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

APPLICATION OF	§	
KEY ENERGY SERVICES, LLC	§	
FOR A SALTWATER DISPOSAL WELL,	§	
KNOWN AS THE QUEEN LAKE FEDERAL	§	
19 NO. 1, SECTION 19, T-24-S, R-29-E,	§	
EDDY COUNTY, NEW MEXICO	§	CASE NO. 20583

APPLICATION

KEY ENERGY SERVICES, LLC ("Key Energy"), OGRID No. 19797, by and through its undersigned attorneys, hereby makes this application to the Oil Conservation Division pursuant to the provisions of N.M. Stat. Ann. §70-2-12, for an order approving a saltwater disposal well in Eddy County, New Mexico. In support of this application, Key Energy states as follows:

1. Key Energy proposes to re-enter, sidetrack and convert the Queen Lake Federal 19 No. 1 Well (API No. 30-015-24292) to a commercial saltwater disposal well. The well is at a surface location of 1,950 feet from the North line and 1,980 feet from the East line of Section 19, Township 24 South, Range 29 East, NMPM, Eddy County, New Mexico.

2. Key Energy seeks authority to inject saltwater into the Devonian Formation at a depth of 14,500' to 16,000'.

3. Key Energy further seeks approval of the use of 13-3/8" surface casing with cement circulated to surface, 9-5/8" intermediate casing with cement circulated to surface, 7" production casing with top of cement at 4,412 feet, 5" injection liner with top of cement at 10,700 feet, and 4-1/2 x 2-7/8" tubing, and requests that the Division approve a maximum daily injection rate for the well of 15,000 barrels per day.

4. Key Energy anticipates using an average of 1,000 psig for this well, and it requests that a maximum pressure of 2,900 psig be approved for the well.

5. By cover letter dated March 29, 2019, Key Energy submitted a Form C-108 for the subject well, with supporting materials, for review by the Division. These documents are attached hereto as Exhibit A.

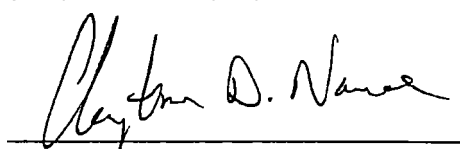
6. By email dated May 16, 2019, Key Energy submitted additional documentation to support its application, at the request of the Division. These documents are attached hereto as Exhibit B.

7. The granting of this application will avoid the drilling of unnecessary wells, will prevent waste, and will protect correlative rights.

WHEREFORE, PREMISES CONSIDERED, Key Energy requests that this application be set for hearing before an Examiner of the Oil Conservation Division on July 11, 2019, and that after notice and hearing, the Division enter its order approving this application.

Respectfully submitted,

RASH, CHAPMAN, SCHREIBER, LEAVERTON & MORRISON, LLP
2112 Rio Grande Street
Austin, Texas 78705
(512) 477-7543
(512) 474-0954 (fax)

By: 

Clayton D Nance
New Mexico Bar No. 144017
cnance@rashchapman.com

Attorneys for Applicant,
Key Energy Services, LLC

CERTIFICATE OF SERVICE

I certify that a copy of this Application has been forwarded to the persons below via certified mail, returned receipt requested, on this 30th day of May 2019.

Chesapeake Operating LLC
Attn: Regulatory Department
P.O. Box 18496
Oklahoma City, OK 73154

Chevron USA Inc.
Attn: Regulatory Department
6001 Bollinger Canyon Rd.
San Ramon, CA 94583

WPX Energy – Permian
5315 Buena Vista
Carlsbad, NM 88220

United States Bureau of Land Management
620 E. Greene Street
Carlsbad, NM 88220

Ms. Deana M. Bennett
Law Firm of Modrall Sperling
P.O. Box 2168
Albuquerque, NM 87103-2168

Counsel for NGL Water Solutions Permian LLC

Clayton D. Nance

CASE NO. 20583: Application of Key Energy Services, LLC for approval of a saltwater disposal well in Eddy County, New Mexico. Applicant seeks an order approving disposal of saltwater into the Devonian Formation through the Queen Lake Federal 19 No. 1 Well (API No. 30-015-24292) at a surface location of 1,950 feet from the North line and 1,980 feet from the East line of Section 19, Township 24 South, Range 29 East, NMPM, Eddy County, New Mexico. Key Energy seeks the authority to sidetrack the well and convert it to a commercial saltwater disposal well, for disposal of saltwater into the Devonian at a depth of 14,500' to 16,000'. Key Energy further seeks approval of the use of 13-3/8" surface casing with cement circulated to surface, 9-5/8" intermediate casing with cement circulated to surface, 7" production casing with top of cement at 4,412 feet, 5" injection liner with top of cement at 10,700 feet, and 4-1/2 x 2-7/8" tubing, and requests that the Division approve a maximum daily injection rate for the well of 15,000 barrels per day. Said well is located approximately 19 miles southeast of Carlsbad, New Mexico.

KEY ENERGY SERVICES, LLC

EXHIBIT A

STRATA TECHNOLOGIES, LLC

New Mexico Oil Conservation Division
1220 S. St. Frances
Santa Fe, NM 87505

March 29, 2019

Attn: Engineering

Re: Application Submittal for Commercial SWD_Queen Lake Federal 19 #1

To Whom it May Concern:

Please see the enclosed Form C108 "Application for Authorization to Inject", along with supporting documents, on behalf of Key Energy Services, LLC. The subject well, Queen Lake Federal 19 #1 is has been released and has no operator of record.

Thank you in advance for your time and review of the enclosed information. If you have any questions, please call me at (512) 914-8590, or email me at the address below.

Sincerely,

Mike Johnson
Technical Manager
Strata Technologies, LLC

stratatech@austin.rr.com

Strata Technologies, LLC
stratatech@austin.rr.com
P.O. Box 5222
(512) 914-8590
Austin, Texas 78763
(900) 693-3955 fax

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: Key Energy Services, LLC **OGRID Number:** 19797
Well Name: Queen Lake Federal 19 No. 1 **API:** 30-015-24292
Pool: Pierce Crossing Bone Spring **Pool Code:** 50731

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 and notifications are submitted to the Division.

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

Turner Phipps
Print or Type Name

Signature

3/28/19
Date

432-571-7216
Phone Number

tphipps@keyenergy.com
e-mail Address

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

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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 and notifications are submitted to the Division.

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

Turner Phipps
Print or Type Name

Signature

3/28/19
Date

432-571-7216
Phone Number

tphipps@keyenergy.com
e-mail Address

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: KEY ENERGY SERVICES, LLC (Operator No. 19797)

ADDRESS: 1301 MCKINNEY ST.; HOUSTON, TX 77010

CONTACT PARTY: RENE AQUERON / MIKE JOHNSON PHONE: 409-370-6353 / 512-914-8590

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. **(See attached)**

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. **(See attached; no wells penetrate the proposed injection zone)**

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected; **avg- 10,000 bpd; max- 15,000 bpd**
2. Whether the system is open or closed; **closed annulus**
3. Proposed average and maximum injection pressure; **avg- 1,000 psig; max- 2,900 psig**
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; **produced saltwater and produced water from area oil and gas exploration and production well** 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.). **(See attached Geologic Study)**

*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. **(See attached Geologic Study)**

IX. Describe the proposed stimulation program, if any. **10,000 gallons- Hydrochloric Acid**

*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. **N/A**

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. **USDS (See attached- "Geology Report").**

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: MIKE JOHNSON TITLE: TECHNICAL MANAGER

SIGNATURE: DATE: 03/28/2019

E-MAIL ADDRESS: stratatech@austin.rr.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

III. WELL DATA **(See attached)**

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.

Side 1

INJECTION WELL DATA SHEET

OPERATOR: KEY ENERGY SERVICES, LLC

WELL NAME & NUMBER: QUEEN LAKE FEDERAL 19 No. 1

WELL LOCATION:	1950' FNL & 1980' FEL	G	19	24S	29E
	FOOTAGE LOCATION	UNIT LETTER	SECTION	TOWNSHIP	RANGE

WELLBORE SCHEMATIC ***WELL CONSTRUCTION DATA***

(SEE ATTACH CURRENT AND PROPOSED WELLBORE DIAGRAMS)

Surface Casing

Hole Size: 17-1/2" Casing Size: 13-3/8"

Cemented with: 810 sx. *or* _____ ft^3

Top of Cement: Surface Method Determined: Circulation

Intermediate Casing

Hole Size: 12-1/4" Casing Size: 9-5/8"

Cemented with: 1890 sx. *or* _____ ft^3

Top of Cement: Surface Method Determined: Circulation

Production Casing

Hole Size: 8-1/2" Casing Size: 7"

Cemented with: 1275 sx. *or* _____ ft^3

Top of Cement: 4412 Method Determined: CBL (11/26/10)

Total Depth: _____

Injection Interval

14,500 feet to 16,000 feet (perforated)

(Perforated or Open Hole; indicate which)

Side 1

INJECTION WELL DATA SHEET (CONTINUED)

