STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

APPLICATION OF OXY USA INC. FOR APPROVAL OF A PRESSURE MAINTENANCE PROJECT, EDDY COUNTY, NEW MEXICO.

CASE NO. 20193

APPLICATION

OXY USA Inc. ("OXY") through its undersigned attorneys, hereby files this application with the Oil Conservation Division for an order approving a pressure maintenance project in the Bone Spring formation underlying a project area comprised of the N/2 of Section 23 and the NW/4 of Section 24, Township 24 South, Range 29 East, NMPM, Eddy County, New Mexico. In support of its application, OXY states:

1. OXY USA Inc., (OGRID No. 16696) is the operator of the following three horizontal wells drilled and completed in the Second Bone Spring interval of the Pierce Crossing Bone Spring, East Pool (Pool Code 96473) underlying the N/2 of Section 23 and the NW/4 of Section 24, Township 24 South, Range 29 East, NMPM, Eddy County, New Mexico:

- The Cedar Canyon 23 Federal 3H well (30-015-43290) dedicated to the S/2 N/2 of Section 23 and the S/2 NW/4 of Section 24;
- The Cedar Canyon 23 Federal 4H well (30-015-43281) dedicated to the S/2 N/2 of Section 23 and the S/2 NW/4 of Section 24; and
- The Cedar Canyon 23 Federal 5H well (30-015-43282) dedicated to the N/2 N/2 of Section 23 and the N/2 NW/4 of Section 24.

2. OXY seeks approval to inject produced gas, produced water and carbon dioxide into the Second Bone Spring interval through the **Cedar Canyon 23 Federal 4H well** at a total vertical depth of approximately 8850 feet to approximately 9002 feet along the horizontal

portion of the wellbore. Oxy anticipates injection through this well will provide pressure maintenance support for the offsetting Cedar Canyon 23 Federal 3H and 5H wells.

3. Oxy seeks authority to inject produced gas, produced water and carbon dioxide at the following maximum surface injection pressures:

Produced gas:	4,350 psi
Produced water:	1,770 psi
Carbon dioxide:	2300 psi

The source of the produced gas and the produced water will be the Bone Spring and Delaware formations. The source of the carbon dioxide is unknown.

4. Oxy seeks to place the packer in the vertical portion of the production casing which is significantly above the first perforations. Oxy therefore seeks an exception to the 100-foot packer setting depth requirement applied to vertical injection wells.

5. Oxy requests allowance to use unlined tubing in the injection well, which has previously been approved by the Division for a similar injection project. *See* Order R-14322.

6. A copy of the Form C-108 for this injection project is provided with this application as Attachment A.

7. Notice of this Application has been provided to all affected parties as required by Division Rules and notice of the hearing on this application will be provided in a newspaper of general circulation in Eddy County.

8. Approval of this pressure maintenance project will result in the production of substantially more hydrocarbons from the project area than would otherwise be produced, will prevent waste and will not impair correlative rights.

WHEREFORE, OXY USA, Inc. requests that this application be set for hearing before an Examiner of the Oil Conservation Division on January 10, 2019, and, after notice and hearing as required by law, the Division approve this application.

Respectfully submitted,

HOLLAND & HART LLP

By: _____

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ATTORNEYS FOR OXY USA, INC.

Case No.: **Application of OXY USA Inc. for Approval of a Pressure Maintenance Project, Eddy County, New Mexico.** Applicant in the above-styled cause seeks an order approving a pressure maintenance project in the Bone Spring formation (Pierce Crossing, Bone Spring, East Pool (96473)) underlying a project area comprised of the N/2 of Section 23 and the NW/4 of Section 24, Township 24 South, Range 29 East, NMPM, Eddy County, New Mexico. Produced gas, produced water and carbon dioxide may be injected into the Second Bone Spring interval through the **Cedar Canyon 23 Federal 4H well** (API No. 30-015-43281) at a total vertical depth of approximately 8850 feet to approximately 9002 feet along the horizontal portion of the wellbore. Oxy seeks approval to inject at the following surface injection pressures:

Produced gas:	4,350 psi
Produced water:	1,770 psi
Carbon dioxide:	2300 psi

The source of the produced gas and produced water will be the Bone Spring and Delaware formations. The source of the carbon dioxide is unknown. Oxy also seeks an exception to the packer setting depth for this injection well and for allowance to use unlined tubing. The proposed project is located approximately ten miles southeast of Loving, New Mexico.

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL
RESOURCES DEPARTMENT

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

FORM C-108
Revised June 10, 2003

APPLICATION FOR AUTHORIZATION TO INJECT

I. PURPOSE: _____ Secondary Recovery __X__ Pressure Maintenance _____ Disposal _____ Storage
Application qualifies for administrative approval? _____ Yes __X__ No

II. OPERATOR: Oxy USA Inc

ADDRESS: P.O. Box 4294 Houston, TX 77210

CONTACT PARTY: Kelley Montgomery PHONE: 713-366-5716

III. WELL DATA: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? _____ Yes __X__ No
If yes, give the Division order number authorizing the project: _____

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and,
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).

*VIII. Attach appropriate geologic data on the injection zone including appropriate lithologic detail, geologic name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such sources known to be immediately underlying the injection interval.

IX. Describe the proposed stimulation program, if any.

*X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted).

*XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

XIV. Certification: I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: Kelley Montgomery TITLE: Regulatory Mgr.

SIGNATURE: Kelley Montgomery DATE: 11/30/18

E-MAIL ADDRESS: kelley_montgomery@oxy.com

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be resubmitted. Please show the date and circumstances of the earlier submittal: _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate District Office

ATTACHMENT - A

C-108 Application
OXY USA Inc.
Cedar Canyon 23 Federal 4H
Eddy County, NM

I. This is a pressure maintenance injection project.

II. OXY USA Inc.
P.O. Box 4294
Houston, TX 77210
Contact Party: Kelley Montgomery, Oxy (713) 366-5716

III. Injection well data sheet and wellbore schematic diagram has been attached for the injection well covered by this application.

IV. This is not an expansion of an existing project.

V. The map with a two-mile radius surrounding this injection well and a one-half mile radius for area of review is attached.

VI. The tabular format of the area of review is attached.

VII. The proposed operations data sheet is attached.

VIII. Please see attached signed statement on geologic data for the Bone Spring formation.

IX. The injection well is an existing horizontal producing well that was hydraulically fractured with 1,540,218 gal of slick water, 41,800 gal of 7.5% HCL and 3,757,478 gal of 15# BXL with 10,578,900# of sand.

