

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENTFORM APPROVED
OMB NO. 1004-0137
Expires: January 31, 2018**SUNDRY NOTICES AND REPORTS ON WELLS**
*Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.*5. Lease Serial No.
NMLC065347

6. If Indian Allottee or Tribe Name

7. Unit or CA/Agreement, Name and/or No.

SUBMIT IN TRIPLICATE - Other instructions on page 2

1. Type of Well <input type="checkbox"/> Oil Well <input checked="" type="checkbox"/> Gas Well <input type="checkbox"/> Other		8. Well Name and No. WHITE CITY PENN 28 GAS COM UNT 4
2. Name of Operator CIMAREX ENERGY CO OF COLORADO Contact: AMITHY E CRAWFORD Email: acrawford@cimarex.com		9. API Well No. 30-015-33862
3a. Address 202 S. CHEYENNE AVE STE 1000 TULSA, OK 74103	3b. Phone No. (include area code) Ph: 432-620-1909	10. Field and Pool or Exploratory Area WC-015 G-04 S262625B
4. Location of Well (Footage, Sec., T., R., M., or Survey Description) Sec 28 T24S R26E 1980FSL 1500FWL		11. County or Parish, State EDD COUNTY, NM

12. CHECK THE APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
<input checked="" type="checkbox"/> Notice of Intent	<input type="checkbox"/> Acidize	<input type="checkbox"/> Deepen	<input type="checkbox"/> Production (Start/Resume)	<input type="checkbox"/> Water Shut-Off
<input type="checkbox"/> Subsequent Report	<input type="checkbox"/> Alter Casing	<input type="checkbox"/> Hydraulic Fracturing	<input type="checkbox"/> Reclamation	<input type="checkbox"/> Well Integrity
<input type="checkbox"/> Final Abandonment Notice	<input type="checkbox"/> Casing Repair	<input type="checkbox"/> New Construction	<input checked="" type="checkbox"/> Recomplete	<input type="checkbox"/> Other
	<input type="checkbox"/> Change Plans	<input type="checkbox"/> Plug and Abandon	<input type="checkbox"/> Temporarily Abandon	
	<input type="checkbox"/> Convert to Injection	<input type="checkbox"/> Plug Back	<input type="checkbox"/> Water Disposal	

13. Describe Proposed or Completed Operation: Clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recompleat horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompleat in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed and the operator has determined that the site is ready for final inspection.

Cimarex Energy Co of Colorado respectfully requests approval to recompleat and downhole commingle the White City Penn 28 GCU 3 #4 well to the White City; Penn (Gas) pool (Cisco Canyon Formation) and Purple Sage (Wolfcamp) pool (wolfcamp) Formation as indicated on the attached procedure. The Bone Spring formation will be isolated with an expandable liner. This Sundry will replace the current sundry approved on 3/30/2017.

The 2016 White City Are Downhole commingling field study included the referenced well for commingling. The Field study was approved on 7/16/16.

NMOCD DHC permit: DHC-4805

attachments: C102s, Procedure, current and proposed Wellbore diagrams, oil gas & water analysis and

RECEIVED

MAY 23 2018

GC 5-24-18
Accepted for record - NMOCD

DISTRICT II-ARTESIA O.C.

14. I hereby certify that the foregoing is true and correct. Electronic Submission #377422 verified by the BLM Well Information System For CIMAREX ENERGY CO OF COLORADO, sent to the Carlsbad Committed to AFMSS for processing by DEBORAH MCKINNEY on 06/01/2017 ()	
Name (Printed/Typed) AMITHY E CRAWFORD	Title REGULATORY ANALYST
Signature (Electronic Submission)	Date 05/30/2017

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

/s/ Jonathon Shepard		PETROLEUM ENGINEER	05/16/2018
Approved By		Title	Date
Conditions of approval, if any, are attached. Approval of this notice 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.		Office Cfo	

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.

(Instructions on page 2)

**** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ****

Appendix D: Recompletion Procedure – White City Penn 28 Gas Com Unit 3 #4

Well Data

KB	21'
TD	11,900'
PBTD	6,982'
Casing	13-3/8" 54.5# J-55 @ 350'. Cmt'd w/ 350 sx, cmt circ 9-5/8" 40# NS-110HC @ 1,600'. Cmt'd w/ 700 sx, cmt circ 5-1/2" 17# P-110 @ 11,900'. Cmt'd w/ 2,725 sx. DV @ 7,083'. TOC @ 2,750' by CBL
Tubing	2-3/8" 4.7# L-80 8rd, EOT @ 6,954'
Rods	3/4" Weatherford HD Steel rods and 225' of 1.5" Flexbar C
Pump	2" x 1.5" x 30' RHBC (HVR) Frac Pump
Proposed RC Perfs	Wolfcamp (8,349' – 9,679') & Cisco Canyon (9,680' – 9,889')

Procedure

Notify BLM 24 hours prior to start of workover operations.

1. Test anchors prior to moving in rig.
2. Move in rig up pulling unit.
3. Kill well as necessary with 7% KCl.
4. Nipple down wellhead, nipple up 5,000 psi blow out preventer stack.
5. TOOH w/ rods, pump, and 2-3/8" 4.7# L-80 tbg. Stand back tbg. Scan tubing during TOOH.
6. Drill out cement plugs from 7,135' – 6,982' and from 8,405' – 8,215'
7. TIH w/ Enventure expandable liner and set liner from 6,522' – 6,993'
8. RU Pump truck and pressure test casing to 8,500 psi on a chart for 30 minutes with no more than 10% leak off.
9. ND 5k BOP, RDMO PU
10. RU two 10k frac valves and flow cross
11. MIRU water transfer with frac tanks to contain water to be pumped from frac pond
12. Test frac valves and flow cross prior to frac job. Arrange for these items, manlift, forklift, and Pace testers to be on location the day before the frac job to test so that we do not have the frac waiting on a successful test the following day.
13. RU frac valves, flow cross, goat head, and wireline lubricator.
14. RIH w/ gauge ring/junk basket for 5-1/2" 17# P-110 csg to +/- 9,889'
15. Perforate Cisco Canyon from 9,680' – 9,889'.
16. RU frac and flowback equipment.
17. Acidize and frac Cisco Canyon perfs down casing.

