Revised March 23, 2017

RECEIVED:	REVIEWER:	TYPE:	APP NO:

ABOVE THIS TABLE FOR OCD DIVISION USE ONLY

NEW MEXICO OIL CONSERVATION DIVISION

- Geological & Engineering Bureau –
1220 South St. Francis Drive, Santa Fe, NM 87505

ADMINISTRATIVE APPLICATION CHECKLIST

THIS CHECKLIST IS MANDATORY FOR ALL ADMINISTRATIVE APPLICATIONS FOR EXCEPTIONS TO DIVISION RULES AND REGULATIONS WHICH REQUIRE PROCESSING AT THE DIVISION LEVEL IN SANTA FE

Applicant: Vista Disposal Solutions, LLC **OGRID Number:** 329051
Well Name: Justin Federal SWD #1 **API:**
Pool: SWD; DEVONIAN - SILURIAN **Pool Code:** 97869

SUBMIT ACCURATE AND COMPLETE INFORMATION REQUIRED TO PROCESS THE TYPE OF APPLICATION INDICATED BELOW

1) **TYPE OF APPLICATION:** Check those which apply for [A]
A. Location – Spacing Unit – Simultaneous Dedication
☐NSL ☐ NSP(PROJECT AREA) ☐NSP(PRORATION UNIT) ☐SD

B. Check one only for [I] or [II]
[I] Commingling – Storage – Measurement
☐DHC ☐CTB ☐PLC ☐PC ☐OLS ☐OLM
[II] Injection – Disposal – Pressure Increase – Enhanced Oil Recovery
☐ WFX ☐PMX ■SWD ☐IPI ☐EOR ☐PPR

FOR OCD ONLY
☐ Notice Complete
☐ Application Content Complete

2) **NOTIFICATION REQUIRED TO:** Check those which apply.
A. ■ Offset operators or lease holders
B. ☐ Royalty, overriding royalty owners, revenue owners
C. ■ Application requires published notice
D. ■ Notification and/or concurrent approval by SLO
E. ■ Notification and/or concurrent approval by BLM
F. ■ Surface owner
G. ■ For all of the above, proof of notification or publication is attached, and/or,
H. ☐ No notice required

3) **CERTIFICATION:** I hereby certify that the information submitted with this application for administrative approval is **accurate** and **complete** to the best of my knowledge. I also understand that **no action** will be taken on this application until the required information a notifications are submitted to the Division.

Note: Statement must be completed by an individual with managerial and/or supervisory capacity.

Dan Arthur, P.E., SPEC
Print or Type Name

JAMES DANIEL ARTHUR NEW MEXICO 21703 PROFESSIONAL ENGINEER 7/26/19

Signature

8/12/2019
Date

918-382-7581
Phone Number

darthur@all-llc.com
e-mail Address

OCD Case# 20803
VISTA DISPOSAL SOLUTIONS, LLC
October 3, 2019
Ex#1

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 _____Pressure Maintenance __X__Disposal
_____Storage Application qualifies for administrative approval? __X__Yes _____No

II. OPERATOR: Vista Disposal Solutions, LLC

ADDRESS: 12444 NM 10th St., Building G, Suite 202-512, Yukon, OK 73099

CONTACT PARTY Nate Alleman PHONE: 918-382-7581

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).

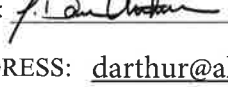
*XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

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: Dan Arthur, P.E., SPEC TITLE: President/Chief Engineer

SIGNATURE:  DATE: 8/12/2019

E-MAIL ADDRESS: darthur@all-llc.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

2

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District Offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and the name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the Section, Township, and Range location of multiple wells;

(3) The formation name and depth with expected maximum injection rates and pressures; and,

(4) A notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505, within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

Application for Authorization to Inject
Well Name: Justin Federal SWD #1

III – Well Data (*The Wellbore Diagram is included as **Attachment 1***)

A.

(1) General Well Information:

Operator: Vista Disposal Solutions, LLC (OGRID No. 329051)
Lease Name & Well Number: Justin Federal SWD #1
Location Footage Calls: 2,401' FNL & 194' FEL
Legal Location: Unit Letter H, S25 T25S R34E
Ground Elevation: 3,354'
Proposed Injection Interval: 18,120' – 19,300'
County: Lea

(2) Casing Information:

Type	Hole Size	Casing Size	Casing Weight	Setting Depth	Sacks of Cement	Estimated TOC	Method Determined
Surface	24"	20"	133.0 lb/ft	925'	940	Surface	Circulation
Intermediate 1	14-3/4"	13-3/8"	68.0 lb/ft	5,400'	1,200	Surface	Circulation
Intermediate 2	12-1/4"	9-5/8"	53.5 lb/ft	14,800'	4,910	Surface	Circulation
Liner	8-1/2"	7-5/8"	39.0 lb/ft	18,120	285	14,600(TOL)	CBL

(3) Tubing Information:

4-1/2" (composite weight string) of fiberglass-coated tubing with setting depth of 18,100'

(4) Packer Information: Lok-set or equivalent packer set at 18,100'

B.

(1) Injection Formation Name: Devonian and Silurian-Fusselman formations
Pool Name: SWD; DEVONIAN - SILURIAN
Pool Code: 97869
(2) Injection Interval: Open-hole injection between 18,120' – 19,300'
(3) Drilling Purpose: New Drill for Salt Water Disposal
(4) Other Perforated Intervals: No other perforated intervals exist.
(5) Overlying Oil and Gas Zones: Below are the approximate formation tops for known oil and gas producing zones in the area.

- Delaware (5,400')
- Bone Springs (10,000')
- Wolfcamp (12,400')
- Atoka (14,950')
- Morrow (15,900')

Underlying Oil and Gas Zones: No underlying oil and gas zones exist.

V – Well and Lease Maps

The following maps are included in ***Attachment 2***:

- 2-mile Oil & Gas Well Map
- 2-mile Lease Map
- 1.5-mile Deep SWD Map (Devonian/Silurian SWDs)
- 1-mile Well Detail List
- Potash Lease Map

VI – AOR Well List

There are no wells within the 1-mile AOR that penetrate the proposed injection zone.

A list of the wells within the 1-mile AOR is included in ***Attachment 2***.

VII – Proposed Operation

(1) Proposed Maximum Injection Rate: 30,000 bpd
Proposed Average Injection Rate: 15,000 bpd

(2) A **closed system** will be used.

(3) Proposed Maximum Injection Pressure: 3,624 psi (surface)
Proposed Average Injection Pressure: approximately 1,500 – 2,000 psi (surface)

(4) Source Water Analysis: It is expected that the injectate will consist of produced water from production wells completed in the Wolfcamp and Bone Springs formations. Analysis of water from these formations is included in ***Attachment 3***.

(5) Injection Formation Water Analysis: The proposed SWD will be injecting water into the Devonian and Silurian-Fusselman formations which is a non-productive zone known to be compatible with formation water from the Wolfcamp and Bone Springs formations. Water analyses from the Devonian-Silurian formation in the area are included in ***Attachment 4.***

VIII – Geologic Description

The proposed injection interval includes the Devonian and Silurian-Fusselman formations from 18,120 – 19,300 feet. These formations consist of carbonates including light colored dolomite and chert intervals interspersed with some tight limestone intervals. Several thick sections of porous dolomite capable of taking water are present within the subject formations in the area.

The freshwater formation is the Rustler at a depth of approximately 900 feet. Water well depths in the area range from approximately 230 - 260 feet below ground surface.

IX – Proposed Stimulation Program

A small cleanup acid job may be used to remove mud and drill cuttings from the formation. However, no other formation stimulation is currently planned.

X – Logging and Test Data

Logs will be submitted to the Division upon completion of the well.

XI – Fresh Groundwater Samples

Based on a review of data from the New Mexico Office of the State Engineer, no groundwater wells are located within 1-mile of the proposed SWD location; therefore, no groundwater samples were collected in association with this application.

A water well map of the area is included in ***Attachment 5***.

XII – No Hydrologic Connection Statement

No faulting is present in the area that would provide a hydrologic connection between the injection interval and overlying USDWs. Additionally, the casing program has been designed to ensure there will be no hydrologic connection between the injection interval and overlying USDWs. A letter from a knowledgeable and qualified expert stating that there is a low risk of seismic activity from the proposed injection activities is included in ***Attachment 6.***

XIII – Proof of Notice

A Public Notice was filed with the Hobbs News-Sun newspaper and an affidavit is included in ***Attachment 7***.

A copy of the application was mailed to the OCD District Office, landowner, and leasehold operators within 1-mile of the proposed SWD location. A list of the recipients, as well as delivery confirmations, are included in ***Attachment 7***.

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Attachments

Attachment 1: Wellbore Diagram

Attachment 2: Area of Review Information:

- 2-mile Oil & Gas Well Map
- 2-mile Lease Map
- 1.5-mile Deep SWD Map (Devonian/Silurian SWDs)
- 1-mile Well Detail List
- Potash Lease Map

Attachment 3: Source Water Analyses

Attachment 4: Injection Formation Water Analyses

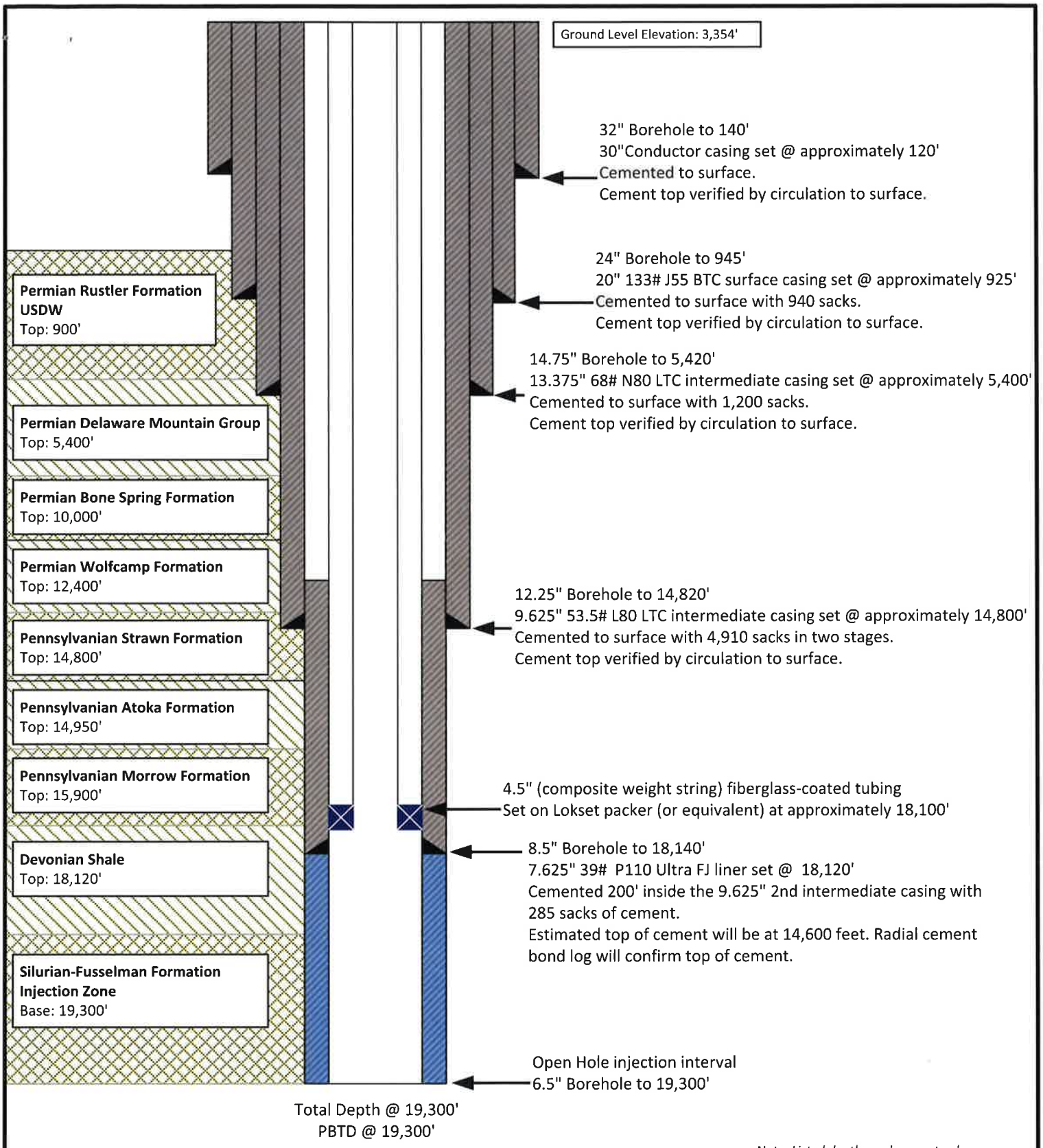
Attachment 5: Water Well Map and Well Data

Attachment 6: Induced Seismicity Assessment Letter

Attachment 7: Public Notice Affidavit and Notice of Application Confirmations

Attachment 1

Wellbore Diagram



Note: Listed depths and cement volumes are approximates based on available information. All cement calculations use yield of 1.18 cubic foot per sack and include 25% excess.

NOT TO SCALE

Prepared by: ALL CONSULTING	Drawn by: Joshua Ticknor	Vista Disposal Solutions, LLC
	Project Manager: Dan Arthur	Justin Federal SWD #1
	Date: 8/5/2019	Section 25, Twp 25S, Rng 34E 2,401' FNL & 194' FEL Lea County, NM

A-3 and AL-2 LOK-SET Retrievable Casing Packers

Product Family No. H64630 and H64628

APPLICATION

The A-3™ LOK-SET™ packer combines advantages of a retrievable packer with the features of a permanent packer. An ability to lock down tubing forces makes the A-3 suitable for a broad range of applications, including production, injection, zone isolation, and remedial operations. The AL-2™ LOK-SET packer is similar to the A-3, and has a larger bore.