OPERATOR: KEY ENERGY SERVICES, LLC

WELL NAME & NUMBER: QUEEN LAKE FEDERAL 19

WELL LOCATION: 1950' FNL & 1980' FEL	G	19	24S	29E
FOOTAGE LOCATION	UNIT LETTER	SECTION	TOWNSHIP	RANGE

WELLBORE SCHEMATIC ***WELL CONSTRUCTION DATA***

(SEE ATTACH CURRENT AND PROPOSED WELLBORE DIAGRAMS)

Surface Casing

Hole Size: _____ Casing Size: _____

Cemented with: _____ sx. *or* _____ ft^3

Top of Cement: Surface Method Determined: Circulation

Intermediate Casing

Hole Size: _____ Casing Size: _____

Cemented with: _____ sx. *or* _____ ft^3

Top of Cement: _____ Method Determined: Circulation

Injection Liner (Proposed)

Hole Size: 6-1/4" Casing Size: 5"

Cemented with: 425 sx. *or* 450 ft^3

Top of Cement: 10700 ft (liner top) Method Determined: CBL (proposed)

Total Depth: 16000 ft

Injection Interval

14,500 feet to 16,000 feet (perforated)

(***Perforated*** or Open Hole; indicate which)

Side 1 (continued)

Side 2

INJECTION WELL DATA SHEET

Tubing Size: 4-1/2 x 2-7/8" Lining Material: NOV Tuboscope TK15XT(IPC)

Type of Packer: D&L Retrievable Seal Bore

Packer Setting Depth: 14,400 ft

Other Type of Tubing/Casing Seal (if applicable): 5" Injection liner from 10,700 to 16,000 feet

Additional Data

1. Is this a new well drilled for injection? ____ Yes X No

   If no, for what purpose was the well originally drilled? Oil & Gas Exploration

2. Name of the Injection Formation: Devonian

3. Name of Field or Pool (if applicable): Pierce Crossing

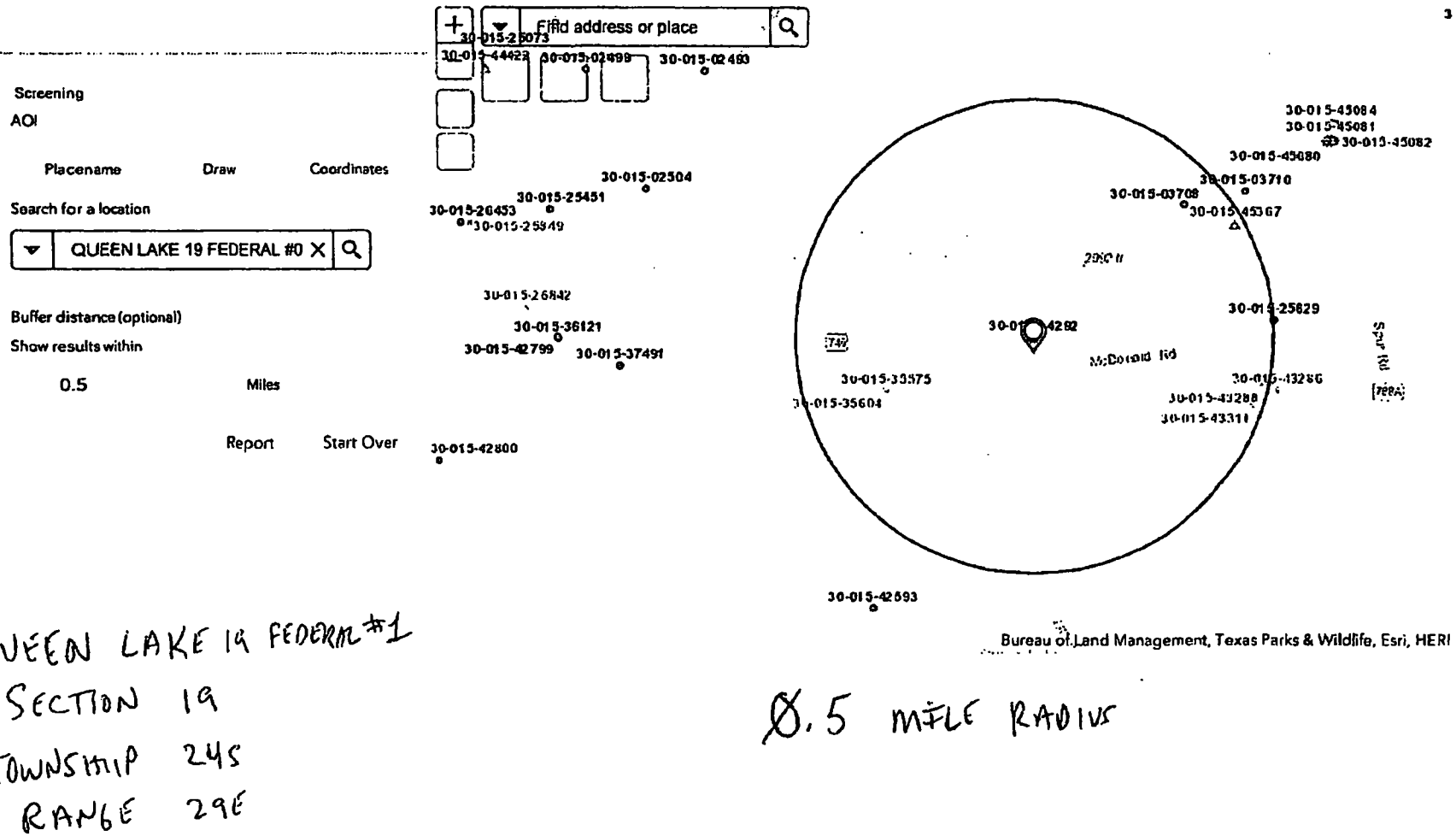
4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e. sacks of cement or plug(s) used. Yes.

   (See attached Current Wellbore Diagram)

5. Give the name and depths of any oil or gas zones underlying or overlying the proposed injection zone in this area:
   Ramsey, Cherry Canyon, Delaware, Bone Spring, Atoka

NM OCD OIL AND GAS MAP New Mexico Oil Conservation Division

NM OCD Oil and Gas Map User Guide



QUEEN LAKE 19 FEDERAL #1

SECTION 19

TOWNSHIP 24S

RANGE 29E

30-015-24292

-104.02155° 32.20503°

0.5 MILE RADIUS

NM OCD OIL AND GAS MAP New Mexico Oil Conservation Division NM OCD Oil and Gas Map User Guide

Screening

AOI

Placename Draw Coordinates

Search for a location

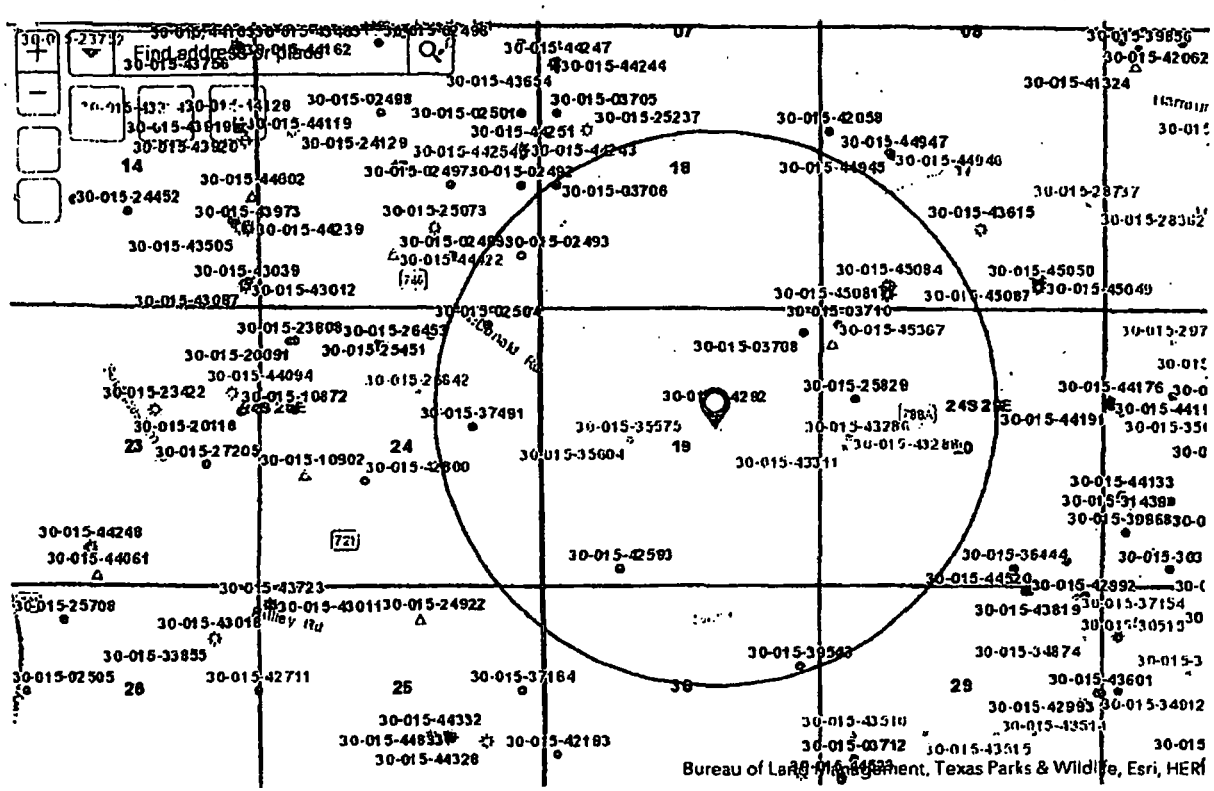
QUEEN LAKE 19 FEDERAL #0

Buffer distance (optional)