Production Operations – Carlsbad Region, Permian Basin
White City Penn 28 GCU 3 #4 - Cisco Canyon and Wolfcamp
(Ciscamp) Proposed Commingling Allocation Factors. Eddy County, NM

18. Set 10k flow through composite plug 15' uphole of top perforation
19. Test to 8,500 psi
20. Perforate Wolfcamp from 8,349' – 9,679'.
21. Acidize and frac Wolfcamp perms down casing.
22. Set 10k flow through composite plug 15' above top perforation
23. Test to 8,500 psi
24. RD frac
25. MIRU 2" coiled tbg unit.
26. RIH w/ blade mill & downhole motor on 2" CT and drill out sand and composite plugs using freshwater for circulation. Pump sweeps each time a plug is tagged, each time a plug is drilled out, and every 60 bbls pumped.
27. Clean out to PBTD
28. POOH w/ blade mill, motor & CT
29. RDMO coiled tbg unit.
30. Flow back well for 24 hours, then SI well overnight.
31. RU wireline and lubricator.
32. RIH w/ GR/JB for 5-1/2" 17# P-110 to +/- 8,299'
33. RIH w/ 2-3/8" WEG, 2-3/8" pump out plug pinned for 1,500 – 2,000 psi differential pressure, 10' 2-3/8" 4.7# L-80 tbg sub w/ 1.875" XN profile nipple w/ blanking plug in place, 5-1/2" Arrowset 1X packer and on-off tool stinger w/ 1.875" X profile nipple. Set packer +/- 8,299'. From downhole up:
 - a. 2-3/8" WEG
 - b. 2-3/8" pump out plug pinned for 1,500 – 2,000 psi differential pressure
 - c. 1.875" XN profile nipple
 - d. 10' 2-3/8" 4.7# L-80 tbg sub
 - e. 5-1/2" x 2-3/8" Arrowset 1X packer and on-off tool stinger w/ 1.875" X profile nipple
34. RD WL and lubricator
35. ND goat head and frac valve, NU BOP, MIRU Pulling Unit
36. TIH w/ on/off tool overshoot, GLVs, and 2-3/8" 4.7# L-80 tbg.
37. Latch overshoot onto on-off tool and space out tubing
38. ND BOP, NU WH
39. RDMO pulling unit
40. RU pump truck and pump out plug. Put well on production.
41. Run Production Log for allocation purposes after recovering load. Run additional production logs if actual production varies significantly from expected performance. Send copies of these logs to BLM and file for an adjustment of allocation factor if necessary.



Production Operations – Carlsbad Region, Permian Basin
**White City Penn 28 GCU 3 #4 - Cisco Canyon and Wolfcamp
(Ciscamp) Proposed Commingling Allocation Factors. Eddy County, NM**

Objective

Cimarex is seeking approval from the U.S. Bureau of Land Management (BLM) of its proposed *commingling permit* application and the *allocation factors* for the Cisco Canyon and Wolfcamp formations in the recompletion of the **White City Penn 28 Gas Com Unit 3 #4** well (API: 30-015-33862).

The proposed “allocation factors” have been estimated following BLM’s approved allocation methodology in the 2016 *Downhole Commingling Field Study “Cisco Canyon and Wolfcamp (Ciscamp) Commingled Allocation Assessment in White City, Eddy County, NM”* (NMP0220), approved by BLM on July 6, 2016 (**Appendix A**). Based on this approach and the assessment of subsurface data, the recommended initial allocation factors are **84%** for the Wolfcamp and **16%** for the Cisco Canyon.

The support evidence for this application includes petrophysical assessment and recoverable reserves estimation for each proposed formation (Table 1) and a log section (**Appendix B**).

Proposed Recompletion

Cimarex plans to recomplete the **White City Penn 28 Gas Com Unit 3 #4** well to the Cisco Canyon and the Wolfcamp formations. This well is located within the BLM approved White City Ciscamp Field Study Area (see Exhibit 6A of the above referenced Field Study) and is currently completed in the Bone Spring formation. The well has produced 932 bbls of oil and 34 MMCF of gas (see **Appendix C**). The company plans to temporarily abandon the currently producing Bone Spring perforations with an expandable liner.

The proposed Ciscamp recompletion will be performed with a *multi-stage frac job*. The plan is to commingle Wolfcamp and Cisco Canyon streams downhole immediately after completion to allow faster flowback recovery and more efficient artificial lift. The synergy between both streams has shown to significantly improve liquid unloading in analog wells by maintaining higher and more stable critical gas velocities for a longer period. This in turn minimizes formation damage and increases reserves recovery by extending the life of the well.

A proposed recompletion and workover procedure is included in **Appendix D**.

Proposed Initial Production Allocation Factors

Based on BLM’s approved Allocation Methodology¹ and Cimarex’s assessment, the “Initial Allocation Factors” for the New Completion Zones in subject well are estimated as follows:



CONFIDENTIAL. December 29, 2016

Production Operations – Carlsbad Region, Permian Basin
White City Penn 28 GCU 3 #4 - Cisco Canyon and Wolfcamp
 (Ciscamp) Proposed Commingling Allocation Factors. Eddy County, NM

$$\text{Wolfcamp \% Alloc. Factor} = \frac{WC \text{ RGIP} - WC \text{ Prev. Cum Gas}}{\text{Total RGIP}}$$

$$\text{Cisco Canyon \% Alloc. Factor} = \frac{CC \text{ RGIP} - CC \text{ Prev. Cum Gas}}{\text{Total RGIP}}$$

The Recoverable Gas in Place (RGIP) for subject well is **1,499 MMCF** from the Wolfcamp and **292 MMCF** from the Cisco Canyon, for a total of **1,790 MMCF of gas** (see Table 1). In this case, the proposed commingling intervals have never produced in this well (no prior cumulative production), therefore Remaining RGIP (RRGIP) is equal to RGIP for both formations.

The resulting proposed allocation factors are calculated as follows:

$$\text{Wolfcamp \% Alloc. Factor} = \frac{1,499 \text{ MMCF}}{1,790 \text{ MMCF}} = 84\%$$

$$\text{Cisco Canyon \% Alloc. Factor} = \frac{292 \text{ MMCF}}{1,790 \text{ MMCF}} = 16\%$$

The RGIP for each zone is estimated using the Hydrocarbon Pore Volume (HCPV) assessment as shown in Table 1. The implemented net pay cut-offs are Average Porosity (PHI) > 6-10% and Average Sw < 25-45%. *Total estimated oil reserves are 57 MBO.*

White City Penn 28 GCU 3#4

Proposed RC Zone(S)	Avg. Depth, ft	Est. Reservoir Pressure, psi	Net Pay, h (ft)	Avg. PHI	Avg. Sw	HCPV (1-Sw)*PHI*h	OGIP, MMCF	Est. Recovery Factor	RGIP @RF, MMCF	Zone Prod. Start Date	Prev. Cum. Gas to Date, MMCF	Remaining RGIP (RRGIP), MMCF	Initial Alloc. Factors, % (based on RRGIP Ratio)
Wolfcamp Total :	9,116	3,965	204	12.1%	20%	19.9	1,765	85%	1,499			1,499	84%
Cisco Canyon :	9,874	4,295	30	14.8%	15%	3.7	343	85%	292		-	292	16%
Total:			233			23.7	2,108	85%	1,790		-	1,790	100%

Table 1: Summary of Reservoir Properties, Estimated Reserves and Resulting Allocation Factors

In this well, the spacing for both formations is the same, as well as public interests: 100% working interest and 77.5% net revenue interest. Both formations are sweet.