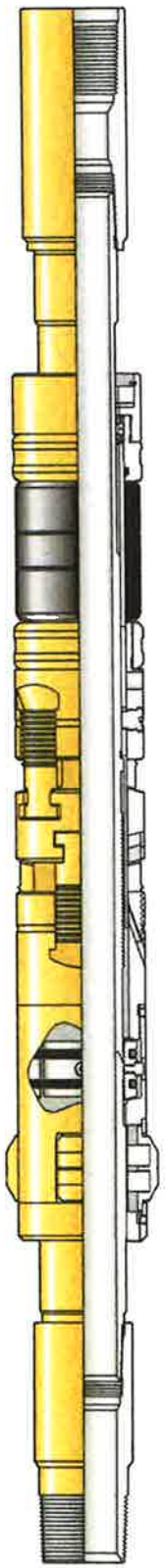
Advantages

- Holds pressure from above and below, without relying on set-down weight, tubing tension, or hydraulic hold down
- Provides tubing anchoring with tension applied, suitable for pumping wells or injection, controlling tubing forces related to change fluid temperatures
- Opposed, non-transferring, dovetail slips prevent packer movement associated with changing differential pressures, while allowing the landing of the tubing in tension, neutral or compression
- Right-hand tubing rotation controls setting and releasing
- Packing element compression locks in by ratcheting action of lock segments, which restricts rotation to one direction

Accessories

To provide a simple and reliable injection system for retrieving an injection string without having to unseat the packer:

L-10 or L-316 on-off sealing connectors, Product Family Nos. H68420 and H68422. Baker Hughes blanking plug can be used in the seating nipple profile of the on-off sealing connector to provide a means of plugging the lower zone while the tubing is being pulled.



A-3 LOK-SET
Retrievable Casing Packer
Product Family No. H64630

SPECIFICATION GUIDES

A-3™ LOK-SET Retrievable Casing Packer, Product Family No. H64630

Casing			Packer				
OD		Weight •	Size	Nom ID		Max Gage Ring OD	
in.	mm	lb/ft		in.	mm	in.	mm
4	101.6	9.5–12.9	41A2	1.500	38.1	3.244	82.4
4-1/2	144.3	21.6–23.6	41A2	1.500	38.1	3.244	82.4
4	101.6	9.5	41A4	1.500	38.1	3.423	112.4
4-1/2	114.3	18.8	41A4	1.500	38.1	3.423	112.4
		13.5–17.7	41B			3.578	90.9
		11.6–13.5	43A2	1.978	50.2	3.786	96.2
		9.5–10.5	43A4			3.786	96.2
5	127.0	15–18	43B	1.978	50.2	4.140	105.2
		11.5–15	43C			4.265	108.3
5-1/2	139.7	26	43C	1.978	50.2	4.265	108.3
		20–23	45A2			4.515	114.7
		15.5–20	45A4			4.656	118.3
		13–15.5	45B			4.796	121.8
6	152.4	26	45B	1.978	50.2	4.796	121.8
		20–23	45C			5.078	129.0
		15–18	45D			5.171	131.3
6-5/8	168.3	34	45E	1.978	50.2	5.421	137.7
		24–32	45F			5.499	139.7
		24	47A2	2.441	62.0	5.671	144.0
		17–24	45G	1.978	50.2	5.796	147.2
		17–20	47A4	2.441	62.0	5.827	148.0
7	177.8	38	47A2	2.441	62.0	5.671	144.0
		32–35	47A4			5.827	148.0
		26–29	47B2			5.983	152.0
		23–26	47B4			6.093	154.8
		17–20	47C2			6.281	159.5
7-5/8	193.7	33.7–39	47C4	2.441	62.0	6.468	164.3
		24–29.7	47D2			6.667	169.9
		20–24	47D4			6.827	173.4
8-5/8	219.1	44–49	49A2	3.500	88.9	7.327	186.1
		32–40	49A4			7.546	191.7
		20–28	49B			7.796	198.0
9-5/8	244.5	47–53.5	51A2	3.500	88.9	8.234	209.1
		40–47	51A4			8.452	214.7
		29.3–36	51B			8.608	218.6

AL-2™ Large Bore LOK-SET Retrievable Casing Packer Product Family No. H64628

Casing		Packer							
OD		Weight •	Size	Nom ID		Max Gage Ring OD		Max Diameter of Compressed Drag Block	
in.	mm	lb/ft		in.	mm	in.	mm	in.	mm
5-1/2	139.7	20	45A2 x 2-3/8	2.375	60.3	4.562	115.9	4.592	116.6
		15.5–17	45A4 x 2-3/8			4.656	118.3	4.750	120.7
		13	45B x 2-3/8			4.796	121.8	4.902	124.5
6	152.4	26	45B x 2-3/8	2.375	60.3	4.796	121.8	4.902	124.5

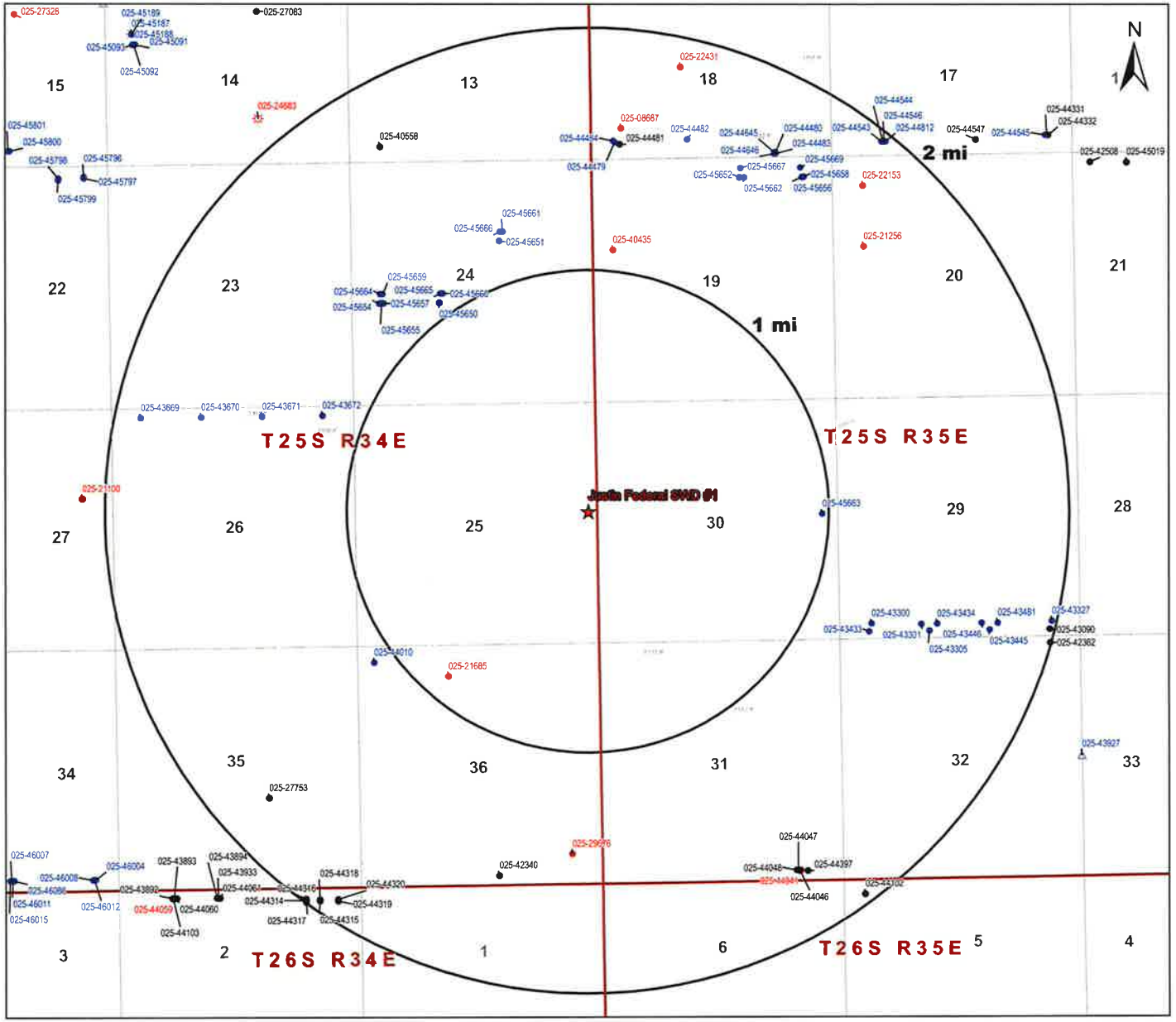
• *When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: for 7-in. (177.8 mm) OD 26 lb/ft casing use packer size 47B4. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.*

Repair kits, including such items as packing elements, seal rings, etc., are available for redressing Baker Retrievable Packers. Contact your Baker Hughes representative. Use only Baker Hughes repair parts.

Attachment 2

Area of Review Information:

- 2-mile Oil & Gas Well Map
- 2-mile Lease Map
- 1.5-mile Deep SWD Map (Devonian/Silurian SWDs)
- 1-mile Well Detail List
- Potash Lease Map



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- ★ Proposed SWD

NMOCD O&G Wells

- ☼ Gas, New (1)
- ☼ Gas, Plugged (1)
- • Oil, Active (31)
- • Oil, New (62)
- • Oil, Plugged (11)
- △ Salt Water Injection, New (2)

O&G Wells Area of Review

Justin Federal SWD #1

Lea County, New Mexico

Proj Mgr: Dan Arthur	July 09, 2019	Mapped by: Ben Bockelmann

Prepared for: Vista Disposal Solutions, LLC

Prepared by: ALL Consulting

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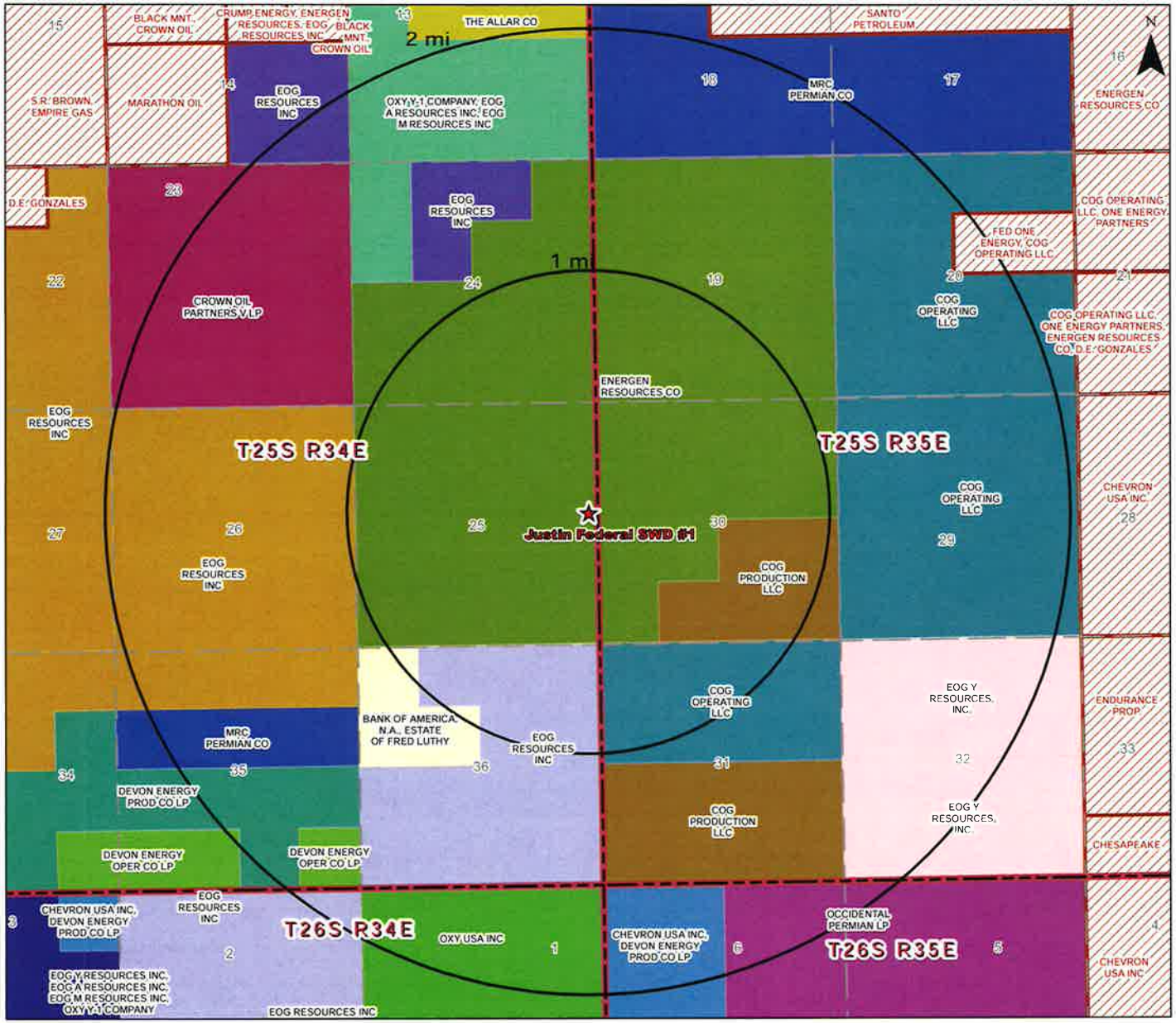


Legend

- Proposed SWD
- Private Mineral Leases

BLM Mineral Leases

- CHEVRON USA INC, DEVON ENERGY PROD CO LP
- COG OPERATING LLC
- COG PRODUCTION LLC
- CROWN OIL PARTNERS V LP
- DEVON ENERGY OPER CO LP
- DEVON ENERGY PROD CO LP
- ENERGEN RESOURCES CO
- EOG RESOURCES INC
- EOG RESOURCES INC
- EOG Y RESOURCES INC, EOG A RESOURCES INC, EOG M RESOURCES INC, OXY Y-1 COMPANY
- MRC PERMIAN CO
- OCCIDENTAL PERMIAN LP
- OXY USA INC
- OXY Y-1 COMPANY, EOG A RESOURCES INC, EOG M RESOURCES INC
- THE ALLAR CO

NMSLO Mineral Leases

- BANK OF AMERICA, N.A., ESTATE OF FRED LUTHY
- EOG RESOURCES INC
- EOG Y RESOURCES, INC.