Show results within

1 Miles

Report Start Over



1km
0.6mi

-104.04597 32.21930 Degrees

QUEEN LAKE FEDERAL 19 # 1

SECTION 19

TOWNSHIP 24S

RANGE 29E

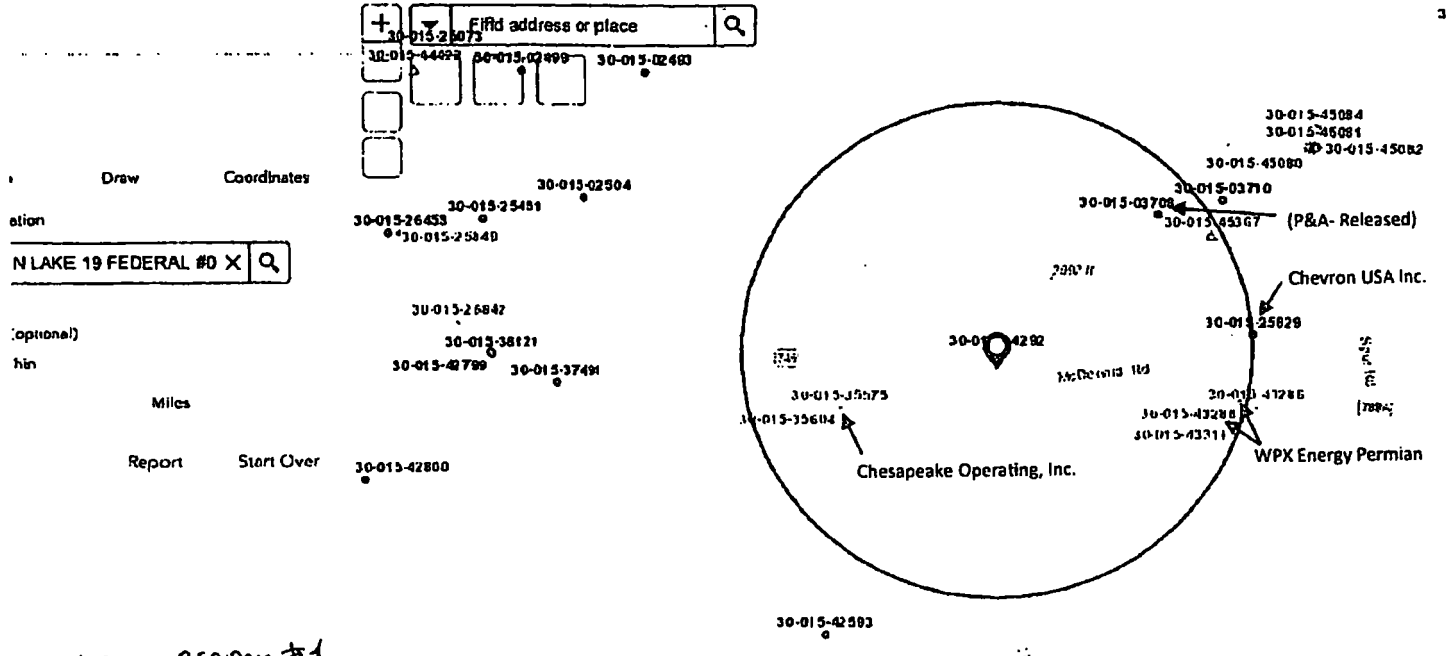
30-015-24292

-104.02155° 32.20503°

1.0 MILE RADIUS

OCD OIL AND GAS MAP New Mexico Oil Conservation Division

NM OCD Oil and Gas Map User Guide



LAKE 19 FEDERAL #1

J 19

P 24S

E 29E

24292

155° 32.20503°

0.5 MILE RADIUS

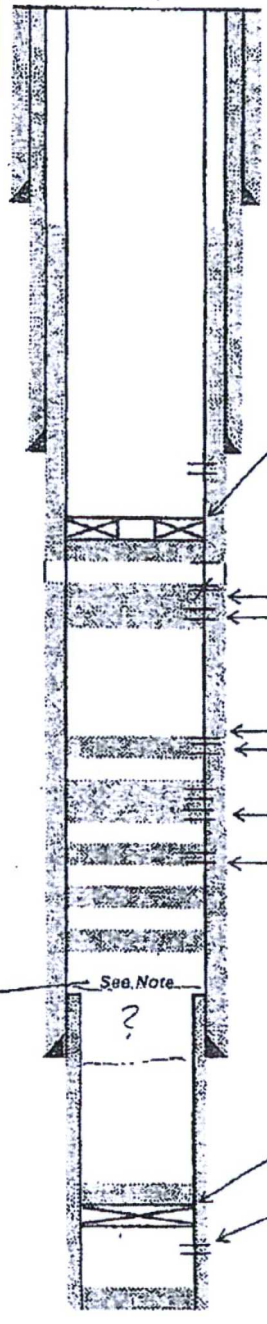
Well: Queen Lake 19 Fed #1 Field: Pierce Crossing Reservoir:

Location:
GPS: 32.20492 -104.02115
1950' FNL & 1980' FEL
Unit Letter: G
Section No: 19
Twp: 24S Range: 29E
County: Eddy State: NM

Elevations:
GL: 2,956'
KB: 2,976'
DF:

Wellbore Diagram

CURRENT



Well ID Info:
Chevno: DQ1372
API No: 30-015-24292
Spud Date: 10/20/1982
Drill End Date: 12/20/1982
Compl. Date: 12/28/1982
Last Prod:

Surface Csg: 13-3/8" 48# H-40
Set: @ 630' w/ 810 sx cmt
Hole Size: 17-1/2"
Circ: Yes TOC: Surface
TOC By: Circulation

Intermediate Csg: 9-5/8" 47#
P-110 & 40# K-55
Set: @ 2630' w/ 1890 sx cmt
Hole Size: 12-1/4"
Circ: Yes TOC: Surface
TOC By: Circulation

Open Perfs:
2,788' - 2,821' (Ramsey)

November 9-10, 2010
Squeeze 350 sx Class C cement under retainer set @ 4,235'.
TOC in annulus @ 950' by CBL.

4,300' - Squeeze perf
4,670' - Could not squeeze.
4,721' (Sqz'd 100 sx cmt 7/13/06)
4,921' - 4,935' (Cherry Canyon)

6,420' (Unused Squeeze Hole)
6,503' - 6,513' (Delaware)

7,520' - 7,636' (1st Bone Spring)

8,856' - 8,884' (3rd Bone Spring)
8,900' - 8,910' (3rd Bone Spring)

Plugs described in work 10/28/2010 - 11/16/2010

40 sx Class C cement
4,700' (tagged) - 5,016'

40 sx Class C cement
6,380' (tagged) - 6,608'

55 sx cement
7,412' (tagged) - 7,717'

8,762' (tagged) - 9,016'

9,496' - 9,736' WC

10,557' - 10,798'

FISH LEFT IN HOLE
April 1 - 2, 2010 Workover Report
Tag @ 10810'.
RIH w/ downhole camera to 10809'.
Found junk. Elt bottom side tip wedges between 2 3/8" tbg & 7" csg.

