Application Part II

Source Water Analyses



__^

Water Analysis

Date: 23-Aug-11

Company		ell Name	Draw 1#	ounty	State		
company		BD		Lea	New Mexico		
Sample Source	Swab Sam	ple	Sample #	ddy	1-265-294 1		
Formation			Depth				
Specific Gravity	1.170		SG @	60 °F	1.172		
рН	6.30			ulfides	Absent		
Temperature (*F)	70		Reducing /	Agents			
Cations							
Sodium (Calc)	na ann ann agus fhreinn fein ainn an an an ann ann an ann	in Mg/L	77,962	in PPM	66,520		
Calcium		in Mg/L	4,000	in PPM	3,413		
Magnesium		in Mg/L	1,200	in PPM	1,024		
Soluable Iron (FE2)		in Mg/L	10.0	in PPM	9		
Anions							
Chlorides		in Mg/L	130,000	in PPM	110,922		
Suffates		in Mg/L	250	in PPM	213		
Bicarbonates		in Mg/L	127	in PPM	108		
Total Hardness (as CaCO:	3)	in Mg/L	15,000	in PPM	12,799		
Total Dissolved Solids (Ca	ic)	in Mg/L	213,549	in PPM	182,209		
Equivalent NaCi Concentra	tion	in Mg/L	182,868	in PPM	156,031		
caling Tendencies							
Calcium Carbonate Index Below 500,000	Remote / 500,00	0 - 1,000,000) Possible / Above 1,	.000,000 Probabl	507,520 •		
Calcium Sulfate (Gyp) Inde	X				1,000,000		
Below 500,000 1	Remote / 500,000	- 10,000,00	Possible / Above 10	.000,000 Probeb	le i		

Report # 3188

Sec 22, T25, S, R28E

Bone Spring

;

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

Water Analysis Report by Baker Petrolite

Company:		Sales RDT:	33514.1
Region:	PERMIAN BASIN	Account Manager:	TONY HERNANDEZ (575) 910-7135
Area:	ARTESIA, NM	Sample #:	534665
Lease/Platform:	PINOCHLE 'BPN' STATE COM	Analysis ID #:	106795
Entity (or well #):	2 H	Analysis Cost:	\$90.00
Formation:	UNKNOWN		
Sample Point:	WELLHEAD		

Summa	iry		Analysis of Sample 534665 @ 75 F								
Sampling Date:	03/10/11	Anions	mg/l	neq/I	Cations	mg/l	ñpem				
Analysis Date:	03/18/11	Chloride:	109618.0	3091.92	Sodium:	70275.7	3056.82				
Analyst: S/	ANDRA GOMEZ	Bicarbonate:	2135.0	34.99	Magnesium:	195.0	16.04				
TDR (184911.1	Carbonate:	0.0	0.	Calcium:	844.0	42.12				
TDS (mg/l or g/m3):		Sulfate:	747.0	15.55	Strontium:	220.0	5.02				
Density (g/cm3, tonne/	/m3): 1.113	Phosphale:			Barlum:	0.8	0.01				
Anion/Cation Ratio:	'	Borate:			Iron:	6.5	0.23				
		Silicate:			Polassium:	869.0	22.22				
					Aluminum:						
Carbon Dioxide:	0 50 PPM	Hydrogen Sullide:		0 PPM	Chromlum:						
Oxygen:		at lat time of compliant		-	Copper:						
Comments:		pH at time of sampling:		· · /	Lead:						
		pH at time of analysis:			Manganese:	0.100	0.				
		pH used in Calculation	n:	7	Nickel:						

Cond	tions		Values C	alculated	at the Give	n Conditi	ons - Amo	unts of Sc	ale in Ib/10	00 bbl		
Temp Gauge Press.	(alcite taCO ₃	Gypsum CaSO_42H_ 0		Anhydrite CaSO4		Celestite SrSO ₄		Barite BaSO 4		CO ₂ Press	
Ŧ	psi	Index	Amount	Index	Amount	Index	Amount	Index	Amount	Index	Amount	psi
80	0	1.08	188.52	-1.20	0.00	-1.18	0.00	-0.11	0.00	0.58	0.29	1.72
100	0	1.10	206.05	-1.29	0.00	-1.20	0.00	-0.15	0.00	0.35	0.29	2.35
120	0	1.12	224.17	-1.36	0.00	-1.19	0.00	-0.17	0.00	0.16	0.00	3,17
140	0	1.13	243.17	-1.42	0.00	-1.18	0 00	-0.18	0.00	0.00	0.00	4.21

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.