X. Logs were filed for the existing well at the time of drilling.

Well Name	Date Submitted
Cedar Canyon 23 Federal 4H	01/20/2016

XI. Per our field personnel, no fresh water wells were found within one-mile of this well.

XII. N/A. This is not a disposal well.

XIII. Attached please find the Proof of Notice.

Side 1

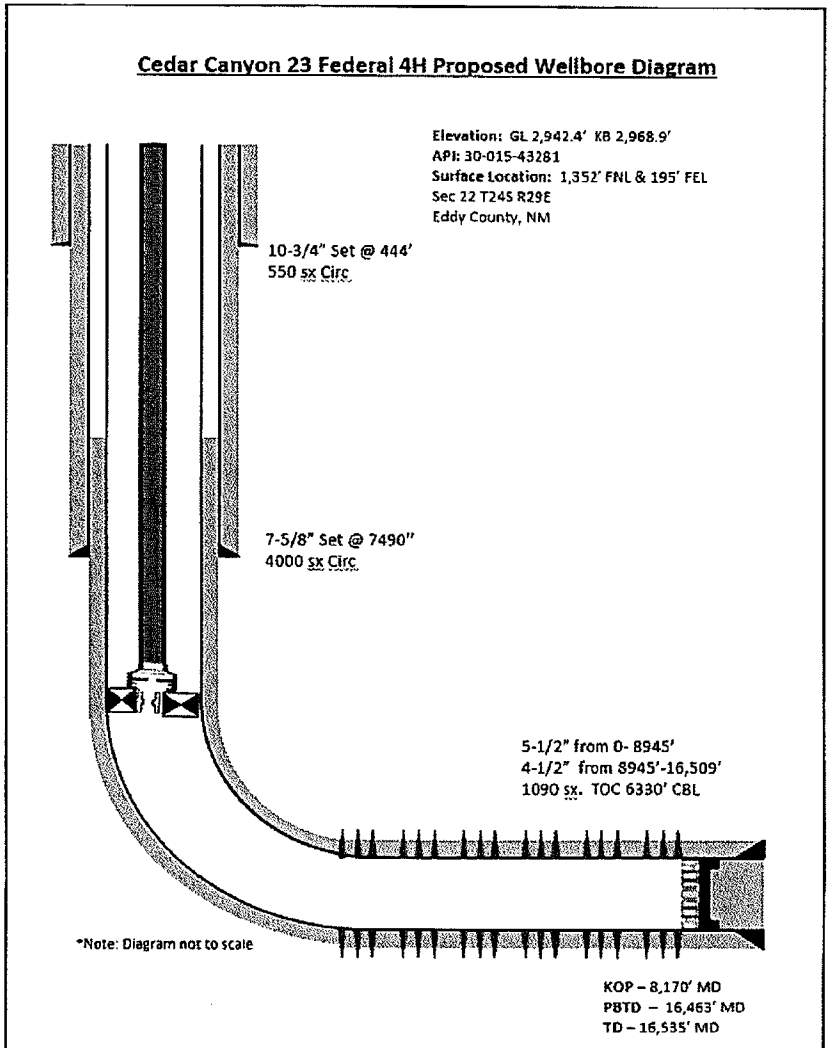
INJECTION WELL DATA SHEET

OPERATOR: _OXY USA Inc. _____

WELL NAME & NUMBER: Cedar Canyon 23 Federal 4H_____

WELL LOCATION: ___1352' FNL 195' FEL_____H_____22_____24S_____29E__
FOOTAGE LOCATION UNIT LETTER SECTION TOWNSHIP RANGE

WELLBORE SCHEMATIC



WELL CONSTRUCTION DATA

Surface Casing

Hole Size: ___14 3/4"_____ Casing Size:__10 3/4" _____

Cemented with: __550_____ sx. *or* _____ ft³

Top of Cement: __Surface_____ Method Determined: _Circulated__

Intermediate Casing

Hole Size: ___9 7/8"_____ Casing Size:__7 5/8"_____

Cemented with: __4000_____ sx. *or* _____ ft³

Top of Cement: _Surface_____ Method Determined: _Circulated__

Production Casing

Hole Size: __6 3/4"_____ Casing Size:__5 1/2"/4 ½"_____

Cemented with: __1090_____ sx. *or* _____ ft³

Top of Cement: _6330'_____ Method Determined: _CBL__

Total Depth: __16535' MD_9006' TVD__

Injection Interval

9312'MD/8850' TVD___feet To 16403'MD/9002' TVD_

(Perforated)

2/R

INJECTION WELL DATA SHEET

Tubing Size: 2 7/8" PH6 7.90# L-80 tubing Lining Material: None

Type of Packer: 5-1/2" Weatherford 10k AS1X Nickel coated retrievable packer

Packer Setting Depth: 8100' (In vertical section of wellbore)

Other Type of Tubing/Casing Seal (if applicable): ___

Additional Data

1. Is this a new well drilled for injection? ____Yes ___X___No

   If no, for what purpose was the well originally drilled? Producer-Oil

2. Name of the Injection Formation: Bone Spring

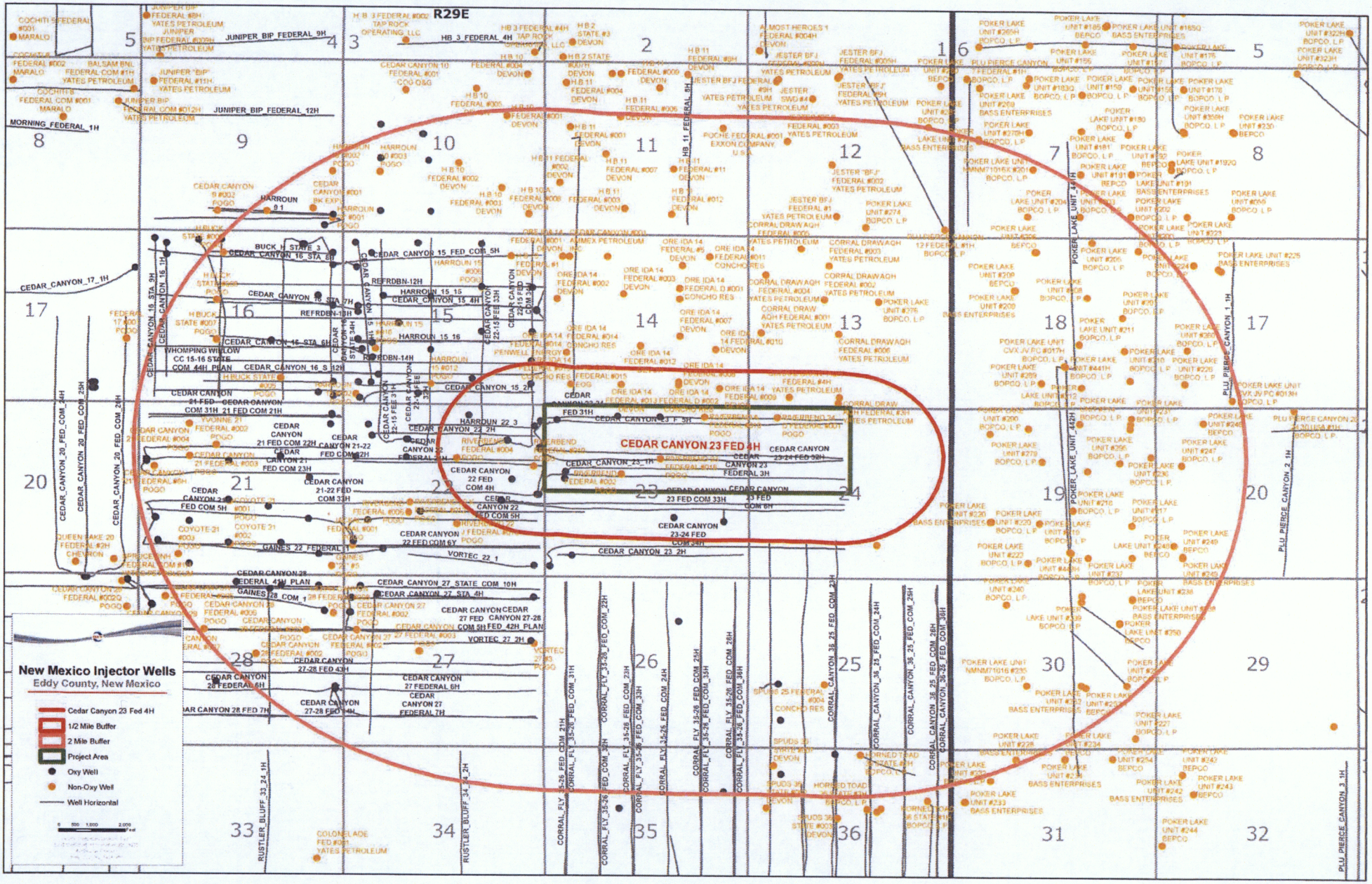
3. Name of Field or Pool (if applicable): Pierce Crossing Bone Spring, East

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e. sacks of cement or plug(s) used. ___No____