See Note

Production Csg: 7" 23# N-80 & K-55
Set: @ 11,190' w/ 1275 sx cmt
Hole Size: 8-1/2"
Circ: No TOC: 4,412'
TOC By: CBL ran 11/6/2010

TOC @ 12,005'
CIBP @ 12,040' w/ 35' cmt

12,154' - 12,163' (Atoka)

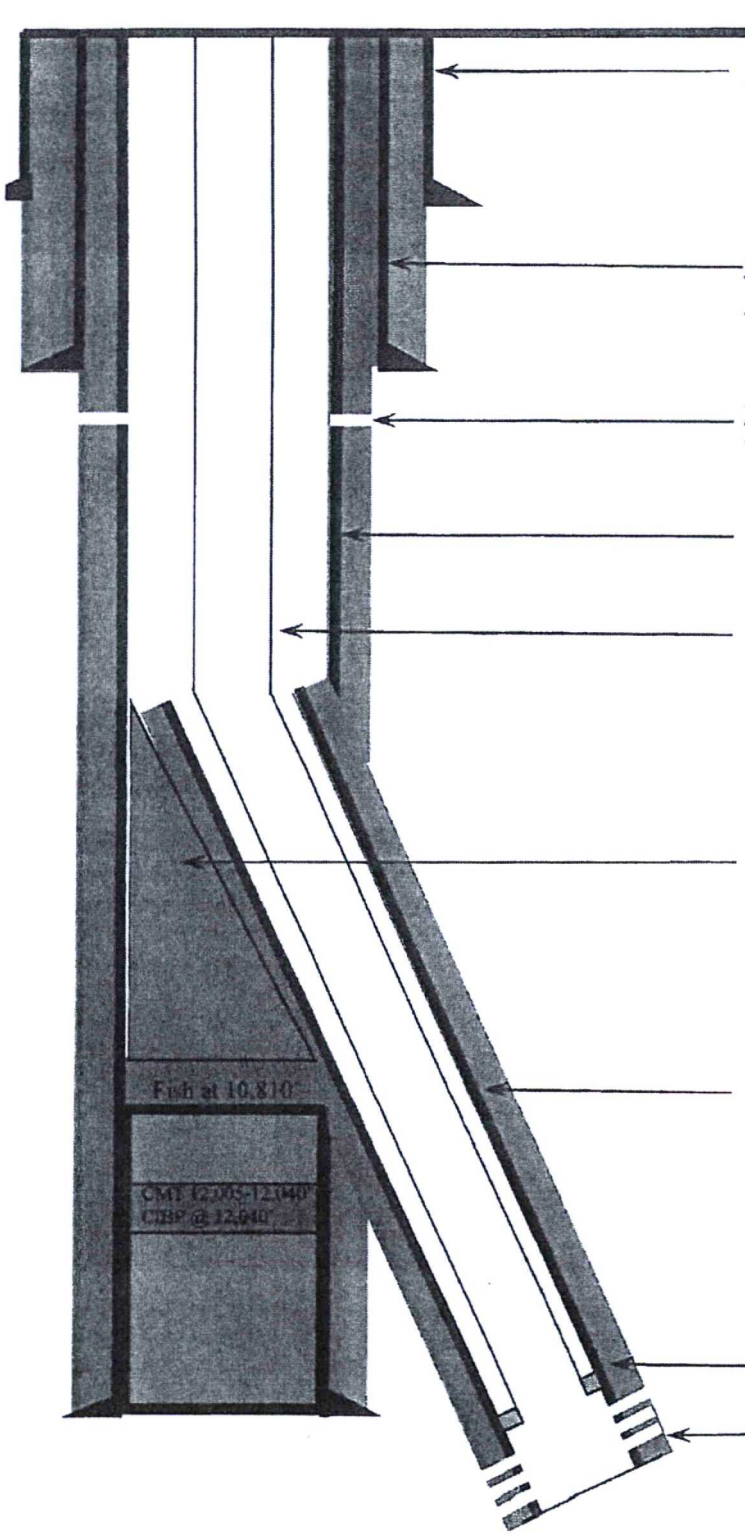
Liner: 4-1/2" 13.5# N-80
Set: @ 13,500' w/ 400 sx cmt
TOL: @ 10,987'
Hole Size: 6-1/8"

PBTD: 4,235'
TD: 13,500'

Updated: 10/24/2013

By: Bob Hall

QUEEN LAKE 19 FEDERAL NO. 1
PROPOSED



Surface Casing: 13-3/8", 48 lb/ft; H-40. Set to 530' in 17-1/2" hole and cemented to surface with 810 sx cement. TOC- Circuation.

Intermediate Casing: 9 5/8", 47 lb/ft, P-110 and 40# K-55. Set to 2,630' in 12-1/4 inch hole and cemented to surface with 1,890 sx cement. TOC-Circulation

Perforations: 2,788 – 2,821' (Ramsey). Proposed to squeeze with 100 sx cement.

Production Casing: 7", 23 lb/ft, N-80 and K-55. Set from surface to 11,190' cemented initially with 1,275 sx cement to 4,412' (CBL). Squeezed 350 sx cement from 4,300' on 11/09/10. TOC- 950' (CBL)

Injection Tubing: 4-1/2", 11.6 lb/ft, L-80 LTC & 2-7/8", 6.50 L-80. Latched into 5" x 2-7/8" RSB packer at approximately 14,500'. Cross-Over from 4-1/2" to 2-7/8" at 10,650 ft.

Whipstock: 7" Proposed set to approximately 10,810' (top of fish).

Completion Liner: 5", 18 lb/ft, L-80. Proposed set from 10,600' to 10,700 and cemented in 6-1/4" sidetrack wellbore with 125 sx cement. TOC- CBL

Packer: 5" x 2-7/8" Proposed Model RSB "12" stainless steel packer set at approximately 14,500 feet.

Perforations: Proposed Selectively shot within permitted injection zone from 14,500 – 16,000 feet.

DRAWN BY: WMJ	CHECKED BY: WMJ	FILE: Queen Lake Federal 19 #1	DATE:03/27/19	REV.: 1

GEOLOGIC STUDY
QUEEN LAKE FEDERAL 19 #1

The proposed SWD Conversion Well is the Queen Lake Federal 19, #1 (API #: 015-24292) located in Section 19, T24S, R29E, in Eddy County, New Mexico approximately 19 miles southeast of Carlsbad, New Mexico (Figure 1). The well was originally drilled in 1982 to a total depth of 13,500 feet and was plugged in 2013. Key Energy Services, LLC plans to sidetrack the well and convert it to a commercial Class II salt water disposal well (SWD), completed in the undivided Silurian-Devonian section between the approximate depths of 14,500 to 16,000 ft. total vertical depth (TVD) relative to Kelly bushing (KB). The expected formation tops and lithologies are summarized in the following table.

Tops From Well Completion Report Received by NMOCD on 1/14/83.

Stratigraphic Unit	Geological System	Formation Tops (Log Depth ft. RKB)	Lithology
Base Lowermost USDW – Permian Redbeds	Permian	~500	Clastics
Delaware Mtn. Group (Guadalupian)	Permian	2,735	Clastics
Cherry Canyon Formation (Guadalupian)	Permian	3,638	Clastics
Brushy Canyon Formation (Guadalupian)	Permian	4,400	Clastics
Bone Spring Formation (Leonardian)	Permian	6,473	Carbonates and Clastics
Wolfcamp (Wolfcampian)	Permian	9,698	Carbonates and Shale
Strawn Group	Pennsylvanian	11,852	Carbonates and Shale
Atoka Group	Pennsylvanian	12,038	Carbonates and Shale
Morrow Group	Pennsylvanian	12,657	Carbonates and Shale
Undivided Mississippian	Mississippian	13,600 ((Estimate)	Carbonates and Shale
Woodford Formation –Upper Devonian (Proposed Confining Zone)	Devonian	14,300 (Estimate)	Shale
Undivided Devonian/Silurian (Proposed Injection Zone)	Devonian/Silurian	14,500 (Estimate)	Carbonates
Ellenburger Fm.	Ordovician	16,500 (Estimate)	Carbonates
Basement	Precambrian	17,000 (Estimate)	Crystalline Rock

The base of the lowermost underground source of drinking water (USDW) is expected to occur at relatively shallow depth based on a review of water well information for the area (Hendrickson and Jones, 1952) and records from the National Water Information System (USGS, 2019a). The base of the USDW is expected at a maximum depth of 500 feet below ground surface as usable groundwater in the area is associated with the Pecos River alluvium and the upper Permian redbeds (Hendrickson and Jones, 1952). Below these strata are evaporite deposits containing bedded salt, gypsum, and anhydrite associated with

the lower part of the Permian Ochoan Series. The expected depth to the proposed injection zone is approximately 14,500 feet. As such, approximately 14,000 feet of sediment is present providing containment between the expected base of the USDW and the proposed injection zone.

Based on a review of commercial structure maps from Geomap® Company (2019), there are no faults located in the vicinity of the proposed injection well. Maps reviewed include Horizon A – Delaware Lime, Horizon B – Strawn Lime, and Horizon C – Siluro-Devonian. The maps reviewed are current as of February 19, 2019. Based on this review, there is no evidence of faults, including open faults, or any other hydrologic connection between the proposed disposal zone and any USDW.

The proposed injection zone consists of the undivided Silurian-Devonian age strata, which primarily consists of carbonates (limestone and dolomite) and possibly chert conglomerates. Porosity in the unit is expected to range from 3 to 15% and consists of both intergranular primary porosity and secondary dissolution porosity. The top of the injection zone will be below the base of the Upper Devonian Woodford Formation, which will be the upper confining zone and is expected to be encountered at a depth of approximately 14,300 ft. KB (TVD). The top of the injection zone is expected at a depth of approximately 14,500 ft. KB (TVD). The thickness of the injection zone is proposed to be 1,500 feet, which will allow selective perforation of zones indicating good porosity and additional rathole for full open-hole log data acquisition. Depths and thicknesses will be finalized upon evaluation of the logs.

The injection zone formation water is expected to be sodium chloride brine having a total dissolved solids (TDS) concentration ranging from approximately 50,000 to 230,000 mg/l based on data obtained from the USGS produced water database (2012). Water samples from the Devonian strata are summarized below.