Mineral Lease Area of Review

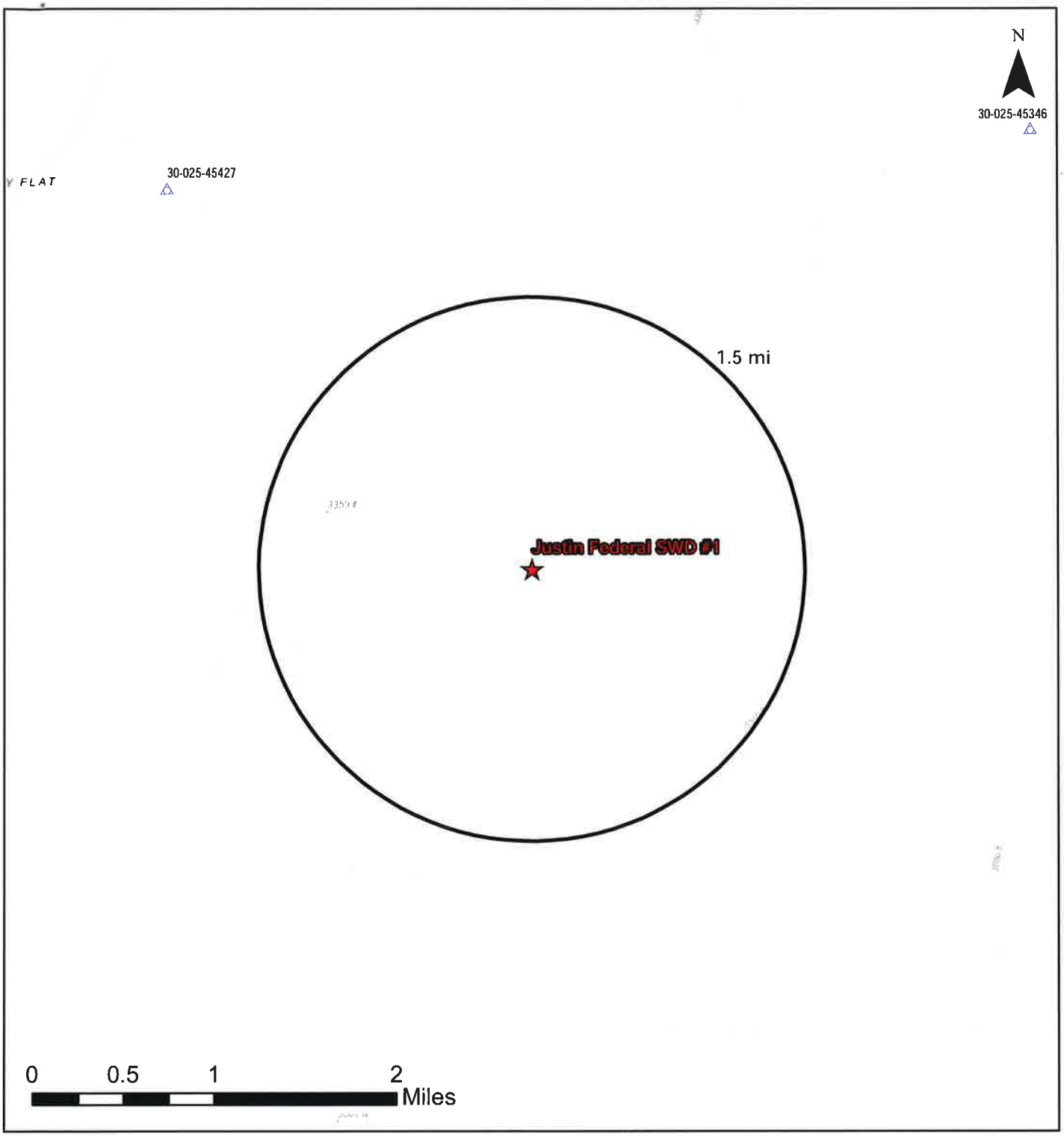
Justin Federal SWD #1

Lea County, New Mexico

Proj Mgr: Dan Arthur	July 15, 2019	Mapped by: Ben Bockelmann

Prepared for: Vista Disposal Solutions, LLC

Prepared by: ALL CONSULTING



Justin Federal SWD #1
Deep SWDs AOR

Proj Mgr: Dan Arthur	Jul 9, 2019	Mapped by: Ben Bockelmann

Prepared for: Vista Disposal Solutions, LLC

Prepared by: ALL CONSULTING

Legend

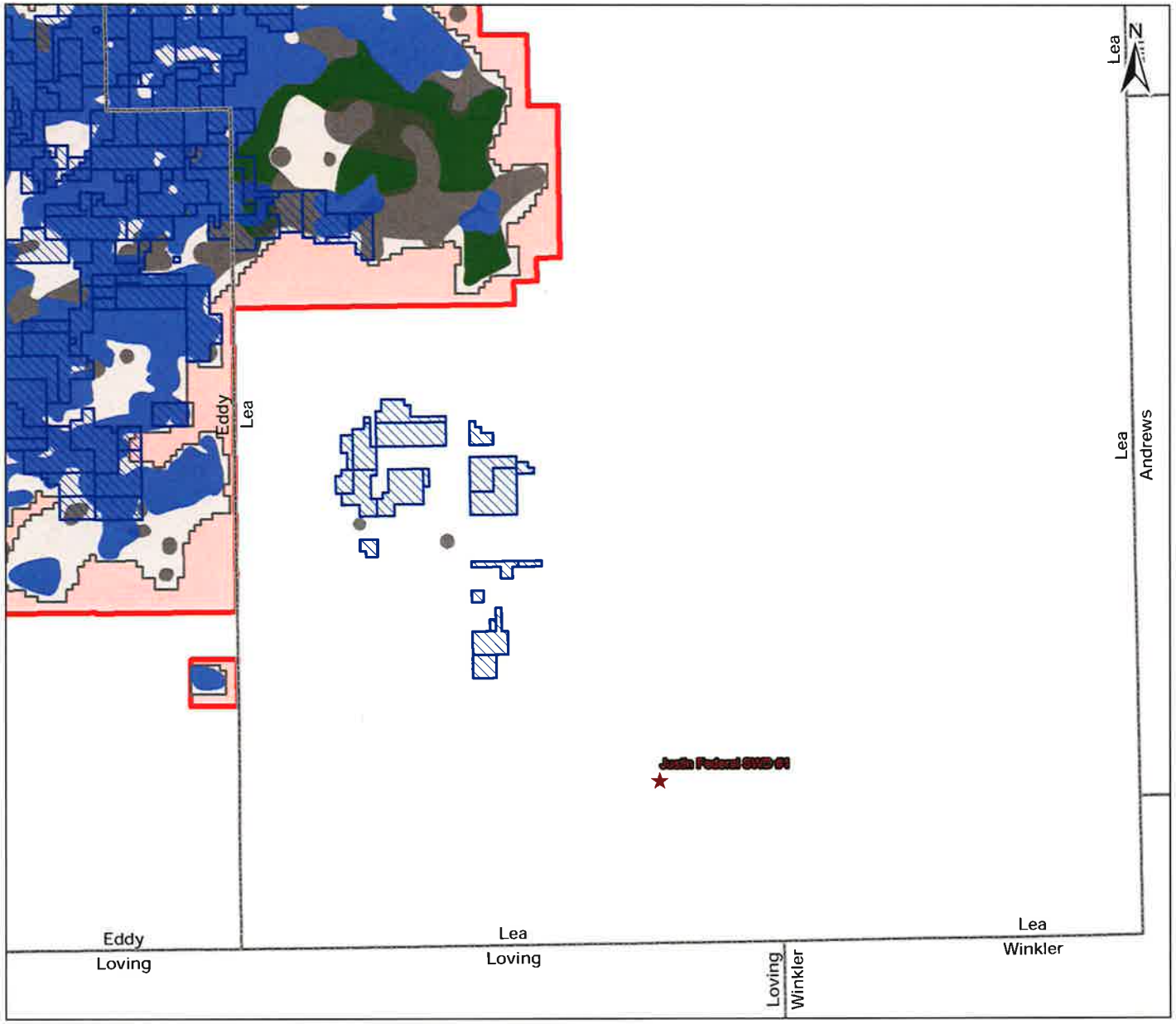
★ Proposed SWD

Devonian/Silurian SWDs

△ Salt Water Injection, New (2)

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

AOR Tabulation for Justin Federal SWD #1 (Top of Injection Interval: 18,120')							
Well Name	**API#**	**Well Type**	**Operator**	**Spud Date**	**Location (Sec., Tn., Rng.)**	**Total Vertical Depth (feet)**	**Penetrate Inj. Zone?**
PITCHBLENDE 19 30 FEDERAL #458H	30-025-45663	O	ENERGEN RESOURCES CORPORATION	Not Drilled	A-19-25S-35E	Proposed (12,465)	No
PRE-ONGARD WELL #001	30-025-21685	Plugged	PRE-ONGARD WELL OPERATOR (Pauley Petroleum Inc.)	3/6/1966	C-36-25S-34E	Plugged (5,795)	No
Notes: No wells within the 1-mile AOR penetrate the injection interval.							



Legend

- Proposed SWD
- Potash Leases
- Ore Type - Measured
- Ore Type - Indicated
- Ore Type - Inferred
- KPLA
- SOPA

Potash Leases
Area of Review

Justin Federal SWD #1
Lea County, New Mexico

Proj Mgr: Dan Arthur	July 06, 2019	Mapped by: Ben Bockelmann

Prepared for: Vista Disposal Solutions, LLC

Prepared by: ALL Consulting

Attachment 3

Source Water Analyses

Wolfcamp

BAKER HUGHES

Water Analysis

Date: 23-Aug-11

2708 West County Road, Hobbs NM 88240
Phone (575) 392-5556 Fax (575) 392-7307

Analyzed For Brushy Draw 1 #1

Company	Well Name	County	State
	BD	~~Lea~~ Eddy	New Mexico 1-26S-29E

Sample Source	Swab Sample	**Sample #**	1
Formation		**Depth**	

Specific Gravity	1.170	SG @ 60 °F	1.172
pH	6.30	Sulfides	Absent
Temperature (°F)	70	Reducing Agents	

Cations

Sodium (Calc)	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
Sulfates	in Mg/L	250	in PPM	213
Bicarbonates	in Mg/L	127	in PPM	108
Total Hardness (as CaCO3)	in Mg/L	15,000	in PPM	12,799
Total Dissolved Solids (Calc)	in Mg/L	213,549	in PPM	182,209
Equivalent NaCl Concentration	in Mg/L	182,868	in PPM	156,031

Scaling Tendencies

*Calcium Carbonate Index 507,520

Below 500,000 Remote / 500,000 - 1,000,000 Possible / Above 1,000,000 Probable

*Calcium Sulfate (Gyp) Index 1,000,000

Below 500,000 Remote / 500,000 - 10,000,00 Possible / Above 10,000,000 Probable

**This Calculation is only an approximation and is only valid before treatment of a well or several weeks after treatment.*

Remarks RW=.048@70F

Report # 3188

Sec 22, T25S, R28E

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

Bone Spring

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		

Summary	
Sampling Date:	03/10/11
Analysis Date:	03/18/11
Analyst:	SANDRA GOMEZ
TDS (mg/l or g/m3):	184911.1
Density (g/cm3, tonne/m3):	1.113
Anion/Cation Ratio:	1
Carbon Dioxide:	0 50 PPM
Oxygen:	
Comments:	

Analysis of Sample 534665 @ 75 °F

Anions	mg/l	meq/l	Cations	mg/l	meq/l
Chloride:	109618.0	3091.92	Sodium:	70275.7	3056.82
Bicarbonate:	2135.0	34.99	Magnesium:	195.0	16.04
Carbonate:	0.0	0.	Calcium:	844.0	42.12
Sulfate:	747.0	15.55	Strontium:	220.0	5.02
Phosphate:			Barium:	0.8	0.01
Borate:			Iron:	6.5	0.23
Silicate:			Potassium:	869.0	22.22
			Aluminum:		
Hydrogen Sulfide:		0 PPM	Chromium:		
pH at time of sampling:		7	Copper:		
pH at time of analysis:			Lead:		
pH used in Calculation:		7	Manganese:	0.100	0.
			Nickel:		

Conditions		Values Calculated at the Given Conditions - Amounts of Scale in lb/1000 bbl										
Temp	Gauge Press.	Calcite $CaCO_3$		Gypsum $CaSO_4 * 2H_2O$		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	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	-1.38	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.