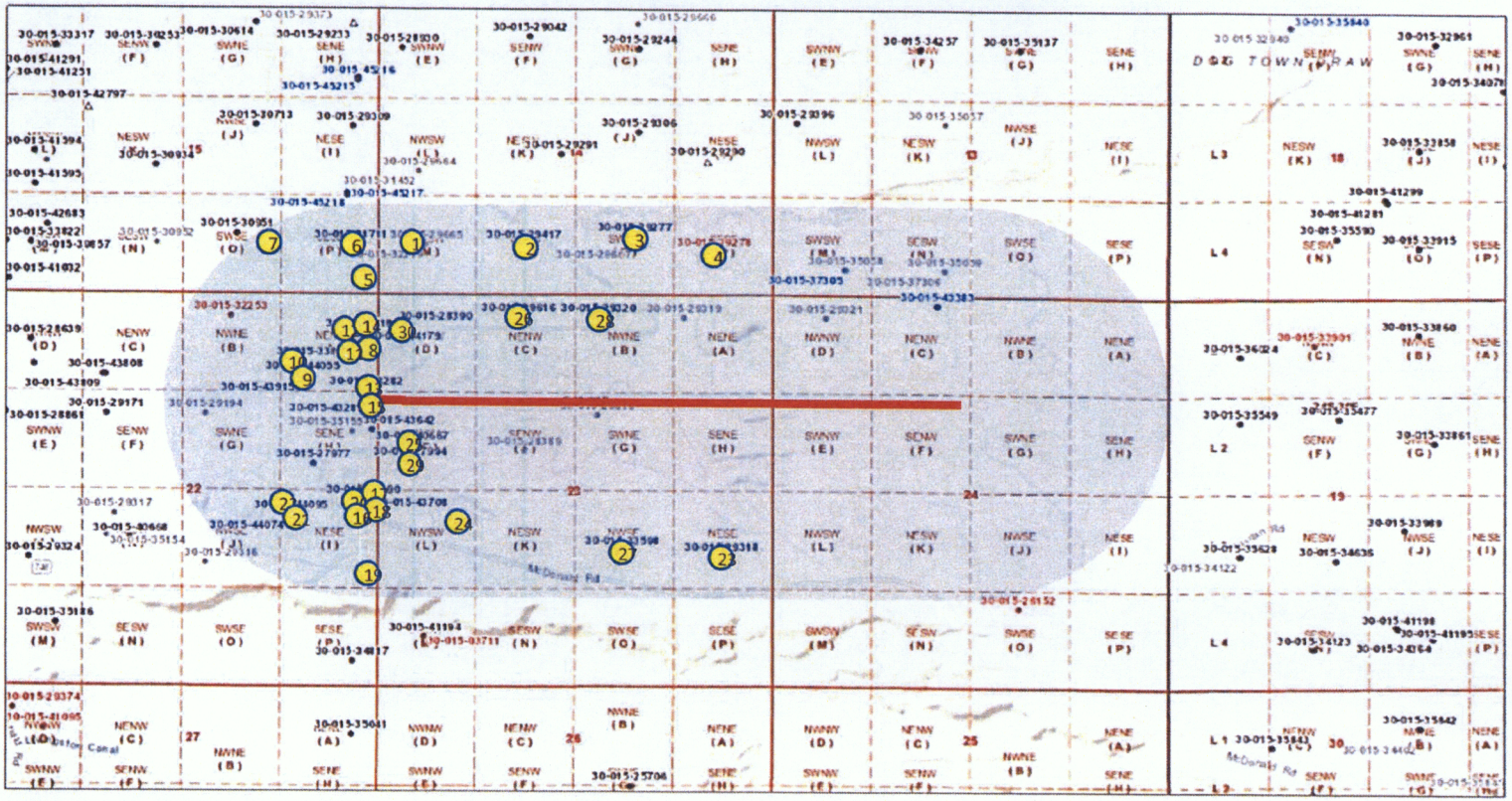
5. Give the name and depths of any oil or gas zones underlying or overlying the proposed injection zone in this area: ___
   Brushy Canyon Formation (Delaware) (overlying) (5190')

   Wolfcamp Formation (underlying) (10,141')

2/3


R29E
CEDAR CANYON 23 FED 4H
New Mexico Injector Wells
Eddy County, New Mexico
Cedar Canyon 23 Fed 4H
1/2 Mile Buffer
2 Mile Buffer
Project Area
Oxy Well
Non-Oxy Well
Well Horizontal

CEDAR CANYON 23 FED #4H AOR MAP



10/3/2018 11:41:11 AM

Override 1
Override 1
Well Locations - Small Scale
Active
New
Plugged
Cancelled
Temporarily Abandoned
Well Locations - Large Scale
Miscellaneous
CO2 Active
CO2 Cancelled
CO2 New
CO2, Plugged
CO2, Temporarily Abandoned
Gas Active
Gas, Cancelled, Never Drilled
Gas, New
Gas, Plugged
Gas, Temporarily Abandoned
Injection, Active
Injection, Cancelled
Injection, New
Injection, Plugged
Injection, Temporarily Abandoned
Oil, Active
Oil, Cancelled
Oil, New
Oil, Plugged
Oil, Temporarily Abandoned
Salt Water Injection, Active
Salt Water Injection, Canceled
Salt Water Injection, New
Salt Water Injection, Plugged
Salt Water InjectionTemporarily Abandoned
Water, Active
Water, Cancelled
Water, New

½ Mile Area of Review
Well ID on AOR Table
Cedar Canyon 23 Fed #4H

New Mexico Oil Conservation Division
NM OCD Oil and Gas Map. http://nm-emnrd.maps.arcgis.com/apps/webappviewer/: New Mexico Oil Conservation Division

5/18

AOR for Injector: Cedar Canyon 23 Fed 4H (API#30-015-43281)
Top of BS is 6733' TVD, Top of 2nd BS is 8026