Injection Formation Water Analyses

	Interview of the provision of the provi																	
						Vista D	isposal Sc	olutions, LLC	C - Devonia	n and Siluri	an-Fusselm	nan Formati	ons					
Wellname	API	Latitude	Longitude	Section	Township	Range	Unit	Ftgns	Ftgew	County	State	Company	Field	Formation	Tds_mgL	Chloride_mgL	Bicarbonate_mgL	Sulfate_mgL
STATE B COM #001	3002509716	32.179405	-103.2212524	36	24S	36E	С	600N	1880W	LEA	NM		CUSTER	DEVONIAN	176234	107400	128	1004
FARNSWORTH FEDERAL #006	3002511950	32.077725	-103.162468	4	265	37E	А	660N	990E	LEA	NM		CROSBY	DEVONIAN	31931	20450	302	591
ARNOTT RAMSAY NCT-B #003	3002511863	32.092228	-103.1784439	32	25S	37E	А	660N	660E	LEA	NM		CROSBY	DEVONIAN		100382	476	
ARNOTT RAMSAY NCT-B #003	3002511863	32.092228	-103.1784439	32	25S	37E	А	660N	660E	LEA	NM		CROSBY	DEVONIAN	158761			
COPPER #001	3002511818	32.099484	-103.1656723	28	25S	37E	J	1980S	1981E	LEA	NM		CROSBY	DEVONIAN	27506	15270	1089	1079
STATE NJ A #001	3002511398	32.164749	-103.1273346	2	25S	37E	А	663N	660E	LEA	NM		JUSTIS NORTH	DEVONIAN	105350	59300	660	4950
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	80880	46200	340	3050
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	84900	48600	840	2650
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	72200	41000	370	2960
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	80900	46200	340	3050
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	77600	44000	550	3240
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	135000	77000	650	5810
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	114000	65000	280	5110
WESTATES FEDERAL #004	3002511389	32.161129	-103.1241226	1	25S	37E	E	1980N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	135000	77000	500	5320
WESTATES FEDERAL #008	3002511393	32.162121	-103.1241226	1	25S	37E	E	1620N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	91058	51020	376	4783
WESTATES FEDERAL #008	3002511393	32.162121	-103.1241226	1	25S	37E	E	1620N	330W	LEA	NM		JUSTIS NORTH	FUSSELMAN	86847	50450	363	2544
STATE Y #009	3002511777	32.10582	-103.1113434	25	25S	37E	А	990N	990E	LEA	NM		JUSTIS	FUSSELMAN	219570	129000	960	4630
STATE Y #009	3002511777	32.10582	-103.1113434	25	25S	37E	A	990N	990E	LEA	NM		JUSTIS	FUSSELMAN	163430	96000	290	3780
SOUTH JUSTIS UNIT #023C	3002511760	32.106728	-103.1184616	25	25S	37E	С	660N	2080W	LEA	NM		JUSTIS	FUSSELMAN	63817	35870	360	3442
CARLSON A #002	3002511764	32.100384	-103.1113434	25	25S	37E	1	2310S	990E	LEA	NM		JUSTIS	FUSSELMAN	208280	124000	510	3400
CARLSON B 25 #004	3002511784	32.096756	-103.1113434	25	25S	37E	Р	990S	990E	LEA	NM		JUSTIS	FUSSELMAN	184030	112900	68	1806

