 13CR8	0.198 B5	0.274 C1	0.157 B5	51.5	33.0	61.5	0.210	0.134	0.251
9	8127.0		0.199 B5	0.274 C1	0.159 B5	51.2	33.0	61.0	0.209	0.134	0.249
10	8191.0		0.199 B5	0.274 C1	0.160 B5	51.1	33.0	60.8	0.209	0.134	0.248
11	8192.0		0.199 B5	0.274 C1	0.160 B5	51.1	33.0	60.8	0.209	0.134	0.248
12											
13	B5	Pressure Test									
14	C1	Full/Partial Evacuatio									
15	C2	Cementing									

MAXIMUM ALLOWABLE OVERPULL (7" Intermediate Casing)

	Running Depth (MD) (ft)	Max. Overpull (lbf)
1	0	422500
2	271	415831
3	1000	419031
4	1536	421383
5	1792	447002
6	2000	441353
7	2202	435867
8	2202	363385
9	3000	343746
10	4000	319135
11	5000	294524
12	5990	270160
13	5990	270159
14	6000	269913
15	7000	245303
16	7921	222637
17	7921	222636
18	8000	220692

TRIAXIAL RESULTS (7" Intermediate Casing) - Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	209141	209141	0.0	3.36	3.26 C	N/A	3.23 C	60.00	2500.00	0.00	N/A	N/A
2	3786	117653	117653	0.0	3.70	2.88 C	N/A	5.75 C	113.45	4466.75	1638.30		
3	3786	117653	117653	0.0	3.70	2.88 C	N/A	5.75 C	113.45	4466.76	1638.31		
4	5477	76790	76790	0.0	3.62	2.74 C	N/A	8.80 C	137.32	5345.19	2370.04		
5	5827	68333	68333	0.0	3.58	2.72 C	N/A	9.89 C	142.26	5527.00	2521.49		
6	5827	68332	68332	0.0	3.58	2.72 C	N/A	9.89 C	142.26	5527.02	2521.50		
7	5990	64394	64394	0.0	3.57	2.70 C	N/A	10.50 C	144.56	5611.68	2592.03		
8	5990	60434	60434	0.0	3.93	3.19	N/A	13.10	144.56	5611.69	2592.04		
9	7921	7980	7980	0.0	3.62	3.02	N/A	99.25	171.83	6614.80	3427.62		
10	7921	12809	12809	0.0	3.28	2.56 C	N/A	52.78 C	171.83	6614.81	3427.63		
11	8127	7831	7831	0.0	3.24	2.55 C	N/A	86.32 C	174.73	6721.81	3516.77		
12	8127	7831	7831	0.0	3.24	2.55 C	N/A	86.32 C	174.73	6721.82	3516.78		
13	8192	6261	6261	0.0	3.23	2.54 C	N/A	+ 100.00	175.65	6755.58	3544.90		
14													
15	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Drill Ahead (Burst)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	N/A	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	68417	68417	0.0	9.55	21.06 C	N/A	9.88 C	117.94	2025.75	1638.30		
3	3786	68417	68417	0.0	9.55	21.06 C	N/A	9.88 C	117.94	2025.76	1638.31		
4	5477	52478	52478	0.0	10.71	14.56 C	N/A	12.88 C	125.45	2930.55	2370.04		
5	5827	49179	49179	0.0	10.90	13.68 C	N/A	13.75 C	127.00	3117.81	2521.49		
6	5827	49179	49179	0.0	10.90	13.68 C	N/A	13.75 C	127.00	3117.83	2521.50		
7	5990	47643	47643	0.0	10.97	13.31 C	N/A	14.19 C	127.72	3205.03	2592.03		
8	5990	47481	47481	0.0	11.73	15.70	N/A	16.68	127.72	3205.04	2592.04		
9	7921	26341	26341	0.0	12.34	11.88	N/A	30.07	136.29	4238.24	3427.62		
10	7921	24519	24519	0.0	11.70	10.07 C	N/A	27.57 C	136.29	4238.25	3427.63		
11	8127	22578	22578	0.0	11.62	9.81 C	N/A	29.94 C	137.21	4348.46	3516.77		
12	8127	22577	22577	0.0	11.62	9.81 C	N/A	29.94 C	137.21	4348.47	3516.78		
13	8192	21965	21965	0.0	11.59	9.73 C	N/A	30.78 C	137.50	4383.25	3544.90		
14													

TRIAXIAL RESULTS (7" Intermediate Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	195625	195625	0.0	4.02	8.16 C	N/A	3.46 C	100.24	1000.00	0.00	N/A	N/A
2	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.75	2458.43		
3	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.76	2458.45		
4	5477	36792	36792	0.0	11.72	28.26 C	N/A	18.37 C	123.75	3845.19	3556.49		
5	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.00	3783.76		
6	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.02	3783.77		
7	5990	21915	21915	0.0	14.27	36.74 C	N/A	30.85 C	125.96	4111.68	3889.60		
8	5990	18346	18346	0.0	15.73	43.35	N/A	43.17	125.96	4111.69	3889.61		
9	6563	10	10	0.0	21.55	65.19	N/A	+ 100.00	128.42	4409.35	4261.68		
10	6564	-22	-22	0.0	21.56	65.25	N/A	(+ 100.00)	128.42	4409.87	4262.33		
11	7921	-43445	-43445	0.0	+ 100.00	N/A	N/A	(14.59) C	134.24	5114.80	5143.49		
12	7921	-39007	-39007	0.0	+ 100.00	N/A	N/A	(13.87) C	134.24	5114.81	5143.51		
13	8127	-44980	-44980	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.81	5277.26		
14	8127	-44981	-44981	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.82	5277.27		
15	8192	-46866	-46866	0.0	+ 100.00	N/A	N/A	(11.54) C	135.41	5255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Full/Partial Evacuation

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	6.90	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	25831	25831	0.0	4.34	N/A	3.55	26.17 C	117.94	2.00	1966.75		
3	3786	25831	25831	0.0	4.34	N/A	3.55	26.17 C	117.94	2.00	1966.76		
4	5035	0	0	0.0	3.57	N/A	2.80	+ 100.00	123.49	2.70	2615.83		
5	5035	-0	-0	0.0	3.57	N/A	2.80	(+ 100.00)	123.49	2.70	2615.84		
6	5477	-9128	-9128	0.0	3.35	N/A	2.57	(59.27) C	125.45	2.95	2845.19		
7	5827	-13196	-13196	0.0	3.37	N/A	2.57	(41.00) C	127.00	184.95	3027.00		
8	5827	-13196	-13196	0.0	3.37	N/A	2.57	(41.00) C	127.00	184.96	3027.02		
9	5990	-15091	-15091	0.0	3.38	N/A	2.57	(35.85) C	127.72	269.72	3111.68		
10	5990	-13775	-13775	0.0	3.71	N/A	3.17	(46.02) C	127.72	269.73	3111.69		
11	7921	-39145	-39145	0.0	3.84	N/A	3.17	(16.20) C	136.29	1273.87	4114.80		
12	7921	-42460	-42460	0.0	3.51	N/A	2.57	(12.74) C	136.29	1273.88	4114.81		
13	8127	-44854	-44854	0.0	3.52	N/A	2.57	(12.06) C	137.21	1381.00	4221.81		
14	8127	-44854	-44854	0.0	3.52	N/A	2.57	(12.06) C	137.21	1381.01	4221.82		
15	8192	-45610	-45610	0.0	3.52	N/A	2.57	(11.86) C	137.50	1414.80	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Cementing

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	165590	165590	0.0	4.34	N/A	4.34	4.08 C	100.24	0.00	0.00	N/A	N/A
2	3786	55796	55796	0.0	7.40	N/A	7.40	12.12 C	116.50	1966.75	2458.43		
3	3786	55795	55795	0.0	7.40	N/A	7.40	12.12 C	116.50	1966.76	2458.45		
4	5477	6757	6757	0.0	9.57	N/A	8.57	+ 100.00	123.75	2845.19	3556.49		
5	5709	29	29	0.0	9.85	N/A	8.60	+ 100.00	124.75	2965.71	3707.14		
6	5710	-0	-0	0.0	9.85	N/A	8.60	(+ 100.00)	124.75	2966.23	3707.79		
7	5827	-3393	-3393	0.0	9.98	N/A	8.60	(+ 100.00)	125.26	3027.00	3783.76		
8	5827	-3394	-3394	0.0	9.98	N/A	8.60	(+ 100.00)	125.26	3027.02	3783.77		
9	5990	-8120	-8120	0.0	10.15	N/A	8.59	(66.63) C	125.96	3111.68	3889.60		
10	5990	-10821	-10821	0.0	11.20	N/A	10.34	(58.59) C	125.96	3111.69	3889.61		
11	7921	-72613	-72613	0.0	11.52	N/A	8.75	(8.73) C	134.24	4114.80	5143.49		
12	7921	-69042	-69042	0.0	10.44	N/A	7.11	(7.84) C	134.24	4114.81	5143.51		
13	8127	-75015	-75015	0.0	10.21	N/A	6.92	(7.21) C	135.13	4221.81	5277.26		
14	8127	-75016	-75016	0.0	10.21	N/A	6.92	(7.21) C	135.13	4221.82	5277.27		
15	8192	-76901	-76901	0.0	10.13	N/A	6.87	(7.04) C	135.41	4255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Drill Ahead (Collapse)

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	104103	104103	0.0	6.90	N/A	6.90	6.49 C	101.14	0.00	0.00	N/A	N/A
2	3786	55364	55364	0.0	8.75	N/A	8.75	12.21 C	117.94	1697.30	1966.75		
3	3786	55364	55364	0.0	8.75	N/A	8.75	12.21 C	117.94	1697.31	1966.76		
4	5477	33595	33595	0.0	9.70	N/A	9.70	20.12 C	125.45	2455.40	2845.19		
5	5827	29089	29089	0.0	9.89	N/A	9.84	23.24 C	127.00	2612.31	3027.00		
6	5827	29089	29089	0.0	9.89	N/A	9.84	23.24 C	127.00	2612.31	3027.02		
7	5990	26991	26991	0.0	9.98	N/A	9.89	25.05 C	127.72	2685.38	3111.68		
8	5990	27091	27091	0.0	10.68	N/A	10.68	29.23	127.72	2685.39	3111.69		
9	7878	0	0	0.0	11.99	N/A	11.74	+ 100.00	136.10	3531.63	4092.28		
10	7878	-0	-0	0.0	11.99	N/A	11.74	(+ 100.00)	136.10	3531.64	4092.29		
11	7921	-622	-622	0.0	12.01	N/A	11.75	(+ 100.00)	136.29	3551.07	4114.80		
12	7921	-2790	-2790	0.0	11.64	N/A	10.55	(+ 100.00)	136.29	3551.08	4114.81		
13	8127	-5442	-5442	0.0	11.72	N/A	10.51	(99.42) C	137.21	3643.42	4221.81		
14	8127	-5442	-5442	0.0	11.72	N/A	10.51	(99.41) C	137.21	3643.43	4221.82		
15	8192	-6279	-6279	0.0	11.75	N/A	10.50	(86.16) C	137.50	3672.57	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Running in Hole

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	274974	274974	0.0	2.61	N/A	N/A	2.46 C	100.24	0.00	0.00	N/A	N/A
2	3786	181798	181798	0.0	3.62	N/A	N/A	3.72 C	116.50	1966.75	1966.75		
3	3786	181797	181797	0.0	3.62	N/A	N/A	3.72 C	116.50	1966.76	1966.76		
4	5477	140181	140181	0.0	4.37	N/A	N/A	4.82 C	123.75	2845.19	2845.19		
5	5827	131567	131567	0.0	4.57	N/A	N/A	5.14 C	125.26	3027.00	3027.00		
6	5827	131567	131567	0.0	4.57	N/A	N/A	5.14 C	125.26	3027.02	3027.02		
7	5990	127556	127556	0.0	4.67	N/A	N/A	5.30 C	125.96	3111.68	3111.68		
8	5990	134585	134585	0.0	4.84	N/A	N/A	5.88	125.96	3111.69	3111.69		
9	7921	82140	82140	0.0	6.57	N/A	N/A	9.64	134.24	4114.80	4114.80		
10	7921	75110	75110	0.0	6.54	N/A	N/A	9.00 C	134.24	4114.81	4114.81		
11	8127	70040	70040	0.0	6.79	N/A	N/A	9.65 C	135.13	4221.81	4221.81		
12	8127	70040	70040	0.0	6.79	N/A	N/A	9.65 C	135.13	4221.82	4221.82		
13	8191	68465	68465	0.0	6.88	N/A	N/A	9.87 C	135.40	4255.06	4255.06		
14	8192	68440	68440	0.0	6.88	N/A	N/A	9.88 C	135.41	4255.58	4255.58		
15													

TRIAXIAL RESULTS (7" Intermediate Casing) - Overpull Force

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	306533	306533	0.0	2.34	N/A	N/A	2.21 C	100.24	0.00	0.00	N/A	N/A
2	3786	213357	213357	0.0	3.12	N/A	N/A	3.17 C	116.50	1966.75	1966.75		
3	3786	213357	213357	0.0	3.12	N/A	N/A	3.17 C	116.50	1966.76	1966.76		
4	5477	171740	171740	0.0	3.67	N/A	N/A	3.94 C	123.75	2845.19	2845.19		
5	5827	163127	163127	0.0	3.81	N/A	N/A	4.14 C	125.26	3027.00	3027.00		
6	5827	163126	163126	0.0	3.81	N/A	N/A	4.14 C	125.26	3027.02	3027.02		
7	5990	159115	159115	0.0	3.87	N/A	N/A	4.25 C	125.96	3111.68	3111.68		
8	5990	159115	159115	0.0	4.21	N/A	N/A	4.98	125.96	3111.69	3111.69		
9	7921	106670	106670	0.0	5.46	N/A	N/A	7.42	134.24	4114.80	4114.80		
10	7921	106669	106669	0.0	5.08	N/A	N/A	6.34 C	134.24	4114.81	4114.81		
11	8127	101600	101600	0.0	5.23	N/A	N/A	6.65 C	135.13	4221.81	4221.81		
12	8127	101599	101599	0.0	5.23	N/A	N/A	6.65 C	135.13	4221.82	4221.82		
13	8191	100025	100025	0.0	5.28	N/A	N/A	6.76 C	135.40	4255.06	4255.06		
14	8192	100000	100000	0.0	5.28	N/A	N/A	6.76 C	135.41	4255.58	4255.58		
15													

TRIAXIAL RESULTS (7" Intermediate Casing) - Pre-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	206533	206533	0.0	3.48	N/A	N/A	3.27 C	100.24	0.00	0.00	N/A	N/A
2	3786	96740	96740	0.0	6.34	N/A	N/A	6.99 C	116.50	1966.75	1966.75		
3	3786	96739	96739	0.0	6.34	N/A	N/A	6.99 C	116.50	1966.76	1966.76		
4	5477	47700	47700	0.0	10.01	N/A	N/A	14.17 C	123.75	2845.19	2845.19		
5	5827	37550	37550	0.0	11.38	N/A	N/A	18.00 C	125.26	3027.00	3027.00		
6	5827	37550	37550	0.0	11.38	N/A	N/A	18.00 C	125.26	3027.02	3027.02		
7	5990	32823	32823	0.0	12.15	N/A	N/A	20.60 C	125.96	3111.68	3111.68		
8	5990	30122	30122	0.0	13.40	N/A	N/A	26.29	125.96	3111.69	3111.69		
9	6931	11	11	0.0	23.60	N/A	N/A	+ 100.00	129.99	3600.52	3600.52		
10	6932	-21	-21	0.0	23.62	N/A	N/A	(+ 100.00)	130.00	3601.04	3601.04		
11	7921	-31669	-31669	0.0	+ 100.00	N/A	N/A	(20.02) C	134.24	4114.80	4114.80		
12	7921	-28099	-28099	0.0	+ 100.00	N/A	N/A	(19.25) C	134.24	4114.81	4114.81		
13	8127	-34072	-34072	0.0	+ 100.00	N/A	N/A	(15.88) C	135.13	4221.81	4221.81		
14	8127	-34073	-34073	0.0	+ 100.00	N/A	N/A	(15.88) C	135.13	4221.82	4221.82		
15	8192	-35957	-35957	0.0	+ 100.00	N/A	N/A	(15.05) C	135.41	4255.58	4255.58		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Post-Cement Static Load

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	165590	165590	0.0	4.34	N/A	N/A	4.08 C	60.00	0.00	0.00	N/A	N/A
2	3786	55796	55796	0.0	7.40	N/A	N/A	12.12 C	113.45	1966.75	2458.43		
3	3786	55795	55795	0.0	7.40	N/A	N/A	12.12 C	113.45	1966.76	2458.45		
4	5477	6757	6757	0.0	9.57	N/A	N/A	+ 100.00	137.32	2845.19	3556.49		
5	5709	29	29	0.0	9.85	N/A	N/A	+ 100.00	140.60	2965.71	3707.14		
6	5710	-0	-0	0.0	9.85	N/A	N/A	(+ 100.00)	140.61	2966.23	3707.79		
7	5827	-3393	-3393	0.0	9.98	N/A	N/A	(+ 100.00)	142.26	3027.00	3783.76		
8	5827	-3394	-3394	0.0	9.98	N/A	N/A	(+ 100.00)	142.26	3027.02	3783.77		
9	5990	-8120	-8120	0.0	10.15	N/A	N/A	(66.63) C	144.56	3111.68	3889.60		
10	5990	-10821	-10821	0.0	11.20	N/A	N/A	(58.59) C	144.56	3111.69	3889.61		
11	7921	-72613	-72613	0.0	11.52	N/A	N/A	(8.73) C	171.83	4114.80	5143.49		
12	7921	-69042	-69042	0.0	10.44	N/A	N/A	(7.84) C	171.83	4114.81	5143.51		
13	8127	-75015	-75015	0.0	10.21	N/A	N/A	(7.21) C	174.73	4221.81	5277.26		
14	8127	-75016	-75016	0.0	10.21	N/A	N/A	(7.21) C	174.73	4221.82	5277.27		
15	8192	-76901	-76901	0.0	10.13	N/A	N/A	(7.04) C	175.65	4255.58	5319.48		
16													
17	C	Conn Critical											

TRIAXIAL RESULTS (7" Intermediate Casing) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	0	195625	195625	0.0	4.02	8.16 C	N/A	3.46 C	100.24	1000.00	0.00	N/A	N/A
2	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.75	2458.43		
3	3786	85831	85831	0.0	7.37	16.05 C	N/A	7.88 C	116.50	2966.76	2458.45		
4	5477	36792	36792	0.0	11.72	28.26 C	N/A	18.37 C	123.75	3845.19	3556.49		
5	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.00	3783.76		
6	5827	26642	26642	0.0	13.35	33.55 C	N/A	25.37 C	125.26	4027.02	3783.77		
7	5990	21915	21915	0.0	14.27	36.74 C	N/A	30.85 C	125.96	4111.68	3889.60		
8	5990	18346	18346	0.0	15.73	43.35	N/A	43.17	125.96	4111.69	3889.61		
9	6563	10	10	0.0	21.55	65.19	N/A	+ 100.00	128.42	4409.35	4261.68		
10	6564	-22	-22	0.0	21.56	65.25	N/A	(+ 100.00)	128.42	4409.87	4262.33		
11	7921	-43445	-43445	0.0	+ 100.00	N/A	N/A	(14.59) C	134.24	5114.80	5143.49		
12	7921	-39007	-39007	0.0	+ 100.00	N/A	N/A	(13.87) C	134.24	5114.81	5143.51		
13	8127	-44980	-44980	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.81	5277.26		
14	8127	-44981	-44981	0.0	+ 100.00	N/A	N/A	(12.03) C	135.13	5221.82	5277.27		
15	8192	-46866	-46866	0.0	+ 100.00	N/A	N/A	(11.54) C	135.41	5255.58	5319.48		
16													
17	C	Conn Critical											

WELL SUMMARY

	String	OD/Weight/Grade	Connection	MD Interval (ft)	Drift Dia. (in)	Minimum Safety Factor (Abs) Burst	Collapse	Axial	Triaxial	Design Cost ($)
1	Conductor Casing	16", 65.000 ppf, H-40	N/A	0.0-80.0	15.063	N/A	18.41	4.07	2.11	1,820
2										Total = 1,820
3										
4	Surface Casing	9 5/8", 36.000 ppf, J-55	STC, J-55	0.0-3786.0	8.765	1.64	1.24	1.79 J	1.89	52,133
5										Total = 52,133
6										
7	Intermediate Casing	7", 29.000 ppf, 13CR85	BEAR	0.0-5990.0	6.059	2.70 C	2.57	2.21 C	2.34	132,953
8		7", 32.000 ppf, 13CR85	BEAR	5990.0-7921.0	6.000 A	3.02	3.17	4.98	3.62	46,449
9		7", 29.000 ppf, 13CR85	BEAR	7921.0-8192.0	6.059	2.54 C	2.57	6.34 C	3.23	6,015
10										Total = 185,417
11										
12	Production Liner	4 1/2", 12.600 ppf, 13CR80	Vam Top	8042.0-8488.0	3.833	8.43 C	2.04	5.24 C	2.61	4,708
13										Total = 4,708
14										
15										Total = 244,078
16	J Conn Jump Out									
17	C Conn Critical									

DEVIATION PROFILE

	MD (ft)	INC (°)	AZ (°)	TVD (ft)	DLS (°/100ft)	Max DLS (°/100ft)	Vsection (ft)	Departure (ft)
1	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.0
2	80.0	0.00	0.00	80.0	0.00	0.00	0.0	0.0
3	3786.0	0.00	0.00	3786.0	0.00	0.00	0.0	0.0
4	5827.0	0.00	0.00	5827.0	0.00	0.00	0.0	0.0
5	5990.0	0.00	0.00	5990.0	0.00	0.00	0.0	0.0
6	7921.0	0.00	0.00	7921.0	0.00	0.00	0.0	0.0
7	8042.0	0.00	0.00	8042.0	0.00	0.00	0.0	0.0
8	8127.0	0.00	0.00	8127.0	0.00	0.00	0.0	0.0
9	8192.0	0.00	0.00	8192.0	0.00	0.00	0.0	0.0
10	8477.0	0.00	0.00	8477.0	0.00	0.00	0.0	0.0
11	8488.0	0.00	0.00	8488.0	0.00	0.00	0.0	0.0
12	8500.0	0.00	0.00	8500.0	0.00	0.00	0.0	0.0

BURST PRESSURE PROFILES (4 1/2" Production Liner)

	Depth (MD) (ft)	Pressure Test (psi)	Green Cement Pres.Test (Int) (psi)	Green Cement Pres. Test (Ext) (psi)	Fluid Gradients w/ Pore Press (psi)
1	8042.0	4479.99	4479.99	3479.99	3479.99
2	8192.0	4544.89	4544.89	3603.10	3544.89
3	8192.0	4544.90	4544.90	3603.11	3544.90

COLLAPSE PRESSURE PROFILES (4 1/2" Production Liner)

	Depth (MD) (ft)	Full/Partial Evacuation (psi)	Cementing (Int) (psi)	Cementing (Ext) (psi)	Fluid Gradients w/ Pore Press (psi)
1	8042.0	4.32	3479.99	3479.99	3479.99
2	8192.0	4.42	3544.89	3603.10	3544.89
3	8192.0	4.42	3544.90	3603.11	3544.90

AXIAL LOADS TABLE (4 1/2" Production Liner)

	Depth (MD) (ft)	Running in Hole (lbf) Apparent (w/Bending)	Actual (w/o Bending)	Overpull Force (lbf) Apparent (w/Bending)	Actual (w/o Bending)	Service Loads (lbf) Apparent (w/Bending)	Actual (w/o Bending)
1	8042.0	34088	34088	54925	54925	-11783	-11783
2	8192.0	32432	32432	53269	53269	-12674	-12674
3	8192.0	32432	32432	53268	53268	-12674	-12674

MINIMUM SAFETY FACTORS (4 1/2" Production Liner)

	Depth (MD) (ft)	OD/Weight/Grade	Connection	Minimum Safety Factor (Abs)			
				Burst	Collapse	Axial	Triaxial
1	8042	4 1/2", 12.600 ppf, 13CR80	Vam Top	8.43 B5 C	2.16 C1	5.24 A4 C	2.74 C1
2	8192			8.43 B5 C	2.12 C1	5.41 A4 C	2.70 C1
3	8487			8.43 B5 C	2.05 C1	5.76 A4 C	2.61 C1
4	8488			8.43 B5 C	2.04 C1	5.76 A4 C	2.61 C1
5							
6	C	Connection Critical					
7	B5	Pressure Test					
8	C1	Full/Partial Evacuation					

MAXIMUM ALLOWABLE WEAR (4 1/2" Production Liner)

	Depth (MD)	OD/Weight/Grade	Remaining Wall Thickness (in)			Max. Wear (% of Wall Thick.)			Max. Wear (in)		
			Burst	Collapse	Triaxial	Burst	Collapse	Triaxial	Burst	Collapse	Triaxial
1	8042.0	4 1/2", 12.600 ppf, 13	0.035 B5	0.196 C1	0.119 C1	87.0	27.8	55.9	0.236	0.075	0.152
2	8192.0		0.035 B5	0.197 C1	0.121 C1	87.0	27.1	55.2	0.236	0.074	0.150
3	8487.1		0.035 B5	0.201 C1	0.125 C1	87.0	25.9	53.8	0.236	0.070	0.146
4	8488.0		0.035 B5	0.201 C1	0.125 C1	87.0	25.9	53.8	0.236	0.070	0.146
5											
6	B5	Pressure Test									

MAXIMUM ALLOWABLE OVERPULL (4 1/2" Production Liner)

	Running Depth (MD) (ft)	Max. Overpull (lbf)
1	0	221538
2	257	218698
3	446	216614
4	514	* 216720
5	772	* 217121
6	1000	* 217477
7	1029	* 217522
8	1286	* 217923
9	1543	* 218323
10	1800	* 218724
11	2000	* 219035
12	2058	* 219125
13	2315	* 219526
14	2572	* 219926
15	2829	* 220327
16	3000	* 220593
17	3087	* 220728
18	3344	* 221128
19	3601	* 221529
20	3858	* 221930
21	4000	* 222151
22	4115	* 222331
23	4373	* 222731
24	4630	* 223132
25	4887	* 223533
26	5000	* 223709
27	5144	* 223934
28	5401	* 224334
29	5659	* 224735
30	5916	* 225136
31	6000	* 225267
32	6173	* 225537
33	6430	* 225937
34	6688	* 226338
35	6945	* 226739
36	7000	* 226825
37	7202	* 227140
38	7459	* 227540
39	7716	* 227941
40	7974	* 228342
41	8000	* 228383
42	8042	* 228448
43	8231	* 228743
44	8488	* 229143
45		
46	* Based on Casing Strength	
47	Only. Running String not	

TRIAXIAL RESULTS (4 1/2" Production Liner) - Pressure Test

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	8042	-3221	-3221	0.0	10.39	8.43 C	N/A	(89.41) C	173.53	4479.99	3479.99	N/A	N/A
2	8192	-4574	-4574	0.0	10.34	8.43 C	N/A	(62.96) C	175.65	4544.89	3544.89		
3	8192	-4574	-4574	0.0	10.34	8.43 C	N/A	(62.96) C	175.65	4544.90	3544.90		
4	8488	-7244	-7244	0.0	10.19	8.43 C	N/A	(39.76) C	179.83	4672.99	3672.99		
5													
6	C	Conn Critical											

TRIAXIAL RESULTS (4 1/2" Production Liner) - Green Cement Pressure Test

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	8042	1946	1946	0.0	10.42	8.43 C	N/A	+ 100.00	136.75	4479.99	3479.99	N/A	N/A
2	8192	57	57	0.0	11.09	8.95 C	N/A	+ 100.00	137.42	4544.89	3603.10		
3	8192	56	56	0.0	11.09	8.95 C	N/A	+ 100.00	137.42	4544.90	3603.11		
4	8196	4	4	0.0	11.10	8.97 C	N/A	+ 100.00	137.43	4546.71	3606.54		
5	8197	-7	-7	0.0	11.11	8.97 C	N/A	(+ 100.00)	137.44	4547.09	3607.25		
6	8488	-3673	-3673	0.0	12.64	10.19 C	N/A	(78.41) C	138.73	4672.99	3846.06		
7													
8	C	Conn Critical											

TRIAXIAL RESULTS (4 1/2" Production Liner) - Full/Partial Evacuation

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	8042	-11783	-11783	0.0	2.74	N/A	2.16	(24.44) C	136.83	4.32	3479.99	N/A	N/A
2	8192	-12674	-12674	0.0	2.70	N/A	2.12	(22.72) C	137.50	4.42	3544.89		
3	8192	-12674	-12674	0.0	2.70	N/A	2.12	(22.72) C	137.50	4.42	3544.90		
4	8488	-14432	-14432	0.0	2.61	N/A	2.04	(19.96) C	138.81	4.60	3672.99		
5													
6	C	Conn Critical											

TRIAXIAL RESULTS (4 1/2" Production Liner) - Cementing

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	8042	-10357	-10357	0.0	+ 100.00	N/A	+ 100.00	(27.81) C	136.75	3479.99	3479.99	N/A	N/A
2	8043	-10368	-10368	0.0	+ 100.00	N/A	+ 100.00	(27.78) C	136.75	3480.37	3480.70		
3	8192	-12247	-12247	0.0	+ 100.00	N/A	+ 100.00	(23.52) C	137.42	3544.89	3603.10		
4	8192	-12248	-12248	0.0	+ 100.00	N/A	+ 100.00	(23.51) C	137.42	3544.90	3603.11		
5	8488	-15977	-15977	0.0	60.42	N/A	43.34	(18.03) C	138.73	3672.99	3846.06		
6													
7	C	Conn Critical											

TRIAXIAL RESULTS (4 1/2" Production Liner) - Running in Hole

	Depth (MD) (ft)	Axial Force (lbf) Apparent (w/Bending)	Axial Force (lbf) Actual (w/o Bending)	Bending Stress at OD (psi)	Absolute Safety Factor Triaxial	Burst	Collapse	Axial	Temperature (°F)	Pressure (psi) Internal	Pressure (psi) External	Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
1	8042	34088	34088	0.0	6.18	N/A	N/A	8.45 C	136.75	3479.99	3479.99	N/A	N/A
2	8192	32432	32432	0.0	6.37	N/A	N/A	8.88 C	137.42	3544.89	3544.89		
3	8192	32432	32432	0.0	6.37	N/A	N/A	8.88 C	137.42	3544.90	3544.90		
4	8487	29173	29173	0.0	6.79	N/A	N/A	9.87 C	138.72	3672.61	3672.61		
5	8488	29164	29164	0.0	6.80	N/A	N/A	9.88 C	138.73	3672.99	3672.99		
6													

TRIAXIAL RESULTS (4 1/2" Production Liner) - Overpull Force

	Depth (MD) (ft)	Axial Force (lbf)		Bending Stress at OD (psi)	Absolute Safety Factor				Temperature (°F)	Pressure (psi)		Addt'l Pickup To Prevent Buck. (lbf)	Buckled Length (ft)
		Apparent (w/Bending)	Actual (w/o Bending		Triaxial	Burst	Collapse	Axial		Internal	External		
1	8042	54925	54925	0.0	4.27	N/A	N/A	5.24 C	136.75	3479.99	3479.99	N/A	N/A
2	8192	53269	53269	0.0	4.36	N/A	N/A	5.41 C	137.42	3544.89	3544.89		
3	8192	53268	53268	0.0	4.36	N/A	N/A	5.41 C	137.42	3544.90	3544.90		
4	8487	50010	50010	0.0	4.56	N/A	N/A	5.76 C	138.72	3672.61	3672.61		
5	8488	50000	50000	0.0	4.56	N/A	N/A	5.76 C	138.73	3672.99	3672.99		
6													

Appendix A: Paradox Salt Drilling Proceudre

Twelve distinct shale bodies occur in the Paradox Salt formation. Most notably, shale numbers 4, 5 and 6, and their associated anhydrite, in the sequence of the Paradox Salt that has the potential for high H_2S content and tendency to stick pipe.

This section lies approximately 400'-500' into the Paradox and usually has a 20'-30' salt section between shale number 4 and 5. Because these shales are subject to plastic flow, to prevent sticking, the following procedure has worked in the past and is recommended.

Preparing to drill the Paradox Salt Formation

1. Test the BOPs on the last bit trip prior to drilling the Paradox Salt.
2. Pick up a set of mechanical drilling jars on the last bit trip prior to drilling into the Paradox.
3. Run a survey to the top of the salt. This will help to avoid shutting down while drilling the sticky shales.
4. Use the salt formation cross-section as an indicator for predicting where each of the shale bodies will be encountered. Shales number 4, 5 and 6 are considered to be the most troublesome.
5. Increase flow rate to an annular velocity of at least 200 ft/min. Limitations of the rig's hydraulic system should be considered when selecting bit nozzle sizes.

Drilling the Paradox Salt Formation

6. The Driller will hand drill the interval beginning at the top of the Paradox Salt and continue until all problem shales have been penetrated and normal conditions return.
7. Control drill the Paradox while noting the normal torque values for the salts. If there is any fluctuation in pump pressure or torque, pick up off bottom and ream until hole conditions stabilize. Drill a maximum of 5' of salt and 1'-2' of shale before picking up 15'- 20' and reaming to bottom slowly to clean the wellbore. The severity of torque, and increases in pump pressure, should dictate the interval lengths. Some portions of the hole may require drilling only a few inches before picking up and reaming.
8. After 1' to 2' of shale is penetrated, expect 50,000-100,000 lbs drag to free the bit initially. After freeing the bit, pick up 15'-20' and start reaming back to bottom. If the torque increases 20-30 ft-lb above normal, pick up and expect 25,000-50,000 lb drag.
9. On each joint down, have the Driller pick up two joints, then ream back to bottom. Reaming serves two purposes:
    a. It conditions the walls of the wellbore
    b. It allows for the cuttings to be carried away from the bit and collars before making a connection.
10. Pipe should be pulled and run slowly to avoid problems in the tight sections of the hole. Torque should dictate the frequency of the short trips. Periodic short trips through the entire salt section have proven useful in reducing high torque due to sticky shale.

At the present time, the key to drilling these sticky shales in the Paradox Salt is **PATIENCE.** It should be noted that good gas shows are also present in these shale stringers, and as the gas out of the sticky shales starts to subside, the hole starts to stabilize.

H2S CONTINGENCY PLAN

CB-4

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I. INTRODUCTION

H2S is a toxic, poisonous gas that could cause death or injury. The objective of this contingency plan is to provide an organized plan of action for alerting and protecting the public from H2S exposure in the event a potentially hazardous volume is accidentally released to the atmosphere. This plan should be activated immediately if any such release occurs. The Drilling Supervisor is responsible for initiating and carrying out the plan.

II. TRAINING PROGRAM

All personnel associated with the drilling operations will receive training to insure efficient and correct action in various potential situations. This training will be in the general areas of: (1) personnel safety, (2) rig operations, and (3) well control procedures.

A. Personnel Safety Training – All personnel shall have received H2S training in the following areas:

1. Hazards and characteristics of H2S.
2. Effect on metal components of the system.
3. Safety precautions.
4. Operation of safety equipment and life support systems.
5. Corrective action and shutdown procedures.

B. Rig Operations – All rig personnel shall have received training in the following areas:

1. Well control procedures.
2. Layout and operations of the well control equipment.

   NOTE: Proficiency will be developed through BOP drills which will be documented by the Drilling Superintendent.

C. Service Company Personnel – All service personnel shall have been trained by their employers in the hazards and characteristics of H2S and the operation of safety equipment and life support systems.

D. Visitors – All first time visitors to the location will be required to attend a safety orientation. The Drilling Superintendent shall be responsible for this orientation and he shall see that every visitor is logged in correctly.

E. Public – The public within the area of exposure shall be given an advance briefing by Kinder Morgan personnel or representative. This briefing must include the following elements:

1. Hazards and characteristics of hydrogen sulfide. It is an extremely dangerous gas. It is normally detectable by its "rotten egg" odor, but odor is not a reliable means of detection because the sense of smell may be dulled or lost due to intake of the gas. It is colorless, transparent, and flammable. It is heavier than air and may accumulate in low places.
2. The necessity of an emergency action plan. Due to the danger of persons exposed to hydrogen sulfide and the need for expeditious action should an emergency occur, this action plan will be put into effect if a leak occurs.
3. The location of hydrogen sulfide within the area of exposure at the drilling location.