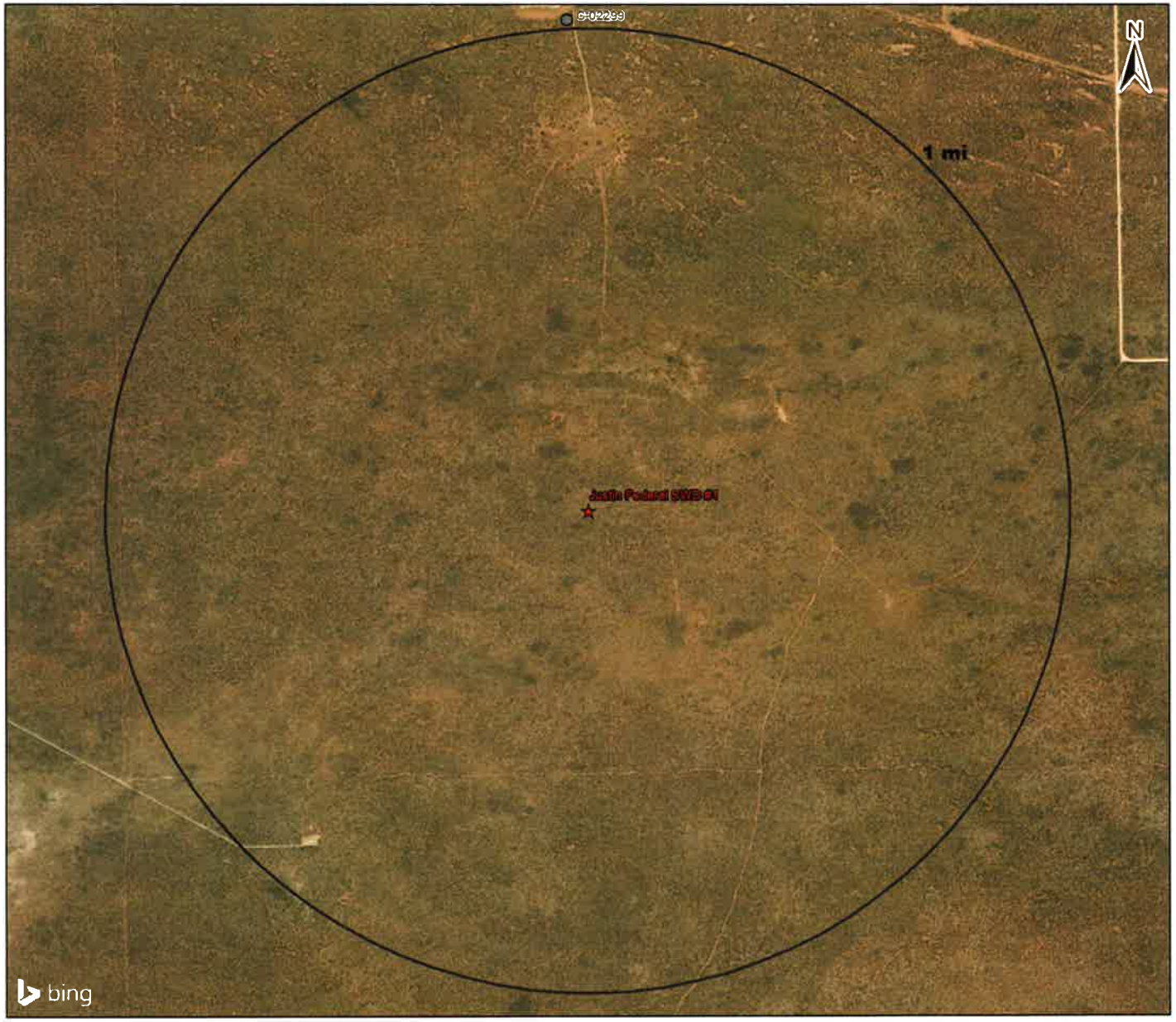
Attachment 4

Injection Formation Water Analyses

Injection Formation Water Analysis																	
Vista Disposal Solutions, LLC - Devonian and Silurian-Fusselman Formations																	
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	C	600N	1880W	LEA	NM		CUSTER	DEVONIAN	176234	107400	128	1004
FARNSWORTH FEDERAL #006	3002511950	32.077725	-103.162468	4	26S	37E	A	660N	990E	LEA	NM		CROSBY	DEVONIAN	31931	20450	302	591
ARNOTT RAMSAY NCT-B #003	3002511863	32.092228	-103.1784439	32	25S	37E	A	660N	660E	LEA	NM		CROSBY	DEVONIAN		100382	476	
ARNOTT RAMSAY NCT-B #003	3002511863	32.092228	-103.1784439	32	25S	37E	A	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	A	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	A	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	C	660N	2080W	LEA	NM		JUSTIS	FUSSELMAN	63817	35870	360	3442
CARLSON A #002	3002511764	32.100384	-103.1113434	25	25S	37E	I	2310S	990E	LEA	NM		JUSTIS	FUSSELMAN	208280	124000	510	3400
CARLSON B 25 #004	3002511784	32.096756	-103.1113434	25	25S	37E	P	990S	990E	LEA	NM		JUSTIS	FUSSELMAN	184030	112900	68	1806

Attachment 5

Water Well Map and Well Data



0 0.25 0.5 1 Miles

Legend

- ★ Proposed SWD

NMOSE PODs

Status

- Active (0)
- Pending (0)
- Change Location of Well (0)
- Capped (0)
- Plugged (0)
- Incomplete (0)
- Unknown (1)

Water Wells Area of Review

Justin Federal SWD #1

Lea County, New Mexico

Proj Mgr: Dan Arthur	August 05, 2019	Mapped by: Ben Bockelmann

Prepared by:

ALL CONSULTING

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

Attachment 6

Induced Seismicity Assessment Letter

ALL CONSULTING
GOVERNMENT RELATIONS · ENERGY · PLANNING · TECHNOLOGY
ENGINEERING · ENVIRONMENTAL

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 Justin 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 Justin 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 2,401 FNL & 194 FEL of Section 25, in T25-S and R34-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 14.0 miles northwest 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 2.9 miles to the northwest (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 2.9 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

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." http://www.beg.utexas.edu/resprog/permianbasin/PBGSP_members/writ_synth/Simpson.pdf (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. https://earthquake.usgs.gov/earthquakes/search/ (accessed June 14, 2018).

Exhibits

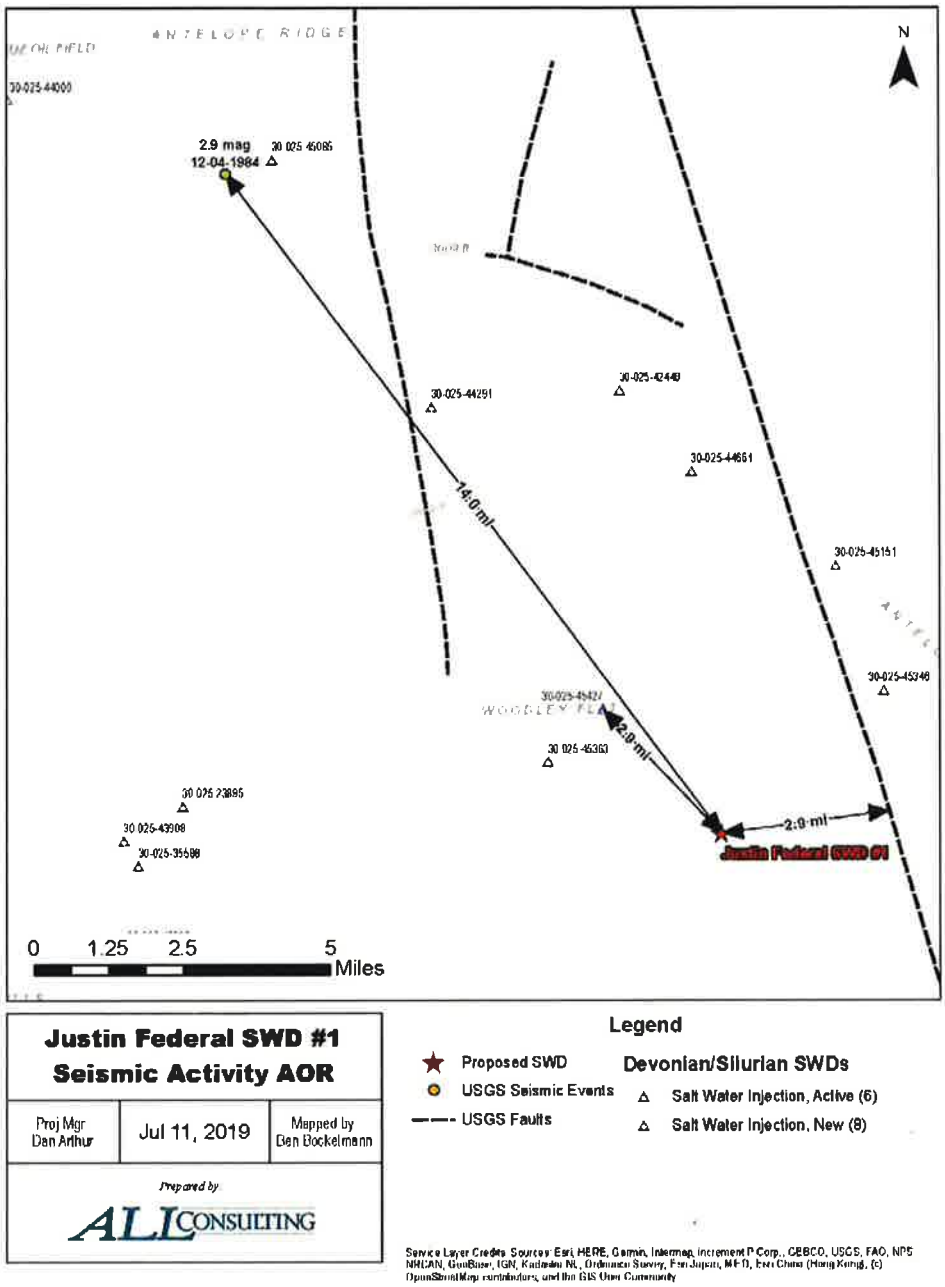


Exhibit 1. Map Showing the Distances from Known and Inferred Faults, Seismic Event, and Closest Deep Injection Well

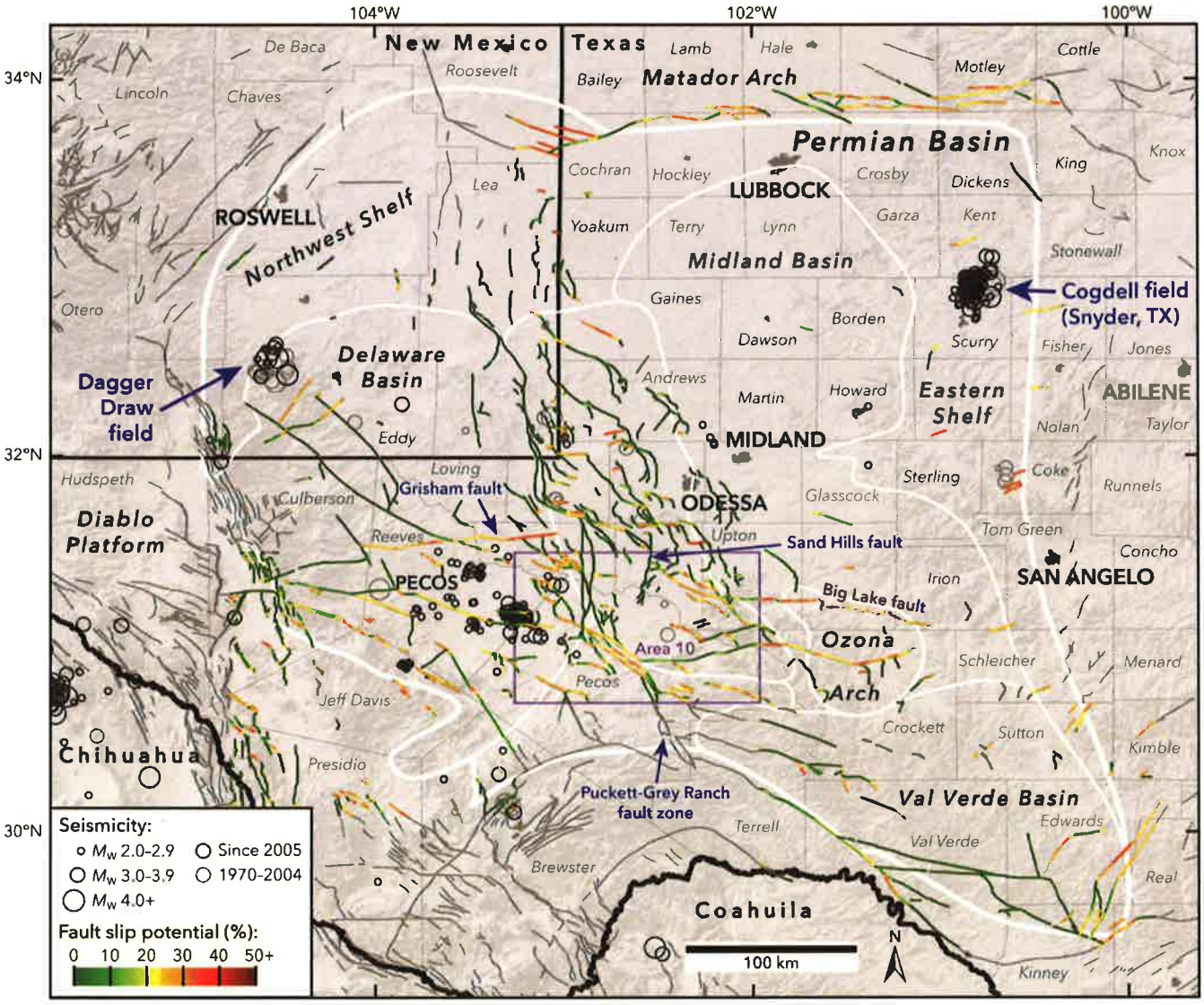


Exhibit 2. Results of the Snee and Zoback (2018) Probabilistic FSP Analysis Across the Permian Basin