WELL ID NUMBER	API NUMBER	OPERATOR	LEASE NAME	WELL NO.	WELL TYPE	STATUS	Surface Location FTG N/S	FTG E/W	UNIT	SEC	TSHIP	RNG	DATE DRILLED	TOTAL TVD	TOTAL MD	HOLE SIZE	CSG SIZE	SET AT	SX CMT	CMT TOP	HOW MEASURED	DVT	CURRENT PROD POOL	CURRENT COMPLETION	ADDITIONAL INFORMATION
1	30-015-43169	DEVON ENERGY PRODUCTION COMPANY, LP	NEW POTATO 11 FEDERAL COM	1H	OIL	ACTIVE	2324' FNL	641' FEL	E	11	24 S	29 E	11/13/2018	8903'	16676'	17 1/2"	13 3/8"	836'	656	Surf	Circ		CEDAR CANYON BONE SPRING	9350' - 16505'	
																12 1/4"	9 5/8"	3113'	1050	Surf	Circ				
																8 3/4"	5 1/2"	16576'	3515	Surf	CBL	3499'			
2	30-015-29417	SHACKELFORD OIL CO.	ORE IDA 14 FEDERAL	13	OIL	ACTIVE	660' FSL	1980' FWL	N	14	24 S	29 E	05/02/1997	8350'	8350'	17 1/2"	13 3/8"	354'	185	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	7841' - 8019'	
																12 1/4"	8 5/8"	3066'	815	Surf	Circ				
																7 7/8"	5 1/2"	8350'	910	5600'	Calc	5487'			
3	30-015-29277	SHACKELFORD OIL CO.	ORE IDA 14 FEDERAL	8	OIL	ACTIVE	760' FSL	1830' FEL	O	14	24 S	29 E	04/06/1997	8340'	8340'	17 1/2"	13 3/8"	355'	760	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	7840' - 7916'	
																12 1/4"	8 5/8"	3127'	1250	Surf	Circ				
																7 7/8"	5 1/2"	8340'	1180	Surf	Circ				
4	30-015-29278	SHACKELFORD OIL CO.	ORE IDA 14 FEDERAL	9	OIL	SHUT IN	660' FSL	760' FEL	P	14	24 S	29 E	05/09/1997	8350'	8350'	17 1/2"	13 3/8"	357'	525	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	7823' - 8096'	
																12 1/4"	8 5/8"	3134'	1220	Surf	Circ				
																7 7/8"	5 1/2"	8350'	730	Surf	Circ	8303'			
5	30-015-41032	OXY USA INC	Cedar Canyon 15	2H	OIL	ACTIVE	170' FSL	360' FWL	M	15	24 S	29 E	06/07/2013	8795'	12960'	14 3/4"	11 3/4"	334'	280	Surf	Circ.		PIERCE CROSSING BONE SPRING EAST	8900'-12800'	
																10 5/8"	8 5/8"	3101'	840	Surf	Circ.				
																7 7/8"	5 1/2"	12960'	1450	2960'	CBL				
6	30-015-31711	OXY USA INC.	HARROUN 15	13	OIL	ACTIVE	660' FSL	360' FEL	P	15	24 S	29 E	09/29/2001	8020'	8020'	17 1/2"	13 3/8"	580'	1070	Surf	Circ		CEDAR CANYON DELAWARE	6282' - 6310' (Orig completion)	8/29/2003: Delaware & BS downhole commingled per Order DHC-3165. Oxy will set a CIBP above the BS perfs at 7780' to isolate the BS from the Delaware.
																11"	8 5/8"	2915'	1050	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	7780' - 7802' (added 7/31/2003)	
																7 7/8"	5 1/2"	8020'	1830	1800'	CBL				
7	30-015-33822	OXY USA INC.	HARROUN 15	17	OIL	ACTIVE	660' FSL	330' FWL	M	15	24 S	29 E	09/07/2006	7738'	10887'	17 1/2"	13 3/8"	315'	560	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	8405' - 10740'	
																12 1/4"	9 5/8"	2880'	1000	Surf	Circ				
																8 1/2"	5 1/2"	10887'	2005	3940'	CBL				
8	30-016-41327	OXY USA INC	Cedar Canyon 22	2H	OIL	ACTIVE	990' FNL	690' FWL	D	22	24 S	29 E	06/08/2013	8813'	12665'	14 3/4"	11 3/4"	389'	415	Surf	Circ.		PIERCE CROSSING BONE SPRING EAST	8920'-12520'	
																10 5/8"	8 5/8"	3105'	960	Surf	Circ.				
																7 7/8"	5 1/2"	12676'	1400	2995'	CBL				
9	30-015-44058	OXY USA INC	Cedar Canyon 22 16 FEDERAL COM	34H	OIL	ACTIVE	1107' FNL	1022' FEL	A	22	24 S	29 E	05/24/2017	9370'	18100'	14 3/4"	10 3/4"	441'	625	Surf	Circ.		PIERCE CROSSING BONE SPRING EAST	9980' - 15931'	
																9 7/8"	7 5/8"	8481'	1350	Surf	Circ.				
																6 3/4"	4 1/2"	16091'	660	9355'	Circ				Top of liner at 9355'
10	30-015-43915	OXY USA INC	Cedar Canyon 22 16 FEE	33H	GAS	ACTIVE	1107' FNL	1052' FEL	A	22	24 S	29 E	05/24/2017	10090'	18336'	14 3/4"	10 3/4"	438'	668	Surf	Circ		PURPLE SAGE WOLFCAMP GAS	10252' - 18170'	
																9 7/8"	7 5/8"	9516'	2540	10'	TS	3051'			
																6 3/4"	4 1/2"	16326'	670	9383'	Circ				Top of liner at 9383'
																	5 1/2"	9383'							5 1/2" tie back string run after liner was set and cemented
11	30-015-44179	OXY USA INC.	CEDAR CANYON 23 24 FEDERAL	31H	OIL	ACTIVE	491' FNL	177' FEL	A	22	24 S	29 E	09/18/2017	10160'	17742'	14 3/4"	10 3/4"	422'	385	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	10330' - 17586'	
																9 7/8"	7 5/8"	9346'	1365	Surf	Circ	3067'			
																6 3/4"	4 1/2"	17727'	815	9181'	Circ				Top of liner at 9181'
																	5 1/2"	9181'							5 1/2" tie back string run after liner was set and cemented
12	30-015-44180	OXY USA INC.	CEDAR CANYON 23 24 FEDERAL	32H	OIL	ACTIVE	520' FNL	172' FEL	A	22	24 S	29 E	09/18/2017	10159'	17665'	14 3/4"	10 3/4"	422'	388	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	10240' - 17475'	
																9 7/8"	7 5/8"	9495'	1600	Surf	Circ	3047'			
																6 3/4"	4 1/2"	17650'	790	9280'	Circ				Top of liner at 9181'
																	5 1/2"	9280'							5 1/2" tie back string run after liner was set and cemented
13	30-015-43282	OXY USA INC.	CEDAR CANYON 23 FEDERAL	5H	OIL	ACTIVE	1305' FNL	185' FEL	A	22	24 S	29 E	01/15/2018	9014'	16385'	14 3/4"	10 3/4"	444'	550	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	9166' - 16263'	
																9 7/8"	7 5/8"	7676'	1570	Surf	Circ	3033'			
																6 3/4"	5 1/2" X 4 1/2"	16370'	1110	3380'	CBL				5 1/2" crosses over to 4 1/2" at 9104'
14	30-015-33821	OXY USA INC	Harroun 22	3	OIL	ACTIVE	660' FNL	330' FEL	A	22	24 S	29 E	03/24/2006	7786'	10864'	17 1/2"	13 3/8"	506'	450	Surf	Circ.		PIERCE CROSSING BONE SPRING EAST	7883-10720'	
																12 1/4"	9 5/8"	2914'	1100	Surf	Circ.				
																8 1/2" x 7 7/8"	5 1/2"	10819'	2150	4670'	CBL				
15	30-015-44176	OXY USA INC	CEDAR CANYON 21 22 FEDERAL COM	32H	GAS	ACTIVE	1794' FNL	141' FWL	E	21	24 S	29 E	11/27/2017	9979'	19983'	17 1/2"	13 3/8"	481'	880	Surf	Circ.		PIERCE CROSSING BONE SPRING EAST	9920' - 19771'	
																12 1/4"	9 5/8"	9260'	2707	Surf	Circ.	2947'			
																8 1/2"	5" & 5 1/2"	18936'	2619	8270'	Calc				
16	30-015-44133	OXY USA INC.	CEDAR CANYON 21 22 FEDERAL COM	33H	OIL	ACTIVE	1764' FSL	374' FWL	L	21	24 S	29 E	08/06/2017	10002'	19981'	17 1/2"	13 3/8"	842'	633	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	9908' - 19667'	
																12 1/4"	9 5/8"	9183'	2235	1305'	Temp Surv	2942'			
																8 1/2"	5 1/2"	19842'	1730	8915'	Circ				Top of liner at 8916'
																	5 1/2"	8918'							5 1/2" tie back string run after liner was set and cemented
17	30-015-43642	OXY USA INC.	CEDAR CANYON 22 FEDERAL	21H	OIL	ACTIVE	2540' FSL	230' FEL	I	22	24 S	29 E	01/29/2017	8817'	13620'	14 3/4"	10 3/4"	482'	382	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	8867' - 13471'	
																9 7/8"	7 5/8"	8300'	2627	Surf	Calc	3136'			
																6 3/4"	5 1/2" X 4 1/2"	13610'	930	9250'	CBL				Cmt did not circulate on 2nd stage, but TOC calculations show it to be or very near surface 5 1/2" casing crosses over to 4 1/2" casing at 8782'
18	30-015-43708	OXY USA INC.	CEDAR CANYON 22 FEDERAL COM	4H	OIL	ACTIVE	2540' FSL	260' FEL	I	22	24 S	29 E	01/26/2017	8728'	13435'	14 3/4"	10 3/4"	488'	382	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	8827' - 13265'	
																9 7/8"	7 5/8"	8197'	2586	Surf	Circ	3114'			
																6 3/4"	5 1/2" X 4 1/2"	13424'	500	5630'	CBL				5 1/2" casing crosses over to 4 1/2" casing at 8845'
19	30-015-43758	OXY USA INC.	CEDAR CANYON 22 FEDERAL COM	5H	OIL	ACTIVE	1120' FSL	207' FWL	M	22	24 S	29 E	11/24/2016	8819'	13525'	14 3/4"	10 3/4"	437'	470	Surf	Circ		CORRAL DRAW BONE SPRING	8939' - 13358'	
																9 7/8"	7 5/8"	7850'	3500	Surf	Circ	2936'			