4. The manner in which the public will be notified of an emergency is by telephone or in person.
5. Steps to be taken in case of an emergency:
    a. Abandon danger area.
    b. Notify necessary agencies and request assistance for controlling traffic and evacuating people.

III. SITE IDENTIFICATION

Operator Name:	Kinder Morgan
Well Name:	Cow Canyon B4 (CB-4)
Lat / Long:	37.56141 N / 108.92479 W
Legal Location:	949’ FSL & 906’ FEL S10, T38N, R19W NMPM
API Number:	TBD

IV. KEY PERSONNEL RESPONSIBILITIES

It is the responsibility of all personnel on the location to familiarize themselves with the procedures outlined in this contingency plan.

A. All Personnel

1. Are responsible for their assigned safety equipment.
2. Are responsible for familiarizing themselves with the location of all safety equipment.
3. Are responsible for reporting any indications of H2S to those in the area and to a supervisor.

B. Drilling Supervisor

1. Is responsible for thoroughly understanding and seeing that all aspects of this contingency plan are enforced.
2. Is responsible for implementing all phases of this contingency plan.
3. Is responsible for keeping a minimum of personnel on the location during expected hazardous operations.
4. Is responsible for coordinating all well site operations and communications in the event that an emergency condition develops.
5. Is responsible for ensuring that all visitors receive an H2S Safety Orientation. A visitor’s log will be maintained as well as a list of all personnel on the location after drilling has progressed to the suspected H2S formation.

V. RESCUE AND MANAGEMENT PERSONNEL

See Appendix A for the Emergency Contact List

VI. WELL SITE

A. Rig Layout and Equipment

There will be at least two pre-determined safe areas on location in the event of an emergency. These locations should be located 180 degrees to one another, and in the direction of the prevailing winds. See Appendix B.

B. Access, Egress and Roads

See Appendix B and C

C. PPE for Essential Personnel

The location and type of all air masks will remain the same for all drilling locations. Self-contained breathing apparatus for use by rig personnel will be kept in the following location(s):

Type: 1-30 Min. Rescue Unit	Location: Drilling Supervisor's Trailer
Type: 1-30 Min. Rescue Unit	Location: Tools Pusher's Trailer
Type: 2-30 Min. Rescue Units	Location: Briefing Area #1
Type: 2-30 Min. Rescue Units	Location: Briefing Area #2
Type: 5-5 Min. Escape Units	Location: Rig Floor

If a cascade system is utilized, indicate the locations(s):

Type:	Location:
Type:	Location:

Testing and calibration records are maintained on location.

D. H2S Detection and Monitoring Equipment

See Appendix D. The rig's H2S monitor contains three (3) heads. One located at the bell nipple, one located at the shale shaker, and one on the rig floor. Personal H2S monitors are worn by all personnel on location. Indicate here any other additional H2S detector locations for this well:

Type:	Location:
Type:	Location:

Testing and calibration records are maintained on location.

E. Visual Warning Systems

The location of windsocks or streamer will remain the same for all drilling locations. The wind direction indicators for this well will be located at:

Type: Windsock	Location: Briefing Area #1
Type: Windsock	Location: Briefing Area #2
Type: Windsock	Location: Pits
Type: Windsock	Location: Rig Floor

The location of any other safety equipment used, such as flare guns or bug blowers will be located at:

Type: Hand Held Detector & Tubes	Location: Rig Floor
Type:	Location:

Warning Signs:

1. Smoking will not be allowed on location except where indicated with a "SMOKING PERMITTED" designation.
2. "POISON GAS" signs will be located at the entrance to location.

NOTE: All warning signs should be black and yellow in color and of readable size at a reasonable distance.

F. Operating Conditions

Operating conditions are defined in three categories. A description of each of these conditions and the required action to take are given below.

CONDITION I - Normal Operating Conditions, Potential Danger, Operations Under Control

Characterized by:	Normal drilling operations and test operations in zones which contain or may contain H2S.
Warning Flag:	Green
Alarm:	None
Probable Occurrence:	No detectable gas present at surface.
General Action:	1. Know location of safety equipment. 2. Check safety equipment for proper function. Keep it available. 3. Be alert for a condition change. 4. Follow instructions of the supervisor.

CONDITION II - Potential to Moderate Danger to Life

Characterized by:	H2S gas present. Concentration less than 10 PPM.
Warning Flag:	Yellow
Alarm:	Flashing light at 10 PPM H2S. Intermittent blasts on horn at 10 PPM H2S.
Probable Occurrence:	1. As drill gas. 2. As trip gas when circulating bottoms up. 3. When a core barrel is pulled. 4. When a well kick is circulated out. 5. Surface pressure, well flow or lost returns. 6. Equipment failure during testing operations.
General Action:	1. Follow instructions of supervisor. 2. Put on breathing equipment if directed, or conditions warrant it. 3. Stay in "SAFE BRIEFING AREA" if instructed and not working to correct the problem.

4. The Drilling Supervisor will initiate action to reduce the H2S concentration to zero.

CONDITION III – Moderate to Extreme Danger to Life

Characterized by: H2S present in concentrations at or above 10 PPM. Critical well operations or well control problems. In the extreme, loss of well control.

Warning Flag: Red

Alarm: Flashing light and continuous blast on horn at 10 PPM H2S.

Probable Occurrence:
1. As drill gas.
2. As trip gas when circulating bottoms up.
3. When a core barrel is pulled.
4. When a well kick is circulated out.
5. Surface pressure, well flow or lost returns.
6. Equipment failure during testing operations.

General Action:
1. Put on breathing equipment. Move to "SAFE BRIEFING AREA" and remain there if not working to correct the problem.
2. Follow instructions of Drilling Supervisor or other supervisor.
3. The Drilling Supervisor will initiate emergency action as provided in the contingency plan and as appropriate to the actual conditions. If testing operations are in progress, the well will be shut in.
4. The Drilling Supervisor will conduct any necessary operations with an absolute minimum of personnel. All persons in the immediate area will wear a breathing apparatus. All other personnel will restrict their movements to those directed by the Drilling Supervisor.
5. If gas containing H2S is ignited, the burning H2S will be converted to sulfur dioxide (SO2), which is poisonous.

VIII. METALLURGY

When operating in a zone with H2S present, certain equipment will be used that is constructed of materials with metallurgical properties that resist or prevent sulfide stress cracking and other failure modes. The following will be in effect:

A. An effective means will be used for monitoring and controlling corrosion caused by acid gases (H2S and CO2) in both downhole and surface portions of a production system.

B. Metals used for sensing lines and safety control devices which are necessarily exposed to H2S bearing fluids must be constructed of H2S corrosion resistant materials or coated so as to resist H2S corrosion.

C. H2S resistant materials will be used for all elastomer seals.

Additionally because CO2 is produced from the reservoir, all materials exposed to the production stream are CO2 compliant.

VIII. WELL CONTROL

A. Equipment

See Appendix E

B. Testing and Inspection

Routine blowout preventer assembly pressure and operating tests shall be made:

1. following installation of assembly and prior to drilling out after each string of casing is set
2. at least monthly while drilling
3. prior to drilling into a known abnormally pressured section
4. following repairs or replacement that require disconnecting a pressure seal in the assembly
5. any other time deemed necessary by the Kinder Morgan Representative

Preventer operating tests will be performed on each round trip but not more than once per day.

IX. MUD PROGRAM

Hole Size:	8-3/4"
Mud Type:	Salt saturated brine
pH:	11+, as required to control H2S

Maximum salt concentration expected: 190,000 ppm

Problems: H2S, Paradox Salt Shale gas influx, hole cleaning

Displace the fresh water system with salt saturated brine 100' above the Desert Creek formation. Circulate through the closed loop system to maintain a clean fluid and to assist in breaking out any entrained gas. Pre-treat mud for H2S prior to drilling the P4 Shale.

Follow the guidelines for drilling the Paradox Salt Shale, titled "Paradox Salt Drilling Procedure", which is located in Appendix A of the drilling prognosis. The recommendations have proven to be very successful in recent drilling programs.

X. PROCEDURES

A. Operating

The following operating procedures will be utilized for drilling in areas with H2S.

1. Any gas kick will be controlled by using approved well control techniques. Upon evidence that ambient H2S concentrations have reached 10 PPM, all non-essential personnel will be evacuated to pre-determined safe areas. Personnel remaining on the rig floor will continue to control the well until the situation indicates the area is safe to re-enter.
2. Special Operations

a. Drill Stem Tests. All drill stem tests must be closed chamber and conducted during daylight hours.

b. Coring. After a core has been cut, circulate bottoms up and monitor for H2S. If hole conditions (and/or detectors) indicate potentially hazardous conditions, put breathing equipment on 10 stands before core barrel reaches the surface. Breathing equipment will be worn by all personnel while core barrel is pulled, broken out and opened up, and until a safe atmosphere is indicated.

B. Emergency

The procedures listed below apply to drilling and testing operations.

1. If at any time during Condition I, the Mud Logger, Mud Engineer, or any other person detects H2S, he will notify the Drilling Supervisor. All personnel should keep alert to the Drilling Supervisor's orders.

He will:

a. Immediately begin to ascertain the cause or the source of the H2S and take steps to reduce the H2S concentration to zero. This should include having the mud engineer run a sulfide and Ph determination on the flowline mud if water-base mud is in use. If an oil-base mud is in use, the Mud Engineer should check the lime content of the mud.

b. Order non-essential personnel out of the potential danger area.

c. Order all personnel to check their safety equipment to see that it is working properly and in the proper location. Persons without breathing equipment will not be allowed to work in a hazard area.

d. Notify the Rig Supervisor of the condition and action taken.

e. Increase gas monitoring activities with portable H2S detectors and continue operations with caution.

c. Display the orange warning flag.

2. If the H2S concentration exceeds 10 PPM the following steps **will** be taken:

a. Put on breathing equipment.

b. Display red flag.

c. Driller – prepare to shut the well in.

i. Ensure tool joint out of BOP's

ii. Close BOP's if necessary.

d. If testing operations are in progress, the well will be shut-in.

e. Help anyone who may be affected by gas.

f. Evacuate quickly to the "SAFE BRIEFING AREA" if instructed or conditions warrant.

3. In the event a potentially hazardous volume of H2S is released into the atmosphere, the following steps must be taken to alert the public:

a. Remove all rig personnel from the danger area and assemble at a pre-determined safe area, preferably upwind from the well site.
b. Alert the drilling office, public safety personnel, regulatory agencies, and the general public of the existence and location of an H2S release. See attached emergency contact list.
c. Assign personnel to block any public road (and access road to location) at the boundary of the area of exposure. Any unauthorized people within the area should be informed that an emergency exists and be ordered to leave immediately.
d. Request assistance from public safety personnel to control traffic and/or evacuate people from the threatened area.

H_2S Contingency Plan Emergency Contact List

Well Name: Cow Canyon B-4 (CB-4) API #: TBD

Date of Completion: Date of Release:

NAME	ADDRESS	PHONE	# RESIDENT	Relocated Yes/No	Comments
Public Safety		C: O: 911			
Montezuma County Sherriff		C: O: 970-565-8452			
Montezuma County Planner		C: O: 970-565-2801			
Steve Lebowski - COGCC Field Ops		C: 970-946-5073 O: 970-259-0945			
Dave Andrews - COGCC Engineer		C: 970-456-5262 O: 970-625-2497			
EPA National Response Center		C: O: 800-424-8802			
Poison Control Center		C: O: 800-222-1222			
Rod Brashear - BLM Engineer (Monument)		C: 970-799-1244 O: 970-385-1347			
Ryan Joyner - BLM Nat Resource Specialist		C: 970-799-6619 O: 970-385-1242			
Todd Gentles - KM Drilling Manager		C: 713-249-2805 O: 713-369-8487			

Notes:

Submit Completed Form to KM Drilling Engineer, Drilling Superintendant and Regulatory Manager

H_2S Contingency Plan Emergency Contact List

Well Name: Cow Canyon B-4 (CB-4) API #: TBD

Date of Completion: Date of Release:

NAME	ADDRESS	PHONE	# RESIDENT	Relocated Yes/No	Comments
Barry Swift - KM Engineering Manager		C: 432-638-6209 O: 970-882-5545			
Chris Lopez - KM Project Manager		C: 505-699-9832 O: 970-882-5537			
Valerie Cawthorn - KM Drilling Engineer		C: 281-798-8769 O: 713-369-8509			
		C: O:			
		C: H:			
		C: H:			
		C: H:			
		C: H:			
		C: H:			
		C: H:			

Notes:

Submit Completed Form to KM Drilling Engineer, Drilling Superintendant and Regulatory Manager

Page 2 of 2

H_2S Contingency Plan Emergency Contact List

Well Name: Cow Canyon B-4 (CB-4) API #: TBD

Date of Completion: Date of Release:

NAME	ADDRESS	PHONE	# RESIDENT	Relocated Yes/No	Comments
Barry Swift - KM Engineering Manager		C: 432-638-6209 O: 970-882-5545			
Chris Lopez - KM Project Manager		C: 505-699-9832 O: 970-882-5537			
Valerie Cawthorn - KM Drilling Engineer		C: 281-798-8769 O: 713-369-8509			
		C: O:			
		C: H:			
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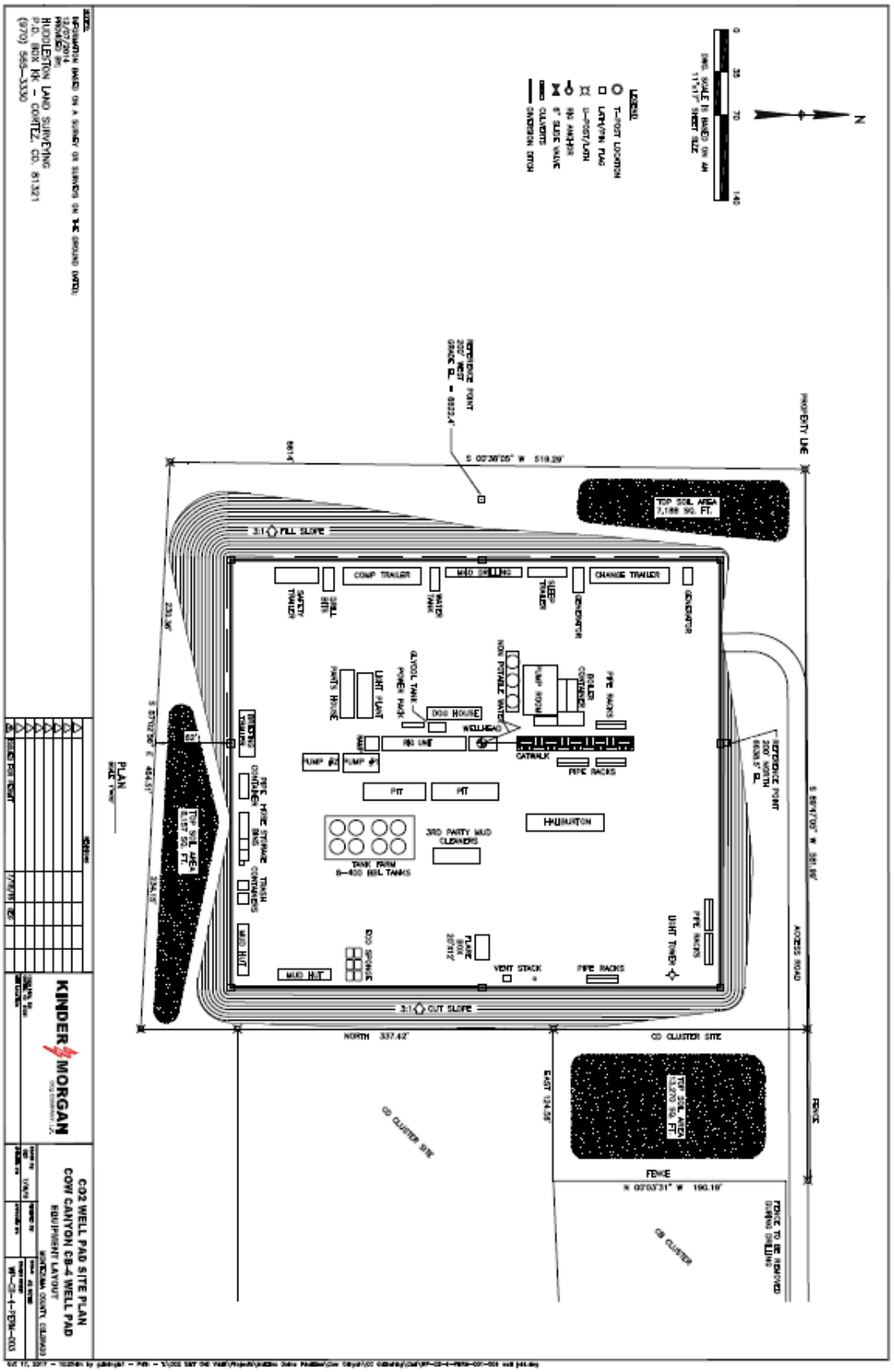
		C: H:			
		C: H:			
		C: H:			
		C: H:			

Notes:

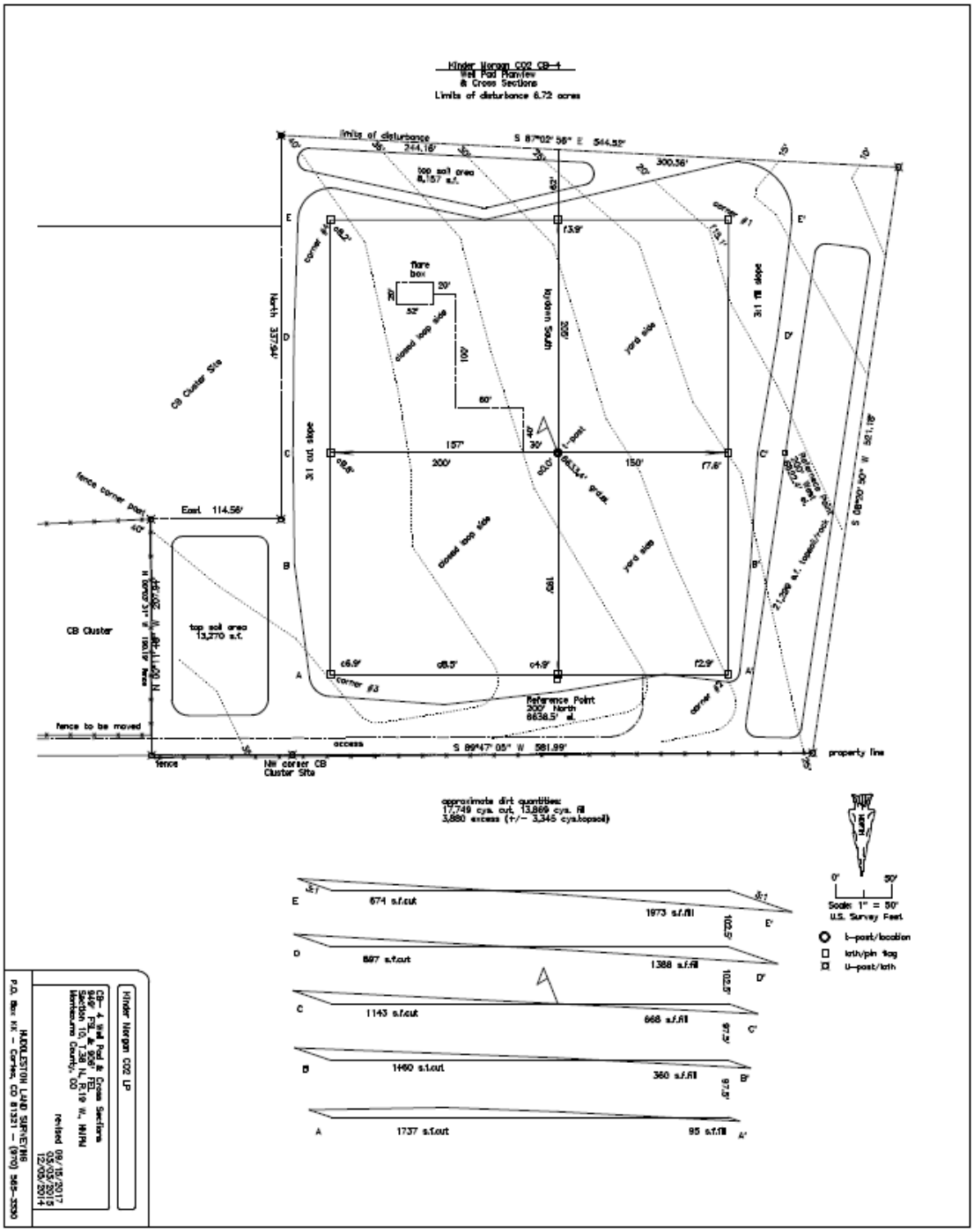
Submit Completed Form to KM Drilling Engineer, Drilling Superintendant and Regulatory Manager

Appendix B: Rig Layout and Equipment

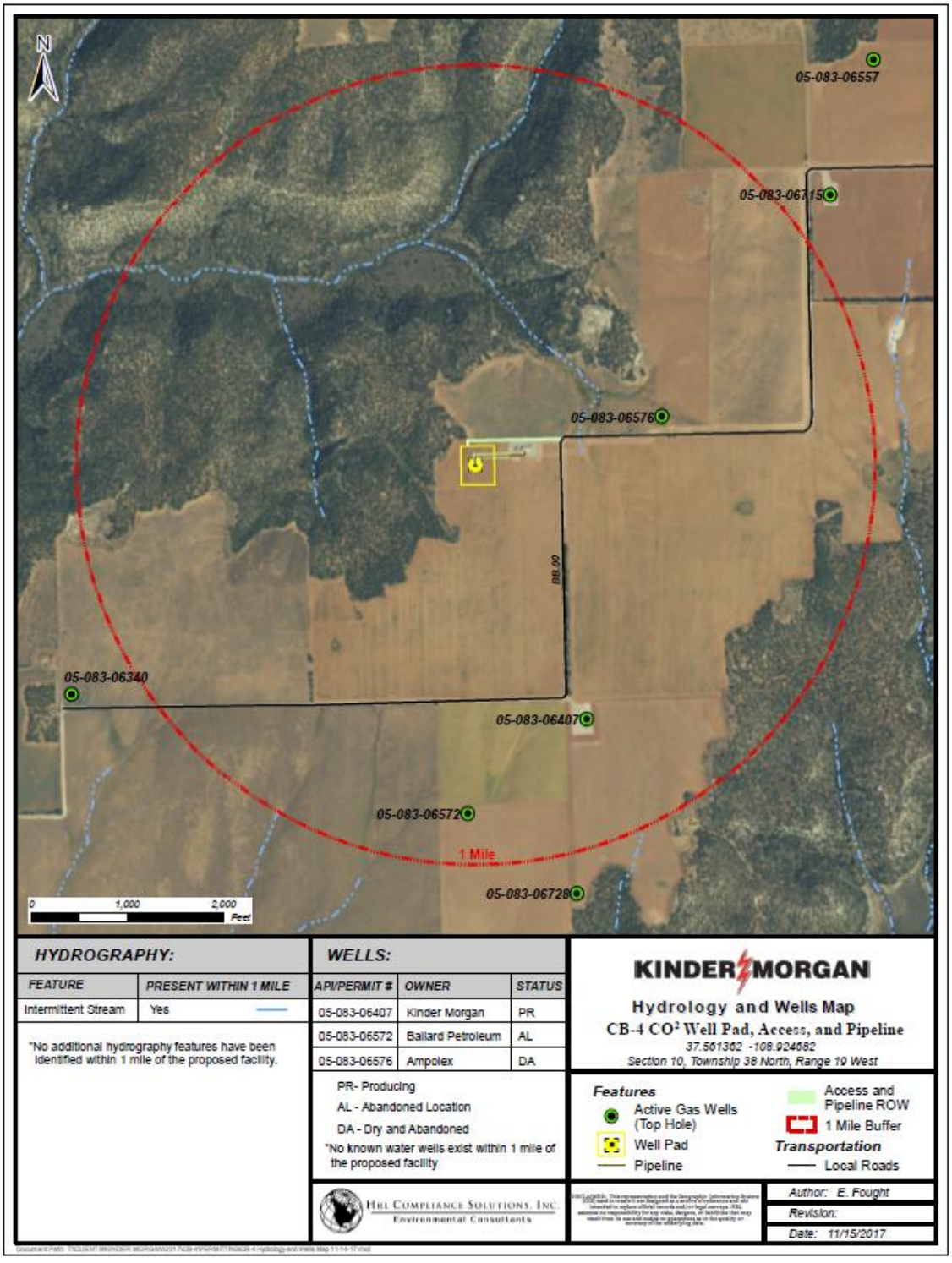


Appendix C: Access, Egress and Roads

Well Pad Map



Topographic Map



HYDROGRAPHY:

FEATURE	PRESENT WITHIN 1 MILE
Intermittent Stream	Yes

*No additional hydrography features have been identified within 1 mile of the proposed facility.

WELLS:

API/PERMIT #	OWNER	STATUS
05-083-06407	Kinder Morgan	PR
05-083-06572	Ballard Petroleum	AL
05-083-06576	Ampolex	DA

PR- Producing
AL - Abandoned Location
DA - Dry and Abandoned
*No known water wells exist within 1 mile of the proposed facility

HRL Compliance Solutions, Inc.
Environmental Consultants

KINDER MORGAN

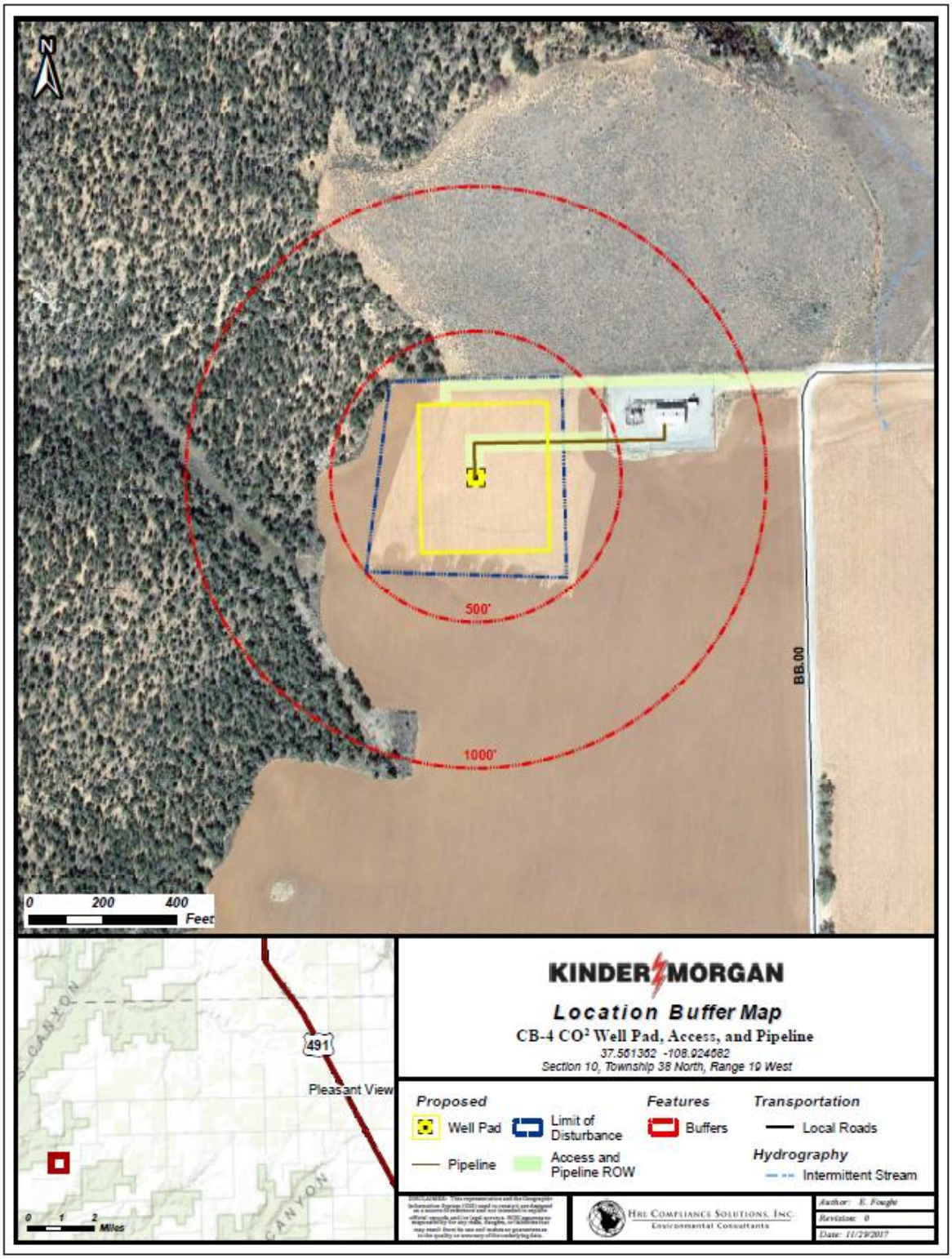
Hydrology and Wells Map
CB-4 CO^2 Well Pad, Access, and Pipeline
37.561362 -108.924662
Section 10, Township 38 North, Range 19 West

Features
Active Gas Wells (Top Hole)
Well Pad
Pipeline
Access and Pipeline ROW
1 Mile Buffer
Transportation
Local Roads

Author: E. Fought
Revision:
Date: 11/15/2017

Appendix D: Radius of Exposure

Location Map

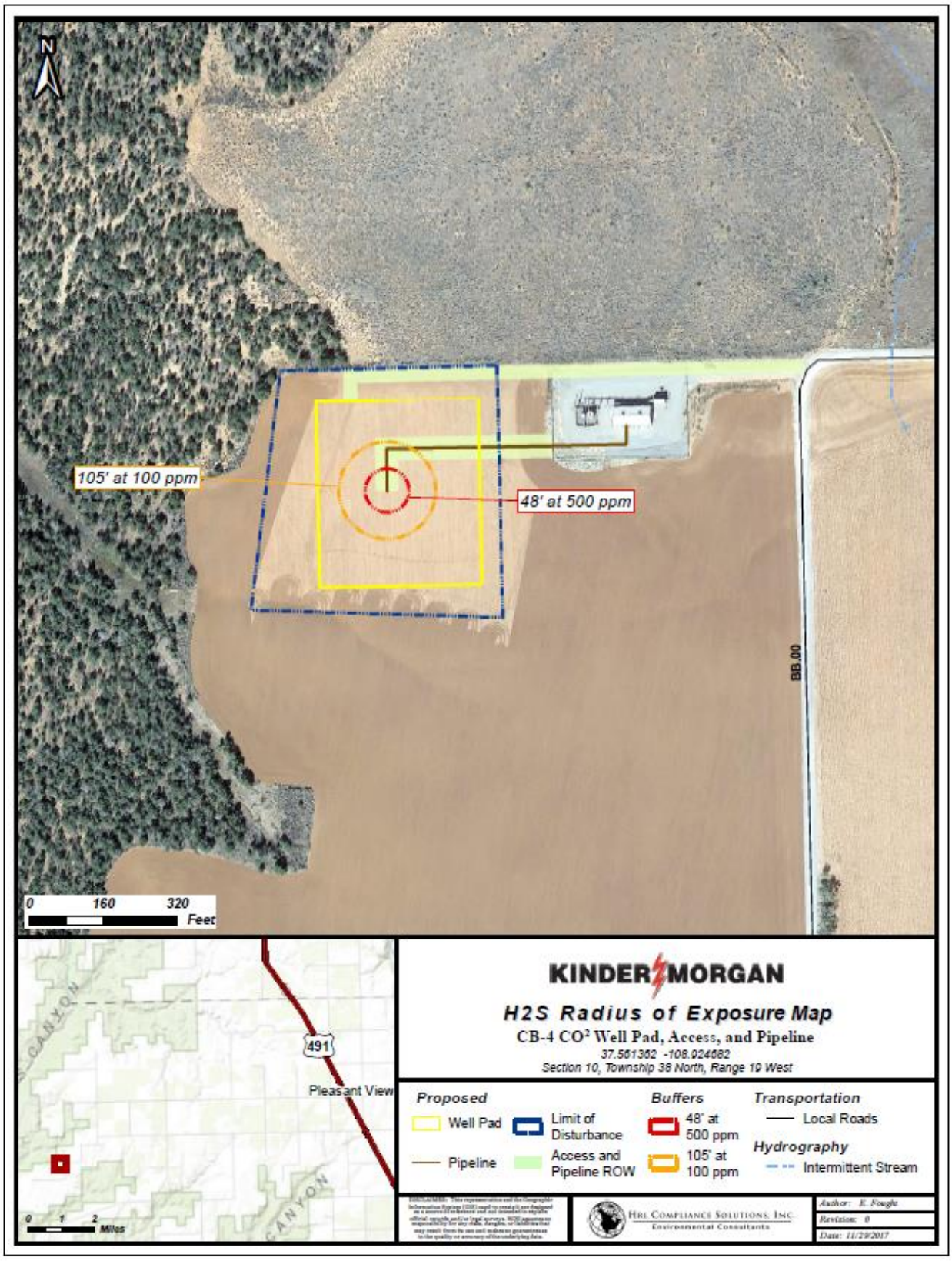


Pasquill-Gifford Model

CB-4

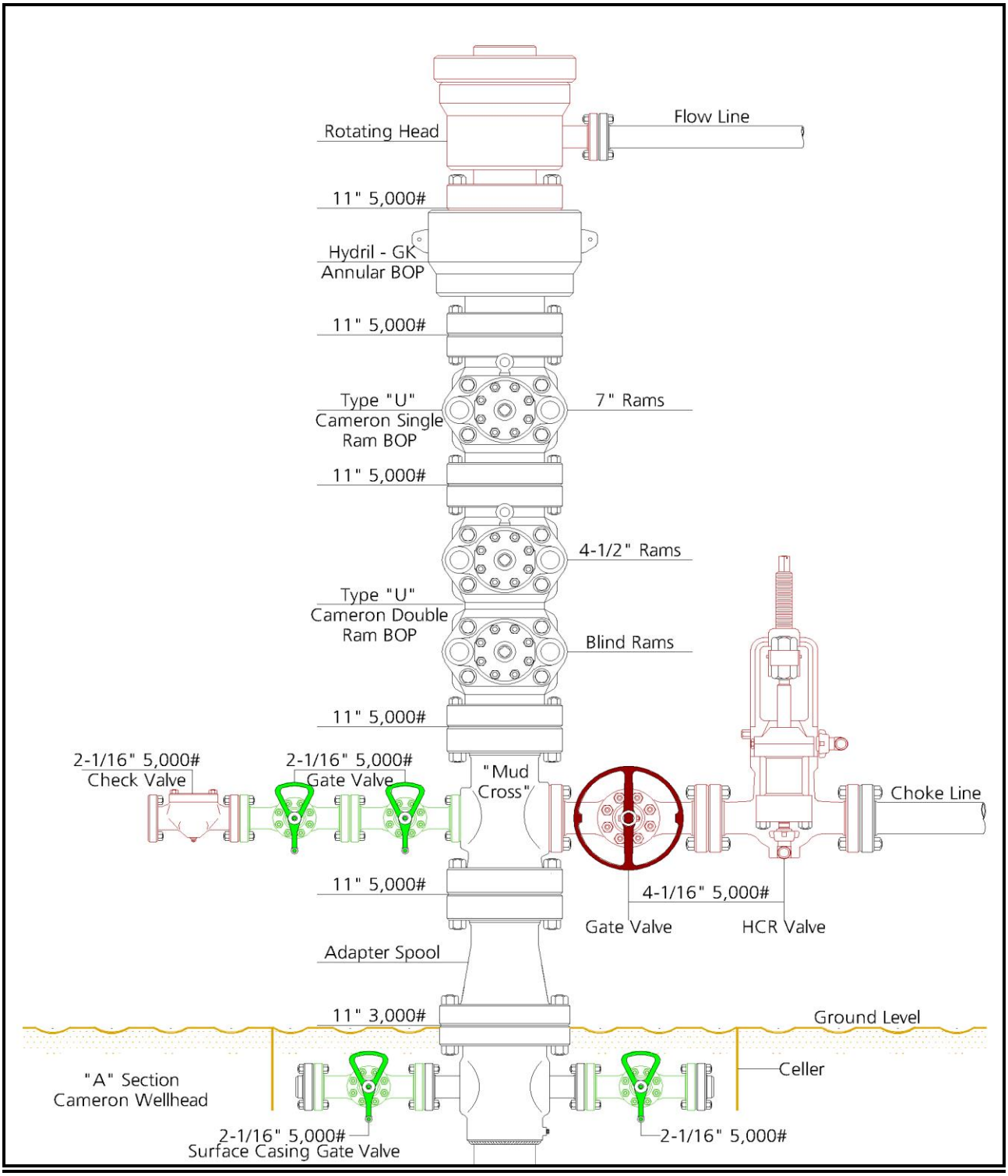
CB-4						
Scenario:	9/7/2017					
flow rate, Q, cubic feet/day:		1,066,000				
H2S, mole %:		0.10%				
feet to 100 ppm radius of exposure:		105				
feet to 500 ppm radius of exposure:		48				
100 ppm radius of exposure = [1.589(mole fraction H2S)(Q)] to the power of 0.6258, where Q is ft^3/day						
500 ppm radius of exposure = [0.4546(mole fraction H2S)(Q)] to the power of 0.6258, where Q is ft^3/day						