Enclosed with this report are the C-107A, Downhole Commingle Worksheet, current and proposed wellbore diagrams, current gas, oil, and water analyses C-102, 3160-5.



CONFIDENTIAL. December 29, 2016

Production Operations – Carlsbad Region, Permian Basin
White City Penn 28 GCU 3 #4 - Cisco Canyon and Wolfcamp
(Ciscamp) Proposed Commingling Allocation Factors. Eddy County, NM

Appendix A: 2016 Downhole Commingling Field Study for the White City Area



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Pecos District

Carlsbad Field Office

620 E. Greene

Carlsbad, New Mexico 88220-6292

www.blm.gov/nm



3180 (P0220)

July 6, 2016

Reference:

White City Area

2016 Downhole Commingling Field Study

Eddy County, New Mexico

Cimarex Energy Co. of Colorado
600 N. Marienfeld Street, Suite 600
Midland, TX 79701

Gentlemen:

In reference to your 2016 Downhole Commingling Field Study for the White City Area, it is hereby approved, with the following conditions of approval:

1. All future NOI Sundries submitted to request approval to downhole commingle (DHC) the Lower Penn, Upper Penn and the Wolfcamp formation shall reference this Study and be mentioned in Exhibit 6A. A copy of this study does not need to be attached to the Sundry.
2. All future NOI Sundries submitted to request approval to DHC shall reference NMOCD approval order.
3. All future NOI Sundries submitted to request approval to DHC shall include the BLM's DHC worksheet.
4. All DHC approvals are subject to like approval by NMOCD.
5. The BLM may require an updated evaluation of the field study be done in the future.

Please contact Edward G. Fernandez, Petroleum Engineer at 575-234-2220 if you have any questions.

Sincerely,

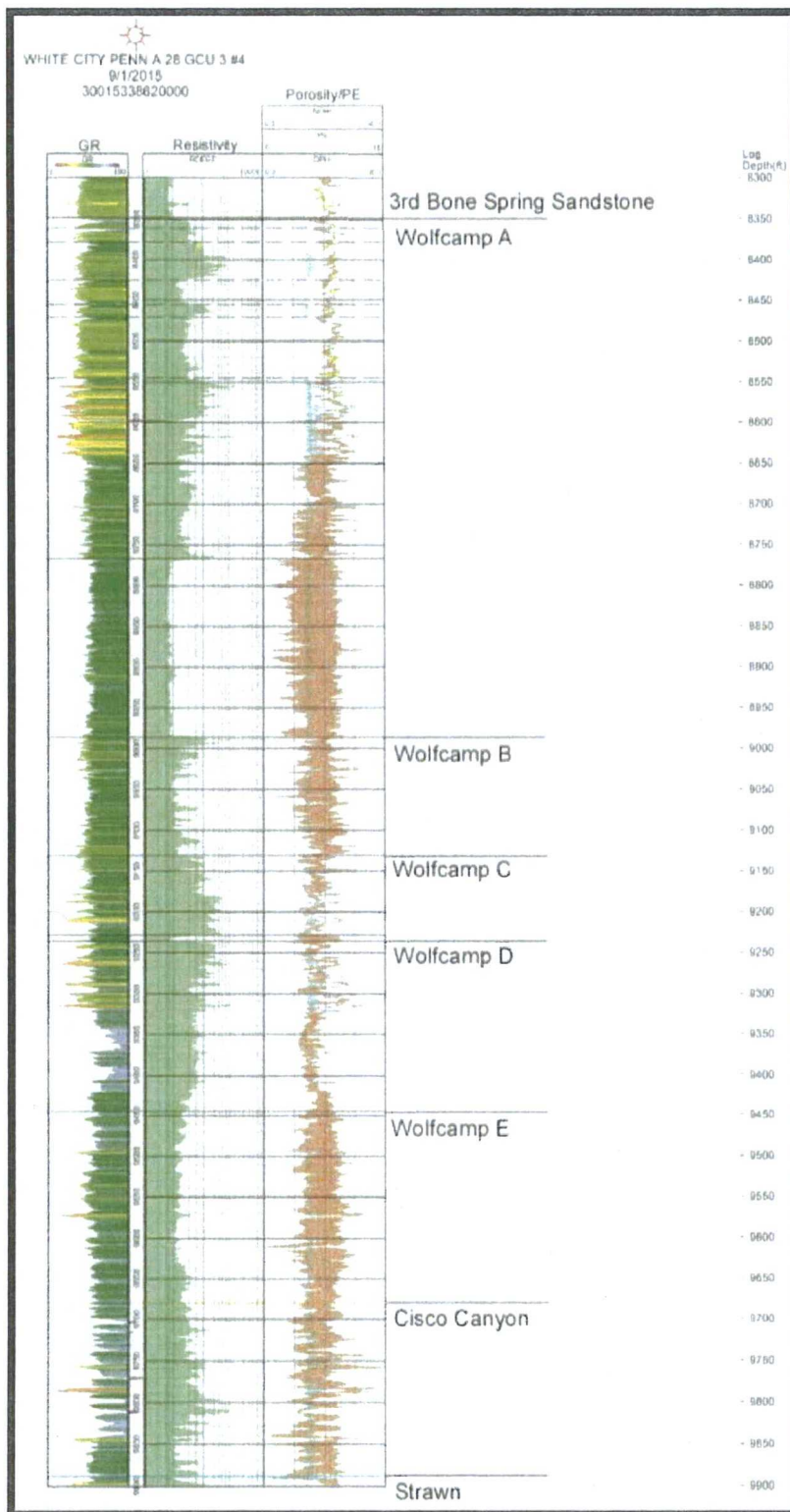
Edward G. Fernandez
for Cody R. Layton
Assistant Field Manager,
Lands and Minerals

Enclosure

cc: NMP0220 (CFO I&E)

Production Operations – Carlsbad Region, Permian Basin
White City Penn 28 GCU 3 #4 - Cisco Canyon and Wolfcamp
(Ciscamp) Proposed Commingling Allocation Factors. Eddy County, NM

Appendix B: Log section from top of Wolfcamp to top of Strawn – White City Penn 28 GCU 3#4