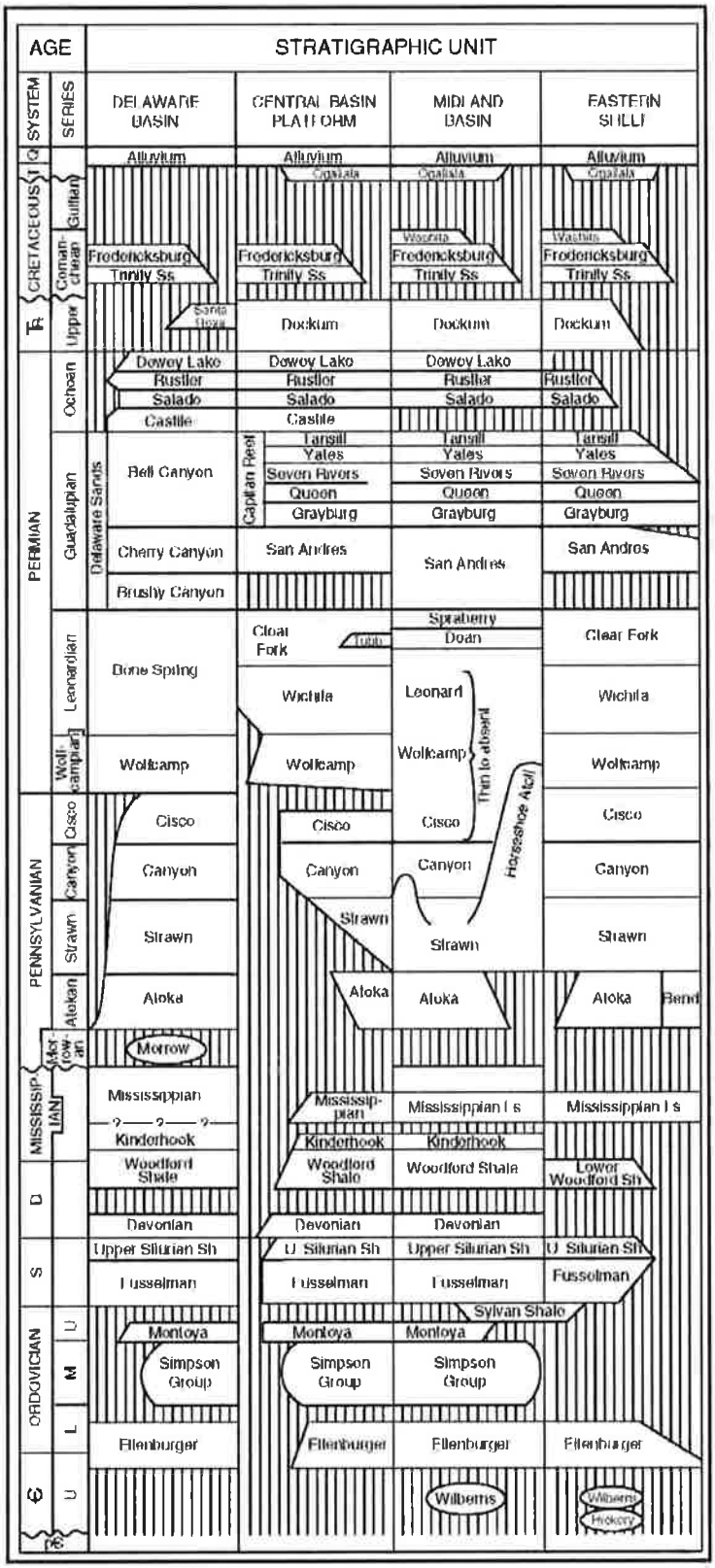


Exhibit 3. Delaware Basin Stratigraphic Chart (Ball 1995)

Attachment 7

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 11, 2019
and ending with the issue dated
July 11, 2019.

Publisher

Sworn and subscribed to before me this
11th day of July 2019.

Business Manager

My commission expires
January 29, 2023
(Seal)

OFFICIAL SEAL
GUSSIE BLACK
Notary Public
State of New Mexico
My Commission Expires 1-29-23

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

LEGAL LEGAL

LEGAL NOTICE
JULY 11, 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:

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: Justin Federal SWD #1
SE ¼ NE ¼, Section 25, Township 25S, Range 34E
2,401' FNL & 194' FEL
Lea County, NM

NAME AND DEPTH OF DISPOSAL ZONE: Devonian – Silurian (18,120 – 19,300)
EXPECTED MAXIMUM INJECTION RATE: 30,000 Bbls/day
EXPECTED MAXIMUM INJECTION PRESSURE: 3,624 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.
#34421

67115320 00230672

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

36

Justin Federal SWD #1 - Notice of Application Recipients				
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				
Bank of America (BANK OF AMERICA, N.A. ESTATE OF FRED LUTHY)	Corporate Trust Administration 550 S. Hope St., Suite 500	Los Angeles	CA	90071
COG Operating, LLC (COG OPERATING LLC)	600 W. Illinois Ave.	Midland	TX	79701
COG Production, LLC (COG PRODUCTION LLC)	600 W. Illinois Ave.	Midland	TX	79701
Commision of Public Lands - State Land Office	310 Old Santa Fe Trail	Santa Fe	NM	87501
Energen Resources Corporation (ENERGEN RESOURCES CO)	2010 Afton Pl.	Farmington	NM	87401
EOG Resources, Inc. (EOG RESOURCES INC)	4000 N. Big Spring St, Suite 500	Midland	TX	79705
Estate of Fred Luthy	P.O. Box 2546	Fort Worth	TX	76113

Notes: The table above shows the Entities who were identified as parties of interest requiring notification on either the 1-mile well detail list (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).

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Carlsbad NM 88220-6292

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

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VOID

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State Land Office
310 Old Santa Fe Trail
Santa Fe NM 87501-2708

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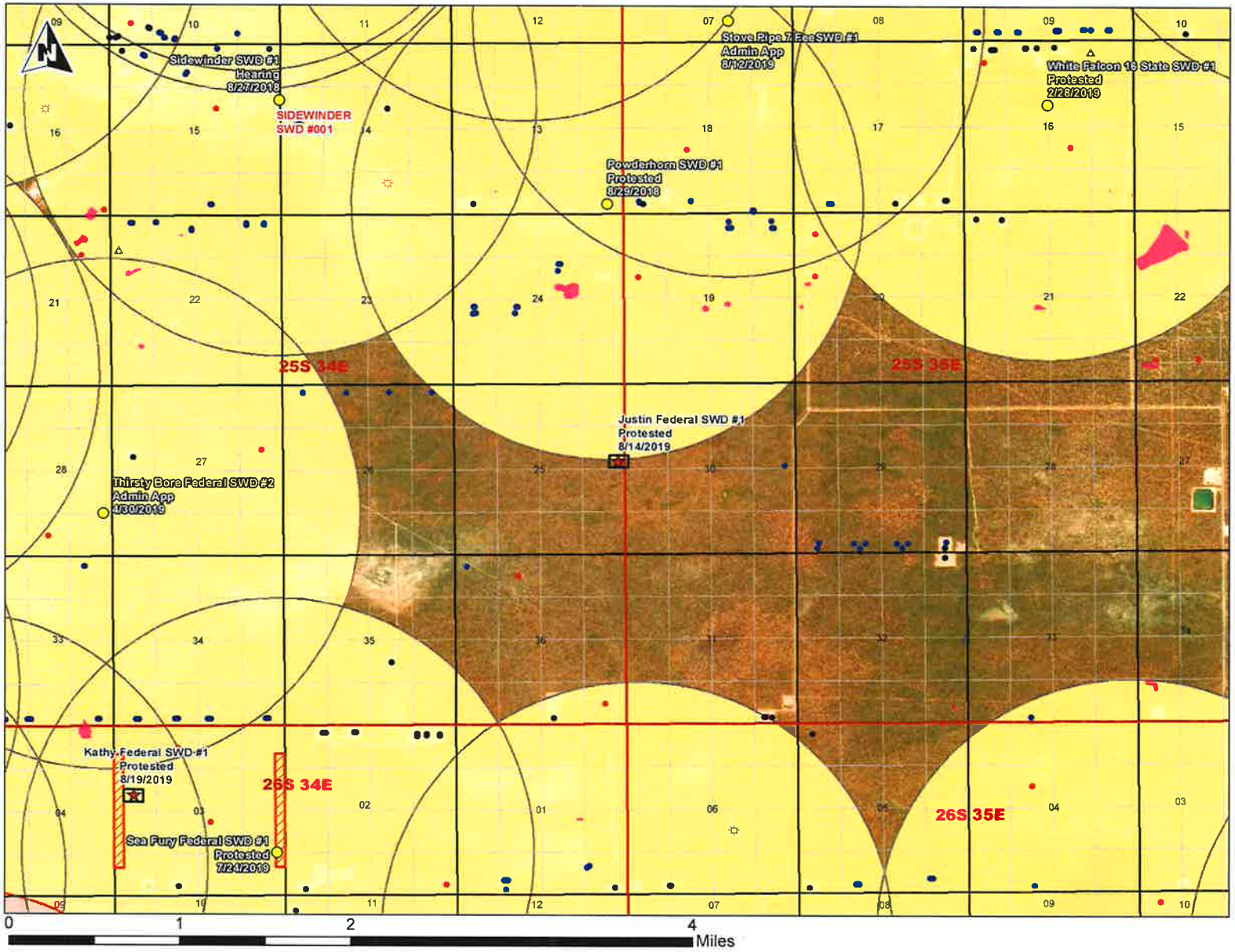
Commission of Public Lands
State Land Office
310 Old Santa Fe Trail
Santa Fe NM 87501-2708

40

Justin Federal SWD #1



Prepared for:

Vista Disposal Solutions

Legend

- Vista Proposed SWD
- Pending Deep SWDs
- Existing Deep SWDs
- Gas, Active
- Gas, New
- Gas, Plugged
- Oil, Active
- Oil, New
- Oil, Plugged
- Salt Water Injection, Active
- Salt Water Injection, New
- Proposed Well Pad
- EOG Recommended Area
- Archaeological Sites
- Existing Deep SWDs - 1.5-mile buffer
- Pending Deep SWDs - 1.5-mile buffer

SWDs Source: Pending & Existing Deep SWDs provided by NMOCD on 9/24/2019.

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared by:

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OCD Case# 20803
VISTA DISPOSAL SOLUTIONS, LLC
October 3, 2019
Ex#2

Vista Disposal Solutions, LLC

Fault Slip Potential Analysis

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OCD Case# 20803
VISTA DISPOSAL SOLUTIONS, LLC
October 3, 2019
Ex#3

FSP Methodology

- 2 FSP areas (100 square miles each) in southeast New Mexico located to include all proposed Vista SWDs.
- Exact geologic conditions of the FSP areas are unknown.
- Two scenarios modeled for each FSP area using range of possible geologic conditions based on nearby geophysical logs.
- Scenario 1 uses low end of possible geologic conditions.
- Scenario 2 uses high end of possible geologic conditions.
- Each scenario modeled over 25 years. Stress gradients and pore pressure gradients derived from published papers (Snee and Zoback 2018).
- Reference depth, injection interval thickness, porosity, and permeability derived from nearby geophysical logs penetrating the injection interval (New Mexico OCD 2019, see appendix).
- No mapped or known sedimentary or Precambrian faults in the 100 square mile area of review for FSP area 1. Two mapped Precambrian faults in the 100 square mile area of review for FSP area 2. (USGS 2019, Ruppel et al 2005, and Wilson 2018).
- Random faults generated for FSP area 1 using strike and dip consistent with known high-angle normal faulting regime in southeast New Mexico (USGS 2019, Snee and Zoback 2018).
- Advanced geological parameters derived from well logs and confirmed with previous expert testimony in the region (Reynolds 2019).

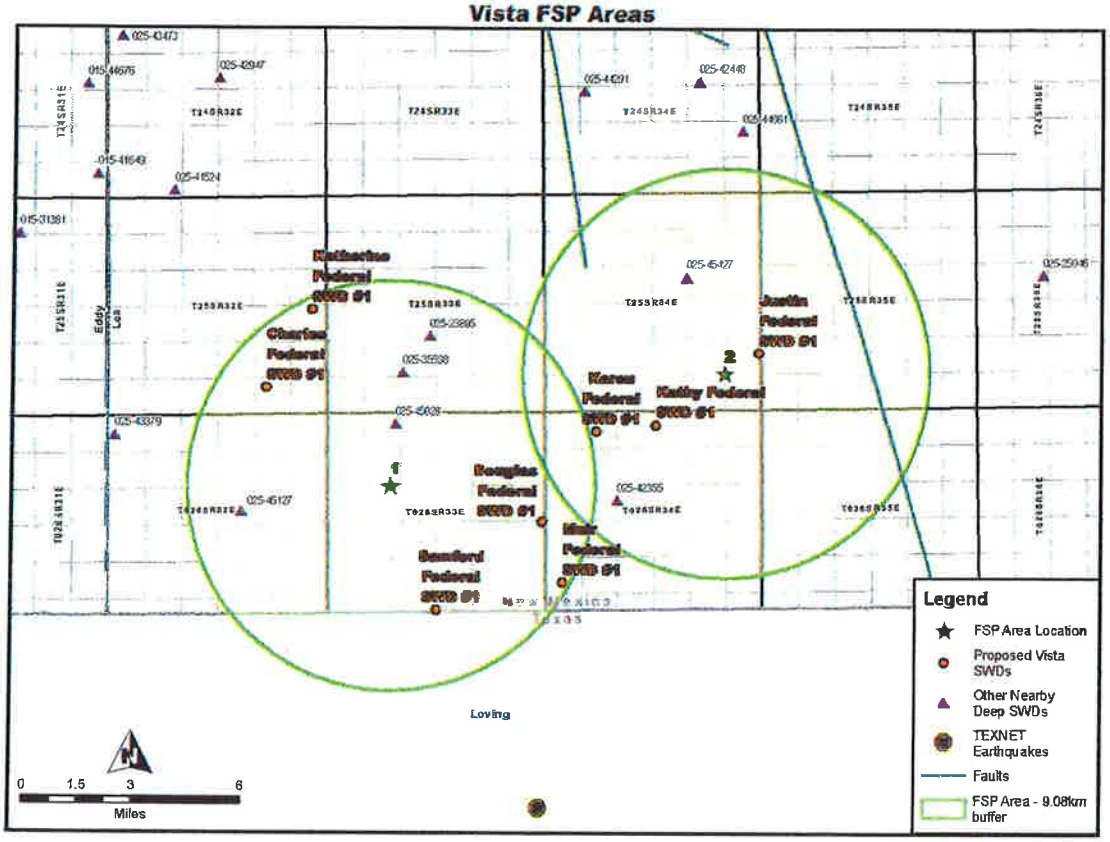
Parameters

Parameter	Value	Source
Vertical Stress Gradient (psi/ft)	1.1	Snee and Zoback (2018)
Horizontal Stress Direction (degrees azimuth)	75	Snee and Zoback (2018)
Reference Depth (ft)	17,500-17,900	Well Logs NMOCD (2019)
Initial Reservoir Pressure Gradient (psi/ft)	0.44	Snee and Zoback (2018)
A Phi	0.7 (normal faulting)	Snee and Zoback (2018)
Friction Coefficient	0.7	Snee and Zoback (2018)
Thickness with High Porosity (ft)	100-250	Well Logs NMOCD (2019)
Porosity (%)	5-10	Well Logs NMOCD (2019)
Permeability (mD)	10-100	Well Logs NMOCD (2019)
Fault Strike Minimum (degrees)	140	Snee and Zoback (2018)
Fault Strike Maximum (degrees)	190	Snee and Zoback (2018)
Fault Dip Minimum (degrees)	50	Snee and Zoback (2018)
Fault Dip Maximum (degrees)	90	Snee and Zoback (2018)
Density (kg/m^3)	1000	ALL Research and Reynolds (2019)
Dynamic Viscosity (Pa*s)	0.0003	ALL Research and Reynolds (2019)
Fluid Compressibility (Pa^-1)	4.70E-10	ALL Research and Reynolds (2019)
Rock Compressibility (Pa^-1)	8.70E-10	ALL Research and Reynolds (2019)

Injection Data

- 5 deep class II injection wells active in 2019 within 2 areas of review (see appendix).
- No active deep class II injection wells within included Texas region (TX RRC 2019).
- Monthly average injection rates calculated from injection start-date through July 2019 (see appendix).
- 8 proposed Vista SWDs within 2 areas of review.
- Proposed Vista SWDs assumed to inject at proposed maximum rate of 30,000 bpd.