Water Well Map and Well Data

N

0

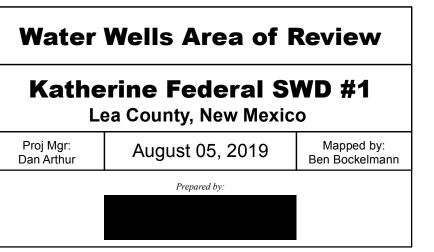
Legend

★ Proposed SWD

NMOSE PODs

Status

- Active (0)
- Pending (0)
- Change Location of Well (0)
- Capped (0)
- Plugged (0)
- Incomplete (0)
- Unknown (0)



	Water Well Sampling Rationale									
	Vista Disposal Solutions, LLC - Katherine Federal SWD #1									
SWD	SWD Water Wells Owner Available Contact Information Use Sampling Required Notes									
Note: No water wells	te: No water wells are present within 1 mile of the proposed SWD location.									

Induced Seismicity Assessment Letter



July 16, 2019

Mr. Phillip Goetze, P.G. NM EMNRD – Oil Conservation Division 1220 South St. Francis Drive Santa Fe, NM 87505

Subject: Induced Seismicity Potential Statement for the Katherine Federal SWD #1

Dear Mr. Goetze,

This letter provides information regarding the seismic potential associated with injection operations associated with Vista Disposal Solutions, LLC (Vista), proposed Katherine Federal SWD #1, hereinafter referred to as the "Subject Well."

As outlined herein, based on my experience as an expert on the issue of induced seismicity, it is my opinion that the potential for the proposed injection well to cause injection-induced seismicity is expected to be minimal, at best. This conclusion is based on (1) the lack of historic seismic activity and faulting in the area, (2) the low fault slip potential (FSP) of Precambrian faults in the area, (3) the presence of confining layers, and (4) the overall vertical distance between the proposed injection zone and basement rock.

The Subject Well, is located 707 FNL & 1,992 FEL of Section 24, in T25-S and R32-E of Lea County, New Mexico. Historically, the Eddy and Lea Counties area has experienced very limited recorded seismic activity (per the U.S. Geological Survey [USGS] earthquake catalog database). There has been one known seismic event located within a 25-mile radius of the proposed Subject Well. The closest recorded seismic event was a M2.9 that occurred on December 4th, 1984, and was located approximately 10.8 miles northeast of the Subject Well (See Exhibit 1). The closest Class IID well injecting into the same formations (Devonian-Silurian) of the Subject Well is approximately 1.6 miles to the west (See Exhibit 1).

Vista does not own either 2D or 3D seismic reflection data in the area of the Subject Well. Fault data from USGS indicates that the closest known fault is approximately 7.9 miles east of the Subject Well (See Exhibit 1).

In a recent paper written by Snee and Zoback (2018) entitled "State of Stress in the Permian Basin, Texas and New Mexico: Implications for Induced Seismicity,", the authors found that large groups of mostly north-south striking Precambrian basement faults, predominantly located along the Central Basin Platform, the western Delaware Basin, and large parts of the Northwest Shelf (which includes Eddy and Lea counties, New Mexico) have low FSP at the modeled fluid-pressure

perturbation. The map in Exhibit 2 depicts the low probability risk of FSP for the Delaware Basin and Northwest Shelf areas (Snee and Zoback 2018).

Geologic analysis indicates that the proposed Devonian-Silurian injection zone is overlain by approximately 200 to 400 feet of Woodford Shale, which is the upper confining zone and will serve as a barrier for upward injection fluid migration. Additionally, the Simpson Group that lies directly below the Montoya Formation will act as a lower confining zone to prohibit fluids from migrating downward into the underlying Ellenberger Formation and Precambrian basement rock. See the stratigraphic column for the Delaware Basin included in Exhibit 3.

In the Eddy and Lea Counties area of New Mexico, the Simpson Group is comprised of a series of Middle to Upper Ordovician carbonates, several sandstones, and sandy shales that range from approximately 350 to 650 feet thick (Jones 2008). This group of rocks is capped by the limestones of the Bromide Formation, which is approximately 200 feet thick in this area (Jones 2008). The closest deep well drilled into the Precambrian basement was completed by the Skelly Oil Company in 1975. This well is located in Section 17, Range 36E, Township 25S of Lea County (API No.30-025-25046) and encountered 602 feet of Ellenburger Formation before reaching the top of the Precambrian granite at a depth of 18,920 feet. Based on the estimated thickness of the Simpson Group and Ellenburger Formation in this area, the Precambrian basement should be approximately 1,000 to 1,200 feet below the bottom of the proposed injection zones in the Subject Well.