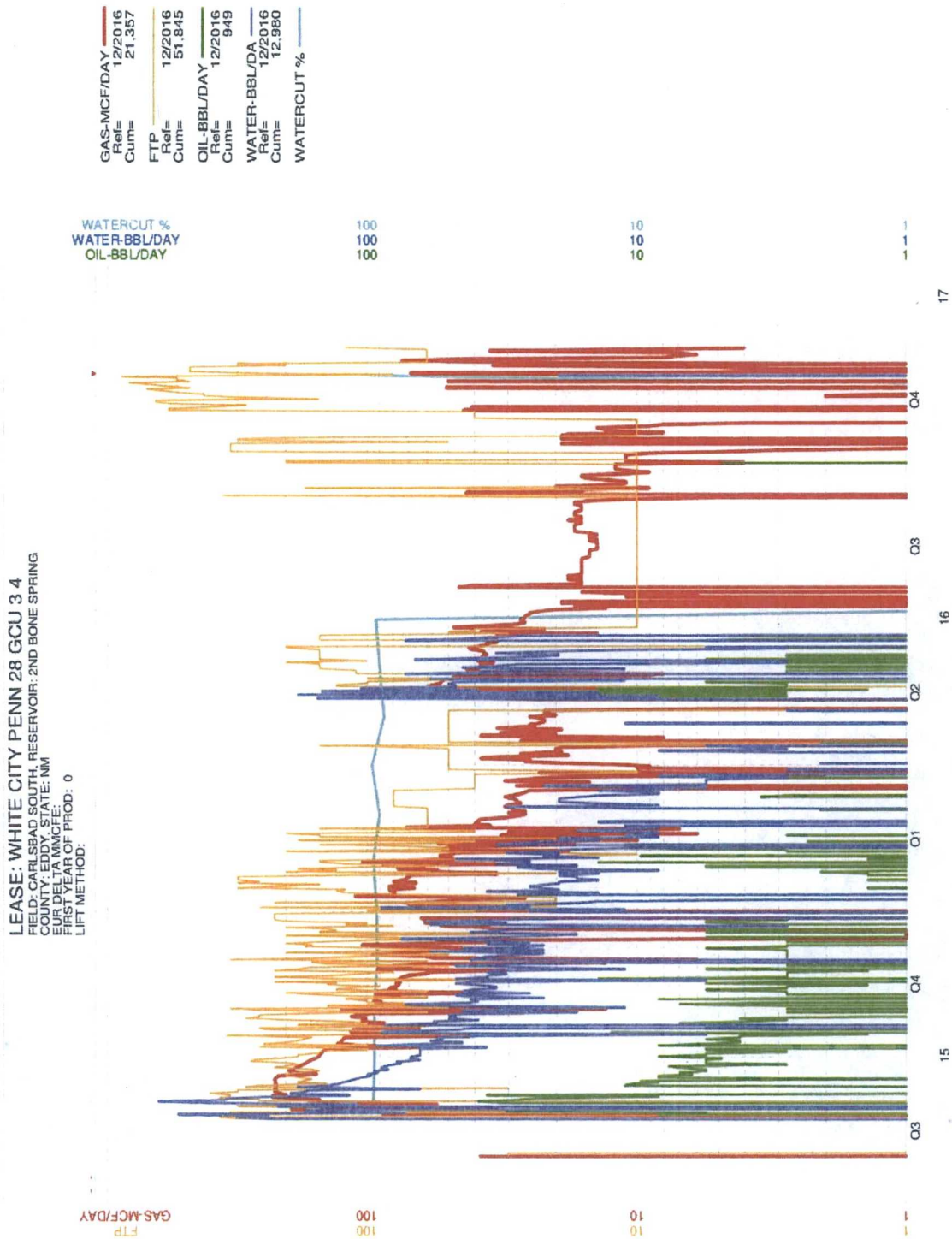




CONFIDENTIAL. December 29, 2016

Production Operations – Carlsbad Region, Permian Basin
White City Penn 28 GCU 3 #4 - Cisco Canyon and Wolfcamp
(Ciscamp) Proposed Commingling Allocation Factors. Eddy County, NM

Appendix C: Current Completion – White City Penn 28 Gas Com Unit 3 #4

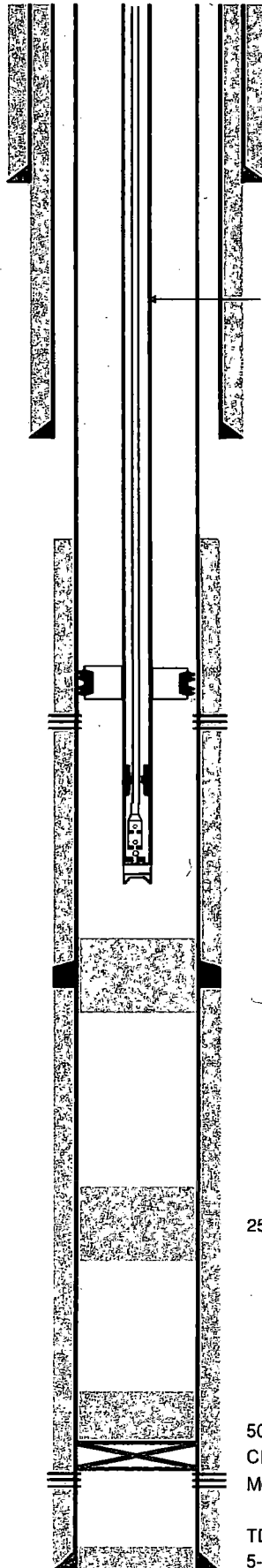


Tubing:

2-3/8" 4.7# L-80 tbg to surface (208 jts)
2-3/8" x 5-1/2" TAC @ 6,585'
10 jts 2-3/8" 4.7# L-80 tbg @ 6,588'
2-3/8" API Cup Type SN @ 6,904'

Rods:

1.5" x 30' Polished Rod at Surface
706' x 3/4" Weatherford HD Steel Rods
not guided (25 jts and one 6' pony rod)
875' x 3/4" Weatherford HD Steel Rods
with 4 molded guides per rod (35 jts)
5,000' x 3/4" Weatherford HD Steel Rods
not guided (200 jts)
225' x 1.5" Flexbar C (9 jts)
J-latch on/off tool at 6,836'
25' x 1.5" Flexbar C (1 jt)
1.3' Guided Lift Sub at 6,862'
30' length 1.5" insert pump @ 6,893'