FSP Areas



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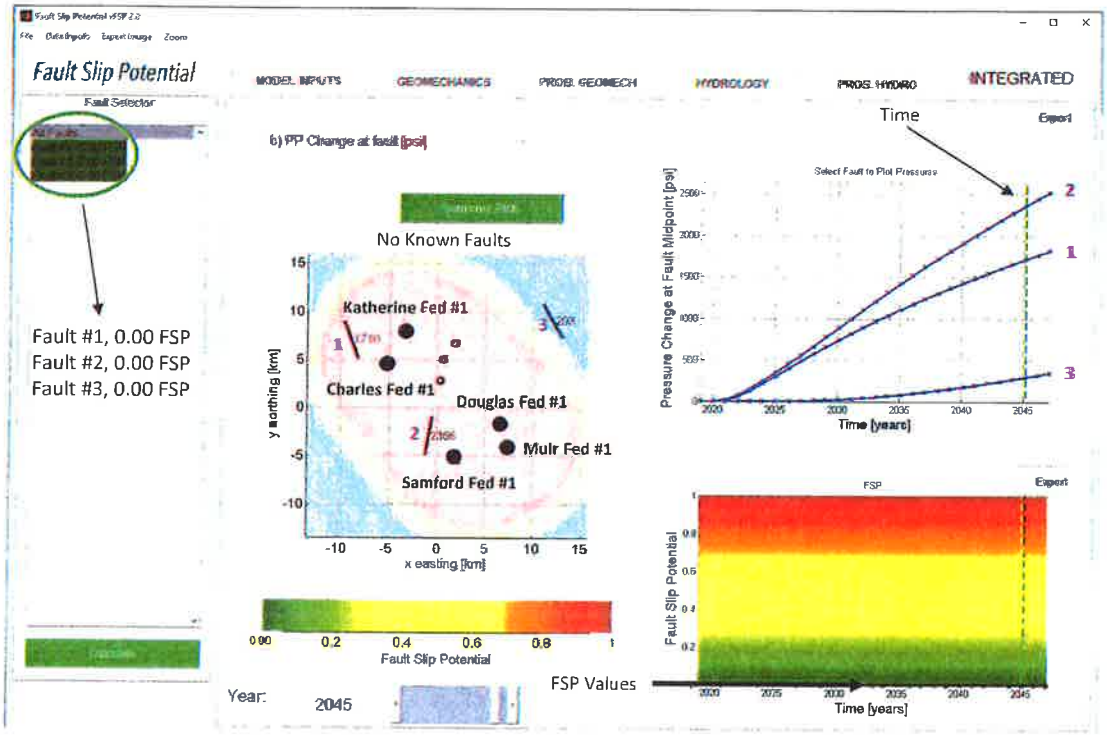
FSP After 25 Years - Area 1 - Scenario 1



Parameters

Estimated Porosity
5%

Estimated Permeability
10 mD

Estimated Injection Interval
17,500 – 18,800 ft

Estimated Thickness with High (5%) Porosity
100 ft

● = Proposed Vista SWDs
□ = Other Deep SWDs

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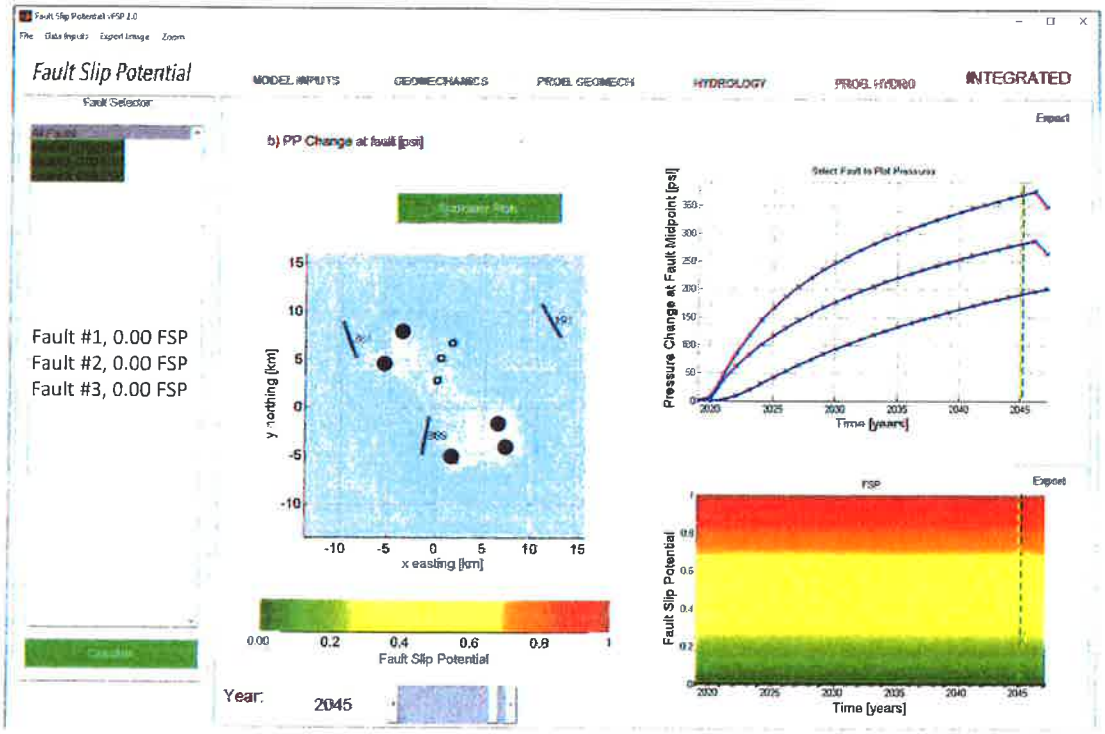
FSP After 25 Years - Area 1 - Scenario 2



Parameters

Estimated Porosity
10%

Estimated Permeability
100 mD

Estimated Injection Interval
17,500 – 18,800 ft

Estimated Thickness with High (10%) Porosity
250 ft

● = Proposed Vista SWDs
□ = Other Deep SWDs

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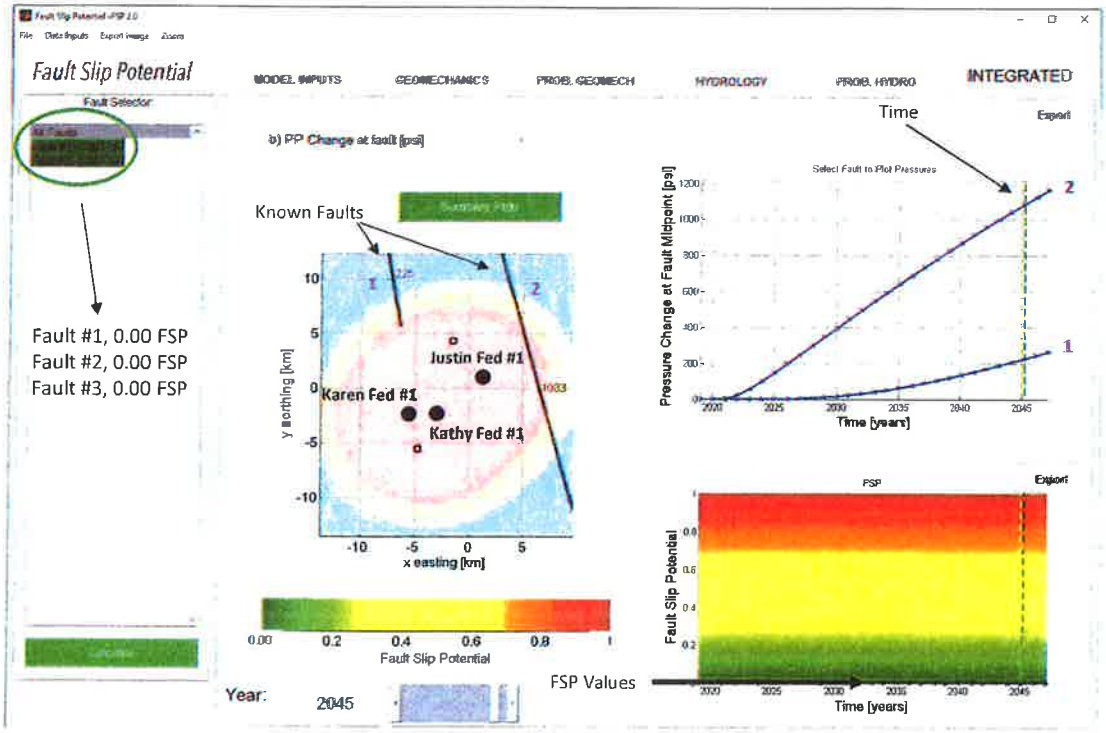
FSP After 25 Years - Area 2 - Scenario 1



Parameters

Estimated Porosity
5%

Estimated Permeability
10 mD

Estimated Injection Interval
17,900 – 19,100 ft

Estimated Thickness with High (5%) Porosity
100 ft

● = Proposed Vista SWDs
□ = Other Deep SWDs

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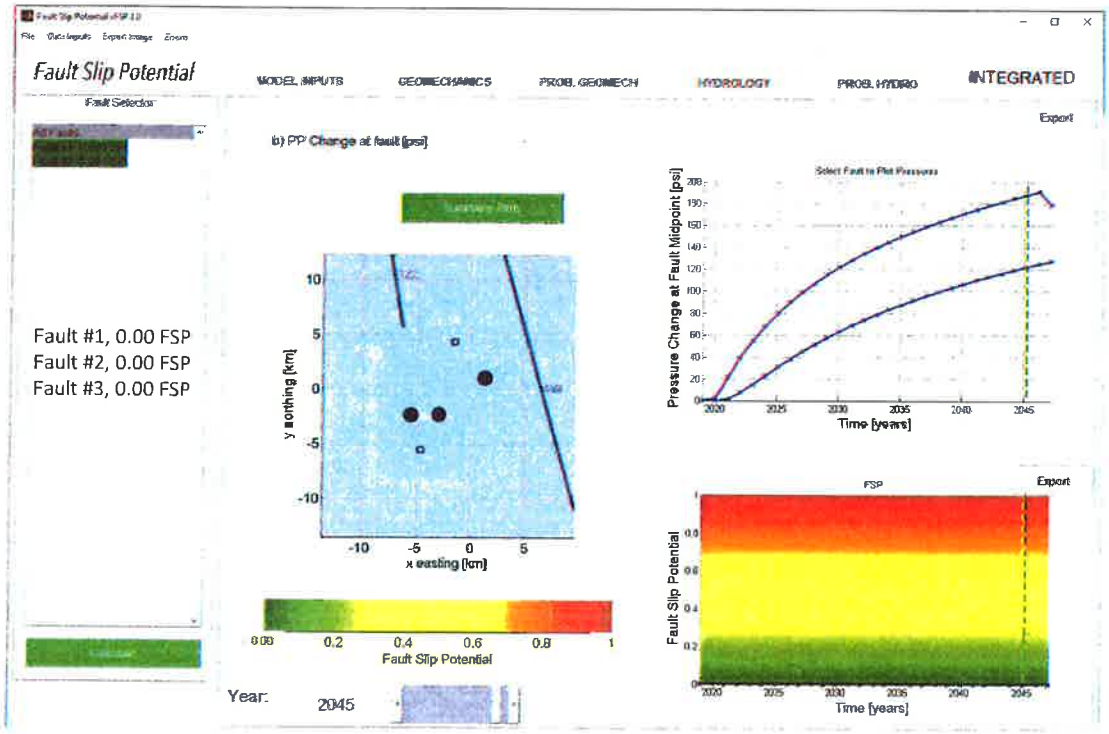
FSP After 25 Years - Area 2 - Scenario 2



Parameters

Estimated Porosity
10%

Estimated Permeability
100 mD

Estimated Injection Interval
17,900 – 19,100 ft

Estimated Thickness with High (10%) Porosity
250 ft

● = Proposed Vista SWDs

□ = Other Deep SWDs

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Conclusions

- There are two mapped Precambrian faults in the 100 square mile review of FSP area 2, which each show FSP of 0.00 over 25 years in both high and low geologic scenarios.
- Faults generated for FSP area 1, consistent with known high-angle normal faulting regime in southeast New Mexico, all show FSP of 0.00 over 25 years in both high and low geologic scenarios.
- Known faults in southeast New Mexico do not align with the horizontal stress field and are not likely to slip.
- FSP modeling through 25 years, with injection rates that are likely overestimated, shows no risk of potential fault slip in the areas of review.
- These areas present little to no risk for injection induced seismicity.