Conclusion

As an expert on the issue of induced seismicity, it is my opinion that the potential for the proposed injection well to cause injection-induced seismicity is expected to be minimal, at best. This conclusion is based on (1) the lack of historic seismic activity and faulting in the area, (2) the low FSP of Precambrian faults in the area, (3) the presence of confining layers, and (4) the overall vertical distance between the proposed injection zone and basement rock.

Sincerely, ALL Consulting

1 dullo

J. Daniel Arthur, P.E., SPEC President and Chief Engineer

Enclosures References Exhibits

References

Ball, Mahlon M. 1995. "Permian Basin Province (044)." In *National Assessment of United States Oil and Gas Resources—Results, Methodology, and Supporting Data*. U.S. Geological Survey. https://certmapper.cr.usgs.gov/data/noga95/prov44/text/prov44.pdf (accessed June 18, 2018).

Green, G.N., and G.E. Jones. 1997. "The Digital Geologic Map of New Mexico in ARC/INFO Format." U.S. Geological Survey Open-File Report 97-0052. https://mrdata.usgs.gov/geology/state/state.php?state=NM (accessed June 14, 2018).

Jones, Rebecca H. 2008. "The Middle-Upper Ordovician Simpson Group of the Permian Basin: Deposition, Diagenesis, and Reservoir Development." <u>http://www.beg.utexas.edu/resprog/permianbasin/PBGSP_members/writ_synth/Simpson.pdf</u> (accessed June 19, 2018).

Snee, Jens-Erik Lund, and Mark D. Zoback. 2018. "State of Stress in the Permian Basin, Texas and New Mexico: Implications for Induced Seismicity." *The Leading Edge* 37, no. 2 (February 2018): 127-34.

U.S. Geological Survey (USGS). No date. Earthquakes Hazard Program: Earthquake Catalog. <u>https://earthquake.usgs.gov/earthquakes/search/</u> (accessed June 14, 2018).

Exhibits

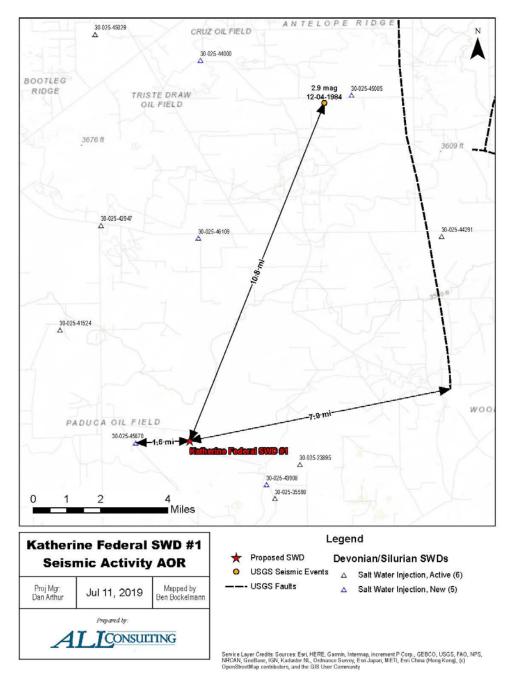


Exhibit 1. Map Showing the Distances from Known and Inferred Faults, Seismic Event, and Closest Deep Injection Well