WELL ID NUMBER	API NUMBER	OPERATOR	LEASE NAME	WELL NO.	WELL TYPE	STATUS	FTG N/S	FTG E/W	UNIT	SEC	TSHIP	RNG	DATE DRILLED	TOTAL TVD	TOTAL MD	HOLE SIZE	CSG SIZE	SET AT	SX CMT	CMT TOP	HOW MEASURED	DVT	CURRENT PROD POOL	CURRENT COMPLETION	ADDITIONAL INFORMATION
																6 3/4"	5 1/2" X 4 1/2"	13814'	580	8329'	Calc				5 1/2" casing crosses over to 4 1/2" casing at 8921'
20	30-015-43280	OXY USA INC.	CEDAR CANYON 23 FEDERAL	3H	OIL	ACTIVE	2540' FSL	200' FEL	I	22	24 S	29 E	01/30/2017	9010'	16430'	14 3/4"	10 3/4"	482'	382	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	9016' - 16282'	
																9 7/8"	7 5/8"	8221'	3238	Surf	Circ	3083'			
																6 3/4"	5 1/2" X 4 1/2"	16419'	830	8400'	Calc				5 1/2" casing crosses over to 4 1/2" casing at 8962'
21	30-015-44035	OXY USA INC.	CEDAR CANYON 23 FEDERAL COM	6H	OIL	ACTIVE	2329' FSL	1173' FEL	I	22	24 S	29 E	09/04/2017	8974'	17351'	14 3/4"	10 3/4"	418'	350	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	9946' - 17187'	
																9 7/8"	7 5/8"	8346'	1870	160'	Calc	3060			
																6 3/4"	5 1/2" X 4 1/2"	17341'	875	8188'	Calc				
22	30-015-44074	OXY USA INC.	CEDAR CANYON 23 FEDERAL COM	33H	GAS	ACTIVE	2344' FSL	1188' FEL	I	22	24 S	29 E	08/03/2017	10329'	17935'	14 3/4"	10 3/4"	420'	350	Surf	Circ		PURPLE SAGE WOLFCAMP GAS	10521' - 17749'	
																9 7/8"	7 5/8"	9737'	1370	Surf	Circ				
																6 3/4"	4 1/2"	17915'	765	9468'	Circ				Top of liner at 9468'
23	30-015-29318	OXY USA INC.	CANYON 23 FEDERAL	1	OIL	ACTIVE	1760' FSL	660' FEL	I	23	24 S	29 E	06/09/1997	13950'	13950'	17 1/2"	13 3/8"	616'	600	Surf	Circ		CEDAR CANYON DELAWARE	5464' - 6772'	BS plugged off in this well with bridge plug set at 8000' and this well was recompleted by Pogo to the Delaware 8/18/1999. Top of BS in this well is 6924'
																12 1/4"	9 5/8"	3120'	1200	Surf	Circ				
																8 1/2"	7"	10500'	1495	1938'	CBL	4277' and 6103'			
																6 1/8"	5"	13930'	416	10242'	Circ				Top of liner at 10242'
24	30-015-40688	OXY USA INC.	CEDAR CANYON 22	1H	OIL	ACTIVE	1980' FSL	1980' FWL	K	22	24 S	29 E	03/12/2013	7905'	11885'	17 1/2"	13 3/8"	465'	840	Surf	Circ		CORRAL DRAW BONE SPRING	7830' - 8931'	10/10/2016: CIBP set at 8960', perfed and fraced 7830' - 8931'
																12 1/4"	9 5/8"	3260'	1910	Surf	Circ				
																8 1/2"	5 1/2"	11870'	1760	2440'	CBL	2699' and 3576'			
25	30-015-40687	OXY USA INC.	CEDAR CANYON 23	1H	OIL	ACTIVE	2068' FNL	483' FWL	E	23	24 S	29 E	03/13/2013	7836'	11965'	17 1/2"	13 3/8"	447'	650	Surf	Circ		CORRAL DRAW BONE SPRING	8902' - 11782'	
																12 1/4"	9 5/8"	3146'	1850	Surf	Circ				
																8 1/2"	5 1/2"	11945'	3000	1850'	CBL	3206' and 8498'			
26	30-015-29516	OXY USA INC.	RIVERBEND 23 FEDERAL	14	OIL	ACTIVE	330' FNL	1910' FWL	C	23	24 S	29 E	07/03/1997	8200'	8200'	14 3/4"	10 3/4"	529'	560	Surf	Circ		CEDAR CANYON DELAWARE	5184' - 6399'	BS plugged off in this well with CIBP set at 6836' 12/19/1998 and well was recompleted in Delaware.
																9 7/8"	7 5/8"	2975'	800	Surf	Circ				
																6 3/4"	4 1/2"	8200'	1325	1497'	Calc	4409' and 6211'			
27	30-015-33598	OXY USA INC.	RIVERBEND 23 FEDERAL	16Q	OIL	ACTIVE	1830' FSL	1980' FEL	J	23	24 S	29 E	06/30/2006	7850'	8320'	17 1/2"	13 3/8"	612'	850	Surf	Circ		CEDAR CANYON DELAWARE	5440' - 6735'	On 8/11/2006, CIBP set at 7150' and additional Delaware perfs were added 5440' - 5450'. See schematic.
																11"	8 5/8"	3060'	1430	Surf	Circ				Well was originally completed in Delaware with perfs 6707' - 6735' and a CIBP set at 7850'. The BS from 7227' - 7323' was completed on 6/22/2005 but is now plugged with a CIBP.
																7 7/8"	5 1/2"	8320'	1690	1530'	CBL	4500'			
28	30-015-29320	OXY USA INC.	RIVERBEND B FEDERAL	11	OIL	ACTIVE	330' FNL	2310' FEL	B	23	24 S	29 E	05/26/1997	8250'	8250'	17 1/2"	13 3/8"	538'	950	Surf	Circ		CEDAR CANYON DELAWARE	5378' - 6673'	Well was originally completed in BS with perfs 7845' - 8022'. Around 2/97, CIBP was set @ 7785' to plug off BS and recomplete in Canyon with perfs 6658' - 6673'. Additional perfs in Delaware 5372' - 6440' were added 3/17/2004.
																11"	8 5/8"	2950'	1107	Surf	Circ				
																7 7/8"	5 1/2"	8250'	1690	1160'	Calc	4318' and 6125'			
29	30-015-27994	OXY USA INC.	RIVERBEND FEDERAL	7	OIL	ACTIVE	2280' FNL	460' FWL	E	23	24 S	29 E	06/28/1994	9020'	9020'	17 1/2"	13 3/8"	468'	660	Surf	Circ		CEDAR CANYON DELAWARE	4370' - 5354'	6/28/1994: BS perfed 8780' - 8848'. 8/23/1994: CIBP set @ 8160' and 1st BS perfed 7814' - 7922'. 10/4/1994: RBP set at 5600' and Brushy Canyon perfed 5330' - 5354'. 11/8/1994: RBP set at 4550' and Delaware perfed 4370' - 4383'. 3/10/1995:
																11"	8 5/8"	2934'	1300	Surf	Circ		PIERCE CROSSING BONE SPRING EAST	7814' - 8848'	Delaware perfs isolated from BS perfs with tubing and two isolation packers, one set above Delaware perfs and the other set below. 7/01/2002: Packer @ 7717' released. Delaware and BS perfs combined per DHC-3005.
																7 7/8"	5 1/2"	9020'	1800	1494'	CBL	4584' and 6704'			Oxy will set a CIBP above the BS perfs at 7814' to isolate the BS from the Delaware.
30	30-015-28390	OXY USA INC.	RIVERBEND FEDERAL	8	SWD	ACTIVE	460' FNL	330' FWL	D	23	24 S	29 E	12/16/1995	9000'	9000	14 3/4"	10 3/4"	451'	470	Surf	Circ			3070' - 4470'	SWD well in the Delaware formation
																9 7/8"	7 5/8"	2900'	700	Surf	Circ				
																6 3/4"	4 1/2"	9000'	1220	1400'	Calc	4570' and 6730'			Note: Plugs left in DV tools, never drilled out, so this well has a PBTD = 4570'

Item VII
Proposed Operations

The Cedar Canyon 23 Federal #4H will inject into the 2nd Bone Spring.

Gas Injection

1.

Well Name	Average Daily Rate of Gas to be Injected	Maximum Daily Rate of Gas to be Injected
Cedar Canyon 23 Federal 004H	13,500 MCFD	20,000 MCFD

2. This will be a closed system
3.

Well Name	Average Injection Pressure	Maximum Injection Pressure
Cedar Canyon 23 Federal 004H	4000 psi	4350 psi

4. The source of the injected gas will be produced gas from the Cedar Canyon Central Delivery Point integration system which is comprised of nearby Delaware, 1st and 2nd Bone Spring wells. Please see the attached gas analysis.
5. N/A

Water Injection

1.

Well Name	Average Daily Rate of Water to be Injected	Maximum Daily Rate of Water to be Injected
Cedar Canyon 23 Federal 004H	7,500 BWIPD	15,000 BWIPD

2. This will be a closed system

3.

Well Name	Average Injection Pressure	Maximum Injection Pressure
Cedar Canyon 23 Federal 004H	1450 psi	1770 psi

4. Water used for injection will be treated produced water from wells drilled in the Bone Springs and Delaware Formations. Please see the attached water compatibility study.

5. N/A

CO2 Injection

1.

Well Name	Average Daily Rate of Water to be Injected	Maximum Daily Rate of Water to be Injected
Cedar Canyon 23 Federal 004H	13,500 MCFD	20,000 MCFD

2. This will be a closed system

Item VII
Proposed Operations

3.

Well Name	Average Injection Pressure	Maximum Injection Pressure
Cedar Canyon 23 Federal 004H	2000 psi	2300 psi

4. Oxy currently does not have a source for CO2 for this project area. However, Oxy would like to have the ability to inject CO2 when a source becomes available.

5. N/A

Calculation for Surface Injection Pressure Limits

For Water Injection:

Calculation for surface pressure limit:

- 0.2 psi/ft * 8850 ft (TVD of first perf) = 1770 psi

Produced Gas and CO2 Injection:

Based on the surface pressure limit for water and assuming a fresh water gradient of 0.433 psi/ft. The bottom hole pressure (BHP) limit is:

- 1770 + 0.433 * 8850 = 5602 psi (or 0.633 psi/ft)

A Petroleum Expert Prosper Model was used to calculate the surface pressure with 2.875" tubing, reservoir depth, injection gas composition and the BHP limit shown above.

*Prosper Model is an industrial standard nodal analysis software for pressure calculation and includes phase behavior change and friction loss.