13-3/8", 54.5# J-55 csg @ 350'
cmtd w/ 350 sx, cmt circ

210 jts 2-3/8" 4.7# L-80 Tbg

9-5/8", 40# NS-110HC csg @ 1600'
cmtd w/ 700 sx, cmt circ

TOC @ 2750 by CBL-DP Jan 2015

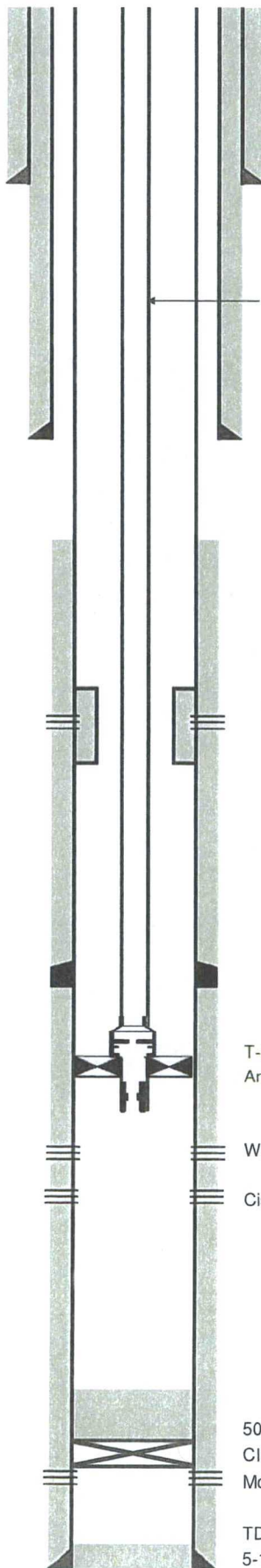
Bone Springs perms (6,622' - 6,883')

25 sx Class H cement plug from 7,197' - 6,982'
DV Tool @ 7083'
cmtd w/ 1550 sx

25 sx Class H cement plug from 8,436' 8,184'

50 sx Class H cement plug tagged at 10,492'
CIBP @ 10,910'
Morrow perms (10996' - 11541')

TD @ 11751'
5-1/2" 17# P-110 @ 11900' cmtd w/ 1175 sx
TD @ 11900'



13-3/8", 54.5# J-55 csg @ 350'
cmtd w/ 350 sx, cmt circ

2-3/8" 4.7# L-80 Tbg

9-5/8", 40# NS-110HC csg @ 1600'
cmtd w/ 700 sx, cmt circ

TOC @ 2750 by CBL-DP Jan 2015

Expandable Liner from 6,522 - 6,993'
Bone Springs perms (6,622' - 6,883')

DV Tool @ 7083'
cmtd w/ 1550 sx

T-2 on-off Tool w/ 1.875" X Profile nipple @ 10,149'
Arrowset 1X pkr @ 9,838'

Wolfcamp perms (8,349' - 9,680')

Cisco Canyon perms (9,680' - 9,889')

50 sx Class H cement plug tagged at 10,492'
CIBP @ 10,910'
Morrow perms (10996' - 11541')

TD @ 11751'
5-1/2" 17# P-110 @ 11900' cmtd w/ 1175 sx
TD @ 11900'



www.permianls.com

575.397.3713 2609 W Marland Hobbs NM 88240

For:	Cimarex Energy	Sample:	Sta. # 309588185
	Attention: Mark Cummings	Identification:	Wigeon 23 Fed Com 1
	600 N. Marienfeld, Suite 600	Company:	Cimarex Energy
	Midland, Texas 79701	Lease:	
		Plant:	

Sample Data:	Date Sampled	7/30/2013	12:25 PM	Sampled by: Taylor Ridings Analysis by: Vicki McDaniel
	Analysis Date	7/31/2013		
	Pressure-PSIA	900		
	Sample Temp F	107		
	Atmos Temp F	85		

H2S = 0.3 PPM

Component Analysis

		Mol Percent	GPM
Hydrogen Sulfide	H2S		
Nitrogen	N2	0.677	
Carbon Dioxide	CO2	0.123	
Methane	C1	82.764	
Ethane	C2	9.506	2.536
Propane	C3	3.772	1.037
I-Butane	IC4	0.640	0.209
N-Butane	NC4	1.185	0.373
I-Pentane	IC5	0.335	0.122
N-Pentane	NC5	0.374	0.135
Hexanes Plus	C6+	<u>0.624</u>	<u>0.270</u>
		100.000	4.681

REAL BTU/CU.FT.		Specific Gravity	
At 14.65 DRY	1219.2	Calculated	0.6973
At 14.65 WET	1197.9		
At 14.696 DRY	1223.0		
At 14.696 WET	1202.1	Molecular Weight	20.1966
At 14.73 DRY	1225.8		
At 14.73 Wet	1204.6		

North Permian Basin Region
P.O. Box 740
Sundown, TX 79372-0740
(806) 229-8121

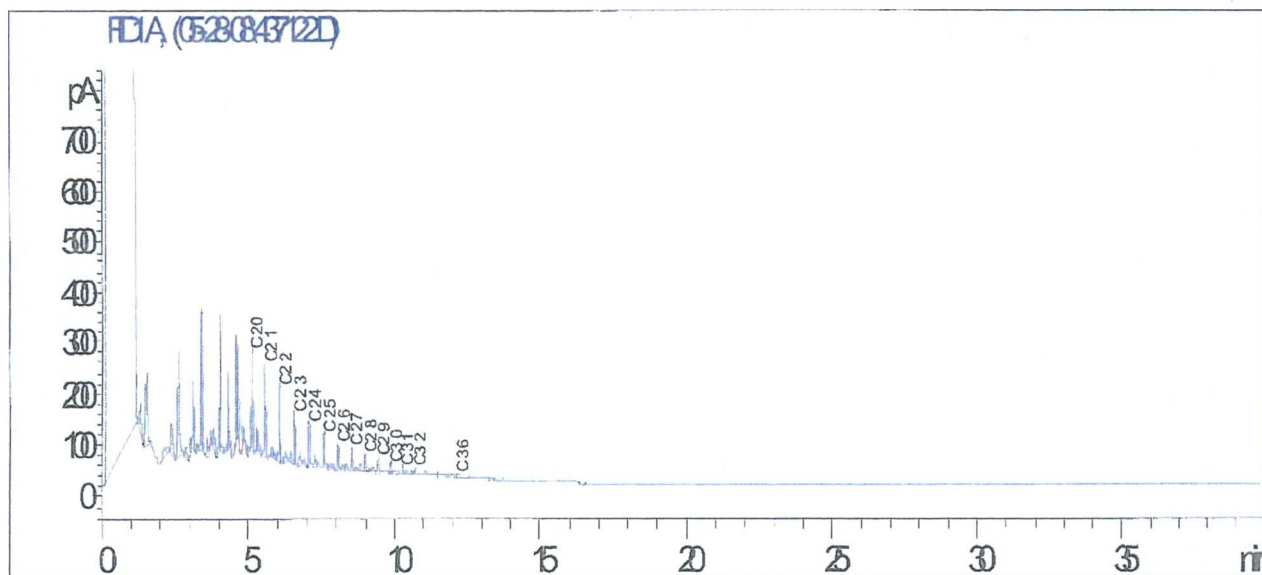
Lab Team Leader - Sheila Hernandez
(432) 495-7240