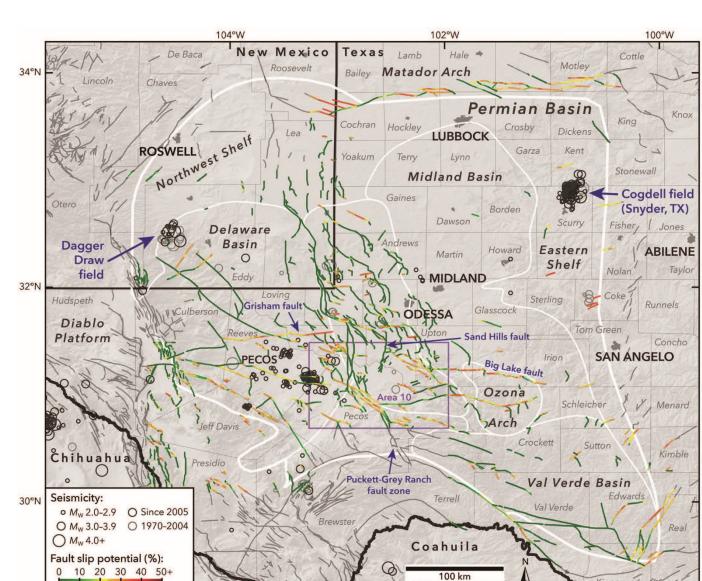


Exhibit 2. Results of the Snee and Zoback (2018) Probabilistic FSP Analysis Across the Permian Basin

Kinney

3

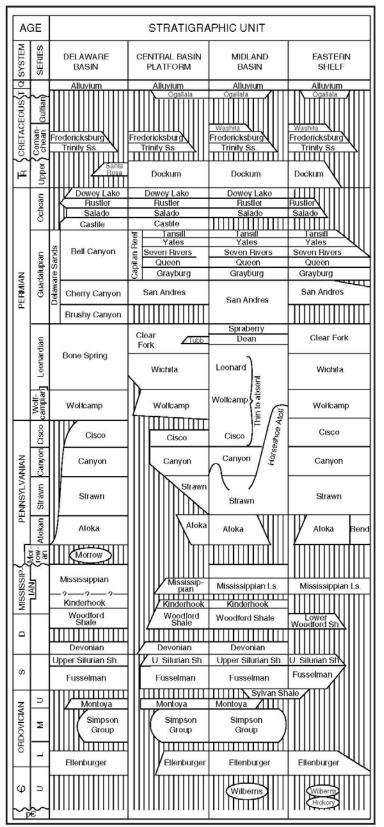


Exhibit 3. Delaware Basin Stratigraphic Chart (Ball 1995)

Public Notice Affidavit and Notice of Application Confirmations

Affidavit of Publication

STATE OF NEW MEXICO COUNTY OF LEA

I. Daniel Russell, Publisher of the Hobbs News-Sun, a newspaper published at Hobbs, New Mexico, solemnly swear that the clipping attached hereto was published in the regular and entire issue of said newspaper, and not a supplement thereof for a period of 1 issue(s).

> Beginning with the issue dated July 06, 2019 and ending with the issue dated July 06, 2019.

Publisher

Sworn and subscribed to before me this 6th day of July 2019.

Black

Business Manager

My commission expires January 29, 2023 (Seal) OFFICIAL SEAL GUSSIE BLACK Notary Public State of New Mexico My Commission Expires. "d

This newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, Chapter 167, Laws of 1937 and payment of fees for said

67115320

DANIEL ARTHUR ALL CONSULTING 1718 S. CHEYENNE AVE. **TULSA, OK 74119**

00230515

PURPOSE: The intended purpose of the injection well is to dispose of salt water produced from permitted oil and gas wells. WELL NAME AND LOCATION: <u>Katherine Federal SWD #1</u> <u>NW ¼ NE ¼. Section 24, Township 25S, Range 32E</u> 707' FNL & 1.992' FEL Lea County, NM

LEGAL NOTICE JULY 6, 2019

APPLICATION FOR AUTHORIZATION TO INJECT

NOTICE IS HEREBY GIVEN: That Vista Disposal Solutions, LLC, 12444 NW 10th St., Building G, Suite 202-512, Yukon, OK 73099, is requesting that the New Mexico Oil Conservation Division administratively approve the APPLICATION FOR AUTHORIZATION TO INJECT as follows:

NAME AND DEPTH OF DISPOSAL ZONE: Devonian -Silurian (17.720' - 19.000') EXPECTED MAXIMUM INJECTION RATE: 30.000

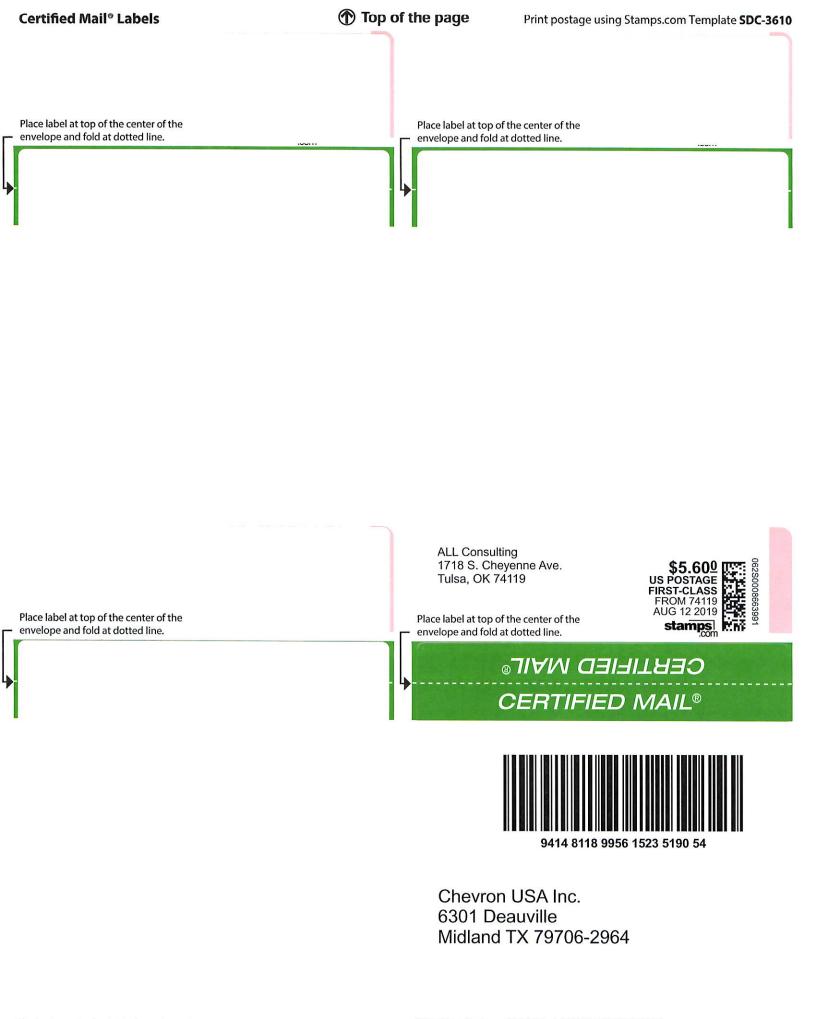
Bbls/day EXPECTED MAXIMUM INJECTION PRESSURE: 3.544 psi (surface)

Objections or requests for hearing must be filed with the New Mexico Oil Conservation Division within fifteen (15) days. Any objection or request for hearing should be mailed to the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505.

Additional information may be obtained by contacting Nate Alleman at 918-382-7581.