Atchafalaya Measurement, Inc.
416 East Main Street
Artesia, NM 88210 575-746-3481

Injection Gas Sample

Sample Information

	Sample Information
Sample Name	OXY__Cedar Canyon 16 State 12H LP__GC1-110117-06
Station Number	14910TD
Lease Name	Cedar Canyon 16 State 12H LP
Analysis for	OXY USA
Producer	OXY USA
Field Name	NM South
County	Eddy
State	NM
Frequency	Spot
Sample Deg F	52
Atmos Deg F	46
Flow Rate	2155.9
LinePSIG	123
Date Sampled	10/31/17
Sampled By	Jacob Marquez
Analysis By	Chris Myers
Report Date	2017-11-01 10:13:39

Component Results

Component Name	Ret. Time	Peak Area	Norm%	PPMV	GPM (Dry) (Gal. / 1000 cu.ft.)
Nitrogen	21.960	8052.1	1.62059	16205.900	0.178
H2S	46.000	0.0	0.00000	0.000	0.000
Methane	22.780	299373.1	77.19299	771929.900	13.058
Carbon Dioxide	26.480	1127.8	0.18594	1859.400	0.032
Ethane	36.800	81412.7	12.57474	125747.400	3.356
Propane	79.140	48829.2	5.73143	57314.300	1.576
i-Butane	28.720	41559.0	0.58209	5820.900	0.190
n-Butane	30.320	97200.6	1.33268	13326.800	0.419
i-Pentane	35.360	20267.2	0.24488	2448.800	0.089
n-Pentane	37.420	20835.3	0.24103	2410.300	0.087
Hexanes Plus	120.000	27727.0	0.29363	2936.300	0.127
Total:			100.00000	1000000.000	19.112

Results Summary

Result	Dry	Sat. (Base)
Total Raw Mole% (Dry)	101.22347	
Pressure Base (psia)	14.650	
Temperature Base	60.0	
Gross Heating Value (BTU / Ideal cu.ft.)	1239.4	1217.7
Gross Heating Value (BTU / Real cu.ft.)	1243.8	1222.5
Relative Density (G), Ideal	0.7239	0.7221
Relative Density (G), Real	0.7261	0.7246
Compressibility (Z) Factor	0.9965	0.9961

Water Compatibility Analysis

Scale precipitation due to incompatibility of mixing different waters is simulated using ScaleSoftPitzer™ (SSP) developed by Rice University Brine Chemistry Consortium. Compatibility simulations between (a) 1st Bone Spring (BS) formation water and treated produced water (TPW) from Cedar Canyon Water Treatment Facility (CC WTF), (b) 2nd BS formation water and TPW, and (c) 3rd BS formation water and TPW were performed. Table 1 shows the water analysis from the 4 waters.

Table 1. Water analysis from 1st, 2nd and 3rd BS water and TPW from CC WTF

Cations / Anions (mg/L)	1st BS	2nd BS	3rd BS	CC15 SWD Treatment Facility
Na^+	62,308	53,400	38,000	46,315
Mg^{2+}	360	1,320	767	1,399
Ca^{2+}	1,098	9,220	4,970	9,569
Sr^{2+}	267	688	1,030	893
Ba^{2+}	0.84	1.15	3.45	2.6
Fe^{2+}	15.9	40.6	19.1	25.3
Cl^-	90,167	98,451	74,630	97,632
SO_4^{2-}	531	417	236	389
$HCO3^-$	561.2	146.4	109.8	119
TDS	155,309	165,620	119,767	157,193
pH	7	7	6.8	5.3

The various waters are input into SSP at different ratios to calculate scaling index (SI) and potential precipitation (ppt) in pound per thousand barrels (ptb). Bottom hole temperature of 122 F and bottom hole pressures of 5,000 psi were used in the modeling. Results are summarized in Tables 2 to 4.

1st BS + Treated Produced Water:

In general, there is a slight, inherent calcite scaling tendency with the 1st BS water itself. The predicted SI is 0.87 as shown in Table 2. Any scaling index above zero indicates a supersaturation condition of the scale. By mixing TPW with the 1st BS formation it is observed that the scaling index of calcite became slightly higher first at 25% TPW and 75% 1st BS and then becoming smaller as the ratio of TPW increases. However, the maximum, predicted precipitation is less than 50 ptb. Therefore, a slight amount of scale inhibitor is recommended for the injection of the TWP into the 1st BS. The exact amount of scale inhibitor can be determined by lab tests. Both Barite and Celestite are not expected to precipitate at all ratios of mixing.

Table 2. Prediction of Scaling Index (SI) and potential precipitation (PPT) of 3 common oilfield scales by mixing the 1st BS water and TPW at different ratios

	Cypress 33-3H	Calcite		Barite		Celestite	
% treated PW	% 1st BS	SI	ppt (ptb)	SI	ppt (ptb)	SI	ppt (ptb)
100	0	-1.49	0.0	-0.28	0.0	-0.54	0.0
75	25	0.13	4.2	-0.22	0.0	-0.44	0.0
50	50	0.66	29.8	-0.18	0.0	-0.36	0.0
25	75	0.95	49.1	-0.18	0.0	-0.30	0.0
0	100	0.87	41.8	-0.22	0.0	-0.25	0.0

Water Compatibility Analysis

2nd BS + Treated Produced Water:

In general, there is an inherent calcite scaling tendency with the 2nd BS water itself. The predicted SI is 1.21 and the predicted precipitation is 18.6 ptb as shown in Table 3. By mixing TPW with the 2nd BS formation it is observed that the scaling index of calcite becomes smaller as the ratio of TPW increases. In other words, by injecting TPW we expect a reduction of incompatibility between the two waters. Both Barite and Celestite are not expected to precipitate at all ratios of mixing.

Table 3. Prediction of SI and potential PPT of 3 common oilfield scales by mixing the 2nd BS water and TPW at different ratios

	CC20-25H	Calcite		Barite		Celestite	
% treated PW	% 2nd BS	SI	ppt (ptb)	SI	ppt (ptb)	SI	ppt (ptb)
100	0	-1.49	0.0	-0.28	0.0	-0.54	0.0
75	25	-0.69	0.0	-0.56	0.0	-0.39	0.0
50	50	-0.15	0.0	-0.55	0.0	-0.26	0.0
25	75	0.43	7.7	-0.54	0.0	-0.15	0.0
0	100	1.21	18.6	-0.53	0.0	-0.05	0.0

3rd BS + Treated Produced Water:

In general, there is a slight, inherent calcite scaling tendency with the 3rd BS water itself. The predicted SI is 0.59 and the predicted precipitation is 8.8 ptb as shown in Table 4. By mixing TPW with the 3rd BS formation it is observed that the scaling index of calcite becomes smaller as the ratio of TPW increases. In other words, by injecting TPW we expect a reduction of incompatibility between the two waters. Both Barite and Celestite are not expected to precipitate at all ratios of mixing.

Table 4. Prediction of SI and potential PPT of 3 common oilfield scales by mixing the 3rd BS water and TPW at different ratios

	CC22-15 32H	Calcite		Barite		Celestite	
% treated PW	% 3rd BS	SI	ppt (ptb)	SI	ppt (ptb)	SI	ppt (ptb)
100	0	-1.49	0.0	-0.28	0.0	-0.54	0.0
75	25	-0.88	0.0	-0.56	0.0	-0.39	0.0
50	50	-0.44	0.0	-0.12	0.0	-0.28	0.0
25	75	0.02	0.3	-0.04	0.0	-0.18	0.0
0	100	0.59	8.8	0.05	0.2	-0.08	0.0

Treated Produced Water for Injection

BAKER HUGHES

Upstream Chemicals

Permian Basin Area Laboratory
2101 Market Street,
Midland, Texas 79703

REPORT DATE: 2/8/2017

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	OXY USA INCORPORATED	ACCOUNT REP:	LARRY G HINES
DISTRICT:	WATER MANAGEMENT - PERMIAN	SAMPLE ID:	201701004772
AREA/LEASE:	CC	SAMPLE DATE:	2/2/2017
SAMPLE POINT NAME	CC15SWD	ANALYSIS DATE:	2/8/2017
SITE TYPE:	FACILITY	ANALYST:	JK
SAMPLE POINT DESCRIPTION:	NOT PROVIDED		