Radius of Exposure Map

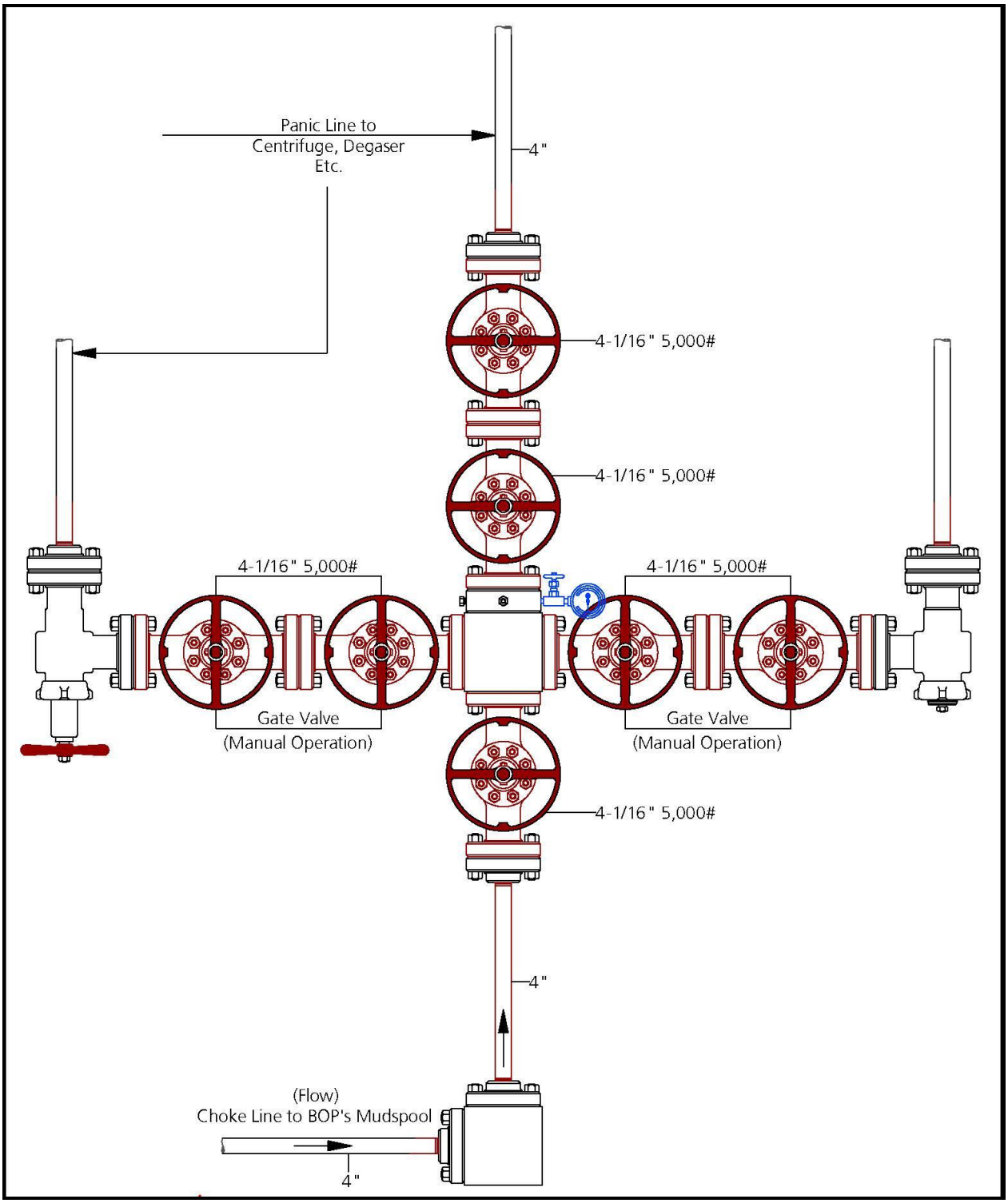


Appendix E: Well Control Equipment

Blowout Preventer



Choke Manifold



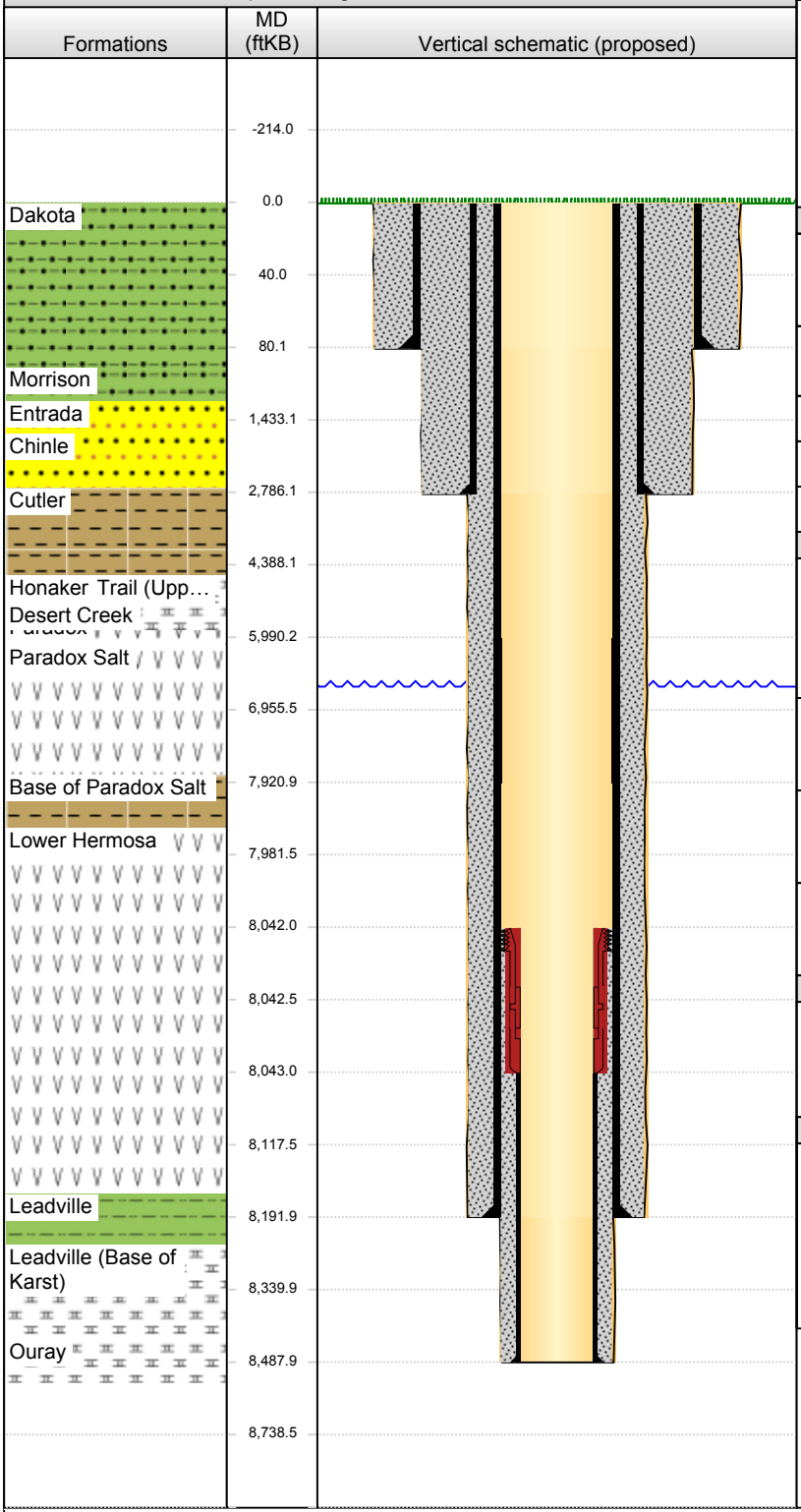
Drilling Prognosis

Well Name: Cow Canyon B #4
Well Configuration Type: Vertical
Account Category/Property ID:
Surface Location: 949' FSL & 906' FEL, SEC 10, T 38 N, R 19 W, NMPM
Latitude (°): 37.56141 **Longitude (°):** -108.92479
County: Montezuma **State:** Colorado

Field Name: McELMO DOME
API/UWI:
Objective: Leadville
Bottom Hole Location: 949' FSL & 906' FEL, SEC 10, T 38 N, R 19 W, NMPM
Datum: NAD 27 **Estimated KB Elevation (ft):** 6,633.40 **Ground Elevation (ft):** 6,633.4

A FOCUSED EFFORT WILL BE EXPECTED BY ALL PARTIES TO ELIMINATE ANY/ALL ACCIDENTS DURING THE EXECUTION OF THIS DRILLING PROJECT. H2S IS ANTICIPATED WHILE DRILLING THE PARADOX SALTS

Vertical - Proposed Original Hole, 11/28/2017 12:27:48 PM



DRILLING PROCEDURE: (add KB to measurements below)

Objective

16" conductor pipe will be set at ~80' prior to moving in the drilling rig.
A 12-1/4" hole drilled from surface to 2786' TVD/MD, ~100' below the top of the Cutler, set 9-5/8" casing run to 2786' with cement to surface.
An 8-3/4" hole drilled out from surface casing point to 7" casing point at 8192' TVD/MD. Run 7" 13-Chrome casing set ~25' into the Leadville.
A 6" production hole will be drilled out from the 7" casing point to ~400' below the Leadville Top. Production will be logged from TD to ~500 inside the 7" shoe. After logging, a 4 1/2" 13-Chrome liner will be run and cemented.

CASING/CEMENTING DETAILS:

Comment

9-5/8" 36# J-55 STC => 0'-2786' TVD/MD
Cement: Conventional => Lead 800sx Light + Tail 300sx Class G + Displacement ~200bbls Fresh Water

Comment

7" 29# 13CR BEAR => 0'-5990' TVD/MD (100' above top of Paradox Salt)
Cement: Lead 900sx + Tail 590 sx

Comment

7" 32# 13CR BEAR => 5990'-7921' TVD/MD (run to 100' below Base Salt)

Comment

7" 29# 13CR BEAR => 7921'-8192' TVD/MD (run to TD)

Comment

4-1/2" 12.6# CR13 VAMTOP => 8042'-8488' TVD/MD

DRILLING FLUIDS:

Description	Comment
12-1/4" Surface (9 5/8" Casing Point)	Spud 12-1/4" surface hole with spud mud and circulate. Use paper for seepage and LCM sweeps for lost circulation problems. Pump viscous sweeps if tight connections are encountered and prior to running the 9 -5/8" casing.
8-3/4" (100' above Desert Creek)	Drill out of the 9-5/8" casing with clean spud mud and circulate. Sweep for hole cleaning or lost circulation problems and use paper for seepage.
8-3/4" (25' into Leadville top/7" Casing Point)	Displace the spud mud system with salt saturated brine 100' above the Desert Creek formation. Pre-treat mud for H2S prior to drilling the P4 Shale.
6" Production Hole	During the pilot hole drill, fresh water will be treated so that the Cl2 content is ~20,000ppm. Do not use LCM.

SURVEY INFORMATION:

Comment

500' intervals from spud to the 9-5/8" casing point
~1000' intervals from below the 9-5/8" casing point to the top of the Paradox Salt
No surveys within the Paradox Salt formation
500' intervals from below the Paradox Salt to 7" casing point

EVALUATION PROGRAM:

Evaluation Program

6" Production Hole:
1st run dual laterolog
2nd run triple combo, monopole sonic
Cased Hole:
1st run GR, pulse neutron log from 7" casing shoe to 9-5/8" casing shoe
2nd run GR, CBL over 7" casing
3rd run GR, CBL over 4-1/2" liner

Objectives:
1. Maintain a focused effort by everyone on location to eliminate all accidents.
2. Drill, evaluate, case and complete the well at or under AFE cost estimate.
3. Run the 7" 13-Chrome production casing to ~25' TVD into the Leadville formation.
4. Isolate the 7" 13-Chrome to surface with high quality cement.
5. Run the 4 1/2" 13- Chrome liner through the Leadville formation.
6. Isolate the 4-1/2" 13-Chrome liner with high quality cement.

Drilling Prognosis

Well Name: Cow Canyon B #4
Well Configuration Type: Vertical
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Surface Location: 949' FSL & 906' FEL, SEC 10, T 38 N, R 19 W, NMPM
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County: Montezuma **State:** Colorado

Field Name: McELMO DOME
API/UWI:
Objective: Leadville
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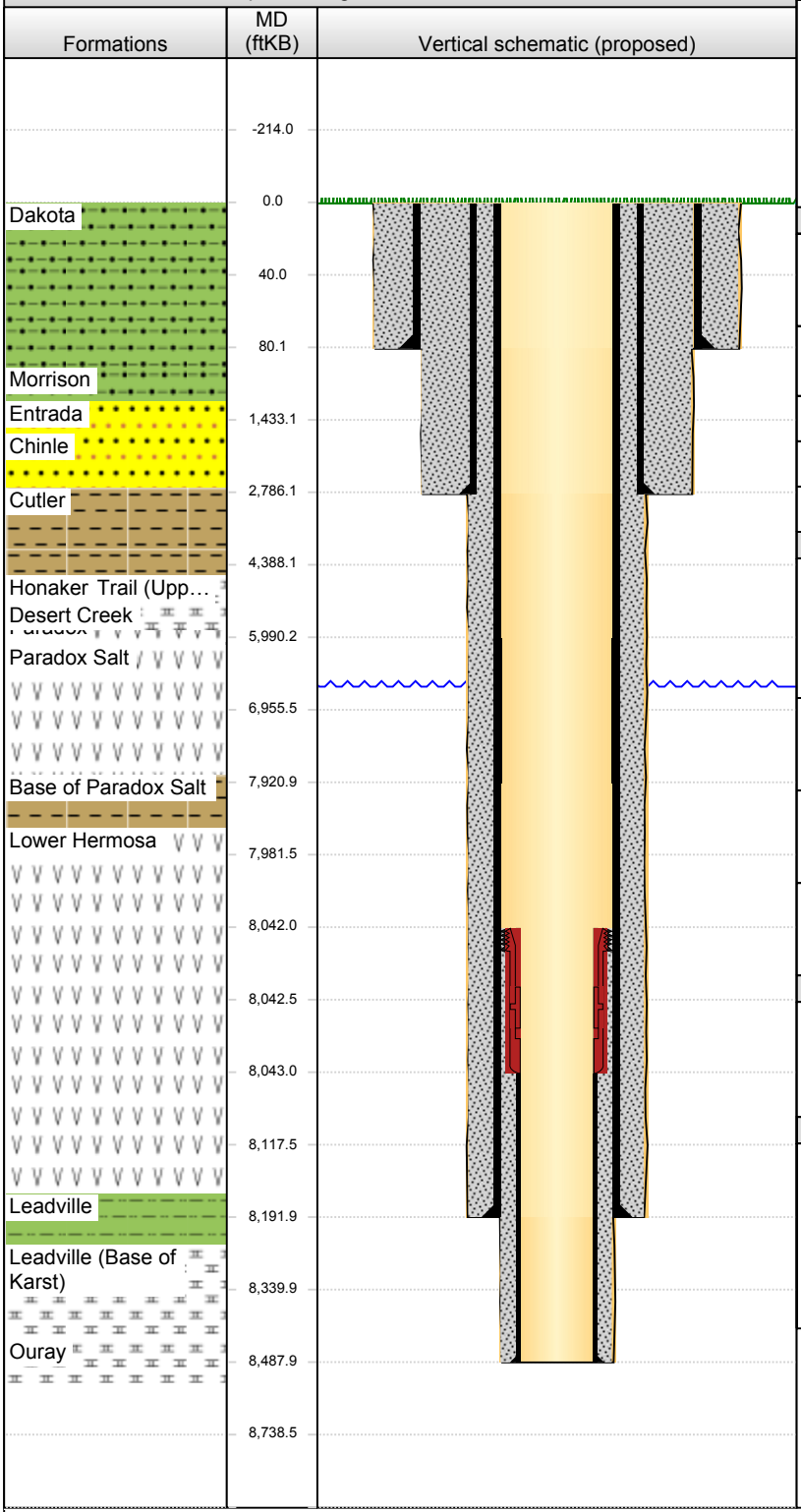
Vertical - Proposed Original Hole, 11/28/2017 12:27:48 PM



DRILLING PROCEDURE: (add KB to measurements below)

Objective

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A 12-1/4" hole drilled from surface to 2786' TVD/MD, ~100' below the top of the Cutler, set 9-5/8" casing run to 2786' with cement to surface.
An 8-3/4" hole drilled out from surface casing point to 7" casing point at 8192' TVD/MD. Run 7" 13-Chrome casing set ~25' into the Leadville.
A 6" production hole will be drilled out from the 7" casing point to ~400' below the Leadville Top. Production will be logged from TD to ~500 inside the 7" shoe. After logging, a 4 1/2" 13-Chrome liner will be run and cemented.

CASING/CEMENTING DETAILS:

Comment

9-5/8" 36# J-55 STC => 0'-2786' TVD/MD
Cement: Conventional => Lead 800sx Light + Tail 300sx Class G + Displacement ~200bbls Fresh Water

Comment

7" 29# 13CR BEAR => 0'-5990' TVD/MD (100' above top of Paradox Salt)
Cement: Lead 900sx + Tail 590 sx

Comment

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Comment

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DRILLING FLUIDS:

Description	Comment
12-1/4" Surface (9 5/8" Casing Point)	Spud 12-1/4" surface hole with spud mud and circulate. Use paper for seepage and LCM sweeps for lost circulation problems. Pump viscous sweeps if tight connections are encountered and prior to running the 9 -5/8" casing.
8-3/4" (100' above Desert Creek)	Drill out of the 9-5/8" casing with clean spud mud and circulate. Sweep for hole cleaning or lost circulation problems and use paper for seepage.
8-3/4" (25' into Leadville top/7" Casing Point)	Displace the spud mud system with salt saturated brine 100' above the Desert Creek formation. Pre-treat mud for H2S prior to drilling the P4 Shale.
6" Production Hole	During the pilot hole drill, fresh water will be treated so that the Cl2 content is ~20,000ppm. Do not use LCM.

SURVEY INFORMATION:

Comment

500' intervals from spud to the 9-5/8" casing point
~1000' intervals from below the 9-5/8" casing point to the top of the Paradox Salt
No surveys within the Paradox Salt formation
500' intervals from below the Paradox Salt to 7" casing point

EVALUATION PROGRAM:

Evaluation Program

6" Production Hole:
1st run dual laterolog
2nd run triple combo, monopole sonic
Cased Hole:
1st run GR, pulse neutron log from 7" casing shoe to 9-5/8" casing shoe
2nd run GR, CBL over 7" casing
3rd run GR, CBL over 4-1/2" liner

Objectives:
1. Maintain a focused effort by everyone on location to eliminate all accidents.
2. Drill, evaluate, case and complete the well at or under AFE cost estimate.
3. Run the 7" 13-Chrome production casing to ~25' TVD into the Leadville formation.
4. Isolate the 7" 13-Chrome to surface with high quality cement.
5. Run the 4 1/2" 13- Chrome liner through the Leadville formation.
6. Isolate the 4-1/2" 13-Chrome liner with high quality cement.

WELL PROGNOSIS OVERVIEW

This well prognosis is organized to follow the Bureau of Land Management (BLM) Eight Point Drilling Plan referenced in the Onshore Order #1. The Eight Points correspond to the following Eight Sections of the Prognosis

1. Estimated tops of important geological markers and formations.
2. Estimated depths at which top and bottom of anticipated water (particularly fresh water), oil, gas or other mineral-bearing formations are expected to be encountered and the lessee's or operator's plans for protecting such resources.
3. Lessee's or operator's minimum specifications for pressure control equipment to be used and a schematic diagram thereof showing sizes, pressure ratings (or API series), and the testing procedures and testing frequency.
4. Any supplementary information more completely describing the drilling equipment and casing program.
5. Type and characteristics of the proposed circulating mechanism to be employed in drilling, the quantities and types of mud and weighting material to be maintained, and the monitoring equipment to be used on the mud system.
6. The anticipated type and amount of testing, logging and coring.
7. The expected bottom hole pressure and any anticipated abnormal pressures or temperatures or potential hazards, such as hydrogen sulfide, expected to be encountered, along with contingency plans for mitigating such identified hazards.
8. Any other facets of the proposed operations which the lessee or operator wishes to point out for BLM's consideration of the application.

Two attachments are referenced in sections of the document

1. Paradox Salt Drilling Procedure (Appendix A)
2. H2S Contingency Plan

SECTION 1 & 2 – Estimated Geologic Markers/Formations, Anticipated Fluids, and Isolation Plan

Formation	Top (TVD, ft)	Bottom (TVD, ft)	Composition	Anticipated Fluids
Dakota			Sandstone/Shale	Water
Morrison	448	1052	Sandstone/Shale	None Anticipated
Entrada	1052	1660	Sandstone	Fresh Water
Chinle	1660	2686	Sandstone	Fresh Water
Cutler	2686	4642	Shales	None Anticipated
Upper Hermosa	4642	5575	Carbonate	None Anticipated
Paradox	5575	5981	Carbonate/Anhydrite	None Anticipated
Desert Creek	5981	6090	Carbonate	Gas
Paradox Salt	6090	7821	Carbonate/Anhydrite/Shale	Gas, **H_2S**
Base of Paradox Salt	7821	7958	Contact	N/A
Lower Hermosa	7958	8167	Carbonate/Siltstone/Shale	CO_2, HC Gas
Leadville	8167	8250	Carbonate/Shale	CO_2, Gas, Water
Leadville (Base of Karst)	8250	8443	Carbonate/Shale	CO_2, Gas, Water
Ouray	8443		Carbonate/Shale	CO_2, HC Gas, Water

9-5/8" Surface casing will be set ~100' TVD into the Cutler formation and cemented to surface to isolate the usable quality fresh water bearing sandstone formations above.

7" Intermediate casing will be set ~25'TVD into the Leadville producing formation and cemented to surface to isolate all zones above, including the Paradox Salt Shales section which may contain hydrogen sulfide gas.

4-1/2" production liner will be set ~400'TVD into the Leadville producing formation and cemented in place for completion purposes.

A detailed explanation of the casing and cementing program is shown in Section 4, and a contingency plan to mitigate the hydrogen sulfide hazard is referenced in Section 7 and attached to this prognosis.

SECTION 3 – Pressure Control Equipment

A 3M system will be utilized. The following procedures, diagrams, and guidelines are included for review with all personnel, and MUST be adhered to at all times:

- Kinder Morgan 3M BOP and Associated Equipment Installation and Testing Procedure for Doe Canyon and McElmo Dome Wells.
- Kinder Morgan BOP and Choke Manifold diagrams including minimum requirements.
- BLM 43 CFR 3160 Section III-A 3M specifications for pressure control equipment including minimum requirements.

3M BOP and Associated Equipment Installation and Testing Procedure

Kinder Morgan CO_2 Company, L.P.

Doe Canyon and McElmo Dome Wells

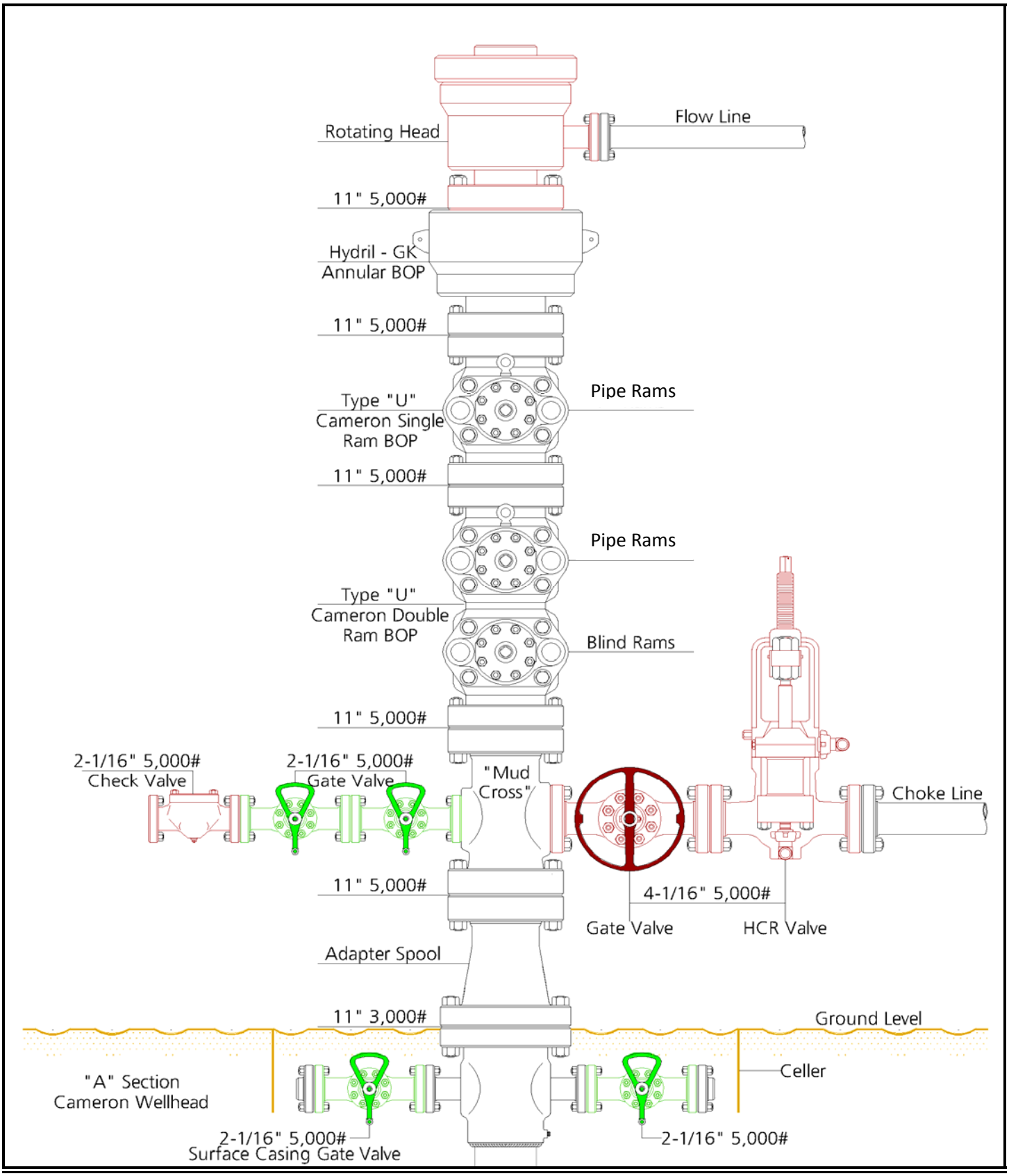
***While drilling the surface hole, a 13-3/8" 3M annular preventer with a diverter will be used.**

1. **NIPPLE UP ON 9 5/8" X 11" 3000# SCREW ON WELLHEAD**
2. **INSTALL 11"X 11" 3000# SPOOL W/TWO SIDE OUTLET (4" OUTLET & 2" OUTLET)**
3. **INSTALL 11" 3000# SINGLE HYDRAULIC BOP (NO RAM BLOCK INSTALLED)**
4. **INSTALL 11"X 11" 3000# SPACER SPOOL (8" TO 10" LONG)**
5. **INSTALL 11" 3000# DOUBLE RAM BOP (BLIND RAMS ON BOTTOM, PIPE RAMS ON TOP)**
6. **INSTALL 11" 3000# HYDRIL ANNULAR BOP**
7. **INSTALL 11" 3000# ROTATING HEAD**
8. **NIPPLE UP FLOW LINES TO ROTATING HEAD**
9. **INSTALL 4" 3000# MANUAL VALVE ON SIDE OF SPOOL**
10. **INSTALL 4" 3000# HCR VALVE ON SIDE OF MANUAL VALVE**
11. **NIPPLE UP HCR VALVE TO 3000# CHOKE MANIFOLD (IF H2S IS EXPECTED A HYDRAULIC SUPER CHOKE SHOULD BE INSTALLED)**
12. **FUNCTION TEST BLIND RAMS, PIPE RAMS, HCR VALVE (USE CLEAR WATER TO TEST AND MAKE SURE ALL BOP's ARE HOOKED UP TO ACCUMULATOR AND ALL RAMS, HYDRIL AND HCR VALVE FUNCTION PROPERLY)**
13. **CLOSE BLIND RAMS AND TEST 9 5/8" CSG & BLIND RAMS TO 300# & 1500# FOR 30 MIN. FOR A TEST NOT UTILIZING A TEST PLUG. (IF A DECLINE OF MORE THAN 10% IN 30 MIN. OCCURS, THE TEST SHALL BE CONSIDERED FAILED)**
14. **INSTALL TEST PLUG IN 9 5/8" X 11" 3000# WELL HEAD (WITH ALL VALVES OPEN BELOW TEST PLUG)**
15. **MAKE SURE BOP's ARE FULL OF WATER AND VALVES SHALL BE TESTED FROM WORKING PRESSURE SIDE DURING BOP TEST**
16. **CLOSE PIPE RAMS (TEST TO 300# FOR 10 MIN. & 3000# FOR 10 MIN. WITH NO PRESSURE LOST)**
17. **REMOVE DRILL PIPE WITH TEST PLUG IN PLACE**
18. **CLOSE BLIND RAMS (TEST BLIND RAMS, HCR VALVE, MANUAL VALVE & CHOKE MANIFOLD TO 300# & 3000# 10 MIN.)**
19. **OPEN BLIND RAMS, INSTALL DRILL PIPE**
20. **CLOSE HYDRIL (TEST HYDRIL TO 300# & 2250# FOR 10 MIN. EACH WITH NO LOST IN PRESSURE)**

*****EMAIL KM REGULATORY REP 24HOURS PRIOR TO BOPE TEST*****

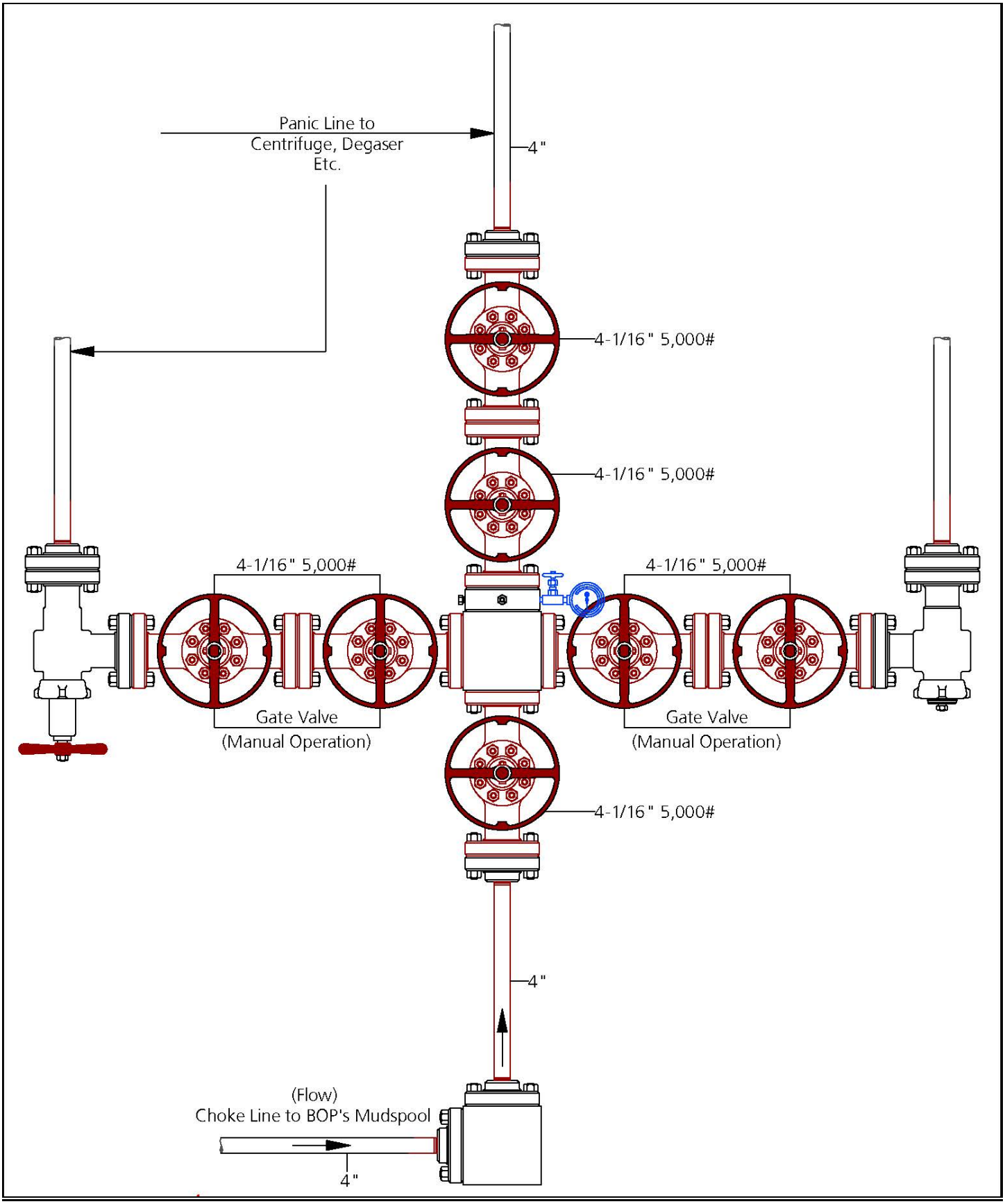
******ALL TESTS MUST BE CHARTED FOR CO&G & BLM******

BOP CONFIGURATION



Note: 3000# equipment is minimum requirement

CHOKE MANIFOLD



Note: 3000# equipment is minimum requirement

BUREAU OF LAND MANAGEMENT
43 CFR 3160
Federal Register / Vol. 53, No. 223
Friday, November 18, 1988
Effective date: December 19, 1988

Onshore Oil and Gas Operations; Federal and Indian Oil and Gas Leases;
Onshore Oil and Gas Order No. 2, Drilling Operations

III. Requirements

A. Well Control Requirements

1. Blowout preventer (BOP) and related equipment (BOPE) shall be installed, used, maintained, and tested in manner necessary to assure well control and shall be in place and operational prior to drilling the surface casing shoe unless otherwise approved by the APD. Commencement of drilling without the approved BOPE installed, unless otherwise approved, shall subject the operator to immediate assessment under 43 CFR 3163.1(b)(1). The BOP and related control equipment shall be suitable for operations in those areas which are subject to sub-freezing conditions. The BOPE shall be based on known or anticipated sub-surface pressures, geologic conditions, accepted engineering practice, and surface environment. The working pressure of all BOPE shall exceed the anticipated surface pressure to which it may be subjected, assuming a partially evacuated hole with a pressure gradient of 0.22 psi/ft.

2. The gravity of the violations for many of the well control minimum standards listed below are shown as minor. However, very short abatement periods in this Order are often specified in recognition that by continuing to drill, the violation which was originally determined to be of a minor nature may cause or threaten immediate, substantial and adverse impact on public health and safety, the environment, production accountability, or royalty income, which would require it reclassification as a major violation.

    a. Minimum standards and enforcement provisions for well control equipment.

        i. A well control device shall be installed at the surface that is capable of complete closure of the well bore. This device shall be closed whenever the well is unattended.

iii. 3M system:

-Annular preventers*
-Double ram with blind rams and pipe rams*
-Drilling spool, or blowout preventer with 2 side outlets (choke side shall be a 3-inch minimum diameter, kill side shall be at least 2-inch diameter)*

-Kill line (2 inch minimum)
-A minimum of 2 choke line valves (3 inch minimum)*
-3 inch diameter choke line
-2 kill line valves, one of which shall be a check valve (2 inch minimum)*

-2 chokes (refer to diagram in Attachment 1)
-Pressure gauge on choke manifold
-Upper Kelly cock valve with handle available
-Safety valve and subs to fit all drill string connections in use
-All BOPE connections subjected to well pressure shall be flanged, welded, or clamped*
-Fill-up line above the uppermost preventer.

vi. If repair or replacement of the BOPE is required after testing, this work shall be performed prior to drilling out the casing shoe.

vii. When the BOPE cannot function to secure the hole, the hole shall be secured using cement, retrievable packer or a bridge plug packer, bridge plug, or other acceptable approved method to assure safe well conditions.

b. Minimum standards and enforcement provisions for choke manifold equipment.

i. All choke lines shall be straight lines unless turns use tee blocks or are targeted with running tees, and shall be anchored to prevent whip and reduce vibration.