Katherine Fed	leral SWD #1 - Notice of Application Recip	ients							
Entity	Address	City	State	Zip Code					
Landowner & Mineral Owner									
New Mexico BLM	620 E Greene St.	Carlsbad	NM	88220					
	OCD District								
NMOCD District 1	1625 N. French Drive	Hobbs	NM	88240					
	Leasehold Operators								
Chevron USA Inc. (CHEVRON USA INC)	6301 Deauville	Midland	TX	79706					
Cimarex Energy Co.	600 N. Marienfield St. Suite 600	Midland	TX	79701					
EOG A Resources, Inc. (EOG A RESOURCES INC)	P.O. Box 900	Artesia	NM	88211					
EOG M Resources, Inc. (EOG M RESOURCES INC)	P.O. Box 840	Artesia	NM	88211					
EOG Resources, Inc. (EOG RESOURCES INC)	104 S. 4th Street	Artesia	NM	88210					
EOG Y Resources, Inc. (EOG Y RESOURCES INC)	104 S. 4th Street	Artesia	NM	88210					
JKM Energy, LLC	26 E Compress Road	Artesia	NM	88210					
Magnum Hunter Production, Inc. (MAGNUM HUNTER PRODUCTION INC)	202 S. Cheyenne Ave., Suite 1000	Tulsa	ОК	74103					
Mobil Producing Texas & New Mexico (MOBIL PROD TX &NM)	P.O. Box 1760	Denver City	тх	79323					
Murchison Oil & Gas Inc. (MURCHISON OIL & GAS INC)	7250 Dallas Parkway, Suite 1400	Plano	ТΧ	75024					
OXY-1 Company	P.O. Box 27570	Houston	ТХ	77227					

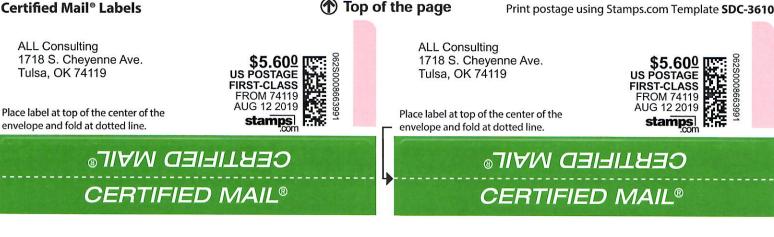
(Attachment 2) or on the 2-mile Mineral Lease Map (Attachment 2). The names listed above in parenthesis, are the abbreviated entity names used on either the 1-mile well detail list (Attachment 2) or on the 2-mile Mineral Lease Map (Attachment 2).



For best results, feed this sheet through your printer as few times as possible. To purchase or for printing instructions go to **www.stamps.com/3610**.

Covered by and/or for use with U.S. Patents 6,244,763, 6,868,406, 7,216,110, 7,236,956, 7,236,970, 7,343,357, 7,490,065, 7,567,940, 7,613,639, 7,743,043, 7,788,2094, 8,027,926, 8,027,927, 8,027,935, 8,041,644, and 8,046,823 8,103,647 8,195,579, 8,301,572, 8,392,391 8,498,943.







Cimarex Energy Co. 600 N. Marienfeld St. Ste 600

Midland TX 79701-4405

ALL Consulting

Tulsa, OK 74119

1718 S. Cheyenne Ave.

Place label at top of the center of the

envelope and fold at dotted line.

4

EOG A Resources, Inc. P.O. Box 900 Artesia NM 88211-0900

\$5.600 III 062S000866399 FIRST-CLASS

E%

FROM 74119 AUG 12 2019

stamps

Place label at top of the center of the envelope and fold at dotted line.

1718 S. Cheyenne Ave.

ALL Consulting

Tulsa, OK 74119

\$5.60⁰ US POSTAGE FROM 74119 AUG 12 2019 stamps



©ERTIFIED MAIL®

CERTIFIED MAIL®

9414 8118 9956 1523 5194 74

EOG M Resources, Inc. P.O. Box 840 Artesia NM 88211-0840



Covered by and/or for use with U.S. Patents 6,244,763, 6,868,406, 7,216,110, 7,236,956, 7,236,970, 7,343,357, 7,490,065, 7,567,940, 7,613,639, 7,743,043, 7,882,094, 8,027,926, 8,027,935, 8,041,644, and 8,046,823 8,103,647 8,195,579, 8,301,572, 8,392,391 8,498,943.