County	Formation	Depth (ft.)	TDS (mg/l)	Sample Source	Location	USGS Record No.	Proximity
Eddy	Devonian	11,748	229,706	Drill Stem Test	T24S, R25E, S24	30000642	20 miles west
Eddy	Devonian	12,820	48,954	Drill Stem Test	T17S, R31E, s17	30000528	40 miles NNE
Eddy	Devonian	11,748	203,100	Unknown	T24S, R25E, s24	30000549	20 miles west
Eddy	Devonian	16,578	120,326	Drill Stem Test	T24S, R31E, s28	30000310	14 miles East
Eddy	Devonian	15,060	56,922	SWAB	T23S, R29E, s24	30900416	7.7 miles East
Eddy	Devonian	15,500	96,171	Flowline	T22S, R30E, s36	30900462	14 miles NE

Source: USGS, 2012

Analysis of the closest sample of Devonian formation fluid from USGS record number 30900416 indicated additional constituents consisting of calcium, magnesium and sulfate with approximately 85% of the total solids attributed to sodium and chloride.

In addition, TDS values for the Devonian strata taken from a separate USGS database (2019) are shown on Figure 1. These data indicate a range in TDS values from approximately 21,000 mg/L to 203,000 mg/L and indicate that the formation fluid is sodium chloride brine. Since this will be a produced water disposal well, no issues with injectate and formation fluid compatibility are apparent.

The proposed upper confining zone consists of the Upper Devonian Woodford Formation also known as the Woodford Shale. The Woodford Shale consists of low permeability black shale and siltstone containing abundant pyrite and organic carbon (Comer, 1991). The Woodford Formation is laterally continuous throughout the Permian Basin (Comer, 1991). In the site vicinity the Woodford Formation is expected to be 200 to 300 feet thick.

REFERENCES:

Comer, J.B., 1991, Stratigraphic Anaysis of the Upper Devonian Woodford Formation, Permian Basin, West Texas and Southeastern New Mexico, The University of Texas at Austin, Bureau of Economic Geology, Report of Investigations No. 201, 66 pp.

Hendrickson, G.E, and Jones, R.S., 1952, Geology and Ground-Water Resources of Eddy County, New Mexico, Ground-Water Report 3, prepared cooperatively by the United States Geological Survey, New Mexico Bureau of Mines & Mineral Resources, and the State Engineer of New Mexico, 179 pp.

Geomap® Company, 2019, Structure Map Plats for Horizon B – Delaware Lime, Horizon B – Strawn Lime, and Horizon C – Siluro-Devonian. Maps current as of February 19, 2019.

United States Geological Survey, 2012, Produced Water Database (Revised) from original database compiled by DOE Fossil Energy Research Center that was located in Bartlesville, Oklahoma. Downloaded at http://energy.cr.usgs.gov/prov/prodwat/data2.htm

United States Geological Survey, 2019a, National Water Information System: Web Interface, Groundwater Levels for New Mexico, Reviewed on 3/26/19 at https://nwis.waterdata.usgs.gov/nm/nwis/gwlevels?search_criteria=county_cd&submitted_form=introduction.

United States Geological Survey, 2019b, Energy Resources Program, Produced Water Geochemical Database v.2.3. Viewed on 3/24/19 at https://energy.usgs.gov/EnvironmentalAspects/EnvironmentalAspectsofEnergyProductionandUse/ProducedWaters.aspx#3822349-data

Queen Lake Federal 19 #1
SWD Application Form C-108
Notification
Mailing List

OFFSET OPERATORS WITHIN ONE-HALF MILE:

Chesapeake Operating, LLC
Attn: Regulatory Department
PO Box 18496
Oklahoma City, OK 73154

Chevron USA Inc.
Attn: Regulatory Department
6001 Bollinger Canyon Rd.
San Ramon, CA 94583

WPX Energy- Permian
5315 Buena Vista
Carlsbad, NM 88220

LAND OWNER:

Bureau of Land Management
620 E. Greene St.
Carlsbad, NM 88220

KEY ENERGY SERVICES, LLC

EXHIBIT B

From: Strata [mailto:stratatech@austin.rr.com]
Sent: Thursday, May 16, 2019 11:35 AM
To: Michael.McMillan@state.nm.us
Cc: Aqueron, Rene <raqueron@keyenergy.com>; 'strata' <stratatech@austin.rr.com>
Subject: Key Energy Queen Lake Federal 19 #1_Supplemental Information

Mike-

Per our telephone conversation, please see the following responses imbedded in your email to Turner Phipps (Key Energy) regarding the Queen Lake Federal 19 #1 application for an SWD permit. The responses are in RED.

We understand that the permit application has been protested, but we want to complete this part of the process now.

Please respond with additional questions or comments.

Thanks,

Mike Johnson
Technical Manager
Strata Technologies, LLC
(512) 914-8590
stratatech@austin.rr.com

The OCD needs the following information:

- Affidavit of publication in the county in which the well is located. **See Attachment 1**
- Better tract map that shows the affected parties. **See Attachment 2**
- TDS of injection formations. **See Attachment 3 (from original submittal; page 2 of 3)**
- The OCD is also concerned because the bottom of the proposed injection interval is near the Ellenburger. Therefore, the OCD will require you to provide the projected top of Montoya. **See Attachments 4a through 4d**
- Clarify the maximum injection rate. **From Form C-108 in the original application, the proposed maximum injection rate is 15,000 barrels per day.**

After the OCD receives the receives the required information, the 15-day clock will start

Mike

Michael McMillan
1220 South St. Francis
Santa Fe, New Mexico
505-476-3448
Michael.mcmillan@state.nm.us

Attachment 1

CARLSBAD CURRENT-ARGUS

AFFIDAVIT OF PUBLICATION

Ad No.
0001284679

STRATA TECHNOLOGIES, LLC
PO BOX 5222

AUSTIN TX 78703

I, a legal clerk of the **Carlsbad Current-Argus**, a newspaper published daily at the City of Carlsbad, in said county of Eddy, state of New Mexico and of general paid circulation in said county; that the same is a duly qualified newspaper under the laws of the State wherein legal notices and advertisements may be published; that the printed notice attached hereto was published in the regular and entire edition of said newspaper and not in supplement thereof on the date as follows, to wit:

05/01/19

Kevin Yu
Legal Clerk

Subscribed and sworn before me this
1st of May 2019.

Vicky Felty
State of WI, County of Brown
NOTARY PUBLIC

9-19-21
My Commission Expires

Ad#:0001284679
P O : Disposal Well
# of Affidavits :0.00

APPLICATION for Authorization to Inject in a Saltwater Disposal Well

KEY ENERGY SERVICES, LLC. located at 1301 MCKINNEY ST., HOUSTON, TX 77010 has applied to the New Mexico Oil Conservation Division for Permit Authorization for Saltwater Injection / Disposal at a proposed Commercial Disposal Facility in Eddy County, New Mexico. The proposed well is located 1950 feet from the North Line and 1980 feet from the East Line in Section 19, Township 24 South, Range 29 East in Eddy County, New Mexico. The proposed injection zone is within the Devonian Formation at approximate depths between 14,500 feet and 16,000 feet. Affected 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. Additional information may be obtained at 713-651-4300.
May 1, 2019