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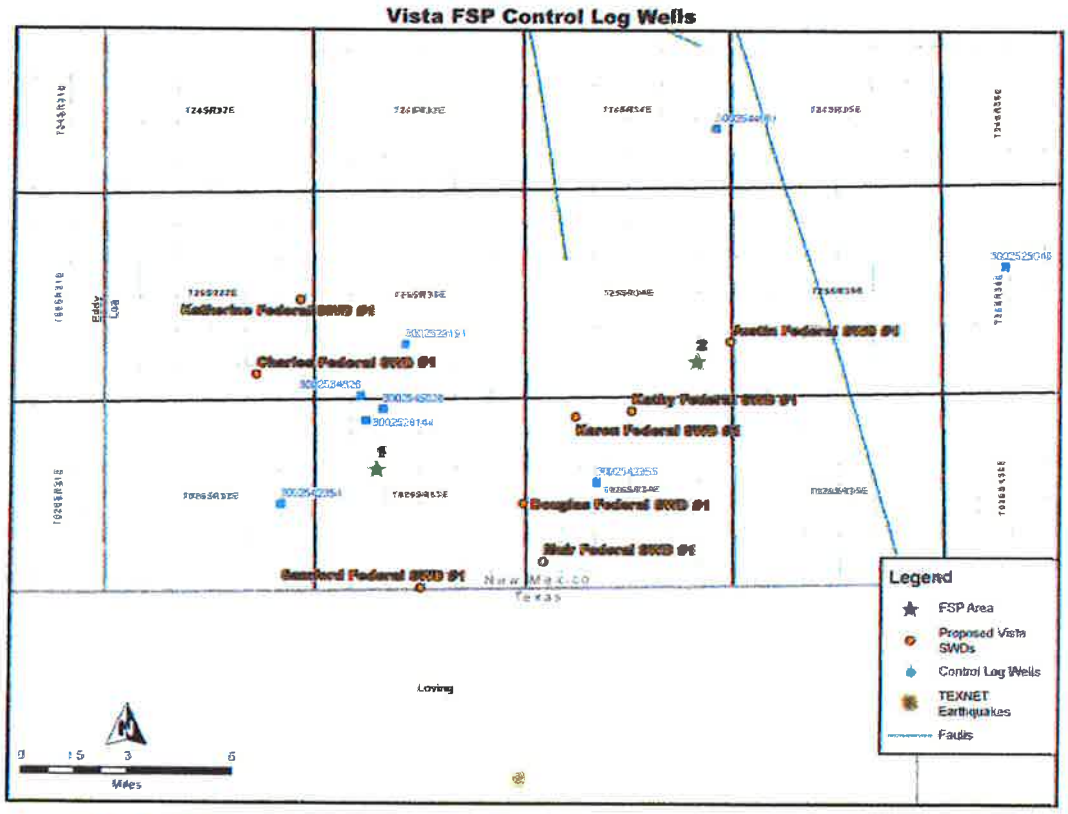
Appendix

Control Log Well Details
and Nearby Deep SWDs Injection Data

Control Log Wells



30-025-45028
Dev/Sil logged from 17,430' to 18,900' (partial)

30-025-42354
Dev/Sil logged from 17,730' to 18,675' (partial)

30-025-42355
Dev/Sil logged from 18,610' to 20,071' (complete)

30-025-28144
Dev/Sil logged from 17,446' to 17,600' (partial)

30-025-29191
Dev/Sil logged from 17,427' to 17,580' (partial)

30-025-34626
Dev/Sil logged from 17,448' to 17,665' (partial)

30-025-44661
Dev/Sil logged from 17,350' to 19,100' (complete)

30-025-25046
Dev/Sil logged from 15,381' to 16,972' (complete)

Note: Approximately 100-250 feet of >5% porosity within injection interval.

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Data Source: New Mexico OCD 2019

Nearby Deep SWD Injection Data

Vista - Deep SWDs Within FSP Areas				
FSP Area	API #	Well Name	Average Daily Injection Rate (BWPD)	Injection Start-Date
1	30-025-45028	Red Hills SWD #001 (Devonian-Montoya)	13,560	Dec - 2018
1	30-025-35598	Red Hills SWD #001 (Devonian)	893	Oct - 2001
1	30-025-23895	Vaca Draw Federal SWD #001	10,491	Jul - 2017
1	30-025-45127	Maelstrom Federal SWD #001*	0	N/A
2	30-025-45427	Sidewinder SWD #001	1,695	Jul - 2019
2	30-025-42355	Rattlesnake 16 SWD #001	5,895	Dec - 2015

* Not Included in models

Geological Analysis of the Proposed Vista SWDs in Lea County, New Mexico

Prepared by:

ALL CONSULTING

GOVERNMENT RELATIONS · ENERGY · PLANNING · TECHNOLOGY
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September 2019

OCD Case# 20803
VISTA DISPOSAL SOLUTIONS, LLC
October 3, 2019
Ex#4

Introduction

The Vista Disposal Solutions, LLC (Vista) Devonian-Silurian saltwater disposal well (SWDs) applications, which includes the Charles Federal SWD #1, Douglas Federal SWD #1, Justin Federal SWD #1, Katherine Federal SWD #1, Muir Federal SWD #1, Kathy Federal SWD #1, and Samford Federal SWD #1 (see **Appendix A**) have been protested and are scheduled for hearing with the New Mexico Oil Conservation Division (OCD). ALL Consulting (ALL) has performed the following technical evaluation and assessment of the Devonian-Silurian injection reservoir geology along with the upper and lower confining zones of the proposed permitted injection intervals.

Devonian-Silurian Injection Reservoir and Confining Zones

The Devonian-Silurian injection reservoir consists of four primary carbonate formations within southern Lea county (see **Appendix B**):

Upper Confining Zone:

- **Woodford Shale** - The Upper Devonian Woodford Shale Formation consists of black shale with low porosity and permeability development. This formation acts as an upper confining layer for the Devonian-Silurian injection reservoir (Broadhead 2005).

Devonian-Silurian Injection Formations:

- **Thirty-One Formation** - The Thirty-One Formation is Lower Devonian in age and consists of cherty limestone and dolomite that has undergone significant alteration since deposition, primarily by means of carbonate dissolution, leading to karst zones. It is a highly heterogeneous formation due to localized variations in porosity development, which generally ranges from 5 to 25% (Hill 1996, Ruppel 2006).
- **Wristen Formation** - The Upper Silurian Wristen Formation consists of dolomite with some shale zones, and varying amounts of karst zones (Hill 1996).
- **Fusselman Formation** - The Fusselman Formation is Lower Silurian in age and consists of crystalline dolomite with a heavily eroded top surface. Paleokarst is distributed throughout the formation, which adds to heterogeneity of porosity and permeability development (Hill 1996, Ruppel 2006).

Lower Confining Zone:

- **Montoya and Simpson Group** - The lower confining zone for the Devonian-Silurian injection zone is the Montoya Group and the Simpson Group. The Montoya Group is Upper Ordovician in age and is composed of calcareous dolomite with some units of interbedded shales or limestones with chert and is dense, impermeable, and non-porous (Hill 1996). The Middle Ordovician Simpson Group contains a series of shales that has some limestones and sandstone units in it (Hill 1996).

Local Devonian-Silurian Geology

Completion reports and open hole geophysical resistivity and porosity logs from existing Devonian-Silurian SWDs in the vicinity of the proposed Vista SWDs have been assessed and analyzed. ALL determined the following from these completion reports and open hole logs:

Woodford Shale:

- Thickness data available via completion reports from seven existing Devonian-Silurian SWDs in the vicinity (see **Appendix C**).
    - Average thickness of 200 ft.

Devonian-Silurian Injection Formations:

- Thickness data available via completion reports from five existing Devonian-Silurian SWDs in the vicinity (see **Appendix C**).
    - Average thickness of 1,597 ft.
- Open hole geophysical logs available from eight existing Devonian-Silurian SWDs in the vicinity (see **Appendix C**).
    - Based on the analysis of the porosity and resistivity logs, the average porosity thickness is approximately 200 feet, with porosities ranging from 2 to 15% and averaging about 6%.
    - The better porosity zones on the logs indicate the presence of fractures or vugs (small borehole enlargement on the caliper log), so most of the porosity and permeability in the Devonian-Silurian formations seem to be secondary porosity development.

Montoya and Simpson Groups:

- Thickness data available via completion reports from two existing Devonian-Silurian SWDs located approximately fifteen miles north of the proposed Vista SWDs (See **Appendix C**).
    - Average thickness of 962 ft.
- Thickness maps (Jones 2008) show approximately 100-200 ft of Montoya and 750-1000 ft of Simpson present in the vicinity of the proposed Vista SWDs (see **Appendix D**).
- A well drilled by Amerada Hess (API No. 30-025-33077) in 1995 Section 6 of Lea County encountered the top of the Montoya Group a depth of 16,141 feet and the base was at 16,538 feet. An analysis of geophysical logs across the Montoya Group indicates a very tight zone of rock from a depth of 16,240 to 16,526 (286 feet), which would act as a lower confining barrier to fluid flow below the Silurian Fusselman Formation.

Depth to Basement

In the Lea county area of New Mexico, the Montoya and Simpson Groups are comprised of a series of Middle to Upper Ordovician carbonates, several sandstones, and sandy shales that range from approximately 850 to 1,200 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 basement 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 1,650 to 2,000 feet below the bottom of the proposed injection zones at the proposed Vista SWDs.

Conclusions

In the sections above, ALL has evaluated and assessed the Devonian-Silurian injection reservoir geology and containment of the injectate to the permitted formations. Based on the analysis performed, it is logical to conclude the Devonian-Silurian injection reservoir is a highly heterogeneous group of carbonate rocks dominated by karstic features and secondary porosity, with little to no potential for disposed fluids to escape the intended injection zones.

References

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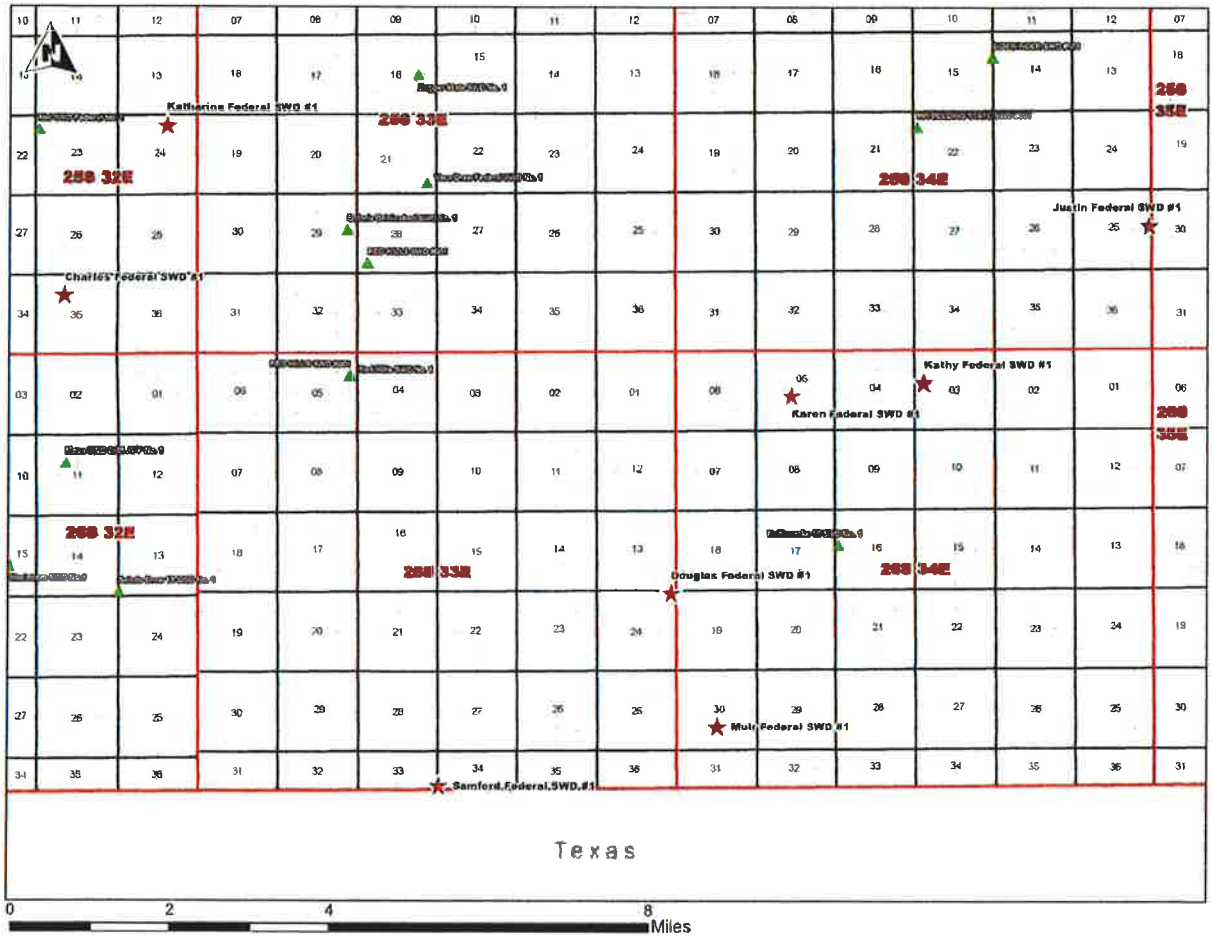
Appendix A

Proposed Vista SWD Location Map

Appendix A – Proposed Vista SWD Locations and Nearby Devonian-Silurian SWDs



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VISTA RESOURCES

Legend

- Proposed Vista SWDs
- Existing & Permitted Deep SWDs

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Appendix B

Delaware Basin Stratigraphic Column

Appendix B – Generalized Delaware Basin Stratigraphic Column
Source: Broadhead 2005