OXY USA INCORPORATED, CC, CC15SWD

FIELD DATA		ANALYSIS OF SAMPLE					
		ANIONS:	mg/L	meq/L	CATIONS:	mg/L	meq/L
Initial Temperature (°F):	250	Chloride (Cl^-):	97631.8	2754.1	Sodium (Na^+):	46314.8	2015.4
Final Temperature (°F):	80	Sulfate (SO_4^{2-}):	389.2	8.1	Potassium (K^+):	846.2	21.6
Initial Pressure (psi):	100	Borate (H_3BO_3):	319.4	5.2	Magnesium (Mg^{2+}):	1399.5	115.2
Final Pressure (psi):	15	Fluoride (F^-):	ND		Calcium (Ca^{2+}):	9568.9	477.5
		Bromide (Br^-):	ND		Strontium (Sr^{2+}):	893.0	20.4
pH:		Nitrite (NO_2^-):	ND		Barium (Ba^{2+}):	2.6	0.0
pH at time of sampling:	5.3	Nitrate (NO_3^-):	ND		Iron (Fe^{2+}):	25.3	0.9
		Phosphate (PO_4^{3-}):	ND		Manganese (Mn^{2+}):	2.4	0.1
		Silica (SiO_2):	ND		Lead (Pb^{2+}):	0.0	0.0
					Zinc (Zn^{2+}):	0.0	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L					
Bicarbonate (HCO_3^-):	119.4	2.0			Aluminum (Al^{3+}):	0.0	0.0
Carbonate (CO_3^{2-}):	ND				Chromium (Cr^{3+}):	ND	
Hydroxide (OH^-):	ND				Cobalt (Co^{2+}):	ND	
		ORGANIC ACIDS:	mg/L	meq/L	Copper (Cu^{2+}):	0.0	0.0
aqueous CO_2 (ppm):	ND	Formic Acid:	ND		Molybdenum (Mo^{2+}):	0.0	0.0
aqueous H_2S (ppm):	ND	Acetic Acid:	ND		Nickel (Ni^{2+}):	ND	
aqueous O2 (ppb):	ND	Propionic Acid:	ND		Tin (Sn^{2+}):	ND	
		Butyric Acid:	ND		Titanium (Ti^{2+}):	ND	
Calculated TDS (mg/L):	157193	Valeric Acid:	ND		Vanadium (V^{2+}):	ND	
Density/Specific Gravity (g/cm³):	1.1015				Zirconium (Zr^{2+}):	ND	
Measured Specific Gravity	1.1114						
Conductivity (mmhos):	ND				Total Hardness:	30708	N/A
Resistivity:	ND						
MCF/D:	No Data						
BOPD:	No Data						
BWPD:	No Data	Anion/Cation Ratio:		1.04	ND = Not Determined		

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	15 psi	0.48	1.023	-0.24	0.000	-0.49	0.000	-0.65	0.000
99°F	24 psi	0.35	0.854	-0.19	0.000	-0.48	0.000	-0.56	0.000
118°F	34 psi	0.24	0.650	-0.12	0.000	-0.47	0.000	-0.46	0.000
137°F	43 psi	0.14	0.415	-0.03	0.000	-0.46	0.000	-0.36	0.000
156°F	53 psi	0.04	0.150	0.06	2.244	-0.45	0.000	-0.26	0.000
174°F	62 psi	-0.04	0.000	0.15	5.282	-0.44	0.000	-0.16	0.000
193°F	72 psi	-0.11	0.000	0.24	8.298	-0.43	0.000	-0.05	0.000
212°F	81 psi	-0.18	0.000	0.34	11.016	-0.43	0.000	0.06	23.450
231°F	91 psi	-0.24	0.000	0.43	13.409	-0.42	0.000	0.17	60.325
250°F	100 psi	-0.29	0.000	0.53	15.533	-0.42	0.000	0.27	88.895

Conditions		Celestite ($SrSO_4$)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	15 psi	0.22	82.616	-1.07	0.000	-10.65	0.000	-1.19	0.000
99°F	24 psi	0.24	86.393	-1.08	0.000	-10.71	0.000	-1.09	0.000
118°F	34 psi	0.25	89.399	-1.09	0.000	-10.69	0.000	-0.96	0.000
137°F	43 psi	0.26	92.391	-1.10	0.000	-10.66	0.000	-0.84	0.000
156°F	53 psi	0.27	95.852	-1.11	0.000	-10.61	0.000	-0.74	0.000
174°F	62 psi	0.28	100.037	-1.11	0.000	-10.55	0.000	-0.65	0.000
193°F	72 psi	0.30	105.016	-1.12	0.000	-10.48	0.000	-0.56	0.000
212°F	81 psi	0.32	110.708	-1.12	0.000	-10.41	0.000	-0.48	0.000
231°F	91 psi	0.34	116.922	-1.12	0.000	-10.34	0.000	-0.42	0.000
250°F	100 psi	0.37	123.390	-1.13	0.000	-10.27	0.000	-0.37	0.000

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 eight (8) scales.

Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

ScaleSoftPitzer™ SSP2010

Comments:

W2C3

13/18

1st B.S.
Native Water

NALCO Champion
An Ecolab Company

Water Analysis Report

Attention: **ljsandmann@ecolab.com**

Location Code: **374553**

Sample ID: **AK17198**

Login Batch: **2018-02-05-001_ACC**

Collection Date: **01/29/2018**

Receive Date: **02/02/2018**

Report Date: **02/07/2018**

Customer: **OXY USA WTP LP**

Region: **Carlsbad NM**

Location: **Cypress 33 Federal Lease**

System: **Production System**

Equipment: **Well 003H**

Lab ID: **ABU-1031**

Sample Point: **Well Head**

Analyses	Result	Unit
Calculated pH	**7.00**	
Dissolved CO2	**270**	mg/L
Dissolved H2S	**0**	mg/L
Gas per Day	**169**	Mcf/D
Oil per Day	**31**	B/D
Pressure	**500**	psi
Temperature	**61**	° F
Water per Day	**37**	B/D

Analyses	Result	Unit
Bicarbonate	**561.2**	mg/L
Conductivity (Calculated)	**242645**	µS - cm3
Ionic Strength	**2.73**	
Resistivity	**0.041**	ohms - m
Specific Gravity	**1.110**	
Total Dissolved Solids	**155309.3**	mg/L

Cations	Result	Unit
Iron	**15.89**	mg/L
Manganese	**0.38**	mg/L
Barium	**0.84**	mg/L
Strontium	**266.6**	mg/L
Calcium	**1097.65**	mg/L
Magnesium	**360.47**	mg/L
Sodium	**62308.26**	mg/L
Potassium	**1273.71**	mg/L
Boron	**13.92**	mg/L
Lithium	**92.65**	mg/L
Copper	**0.05**	mg/L
Zinc	**0.01**	mg/L
Lead	**0.09**	mg/L
Cobalt	**0.03**	mg/L
Chromium	**0.03**	mg/L
Silicon	**8.07**	mg/L
Aluminum	**0.05**	mg/L
Molybdenum	**0.04**	mg/L
Phosphorus	**0.06**	mg/L

Anions	Result	Unit
Bromide	879	mg/L
Chloride	90167	mg/L
Sulfate	531	mg/L

Scaling predictions calculated using Scale Soft Pitzer 2017

2nd B.S.
Native Water

NALCO Champion
An Ecolab Company

Water Analysis Report

Attention: **Ramon.Artalejo@ecolab.com**

Location Code: **395860**

Sample ID: **AL86756**

Login Batch: **2018-10-30-001 GC**

Collection Date: **10/18/2018**

Receive Date: **10/30/2018**

Report Date: **10/31/2018**

Customer: **OXY PERMIAN RES - NEW MEXICO**

Region: **Delaware Basin**

Location: **Cedar Canyon 20 Lease**

System: **Production System**

Equipment: **Cedar Canyon 20-25H**

Lab ID: **ABU-1031**

Sample Point: **Wellhead**

Analyses	Result	Unit
Dissolved CO2	400	mg/L
Dissolved H2S	0.1	mg/L
pH	7.0	
Pressure	160	psi
Temperature	54	° F

Analyses	Result	Unit
Bicarbonate	146.4	mg/L
Conductivity (Calculated)	255694	µS - cm3
Ionic Strength	3.14	
Resistivity	0.039	ohms - m
Specific Gravity	1.119	
Total Dissolved Solids	165620	mg/L

Cations	Result	Unit
Iron	40.6	mg/L
Manganese	0.972	mg/L
Barium	1.15	mg/L
Strontium	688	mg/L
Calcium	9220	mg/L
Magnesium	1320	mg/L
Sodium	53400.00	mg/L
Potassium	890	mg/L
Boron	41.8	mg/L
Lithium	29.3	mg/L
Copper	0.042	mg/L
Zinc	0.171	mg/L
Lead	0.128	mg/L
Cobalt	0.022	mg/L
Chromium	0.014	mg/L
Silicon	6.44	mg/L
Aluminum	Not Detected	mg/L
Molybdenum	0.03	mg/L
Phosphorus	Not Detected	mg/L

Anions	Result	Unit
Bromide	964.15	mg/L
Chloride	98451.27	mg/L
Fluoride	2.4470	mg/L
Sulfate	417.39	mg/L