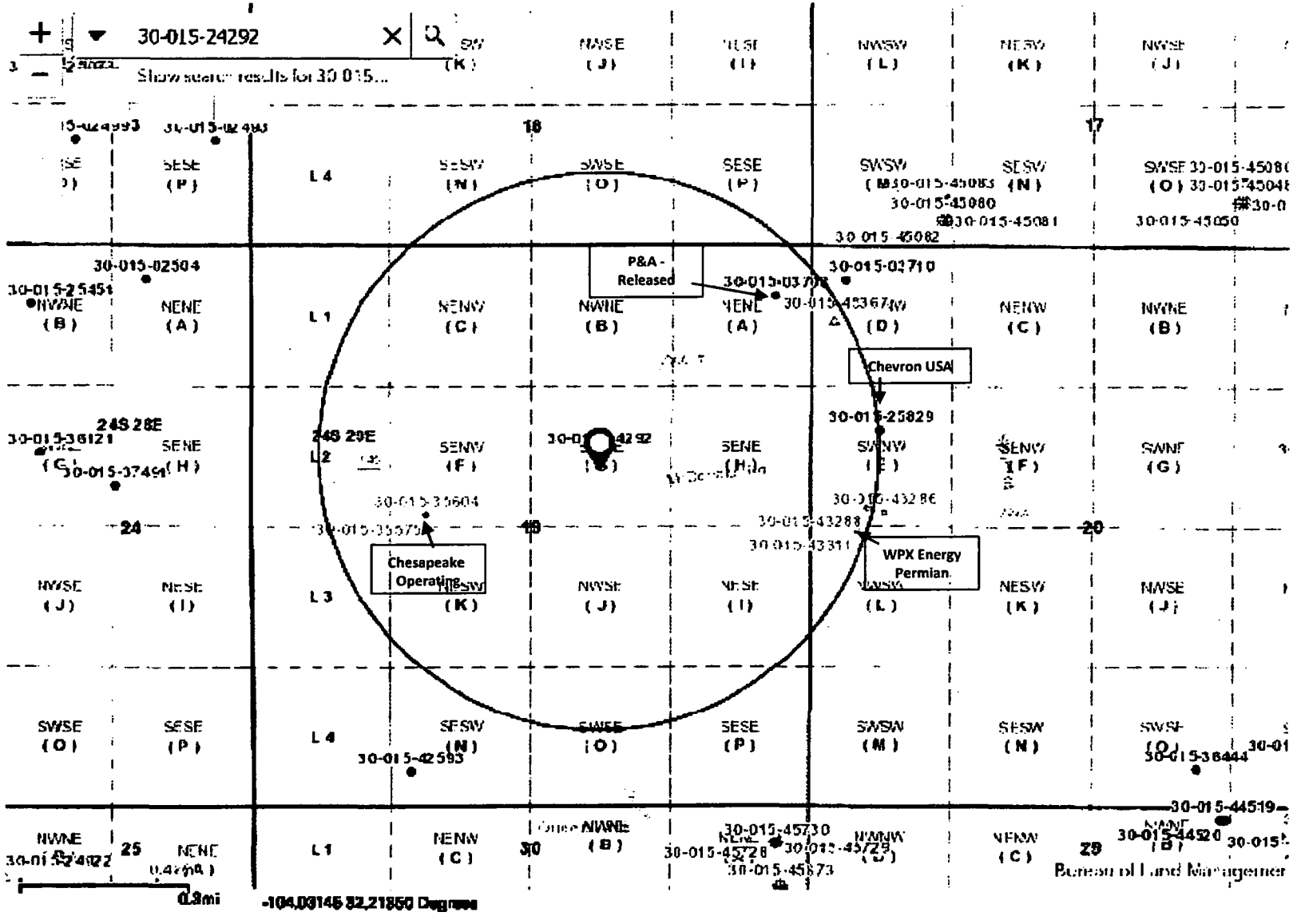
VICKY FELTY NOTARY PUBLIC STATE OF WISCONSIN

Attachment 2

NM OCD OIL AND GAS MAP

New Mexico Oil Conservation Division

NM OCD Oil and Gas Map User Guide



Attachment 3

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Attachment 4a

Response to ENMRD-OCD Request for Additional Information

Prepared by Mike Eide, PG (4/15/19)

The request, as transmitted by email, reads as follows:

- The OCD is also concerned because the bottom of the proposed injection interval is near the Ellenburger. Therefore, the OCD will require you to provide the projected top of Montoya

The expected top of the Ellenburger Group (lower Ordovician) is projected to occur at an elevation of approximately 13,200 feet relative to mean sea level (MSL) at the Queen Lake Federal 19 no. 1 well site as indicated on Figure 1. The ground level elevation at the well site is 2,956 feet MSL as indicated by the available open-hole log for the well. This results in an expected depth to the top of the Ellenburger Group of approximately 16,156 feet below ground level (BGL) at the well site. Based on thickness information derived from maps provided in Figure 2 (see Figures 2a and 2b), which were extrapolated into the subject well site area (as indicated by dashed lines); the combined thickness of the middle Ordovician Simpson Group (325 feet) and upper Ordovician Montoya Formation (325 feet) is expected to be 650 feet. Based on this information, the projected top of the Montoya Formation occurs at an approximate depth of 15,506 feet BGL.

Proposed Approach

It is proposed that, during the well construction phase, the wellbore will be drilled to the Montoya Formation, and then confirmed via open-hole logging. The well will then be plugged back to ensure that only the Devonian / Silurian Formation is completed for injection operations.

References:

Ruppel, S. C., Jones, R. H., Breton, C. L., and Kane, J. A., 2005, Preparation of maps depicting geothermal gradient and Precambrian structure in the Permian Basin: The University of Texas at Austin, Bureau of Economic Geology, contract report prepared for the U.S. Geological Survey under order no. 04CRSA0834 and requisition no. 04CRPR01474, 23 p. + CD-ROM

Texas Water Development Board, 1972, A Survey of the Subsurface Saline Water of Texas, Report 157, vol. 1, 118 p. (Prepared by Core Laboratories, Inc., Consulting and Engineering Department).

Attachment 4b

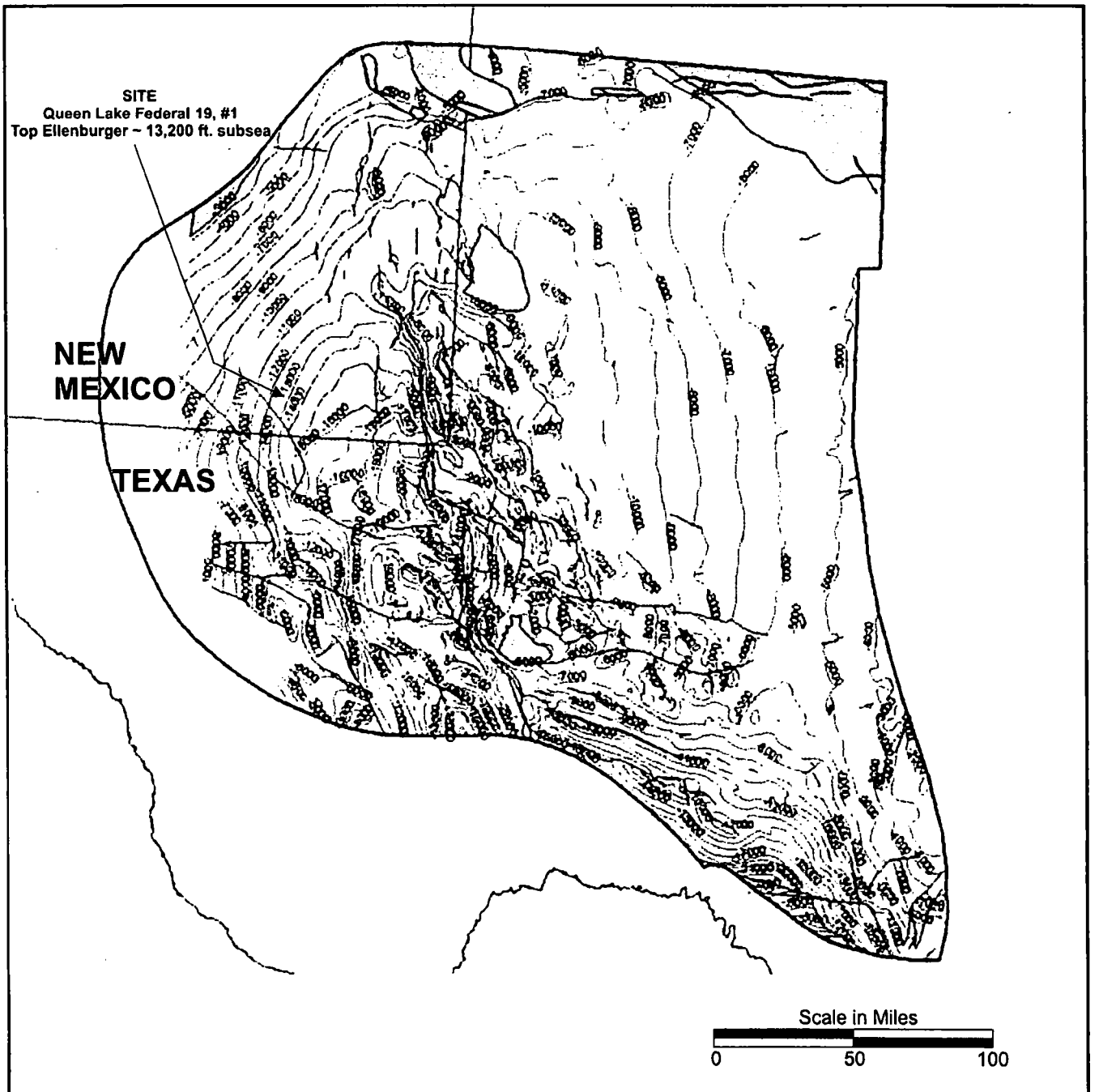


Figure 1 - Structure map on top of the Ellenburger Group. Contours are subsea depths.