OIL ANALYSIS

Company:	CIMAREX ENERGY	Sales RDT:	44212
Region:	PERMIAN BASIN	Account Manager:	WAYNE PETERSON (575) 910-9389
Area:	CARLSBAD, NM	Analysis ID #:	3208
Lease/Platform:	WIGEON '23' FEDERAL	Sample #:	437122
Entity (or well #):	1	Analyst:	SHEILA HERNANDEZ
Formation:	WOLFCAMP	Analysis Date:	5/30/08
Sample Point:	FRAC TANK 234	Analysis Cost:	\$100.00
Sample Date:	5/13/08		

Cloud Point:	<68 °F
Weight Percent Paraffin (by GC)*:	1.49%
Weight Percent Asphaltenes:	0.03%
Weight Percent Oily Constituents:	98.41%
Weight Percent Inorganic Solids:	0.07%

*Weight percent paraffin and peak carbon number includes only n-alkanes (straight chain hydrocarbons) greater than or equal to C20H42.



North Permian Basin Region
P.O. Box 740
Sundown, TX 79372-0740
(806) 229-8121
Lab Team Leader - Sheila Hernandez
(432) 495-7240

Water Analysis Report by Baker Petrolite

Company: CIMAREX ENERGY Region: PERMIAN BASIN Area: CARLSBAD, NM Lease/Platform: WIGEON UNIT Entity (or well #): 23 FEDERAL 1 Formation: UNKNOWN Sample Point: SEPARATOR	Sales RDT: 44212 Account Manager: WAYNE PETERSON (505) 910-9389 Sample #: 43887 Analysis ID #: 82014 Analysis Cost: \$80.00
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Summary		Analysis of Sample 43887 @ 75 °F					
		Anions				Cations	
		mg/l	meq/l			mg/l	meq/l
Sampling Date:	05/14/08	Chloride:	55040.0	1552.48	Sodium:	32207.4	1400.94
Analysis Date:	05/15/08	Bicarbonate:	329.4	5.4	Magnesium:	268.0	22.05
Analyst:	WAYNE PETERSON	Carbonate:	0.0	0.	Calcium:	2780.0	138.72
TDS (mg/l or g/m3):	90873.3	Sulfate:	225.0	4.68	Strontium:		
Density (g/cm3, tonne/m3):	1.062	Phosphate:			Barium:		
Anion/Cation Ratio:	1	Borate:			Iron:	23.5	0.85
		Silicate:			Potassium:		
Carbon Dioxide:	150 PPM	Hydrogen Sulfide:		0 PPM	Aluminum:		
Oxygen:		pH at time of sampling:		7.31	Chromium:		
Comments:		pH at time of analysis:			Copper:		
TEST RAN IN THE FIELD		pH used in Calculation:		7.31	Lead:		
					Manganese:		
					Nickel:		

Conditions		Values Calculated at the Given Conditions - Amounts of Scale in lb/1000 bbl										
Temp	Gauge Press.	Calcite CaCO ₃		Gypsum CaSO ₄ *2H ₂ O		Anhydrite CaSO ₄		Celestite SrSO ₄		Barite BaSO ₄		CO ₂ Press
°F	psi	Index	Amount	Index	Amount	Index	Amount	Index	Amount	Index	Amount	psi
80	0	0.94	27.24	-1.11	0.00	-1.14	0.00	0.00	0.00	0.00	0.00	0.13
100	0	0.97	31.09	-1.16	0.00	-1.12	0.00	0.00	0.00	0.00	0.00	0.19
120	0	0.99	35.26	-1.20	0.00	-1.08	0.00	0.00	0.00	0.00	0.00	0.28
140	0	1.02	39.74	-1.23	0.00	-1.02	0.00	0.00	0.00	0.00	0.00	0.38

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered.

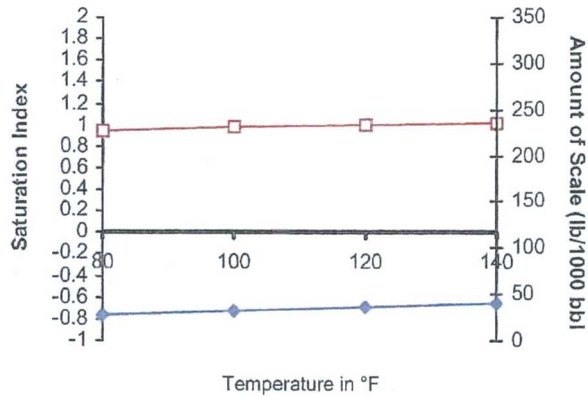
Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the five scales.

Note 3: The reported CO2 pressure is actually the calculated CO2 fugacity. It is usually nearly the same as the CO2 partial pressure.