Violation: Minor.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

ii. Choke manifold equipment configuration shall be functionally equivalent to the appropriate example diagram shown in Attachment 1 of this Order. The configuration of the chokes may vary.

Violation: Minor.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

iii. All valves (except chokes) in the kill line choke manifold, and choke line shall be a type that does not restrict the flow (full opening) and that allows a straight through flow (same enforcement as item ii).

iv. Pressure gauges in the well control system shall be a type designed for drilling fluid service (same enforcement as above).

[57 FR 3025, Jan 27, 1992]

c. Minimum standards and enforcement provisions for pressure accumulator system.

i. 2M system accumulator shall have sufficient capacity to close all BOP's and retain 200 psi above pre-charge. Nitrogen bottles that meet manufacturer's specifications may be used as the backup to the required independent power source.

Violation: Minor.
Corrective Action: Install the equipment as specified
Normal Abatement Period: 24 hours.

ii. 3M system accumulator shall have sufficient capacity to open the hydraulically-controlled choke line valve (if so equipped), close all rams plus the annual preventer, and retain a minimum of 200 psi above pre-charge on the closing manifold without the use of the closing pumps. This is a minimum requirement. The fluid reservoir capacity shall be double the usable fluid volume of the accumulator system capacity and the fluid level shall be maintained at the manufacturer's recommendations. The 3M system shall have 2 independent power sources to close the preventers. Nitrogen bottles (3 minimum) may be 1 of the independent power sources and, if so, Shall maintain a charge equal to the manufacturer's specifications.

d. Minimum standards and enforcement provisions for accumulator pre-charge pressure test. This test shall be conducted prior to connecting the closing unit to the BOP stack and at least Once every 6 months. The accumulator pressure shall be corrected if the measured pre-charge Pressure is found to be above or below the maximum or minimum limit specified below (only Nitrogen gas may be used to pre-charge):

Accumulator working pressure rating	Minimum acceptable operating pressure	Desired pre-charge pressure	Maximum acceptable pre-charge pressure	Minimum acceptable pre-charge pressure
1,500 psi	1,500 psi	750 psi	800 psi	700 psi
2,000 psi	2,000 psi	1,000 psi	1,100 psi	900 psi
3,000 psi	3,000 psi	1,000 psi	1,100 psi	900 psi

e. Minimum standards and enforcement provisions for power availability. Power for the closing unit pumps shall be available to the unit at all times so that the pumps shall automatically start when the closing valve manifold pressure has decreased to the pre-set level.

f. Minimum standards and enforcement provisions for accumulator pump capacity. Each BOP closing unit shall be equipped with sufficient number and sizes of pumps so that, with the accumulator system isolated from service, the pumps shall be capable of opening the hydraulically-operated gate valve (if so equipped), plus closing the annular

preventer on the smallest size drill pipe to be used within 2 minutes, and obtain a minimum of 200 psi above specified accumulator pre-charge pressure.

g. Minimum standards and enforcement provisions for locking devices. A manual locking device (i.e. hand wheels) or automatic locking devices shall be installed on all systems of 2M or greater. A valve shall be installed in the closing line as close as possible to the annular preventer to act as a locking device. This valve shall be maintained in the open position and shall be closed only when the power source for the accumulator system is inoperative.

h. Minimum standards and enforcement provisions for remote controls. Remote controls shall be readily accessible to the driller. Remote controls for all 3M or greater systems shall be capable of closing all preventers. Remote controls for 5M or greater systems shall be capable of both opening and closing all preventers. Master controls shall be at the accumulator and shall be capable of opening and closing all preventers and the choke line valve (if so equipped). No remote control for a 2M system is required.

i. Minimum Standards and enforcement provisions for well control equipment testing.

i. Perform all tests described below using clear water or an appropriate clear liquid for subfreezing temperatures with a viscosity similar to water.

ii. Ram type preventers and associated equipment shall be tested to approved (see item I.D.1. of this order) stack working pressure if isolated by test plug or to 70 percent of internal yield pressure of casing if BOP stack is not isolated from casing. Pressure shall be maintained for at least 10 minutes or until requirements of test are met, whichever is longer. If a test plug is utilized, no bleed-off of pressure is acceptable. For a test not utilizing a test plug, if a decline in pressure of more than 10 percent in 30 minutes occurs, the test shall be considered to have failed. Valve on casing head below test plug shall be open during test of BOP stack.

iii. Annular type preventers shall be tested to 50 percent of rated working pressure. Pressure shall be maintained at least 10 minutes or until provisions of test are met, whichever is longer.

iv. As a minimum, the above test shall be performed:

A. When initially installed;
B. Whenever any seal subject to test pressure is broken:
C. Following related repairs: and
D. At 30-day intervals.

v. Valves shall be tested from working pressure side during BOPE tests with all down stream valves open.

vi. When testing the kill line valve(s), the check valve shall be held open or the ball removed.

vii. Annular preventers shall be functionally operated at least weekly.

viii. Pipe and blind rams shall be activated each trip, however, this function need not be performed more than once a day.

ix. A BOPE pit level drill shall be conducted weekly for each drilling crew.

x. Pressure tests shall apply to all related well control equipment.

xi. All of the above described tests and/or drills shall be recorded in the drilling log.

Violation: Minor.
Corrective action: Perform the necessary test or provide documentation.
Normal Abatement Period: 24 hours or next trip, as most appropriate.

[54 FR 39528, Sept. 27, 1989]

SECTION 4 – Drilling Equipment, Casing, and Cementing Programs

PROSPECT INFORMATION

The Cow Canyon B #4 (CB-4) will be drilled as part of the 2018 drilling program at McElmo Dome. The wellplan calls for a 9-5/8" x 7" 13-Chrome casing x 4-1/2" 13-Chrome liner program.

WELL OBJECTIVE

The main objectives for the drilling operation on the CB-4 are:

1. Maintain a focused effort by everyone on location to eliminate all accidents.
2. Drill, evaluate, case and complete the well at or under the AFE cost estimate.
3. Run the 7" 13-Chrome production casing to ~25'TVD into the Leadville formation.
4. Isolate the 7" 13-Chrome to surface with high quality cement.
5. Run the 4-1/2" 13-Chrome liner through the Leadville formation.
6. Isolate the 4-1/2" 13-Chrome liner with high quality cement.

POTENTIAL PROBLEMS

The main problems for the CB-4 are the typical problems expected while drilling in the area:

1. **Lost Circulation in the 12-1/4" Surface Hole:** Lost circulation can be expected at any depth while drilling the surface hole. Maintain a clean fresh water system, utilizing the closed loop system while drilling this hole section. Pump LCM pills as required to control the losses. No losses in surface hole were encountered on offsets.

2. **Gas Kick from the Desert Creek @ 5981' TVD:** Gas kicks have been encountered while drilling the Desert Creek formation. A planned mud weight schedule will be utilized to help minimize the chance of kicks in this section.

3. **Gas and H_2S from the Paradox Salt Shales:** Geo-pressured shales from the P4 on down will contain varying amounts of gas and associated H_2S. Circulate the salt water of the closed loop system to remove excess gas. Pre-treat the mud using H_2S scavenger for H_2S contamination.

4. **Stuck Pipe in the Paradox Salt Shales:** The Paradox Salt Shale is a high pressure, low volume shale which "flows" into the well causing stuck pipe. An attached list of recommendations for drilling the Paradox Salt Shale, titled "Paradox Salt Drilling Procedure", is located in Appendix A of this prognosis. The recommendations have proven to be very successful in recent drilling programs and are strongly recommended they be followed. Educate the drillers prior to drilling the Paradox Salt Shale and discuss in detail the procedure for drilling the shale.

5. **Gas Kick from Leadville after Production Casing set:** Gas kicks have been encountered during the drilling/well stimulation within the open hole segment of the Leadville. The primary barrier is the BOPE and the hydrostatic pressure of the kill fluid (fresh water). Drill pipe/workstrings will be utilized with double float valves inserted. This will prevent kicks from occurring up the drill pipe/workstring during drilling or stimulation in the Leadville.

GENERAL DRILLING PROCEDURE

16" conductor pipe will be set at ~80' prior to moving in the drilling rig. It is necessary to rig up a 13-3/8" 3M annular preventer with diverter to drill the surface hole.

A 12-1/4" hole will be drilled from surface to 2786' TVD, located ~100' TVD below the top of the Cutler. A full string of 9-5/8" surface casing will be run to 2786' TVD with cement circulated to surface. The 9-5/8" surface casing will protect the groundwater in the area. After the casing is run and cemented, screw on the 9-5/8" X 11" 3M casing head housing and nipple-up the 11" 3M BOP. Wait on cement 12 hours and pressure test the casing to 1500 psi and the BOP's to their rating prior to drilling out.

An 8-3/4" hole will be drilled out from the surface casing point to the 7" casing point at 8192' TVD, located ~25'TVD into the Leadville formation. At ~8000' TVD a measurement while drilling (MWD) tool including gamma ray (GR) will be picked up to drill the well to TD. This along with mud logging will be used to determine the casing setting depth. A string of 7" 13-Chrome casing will be run and set ~25' TVD into the Leadville. The well integrity is dependent on the 13-Chrome casing being handled and run correctly. The 7" 13-Chrome requires special handling and is to be handled according to the procedures specified on site. The 7" casing will be cemented back to surface in one stage. A CBL log will be run.

A 6" production hole will be drilled out from the 7" casing to ~400' below the Leadville top. A gyro will be dropped at TD before tripping out of the hole. The pilot hole will then be logged from TD to ~500' inside the 7" casing shoe. After logging, a 4-1/2" 13-Chrome liner will be run and cemented in place. The liner will then be perforated, tested for CO_2 production and/or acid stimulated.

This well will be drilled with a closed loop, pitless system.

SURVEY DETAIL

Normal well deviation is not a concern.
Inclination surveys:

- 500' intervals from spud to the 9-5/8" casing point
- ~1000' intervals from below the 9-5/8" casing point to the top of the Paradox Salt
- **Do not drop surveys while drilling below the Paradox Salt due to potential sticking**
- 500' intervals from below the Paradox Salt Shales to TD

CASING DETAIL **CASING RATING / DESIGN FACTORS**

SIZE	INTERVAL	DESCRIPTION	COLLAPSE (psi / SF)	BURST (psi / SF)	TENSION (klbs / SF)
9-5/8"	**0' – 2786'**	**36# J-55 STC**	**2020 / 1.24**	**3520 / 1.64**	**394 / 1.89**
7"	**0' – 5990'**	**29# 13CR FOX**	**7030 / 2.57**	**8160 / 2.70**	**676 / 2.21** **(100' TVD above top of Paradox Salt)**
7"	**5990' –7921'**	**32# 13CR FOX**	**9000 / 3.17**	**9630 / 3.02**	**792 / 3.62** **(run to 100' TVD below Base Salt)**
7"	**7921' – 8192'**	**29# 13CR FOX**	**7030 / 2.57**	**8160 / 2.54**	**676 / 3.23** **(run to TD)**
4-1/2"	**8042' – 8488'**	**12.6# 13CR Vam Top**	**7500 / 2.04**	**8430 / 8.43**	**288 / 2.61** **(hanger set ~150' TVD in 7" to TD)**

All of the 32# casing will be coated with Rytwrap (ICO in Odessa) prior to arriving on location.

DESIGN ASSUMPTIONS:

9-5/8" Surface	Tension:	Buoyed weight in 8.4 ppg fresh water (Min SF = 1.6)
	Collapse:	Full evacuation w/ 9.0 ppg on outside (Min SF = 1.0)
	Burst:	2000 psi shut in pressure at the surface (Min SF = 1.32)
7" Intermediate	Tension:	Buoyed weight in 10.0 ppg brine
	Collapse:	Full evacuation in 10.0 ppg brine for 29#, 1.0 psi/ft for 32#
	Burst:	2500 psi shut in pressure at the surface with 10.0 ppg inside and 9.0 ppg outside
4-1/2" Liner	Tension:	Buoyed weight in 8.4 ppg fresh water
	Collapse:	Full evacuation in 9.0 ppg on outside
	Burst:	3000 psi shut in pressure at the surface

CEMENTING PROCEDURE

9-5/8" SURFACE CASING → Single stage

Use API 8-3/4" drift on location

Shoe Type:	Regular Guide Shoe
Collar Type:	Regular Float collar, 40' above shoe
Centralizers:	15 required → Place centralizers on shoe joint, and every 4th joint to surface
Flag Joints:	None Required
Other Equipment:	Stop clamp, thread lock the bottom 2 joints of casing + all float equipment, top and bottom plugs
Reciprocate:	Not required, limit of 294,000 lbs based on 36# J-55 STC w/ a 1.6 SF
Preflush:	10 bbls → Fresh water 20 bbls → Chemical wash 10 bbls → Fresh water
Lead CMT Slurry:	800 sks → VersaCem™ System → 6% Bemtonite+5 lbm/sk KOL-SEAL+0.125 lbm/sk POLY-E-FLAKE+0.1% Halad®-9
Specifications: **100% Excess**	12.4 ppg / 1.92 ft^3 / sk / 9.91 gal / sk
Tail CMT Slurry:	300 sks → HalCem™ System → 0.125 lbm/sk POLY-E-Flake+0.1% Halad-9
Specifications: **100% Excess**	15.8 ppg / 1.16 ft3 / sk / 5.08 gal / sk
Displacement:	~200 bbls → Fresh Water @ 8 - 10 bbls / min
Volume Based:	All volumes listed are estimates only, for calculations use 12-1/4" X 9-5/8" annulus + 100% excess + shoe joints + ~100 sks circulated @ surface, attempt to circulate cement to surface, excess volume is based on experience.
Pressure Limits:	2000 psi while pumping or bumping plug due to collapse rating of the 9-5/8" 36# J-55 STC w/ a 1.0 SF
Test Required:	Lab test w/ field water, want a 2 hr minimum @ 105° BHST
Temperature Survey:	Required if cement does not circulate at surface, call Todd Gentles @ (713) 369-8487 or 713-249-2805 for details
Wellhead:	Install section "A" assembly

Special Note:

1. Report the volume of cement circulated to the surface.
2. WOC for a minimum of 12 hours prior to drilling out.
3. NU 3M - 11 - BOP and test to rating.
4. Test the casing to 500 psi.
5. Cement Co. → Send copy of pressure charts, job log and summary to:

Kinder Morgan, Attn: Todd Gentles, 1001 Louisiana St, Suite 1000, Houston, TX 77002

CEMENTING PROCEDURE

7" PRODUCTION CASING → Single stage

Shoe Type:	Differential Fill Float Shoe
Collar Type:	Differential Fill Float Collar, 40' above shoe
Centralizers:	78 required → 10' above shoe and every other joint excluding wrapped casing
Flag Joints:	Cross over from 32# to 29# will serve as flag joints
Other Equipment:	Thread lock the bottom 3 joints of casing + all float equipment.
Reciprocate:	If required, limit @ 100,000 lbs
Preflush:	15 bbls → Fresh water 40 bbls → Chemical wash 10 bbls → Fresh water
Lead Slurry:	900 sks → NeoCem™ System → 0.125% Poly-E-Flake + 0.125% Tuf Fiber 594
Specifications:	12.0 ppg / 2.318 ft3 / sk / 6.61 gal / sk
50% Excess	
Tail Slurry:	590 sks → HalCem™ System → 0.25% Poly-E-Flake + 0.125% Tuf Fiber 594
Specifications:	13 ppg / 1.456 ft3 / sk / 12.1 gal / sk
50% Excess	
Displacement:	~300 bbls freshwater @ 8 - 10 bbls / min
Volume Based:	Use 9" hole diameter to calculate cement volume
Test Required:	Lab test w/ field water, 3.25 hr minimum @ 200° BHST Lab test w/ field water, 3.50 hr minimum @ 170° BHST
Temperature Survey:	Possible survey if severe lost circulation occurs
CBL Survey:	A CBL will be run after setting and cementing of this casing.
Wellhead:	Install section "B" assembly

Special Note:

1. Circulate 3 annular volumes prior to cementing @ maximum rate possible.
2. Displace cement at the maximum rate possible.
3. Report volumes of cement circulated.
4. Report any circulation problems on the morning report.
5. Cement Co. → Send copy of pressure charts, job log and summary to:

Kinder Morgan, Attn: Todd Gentles 1001 Louisiana St., Suite 1000, Houston, TX 77002

CEMENTING PROCEDURE

4-1/2" PRODUCTION LINER → Single stage

Shoe Type:	Differential Fill Float Shoe
Collar Type:	None
Centralizers:	None
Flag Joints:	None
Other Equipment:	Thread lock the bottom 3 joints of casing + all float equipment.
Reciprocate:	If required, limit @ 50,000 lbs
Preflush:	10 bbls → Fresh water 20 bbls → Chemical wash 10 bbls → Fresh water
Lead Slurry:	100 sks → HalCem™ System → 0.3% Halad®-9 + 0.1% HR-5 + 5lbm Kol-Seal + 0.05% SA-1015
Specifications: 50% Excess	13.0 ppg / 1.449 ft3 / sk / 6.45 gal / sk
Displacement:	~70 bbls freshwater @ 8 - 10 bbls / min
Volume Based:	Use 6" hole diameter to calculate cement volume
Test Required:	Lab test w/ field water, 3.25 hr minimum @ 200° BHST Lab test w/ field water, 3.50 hr minimum @ 170° BHST
Temperature Survey:	None
CBL Survey:	A CBL will be run after setting and cementing of this casing.
Wellhead:	None

Special Note:

1. Displace cement at the maximum rate possible.
2. Report any circulation problems on the morning report.
3. Cement Co. → Send copy of pressure charts, job log and summary to:

Kinder Morgan, Attn: Todd Gentles 1001 Louisiana St., Suite 1000, Houston, TX 77002

SECTION 5 – Mud Program

The "standard" mud program and procedures used during the previous drilling programs at McElmo will be employed during the drilling operation of the well.

Surface – 2786' TVD (9-5/8" Casing Point):

Hole Size: 12-1/4"
Mud Type: Spud mud
Mud Weight: 8.5 – 9.0 ppg
pH: 9.5
Salt Conc: 1,200 ppm

Spud the 12-1/4" surface hole with spud mud and circulate the closed loop system. Maintain the fluid as clean as possible to help prevent lost circulation. Use paper to control any seepage and pump LCM sweeps if lost circulation becomes a problem. Pump viscous sweeps if tight connections are encountered and prior to running the 9-5/8" casing.

2786' – 5881' TVD (100' above the Desert Creek):

Hole Size: 8-3/4"
Mud Type: Spud mud
Mud Weight: 8.5 – 9.0 ppg
pH: 9.5
Salt Conc: 1,200 ppm
Problems: Seepage, hole cleaning

Drill out of the 9-5/8" casing with clean spud mud. Circulate the closed loop system to keep solids to a minimum. Sweep the hole as required for hole cleaning and / or lost circulation problems. Use paper to control any seepage problems.

5881' – 8192' MD/TVD (25' into the Leadville / 7" Casing Point):

Hole Size: 8-3/4"
Mud Type: Salt saturated brine
Mud Weight: 10+ ppg
pH: 11+, as required to control H2S
Salt Conc: 190,000 ppm
Problems: H2S, Paradox Salt shale gas influx, hole cleaning

Displace the fresh water system with salt saturated brine 100' above the Desert Creek formation. Circulate through the closed loop system to maintain a clean fluid and to assist in breaking out any entrained gas. Pre-treat mud for H2S prior to drilling the P4 Shale.

Follow the attached guidelines for drilling the Paradox Salt Shales, titled "Paradox Salt Drilling Procedure", which is located in Appendix A of this prognosis. The recommendations have proven to be very successful in recent drilling programs.

8192' – 8488' MD/TVD (Production Hole):

Hole Size: 6"
Mud Type: Fresh water
pH: 9-9.5 with caustic soda
Problems: LC, Hole cleaning, Lubricity

During the production hole drill the fresh water will be treated so that the Cl_2 content is ~20,000ppm. This is for logging purposes. Acid soluble LCM will be added to mitigate lost circulation. If circulation is lost and unable to be regained, nitrogen (or air) will be added to the mud system to help lift the fluid for circulation and cuttings movement. A specific description of this process is discussed in Section 8 of this prognosis.

SECTION 6 – Evaluation Program

Mud logging services will be used from surface to TD. Samples will be collected in 10' intervals

A measure while drilling (MWD) tool with gamma ray (GR) capability will be run from ~8000' TVD to 7" casing point. GR response, mud logs, and penetration rate will be used to determine the top of the Leadville formation and final casing point.

The 6" production hole will be logged with 2 runs as follows:

- 1st run dual laterolog
- 2nd run triple combo, monopole sonic

The vertical wellbore will be logged to the surface casing shoe through casing with 3 runs as follows (COGCC Rule 317.p)

- 1st run GR, pulsed neutron from 7" casing shoe to surface casing shoe
- 2nd run CBL from 7" casing shoe to surface
- 3rd run CBL from TD to top of 4-1/2" liner

SECTION 7 – Expected Pressures and Identified Hazards

BOTTOM HOLE PRESSURE

The Leadville/Ouray formation is approximately 325' thick in the Doe Canyon and McElmo Dome area. This vertical hole will be drilled through the Leadville and Ouray formations. The expected bottom-hole pressure is currently about 2100 psi in the McElmo Dome area. Original field pressures were in the range of 2500 psi; 2500 psi would be the maximum pressure expected should there to be compartmentalization within the reservoir. This reservoir is under pressured; given the well depth of approximately 8500' TVD, a fresh water column provides approximately 3680 psi for well control. During drilling/well stimulation operations, the drill pipe/workstring will have double float valves installed to prevent kicks from coming up the string.

H_2S POTENTIAL

H_2S is expected to be circulated to the surface during the drilling of the Paradox Salt Shales located at 6090' – 7821' TVD. The H_2S contingency plan that was used in the previous programs has been updated and revised and will be in force. This plan is located in Appendix A of this prognosis. All the necessary precautions, drills, and training will be done to protect personnel on location. H_2S monitors and safety equipment will be on location and operational prior to drilling the section and remain until rig release.

SECTION 8 – Other Items

LOST CIRCULATION CONTINGENCY PLAN

Circulation may be lost in the 6" production hole. In this situation, managed pressure drilling techniques will be implemented. A normal fresh water fluid column of water is approximately 3680 psi downhole pressure, and the reservoir pressure is 2500 psi - therefore an overbalanced condition exists. The fracture gradient of the formation is estimated at 0.6 to 0.7 psi/ft, which equates to approximately 5100 to 5950 psi downhole pressure, which indicates fractures are not being induced; however, when a high porosity zone is encountered in the Leadville, and the pore volume exists to take the fluid. At this point, there is a high probability of sticking drill pipe as the cuttings flowing up the annulus immediately fallback.

A nitrogen managed pressure drilling package can be brought out to location while drilling the production hole should this situation occur. The nitrogen will be added into the mud system to lighten the hydrostatic pressure and regain circulation in a managed pressure scenario. Managed pressure drilling equipment will be used to handle the return flow of nitrogen and any influx of CO_2 gas through a separator and vent stack. Well control is maintained by reducing or stopping the flow of nitrogen, which will kill the well. A dedicated rig pump and kill line are also hooked up and ready to boost the water flow if needed.

GENERAL COMPLETION PROCEDURE

The well will be completed by perforating the 4.5" liner in the Leadville formation. Log analysis will determine placement of the perforations and whether the perforations will be acidized. A static pressure test may be collected prior to the well being tested for CO_2 production. The well will then be shut in until production facilities are constructed.

CONTACT INFORMATION	OFFICE	CELL
Operations Manager – Todd Gentles	713-369-8487	713-249-2805
Drilling Director – Doug Frederick	713-369-9208	281-421-2333
Drilling Engineer – Valerie Cawthorn	713-369-8509	281-798-8769
Geologist – Michael Schneider	713-420-3901	361-550-3165

APPROVAL

_____

Douglas A. Frederick
Drilling Director
Kinder Morgan CO2 Company, L.P.

Appendix A: Paradox Salt Drilling Proceudre

Twelve distinct shale bodies occur in the Paradox Salt formation. Most notably, shale numbers 4, 5 and 6, and their associated anhydrite, in the sequence of the Paradox Salt that has the potential for high H_2S content and tendency to stick pipe.

This section lies approximately 400'-500' into the Paradox and usually has a 20'-30' salt section between shale number 4 and 5. Because these shales are subject to plastic flow, to prevent sticking, the following procedure has worked in the past and is recommended.

Preparing to drill the Paradox Salt Formation

1. Test the BOPs on the last bit trip prior to drilling the Paradox Salt.
2. Pick up a set of mechanical drilling jars on the last bit trip prior to drilling into the Paradox.
3. Run a survey to the top of the salt. This will help to avoid shutting down while drilling the sticky shales.
4. Use the salt formation cross-section as an indicator for predicting where each of the shale bodies will be encountered. Shales number 4, 5 and 6 are considered to be the most troublesome.
5. Increase flow rate to an annular velocity of at least 200 ft/min. Limitations of the rig's hydraulic system should be considered when selecting bit nozzle sizes.

Drilling the Paradox Salt Formation

6. The Driller will hand drill the interval beginning at the top of the Paradox Salt and continue until all problem shales have been penetrated and normal conditions return.
7. Control drill the Paradox while noting the normal torque values for the salts. If there is any fluctuation in pump pressure or torque, pick up off bottom and ream until hole conditions stabilize. Drill a maximum of 5' of salt and 1'-2' of shale before picking up 15'- 20' and reaming to bottom slowly to clean the wellbore. The severity of torque, and increases in pump pressure, should dictate the interval lengths. Some portions of the hole may require drilling only a few inches before picking up and reaming.
8. After 1' to 2' of shale is penetrated, expect 50,000-100,000 lbs drag to free the bit initially. After freeing the bit, pick up 15'-20' and start reaming back to bottom. If the torque increases 20-30 ft-lb above normal, pick up and expect 25,000-50,000 lb drag.
9. On each joint down, have the Driller pick up two joints, then ream back to bottom. Reaming serves two purposes:
    a. It conditions the walls of the wellbore
    b. It allows for the cuttings to be carried away from the bit and collars before making a connection.
10. Pipe should be pulled and run slowly to avoid problems in the tight sections of the hole. Torque should dictate the frequency of the short trips. Periodic short trips through the entire salt section have proven useful in reducing high torque due to sticky shale.

At the present time, the key to drilling these sticky shales in the Paradox Salt is **PATIENCE.** It should be noted that good gas shows are also present in these shale stringers, and as the gas out of the sticky shales starts to subside, the hole starts to stabilize.

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1. Applicability

☒ Workovers
☒ Completions
☐ Drilling

2. Scope

This document has been created to outline and define the proper method for venting and monitoring CO2 in the McElmo Dome and Doe Canyon fields in Cortez, CO.

3. Core Information and Requirements

3.1. Procedure

Prior to Venting Operations

- Complete CO2 dispersion model to determine if the additional safeguards detailed in this procedure are required.
- Based on dispersion modeling, determine critical distances from well where monitoring will be required.
- Prior to venting activities, conduct field reconnaissance to:
  - Identify low lying areas within critical area surrounding the well for monitoring CO2 and oxygen concentrations throughout the flow test.
  - Consider effect on nearby livestock prior to venting CO2 and provide assistance in the relocation if necessary.
- Identify all residential locations within critical area of the well being tested.
- Offer relocation to hotels and assistance for meals for residents within critical area of the well location as defined by the dispersion model for the entire duration of venting operations.
- Create a roster of neighbors within the critical area that chose to not relocate. This roster will be used by first responders in the event of an emergency.
  - Include the following emergency contact information
    - Name
    - Number of residents in each home site
    - Document any special needs that should be considered (health, mobility, etc.)
    - Phone number(s)
- Notify local emergency response personnel prior to venting activities.

- Seek approval from local authorities for the ability to restrict road access in the event high levels of CO2 are detected along road ways.
- Contact the local COGCC representatives and notify them of planned venting activities.

During Venting Operations

- For residents that choose not to relocate during flow test, provide continuous monitoring of CO2 and oxygen levels at the home(s), including low lying areas such as basements or root cellars with poor air circulation. Readings will be logged every hour.
- Monitor CO2 and oxygen levels in low lying areas within critical area during flow test based on wind direction to determine if CO2 is migrating down to low lying areas.
- Monitor CO2 and oxygen levels on public roads within critical area based on wind direction and ambient conditions.
- Continuously monitor CO2 and oxygen levels and wind direction and speed at well site throughout venting operations.
- Stop flow test if:
  - CO2 concentrations exceed 0.5% (5000 ppm) at well site, public roads or residential driveways where residents that have evacuated are likely to travel.
  - CO2 concentrations exceed 0.2% (2000 ppm) at residential locations where people are not willing to relocate during test.
- Prior to relocated residents returning to their homes, monitor area around home sites to confirm CO2 and oxygen levels are normal as define by OSHA, including low areas such as basements and root cellars with poor air circulation, as necessary.

4. Training

Not applicable

5. Documentation

Roster

APD ID: 10400025105 **Submission Date:** 12/21/2017

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Well Type: OTHER **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - Existing Roads

Will existing roads be used? YES

Existing Road Map:

CB_4_Transportation_Map_11_28_17_Topo_1653_20171130150925.pdf

Existing Road Purpose: ACCESS,FLUID TRANSPORT **Row(s) Exist?** NO

ROW ID(s)

ID:

Do the existing roads need to be improved? YES

Existing Road Improvement Description: The CB-4 is access from Montezuma County Roads CC, 10 and 8. Kinder Morgan has an updated Road Maintenance Agreement with Montezuma County and currently maintains the existing county roads to the set county standards.

Existing Road Improvement Attachment:

Section 2 - New or Reconstructed Access Roads

Will new roads be needed? YES

New Road Map:

CB_4_Acces_Road___Utility_Pipeline_Corridor_diagram_20171130151423.pdf
CB_4_Well_Pad_Diagram_Construction_BMP50__20180209111124.pdf

New road type: RESOURCE

Length: 810 Feet **Width (ft.):** 30

Max slope (%): 8 **Max grade (%):** 8

Army Corp of Engineers (ACOE) permit required? NO

ACOE Permit Number(s):

New road travel width: 20

New road access erosion control: The CB-4 access road will be constructed to BLM Gold Book standards. The new access road will consist of a gravel base consisting of twelve-inches (12") of three-inch (3") hard-rock gravel layered in two six-inch (6") lifts, with each lift being compacted. Four and one-half -inches (4 1/2") of three-quarter-inch (3/4") hard-rock gravel will then be layered on top and compacted. The new access road will be crowned, and storm water ditches with check dams will be constructed along both sides of the proposed access road. One culvert with both inlet and outlet protection will be installed to accommodate storm water drainage. No turnouts are planned and all features related to drainage and erosion

control will be located within the proposed easement (see attached 'CB-4 Access Road Stormwater Diagram', diagram is for information purposes only and is not to scale as all features related to drainage and erosion control will be located within the proposed easement). A Site Specific Data Sheet (SSDS) and storm water management plan will be developed for the CB-4 access road per Kinder Morgan's Colorado Department of Public Health and the Environment (CDPHE) Field Wide Permit that will address drainage control, including instructions from the BLM at the Onsite, which can be provided to the BLM at their request.

New road access plan or profile prepared? NO

New road access plan attachment:

Access road engineering design? NO

Access road engineering design attachment:

Access surfacing type: GRAVEL

Access topsoil source: ONSITE

Access surfacing type description:

Access onsite topsoil source depth: 6

Offsite topsoil source description:

Onsite topsoil removal process: Topsoil will be stripped and stock piled as indicated on the well pad site plan drawing (see 'CB-4 Well Pad Diagram' attached in Section 10 of this SUPO).

Access other construction information:

Access miscellaneous information:

Number of access turnouts: **Access turnout map:**

Drainage Control

New road drainage crossing: CULVERT

Drainage Control comments: The CB-4 access road will be constructed to BLM Gold Book standards. The new access road will consist of a gravel base consisting of twelve-inches (12") of three-inch (3") hard-rock gravel layered in two six-inch (6") lifts, with each lift being compacted. Four and one-half -inches (4 1/2") of three-quarter-inch (3/4") hard-rock gravel will then be layered on top and compacted. The new access road will be crowned, and storm water ditches with check dams will be constructed along both sides of the proposed access road. One culvert with both inlet and outlet protection will be installed to accommodate storm water drainage. No turnouts are planned and all features related to drainage and erosion control will be located within the proposed easement (see attached 'CB-4 Access Road Stormwater Diagram', diagram is for information purposes only and is not to scale as all features related to drainage and erosion control will be located within the proposed easement). A Site Specific Data Sheet (SSDS) and storm water management plan will be developed for the CB-4 access road per Kinder Morgan's Colorado Department of Public Health and the Environment (CDPHE) Field Wide Permit that will address drainage control, including instructions from the BLM at the Onsite, which can be provided to the BLM at their request.

Road Drainage Control Structures (DCS) description: The CB-4 access road will be constructed to BLM Gold Book standards. The new access road will consist of a gravel base consisting of twelve-inches (12") of three-inch (3") hard-rock gravel layered in two six-inch (6") lifts, with each lift being compacted. Four and one-half -inches (4 1/2") of three-quarter-inch (3/4") hard-rock gravel will then be layered on top and compacted. The new access road will be crowned, and storm water ditches with check dams will be constructed along both sides of the proposed access road. One culvert with both inlet and outlet protection will be installed to accommodate storm water drainage. No turnouts are planned and all features related to drainage and erosion control will be located within the proposed easement (see attached 'CB-4 Access Road Stormwater Diagram', diagram is for information purposes only and is not to scale as all features related to drainage and erosion control will be located within the proposed easement). A Site Specific Data Sheet (SSDS) and storm water management plan will be developed for the CB-4 access road per Kinder Morgan's Colorado Department of Public Health

and the Environment (CDPHE) Field Wide Permit that will address drainage control, including instructions from the BLM at the Onsite, which can be provided to the BLM at their request.

Road Drainage Control Structures (DCS) attachment:

Access Additional Attachments

Additional Attachment(s):

Section 3 - Location of Existing Wells

Existing Wells Map? YES

Attach Well map:

CB_4_Hydrology_and_Wells_Map_11_14_17_REV1_013018_1402_20180209073749.pdf

Existing Wells description:

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

Submit or defer a Proposed Production Facilities plan? SUBMIT

Production Facilities description: Production from the CB-4 well will flow into a 10" flowline to the existing CB Cluster facility for testing and initial separation, then flow to the existing Cow Canyon Plant for additional dehydration and compression into the Cortez CO2 pipeline. A Glycol Skid may be added to the well pad to prevent hydration of the flowline (see attached 'KM Glycol Skid Diagram Typical Well Site').

Production Facilities map:

KM_Glycol_Skid_Diagram_Typical_Well_Site_20171130153108.pdf

CB_4_Acces_Road___Utility_Pipeline_Corridor_diagram_20180126142235.pdf

Section 5 - Location and Types of Water Supply

Water Source Table

Water source use type: CAMP USE, DUST CONTROL, INTERMEDIATE/PRODUCTION CASING, SURFACE CASING

Describe type: FRESH WATER Fresh water will be delivered by a commercial water hauling service, R W Trucking located at 6567 Road 24, Cortez, Colorado. Fresh water sources for this project include the Dolores Water Conservancy District that R W Trucking owns M&I shares of (canals located at Road CC & Road BB in Montezuma County, and Road 15 in Dolores County), a private pond, a municipal source (City of Cortez), and a fresh water tap at R W Trucking's yard (see attached ' CB-4 Water Sources & Transportation Map'). R W Trucking will use the Kinder Morgan designated truck route roads to access the water sources and to deliver to the well pad (see attached Kinder Morgan Designated Truck Routes').