©EBTIFIED MAIL®

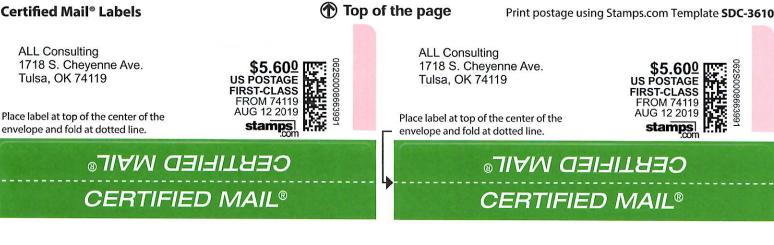
CERTIFIED MAIL®



9414 8118 9956 1523 5194 98

9414 8118 9956 1523 5195 97

Top of the page





EOG Y Resources, Inc. 104 S. Fourth Street Artesia NM 88210-2123

ALL Consulting

Tulsa, OK 74119

1718 S. Cheyenne Ave.

Place label at top of the center of the

envelope and fold at dotted line.

JKM Energy, LLC 26 E Compress Road Artesia NM 88210-9215

ALL Consulting 1718 S. Cheyenne Ave. Tulsa, OK 74119

Place label at top of the center of the envelope and fold at dotted line.

\$5.600 US POSTAGE FIRST-CLASS FROM 74119 AUG 12 2019 stamps

f the center of the at dotted line.

4 8118 9956 1523 5132 98





©ERTIFIED MAIL®

CERTIFIED MAIL®

\$5.600 US POSTAGE FIRST-CLASS FROM 74119 AUG 12 2019

stamps

062S000866399

Magnum Hunter Production, Inc. 202 S. Cheyenne Ave., Suite 1000 Tulsa OK 74103-3001

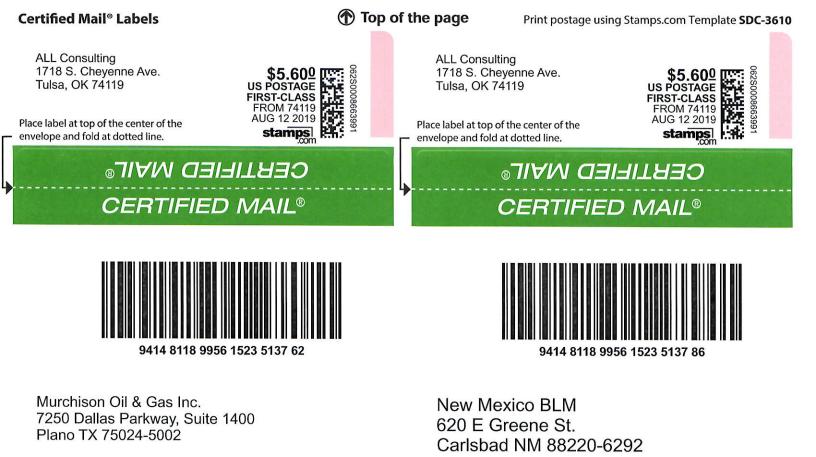


9414 8118 9956 1523 5138 30

Mobil Producing Texas & New Mexico P.O. Box 1760 Denver City TX 79323-1760







62S000866399

\$5.60⁰ [

US POSTAGE

FIRST-CLASS FROM 74119 AUG 12 2019

stamps

ALL Consulting 1718 S. Cheyenne Ave. Tulsa, OK 74119

Place label at top of the center of the envelope and fold at dotted line.

OXY-1 Company P.O. Box 27570

Houston TX 77227-7570





©ERTIFIED MAIL®

CERTIFIED MAIL®

9414 8118 9956 1523 5139 53

NMOCD District 1 1625 N. French Drive Hobbs NM 88240-9273

ALL Consulting

Tulsa, OK 74119

1718 S. Cheyenne Ave.

Place label at top of the center of the

envelope and fold at dotted line.

Covered by and/or for use with U.S. Patents 6,244,763, 6,868,406, 7,216,110, 7,236,956, 7,236,970, 7,343,357, 7,490,065, 7,567,940, 7,613,639, 7,743,043, 7,882,094, 8,027,926, 8,027,927, 8,027,935, 8,041,644, and 8,046,823 8,103,647 8,195,579, 8,301,572, 8,392,391 8,498,943.

<u>CERTIFIED MAIL®</u>

CERTIFIED MAIL®

9414 8118 9956 1523 5139 77