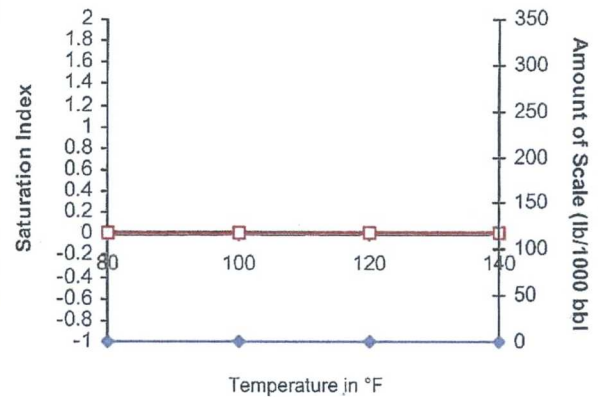
Scale Predictions from Baker Petrolite

Analysis of Sample 43887 @ 75 °F for CIMAREX ENERGY, 05/15/08

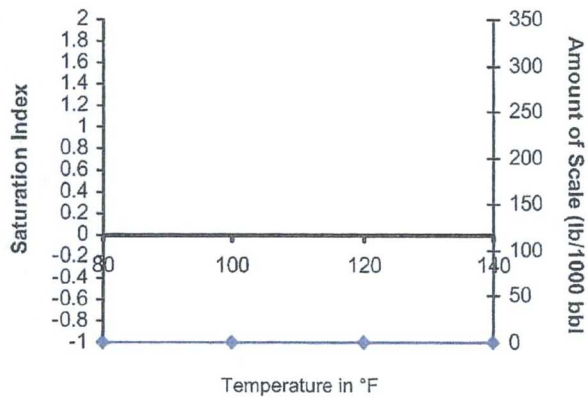
Calcite - CaCO_3



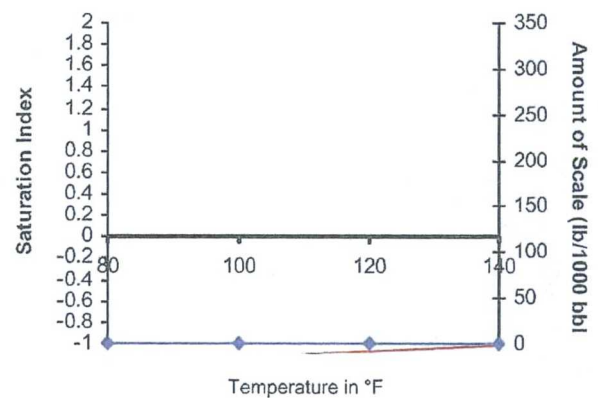
Barite - BaSO_4



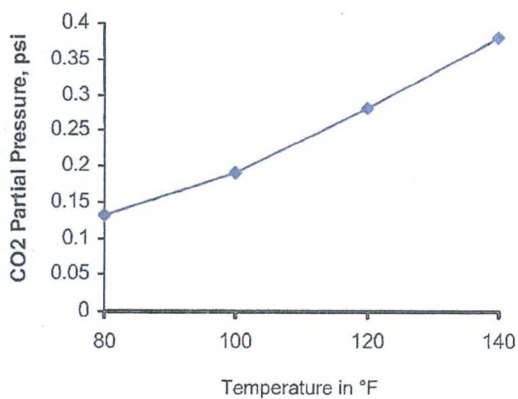
Gypsum - $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$



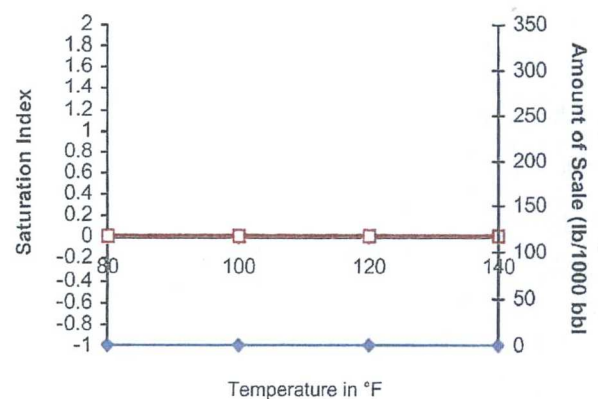
Anhydrite - CaSO_4



Carbon Dioxide Partial Pressure



Celestite - SrSO_4





LABORATORY SERVICES
Natural Gas Analysis

www.permianls.com

575.397.3713 2609 W Marland Hobbs NM 88240

For:	Cimarex Energy	Sample:	Sta. # 309588438
	Attention: Mark Cummings	Identification:	Taos Fed. #3 Sales
	600 N. Marienfeld, Suite 600	Company:	Cimarex Energy
	Midland, Texas 79701	Lease:	
		Plant:	

Sample Data:	Date Sampled	7/2/2014	10:30 AM	
	Analysis Date	7/9/2014		
	Pressure-PSIA	83		Sampled by: K. Hooten
	Sample Temp F	76.4		Analysis by: Vicki McDaniel
	Atmos Temp F	76		

H2S =

Component Analysis

		Mol Percent	GPM
Hydrogen Sulfide	H2S		
Nitrogen	N2	0.618	
Carbon Dioxide	CO2	0.172	
Methane	C1	88.390	
Ethane	C2	7.080	1.889
Propane	C3	1.966	0.540
I-Butane	IC4	0.355	0.116
N-Butane	NC4	0.569	0.179
I-Pentane	IC5	0.198	0.072
N-Pentane	NC5	0.213	0.077
Hexanes Plus	C6+	<u>0.439</u>	<u>0.190</u>
		100.000	3.063

REAL BTU/CU.FT.		Specific Gravity	
At 14.65 DRY	1136.2	Calculated	0.6445
At 14.65 WET	1116.4		
At 14.696 DRY	1139.7		
At 14.696 WET	1120.3	Molecular Weight	18.6673
At 14.73 DRY	1142.4		
At 14.73 Wet	1122.6		

North Permian Basin Region
P.O. Box 740
Sundown, TX 79372-0740
(806) 229-8121

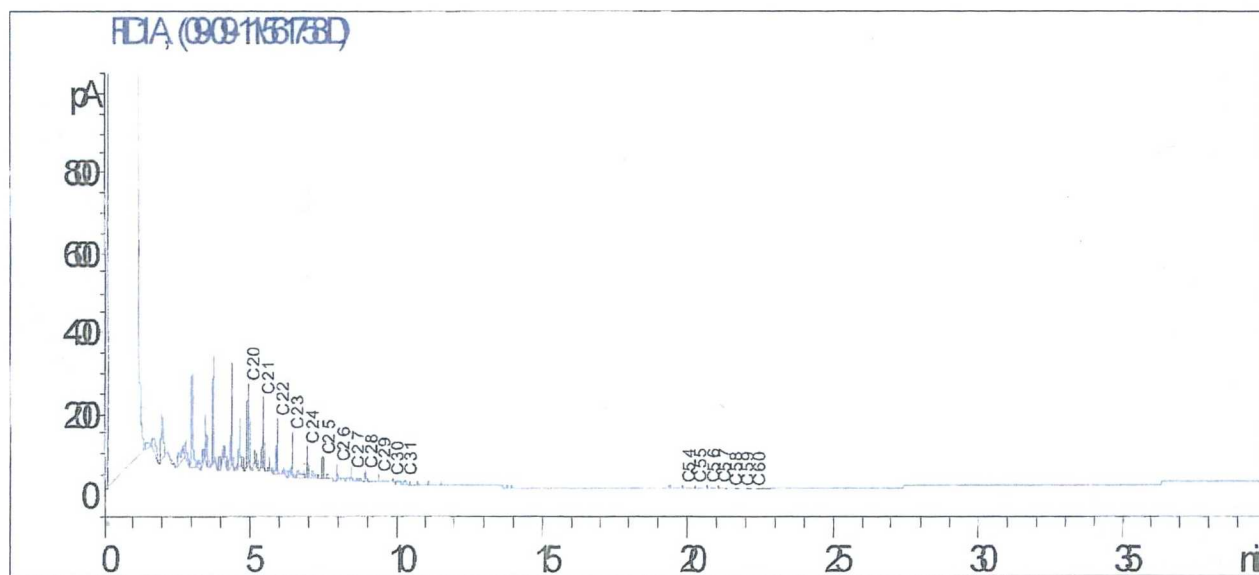
Lab Team Leader - Sheila Hernandez
(432) 495-7240