Source latitude:

Source datum:

Water source type: OTHER

Source longitude:

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Water source permit type: PRIVATE CONTRACT

Source land ownership: COMMERCIAL

Water source transport method: TRUCKING

Source transportation land ownership: COMMERCIAL

Water source volume (barrels): 6500 **Source volume (acre-feet):** 0.83780515

Source volume (gal): 273000

Water source use type: INTERMEDIATE/PRODUCTION CASING **Water source type:** OTHER

Describe type: BRINE WATER Brine water (max salinity 190,000 ppm) will be mixed at R W Trucking's yard located at 6567 Road 24, Cortez, CO with fresh water obtained from a fresh water tap location at R W Trucking's yard. Brine water will be transported from R W Trucking to the CB-4 location using Highway 491 and Kinder Morgan designated truck routes (see attached 'CB-4 Water Sources & Transportation Map' and 'Kinder Morgan Designated Truck Routes' map).

Source longitude:

Source latitude:

Source datum:

Water source permit type: PRIVATE CONTRACT

Source land ownership: COMMERCIAL

Water source transport method: TRUCKING

Source transportation land ownership: COMMERCIAL

Water source volume (barrels): 2200 **Source volume (acre-feet):** 0.2835648

Source volume (gal): 92400

Water source and transportation map:

Kinder_Morgan_Designated_Truck_Routes_20180126144033.pdf

CB_4_Water_Sources_and_Transportation_Map_20180209080502.pdf

Water source comments: Fresh and brine water (max salinity 190,000 ppm) will both be delivered by a commercial water hauling service, R W Trucking located at 6567 Road 24, Cortez, Colorado. Fresh water sources for this project include the Dolores Water Conservancy District that R W Trucking owns M&I shares of (canals located at Road CC & Road BB in Montezuma County, and Road 15 in Dolores County), a private pond, a municipal source (City of Cortez), and a fresh water tap at R W Trucking's yard (see attached ' CB-4 Water Sources & Transportation Map'). Brine water will be mixed at R W Trucking's yard located at 6567 Road 24, Cortez, CO with fresh water obtained from a fresh water tap location at R W Trucking's yard. Brine water will be transported from R W Trucking to the CB-4 location using Highway 491 and Kinder Morgan designated truck routes (see attached 'CB-4 Water Sources & Transportation Map' and 'Kinder Morgan Designated Truck Routes' map).

New water well? NO

New Water Well Info

Well latitude: **Well Longitude:** **Well datum:**

Well target aquifer:

Est. depth to top of aquifer(ft): **Est thickness of aquifer:**

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Aquifer comments:

Aquifer documentation:

Well depth (ft): **Well casing type:**

Well casing outside diameter (in.): **Well casing inside diameter (in.):**

New water well casing? **Used casing source:**

Drilling method: **Drill material:**

Grout material: **Grout depth:**

Casing length (ft.): **Casing top depth (ft.):**

Well Production type: **Completion Method:**

Water well additional information:

State appropriation permit:

Additional information attachment:

Section 6 - Construction Materials

Construction Materials description: Construction material (e.g. gravel, rip-rap, road base) will be hauled to the project area form an off-site location. The locations include existing Kinder Morgan locations and material stockpiles, Four Corners Materials in Mancos, McStone Sand and Gravel at Haycamp pit, or Mesa Sandstone in Cortez). The well pad will consist of a geotextile material under a gravel base consisting of twelve-inches (12") of three-inch (3") hard-rock gravel layered in two six inch (6") lifts, with each lift being compacted. Four and one-half -inches (4 1/2") of three-quarter-inch (3/4") hard-rock gravel will then be layered on top and compacted. The access road will built with the same same specs as the well pad.
Construction Materials source location attachment:

Section 7 - Methods for Handling Waste

Waste type: DRILLING

Waste content description: Freshwater drill cuttings generated during drilling. Approximately 3,700 cubic feet (27,680 gallons).
Amount of waste: 27680 gallons

Waste disposal frequency : Daily

Safe containment description: Kinder Morgan will install a 30-mil thick liner underneath the drilling rig. The liner is buried under a foot of gravel for protection. A 9-inch compacted dirt berm is constructed around the well pad to meet stormwater requirements. Additional BMP's are discussed in Section 10 of this SUPO. The tank battery for drilling fluids has its own secondary containment. Secondary containment is equal to 110% of the largest tank per COGCC rules. The secondary containment typically consists of a minimum 30-mil synthetic liner, draped over HDPE pipe used as the berm, and then secured to prevent movement. Waste material generated during drilling will be collected and stored utilizing a closed-loop system of waste management. A) All non-fresh water storage tanks, including roll-off cuttings storage tanks and hose connections, must be pre-cleaned and free of leaks. B) The closed-loop system keeps fresh water cuttings separated from the salt formation and brine water cuttings. C) Drill cuttings recovered from the drilling mud will be temporarily stored on site in an open top tank with containments. The tank allows some natural evaporation of moisture from the cuttings to occur. An "ecosponge" product or an equivalent and environmentally friendly absorption agent will be added to absorb moisture prior to transport of the cuttings for offsite disposal. No waste material other than drill cuttings are allowed to be stored in the cuttings storage containers. Drilling fluids will be recycled whenever practical. When fluids are no longer reusable, they will be trucked to a commercial waste disposal site in New Mexico.
Safe containmant attachment:

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

CB_4_Proposed_Secondary_Containent_Example_20171219173018.pdf

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

Disposal type description:

Disposal location description: Cuttings: Disposed of at the Montezuma County Landfill, located at 26100 Road F, Cortez, CO.

Waste type: PRODUCED WATER

Waste content description: No formation water is expected to be produced during drilling due to overbalanced drilling. The formation water produced with CO2 after completion will be separated and disposed of by injection into Kinder Morgan's UIC wells.

Amount of waste: 1000 barrels

Waste disposal frequency : One Time Only

Safe containment description: Kinder Morgan will install a 30-mil thick liner underneath the completion rig. The liner is buried under a foot of gravel for protection. A 9-inch compacted dirt berm is constructed around the well pad to meet stormwater requirements. Additional BMP's are discussed in Section 10 of this SUPO. The produced water from the completion and flowback operations will flow into two (2) temporary 500-bbl flowback tanks that will be located near the drilling rig in the same approximate location as the closed-loop tanks used during drilling. The flowback tanks and associated manifolds for completion fluids have their own secondary containment. Secondary containment is equal to 110% of the largest tank per COGCC rules. The secondary containment typically consists of a minimum 30-mil synthetic liner, draped over HDPE pipe used as the berm, and then secured to prevent movement. Produced water will be reused whenever practical and for as long as possible. It will be removed via a vacuum truck, hauled and disposed of in Kinder Morgan disposal wells DWD-1, HWD-1 or MWD-1.

Safe containmant attachment:

CB_4_Proposed_Secondary_Containent_Example_20171219173251.pdf

Waste disposal type: ON-LEASE INJECTION **Disposal location ownership:** PRIVATE

Disposal type description:

Disposal location description: Kinder Morgan's disposal wells: DWD-1 (NENE Sec. 19, T40N, R17W); HWD-1 (SESE Sec. 9, T38N, R18W); MWD-1 (SENE Sec. 16, T37N, R17W).

Waste type: DRILLING

Waste content description: Brine drilling fluids.

Amount of waste: 1500 barrels

Waste disposal frequency : Weekly

Safe containment description: Kinder Morgan will install a 30-mil thick liner underneath the drilling rig. The liner is buried under a foot of gravel for protection. A 9-inch compacted dirt berm is constructed around the well pad to meet stormwater requirements. Additional BMP's are discussed in Section 10 of this SUPO. The tank battery for drilling fluids has its own secondary containment. Secondary containment is equal to 110% of the largest tank per COGCC rules. The secondary containment typically consists of a minimum 30-mil synthetic liner, draped over HDPE pipe used as the berm, and then secured to prevent movement. Waste material generated during drilling will be collected and stored utilizing a closed-loop system of waste management. A) All non-fresh water storage tanks, including roll-off cuttings storage tanks and hose connections, must be pre-cleaned and free of leaks. B) The closed-loop system keeps fresh water cuttings separated from the salt formation and brine water cuttings. C) Drill cuttings recovered from the drilling mud will be temporarily stored on site in an open top tank with containments. The tank allows some natural evaporation of moisture from the cuttings to occur. An "ecosponge" product or an equivalent and environmentally friendly absorption agent will be added to absorb moisture prior to transport of the cuttings for offsite disposal. No waste material other than drill cuttings are allowed to be stored in the cuttings storage containers. Brine drilling fluids will be recycled whenever practical. When fluids are no longer reusable, they will be

removed via a vacuum truck and hauled to a commercial waste disposal off-lease injection well in New Mexico.

Safe containmant attachment:

CB_4_Proposed_Secondary_Containent_Example_20180209104053.pdf

Waste disposal type: OFF-LEASE INJECTION **Disposal location ownership:** COMMERCIAL

Disposal type description:

Disposal location description: Fluids: Disposed of at Agua Moss LLC, 3782 Provo, Bloomfield, NM.

Waste type: SEWAGE

Waste content description: Sewage from personnel on location.

Amount of waste:

Waste disposal frequency : Weekly

Safe containment description: Commercial tanks.

Safe containmant attachment:

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

Disposal type description:

Disposal location description: Sewage: Disposed of at the Cortez Sanitation District located in Cortez, CO.

Waste type: GARBAGE

Waste content description: Typical waste associated with personnel and construction process.

Amount of waste:

Waste disposal frequency : Weekly

Safe containment description: Trash will be stored in an appropriate on-site trash bin that will prevent loss due to wind and it will be periodically hauled to a permitted landfill.

Safe containmant attachment:

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

Disposal type description:

Disposal location description: Disposed of at the Montezuma County Landfill located at 26100 Road F, Cortez, CO.

Waste type: DRILLING

Waste content description: Fresh water drilling fluids waste.

Amount of waste: 3500 barrels

Waste disposal frequency : Weekly

Safe containment description: Kinder Morgan will install a 30-mil thick liner underneath the drilling rig. The liner is buried under a foot of gravel for protection. A 9-inch compacted dirt berm is constructed around the well pad to meet stormwater requirements. Additional BMP's are discussed in Section 10 of this SUPO. The tank battery for drilling fluids has its own secondary containment. Secondary containment is equal to 110% of the largest tank per COGCC rules. The secondary containment typically consists of a minimum 30-mil synthetic liner, draped over HDPE pipe used as the berm, and then secured to prevent movement. Waste material generated during drilling will be collected and stored utilizing a closed-loop

system of waste management. A) All non-fresh water storage tanks, including roll-off cuttings storage tanks and hose connections, must be pre-cleaned and free of leaks. B) The closed-loop system keeps fresh water cuttings separated from the salt formation and brine water cuttings. C) Drill cuttings recovered from the drilling mud will be temporarily stored on site in an open top tank with containments. The tank allows some natural evaporation of moisture from the cuttings to occur. An “ecosponge” product or an equivalent and environmentally friendly absorption agent will be added to absorb moisture prior to transport of the cuttings for offsite disposal. No waste material other than drill cuttings are allowed to be stored in the cuttings storage containers. Drilling fluids will be recycled whenever practical. When fluids are no longer reusable, they will be removed via vacuum truck and hauled to and disposed of in Kinder Morgan disposal wells DWD-1, HWD-1 or MWD-1.
Safe containmant attachment:

CB_4_Proposed_Secondary_Containent_Example_20180209104019.pdf

Waste disposal type: ON-LEASE INJECTION **Disposal location ownership:** PRIVATE

Disposal type description:

Disposal location description: Kinder Morgan's disposal wells: DWD-1 (NENE Sec 19, T40N, R17W); HWD-1 (SESE Sec 9, T38N, R18W); MWD-1 (SENE Sec 16, T37N, R17W).

Waste type: DRILLING

Waste content description: Brine drill cuttings generated during drilling. Approximately 1,590 cubic feet (11,900 gallons).

Amount of waste: 11900 gallons

Waste disposal frequency : Daily

Safe containment description: Kinder Morgan will install a 30-mil thick liner underneath the drilling rig. The liner is buried under a foot of gravel for protection. A 9-inch compacted dirt berm is constructed around the well pad to meet stormwater requirements. Additional BMP’s are discussed in Section 10 of this SUPO. The tank battery for drilling fluids has its own secondary containment. Secondary containment is equal to 110% of the largest tank per COGCC rules. The secondary containment typically consists of a minimum 30-mil synthetic liner, draped over HDPE pipe used as the berm, and then secured to prevent movement. Waste material generated during drilling will be collected and stored utilizing a closed-loop system of waste management. A) All non-fresh water storage tanks, including roll-off cuttings storage tanks and hose connections, must be pre-cleaned and free of leaks. B) The closed-loop system keeps fresh water cuttings separated from the salt formation and brine water cuttings. C) Drill cuttings recovered from the drilling mud will be temporarily stored on site in an open top tank with containments. The tank allows some natural evaporation of moisture from the cuttings to occur. An “ecosponge” product or an equivalent and environmentally friendly absorption agent will be added to absorb moisture prior to transport of the cuttings for offsite disposal. No waste material other than drill cuttings are allowed to be stored in the cuttings storage containers.
Safe containmant attachment:

CB_4_Proposed_Secondary_Containent_Example_20180209104303.pdf

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

Disposal location description: Disposed of at Industrial Ecosystems, Inc., 49 Road 3150, Aztec, NM. The cuttings are put through a centrifuge to separate out the solids from the fluids. The solids are disposed of at IEI's landfarms, and the fluids are disposed of at IEI's evaporation facility.

Reserve Pit

Reserve Pit being used? NO

Temporary disposal of produced water into reserve pit?

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

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

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

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

Reserve pit liner

Reserve pit liner specifications and installation description

Cuttings Area

Cuttings Area being used? NO

Are you storing cuttings on location? NO

Description of cuttings location

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

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

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

WCuttings area liner

Cuttings area liner specifications and installation description

Section 8 - Ancillary Facilities

Are you requesting any Ancillary Facilities?: NO

Ancillary Facilities attachment:

Comments:

Section 9 - Well Site Layout

Well Site Layout Diagram:

CB_4_Well_Pad_Diagram_Construction_BMP50__20180209073238.pdf
CB_4_Cuts___Fills_Diagram_50__20180209073343.pdf
CB_4_Drilling_Rig_Layout_50__20180209073407.pdf
CB_4_Interim_Reclamation_Diagram_BMP50__20180209073429.pdf

Comments:

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Section 10 - Plans for Surface Reclamation

Type of disturbance: New Surface Disturbance **Multiple Well Pad Name:**

Multiple Well Pad Number:

Recontouring attachment:

CB_4_Well_Pad_Diagram_Construction_BMP50__20180209073504.pdf

Drainage/Erosion control construction: Erosion control logs (straw wattles) will be installed around the perimeter of the Construction Buffer, as well as around the topsoil stockpile(s). Cut and fill slopes will be constructed at no greater than a 3:1 slope. Tackifier will be applied to the top soil stockpile, as well as the cut and fill slopes to assist with erosion control prior to interim reclamation. A control ditch will be installed around the perimeter of the well pad surface with two (2) slide gates to contain and control any spills or stormwater on location. Armored outlet protection will be installed at the slide gate exit points, as well as inlet/outlet protection will be installed at all culverts. Bermed ditches with check dams, sediment traps and armored outlet protection will be installed along the West and East sides of the Construction Buffer between the cut/fill slopes and the topsoil stockpiles to divert any stormwater away from the location. See attached 'CB-4 Construction Stormwater BMP Diagram'.

Drainage/Erosion control reclamation: The well pad will be pulled back to a 250 foot by 150 foot graveled area to accommodate any future work-over rigs, and will remain level and weed free for the life of the well(s). During the interim reclamation, the areas on the well pad and pipeline corridor will be shaped (re-contoured) to conform to the approximate original contour using the stockpiled topsoil. After the area is re-contoured, the area would be reseeded according the surface owners specifications. See attached 'CB-4 Interim Reclamation Diagram'.

Well pad proposed disturbance (acres): 6.72
Road proposed disturbance (acres): 0.56
Powerline proposed disturbance (acres): 0
Pipeline proposed disturbance (acres): 0.24
Other proposed disturbance (acres): 0

Total proposed disturbance: 7.52

Well pad interim reclamation (acres): 0.86
Road interim reclamation (acres): 0.37
Powerline interim reclamation (acres): 0
Pipeline interim reclamation (acres): 0
Other interim reclamation (acres): 0

Total interim reclamation: 1.23

Well pad long term disturbance (acres): 0.86
Road long term disturbance (acres): 0.37
Powerline long term disturbance (acres): 0
Pipeline long term disturbance (acres): 0
Other long term disturbance (acres): 0

Total long term disturbance: 1.23

Disturbance Comments:

Reconstruction method: During the interim reclamation, the areas on the well pad and pipeline corridor will be shaped (re-contoured) to conform to the approximate original contour using the stockpiled topsoil. After the area is re-contoured, the area would be reseeded according the surface owners specifications. See attached 'CB-4 Interim Reclamation Diagram'.
Topsoil redistribution: See 'Reconstruction method' above.

Soil treatment: Stock piles will be treated with soil tackifier to minimize erosion. No other treatments are planned.

Existing Vegetation at the well pad: The proposed well pad, access road and pipeline are located in active crop-land currently planted in winter wheat.
Existing Vegetation at the well pad attachment:

Existing Vegetation Community at the road: The proposed well pad, access road and pipeline are located in active crop-land currently planted in winter wheat.
Existing Vegetation Community at the road attachment:

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Existing Vegetation Community at the pipeline: The proposed well pad, access road and pipeline are located in active crop-land currently planted in winter wheat.
Existing Vegetation Community at the pipeline attachment:

Existing Vegetation Community at other disturbances: Not Applicable.

Existing Vegetation Community at other disturbances attachment:

Non native seed used? NO

Non native seed description:

Seedling transplant description:

Will seedlings be transplanted for this project? NO

Seedling transplant description attachment:

Will seed be harvested for use in site reclamation? NO

Seed harvest description:

Seed harvest description attachment:

Seed Management

Seed Table

Seed type: **Seed source:**

Seed name:

Source name: **Source address:**

Source phone:

Seed cultivar:

Seed use location:

PLS pounds per acre: **Proposed seeding season:**

Seed Summary

Total pounds/Acre:

Seed Type	Pounds/Acre

Seed reclamation attachment:

Operator Contact/Responsible Official Contact Info

First Name: Chris **Last Name:** Lopez

Phone: (970)882-5537 **Email:** christopher_lopez@kindermorgan.com

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Seedbed prep:

Seed BMP:

Seed method:

Existing invasive species? NO

Existing invasive species treatment description:

Existing invasive species treatment attachment:

Weed treatment plan description: See attached 'KM Weed Plan'.

Weed treatment plan attachment:

KM__Weed_Plan_01122017_20171221101031.pdf

Monitoring plan description: See attached 'KM Weed Plan'.

Monitoring plan attachment:

KM__Weed_Plan_01122017_20171221101143.pdf

Success standards: Interim and Final Reclamation will be considered successful when 80% of background vegetative cover is achieved on disturbed areas.
Pit closure description: Not Applicable.

Pit closure attachment:

Section 11 - Surface Ownership

Disturbance type: NEW ACCESS ROAD

Describe:

Surface Owner: PRIVATE OWNERSHIP

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Fee Owner: Brad E. & Pamela K. White **Fee Owner Address:** 9136 Road BB Pleasant View, CO 81331

Phone: (970)739-4774 **Email:**

Surface use plan certification: NO

Surface use plan certification document:

Surface access agreement or bond: Agreement

Surface Access Agreement Need description: Surface Use Agreement

Surface Access Bond BLM or Forest Service:

BLM Surface Access Bond number:

USFS Surface access bond number:

Disturbance type: EXISTING ACCESS ROAD

Describe:

Surface Owner: PRIVATE OWNERSHIP

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Fee Owner: Brad E. & Pamela K. White **Fee Owner Address:** 9136 Road BB Pleasant View, CO 81331

Phone: (970)739-4774 **Email:**

Surface use plan certification: NO

Surface use plan certification document:

Surface access agreement or bond: Agreement

Surface Access Agreement Need description: Surface Use Agreement

Surface Access Bond BLM or Forest Service:

BLM Surface Access Bond number:

USFS Surface access bond number:

Disturbance type: WELL PAD

Describe:

Surface Owner: PRIVATE OWNERSHIP

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Fee Owner: Brad E. & Pamela K. White **Fee Owner Address:** 9136 Road BB Pleasant View, CO 81331

Phone: (970)739-4774 **Email:**

Surface use plan certification: NO

Surface use plan certification document:

Surface access agreement or bond: Agreement

Surface Access Agreement Need description: Surface use Agreement

Surface Access Bond BLM or Forest Service:

BLM Surface Access Bond number:

USFS Surface access bond number:

Disturbance type: PIPELINE

Describe:

Surface Owner: PRIVATE OWNERSHIP

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Operator Name: KINDER MORGAN C02 COMPANY

Well Name: CB **Well Number:** 4

Fee Owner: Brad E. & Pamela K. White **Fee Owner Address:** 9136 Road BB Pleasant View, CO 81331

Phone: (970)739-4774 **Email:**

Surface use plan certification: NO

Surface use plan certification document:

Surface access agreement or bond: Agreement

Surface Access Agreement Need description: Surface use Agreement

Surface Access Bond BLM or Forest Service:

BLM Surface Access Bond number:

USFS Surface access bond number:

Section 12 - Other Information

Right of Way needed? NO **Use APD as ROW?**

ROW Type(s):

ROW Applications

SUPO Additional Information:

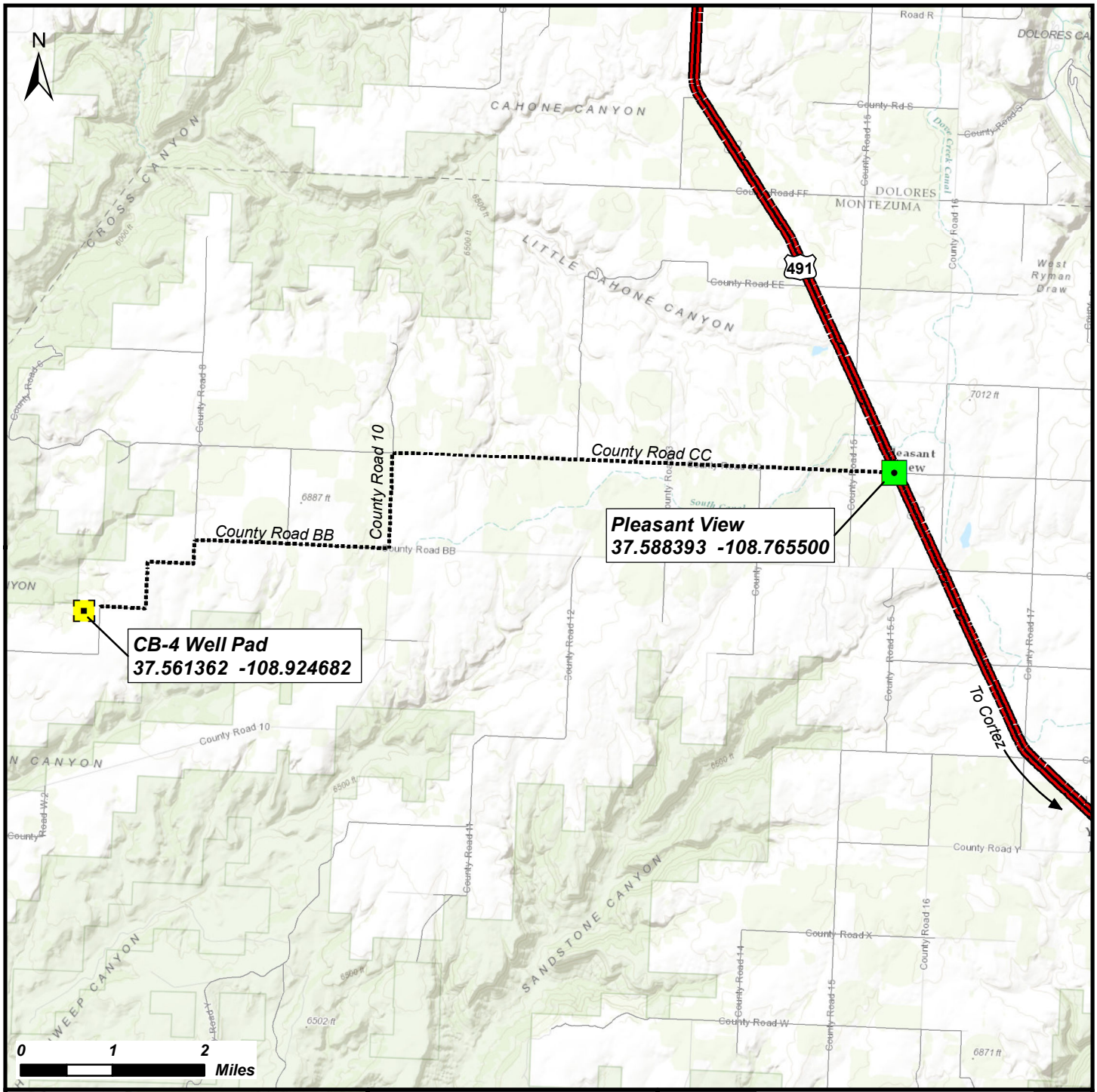
Use a previously conducted onsite? NO

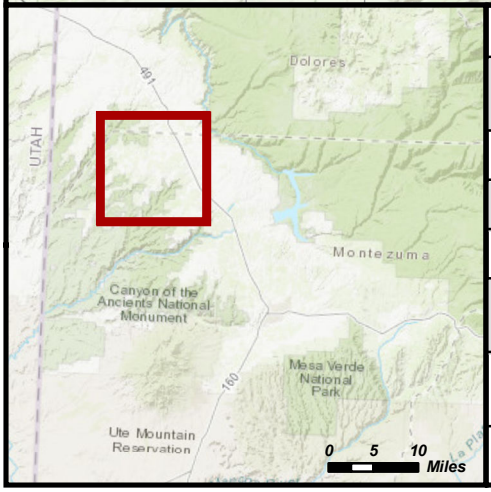
Previous Onsite information:

Other SUPO Attachment

CB_4_Lease_COC052523_20171219175222.pdf

CX_4_Executed_SUA_20171219175239.pdf





DIRECTIONS

1) Directions and mileage begin at the junction of Hwy 491 and CR CC.	
2) Travel west on CR CC	5.3 miles
3) Turn South on CR 10	1 mile
4) Turn west on CR BB	2.1 miles
5) Follow CR BB which turns into CR 8	1.7 miles
6) Follow CR 8 to well location access road at the CB Cluster Facility	

KINDER MORGAN

Transportation Map

CB-4 CO^2 Well Pad, Access, and Pipeline

37.561362 -108.924682

Section 10, Township 38 North, Range 19 West

Features

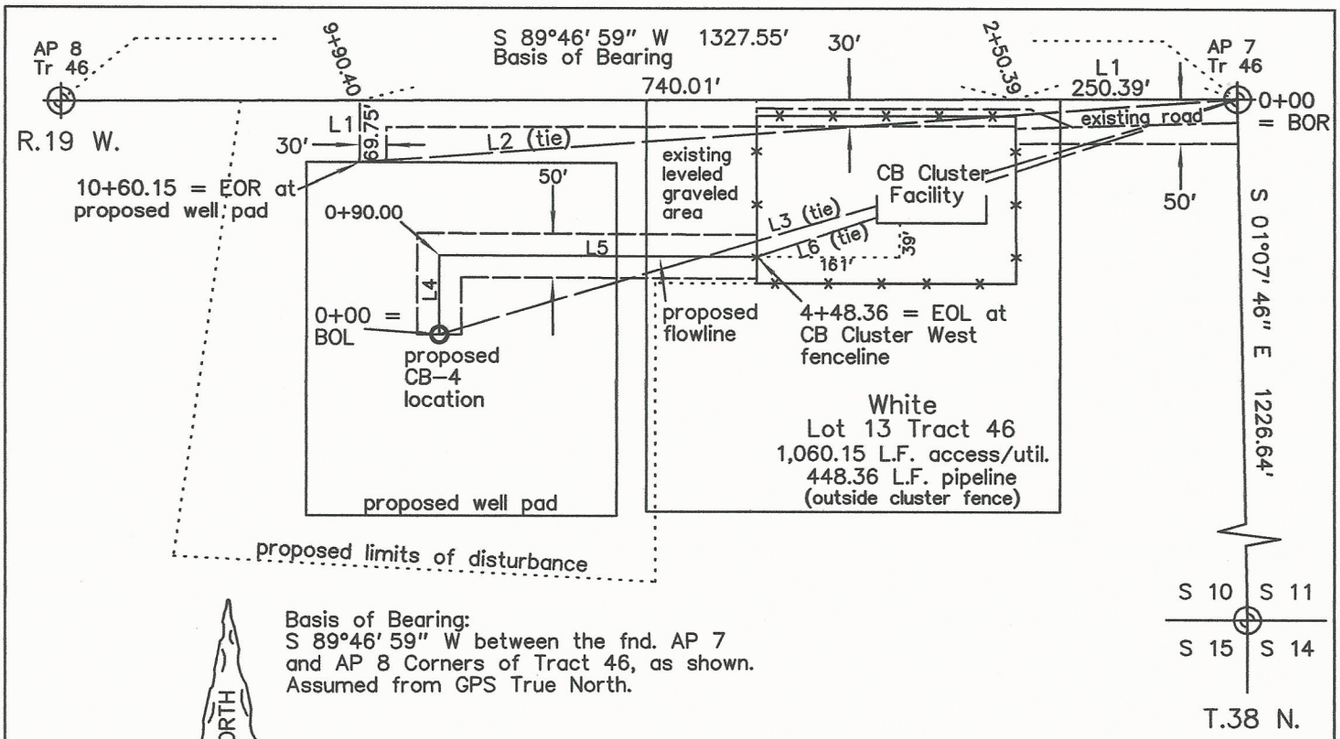
- CB-4 Well Pad
- Pleasant View
- Route to Well Pad

Transportation

- US HWY 491

HRL Compliance Solutions, Inc.
Environmental Consultants

Author: E. Fought
Revision: 0
Date: 11/28/2017



Basis of Bearing:
S 89°46' 59" W between the fnd. AP 7 and AP 8 Corners of Tract 46, as shown. Assumed from GPS True North.

NORTH

0' 200'

Scale: 1" = 200'

U.S. Survey Feet

⊕ fnd. stnd. GLO brass cap monument

LINE DESCRIPTION TABLE

L1	SOUTH	69.75'	
L2	N 85°45' 20" E	993.11'	(tie)
L3	N 73°23' 43" E	939.71'	(tie)
L4	NORTH	90.00'	
L5	S 89°50' 12" E	358.36'	
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LEGAL DESCRIPTION – 50 Foot/30 Foot Wide Access and Utility Corridor

A 50 foot/30 foot wide access and utility corridor contained in Lot 13 of Tract 46 in Section 10, T.38 N., R.19 W., NMPM, Montezuma County, Colorado, whose North and West lines are described as follows:
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COLORADO REGISTERED
GERALD G. HUDDLESTON
28 Sept 17
17490
PROFESSIONAL LAND SURVEYOR

KNOW ALL MEN BY THESE PRESENTS that I, GERALD G. HUDDLESTON, do hereby cerify that this plat was prepared from field notes of an actual survey ade by me or under my supervision and that the same is true and accurate to the best of my knowledge and belief. This plat is in accordance with applicable standards of practice. This statement is not a guaranty or warranty, either expressed or implied.

NOTICE:
According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you first discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years from the date of certification shown hereon.