<table>
<tr><th>System</th><th>Series</th><th>Lithostratigraphic unit</th></tr>
<tr><td rowspan="4">Mississippian</td><td>Chesterian</td><td colspan="2" rowspan="2">undivided</td></tr>
<tr><td>Meramecian</td></tr>
<tr><td>Osagian</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Kinderhookian</td></tr>
<tr><td rowspan="3">Devonian</td><td>Upper</td><td colspan="2">Woodford Shale</td></tr>
<tr><td>Middle</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Lower</td><td colspan="2">Thirtyone Fm.</td></tr>
<tr><td rowspan="5">Silurian</td><td>Pridolian</td><td rowspan="3">Wristen Gp.</td><td rowspan="3">Fasken Fm.</td><td>Frame Fm.</td></tr>
<tr><td>Ludlovian</td><td rowspan="2">Wink Fm.</td></tr>
<tr><td>Wenlockian</td></tr>
<tr><td rowspan="2">Llandoverian</td><td colspan="3"></td></tr>
<tr><td colspan="3">Fusselman Fm.</td></tr>
<tr><td rowspan="3">Ordovician</td><td rowspan="2">Upper</td><td colspan="3">Montoya Fm.</td></tr>
<tr><td colspan="3" rowspan="2">Simpson Gp.</td></tr>
<tr><td>Middle</td></tr>
<tr><td>Lower</td><td colspan="3">Ellenburger Fm.</td></tr>
</table>

Appendix C

Completion Report and Geophysical Log Data

Appendix C – Formation Top Data from Nearby Devonian-Silurian SWDs
Data Source: New Mexico OCD 2019

Formation Top Data - Nearby Devonian-Silurian SWDs				
API	Woodford Top (ft)	Dev/Sil Top (ft)	Montoya Top (ft)	Ellenburger Top (ft)
30-025-26188	17,255	17,412	ND	ND
30-025-28144	17,292	17,446	ND	ND
30-025-29191	17,271	17,427	ND	ND
30-025-34626	17,287	17,448	ND	ND
30-025-42354	17,405	17,730	ND	ND
30-025-43379	ND	17,302	18,854	ND
30-025-45028	ND	17,430	ND	ND
30-025-42355	18,415	18,610	20,071	ND
30-025-44661	17,100	17,350	19,100	ND
30-025-33077	ND	14,571	16,141	17,125
30-025-32672	ND	14,558	16,211	17,150

ND = No Data

Appendix C – Formation Thickness Data from Nearby Devonian-Silurian SWDs
Data Source: New Mexico OCD 2019

Formation Thickness Data - Nearby Devonian-Silurian SWDs			
API	Woodford Thickness (ft)	Dev/Sil Thickness (ft)	Montoya/Simpson Thickness (ft)
30-025-26188	157	ND	ND
30-025-28144	154	ND	ND
30-025-29191	156	ND	ND
30-025-34626	161	ND	ND
30-025-42354	325	ND	ND
30-025-43379	ND	1,552	ND
30-025-45028	ND	ND	ND
30-025-42355	195	1,461	ND
30-025-44661	250	1,750	ND
30-025-33077	ND	1,570	984
30-025-32672	ND	1,653	939

ND = No Data

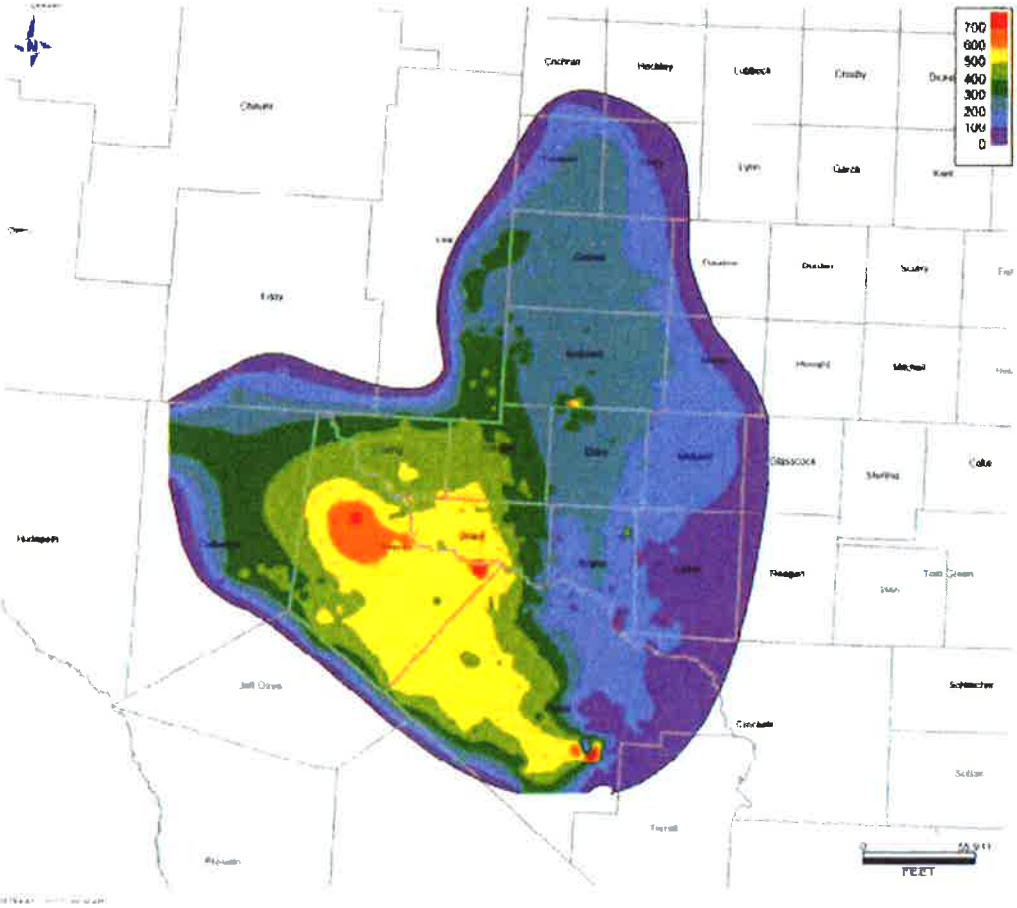
Appendix C –Geophysical Logs from Nearby Devonian-Silurian SWDs
Data Source: New Mexico OCD 2019

Geophysical Logs - Nearby Devonian-Silurian SWDs		
API #	Dev/Sil Logged (ft)	Complete/Partial
30-025-45028	17,430 to 18,900	Partial
30-025-42354	17,730, to 18,675	Partial
30-025-42355	18,610 to 20,071	Partial
30-025-28144	17,446 to 17,600	Partial
30-025-29191	17,427 to 17,580	Partial
30-025-34626	17,448 to 17,665	Partial
30-025-44661	17,350 to 19,100	Complete

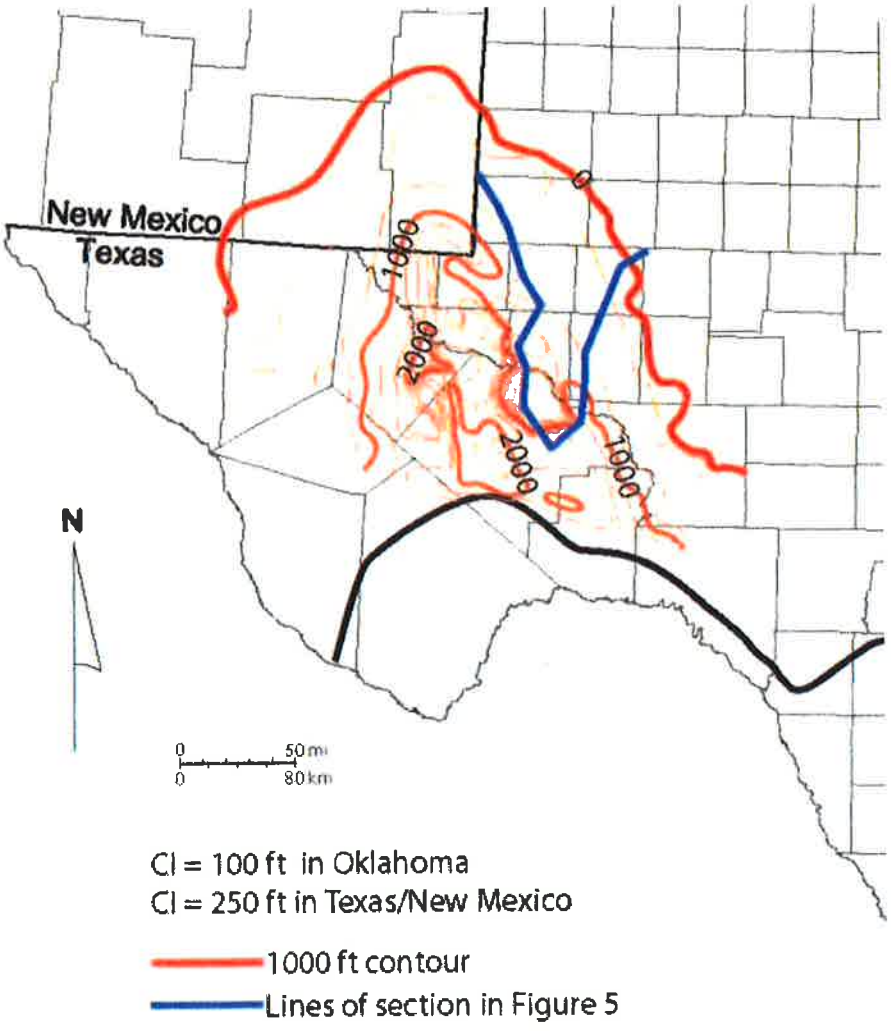
Appendix D

Montoya and Simpson Thickness Maps

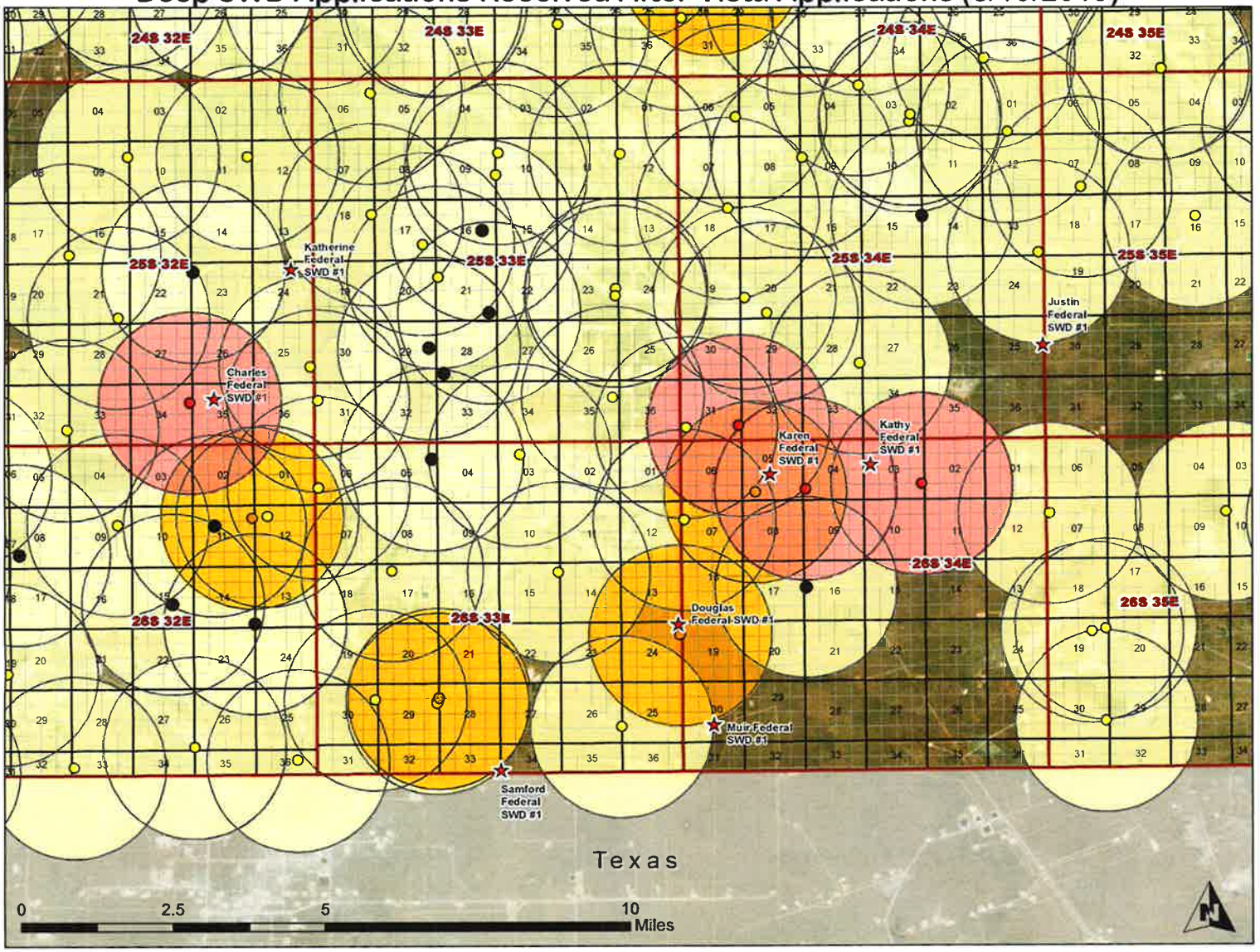
Appendix D –Montoya Formation Thickness Map
Source: Jones 2008



Appendix D –Simpson Formation Thickness Map
Source: Jones 2008



Deep SWD Applications Received After Vista Applications (8/19/2019)



Prepared for:

Vista Disposal Solutions

Legend

- Proposed Vista SWDs
- Existing Deep SWDs
- Deficient Deep SWD Applications
- Deep SWD Applications Received After Vista Applications (8/19/2019)
- Pending Deep SWDs
- Deficient Deep SWD Applications - 1.5-mile buffer
- Deep SWD Applications Received After Vista Applications (8/19/2019) - 1.5-mile buffer
- Deep SWDs - 1.5-mile buffer

Prepared by:

ALI CONSULTING

OCD Case# 20803
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October 3, 2019
Ex#5