OIL ANALYSIS

Company:	CIMAREX ENERGY	Sales RDT:	33521
Region:	PERMIAN BASIN	Account Manager:	STEVE HOLLINGER (575) 910-9393
Area:	LOCO HILLS, NM	Analysis ID #:	5419
Lease/Platform:	TAOS FEDERAL LEASE	Sample #:	561758
Entity (or well #):	3	Analyst:	SHEILA HERNANDEZ
Formation:	UNKNOWN	Analysis Date:	09/13/11
Sample Point:	TANK	Analysis Cost:	\$125.00
Sample Date:	08/24/11		

Cloud Point:	89 °F
Weight Percent Paraffin (by GC)*:	1.03%
Weight Percent Asphaltenes:	0.01%
Weight Percent Oily Constituents:	98.93%
Weight Percent Inorganic Solids:	0.03%

*Weight percent paraffin and peak carbon number includes only n-alkanes (straight chain hydrocarbons) greater than or equal to C20H42.



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Water Analysis Report by Baker Petrolite

Company:	CIMAREX ENERGY	Sales RDT:	33521
Region:	PERMIAN BASIN	Account Manager:	STEVE HOLLINGER (575) 910-9393
Area:	CARLSBAD, NM	Sample #:	535681
Lease/Platform:	TAOS FEDERAL LEASE	Analysis ID #:	113272
Entity (or well #):	3	Analysis Cost:	\$90.00
Formation:	UNKNOWN		
Sample Point:	SEPARATOR		

Summary		Analysis of Sample 535681 @ 75 °F					
Sampling Date:	09/28/11	Anions	mg/l	meq/l	Cations	mg/l	meq/l
Analysis Date:	10/13/11	Chloride:	52535.0	1481.82	Sodium:	28338.7	1232.66
Analyst:	SANDRA GOMEZ	Bicarbonate:	146.0	2.39	Magnesium:	417.0	34.3
TDS (mg/l or g/m3):	86836.7	Carbonate:	0.0	0.	Calcium:	3573.0	178.29
Density (g/cm3, tonne/m3):	1.063	Sulfate:	83.0	1.73	Strontium:	1472.0	33.6
Anion/Cation Ratio:	1	Phosphate:			Barium:	22.0	0.32
		Borate:			Iron:	34.0	1.23
		Silicate:			Potassium:	215.0	5.5
Carbon Dioxide:	150 PPM	Hydrogen Sulfide:		0 PPM	Aluminum:		
Oxygen:		pH at time of sampling:		6	Chromium:		
Comments:		pH at time of analysis:			Copper:		
RESISTIVITY 0.083 OHM-M @ 75°F		pH used in Calculation:		6	Lead:		
					Manganese:	1.000	0.04
					Nickel:		

Conditions Values Calculated at the Given Conditions - Amounts of Scale in lb/1000 bbl												
Temp	Gauge Press.	Calcite CaCO ₃		Gypsum CaSO ₄ *2H ₂ O		Anhydrite CaSO ₄		Celestite SrSO ₄		Barite BaSO ₄		CO ₂ Press
		Index	Amount	Index	Amount	Index	Amount	Index	Amount	Index	Amount	
80	0	-0.61	0.00	-1.46	0.00	-1.49	0.00	-0.05	0.00	1.22	11.59	1.14
100	0	-0.51	0.00	-1.51	0.00	-1.47	0.00	-0.07	0.00	1.04	10.94	1.44
120	0	-0.40	0.00	-1.54	0.00	-1.43	0.00	-0.07	0.00	0.89	10.30	1.76
140	0	-0.28	0.00	-1.57	0.00	-1.36	0.00	-0.06	0.00	0.75	9.66	2.07

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered.

Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the five scales.

Note 3: The reported CO₂ pressure is actually the calculated CO₂ fugacity. It is usually nearly the same as the CO₂ partial pressure.

Downhole Commingling Worksheet

Operator: Cimarex Energy
Lease/Well Name/API Number/Location: White City Penn 28 Gas Com Unit 3 #4/30-015-33862/Sec. 28, T24S, R26E

Date:

Data	Bottom Formation	Upper Formation	Estimated Combined Production Data
Pool name	White City Penn (Gas)	Purple Sage - (wolfcamp) Gas	
Pool Code	87280	98220	
State Form C-102 with dedicated Acres Provided	320 acres	320 acres	320 acres
Formation Name	Cisco Canyon	Wolfcamp	
Top and Bottom of Pay Section (Perforated or open-Hole Interval)	9,680' - 9,969'	8,349' - 9,680'	8,349' 9,969'
Method of production	Flowing	Flowing	Flowing
Bottom Hole Pressure	Within 150% of top perf	Within 150% of top perf	Within 150% of top perf
Reservoir Drive mechanism	Gas Drive	Gas Drive	Gas Drive
Oil gravity and/or BTU	Oil: 53.5° API Gas: 1142.4 BTU dry / 1122.6 BTU wet @ 14.73 psi	Oil: 51.8° API Gas: 1225.8 BTU dry / 1204.6 BTU wet @ 14.73 psi	Oil: 52.1° API Gas: 1212.5 BTU dry / 1191.5 BTU wet @ 14.7 psi
Average Sulfur Content (Wt %)	0	0	0
Oil sample Analysis provided	Yes	Yes	
Gas Analysis provided	Yes	Yes	
Produce Water Analysis provided	Yes	Yes	
H2S present	No	No	No
Producing, Shut-In or New Zone	New Zone	New Zone	
Date and Oil/Gas/Water rates of Last Production (new zones or no production history Operator shall attached production estimated and supporting data)	Date: N/A Expected Rate: 16 BOPD, 401 MCFPD, 101 BWPD	Date: N/A Expected Rate: 84 BOPD, 2,106 MCFD, 532 BWPD	Date: N/A Expected Rate: 100 BOPD, 2507 MCFD, 633 BWPD
Average decline % (provide back up data)	7% (terminal)	7% (terminal)	7% (teterminal)
Fixed Allocation Percentage	Oil: 16% Gas: 16%	Oil: 84% Gas: 84%	Oil: 100% Gas: 100%

Remarks:

Production history for analogs for both zones provided in field study appendix.

Operator Signature:

Date: 5/30/17

Attached Supporting documents

State Form C-102 with dedicated Acres Provided

Oil sample Analysis provided (Must be current)

Gas Analysis provided (Must be current)

Produce Water Analysis provided (Must be current)

Any additional supporting data (i.e. offset well production and decline curves etc..)

*Utilize weighted average.