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3rd B.S.
Native Water

NALCO Champion
An Ecolab Company

Complete Water Analysis Report

Customer: **OXY USA WTP LP**
Region: **Delaware Basin**
Location: **Cedar Canyon 22 Lease**
System: **Production System**

Equipment: **Cedar Canyon 22-15 Fee 32H**
Sample Point: **Wellhead**
Sample ID: **AL71401**
Acct Rep Email: **Ramon.Artalejo@ecolab.com**

Collection Date: **10/03/2018**
Receive Date: **10/04/2018**
Report Date: **10/12/2018**
Location Code: **394555**

Field Analysis

Bicarbonate	109.8 mg/L	Dissolved CO2	280 mg/L	Dissolved H2S	8.55 mg/L
Pressure Surface	200 psi	Temperature	83 ° F	pH of Water	6.8

Sample Analysis

Calculated Gaseous CO2	0.62%	Calculated pH	6.80	Conductivity (Calculated)	187104 µS - cm3
Ionic Strength	2.22	Resistivity	0.053 ohms - m	Specific Gravity	1.085
Total Dissolved Solids	119766.6 mg/L				

Cations

Iron	19.1	mg/L	Manganese	0.899	mg/L	Barium	3.45 mg/L
Strontium	1030	mg/L	Calcium	4970	mg/L	Magnesium	767 mg/L
Sodium	38000.00	mg/L	Potassium	664	mg/L	Boron	87.3 mg/L
Lithium	20.6	mg/L	Copper	0.328	mg/L	Nickel	0.042 mg/L
Zinc	0.396	mg/L	Lead	0.144	mg/L	Cobalt	0.021 mg/L
Chromium	0.004	mg/L	Silicon	10.2	mg/L	Aluminum	Not Detected mg/L
Molybdenum	0.012	mg/L	Phosphorus	0.1	mg/L		

Anions

Bromide	575.661	mg/L	Chloride	74630	mg/L	Sulfate	236.327 mg/L

PTB Value

	Barite PTB	Calcite PTB	Celestite PTB	Gypsum PTB	Halite PTB	Iron Carbonate PTB	Iron Sulfide PTB
50°	1.74	7.35	16.12	0.00	0.00	0.00	7.70
75°	1.51	10.25	17.01	0.00	0.00	0.00	7.70
100°	1.19	12.64	23.75	0.00	0.00	0.00	7.83
125°	0.78	14.64	33.70	0.00	0.00	0.00	8.02
150°	0.29	16.35	45.15	0.00	0.00	0.00	8.25
175°	0.00	17.85	56.88	0.00	0.00	1.84	8.48
200°	0.00	19.20	68.07	0.00	0.00	3.48	8.72
225°	0.00	20.42	78.34	0.00	0.00	4.76	8.95
250°	0.00	21.54	87.50	0.00	0.00	5.76	9.17
275°	0.00	22.59	95.55	0.00	0.00	6.51	9.37
300°	0.00	23.56	102.58	0.00	0.00	7.03	9.55
325°	0.00	24.43	108.73	0.00	0.00	7.35	9.70
350°	0.00	25.22	114.10	0.00	0.00	7.46	9.83
375°	0.00	25.92	118.76	0.00	0.00	7.34	9.93
400°	0.00	26.86	122.72	0.00	0.00	7.76	9.89

Saturation Index

	Barite SI	Calcite SI	Celestite SI	Gypsum SI	Halite SI	Iron Carbonate SI	Iron Sulfide SI
50°	0.82	0.31	0.06	-0.91	-1.32	-0.78	1.45
75°	0.58	0.44	0.06	-0.93	-1.34	-0.55	1.39
100°	0.38	0.56	0.08	-0.93	-1.35	-0.35	1.37
125°	0.21	0.67	0.12	-0.92	-1.36	-0.17	1.38
150°	0.07	0.78	0.17	-0.91	-1.37	-0.02	1.40
175°	-0.05	0.89	0.23	-0.92	-1.38	0.12	1.44
200°	-0.14	1.00	0.23	-0.94	-1.38	0.24	1.50
225°	-0.22	1.11	0.34	-0.97	-1.38	0.35	1.56
250°	-0.30	1.22	0.40	-1.01	-1.38	0.43	1.64
275°	-0.36	1.33	0.46	-1.05	-1.37	0.50	1.72
300°	-0.42	1.43	0.52	-1.08	-1.37	0.55	1.80
325°	-0.48	1.53	0.57	-1.08	-1.36	0.58	1.88
350°	-0.55	1.63	0.62	-1.04	-1.35	0.58	1.96
375°	-0.62	1.71	0.68	-0.93	-1.33	0.56	2.03
400°	-0.70	1.86	0.72	-0.73	-1.32	0.60	2.16

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

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Part VIII- Geologic Information for Cedar Canyon 23 Fed 4H

The Cedar Canyon 23 Fed 4H will be injecting into the 2nd Bone Spring Sandstone of the Bone Spring Formation. The well has a TVD of approximately 8,982 ft. with a lateral length of approximately 7,553 ft. It will be injecting into a reservoir composed of tight siltstone. Core data indicates that the grain sizes range from coarse siltstone to very-fine-grained subarkose (Folk, 1980) sandstone. Samples show evidence of moderate compaction. Minor amounts of illite and smectite clays are found throughout the samples ranging from 5% to 15%. Cements are Fe-calcite, Fe-dolomite, with some quartz overgrowths. Minor amounts of pyrite (<1%) are present. The resulting reservoir rock has porosity of 8-18% with an average porosity of 11.7%. Permeability measured by injection fall-off tests conducted within the reservoir ranges from 0.02 millidarcies to 0.001 millidarcies.

The injection area for this well is bounded by two producing wells in the same reservoir interval that is 330 ft. thick. Low-permeability barriers act as seals above and below the reservoir. These barriers consist of carbonate mudstone and dolomudstone that are 520 ft. thick above and 715 ft. thick below. Laterally the injection will be primarily contained by the reservoir volume that has been previously and partially depleted by the adjacent producing wells. The tight low-permeability reservoir and the production from the adjacent wells will be the primary constraints on the conformance of the injection to the project area and are expected to contain the injected gas.

The top of the Bone Spring Formation is at 6,733 ft. (log depth) with over 2,000 ft. of carbonate mudstones and shales acting as permeability barriers to upward migration of injected gas. Above that the Delaware Mountain Group consists of connate-water bearing and hydrocarbon-bearing sands, with minor limestone and shale intervals and is 3,700 ft. thick. Above that is the Castile Formation consisting of very low permeability anhydrite, gypsum, and calcite that acts as another 1,500 ft. thick barrier to upward movement of fluids. The Salado overlies the Castile and forms a 1,000 ft. thick barrier of salt. The top of the Salado is at 510 ft. and the deep aquifers found just above the Salado at the base of the Rustler are saline water. The top of Rustler Formation is at 440 ft. The Rustler top is a continuous anhydrite layer that acts as another permeability barrier creating a perched aquifer above it that is the lowest level where fresh water is known in the area. Water wells drilled in the area typically have not reached this depth. Because of the thickness of multiple impermeable rock layers above the injection reservoir there is no possible path for migration upward into freshwater aquifers where they exist.

Locate freshwater wells within two miles:
An investigation of existing shallow water wells has not found any freshwater wells within a one-mile radius of this injector.

I hereby certify that the information presented above is true and correct to the best of my knowledge and belief.

Tony Troutman
Geological Advisor

11/30/2018
Date

C-108 Injection Application
Item XIII - Proof of Notice
OXY USA Inc.
Cedar Canyon 23 Federal 4H

New Mexico Oil Conservation Division
811 S. First St.
Artesia, NM 88210

New Mexico Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

United State Dept of Interior
Bureau of Land Management
620 E. Greene Street
Carlsbad, NM 88220

GD McKinney Investments LP
300 N Marienfield, Ste 1100
Midland, TX 79701

Leopard Petroleum LP
P.O. Box 51440
Midland, TX 79710

Beryl Oil and Gas, LP
P.O. Box 51440
Midland, TX 79710

B. Jack Reed
506 Charismatic
Midland, TX 79705

DRW Energy, LLC
400 W. Illinois, Suite 970
Midland, TX 79701

M'lissa M. Schoening
300 N. Marienfeld, Ste 1100
Midland, TX 79701

EOG Y Resources Inc.
5509 Champions Drive
Midland, TX 79706

EOG A Resources Inc.
5509 Champions Drive
Midland, TX 79706

EOG M Resources Inc.
5509 Champions Drive
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Devon Energy Production CO LP
6100 N. Western
Oklahoma City, OK 73118

BOPCO LP
201 Main Street, Ste. 2700
Ft. Worth, TX 76102

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