KINDER MORGAN CO2 COMPANY, LP

Proposed CB–4 Access/Utility and Pipeline Corridors
Brad White
Lot 13 of Tract 46 in Section 10,
T.38 N., R.19 W., NMPM
Montezuma County, Colorado

revised 28 September 2017
revised 2 March 2015
1 March 2015

HUDDLESTON LAND SURVEYING
P.O. DRAWER KK / CORTEZ, CO 81321 / (970) 565–3330

N

PLANT

0 25 50 100

1"=50'
DWG. SCALE IS BASED ON
AN 24"x36" SHEET SIZE

LEGEND

- T-POST LOCATION
- LATH/PIN FLAG
- U-POST/LATH
- RIG ANCHOR
- 6" SLIDE VALVE
- CULVERTS
- DIVERSION DITCH
- Erosion Log
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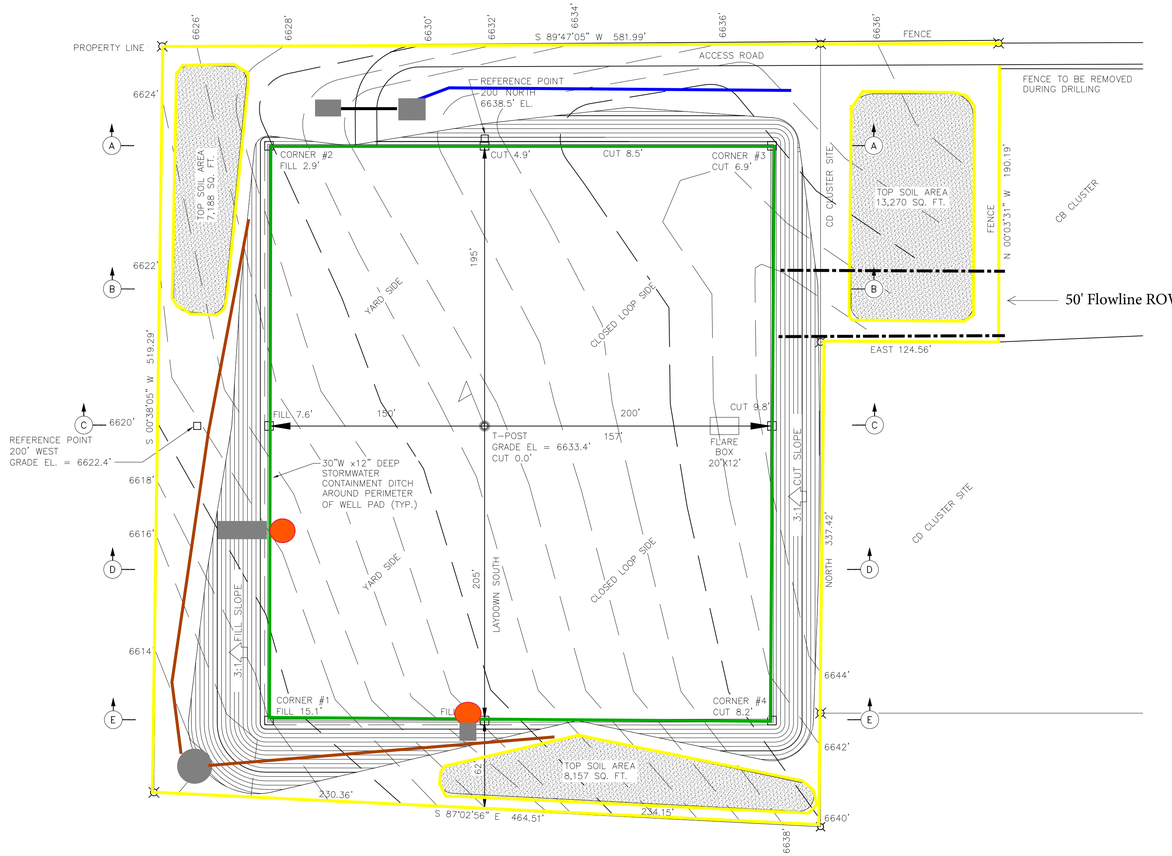


PLAN
SCALE 1"=50'

LIMITS OF DISTURBANCE 6.22 ACRES
APPROXIMATE DIRT QUANTITIES:
17,749 CYS. CUT, 13,869 CYS. FILL
3,880 EXCESS (3,345 CYS. TOP SOIL)
NO SHRINK OR FILL

NOTES:

INFORMATION BASED ON A SURVEY OR SURVEYS ON THE GROUND DATED: 12/07/2014
PROVIDED BY:
HUDDLESTON LAND SURVEYING
P.O. BOX KK - CORTEZ, CO. 81321
(970) 565-3330

REVISIONS				
0	ISSUED FOR PERMIT	7/18/16	GEG	

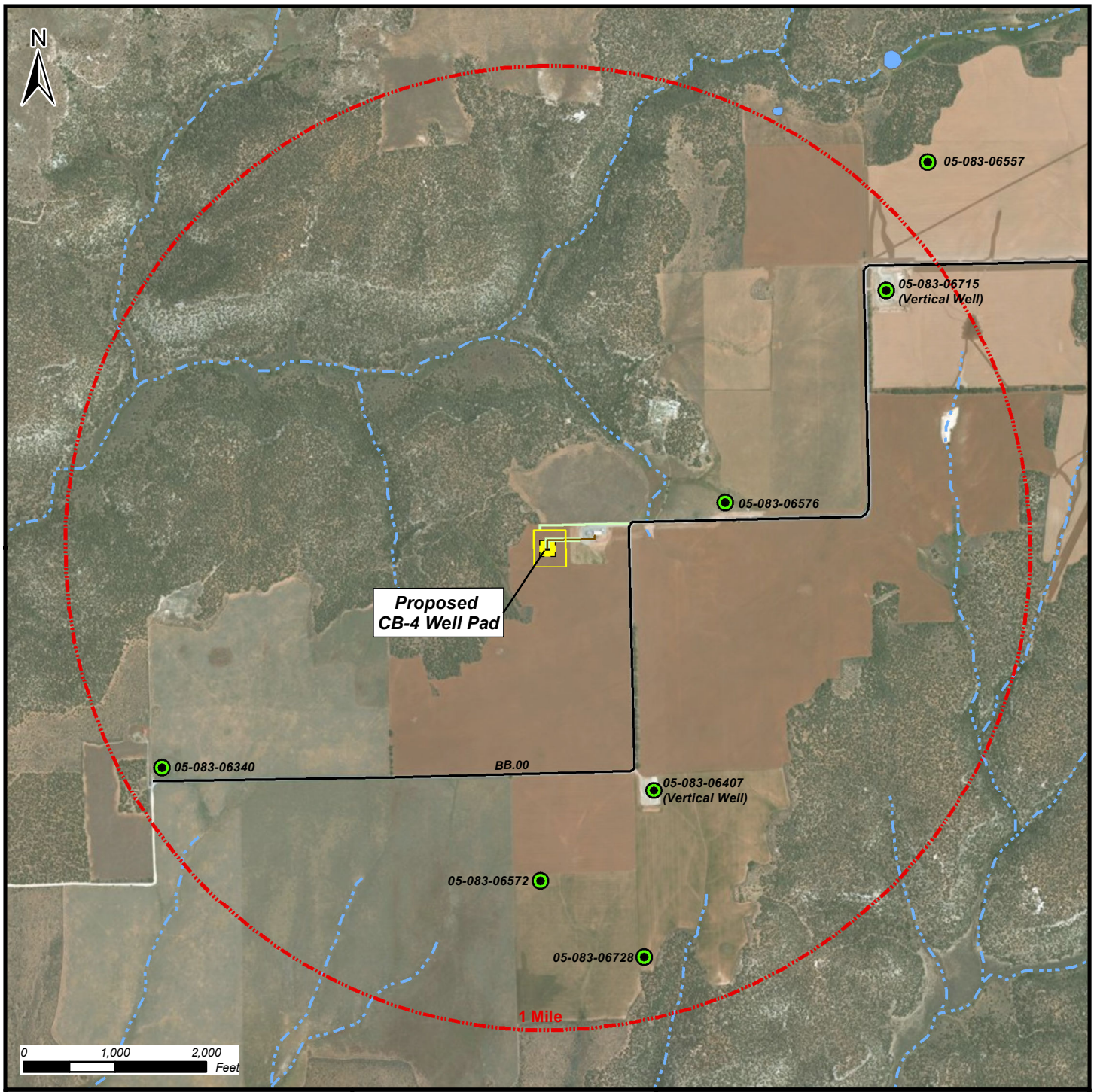
KINDER MORGAN
CO_2 COMPANY, L.P.
17801 HWY. 491
CORTEZ, CO 81321
SITE LOCATION:

CO2 WELL PAD SITE PLAN
COW CANYON CB-4 WELL PAD
EXISTING AND DESIGN CONTOURS

COW CANYON FACILITIES — DELORES COUNTY, COLORADO

DRAWN BY: GEG 7/18/16	REVIEWED BY:	SCALE: AS-NOTED	
CHECKED BY: CM	APPROVED BY:	DRAWING NUMBER: WP-CB-4-PERM-001	

Jan 04, 2018 - 7:32am by gummgle1 - Path = F:\CO2 S&T CAD Vault\Projects\McElmo Dome Facilities\Cow Canyon\CC Gathering\Civil\WP-CB-4-PERM-001-004 well pad.dwg



HYDROGRAPHY:

FEATURE	PRESENT WITHIN 1 MILE
Intermittent Stream	Yes

*No known water wells exist within 1 mile of the proposed facility

**No additional hydrography features have been identified within 1 mile of the proposed facility.

Well Status Key

AL - Abandoned Location

DA - Dry and Abandoned

PER - Permitted

PR- Producing

WELLS:

API/PERMIT #	OWNER	STATUS
05-083-06407	Kinder Morgan	PR
05-083-06572	Ballard Petroleum	AL
05-083-06576	Ampolex	DA
05-083-06715	Kinder Morgan	PR
05-083-06340	Swepi LP	AL
05-083-06728	Kinder Morgan	PER

HRL COMPLIANCE SOLUTIONS

KINDER MORGAN

Hydrology and Wells Map

CB-4 CO^2 Well Pad, Access, and Pipeline

37.561362 -108.924682

Section 10, Township 38 North, Range 19 West

Features

- Active Gas Wells (Top Hole)
- Proposed Well Pad
- Pipeline
- Access and Pipeline ROW
- 1 Mile Buffer

Transportation

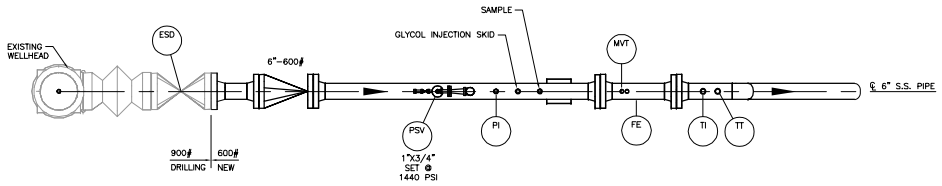
- Local Roads

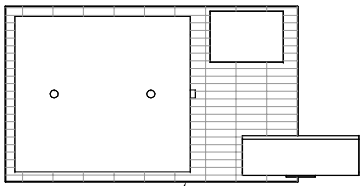
Author: E. Fought

Revision: 1

Date: 1/30/2018

Document Path: T:\CLIENTS\KINDER MORGAN\2018\CB-4\PERMITTING\CB-4 Hydrology and Wells Map 11-14-17 REV1 013018.mxd

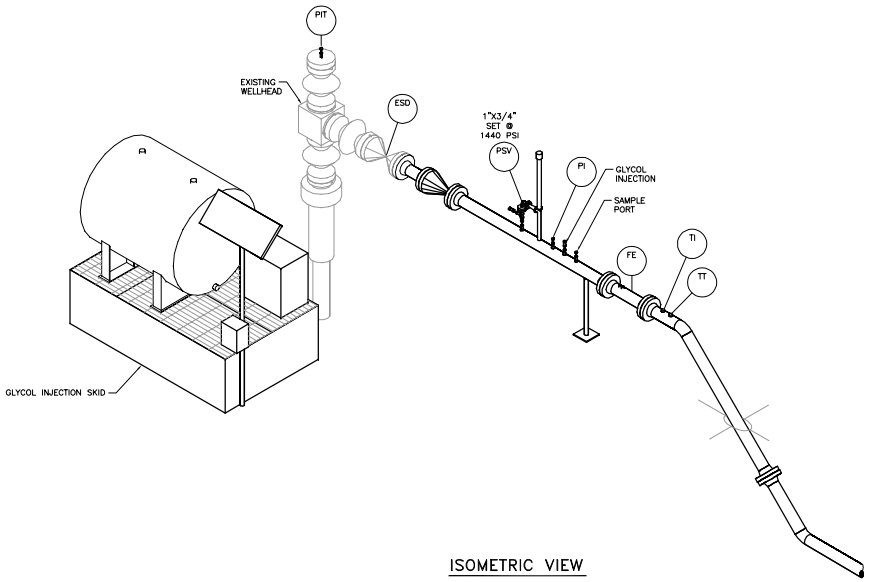




PLOT PLAN

SCALE: 1/2"=1'-0"

NOTE:
SKID PLACEMENT RELATIVE TO WELLHEAD WILL VARY DEPENDING ON WELLSITE ORIENTATION AND SPACE.



ISOMETRIC VIEW

0 1' 2' 3' 4' 5'

SCALE: 1/2"=1'-0"

SCALE PERTAINS TO DRAWING PLOTTED AT 24X36

NOTES:

REVISIONS					
1	ISSUED FOR REVIEW	9/11/13	GEG		

KINDER MORGAN
CO_2 COMPANY, L.P.

185 Suttle St. Suite 101
Durango, CO 81303

REFERENCE TITLE SHEET DRAWING:

PLOT PLAN
TYPICAL WELL SITE
EQUIPMENT LAYOUT

CO2 WELL SITE — MONTEZUMA COUNTY, COLORADO

DRAWN BY: GEG 9/11/13	REVIEWED BY:	SCALE: AS NOTED	
CHECKED BY:	APPROVED BY:	DRAWING NUMBER: TYP092013D-MP-800	

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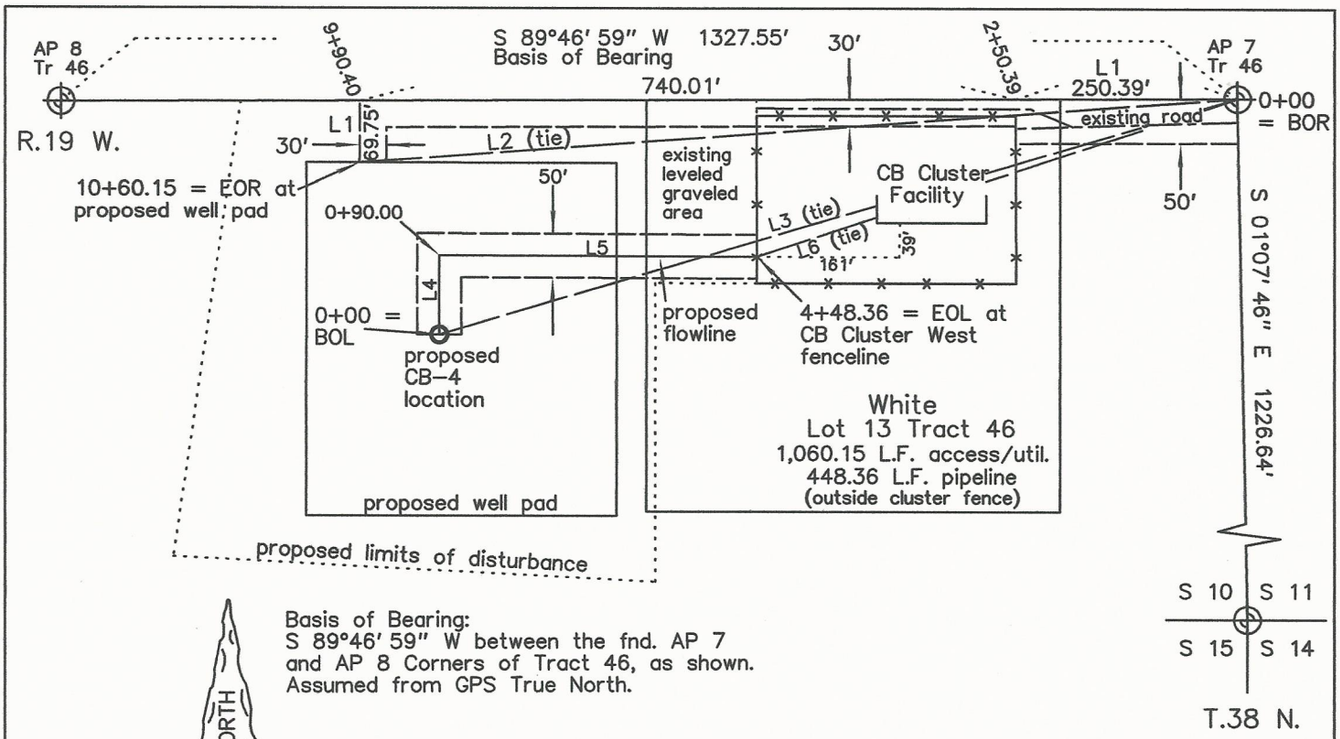

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0' 200'

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U.S. Survey Feet

⊕ fnd. stnd. GLO brass cap monument

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COLORADO REGISTERED
GERALD G. HUDDLESTON
28 Sept 17
17490
PROFESSIONAL LAND SURVEYOR

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Proposed CB–4 Access/Utility and Pipeline Corridors
Brad White
Lot 13 of Tract 46 in Section 10,
T.38 N., R.19 W., NMPM
Montezuma County, Colorado

revised 28 September 2017
revised 2 March 2015
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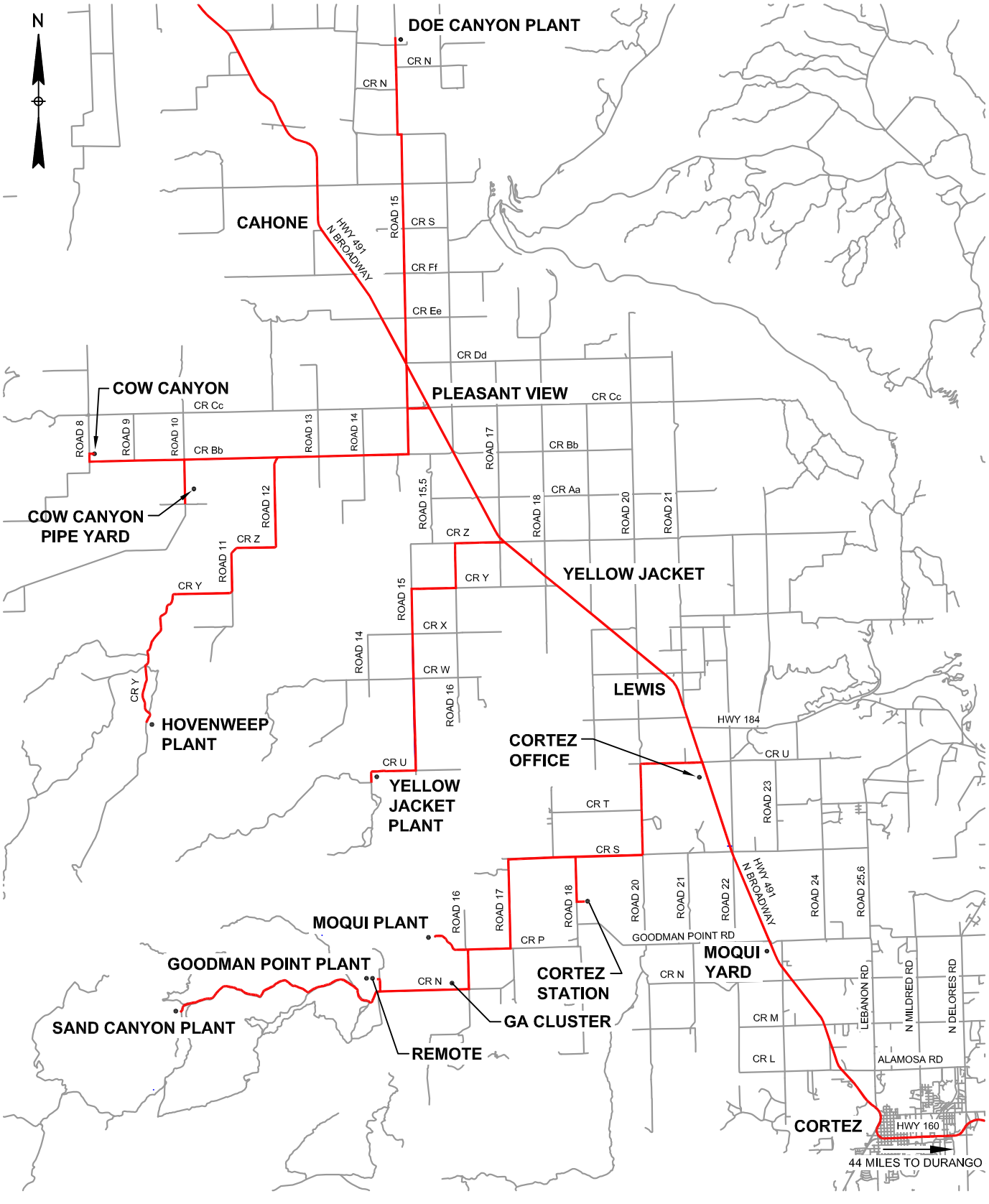
HUDDLESTON LAND SURVEYING
P.O. DRAWER KK / CORTEZ, CO 81321 / (970) 565–3330



REVISIONS					
NO.	DESCRIPTION	DATE	BY	CHKD.	APPR.

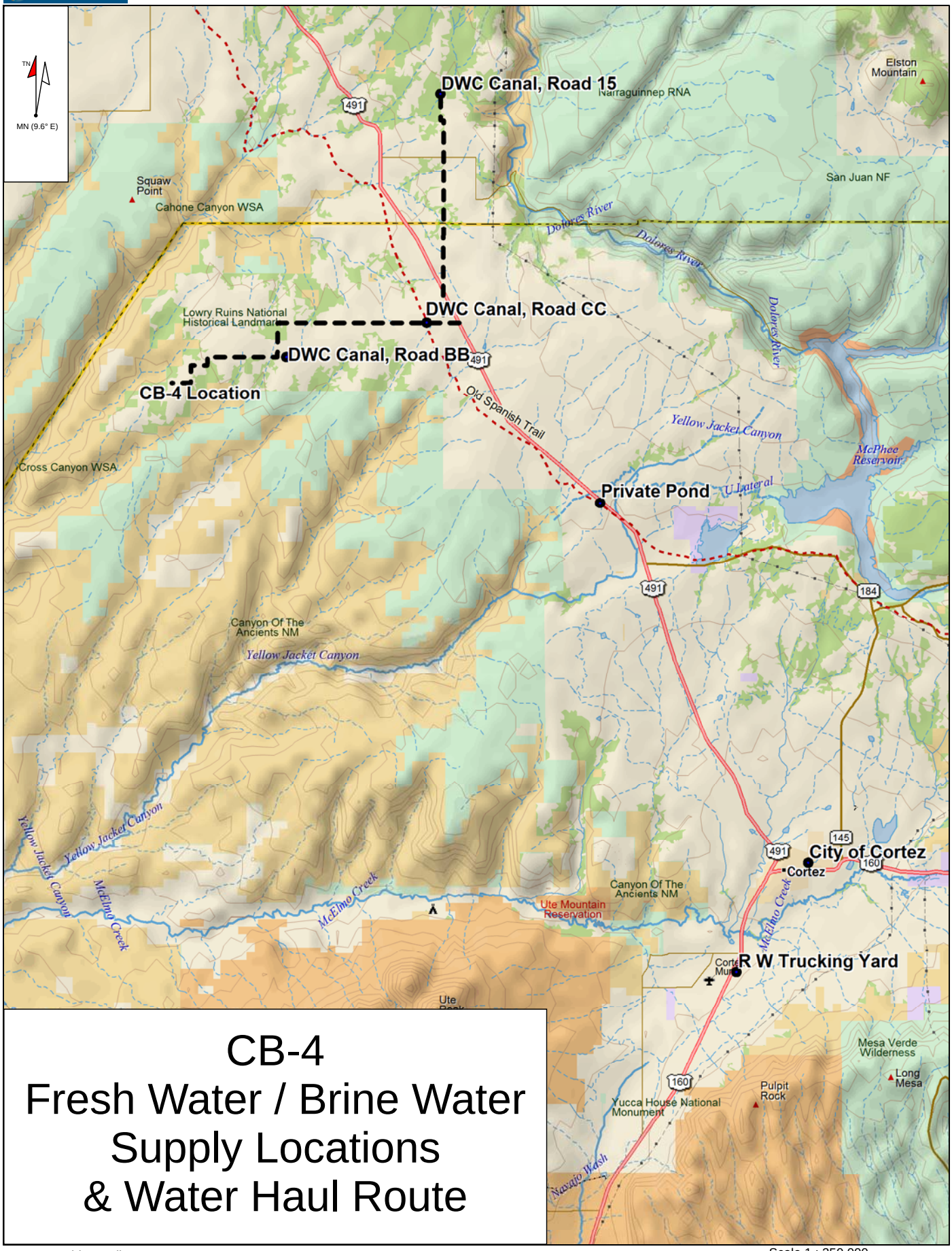
KINDER MORGAN
CO_2 COMPANY, L.P.

185 Suttle St. Suite 101
Durango, CO 81303

PLANT LOCATIONS
TRUCK ROUTE

DATE: 7/23/13		APPROVED BY:
SCALE: N.T.S.	TRUCK ROUTE	SH. 1 OF 1

Jul 20, 2017 - 7:51am by gummgle1 - Path = T:\CO2 S&T CAD Vault\Mapping\Maps\Cortez\Autocad\PLANT LOCATIONS TRUCK ROUTE.dwg



CB-4
Fresh Water / Brine Water Supply Locations & Water Haul Route

Scale 1 : 250,000
1" = 3.95 mi
Data Zoom 9-6

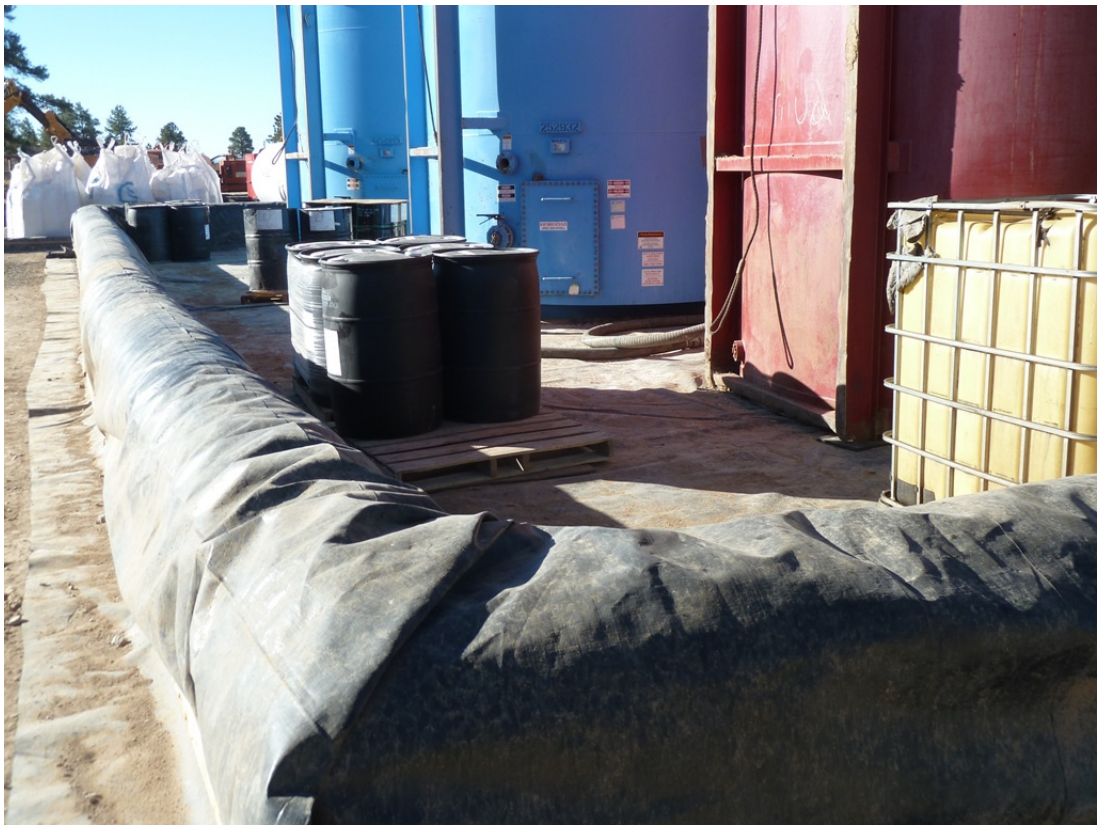
KINDER MORGAN
CO_2 COMPANY, L.P.

AFMSS II
SECTION 7 – Methods for Handling Waste

Waste Type – DRILLING
Drill cuttings & non-reusable drilling fluids

The tank battery for drilling fluids has its own secondary containment. Secondary containment is equal to 110% of the largest tank per COGCC rules. The secondary containment typically consists of a minimum 30-mil synthetic liner, draped over HDPE pipe used as the berm, and then secured to prevent movement.

See example below from Kinder Morgan's DC-3 Drilling operations (API #05-033-06133)



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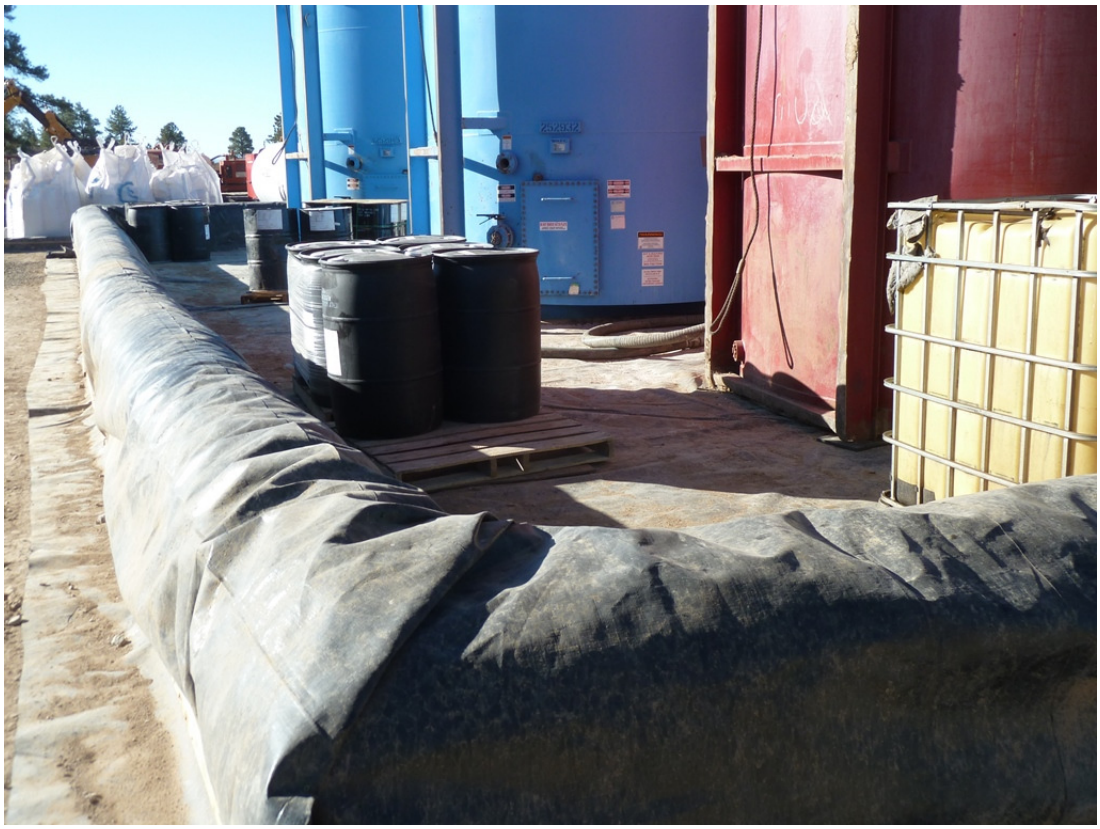

KINDER MORGAN
CO_2 COMPANY, L.P.

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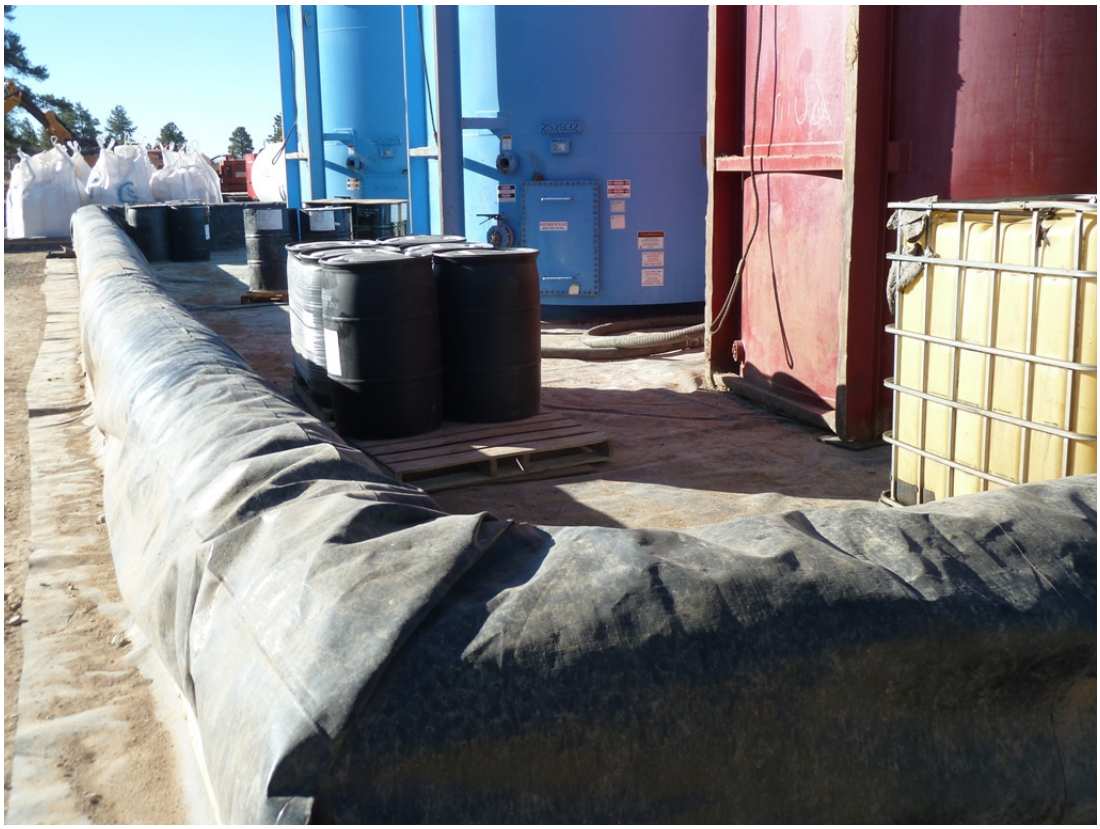

KINDER MORGAN
CO_2 COMPANY, L.P.

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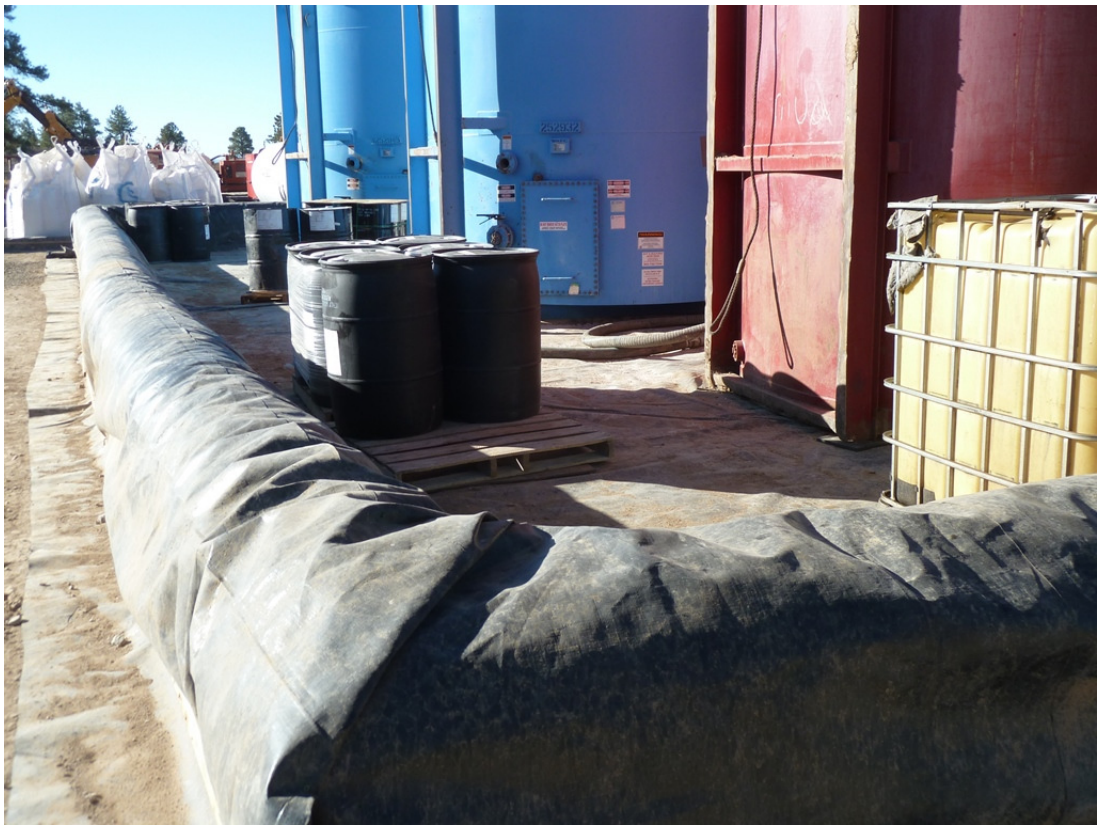

KINDER MORGAN
CO_2 COMPANY, L.P.