Source: Ruppel, S. C., Jones, R. H., Breton, C. L., and Kane, J. A., 2005, Preparation of maps depicting geothermal gradient and Precambrian structure in the Permian Basin: The University of Texas at Austin, Bureau of Economic Geology, contract report prepared for the U.S. Geological Survey under order no. 04CRSA0834 and requisition no. 04CRPR01474, 23 p. + CD-ROM

Attachment 4c

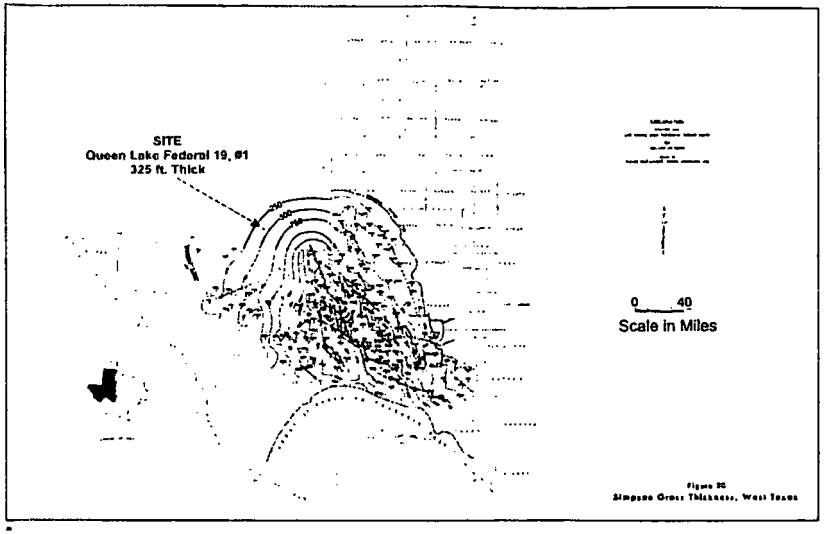
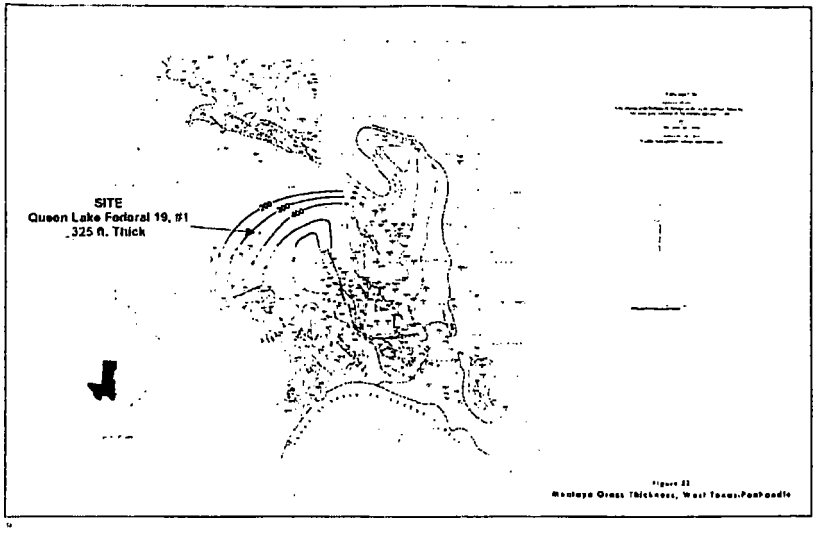


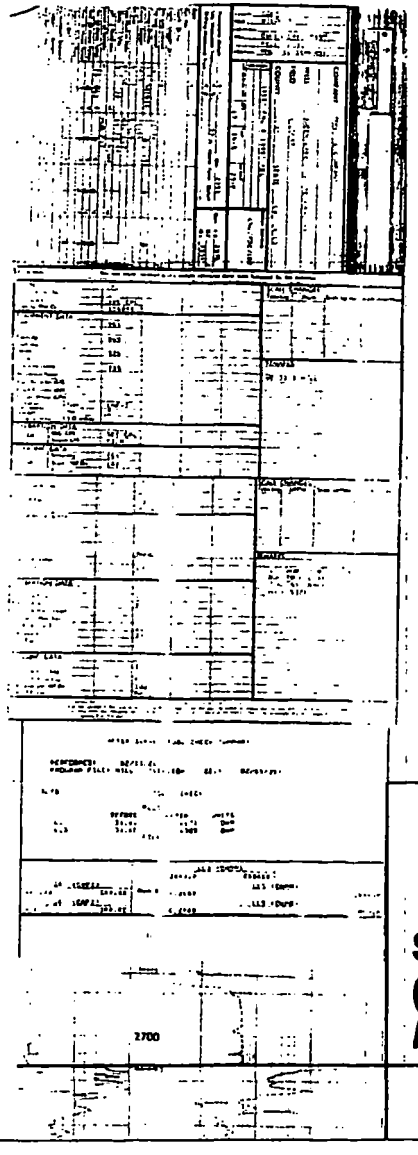
Figure 2a - Simpson Group Thickness, West Texas

Figure 2b - Montoya Formation Thickness, West Texas



Source: Texas Water Development Board, 1972, A Survey of the Subsurface Saline Water of Texas, Report 157, vol. 1, 118 p. (Prepared by Core Laboratories, Inc., Consulting and Engineering Department).

Attachment 4d

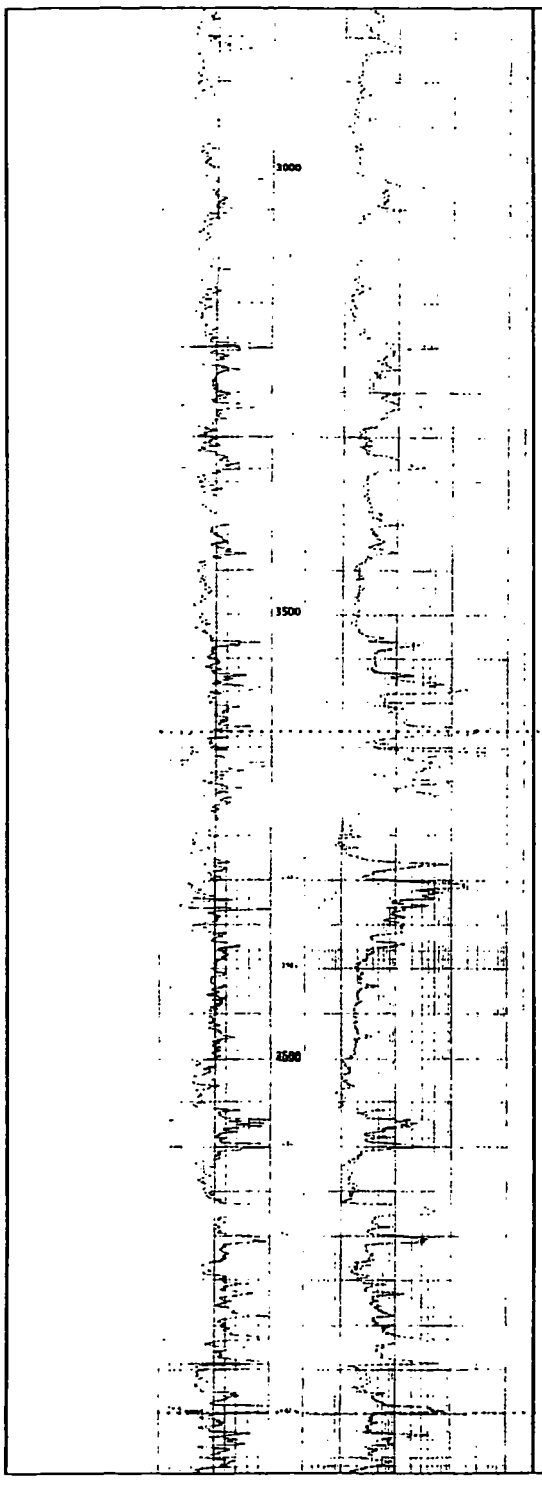


Key Energy Services, LLC
Queen Lake 19, Federal #1
T24S R29E Section 19
Eddy County, New Mexico
API#: 015-24292

KB = 2,976 ft.
GL = 2,956 ft.

TD = 13,500

Salado & Castile Fm.
(Permian/Ochoan)
Evaporites



Delaware Mtn. Group (Permian/Guadalupian)

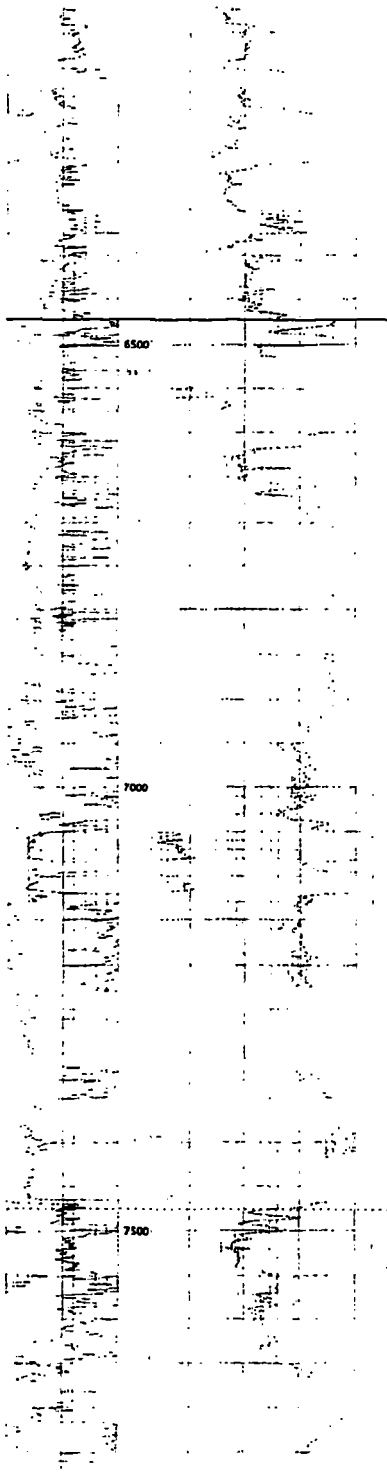
Clastics

Cherry Canyon Fm.

Clastics

Brushy Canyon Fm.

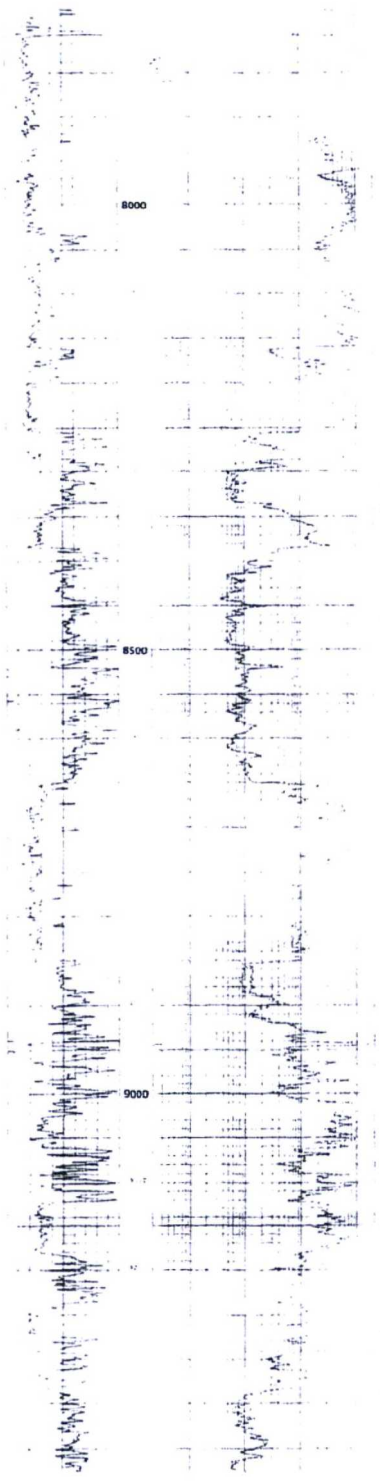
Clastics
4500
5000
5500
6000



Bone Spring Fm.
(Permian/Leonardian)

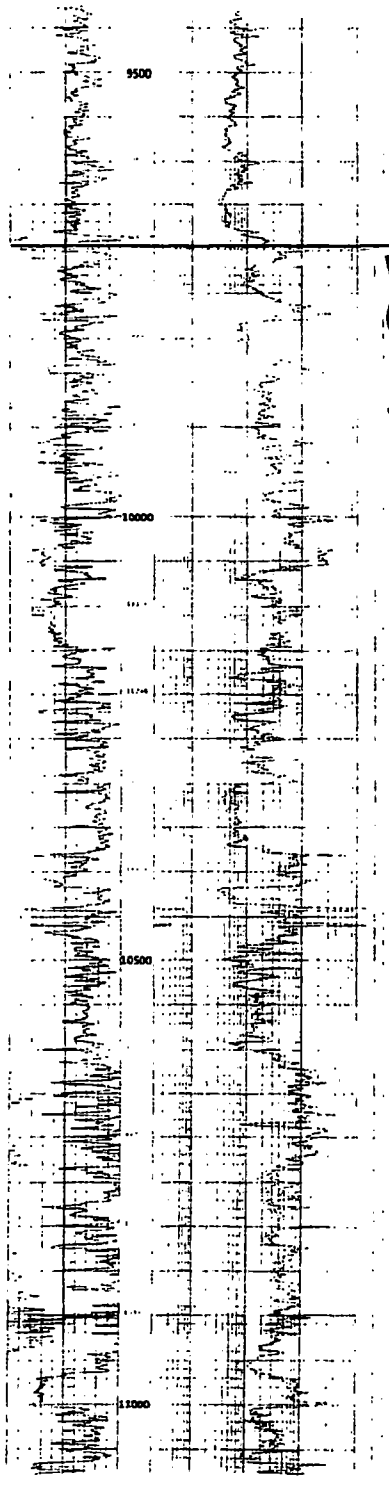
Clastics & Carbonates

Bone Spring Sand #1



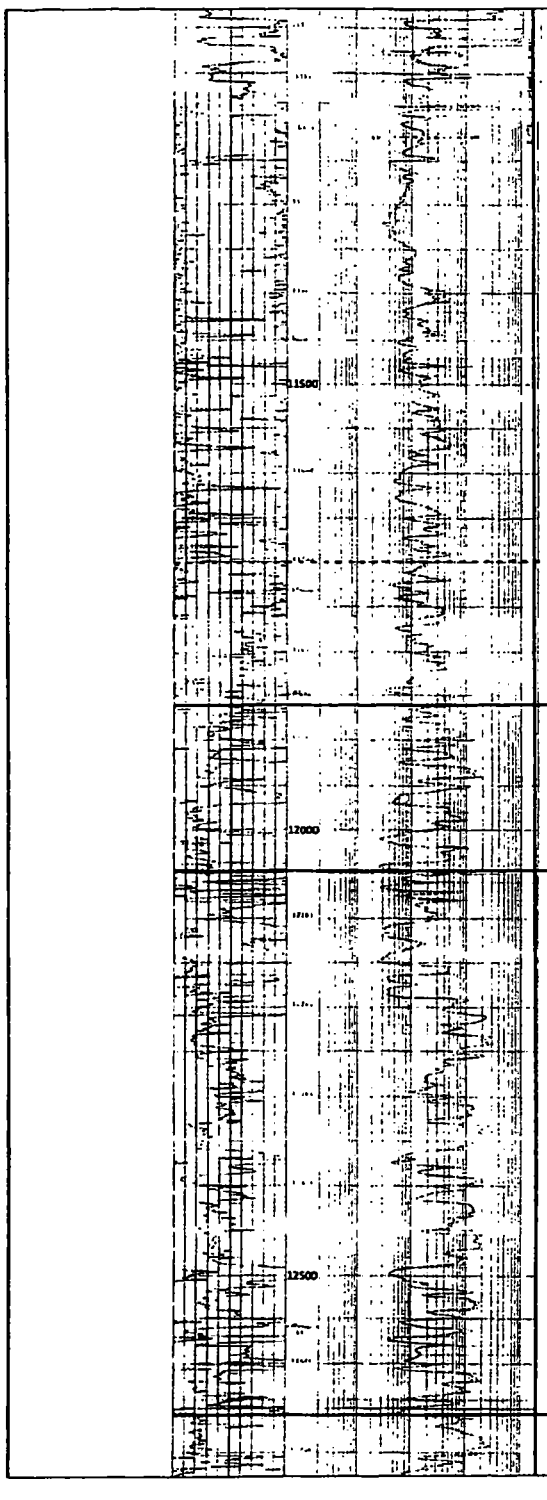
Bone Spring Sand #2 (?)

Bone Spring Sand #3



Wolfcamp
(Permian/Wolfcampian)

Shale & Carbonate

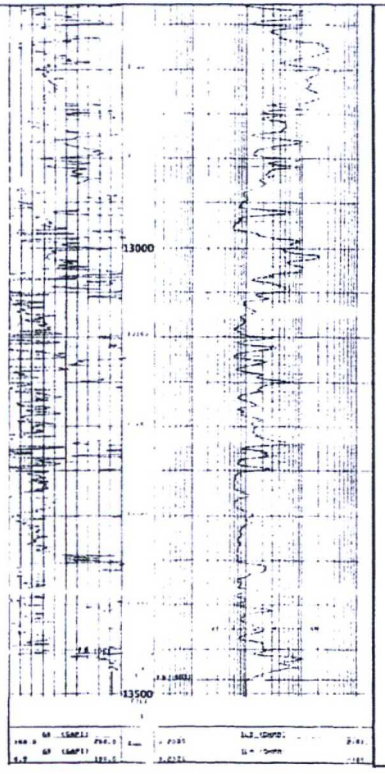


Upper Pennsylvanian
(Cisco/Canyon Grp.)
Shale & Carbonates

Strawn Group
(Pennsylvanian/Strawn)
Shale & Carbonates

Atoka Group
(Pennsylvanian/Atokan)
Shale & Carbonates

Morrow Group



(Pennsylvanian/Morrowan)
Shale & Carbonates

- **Expected Top Mississippian = 13,600 ft.**
- **Expected Top Woodford Shale (CZ) = 14,300 ft.**
- **Expected Top Silurian-Devonian (IZ) = 14,500 ft.**
- **Expected Top Montoya Fm. = 15,506 ft. (BGL)**
- **Expected Top Simpson Group = 15,531 ft. (BGL)**
- **Expected Top Ellenburger Group = 16,156 ft. (BGL)**
- **Expected Top Basement = 16,956 ft.**