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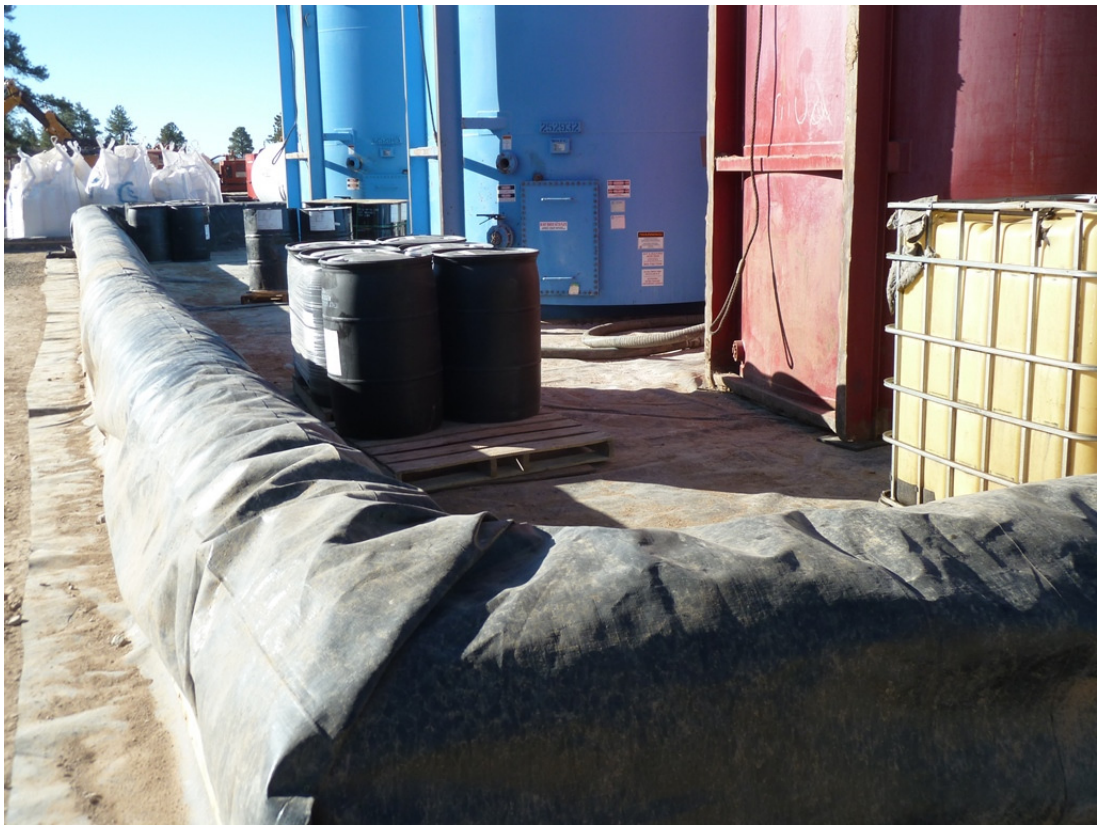

N

PLANT

0 25 50 100

1"=50'
DWG. SCALE IS BASED ON
AN 24"x36" SHEET SIZE

LEGEND

- T-POST LOCATION
- LATH/PIN FLAG
- U-POST/LATH
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- 6" SLIDE VALVE
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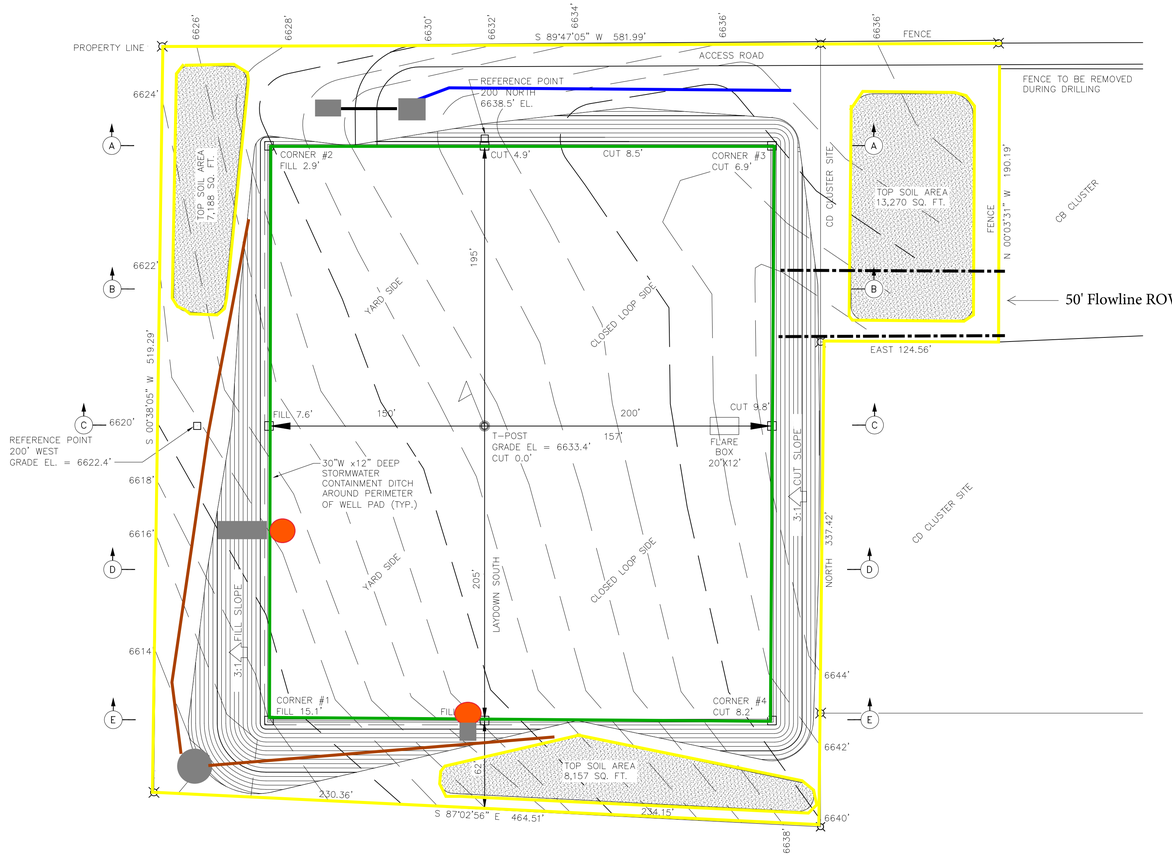

PLAN
SCALE 1"=50'

LIMITS OF DISTURBANCE 6.22 ACRES
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17,749 CYS. CUT, 13,869 CYS. FILL
3,880 EXCESS (3,345 CYS. TOP SOIL)
NO SHRINK OR FILL

NOTES:

INFORMATION BASED ON A SURVEY OR SURVEYS ON THE GROUND DATED: 12/07/2014
PROVIDED BY:
HUDDLESTON LAND SURVEYING
P.O. BOX KK - CORTEZ, CO. 81321
(970) 565-3330

REVISIONS				
0	ISSUED FOR PERMIT	7/18/16	GEG	

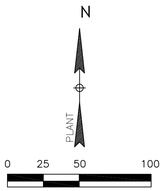
KINDER MORGAN
CO_2 COMPANY, L.P.
17801 HWY. 491
CORTEZ, CO 81321
SITE LOCATION:

CO2 WELL PAD SITE PLAN
COW CANYON CB-4 WELL PAD
EXISTING AND DESIGN CONTOURS

COW CANYON FACILITIES — DELORES COUNTY, COLORADO

DRAWN BY: GEG 7/18/16	REVIEWED BY:	SCALE: AS-NOTED	
CHECKED BY: CM	APPROVED BY:	DRAWING NUMBER: WP-CB-4-PERM-001	

Jan 04, 2018 - 7:32am by gummgle1 - Path = F:\CO2 S&T CAD Vault\Projects\McElmo Dome Facilities\Cow Canyon\CC Gathering\Civil\WP-CB-4-PERM-001-004 well pad.dwg



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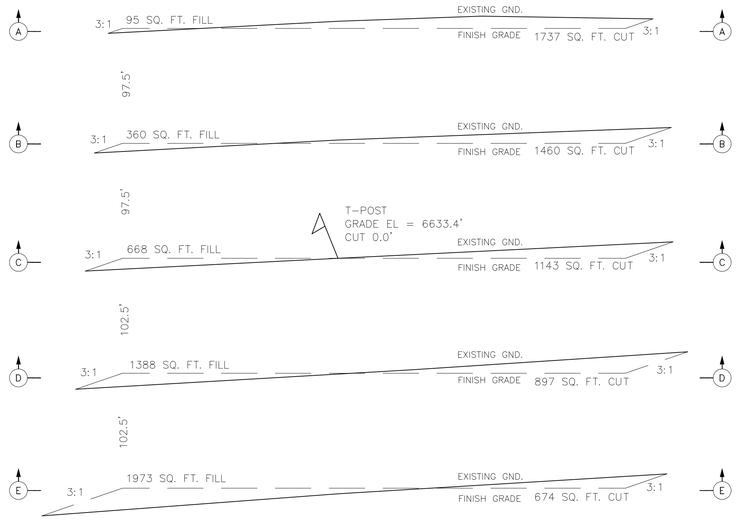

CROSS SECTIONS

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INFORMATION BASED ON A SURVEY OR SURVEYS ON THE GROUND DATED; 12/07/2014
PROVIDED BY;

HUDDLESTON LAND SURVEYING
P.O. BOX KK - CORTEZ, CO. 81321
(970) 565-3330

REVISIONS					
0	ISSUED FOR PERMIT	7/18/16	GEG		

KINDER MORGAN
CO_2 COMPANY, L.P.

17801 HWY. 491
CORTEZ, CO 81321

SITE LOCATION:

CO2 WELL PAD SITE PLAN
COW CANYON CB-4 WELL PAD
GRADING CROSS SECTIONS

COW CANYON FACILITIES — DELORES COUNTY, COLORADO

DRAWN BY: GEG 7/18/16	REVIEWED BY:	SCALE: AS-NOTED	
CHECKED BY: CM	APPROVED BY:	DRAWING NUMBER: WP-CB-4-PERM-002	

Jan 04, 2018 - 7:31am by gummgle1 - Path = T:\CO2 S&T CAD Vault\Projects\McElmo Dome Facilities\Cow Canyon\CC Gathering\Civil\WP-CB-4-PERM-001-004 well pad.dwg

N

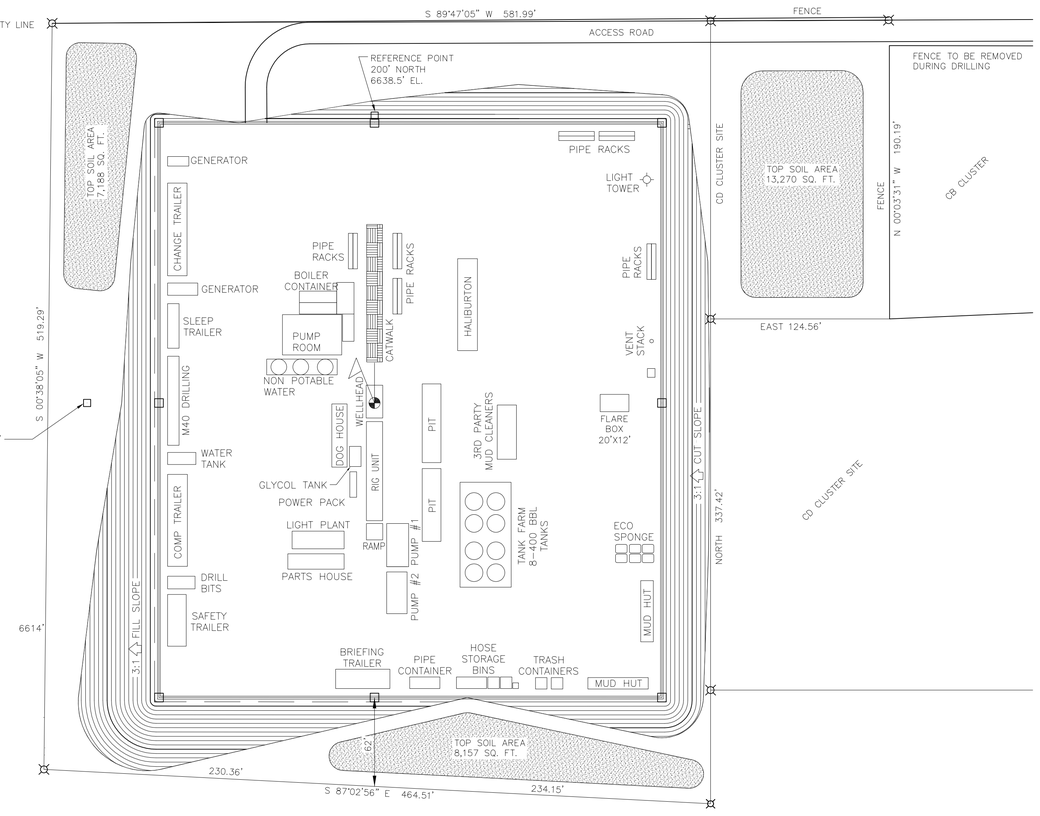
PLANT

0 25 50 100

1"=50'
DWG. SCALE IS BASED ON
AN 24"x36" SHEET SIZE

LEGEND

- T-POST LOCATION
- LATH/PIN FLAG
- U-POST/LATH
- RIG ANCHOR
- 6" SLIDE VALVE
- CULVERTS
- DIVERSION DITCH



PLAN
SCALE 1"=50'

NOTES:

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ON THE GROUND DATED; 12/07/2014
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P.O. BOX KK - CORTEZ, CO. 81321
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KINDER MORGAN
CO_2 COMPANY, L.P.

17801 HWY. 491
CORTEZ, CO 81321

SITE LOCATION:

CO2 WELL PAD SITE PLAN
COW CANYON CB-4 WELL PAD
EQUIPMENT LAYOUT

COW CANYON FACILITIES — DELORES COUNTY, COLORADO

DRAWN BY: GEG 7/18/16	REVIEWED BY:	SCALE: AS-NOTED	
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N

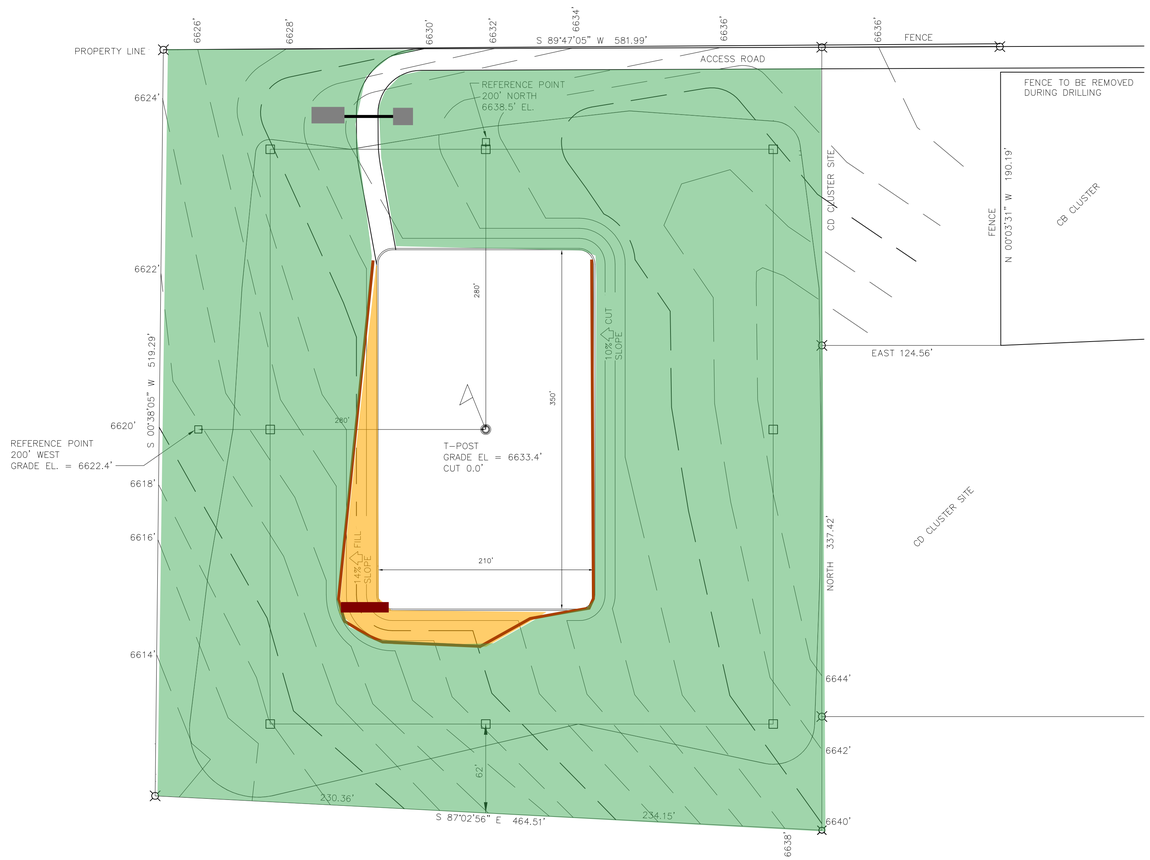
PLANT

0 25 50 100

1"=50'
DWG. SCALE IS BASED ON
AN 24"x36" SHEET SIZE

LEGEND

- T-POST LOCATION
- LATH/PIN FLAG
- U-POST/LATH
- RIG ANCHOR
- 6" SLIDE VALVE
- CULVERTS
- DIVERSION DITCH
- Bermed Ditch
- Area returned to Agriculture
- Erosion Control Blankets
- Blanketed Swale
- Rock Armoring



PLAN
SCALE 1"=50'

NOTES:

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P.O. BOX KK - CORTEZ, CO. 81321
(970) 565-3330

REVISIONS					
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KINDER MORGAN
CO_2 COMPANY, L.P.

17801 HWY. 491
CORTEZ, CO 81321

SITE LOCATION:

CO2 WELL PAD SITE PLAN
COW CANYON CB-4 WELL PAD
INTERIM RECLAMATION PLAN

COW CANYON FACILITIES — DELORES COUNTY, COLORADO

DRAWN BY: GEG 7/18/16	REVIEWED BY:	SCALE: AS-NOTED	
CHECKED BY: CM	APPROVED BY:	DRAWING NUMBER: WP-CB-4-PERM-004	

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N

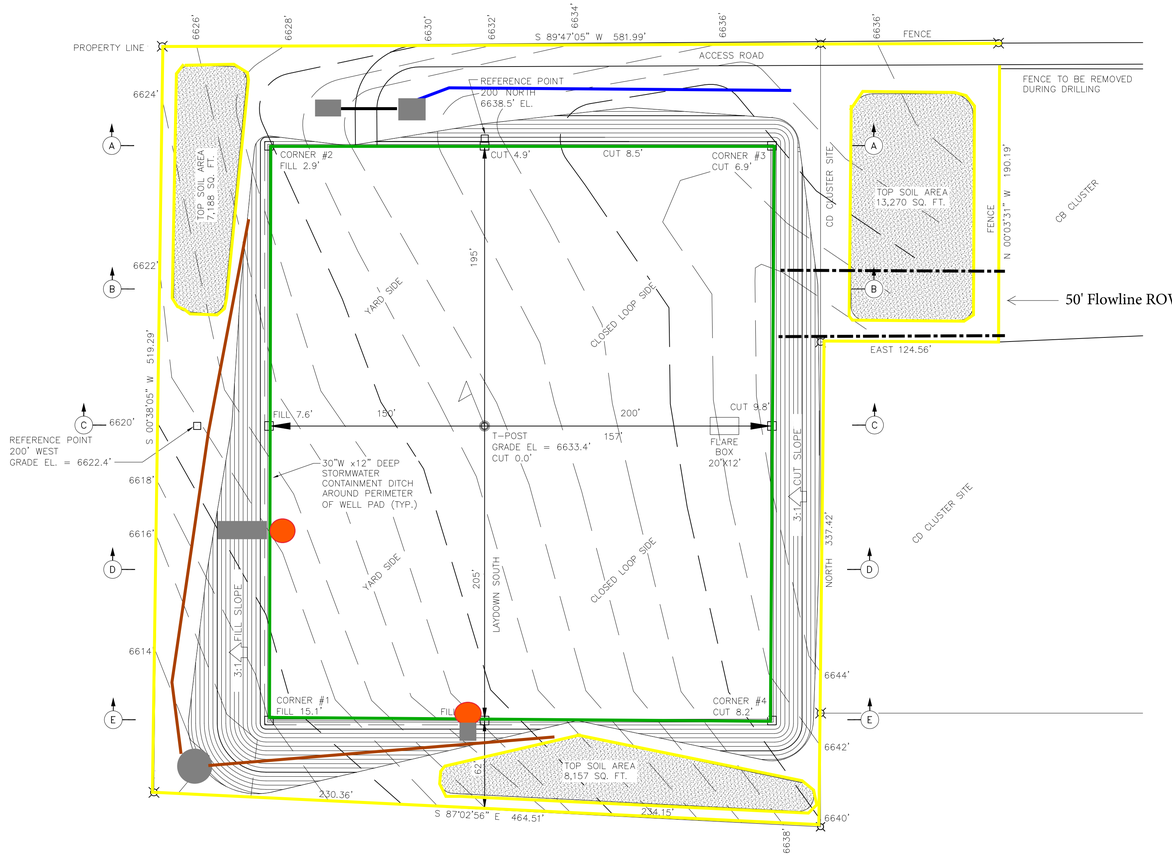
PLANT

0 25 50 100

1"=50'
DWG. SCALE IS BASED ON
AN 24"x36" SHEET SIZE

LEGEND

- T-POST LOCATION
- LATH/PIN FLAG
- U-POST/LATH
- RIG ANCHOR
- 6" SLIDE VALVE
- CULVERTS
- DIVERSION DITCH
- Erosion Log
- Bermed Ditch
- Control Ditch
- Culvert
- Armored Sediment basin
- Armored Outlet



PLAN
SCALE 1"=50'

LIMITS OF DISTURBANCE 6.22 ACRES
APPROXIMATE DIRT QUANTITIES:
17,749 CYS. CUT, 13,869 CYS. FILL
3,880 EXCESS (3,345 CYS. TOP SOIL)
NO SHRINK OR FILL

NOTES:

INFORMATION BASED ON A SURVEY OR SURVEYS ON THE GROUND DATED: 12/07/2014
PROVIDED BY:
HUDDLESTON LAND SURVEYING
P.O. BOX KK - CORTEZ, CO. 81321
(970) 565-3330

REVISIONS				
0	ISSUED FOR PERMIT	7/18/16	GEG	

KINDER MORGAN
CO_2 COMPANY, L.P.
17801 HWY. 491
CORTEZ, CO 81321
SITE LOCATION:

CO2 WELL PAD SITE PLAN
COW CANYON CB-4 WELL PAD
EXISTING AND DESIGN CONTOURS

COW CANYON FACILITIES — DELORES COUNTY, COLORADO

DRAWN BY: GEG 7/18/16	REVIEWED BY:	SCALE: AS-NOTED	
CHECKED BY: CM	APPROVED BY:	DRAWING NUMBER: WP-CB-4-PERM-001	

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KINDER MORGAN
CO_2 COMPANY, L.P.

Noxious & Invasive Weed Management Plan

Updated January 2017

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1.0 Introduction

This document is a Noxious Weed Invasive Plant Management Plan (NWIPMP) for the management of noxious weeds and invasive plants on all land leased, owned and/or controlled by Kinder Morgan CO2 ("KM") within McElmo Dome and Doe Canyon Units.

The control and spread of weeds designated noxious within the State of Colorado is legislated under the Colorado Noxious Weed Act (Title 35; Article 5.5) and under the directive of the "Rules Pertaining to the Administration and Enforcement of the Colorado Noxious Weed Act" (8 CCR 1203-19) ("Weed Rules").

Noxious weeds impact agriculture where they displace or reduce the quality of crop and forage species and natural environments. They also out compete native plant species, reducing biodiversity and forage for wildlife. Noxious weeds are plants that are typically introduced from other countries, without their natural predators and pathogens that would normally keep them under control. They are generally very invasive, aggressive plants that are capable of colonizing areas and replacing desirable native vegetation.

According to the Colorado Noxious Weed Act, a noxious weed is an alien plant or parts of an alien plant that have been designated by rule as being noxious or has been declared a noxious weed by a local advisory board, and meets one or more of the following criteria:

- Aggressively invades or is detrimental to economic crops or native plant communities.
- Is poisonous to livestock.
- Is a carrier of detrimental insects, diseases, or parasites.
- The direct or indirect effect of the presence of this plant is detrimental to the environmentally sound management of natural or agricultural ecosystems.

The combined state and county noxious weed list for Colorado, Montezuma and Dolores Counties is illustrated in Table 1.

Table 1: Noxious Weed List (State & Local)

State of Colorado		Montezuma County	Dolores County
List A Species: *Designated for eradication.*			
African rue	Mediterranean sage	Dalmatian toadflax	Canada thistle
Bohemian knotweed	Medusahead	Diffuse knapweed	Musk thistle
Camelthorn	Myrtle spurge	Leafy spurge	Plumeless thistle
Common crupina	Orange hawkweed	Mediterranean sage	Scotch thistle
Cypress spurge	Parrotfeather	Myrtle spurge	Yellow starthistle
Dyer's woad	Purple loosestrife	Spotted knapweed	Leafy Spurge
Elongated mustard	Rush skeletonweed	Yellow toadflax	Diffuse Knapweed
Flowering rush	Squarrose knapweed		Bindweed
Giant knotweed	Tansy ragwort		Oxeye Daisy
Giant reed	Yellow starthistle		Dalmation toadflax
Giant salvinia			Russian knapweed
Hairy willow-herb			Spotted Knapweed
Hydrilla			Western Whorled Milkweed
Japanese knotweed			Houndstongue
Meadow knapweed			Dyers woad
List B Species: *Designated for control and suppression.*			
Absinth wormwood	Mayweed chamomile	Bull thistle	
Black henbane	Moth mullein	Canada thistle	
Bouncingbet	Musk thistle	Common teasel	
Bull thistle	Oxeye daisy	Hoary cress	
Canada thistle	Perennial pepperweed	Houndstongue	
Chinese clematis	Plumeless thistle	Jointed goatgrass	Varies from state list
Common tansy	Russian knapweed	Musk thistle	
Common teasel	Russian-olive	Oxeye daisy	
Corn chamomile	Salt cedar	Perennial pepperweed	
Cutleaf teasel	Scentless chamomile	Plumeless thistle	
Dalmatian toadflax, broad-leaved	Scotch thistle	Russian knapweed	
Dalmatian toadflax, narrow-leaved	Spotted knapweed	Russian olive	
Dame's rocket	Spotted x diffuse knapweed hybrid	Salt cedar	
Diffuse knapweed	Sulfur cinquefoil	Scotch thistle	
Eurasian watermilfoil	Wild caraway	Sulfur cinquefoil	
Hoary cress	Yellow nutsedge		
Houndstongue	Yellow toadflax		
Jointed goatgrass	Yellow x Dalmatian toadflax hybrid		
Leafy spurge			
List C Species: *Highly recommended for control and suppression.*			
Bulbous bluegrass	Puncturevine	Chicory	
Chicory	Quackgrass	Common burdock	
Common burdock	Redstem filaree	Common mullein	
Common mullein	Velvetleaf	Downy brome	
Common St. Johnswort	Wild proso millet	Field bindweed	
Downy brome		Halogeton	
Field bindweed		Poison hemlock	
Halogeton		Puncturevine	
Johnsongrass		Redstem filaree	
Perennial sowthistle		Kochia	
Poison hemlock		Russian thistle	

2.0 Noxious Weed and Invasive Plant Management Program

KM is actively involved in taking preventative measures aimed at reducing the establishment or spread of noxious weeds and invasive plants on their property. Staff, contractors, and applicable regulatory agencies are encouraged to report incidences of weed presence on KM property. Furthermore, KM staff and/or contractors will undertake non-chemical methods of noxious weed and invasive plant management as part of their weed management program, and staff will also undertake post-treatment evaluations of all herbicide treatments.

In meeting its corporate responsibility to manage noxious weeds and invasive plants on their property, KM will:

- Require contractors to apply herbicides, if required, in a safe, legal and effective manner.
- Control invasive plants as mandated by the Colorado Noxious Weed Act and applicable local laws/regulations.
- Use the most effective, efficient, and environmentally friendly control options.
- Consider preventative, non-chemical control methods as an integral part of the program.

2.1 Prevention

KM will practice and promote the following preventative measures for noxious weed and invasive plant management:

- Re-seeding of bare ground following construction of well pads, pipeline ROWs, and facilities with certified seed mix.
- Preventing the spread of weeds to non-infested areas by restricting vehicle traffic to stabilized working surfaces.
- Inspecting vehicles to ensure that noxious weed and invasive plant parts have not attached themselves to the undercarriage.

2.2 Identification

The accurate identification of noxious weeds and invasive plants is important for the following reasons:

- Control may or may not be required, depending on the plant's growth stage, physical location and degree of invasiveness.
- Control methods may differ depending on the plant species. Some may be easily controlled by non-chemical methods, but others may only be effectively managed

through a combination of chemical and non-chemical methods.

There are numerous publications that will assist in identification of weeds. Guidebooks, brochures, and web-based information will be used to assist in the identification, management and control of noxious weeds and invasive plants.

2.3 Monitoring Populations

KM staff may undertake incidental monitoring of noxious weed and invasive plant populations during scheduled inspections or maintenance activities on well pads, pipeline ROWs, and at facilities. More formal inspections will be conducted by a qualified environmental professional during bi-annual interim reclamation inspections of all KM facilities in McElmo Dome and Doe Canyon Units.

3.0 Treatment Options for Noxious Weeds and Invasive Plants

This plan involves the use of different treatment options to manage noxious weeds and invasive plants on KM properties. In this context, herbicides may be required to target specific species of noxious weeds and invasive plants. The selection of a particular control technique will depend on:

- Timing
- Site characteristics including adjacent land use, proximity to water sources, bodies of water, soil type and other environmentally sensitive features
- Environmental sensitivities in surrounding areas
- The noxious weed or invasive plant species being targeted
- Safety, economic impacts and site accessibility
- Species composition on the site and percentage cover
- The consequences of not treating

The following treatment options may be used, as appropriate, in this plan for noxious weed and invasive plant control:

- Mowing (non-chemical)
- Hand Pulling (non-chemical)
- Weed Trimming and Hand Cutting (non-chemical)
- Geotextile fabric (non-chemical)
- Seeding/Planting Grasses – cultural (non-chemical)

- Foliar Applications (chemical)

3.1 Manual and Mechanical Control Methods

Manual and mechanical methods of noxious weed and invasive plant control are effective and environmentally safe methods if timed correctly and precautions are taken to minimize soil disturbance and native vegetation loss. These methods are not practical for large areas, and alternative methods may have to be applied.

Manual and mechanical control methods that may be used to control noxious weeds and invasive plants at KM properties include hand pulling, hand cutting, mowing, and the use of weed trimmers. The following information describes the currently available manual and mechanical options. This list may not be wholly inclusive and does not prohibit the ability of KM to utilize other generally accepted non-chemical methods of control.

Table 2: Description of, Rationale and Selection Criteria for, and the Benefits and Limitations of Manual and Mechanical (Non-Chemical) Control Methods.

Description & Rationale	Benefits & Limitations
Mowing, Hand Cutting and the use of Weed Trimmers can sometimes be an effective approach to reducing noxious weed and invasive plant populations or reducing off site movement. The most effective time for these methods is generally in the late bud or early bloom stage when the plants have used up most of the carbohydrate reserves in their roots.	The **advantages** of mowing, hand cutting and the use of string trimmers is that these techniques will generally effectively eliminate the current year's seed production and significantly reduce the plant's root reserves that contribute to the next year's growth. Along with hand pulling, they may be the only alternatives for noxious weeds and invasive plants growing adjacent to bodies of water and other environmentally sensitive areas where herbicides cannot be used. The **limitations** (disadvantages) of mowing, hand cutting and the use of string trimmers is that these techniques is that they are less effective on low-growing plants that are growing beneath the cutting height, where they can produce secondary flowering. Restoration, including prompt re-establishment of native vegetation, may be required to prevent erosion and the re-establishment of invasive plants. Repeated follow-up treatments generally need to be conducted to remove all new germinates, often for 3-5 years, sometimes longer.
Hand Pulling is a viable control method only for certain established noxious weeds and invasive plants that can be easily uprooted and where the roots can be fully removed. It is effective if the number of weeds to be pulled is small and the site is a manageable size. When hand pulling is used, the exposed soil should be immediately covered with gravel.	The **advantages** of hand pulling are that it can be used In areas where there has been little or no vegetation management undertaken for an extended period of time. Hand pulling can be effective in reducing a large volume of vegetation to a manageable level. Other control methods can then be used to complete the vegetation management work. It may be one of the only alternatives for noxious weeds and invasive plants growing adjacent to bodies of water and other environmentally sensitive areas where herbicides cannot be used. The **limitations** (disadvantages) of hand pulling are that it is labor intensive, and that excessive hand pulling of noxious weeds and invasive plants tends to increase the amount of organic matter, which can encourage their establishment.

Geotextile is a porous, polypropylene fabric that is generally placed below mulches, crushed rock or gravel. It is commonly used in landscaped areas such as flower or shrub beds. It works as a physical barrier – preventing root growth of noxious weeds and invasive plants through the fabric.	The **advantages** of using geotextile fabric are that their use has the potential to reduce the need for other control methods for noxious weed and invasive plant management. The **limitations** (disadvantages) of using geotextile fabric are that the initial placement of geotextile fabric can be labor intensive, and their use is limited to control at facilities.

3.2 Cultural Control Methods (Seeding and Re-Vegetation)

Seeding involves using certified seed to proactively re-vegetate disturbed areas/bare ground adjacent to, or known to be at risk of, noxious weed or invasive plant establishment. This practice is designed to help reduce the risk of noxious weed and invasive plant establishment at KM properties (during new construction or upgrading).

A description, rationale, selection criteria, and the benefits and limitations of seeding (re-vegetation) are shown in Tables 3:

Table 3: Description of, Rationale and Selection Criteria for, and the Benefits and Limitations of Cultural Control Methods

Description & Rationale	Benefits & Limitations
Seeding and Planting Grasses involves re-vegetating and stabilizing the pipeline ROW or bare/disturbed ground and landscaped areas in facilities with a suitable mixture of species compatible to the surrounding land capability and use. The technique of hydro seeding (spraying the ground with a mixture of seed, fertilizer and an adhesive) is actively utilized by KM upon the completion of pipeline construction.	The **advantages** of seeding and planting grasses are that it prevents erosion, inhibits weed establishment and growth, and promotes aesthetics. Another side benefit is that these grasses can better withstand hot spells in the summer. The **limitations** (disadvantages) of seeding and planting grasses are that it requires continued maintenance (i.e. mowing), does not provide a stable plant community because unwanted species may invade, and the sustained promotion of grasses as a monoculture in forested areas may pose a fire hazard if there are insufficient numbers of grazing animals.

3.3 Chemical Control (Herbicides)

Herbicides work best for:

- Eradicating some weed species in certain situations. Herbicides are most effective on pure stands of a single weed species where desirable non-target plants are scarce or absent. In this situation, one often has the option of selecting from several different herbicides.
- Rhizomatous weed species that are unpalatable to livestock require repeated pulling or cutting for control, or are located in remote areas where pulling or cutting is not feasible.
- Small patches of weeds where hand pulling or cutting is not effective or feasible.
- Use in combination with other control methods. For example, Canada thistle can be

controlled by repeated cutting during the growing season followed by treatment with Clopyralid herbicide in the fall. Also noted, tamarisk and Russian olive can be controlled very effectively by cutting stems very close to the ground in the fall then immediately spraying or painting the cut stems with Triclopyr herbicide.

If chemical treatment is selected at KM properties the following protocol will be followed:

- The Contractor shall follow all herbicide manufacturer safety and application instructions to maximize treatment efficiency.
- The contractor shall not apply herbicides if the sustained wind speed exceeds 10 miles per hour, rainfall is forecast within 6 hours, or the air temperature is not conducive to plant uptake.
- At all KM facilities, a 10 feet perimeter for bare ground application will be imposed. If a drift control agent is added to the bare ground chemical to prevent run-off, bare ground spray will be accepted outside the 10 foot perimeter.
- Any herbicide applied within interim reclamation areas will be spot sprayed.

3.4 Treatment Selection Criteria

Prior to selecting a treatment method (chemical or non-chemical) for a noxious weed or invasive plant infestation, the following considerations will be taken into account, as appropriate/applicable:

- Consideration if the infestation is within a community watershed, and, if so, what strategies would be required for its protection with the treatment method chosen.
- Consideration if the infestation is within proximity of domestic or agricultural water sources, and, if so, what strategies would be required for their protection with the treatment method chosen.
- Consideration if the infestation is adjacent to fish and wildlife, riparian areas or wildlife habitat, and, if so, what strategies would be required for their protection with the treatment method chosen.
- Consideration if the infestation is adjacent to areas where food for human consumption is grown or found, and, if so, what strategies would be required for their protection with the treatment method chosen.
- Consideration if there are human activities associated with the site of the infestation, and, if so, what strategies would be required for their protection with the treatment method chosen.

4.0 Treatment Inspections and Evaluations

4.1 Noxious Weed and Invasive Plant Treatments

KM licensed contractors shall carry out all applications of herbicides. Post-treatment inspections and evaluations of vegetation management treatment on KM properties will generally be based on visual evaluations. Evaluations may include qualitative and/or quantitative determinations of mortality to the targeted noxious weeds and invasive plants, as well as observation of any non-target mortality that is evident. Inspections will ensure:

- Compliance with the commitments made in this control plan.
- Compliance with the Colorado Noxious Weed Act.
- That site objectives have been achieved.
- The success of the treatment methods employed.
- If pesticides free zones, no treatment zones and buffer zones were maintained.
- If environmental features requiring protection were adequately protected.
- If any negative environmental impacts have occurred.
- If corrective action is required.

KINDER MORGAN
CO_2 COMPANY, L.P.

Noxious & Invasive Weed Management Plan

Updated January 2017

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Common crupina	Orange hawkweed	Mediterranean sage	Scotch thistle
Cypress spurge	Parrotfeather	Myrtle spurge	Yellow starthistle
Dyer's woad	Purple loosestrife	Spotted knapweed	Leafy Spurge
Elongated mustard	Rush skeletonweed	Yellow toadflax	Diffuse Knapweed
Flowering rush	Squarrose knapweed		Bindweed
Giant knotweed	Tansy ragwort		Oxeye Daisy
Giant reed	Yellow starthistle		Dalmation toadflax
Giant salvinia			Russian knapweed
Hairy willow-herb			Spotted Knapweed
Hydrilla			Western Whorled Milkweed
Japanese knotweed			Houndstongue
Meadow knapweed			Dyers woad
List B Species: *Designated for control and suppression.*			
Absinth wormwood	Mayweed chamomile	Bull thistle	
Black henbane	Moth mullein	Canada thistle	
Bouncingbet	Musk thistle	Common teasel	
Bull thistle	Oxeye daisy	Hoary cress	
Canada thistle	Perennial pepperweed	Houndstongue	
Chinese clematis	Plumeless thistle	Jointed goatgrass	Varies from state list
Common tansy	Russian knapweed	Musk thistle	
Common teasel	Russian-olive	Oxeye daisy	
Corn chamomile	Salt cedar	Perennial pepperweed	
Cutleaf teasel	Scentless chamomile	Plumeless thistle	
Dalmatian toadflax, broad-leaved	Scotch thistle	Russian knapweed	
Dalmatian toadflax, narrow-leaved	Spotted knapweed	Russian olive	
Dame's rocket	Spotted x diffuse knapweed hybrid	Salt cedar	
Diffuse knapweed	Sulfur cinquefoil	Scotch thistle	
Eurasian watermilfoil	Wild caraway	Sulfur cinquefoil	
Hoary cress	Yellow nutsedge		
Houndstongue	Yellow toadflax		
Jointed goatgrass	Yellow x Dalmatian toadflax hybrid		
Leafy spurge			
List C Species: *Highly recommended for control and suppression.*			
Bulbous bluegrass	Puncturevine	Chicory	
Chicory	Quackgrass	Common burdock	
Common burdock	Redstem filaree	Common mullein	
Common mullein	Velvetleaf	Downy brome	
Common St. Johnswort	Wild proso millet	Field bindweed	
Downy brome		Halogeton	
Field bindweed		Poison hemlock	
Halogeton		Puncturevine	
Johnsongrass		Redstem filaree	
Perennial sowthistle		Kochia	
Poison hemlock		Russian thistle	

2.0 Noxious Weed and Invasive Plant Management Program

KM is actively involved in taking preventative measures aimed at reducing the establishment or spread of noxious weeds and invasive plants on their property. Staff, contractors, and applicable regulatory agencies are encouraged to report incidences of weed presence on KM property. Furthermore, KM staff and/or contractors will undertake non-chemical methods of noxious weed and invasive plant management as part of their weed management program, and staff will also undertake post-treatment evaluations of all herbicide treatments.

In meeting its corporate responsibility to manage noxious weeds and invasive plants on their property, KM will:

- Require contractors to apply herbicides, if required, in a safe, legal and effective manner.
- Control invasive plants as mandated by the Colorado Noxious Weed Act and applicable local laws/regulations.
- Use the most effective, efficient, and environmentally friendly control options.
- Consider preventative, non-chemical control methods as an integral part of the program.

2.1 Prevention

KM will practice and promote the following preventative measures for noxious weed and invasive plant management:

- Re-seeding of bare ground following construction of well pads, pipeline ROWs, and facilities with certified seed mix.
- Preventing the spread of weeds to non-infested areas by restricting vehicle traffic to stabilized working surfaces.
- Inspecting vehicles to ensure that noxious weed and invasive plant parts have not attached themselves to the undercarriage.

2.2 Identification

The accurate identification of noxious weeds and invasive plants is important for the following reasons:

- Control may or may not be required, depending on the plant's growth stage, physical location and degree of invasiveness.
- Control methods may differ depending on the plant species. Some may be easily controlled by non-chemical methods, but others may only be effectively managed

through a combination of chemical and non-chemical methods.

There are numerous publications that will assist in identification of weeds. Guidebooks, brochures, and web-based information will be used to assist in the identification, management and control of noxious weeds and invasive plants.

2.3 Monitoring Populations

KM staff may undertake incidental monitoring of noxious weed and invasive plant populations during scheduled inspections or maintenance activities on well pads, pipeline ROWs, and at facilities. More formal inspections will be conducted by a qualified environmental professional during bi-annual interim reclamation inspections of all KM facilities in McElmo Dome and Doe Canyon Units.

3.0 Treatment Options for Noxious Weeds and Invasive Plants

This plan involves the use of different treatment options to manage noxious weeds and invasive plants on KM properties. In this context, herbicides may be required to target specific species of noxious weeds and invasive plants. The selection of a particular control technique will depend on:

- Timing
- Site characteristics including adjacent land use, proximity to water sources, bodies of water, soil type and other environmentally sensitive features
- Environmental sensitivities in surrounding areas
- The noxious weed or invasive plant species being targeted
- Safety, economic impacts and site accessibility
- Species composition on the site and percentage cover
- The consequences of not treating

The following treatment options may be used, as appropriate, in this plan for noxious weed and invasive plant control:

- Mowing (non-chemical)
- Hand Pulling (non-chemical)
- Weed Trimming and Hand Cutting (non-chemical)
- Geotextile fabric (non-chemical)
- Seeding/Planting Grasses – cultural (non-chemical)

- Foliar Applications (chemical)

3.1 Manual and Mechanical Control Methods

Manual and mechanical methods of noxious weed and invasive plant control are effective and environmentally safe methods if timed correctly and precautions are taken to minimize soil disturbance and native vegetation loss. These methods are not practical for large areas, and alternative methods may have to be applied.

Manual and mechanical control methods that may be used to control noxious weeds and invasive plants at KM properties include hand pulling, hand cutting, mowing, and the use of weed trimmers. The following information describes the currently available manual and mechanical options. This list may not be wholly inclusive and does not prohibit the ability of KM to utilize other generally accepted non-chemical methods of control.

Table 2: Description of, Rationale and Selection Criteria for, and the Benefits and Limitations of Manual and Mechanical (Non-Chemical) Control Methods.

Description & Rationale	Benefits & Limitations
Mowing, Hand Cutting and the use of Weed Trimmers can sometimes be an effective approach to reducing noxious weed and invasive plant populations or reducing off site movement. The most effective time for these methods is generally in the late bud or early bloom stage when the plants have used up most of the carbohydrate reserves in their roots.	The **advantages** of mowing, hand cutting and the use of string trimmers is that these techniques will generally effectively eliminate the current year's seed production and significantly reduce the plant's root reserves that contribute to the next year's growth. Along with hand pulling, they may be the only alternatives for noxious weeds and invasive plants growing adjacent to bodies of water and other environmentally sensitive areas where herbicides cannot be used. The **limitations** (disadvantages) of mowing, hand cutting and the use of string trimmers is that these techniques is that they are less effective on low-growing plants that are growing beneath the cutting height, where they can produce secondary flowering. Restoration, including prompt re-establishment of native vegetation, may be required to prevent erosion and the re-establishment of invasive plants. Repeated follow-up treatments generally need to be conducted to remove all new germinates, often for 3-5 years, sometimes longer.
Hand Pulling is a viable control method only for certain established noxious weeds and invasive plants that can be easily uprooted and where the roots can be fully removed. It is effective if the number of weeds to be pulled is small and the site is a manageable size. When hand pulling is used, the exposed soil should be immediately covered with gravel.	The **advantages** of hand pulling are that it can be used In areas where there has been little or no vegetation management undertaken for an extended period of time. Hand pulling can be effective in reducing a large volume of vegetation to a manageable level. Other control methods can then be used to complete the vegetation management work. It may be one of the only alternatives for noxious weeds and invasive plants growing adjacent to bodies of water and other environmentally sensitive areas where herbicides cannot be used. The **limitations** (disadvantages) of hand pulling are that it is labor intensive, and that excessive hand pulling of noxious weeds and invasive plants tends to increase the amount of organic matter, which can encourage their establishment.

Geotextile is a porous, polypropylene fabric that is generally placed below mulches, crushed rock or gravel. It is commonly used in landscaped areas such as flower or shrub beds. It works as a physical barrier – preventing root growth of noxious weeds and invasive plants through the fabric.	The **advantages** of using geotextile fabric are that their use has the potential to reduce the need for other control methods for noxious weed and invasive plant management. The **limitations** (disadvantages) of using geotextile fabric are that the initial placement of geotextile fabric can be labor intensive, and their use is limited to control at facilities.

3.2 Cultural Control Methods (Seeding and Re-Vegetation)

Seeding involves using certified seed to proactively re-vegetate disturbed areas/bare ground adjacent to, or known to be at risk of, noxious weed or invasive plant establishment. This practice is designed to help reduce the risk of noxious weed and invasive plant establishment at KM properties (during new construction or upgrading).

A description, rationale, selection criteria, and the benefits and limitations of seeding (re-vegetation) are shown in Tables 3:

Table 3: Description of, Rationale and Selection Criteria for, and the Benefits and Limitations of Cultural Control Methods

Description & Rationale	Benefits & Limitations
Seeding and Planting Grasses involves re-vegetating and stabilizing the pipeline ROW or bare/disturbed ground and landscaped areas in facilities with a suitable mixture of species compatible to the surrounding land capability and use. The technique of hydro seeding (spraying the ground with a mixture of seed, fertilizer and an adhesive) is actively utilized by KM upon the completion of pipeline construction.	The **advantages** of seeding and planting grasses are that it prevents erosion, inhibits weed establishment and growth, and promotes aesthetics. Another side benefit is that these grasses can better withstand hot spells in the summer. The **limitations** (disadvantages) of seeding and planting grasses are that it requires continued maintenance (i.e. mowing), does not provide a stable plant community because unwanted species may invade, and the sustained promotion of grasses as a monoculture in forested areas may pose a fire hazard if there are insufficient numbers of grazing animals.

3.3 Chemical Control (Herbicides)

Herbicides work best for:

- Eradicating some weed species in certain situations. Herbicides are most effective on pure stands of a single weed species where desirable non-target plants are scarce or absent. In this situation, one often has the option of selecting from several different herbicides.
- Rhizomatous weed species that are unpalatable to livestock require repeated pulling or cutting for control, or are located in remote areas where pulling or cutting is not feasible.
- Small patches of weeds where hand pulling or cutting is not effective or feasible.
- Use in combination with other control methods. For example, Canada thistle can be

controlled by repeated cutting during the growing season followed by treatment with Clopyralid herbicide in the fall. Also noted, tamarisk and Russian olive can be controlled very effectively by cutting stems very close to the ground in the fall then immediately spraying or painting the cut stems with Triclopyr herbicide.

If chemical treatment is selected at KM properties the following protocol will be followed:

- The Contractor shall follow all herbicide manufacturer safety and application instructions to maximize treatment efficiency.
- The contractor shall not apply herbicides if the sustained wind speed exceeds 10 miles per hour, rainfall is forecast within 6 hours, or the air temperature is not conducive to plant uptake.
- At all KM facilities, a 10 feet perimeter for bare ground application will be imposed. If a drift control agent is added to the bare ground chemical to prevent run-off, bare ground spray will be accepted outside the 10 foot perimeter.
- Any herbicide applied within interim reclamation areas will be spot sprayed.

3.4 Treatment Selection Criteria

Prior to selecting a treatment method (chemical or non-chemical) for a noxious weed or invasive plant infestation, the following considerations will be taken into account, as appropriate/applicable:

- Consideration if the infestation is within a community watershed, and, if so, what strategies would be required for its protection with the treatment method chosen.
- Consideration if the infestation is within proximity of domestic or agricultural water sources, and, if so, what strategies would be required for their protection with the treatment method chosen.
- Consideration if the infestation is adjacent to fish and wildlife, riparian areas or wildlife habitat, and, if so, what strategies would be required for their protection with the treatment method chosen.
- Consideration if the infestation is adjacent to areas where food for human consumption is grown or found, and, if so, what strategies would be required for their protection with the treatment method chosen.
- Consideration if there are human activities associated with the site of the infestation, and, if so, what strategies would be required for their protection with the treatment method chosen.

4.0 Treatment Inspections and Evaluations

4.1 Noxious Weed and Invasive Plant Treatments

KM licensed contractors shall carry out all applications of herbicides. Post-treatment inspections and evaluations of vegetation management treatment on KM properties will generally be based on visual evaluations. Evaluations may include qualitative and/or quantitative determinations of mortality to the targeted noxious weeds and invasive plants, as well as observation of any non-target mortality that is evident. Inspections will ensure:

- Compliance with the commitments made in this control plan.
- Compliance with the Colorado Noxious Weed Act.
- That site objectives have been achieved.
- The success of the treatment methods employed.
- If pesticides free zones, no treatment zones and buffer zones were maintained.
- If environmental features requiring protection were adequately protected.
- If any negative environmental impacts have occurred.
- If corrective action is required.

Serial Number

01 02-25-1920;041STAT0437;30USC181ETSEQ **Total Acres:**
Case Type 311211: O&G LSE SIMO PUBLIC LAND **447.250** **COC 052523**
Commodity 459: **OIL & GAS**
Case Disposition: AUTHORIZED

Serial Number: COC--- 052523

Name & Address					Int Rel	% Interest
MOBIL OIL CORP	PO BOX 650232	DALLAS	TX	75265	15	100.000000000

Serial Number: COC--- 052523

Mer	Twp	Rng	Sec	SType	Nr	Suff	Subdivision	District/ Field Office	County	Mgmt Agency
23	0380N	0190W	003	LOTS			11-14;	TRES RIOS FO	MONTEZUMA	BUREAU OF LAND MGMT
23	0380N	0190W	010	LOTS			1,2,6,11,13;	TRES RIOS FO	MONTEZUMA	BUREAU OF LAND MGMT
23	0380N	0190W	015	LOTS			1,2,7;	TRES RIOS FO	MONTEZUMA	BUREAU OF LAND MGMT

Relinquished/Withdrawn Lands

Serial Number: COC--- 052523

Serial Number: COC--- 052523

Act Date	Act Code	Action Txt	Action Remarks	Pending Off
02/07/1972	387	CASE ESTABLISHED	COC14885;	
03/01/1972	496	FUND CODE	05;145003	
03/01/1972	530	RLTY RATE - 12 1/2%		
03/01/1972	868	EFFECTIVE DATE		
08/15/1978	510	KMA CLASSIFIED	HOVENWEEP CANYON	
08/28/1978	315	RENTAL RATE DET/ADJ	$2.00;EFF 03/01/79	
09/27/1990	209	CASE CREATED BY SEGR	OUT OF COC26079;	
09/27/1990	232	LEASE COMMITTED TO UNIT	COC47633X;MCELMO DOME	
09/27/1990	648	EXT BY PROD ON ASSOC LSE	COC26079;	
09/27/1990	651	HELD BY PROD - ALLOCATED	VER, 08/08/91, 921A	
09/27/1990	660	MEMO OF 1ST PROD-ALLOC	COC47633A;MISS-LEADVL	
12/12/1990	235	EXTENDED	THRU 09/27/92;UA SEGR	
11/03/1993	932	TRF OPER RGTS FILED	01	
06/03/1994	933	TRF OPER RGTS APPROVED	01 EFF 12/01/93;	
06/03/1994	974	AUTOMATED RECORD VERIF	JMB	
09/06/1994	932	TRF OPER RGTS FILED		
10/03/1994	932	TRF OPER RGTS FILED		
02/07/1995	899	TRF OF ORR FILED		

Serial Number: COC--- 052523

Act Date	Act Code	Action Txt	Action Remarks	Pending Off
02/07/1995	932	TRF OPER RGTS FILED		
05/18/1995	933	TRF OPER RGTS APPROVED	EFF 10/01/94;	
05/18/1995	933	TRF OPER RGTS APPROVED	EFF 11/01/94;	
06/24/1995	933	TRF OPER RGTS APPROVED	EFF 03/01/95;	
03/07/1997	932	TRF OPER RGTS FILED		
03/07/1997	933	TRF OPER RGTS APPROVED	EFF 04/01/97;	
04/04/1997	932	TRF OPER RGTS FILED		
04/04/1997	933	TRF OPER RGTS APPROVED	EFF 05/01/97;	
09/15/1997	932	TRF OPER RGTS FILED		
09/15/1997	933	TRF OPER RGTS APPROVED	EFF 10/01/97;	
01/25/1999	226	ELIM BY CONTRACTION	COC51765X;ISL BUTTE 2	
04/19/1999	932	TRF OPER RGTS FILED		
04/19/1999	933	TRF OPER RGTS APPROVED	EFF 05/01/99;	
11/03/2000	817	MERGER RECOGNIZED	CELSIUS/QUESTAR	
02/05/2001	932	TRF OPER RGTS FILED		
03/12/2001	933	TRF OPER RGTS APPROVED	EFF 03/01/01;	
12/28/2001	817	MERGER RECOGNIZED	BALLARD/AEC OG USA	
08/04/2005	932	TRF OPER RGTS FILED	1	
08/15/2005	933	TRF OPER RGTS APPROVED	EFF 9/1/05	

Line Number **Remark Text**

Serial Number: COC--- 052523

SURFACE USE AGREEMENT
(CX-4 Well Project)

This Surface Use Agreement ("**SUA**") is effective the 20th day of November, 2014, ("**Effective Date**"), between Brad E. White and Pamela K. White ("**Landowner**" whether one or more), with a mailing address of 9136 Road BB, Pleasant View, CO 81331 and Kinder Morgan CO_2 Company, L.P., a Texas limited partnership ("**KM**"), with an office at *17801 Hwy. 491, Cortez, CO 81321.*

Landowner owns the surface estate in a tract of land in Montezuma County, Colorado, more particularly described as ("**Property**"):

Township 38 North, Range 19West, N.M.P.M.
Section 10: Lots 11 and 13 lying in Tract 46 (S1/2SE1/4)
Montezuma County, CO
(The "Property")

KM is the owner of certain rights in one or more oil and gas leases underlying the Property or in oil and gas leases unitized therewith. KM is the operator of the McElmo Dome (Leadville) Deep Unit ("**Unit**"). The Property is located wholly or partially within the Unit boundaries and KM has plans to drill a well, the CX-4 ("**Well**"), from a surface location on the Property and within the Unit.

Landowner and KM have engaged in a discussion of certain aspects of KM's plan for the drilling, completion and operation of the Well on the Property, and the Parties now desire to enter into this Agreement principally in order to confirm KM rights and to clarify KM's plans.

In consideration of the promise by KM to pay a certain sum of money to Landowner (the amount of which is set forth in a side letter agreement) to be paid at the time of commencement of construction by KM in connection with the Well and related roads, pipelines, facilities and infrastructure and in consideration of the covenants contained in this SUA, the Parties agree as follows:

A. Matters Pertaining to Landowner:

1. Damage Compensation. Landowner agrees that the recited consideration constitutes full payment for all present and future surface damages that may normally occur to the Property as a result of KM's reasonable operations.

2. Re-Seeding of Disturbed Areas. KM shall comply with the Colorado Oil and Gas Conservation Commission ("COGCC") Rules and Regulations ("Rules") 1003 and 1004.

3. Landowner Use of Drillsite. KM will have exclusive and full use of the Drillsite, as defined below, at all times. Landowner shall not use the Drillsite for storage, access or any other purpose.

4. Cuttings, Storage Areas and Pits. The requirements of COGCC Rules 902, 904 and 905, as amended from time to time, shall be followed by KM.

5. Setback Regulations. KM will comply with all valid and applicable local, state and federal laws, rules and regulations pertaining to distance setbacks between the Well and Landowner's existing home and any other habitable structures on the Property.

6. Setback of Future Buildings from KM Well Facilities. Landowner agrees to comply with all valid and applicable local, state and federal laws, rules and regulations pertaining to distance setbacks between the Well and Well facilities, and any future homes and other habitable structures constructed or located on the Property.

7. Waiver of Notice and Consultation. Landowner waives the right to receive any notices set forth in COGCC Rule 305, and Landowner further waives the right to the Drilling Consultation set forth in COGCC Rule 306.a. Landowner acknowledges the receipt from KM of the information brochure for surface owners described in the COGCC Rules. Landowner acknowledges and agrees that KM has complied with all notice and consultation requirements of COGCC Rules 305 and 306. Landowner also waives the right to receive notices under any applicable County or other local code, in connection with the matters addressed in this SUA.

8. Landowner Use of Property. Landowner expressly acknowledges that the terms of this SUA shall be deemed to fully satisfy any obligation of KM to accommodate, whether under statute or common law, Landowner's use of the surface of the Property, existing or future.

B. Matters Pertaining to KM:

1. Drillsite. KM will use only as much of the surface of the Property as is reasonably necessary for the on-going operation of the Well and associated facilities. KM estimates that the surface area that will actually be used on an on-going basis for the drill site of the Well ("**Drillsite**") will be approximately _____ acres. This acreage estimate does not include areas temporarily disturbed during construction, repair, work over and other similar activities. The _____ attached plats reflect the approximate location of the Drillsite.

2. Excess Material. KM may store material (*e.g.*, soil and gravel) excavated from the Property on the Drillsite to be used for construction and/or reclamation of the Drillsite. KM also may import material from off of the Property for construction and reclamation of the Drillsite. After constructing the Drillsite, should KM determine that there is material in excess of what is required for reclamation and which can reasonably be stored on the Drillsite, then KM may deliver said excess material to a location on the Property that is mutually acceptable to KM and Landowner. Any such excess material so delivered shall become the sole responsibility of Landowner, and KM shall have no further responsibility for said excess material. Should a mutually acceptable location on the Property not be found, then KM may remove such excess material from the Property; provided that KM shall make a reasonable attempt to minimize the amount of excess material that it removes from the Property.

3. Firewood. Should KM cut down or trim any trees on the Property during its operations and should Landowner so request in writing, KM will cut wood greater than 4 inches in diameter into firewood ranging from 12 to 18 inches in length and place such firewood in a pile (not stacked) just off of the Drillsite, road or pipeline route, as KM deems appropriate for Landowner's use. In KM's sole discretion, it may purchase firewood to satisfy the foregoing firewood obligation. All wood less than 4 inches in diameter will be chipped and spread on the Drillsite, access road, reclamation areas or pipeline route, as KM deems appropriate. Firewood will not in any case be split for the Landowner. KM

will not be responsible for the theft of any firewood. Any such wood not requested to be cut into firewood by Landowner will be buried or chipped and spread on the Drillsite, access road, reclamation areas or pipeline route, as KM deems appropriate.

4. Survey Plats. Upon Landowner's request in writing, KM will provide to Landowner a copy of any survey plat obtained by KM depicting the Drillsite or any access roads, pipelines or facilities on the Property.

5. Recording of Agreement. KM may record this Agreement in the County real estate records. KM may also, in its sole discretion and without the joinder of Landowner, execute and record from time to time written declarations with accompanying survey plats, and any amendments to same, for the purpose of locating and describing the Drillsite, access roads, pipelines and other Well facilities. The recording of such declarations, and any amendments, will serve for all purposes to locate and describe the Drillsite, access roads, pipelines or other referenced Well facilities.

6. Maintenance and Repair of Access Roads. KM will reasonably maintain any existing roads that are used by KM on the Property to at least their pre-existing condition. KM will maintain any new roads that may be constructed by KM on the Property to KM's standards. KM will make all necessary repairs to the roads caused by KM's use. However, KM will not be required to snow plow or otherwise clear any road of snow.

7. Burial of Pipelines. KM will, to the extent reasonably practicable, bury all water, oil and gas pipelines to a minimum depth of 36 inches below the surface at the time of installation, unless subsurface conditions such as rock prohibit the installation of the line to that depth at a reasonable cost.

8. Noise Abatement. KM will comply with COGCC Rule 802 concerning noise abatement and will install sound walls, mufflers and/or other devices, if necessary, to comply with said Rule.

9. Reclamation.

    a. Initial Construction. After the drilling and completion of the Well, and the construction of any associated facilities such as the well pad, access roads and pipelines, those areas of land that KM will not use for continuing production operations will be reclaimed as described in Article A.2, above. Reclamation will be performed within a reasonable amount of time after completion and first delivery of the Well or construction of any associated facilities, recognizing practical limitations of weather and season. KM does not guaranty seed germination.

    b. Subsequent Surface Disturbance. All subsequent disturbances by KM to areas reclaimed under the preceding paragraph will be similarly reclaimed by KM within a reasonable amount of time, recognizing practical limitations of weather and season. KM will make a reasonable attempt to notify Landowner in advance of any significant subsequent disturbance activities on the Property, including but not limited to, Well servicing, Well re-drill, and pipeline repairs, with the exception of emergency repairs or situations.

c. Final Abandonment. Any areas disturbed by KM, and which are required to be reclaimed, will be reclaimed by KM in accordance with applicable laws, rules and regulations as set forth in Article A.2, above, unless Landowner desires that the roads and Drillsite remain in their then present condition and regulatory approval for same is obtained.

12. Indemnification. KM agrees to indemnify, defend and hold Landowner harmless from and against any and all expenses, losses or damages resulting from or relating to KM's operation and maintenance of the Well, facilities, access roads and pipelines; provided, however, KM will not indemnify, defend and hold Landowner harmless from such expenses, losses or damages to the extent resulting from or relating to, in whole or in part, the negligence or willful misconduct of Landowner or Landowner's employees, contractors, guests or invitees.

13. Compliance with the Law. KM will comply with all applicable laws, rules and regulations.

14. Temporary Parking. Landowner agrees that during times of construction or other significant work, KM may park vehicles in areas near the work site or along roads.

C. General Provisions:

1. Term. This SUA is effective as of the Effective Date and will continue until (i) all oil and gas leases underlying the Unit expire, (ii) production from the Well and any additional wells producing from the Unit have permanently ceased and are permanently plugged and abandoned, (iii) any compressor on the Property is no longer being used and (iv) any Salt Water Disposal well in the Unit has ceased being used and is plugged and abandoned. After expiration, KM will have a reasonable period of time within which to remove such Well equipment and facilities from the Property as it deems appropriate or as required by applicable rules, regulations or laws.

2. No Waiver of Other Rights. With the exception of those duties and obligations that each Party has specifically agreed to assume and perform in this SUA, those duties and obligations which have been confirmed or clarified in this SUA and the rights specifically granted to, waived or relinquished by a Party in this SUA, this SUA will not be construed to waive or relinquish any Party's legal rights in, to or under the Property, including but not limited to rights of ingress or egress, access or other reasonable surface use, now owned or hereafter acquired by a Party under any oil and gas lease or other agreement or instrument pertaining to the Property. Nor does this SUA, subject to the foregoing exceptions, waive the rights of either Party under any applicable laws, rules or regulations pertaining to the Property.

3. No Application to Other Wells. The rights, duties and obligations of the Parties and other confirmatory or clarifying matters regarding the Well and its related facilities in this SUA pertain only to the Well, except that roads, pipelines and facilities may be utilized for other wells. This SUA is not intended to, and will not be interpreted to, apply to any other well that may now be located or hereafter be drilled within the Unit, whether or not located on the Property. Each Party retains all of his/her/its legal rights with respect to

such other well or wells, including, but not limited to, those legal rights referenced in the preceding paragraph.

4. Successors and Assigns. This SUA will be binding upon and inure to the benefit of the Parties and their respective heirs, successors and assigns. In addition, KM and its successor Well Operator may assign this SUA to successive Operators of the Well. Assignment of this SUA by either Party will act to terminate the assigning Party's duties, obligations and liabilities under this SUA from and after the date that the non-assigning Party receives a true copy of the assignment, with the exception of any indemnity or monetary obligations accruing prior to such date.

5. Applicable Law. This SUA will be interpreted under the laws of the state of Colorado.

6. Entire Agreement. This SUA contains the final agreement, clarifications and confirmations of the Parties as to the matters addressed, and supersedes any and all prior oral or written negotiations, understandings and agreements regarding the Well and its related facilities, roads and pipelines. This SUA may not be modified unless the modification is in writing and is signed by Landowner and an authorized representative of KM.

7. Further Assurance. The Parties agree, at any time and from time to time, upon the reasonable request of either Party and without additional consideration, to take or do all such further acts and things, and furnish and deliver all such further documentation and material (including any document or instrument requested by local, state or federal authorities) which, in the opinion of the requesting Party, may be necessary or useful in carrying out the purposes of this SUA.

8. Regulatory Conditions. If KM is required by any regulatory agency as a condition of approval to either change the location of the well to be drilled or the configuration of the Drillsite, KM reserves the right to unilaterally amend the SUA to conform to the new location(s) and/or configuration(s) as approved by the regulatory agency.

9. Counterparts. This SUA may be executed in two or more original counterparts, each of which shall be an original, but all of which together shall constitute one and the same instrument.

10. Letter Agreement. This SUA subject to the terms of a Letter Agreement dated November 20, 2014, by and between Landowner and KM.

This SUA is executed by the Parties on the dates appearing in the acknowledgements below, but this SUA effective as of the Effective Date.

Landowner

By: Brad E. White
Brad E. White

By:
Pamela K. White

KINDER MORGAN CO_2 COMPANY, L.P., a Texas Limited Partnership

By:
S. Paul Nunley, Attorney-in-Fact

STATE OF COLORADO)
) ss
COUNTY OF Montezuma)

SUBSCRIBED AND SWORN TO before me this 27th day of November, 2014, by Brad E. White and Pamela K. White.

My commission expires: 11-01-17

[SEAL]

MARTHA A. GUSTIN
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20014034520
MY COMMISSION EXPIRES 11/01/2017

Martha A Gustin
Notary Public

Address: 2714 RD M.7
Dolores Co 81323

STATE OF TEXAS)
) ss
COUNTY OF HARRIS)

Subscribed and acknowledged to before me this 9th day of December, 2014, by S. Paul Nunley, Attorney-in-Fact for Kinder Morgan CO2 Company, L.P, a Texas Limited Partnership.

My commission expires: 11-8-16

[Seal]

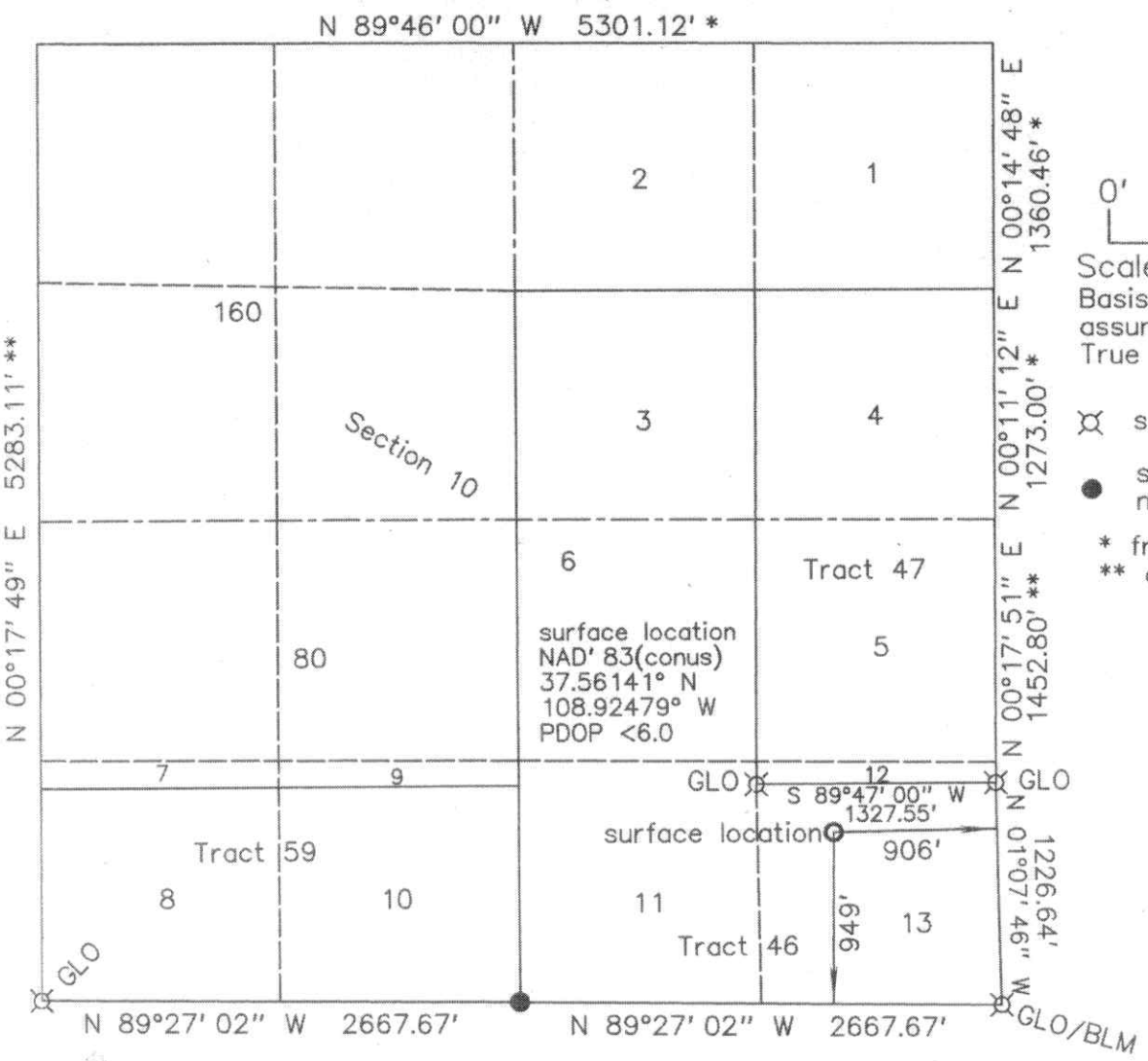
SARAH MACDONELL-SMITH
Notary Public, State of Texas
My Commission Expires
November 08, 2016

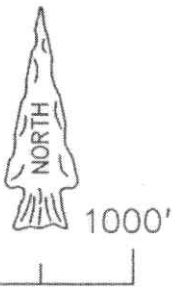
Sarah Macdonell-Smith
Notary Public, State of Texas

Address: Harris County, Texas

Exhibit "A"

WELL LOCATION PLAT
page 1 of 1





Scale: 1" = 1000'
Basis of bearing is assumed from GPS True North as shown.

⌧ standard monument

● set standard monument

* from record plat
** calculated

KINDER MORGAN CO2 COMPANY, LP
CX-4
949' FSL & 906' FEL (surface location)
6633.4' grd. el. NAVD '88 (from OPUS)
Section 10, T.38 N., R.19 W., NMPM
Montezuma County, CO

Notes:
1)Distances/dimensions are perpendicular to section/aliquot lines.
2)Surface use is dryland farming.
3)GPS was corrected with OPUS, GPS operator was R.J. Caffey, CO LS 36562.
4)There are no dwellings 1000 feet.

date of survey : 12/02/2014
date of plat : 12/03/2014
& 12/04/2014

KNOW ALL MEN BY THESE PRESENTS that I, GERALD G. HUDDLESTON, do hereby certify that this plat was prepared from field notes of an actual survey made by me or under my supervision and that the same is true and accurate to the best of my knowledge and belief.

Section 1 - General

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

Section 2 - Lined Pits

Would you like to utilize Lined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Lined pit PWD on or off channel:

Lined pit PWD discharge volume (bbl/day):

Lined pit specifications:

Pit liner description:

Pit liner manufacturers information:

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal permit:

Lined pit precipitated solids disposal schedule:

Lined pit precipitated solids disposal schedule attachment:

Lined pit reclamation description:

Lined pit reclamation attachment:

Leak detection system description:

Leak detection system attachment:

Lined pit Monitor description:

Lined pit Monitor attachment:

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

Is the reclamation bond a rider under the BLM bond?

Lined pit bond number:

Lined pit bond amount:

Additional bond information attachment:

Section 3 - Unlined Pits

Would you like to utilize Unlined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Unlined pit PWD on or off channel:

Unlined pit PWD discharge volume (bbl/day):

Unlined pit specifications:

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal permit:

Unlined pit precipitated solids disposal schedule:

Unlined pit precipitated solids disposal schedule attachment:

Unlined pit reclamation description:

Unlined pit reclamation attachment:

Unlined pit Monitor description:

Unlined pit Monitor attachment:

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

Beneficial use user confirmation:

Estimated depth of the shallowest aquifer (feet):

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

TDS lab results:

Geologic and hydrologic evidence:

State authorization:

Unlined Produced Water Pit Estimated percolation:

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

Is the reclamation bond a rider under the BLM bond?

Unlined pit bond number:

Unlined pit bond amount:

Additional bond information attachment:

Section 4 - Injection

Would you like to utilize Injection PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Injection PWD discharge volume (bbl/day):

Injection well mineral owner:

Injection well type:

Injection well number: **Injection well name:**

Assigned injection well API number? **Injection well API number:**

Injection well new surface disturbance (acres):

Minerals protection information:

Mineral protection attachment:

Underground Injection Control (UIC) Permit?

UIC Permit attachment:

Section 5 - Surface Discharge

Would you like to utilize Surface Discharge PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Surface discharge PWD discharge volume (bbl/day):

Surface Discharge NPDES Permit?

Surface Discharge NPDES Permit attachment:

Surface Discharge site facilities information:

Surface discharge site facilities map:

Section 6 - Other

Would you like to utilize Other PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Other PWD discharge volume (bbl/day):

Other PWD type description:

Other PWD type attachment:

Have other regulatory requirements been met?

Other regulatory requirements attachment:

AFMSS

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

Bond Info Data Report

07/02/2018

Bond Information

Federal/Indian APD: FED

BLM Bond number: COB000223

BIA Bond number:

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond attachment:

Reclamation bond number:

Reclamation bond amount:

Reclamation bond rider amount:

Additional reclamation bond information attachment: