

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

**IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION FOR THE PURPOSE OF
CONSIDERING:**

**APPLICATION OF SALT CREEK MIDSTREAM, LLC FOR AUTHORIZATION
TO INJECT ACID GAS INTO THE PROPOSED LEAVENWORTH AGI NO. 1,
SECTION 23, TOWNSHIP 26 SOUTH, RANGE 36 EAST, LEA COUNTY, NEW
MEXICO.**

CASE NO. 16446

SALT CREEK MIDSTREAM, LLC'S PRE-HEARING STATEMENT

SALT CREEK MIDSTREAM, LLC ("Salt Creek"), the applicant in the above-referenced cases, submits this Pre-Hearing Statement pursuant to the rules of the Oil Conservation Commission.

APPEARANCES

APPLICANT

Salt Creek Midstream, LLC

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INTERVENOR

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APPLICANT'S STATEMENT OF THE CASE

Salt Creek Midstream, LLC seeks authorization to inject treated acid gas for purposes of disposal through its proposed Leavenworth AGI No. 1 well, to be located in Section 23, Township 26 South, Range 36 East, N.M.P.M., Lea County, New Mexico.

The proposed Leavenworth AGI No. 1 well will be drilled at a surface location approximately 973 feet from the South line and 1,836 feet from the East line (Unit O) of said Section. The target injection zone will be from approximately 16,459 to 18,600 feet deep in the Devonian and Fusselman formations and will potentially include the top of the Montoya formation.

The well will be drilled as a vertical well with an open hole completion. The maximum allowable surface injection pressure is calculated to be 4,954 psig. The proposed well will inject treated acid gas up to a maximum of 60 MMSCFD at a maximum surface injection pressure of 2,830 psig. The average daily injection rate is projected to be 25 MMSCFD and the average surface injection pressure is expected to be 2,402 psig. Salt Creek will present four witnesses, identified below.

APPLICANT'S PROPOSED EVIDENCE

WITNESS Name and Expertise	ESTIMATED TIME	EXHIBITS
David Martinkewiz, Project Manager	Approx. 15	Approx. 3 Demonstrative Exhibits
Jerry Ferguson, Geologist	Approx. 20	Approx. 4
Peter Jordan, Plume Analysis	Approx. 15	Approx. 4
Steve Pattee, Engineer	Approx. 20	Approx. 3

PROCEDURAL MATTERS

Salt Creek modified the proposed well design to address concerns raised by the Division after its initial review. The attached Form C-108, marked as Exhibit A, has been updated to reflect those changes and to include water samples from wells within the area of review.

Respectfully submitted,

HOLLAND & HART LLP

By: 

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ATTORNEYS FOR SALT CREEK MIDSTREAM, LLC

RECEIVED:	REVIEWER:	TYPE:	APP NO:
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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: Salt Creek Midstream, LLC **OGRID Number:** 373554
Well Name: Leavenworth AGI #1 **API:** _____
Pool: _____ **Pool Code:** _____

**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
Other: Acid Gas Injection**2) NOTIFICATION REQUIRED TO:** Check those which apply.A. ☒ Offset operators or lease holdersB. ☒ Royalty, overriding royalty owners, revenue ownersC. ☒ Application requires published noticeD. ☐ Notification and/or concurrent approval by SLOE. ☐ Notification and/or concurrent approval by BLMF. ☒ Surface ownerG. ☐ For all of the above, proof of notification or publication is attached, and/or,H. ☐ No notice required**FOR OCD ONLY**
☐ Notice Complete
☐ Application
 Content
 Complete

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.

Steve Pattee, P.G.

Print or Type Name

Signature

08-21-2018
 Date

(512) 600-1774

Phone Number

steve@lonquist.com

e-mail Address

**BEFORE THE OIL CONSERVATION
 COMMISSION**

Santa Fe, New Mexico


Exhibit No. A

Submitted by: **SALT CREEK MIDSTREAM**

Hearing Date: January 17, 2019

Case No 16446

APPLICATION FOR AUTHORIZATION TO INJECT

- I. PURPOSE: Secondary Recovery Pressure Maintenance X Disposal Storage
Application qualifies for administrative approval? X Yes No
- II. OPERATOR: Salt Creek Midstream, LLC
ADDRESS: 20329 State Highway 249, Houston, TX 77070
CONTACT PARTY: David Martinkewiz PHONE: (713) 628-3952
- 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. **SECTION 4 and 5, APP A and B**
- 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. **SECTION 4**
- VII. Attach data on the proposed operation, including:
1. Proposed average and maximum daily rate and volume of fluids to be injected; **SECTION 2**
 2. Whether the system is open or closed;
 3. Proposed average and maximum injection pressure; **SECTION 2**
 4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and, **SECTION 2.3**
 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. **SECTION 3**
- IX. Describe the proposed stimulation program, if any. **SECTION 2.4 – N/A**
- *X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted). **N/A – Well not drilled**
- *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. **SECTION 3, APPENDIX 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. **SECTION 6**
- XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form. **APPENDIX C**
- 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: Stephen L. Pattee, P.G. TITLE: Consulting Engineer – Agent for Salt Creek Midstream, LLC
SIGNATURE:  DATE: 09/20/2018
E-MAIL ADDRESS: steve@lonquist.com
- XV. 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: _____

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. **SECTION 2.1**
- (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. **SECTION 2.4**
- (3) A description of the tubing to be used including its size, lining material, and setting depth. **SECTION 2.4**
- (4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used. **SECTION 2.4**

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. **SECTION 1 AND 2**
- (2) The injection interval and whether it is perforated or open-hole. **SECTION 1 AND 2**
- (3) State if the well was drilled for injection or, if not, the original purpose of the well. **SECTION 1**
- (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. **N/A**
- (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. **SECTION 3**

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.

APPENDIX C

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: **APPENDIX C**

- (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.

INJECTION WELL DATA SHEET

OPERATOR: Salt Creek Midstream, LLCWELL NAME & NUMBER: Leavenworth AGI No. 1WELL LOCATION: 973' FSL & 1.836 FEL
FOOTAGE LOCATIONUNIT LETTER OSECTION 23 TOWNSHIP 26S RANGE 36EWELLBORE SCHEMATICWELL CONSTRUCTION DATASurface CasingHole Size: 30.00"Casing Size: 24.00"Cemented with: 7,310 sx.or _____ ft³Top of Cement: surfaceMethod Determined: circulation1st Intermediate CasingHole Size: 20.000"Casing Size: 16"Cemented with: 4,375 sx.or _____ ft³Top of Cement: surfaceMethod Determined: circulation2nd Intermediate CasingHole Size: 14.75"Casing Size: 11.875"Cemented with: 3,655 sx.or _____ ft³Top of Cement: surfaceMethod Determined: circulation

Production Liner / Tieback

Hole Size: 10.625"

Casing Size: 9.625"

Cemented with: 1,050 sx.

or ft³

Top of Cement: 0'

Method Determined:
calculation/circulation

Total Depth: 18,600

Injection Interval

16,459 feet to 18,600 feet

(Open Hole)

INJECTION WELL DATA SHEET

Tubing Size: 5.500", 17 lb/ft. 5CRA Group 3 VanTop premium T&C (or equivalent) from 0' - 16,400'
 Lining Material: N/A

Type of Packer: 9-5/8" 70.3lb X 6 X 4-3/4" Dual Bore Optima WL Incoloy 925 PBR, Adapter, Inner Mandrel, and Bottom Sub, w/ Ecner Aflas Element, Carbide Slips & Threaded Bottom (or equivalent)

Packer Setting Depth: 16,400'

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

Additional Data

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

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

2. Name of the Injection Formation: Silurian-Devonian; Top ~50' of the Montoya

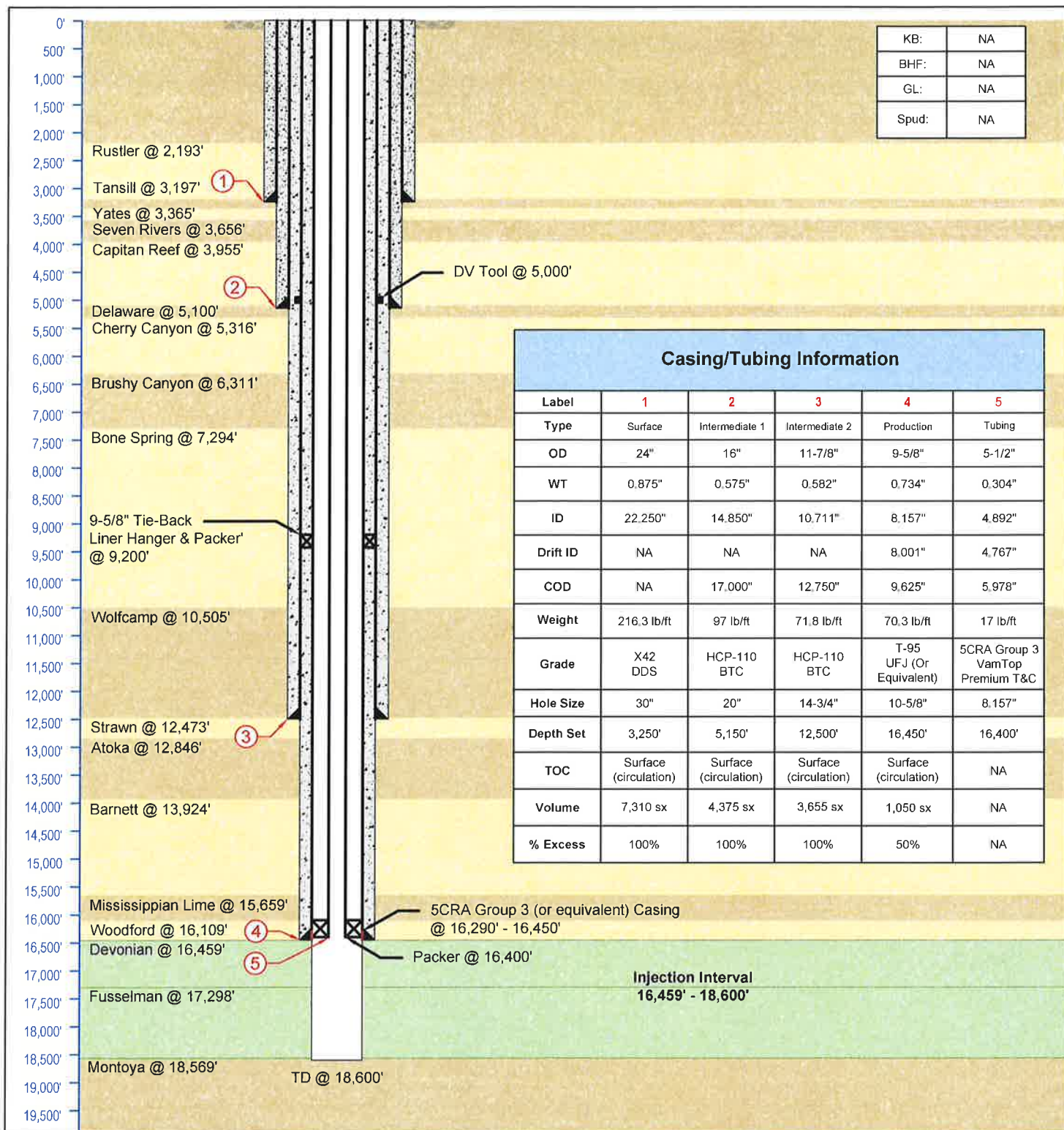
3. Name of Field or Pool (if applicable): _____

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

No, new drill.

5. Give the name and depths of any oil or gas zones underlying or overlying the proposed injection zone in this area:

Formation	Depth
Delaware	5,100'
Bone Spring	7,294'
Wolfcamp	10,505'
Strawn	12,473'
Atoka	12,846'



KB:	NA
BHF:	NA
GL:	NA
Spud:	NA

Casing/Tubing Information					
Label	1	2	3	4	5
Type	Surface	Intermediate 1	Intermediate 2	Production	Tubing
OD	24"	16"	11-7/8"	9-5/8"	5-1/2"
WT	0.875"	0.575"	0.582"	0.734"	0.304"
ID	22.250"	14.850"	10.711"	8.157"	4.892"
Drift ID	NA	NA	NA	8.001"	4.767"
COD	NA	17,000"	12,750"	9,625"	5,978"
Weight	216.3 lb/ft	97 lb/ft	71.8 lb/ft	70.3 lb/ft	17 lb/ft
Grade	X42 DDS	HCP-110 BTC	HCP-110 BTC	T-95 UFJ (Or Equivalent)	5CRA Group 3 VamTop Premium T&C
Hole Size	30"	20"	14-3/4"	10-5/8"	8.157"
Depth Set	3,250'	5,150'	12,500'	16,450'	16,400'
TOC	Surface (circulation)	Surface (circulation)	Surface (circulation)	Surface (circulation)	NA
Volume	7,310 sx	4,375 sx	3,655 sx	1,050 sx	NA
% Excess	100%	100%	100%	50%	NA

<div>LONQUIST & CO. LLC</div> <div>PETROLEUM ENGINEERSENERGY ADVISORS</div> <div>HOUSTON CALGARY AUSTIN WICHITA DENVER</div>	Salt Creek Midstream	Leavenworth AGI No. 1	
	Country: USA	State/Province: New Mexico	County/Parish: Lea
	Location:	Site:	Survey:
	API No: NA	Field:	Well Type/Status: AGI / New Drill
Texas License F-9147	RRC District No:	Project No: 1624	Date: 9/6/2018
12912 Hill Country Blvd. Ste F-200 Austin, Texas 78738 Tel: 512.732.9812 Fax: 512.732.9816	Drawn: WHG	Reviewed: SLP	Approved:
	Rev No: 14	Notes:	



**Application for Authorization to Inject
Leavenworth AGI #1
Lea County, NM**

September 20, 2018

LONQUIST & CO. LLC

PETROLEUM
ENGINEERS

ENERGY
ADVISORS

HOUSTON | CALGARY
AUSTIN | WICHITA | DENVER

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Appendix B: Information on Land Tracts within One Mile of Proposed AGI well

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1.0 EXECUTIVE SUMMARY

On behalf of Salt Creek Midstream, LLC (Salt Creek), Lonquist & Co. (Lonquist) is submitting a complete C-108 application for approval to drill, complete and operate a new acid injection well, Leavenworth AGI #1, in Section 23, T26S, R36E approximately 6.5 miles Southwest of Jal in Lea County, New Mexico. The Leavenworth AGI #1 well will be drilled at a surface location approximately 973 feet from the south line (FSL) and 1,836 feet from the east line (FEL) of the section boundary.

Salt Creek plans to safely inject up to a maximum of 60 MMSCFD and an average of 25 MMSCFD of treated acid gas (TAG) for at least 25 years. Geological studies conducted demonstrate the proposed injection zone is able to receive the proposed acid gas injection volumes within the NMOCD's recommended injection pressures.

The proposed injection zone includes both the Devonian and Fusselman formations with potentially the top ~50 feet of the Montoya also in the open hole section. This gross injection interval is proposed to be from approximately 16,459' – 18,569' BGL. Leavenworth AGI #1 will be drilled as a vertical well to a total depth of 18,600 feet and completed as an open hole interval. The proposed well will be constructed with three casing strings cemented to surface and a production liner set

Lonquist has reviewed all the surface owners, operators, leaseholders and mineral owners within one-mile of the proposed AGI #1 well. A total of 6 impacted parties were identified. There are no wells within the one-mile area of review that penetrate the injection zone. A search of the New Mexico State Engineer's files shows 2 water wells that are located within one mile of the proposed Leavenworth AGI #1 well.

Based on this detailed evaluation, Lonquist and Salt Creek have determined that the proposed AGI well is a safe and environmentally sound well for the disposal of acid gas into the injection zone. The carbonate nature of the Devonian and Fusselman formations indicate that a favorable formation chemistry will exist, allowing for the acid to be somewhat neutralized over time while, concurrently, secondary porosity is created as the formation chemically reacts with the acid being injected.

At the anticipated reservoir conditions of 185° F and 7,930 psi, each MMSCFD of TAG will occupy a volume of 1,976 cubic feet (352 bbls). At the anticipated maximum operational capacity of 60 MMSCFD, the compressed TAG will occupy 129,994 cubic feet (23,153 barrels) per day. After 25 years of operation, the TAG will occupy an area of approximately 7,936 acres in the proposed injection zone, with a dispersed plume radius (1% concentration contour) of approximately 10,490 feet (1.99 miles) from the Leavenworth AGI #1 well.

An H₂S contingency plan is currently being prepared and will be submitted prior to the commencement of any injection operations.

2.0 PROPOSED WELL CONSTRUCTION AND OPERATION DETAILS

2.1 LOCATION DETAILS:

Well Information	
Lease Name	Leavenworth AGI
Well No.	1
Location	S-23 T-26S R-36E
Footage Location	973' FSL & 1,836' FEL

2.2 CALCULATED MAXIMUM INJECTION PRESSURE

The Leavenworth AGI #1 will be designed to facilitate injection of a stream of treated acid gas (TAG). The treated acid gas stream will be composed of approximately:

- 80% CO₂
- 19.5% H₂S
- Approximately 0.5% Water, Methane, Ethane +

At maximum proposed injection rate, the total volume of TAG will be approximately 351 barrels per day for each million cubic feet at reservoir conditions. Pressure reduction valves will be installed to ensure that the maximum surface injection pressured allowed is not exceeded.

Using the following NMOCD approved formula, the maximum allowable surface injection pressure is calculated to be 4,954 psi. This value is significantly higher the maximum allowable surface pressure for saltwater of 0.2 x top of injection zone (3,292 psi) because of the lower specific gravity of the treated acid gas.

$$IP_{\max} = PG(D_{\text{top}})$$

where: IP_{\max} = maximum surface injection pressure (psig)

PG = pressure gradient of mixed injection stream fluid (psig/foot)

D_{top} = depth of top of injection interval (feet)

$PG = 0.2 + 0.433 (1.04 - SG_{\text{tag}})$ where:

SG_{tag} = specific gravity of treated acid gas, calculated as the average density in the tubing, using surface condition assumptions of 120° F and 2,830 psig, and bottom hole conditions of 185° F and 7,930 psi.

At the maximum proposed injection volume of 60 MMSCF/Day, we determine a SG_{tag} of 0.807 and D_{top} of 16,459 feet, resulting in the following calculation:

$$PG = 0.2 + 0.433 (1.04 - 0.807) = 0.301$$

$$IP_{\max} = PG(D_{\text{top}}) = 0.301 \times 16,459 = 4,954 \text{ psig}$$

2.3 INJECTION VOLUMES

Using offset log data, we estimate that the gross injection interval will be approximately 16,459' – 18,600' which equates to approximately 2,140 feet of reservoir rock in the proposed injection zone with an average porosity of 8% percent or more. The calculated net available porosity is estimated to be 80.5 feet.

Salt Creek anticipates injecting an average daily volume of 25 MMSCF/D at an injection pressure of 2,402 psi up to a maximum of 60 MMSCF/D at an injection pressure of 2,830 psi. The 25-year radius of injection at the maximum rate of 60 MMSCF/D rate is shown in Table 1.

Table 1: Calculation of Injection Radius for Maximum rate of 60 MMSCF/D

	Units	Value
<u>Injection Zone Properties</u>		
Temperature	°F	185
Pressure	psig	7,930
Net Thickness	feet	80.5
Porosity	%	8
<u>Operating Parameters</u>		
Treated Acid Gas (TAG) Volume Injection Rate	MMscfD	60.51
TAG Mass Injection Rate	pounds per hour	280,242
TAG Density at Formation Conditions	pounds per cubic foot	51.739
<u>Volume and Radius Estimates</u>		
Duration of Injection	years	25
TAG Volume Injected	cubic feet	1,186,195,019
Radius in Formation Occupied by TAG Volume	feet	7,657
Radius of Dispersed Plume	feet	10,022

2.4 WELL DESIGN

The preliminary well design for the proposed Leavenworth AGI #1 well is shown in Figure 1. The well will have four strings of telescoping casing cemented to the surface.

The well will be drilled vertically to a projected total depth of 18,600'. The injection zone (16,459' – 18,600') will be completed as an open hole interval into the Devonian and Fusselman formations.

An appropriate drilling rig will be selected and will include appropriate blowout preventer and choke manifold. Visual inspections of cement returns to surface will be noted in the surface, intermediate and production casing jobs. Casing and cement integrity will be validated by pressure tests and cement bond logs after each cement job.

The four proposed casing strings and cement programs are shown in Figure 1, and Tables 2 and 3 below, and summarized as follows:

1. Surface casing will be set below the base of the Rustler Formation, into the Tansill, at approximately 3,250 feet BGL, to protect the fresh water zones. The borehole will be drilled with a 26-inch bit, opened to 30 inches and then 24", 216.3 lb/ft, X-42 DDS casing will be run and cemented to surface with approximately 7,310 sacks of HalCem™ Cement or equivalent.
2. The first intermediate casing string will be set 50' into the Delaware, at approximately 5,150 feet to protect any productive sands above the Delaware formation. The borehole will be drilled with a 20" bit and 16", 97 lb/ft, HCP-110 BTC casing will be run and cemented to surface with approximately 4,375 sacks of HalCem™ cement or equivalent.
3. The second intermediate casing string will protect potentially production zones above the Strawn formation. It will be drilled with a 14-3/4" bit to a depth of approximately 12,500 feet. A diverter valve assembly will be installed at approximately 5,000 feet. The 11-7/8", 71.8 lb/ft, HCP-110 BTC (or equivalent) casing will be cemented to the surface in two stages, with an approximately total 3,655 sacks of NeoCem™ and HalCem™ cement or equivalent.
4. The production casing will be set just above the top of the Devonian Formation, at approximately 16,450 feet in an 10-5/8" borehole. A 9-5/8" 70.3 lb/ft, T-95 UFJ (or equivalent) casing liner will be run from 9,200' to 16,450' and cemented with 435 sacks of NeoCem™ (or equivalent) lead and 20 bbls of SBM CMT WellLock tail. Then the same grade casing will be run to tie-back from 9,200' to surface and cemented with 415 sacks of NeoCem™ plus 200 sacks of HalCem™ (or equivalent). Approximately 160' of the base of the 9-5/8" production casing will be comprised of 5CRA group 3 (or equivalent) casing to facilitate the setting of the tubing packer within the well.

The cement for the casing shoe of the production casing will be comprised of a premium cement product which will include additives designed to resist degradation in an acidic environment.

Table 2: Casing Design

Casing Information				
Type	Surface	Intermediate	Intermediate 2	Production
OD	24"	16"	11-7/8"	9-5/8"
WT	0.875"	0.575"	0.582"	0.734"
ID	22.25"	14.850"	10.711"	8.157"
Drift ID	N/A	N/A	N/A	8.001"
COD	N/A	17.000"	12.750"	9.625"
Weight	216.3 lb/ft	97 lb/ft	71.8 lb/ft	70.3 lb/ft
Grade	X-42 DDS	HCP-110 BTC	HCP-110 BTC	T-95 UFJ (or equivalent)
Hole Size	30"	20"	14-3/4"	10-5/8"
Depth Set	3,250'	5,150'	12,500'	16,450'

Table 3: Cementing Plan

Cement Information					
Casing String	Surface	Intermediate	Intermediate 2	Production Liner	Production Tie Back
Lead Cement	HALCEM	HALCEM	Stage 1: NeoCem Stage 2: NeoCem	NeoCem	NeoCem
Lead Cement Volume	5,820 sks	3,715 sks	Stage 1: 1,970 sks Stage 2: 745 sks	435 sks	415 sks
Tail Cement	HALCEM	HALCEM	Stage 1: NeoCem Stage 2: HALCEM	SBM CMT WellLock	HalCem
Tail Cement Volume	1,490 sks	660 sks	Stage 1: 840 sks Stage 2: 100 sks	20 bbls	200 sks
Cement Excess	100%	100%	100%	50%	0%
TOC	Surface	Surface	Surface	9,200'	Surface
Method	Circulate to Surface	Circulate to Surface	Circulate to Surface	Logged	Circulate to Surface

The proposed open hole logging suite for the Production section includes Dual Induction, Density-Neutron, Gamma Ray, and Sonic logs. This logging suite will provide us with useful information on the proposed injection interval. No stimulation is proposed for this well.

After the production string is cemented and set, a cement bond log and mechanical integrity test will be run, then an injection step-test will be performed to determine injection pressures and volumes. After testing, the tubing will be installed with a packer set at approximately 16,400 feet as shown in Figure 1 and Table 3. Corrosion-inhibited diesel will fill the annular space between the tubing and the casing.

Table 4: Tubing Design

OD	5.5"
WT	0.304"
ID	4.892"
Drift ID	4.767"
Weight	17 lb/ft
Grade	5CRA Group 3 VamTop Premium T&C (or equivalent)
Depth Set	0'-16,400'

As the tubing will be comprised of a chrome-moly alloy or similar, no internal lining will be part of the design. Other considerations taken with the design of the proposed well include the packer and all wetted section of the wellhead be Inconel clad for acid resistance. The packer to be used will be a 9-5/8" 70.3lb X 6 X 4-3/4" Dual Bore Optima WL Incoloy 925 PBR, Adapter, Inner Mandrel, and Bottom Sub, w/ Ecner Aflas Element, Carbide Slips & Threaded Bottom (or equivalent). The wellhead will be designed to handle greater than maximum allowable surface injection pressure. The wellhead will be equipped with a pressure shut-off valve and monitor to ensure that the MASIP is not exceeded. H₂S gas detection devices will also be installed on and near the wellhead. These sensors will be designed to automatically activate the emergency shutdown valve on the wellhead in the event that H₂S gas is detected. Should this occur, visual and audible alarms will also sound at the facility and appropriate actions taken as outlined in the facility Contingency Plan dictates.

3.0 GEOLOGICAL DATA

The proposed injection interval includes the Devonian and Fusselman formations with the very top (~50') of the Montoya included. Geologic analysis shows that the Devonian is the more optimal formation for acid gas injection but the Fusselman may have some potential. It is desired to drill into the very top of the Montoya to ensure the entire Fusselman has been opened and to yield an open hole log across the entire injection horizon. Figure 2 shows a structure map of the top of the Devonian formation. Figures 3 and 4 provide cross-sections showing the stratigraphy and relative thickness of the formations in the area of the proposed wells.

3.1 Devonian/Silurian Lithology:

The Devonian/Silurian section is a dolomitic ramp carbonate sequence that occurs below the Woodford Shale and above the Fusselman Formation. The Woodford is the upper confining layer for the proposed Leavenworth AGI well. The Devonian/Silurian interval is composed of two members: the Thirtyone Formation in the upper part and the lower Wristen Group. The Thirtyone Formation contains two end-member reservoir facies: skeletal packstones/grainstones and spiculitic chert, with most of the porosity and permeability found in coarsely crystalline, cherty dolomite. The Wristen Group is composed of mixed limestone and dolomite lithologies with mudstone, grainstone and boundstone textures. Porosity in the Wristen member is the result of both primary and secondary development. Moldic, vugular, and karst facies (including collapse breccias) have higher porosities and permeabilities. These characteristics allow for the Devonian to be a potentially prolific horizon for disposal. The Devonian section is approximately 800 feet thick at the proposed location.

3.2 Fusselman Formation lithology:

The Silurian/Ordovician Fusselman Formation is stratigraphically below the Wristen Group and is above and separated from the Montoya Formation by the Sylvan Shale. The Sylvan Shale is the lower confining layer for the proposed Leavenworth AGI well. Fusselman facies include a laminated skeletal wackestone in the upper part and a buildup complex in the lower part composed of ooid and bryozoan grainstones. These grainstones can also be potentially prolific zones for disposal. The Fusselman is approximately 1200 feet thick at the proposed location.

The Montoya Group of Late Ordovician age unconformably overlies the Simpson Group. The Montoya is composed of light gray to medium-dark gray, fine- to medium-crystalline, calcareous dolomite, some units of which are interbedded with shale or dark-gray limestone and some units of which contain white to very light-gray chert. The Montoya carbonate limestone dolomite sequence is dense, impermeable, and non-porous.

3.3 Estimated Formation Tops:

Table 5 provides the estimated tops for the formations that are anticipated to be encountered while drilling the Leavenworth AGI No. 1 well based from offset logs and geological analysis.

Table 5: Formation Tops

Formation	Depth
Rustler	2,193'
Tansill	3,197'
Yates	3,365'
Seven Rivers	3,656'
Capitan Reef	3,955'
Delaware	5,100'

Cherry Canyon	5,316'
Brushy Canyon	6,311'
Bone Spring	7,294'
Wolfcamp	10,505'
Strawn	12,473'
Atoka	12,846'
Barnett	13,924'
Mississippian Lime	15,659'
Woodford	16,109'
Devonian	16,459'
Fusselman	17,298'
Montoya	18,569'

3.4 Groundwater Hydrology Near the Proposed Injection Well

Southern Lea County is at the southeastern corner of New Mexico. Most of the area is in the Pecos Valley section of the Great Plains physiographic province; it also includes the southern margin of the Llano Estacado. There are no perennial streams and no through going surface drainage. The surface sediments in the area of the proposed well are described as the Kermit-Palomas Soils of fine dune sands and the Kermit Soils and Dune Lands according to the US Department of Agriculture web site <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.

Rocks of Quaternary, Tertiary, and Triassic age are exposed and contain the principal aquifers. The most important aquifer is the Ogallala formation. In large parts of southern Lea County the Ogallala has been removed by erosion and in the low-lying areas Quaternary alluvium, derived principally from the Ogallala formation, has been deposited and is the main aquifer. The two aquifers are continuous in the area. Below the Cenozoic rocks are sandstones and shales of the Dockum group (Rustler) of Late Triassic age, from which small quantities of water are obtained. The chemical quality of the ground water from the principal aquifers is generally fair to good.

The top of the Tansill formation is estimated at a depth of 3,197'; therefore, the surface casing is set at 3,250'. There are no sources of drinking water underlying the injection interval.

A search of the New Mexico Water Rights Database shows there are 2 fresh water wells located within a one-mile radius of the proposed Leavenworth AGI #1 well. These fresh water wells are provided in Table 6 and their locations shown in Figure 5. Both wells are owned/operated by Jay Anthony, Anthony Ranch and were drilled prior to 1940. Fresh water samples are being obtained from the two wells. A map and the Water Right Summaries from the New Mexico Office of the State Engineer are included in Appendix A. The chemical analysis of these samples will be provided once the samples are obtained and analysis performed. The shallow aquifers from which these wells are sourced will be protected by the surface, intermediate and production casing strings in the proposed Leavenworth AGI #1 well.

Table 6: Water wells within 1 mile of Leavenworth AGI #1

WR File Number	Owner	Primary Purpose	Primary Status	X (Nad 83 UTM)	Y (Nad 83 UTM)	Depth (ft)
CP 00859	B&D Water	Livestock Watering	Declaration	667175	3545594	UNK
CP 00860	B&D Water	Livestock Watering	Declaration	666806	3543576	UNK

3.5 Zones that Contain Oil and Gas, Water and/or Mineral Bearing Formations

The proposed Leavenworth well is located 1.5 miles east of the Sioux Field, which produced primarily from the Tansill, Yates and Seven Rivers reservoirs. Only 4 wells are listed as active in 2018. One well did produce 172 MMCFG from the Devonian and was plugged in June 2000.

The Leavenworth well location is in an area well-separated from faulting as indicated by well and 3D seismic data. Seismic mapping at the Devonian level shows the location to be in a graben, downthrown to faults 2.51 miles down dip to the west, 2.9 miles up dip to the northeast, and 2.3 miles on strike to the north.

Potential Oil and Gas Bearing Zones within area of well:

Formation	Depth
Delaware	5,100'
Bone Spring	7,294'
Wolfcamp	10,505'
Strawn	12,473'
Atoka	12,846'

4.0 AREA OF REVIEW

Within two miles of the proposed Leavenworth AGI #1 well, there are 80 recorded oil and/or gas wells as shown in Figure 6. Of these only six wells within the one-mile AOR were drilled and the information is included in Table 7. No wells within the AOR penetrate the proposed injection zone.

5.0 IDENTIFICATION AND REQUIRED NOTIFICATION OF AFFECTED PARTIES WITHIN THE AREA OF REVIEW

Lonquist has reviewed the land status and operators within one mile of the proposed well location. There are no active operators within the one-mile radius with wells penetrating the injection zone. There are 6 potentially impacted parties with details provided in Appendix B.

Appendix C contains copies of the registered mail receipts, letters and the newspaper affidavit of publication.

6.0 AFFIRMATIVE STATEMENT OF EXAMINATION OF GEOLOGIC AND ENGINEERING DATA

Based on the available engineering and geologic data we find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water. 3D mapping and subsurface well control do not indicate that the regional faulting in the Devonian age rock extends vertically beyond the Pennsylvanian age rock. Therefore, there is no apparent hydrologic connection between the disposal zone and any underground sources of drinking water.

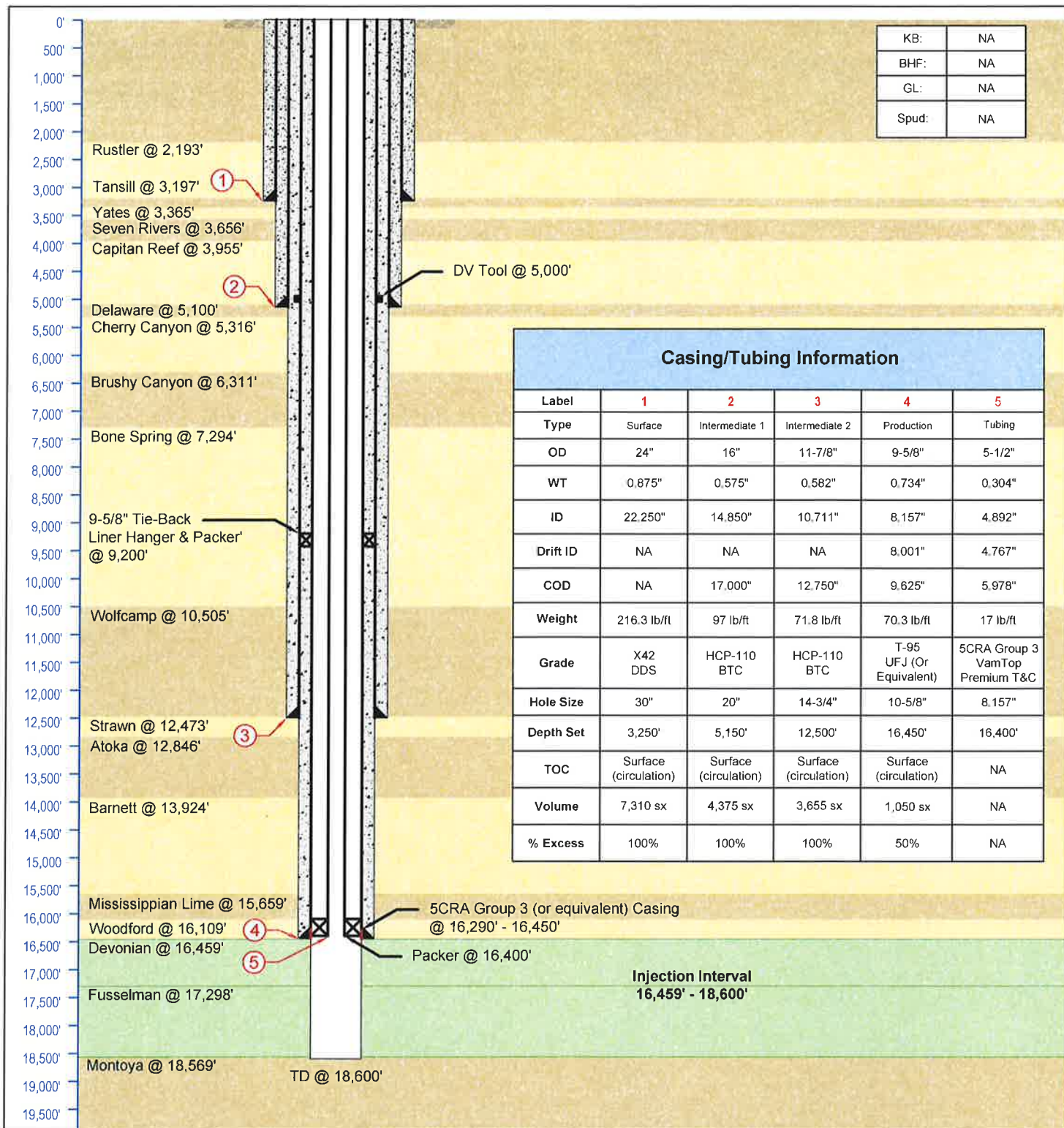
7.0 REFERENCES

Geology and Ground-Water Conditions in Southern Lea County, New Mexico GROUND-WATER REPORT 6; 1961; ALEXANDER NICHOLSON, Jr. and ALFRED CLEBSCH, JR.; UNITED STATES GEOLOGICAL SURVEY-New Mexico Institute of Mining and Technology, State Bureau of Mines and Mineral Resources Division and the New Mexico State Engineer.

MIDDLE PERMIAN BASINAL SILICICLASTIC DEPOSITION IN THE DELAWARE BASIN: THE DELAWARE MOUNTAIN GROUP (GUADALUPIAN); 2006; H. S. Nance; Bureau of Economic Geology Jackson School of Geosciences; The University of Texas at Austin; Austin, Texas.

Stratigraphic Analysis of the Upper Devonian Woodford Formation, Permian Basin, West Texas and Southeastern New Mexico, 1991, John B. Comer, Report of Investigations No. 201 Bureau of Economic Geology.

FIGURE 1



Casing/Tubing Information					
Label	1	2	3	4	5
Type	Surface	Intermediate 1	Intermediate 2	Production	Tubing
OD	24"	16"	11-7/8"	9-5/8"	5-1/2"
WT	0.875"	0.575"	0.582"	0.734"	0.304"
ID	22.250"	14.850"	10.711"	8.157"	4.892"
Drift ID	NA	NA	NA	8.001"	4.767"
COD	NA	17.000"	12.750"	9.625"	5.978"
Weight	216.3 lb/ft	97 lb/ft	71.8 lb/ft	70.3 lb/ft	17 lb/ft
Grade	X42 DDS	HCP-110 BTC	HCP-110 BTC	T-95 UFJ (Or Equivalent)	5CRA Group 3 VamTop Premium T&C
Hole Size	30"	20"	14-3/4"	10-5/8"	8.157"
Depth Set	3,250'	5,150'	12,500'	16,450'	16,400'
TOC	Surface (circulation)	Surface (circulation)	Surface (circulation)	Surface (circulation)	NA
Volume	7,310 sx	4,375 sx	3,655 sx	1,050 sx	NA
% Excess	100%	100%	100%	50%	NA

<div>LONQUIST & CO. LLC</div> <div>PETROLEUM ENGINEERSENERGY ADVISORS</div> <div>HOUSTON CALGARY AUSTIN WICHITA DENVER</div>	Salt Creek Midstream	Leavenworth AGI No. 1	
	Country: USA	State/Province: New Mexico	County/Parish: Lea
	Location:	Site:	Survey:
	API No: NA	Field:	Well Type/Status: AGI / New Drill
	Texas License F-9147	RRC District No:	Project No: 1624
12912 Hill Country Blvd. Ste F-200 Austin, Texas 78738 Tel: 512.732.9812 Fax: 512.732.9816	Drawn: WHG	Reviewed: SLP	Approved:
	Rev No: 14	Notes:	

FIGURE 2

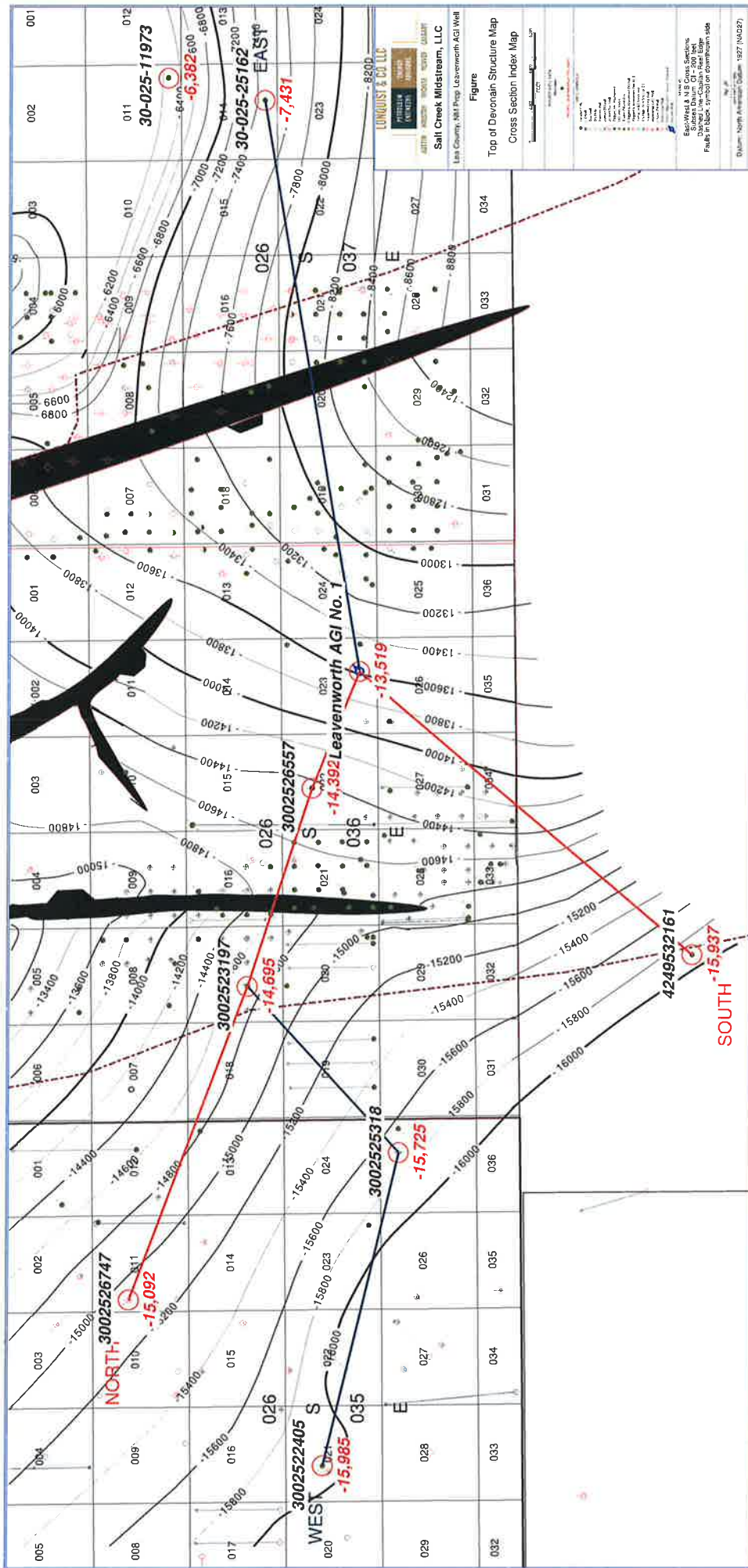


FIGURE 3

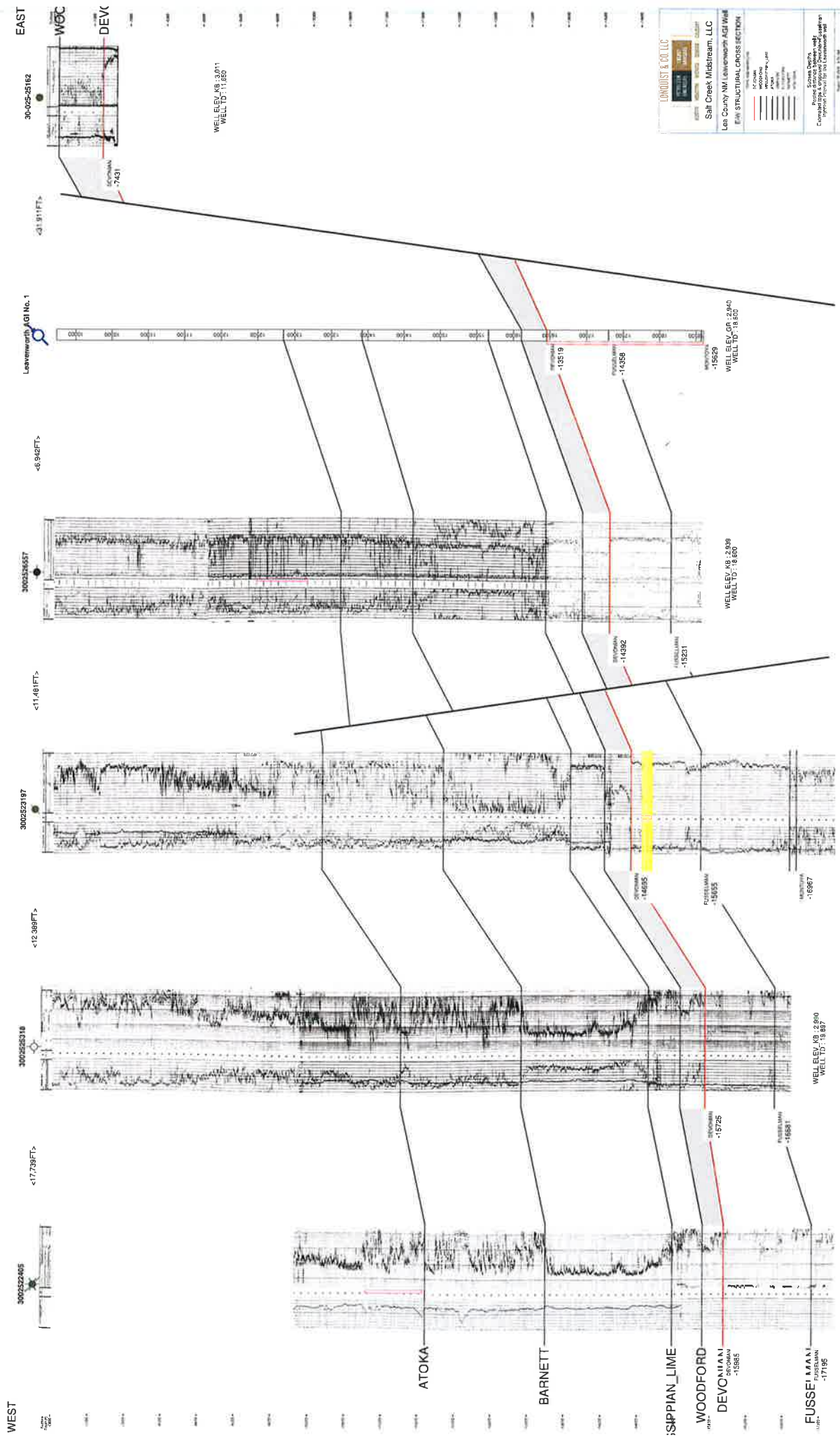
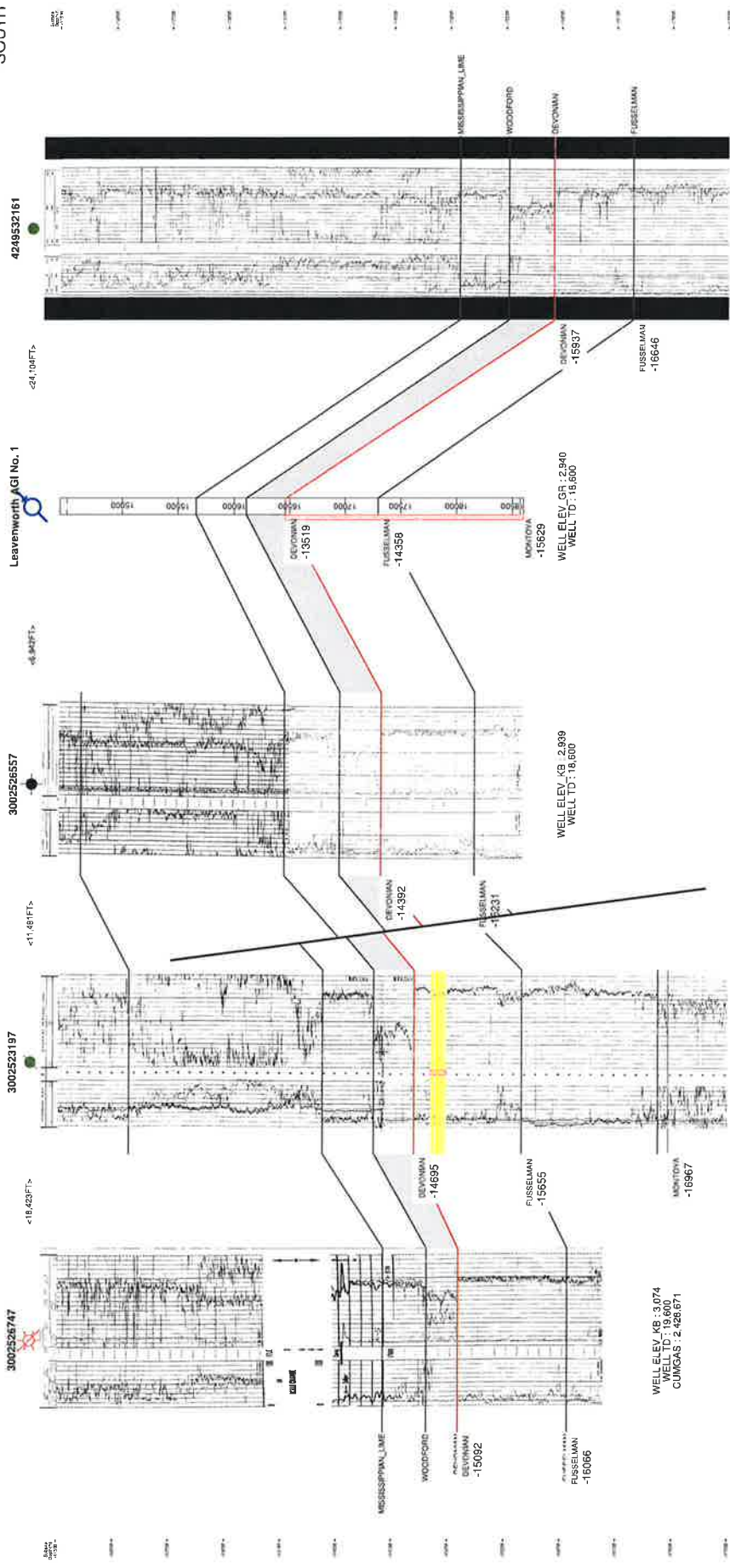


FIGURE 4

NORTH

SOUTH



CONQUEST & CO. LLC
3029A 10020N 1002E 9W33 Q334P
Sall Creek Midstream, LLC
Lee County NM Leavenworth AGI Well
N/E STRUCTURAL CROSS SECTION

Scale: 1" = 1000'
Project: Sall Creek Midstream
Estimated Well & Proposed Deviation Trajectory
Copyright © 2014 Conquest & Co. LLC

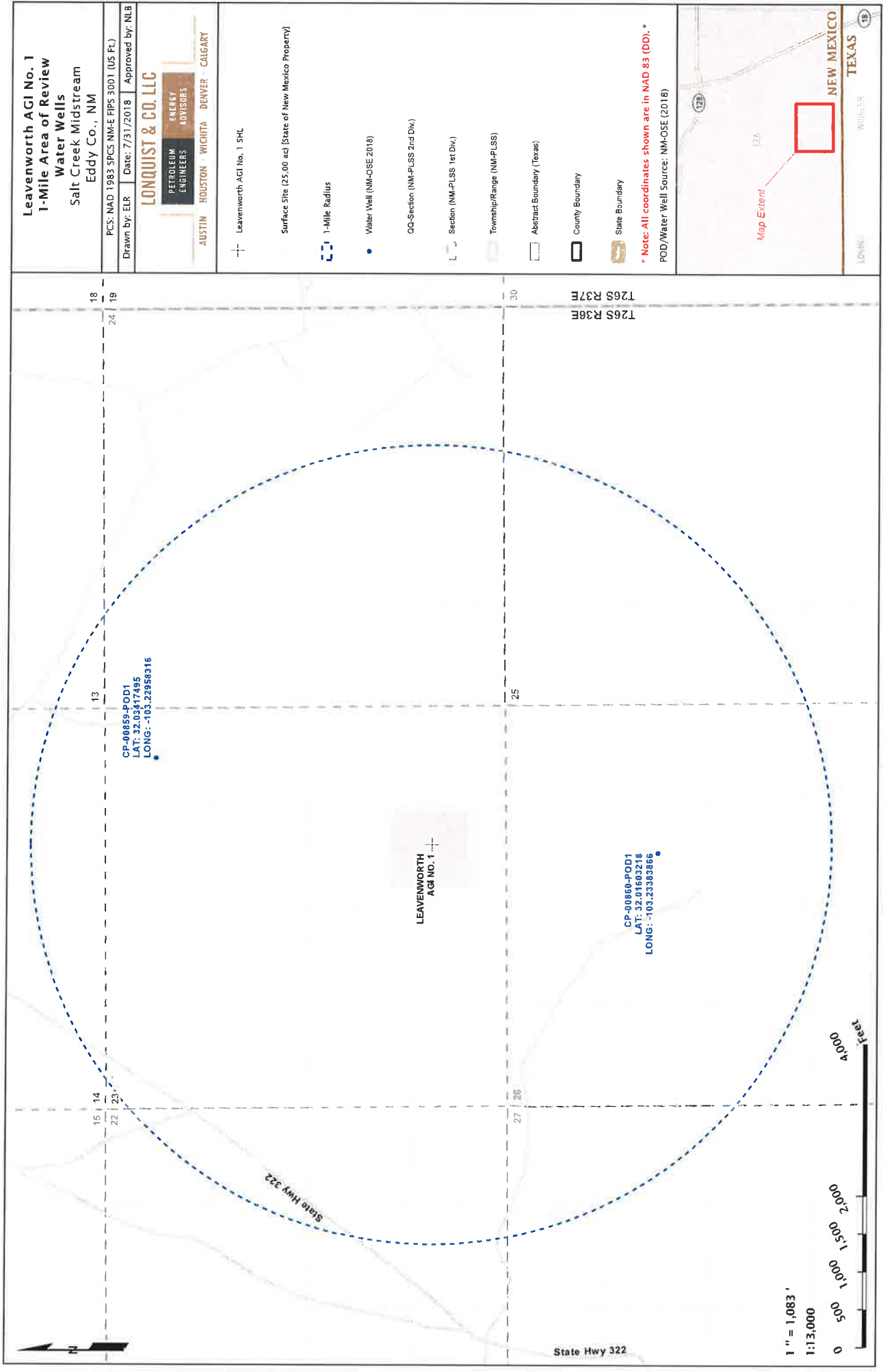
WELL ELEV. KB: 2,927
WELL TD: 22,300

WELL ELEV. KB: 2,915
WELL TD: 21,252
CUMGAS: 75,488
NET_DEVONIAN_2-6% [W]: 80

WELL ELEV. KB: 3,074
WELL TD: 19,600
CUMGAS: 2,426,671

WELL ELEV. KB: 2,939
WELL TD: 18,600

FIGURE 5



Leavenworth AGI No. 1
1-Mile Area of Review
Water Wells
 Salt Creek Midstream
 Eddy Co., NM

PCS: NAD 1983 SPCS NM-E FIPS 3001 (US FL)
 Drawn by: ELR Date: 7/31/2018 Approved by: NLB

LONGQUIST & CO. LLC

PETROLEUM
 ENGINEERS
 ADVISORS

AUSTIN HOUSTON WICHITA DENVER CALGARY

Leavenworth AGI No. 1 SHL

Surface Site (25.00 ac) [State of New Mexico Property]

1-Mile Radius

Water Well (NM-OSE 2018)

QQ-Section (NM-PLSS 2nd Div.)

Section (NM-PLSS 1st Div.)

Township/Range (NM-PLSS)

Abstract Boundary (Texas)

County Boundary

State Boundary

* Note: All coordinates shown are in NAD 83 (DD).
 POD/Water Well Source: NM-OSE (2018)

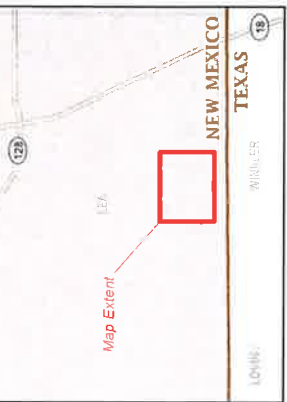
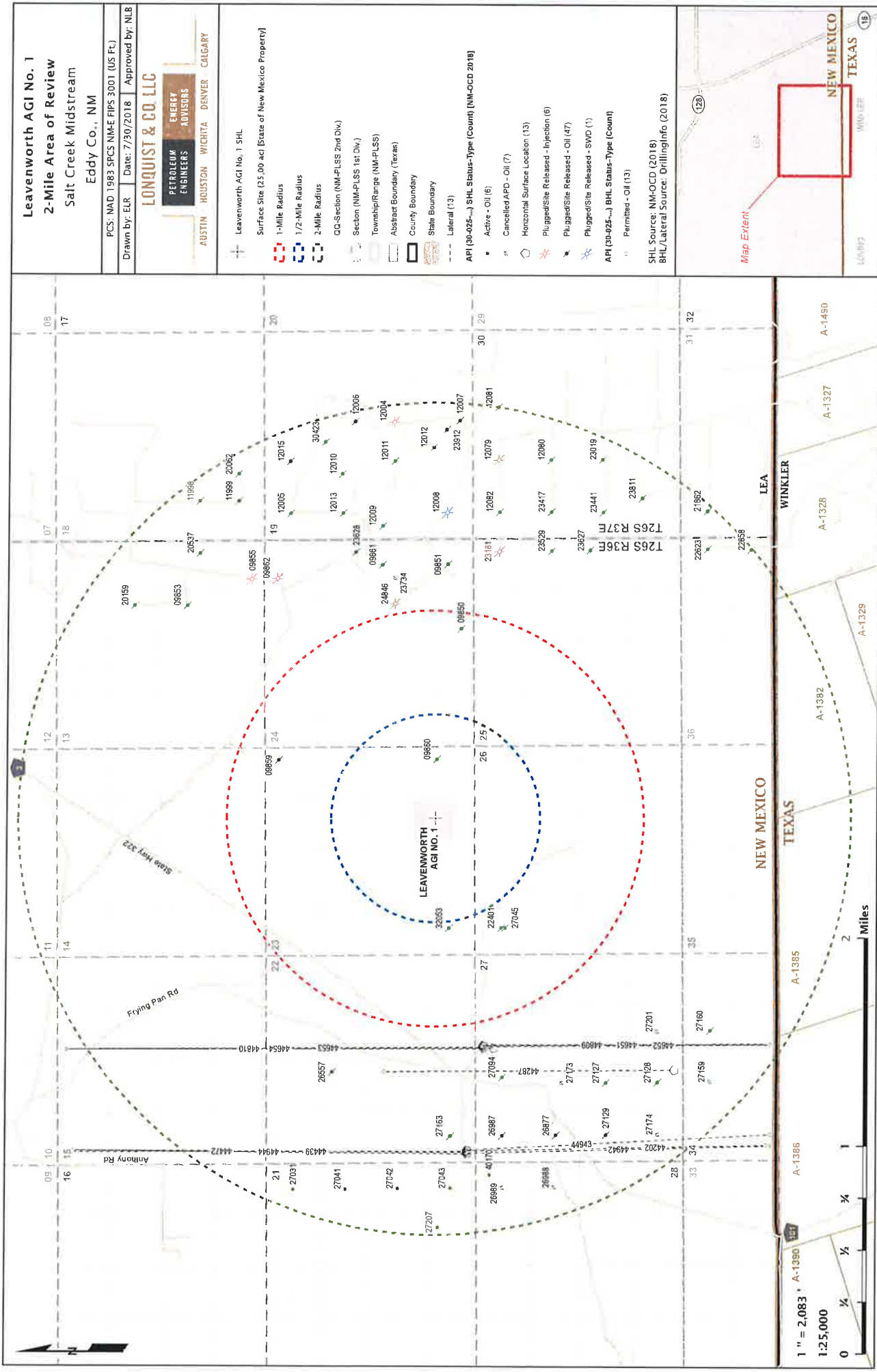


FIGURE 6



Leavenworth AGI No. 1
1/2-Mile Area of Review List

API (30-025-...)	WELL NAME	WELL TYPE	STATUS	OPERATOR	TVD (FT.)	LATITUDE (NAD 83 DD)	LONGITUDE (NAD 83 DD)	DATE DRILLED
09860	PRE-ONGARD WELL #001	O	P	PRE-ONGARD WELL OPERATOR	3500	32.02408220	-103.22850040	1/1/1900

**Leavenworth AGI No. 1
1-Mile Area of Review List**

API (30-025-...)	WELL NAME	WELL TYPE	STATUS	OPERATOR	TVD (FT.)	LATITUDE (NAD 83 DD)	LONGITUDE (NAD 83 DD)	DATE DRILLED
09850	PRE-ONGARD WELL #001	O	P	PRE-ONGARD WELL OPERATOR	3304	32.0223732	-103.2178879	1/1/1900
09859	PRE-ONGARD WELL #001	O	P	PRE-ONGARD WELL OPERATOR	3,708	32.0350876	-103.2285080	1/1/1900
09860	PRE-ONGARD WELL #001	O	P	PRE-ONGARD WELL OPERATOR	3,500	32.0240822	-103.2285004	1/1/1900
22401	PRE-ONGARD WELL #001	O	P	PRE-ONGARD WELL OPERATOR	3,502	32.0196686	-103.2423859	1/1/1900
27045	LEA 26 7406 JV-S #001	O	P	BTA OIL PRODUCERS	3,660	32.0193901	-103.2423859	12/31/9999
32053	BEARTOOTH STATE UNIT #001	O	P	EOG Y RESOURCES, INC.	7,725	32.0232964	-103.2423859	7/26/1993

FIGURE 7

Leavenworth AGI No. 1
Offset Leases
Salt Creek Midstream
Lea Co., NM

PCS: NAD 1983 SPCS NME FIPS 3001 (US FL)

Drawn by: ASC Date: 8/16/2018 Approved by: EIR

LONGQUEST & CO. LLC

PETROLEUM
ENGINEERS
ADVISORS

AUSTIN HOUSTON WICHITA DENVER CALGARY

Leavenworth AGI No. 1 SHL

Surface Site (25.00 ac) (State of New Mexico Property)

State Land Office

BLM, Leased

NEED LESSEE INFORMATION

1-Mile Radius

1/2-Mile Radius

0.5-Mile Radius

Section (NMP-PLUS 2nd Div)

Township/Range (NMP-PLUS)

Abstract Boundary (Texas)

County Boundary

State Boundary

Lease (13)

API (20-255-...) SHL Status-Type Count (NIM-OCO 2018)

Horizontal Surface Location (13)

Active - Oil (6)

Cancelled APD - Oil (7)

Plugged/Seal Released - Injection (6)

Plugged/Seal Released - Oil (47)

Plugged/Seal Released - SWD (1)

API (20-255-...) BHL Status-Type Count

Permitted - Oil (13)

Offet Lease Boundary

Lessee(s)

AMERDEV NEW MEXICO, LLC

AMERDEV NEW MEXICO, LLC - IMPETO OPERATING LLC

AMERDEV OPERATING, LLC - IMPER OPERATING, LLC

APACHE CORP

BLM NON-LEASED LAND

BLM OIL PRODUCERS

BURLINGTON RES OIL & GAS CO LP

CHEVRON U.S.A INC

EGGY RESOURCES, INC

EXXON MOBIL CORPORATION

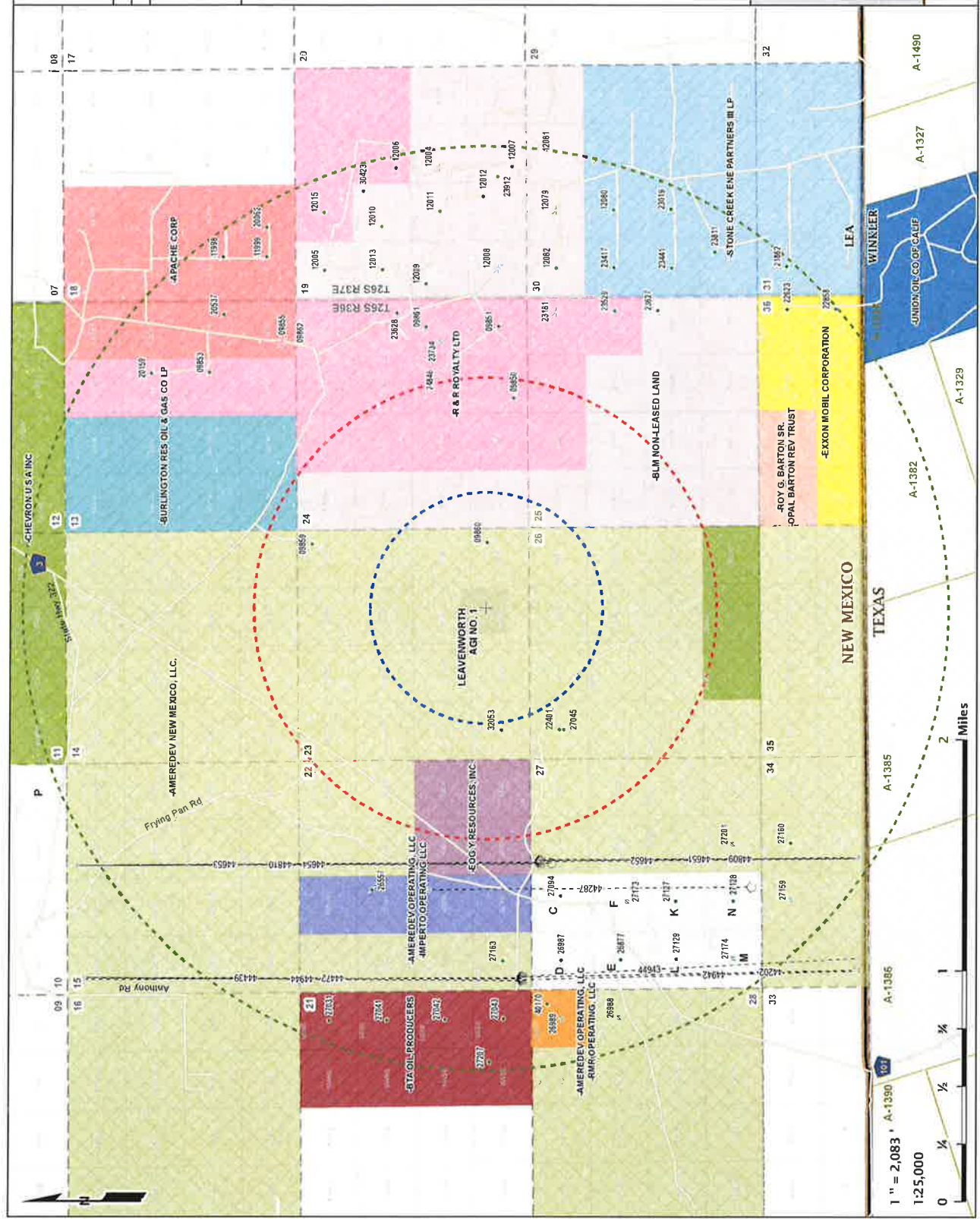
ROY G. BARTON SR. - OPAL BARTON REV TRUST

ROY G. BARTON SR. - OPAL BARTON REV TRUST

STONE CREEK PARTNERS III LP

SHL Source: NM-OCO/NM-BLM/NM-SLO (2018)

BHL/Lateral Source: DrillingInfo (2018)



1" = 2,083' A-1390
1:25,000
0 1/4 1/2 1 Miles

ANDREWS

Map Extent

NEW MEXICO

TEXAS

WINKLER

LEA

Leavenworth AGI No. 1
1-Mile Offset Lessees List

TOWNSHIP	RANGE	SECTION	QQ UNIT LETTER	MINERAL LESSEE	MINERAL OWNER	ADDRESS 1	ADDRESS 2
26S	36E	13	M	BURLINGTON RES OIL & GAS CO LP	-	PO BOX 51810	MIDLAND TX, 797101810
26S	36E	14	Entire Section	AMEREDEV NEW MEXICO, LLC.	-	5707 SOUTHWEST PARKWAY, BUILDING 1, SUITE 275	AUSTIN, TX 78735
26S	36E	22	A,G,H	AMEREDEV NEW MEXICO, LLC.	-	5707 SOUTHWEST PARKWAY, BUILDING 1, SUITE 275	AUSTIN, TX 78735
			I,J,O,P	EOG Y RESOURCES, INC.	-	104 S 4TH ST	ARTESIA, NM 88210
26S	36E	23	Entire Section	AMEREDEV NEW MEXICO, LLC.	-	5707 SOUTHWEST PARKWAY, BUILDING 1, SUITE 275	AUSTIN, TX 78735
26S	36E	24	C,F,G,J,K,N,O	R & R ROYALTY LTD	-	500 N SHORELINE BLVD STE 322	CORPUS CHRISTI TX, 78401
			D,E,L,M	NO INFORMATION FOUND	BUREAU OF LAND MANAGEMENT	301 DINOSAUR TRAIL	SANTA FE, NM 87508
26S	36E	25	B,C	R & R ROYALTY LTD	-	500 N SHORELINE BLVD STE 322	CORPUS CHRISTI TX, 78401
26S	36E	25	D,E,F,G,K,L,M	NO INFORMATION FOUND	BUREAU OF LAND MANAGEMENT	301 DINOSAUR TRAIL	SANTA FE, NM 87508
26S	36E	26	A,B,C,D,E,F,G,H,I,J,K,L,M	AMEREDEV NEW MEXICO, LLC.	-	5707 SOUTHWEST PARKWAY, BUILDING 1, SUITE 275	AUSTIN, TX 78735
			N,O,P	CHEVRON U S A INC	-	6301 DEALVILLE BLVD	MIDLAND, TX U.S.A. 79706
26S	36E	27	A,B,G,H,I,J,O,P	AMEREDEV NEW MEXICO, LLC.	-	5707 SOUTHWEST PARKWAY, BUILDING 1, SUITE 275	AUSTIN, TX 78735

APPENDIX A



New Mexico Office of the State Engineer

Water Right Summary



WR File Number: CP 00859 **Subbasin:** CP **Cross Reference:** -
Primary Purpose: PLS NON 72-12-1 LIVESTOCK WATERING
Primary Status: DCL DECLARATION
Total Acres: 0 **Subfile:** -
Total Diversion: 3 **Cause/Case:** -
Owner: JAY ANTHONY
Owner: ANTHONY RANCH

Documents on File

Trn #	Doc	File/Act	Status		Transaction Desc.	From/ To	Acres	Diversion	Consumptive
			1	2					
600652	DCL	1997-02-05	DCL	PRC	CP 00859	T	0	3	

Current Points of Diversion

(NAD83 UTM in meters)

POD Number	Source	Q	Q	Q	Q	X	Y	Other Location Desc
CP 00859 POD1		2	2	23	26S 36E	667175	3545594*	

An () after northing value indicates UTM location was derived from PLSS - see Help

Priority Summary

Priority	Status	Acres	Diversion	Pod Number	Source
12/31/1940	DCL	0	3	CP 00859 POD1	

Place of Use

Q	Q	Q	Q	Q	Acres	Diversion	CU	Use	Priority	Status	Other Location Desc
256	64	16	4	SecTws Rng	0	3		PLS	12/31/1940	DCL	NO PLACE OF USE GIVEN

Source

Acres	Diversion	CU	Use	Priority	Source Description
0	3		PLS	12/31/1940	GW



New Mexico Office of the State Engineer

Water Right Summary



WR File Number: CP 00860 **Subbasin:** CP **Cross Reference:** -
Primary Purpose: PLS NON 72-12-1 LIVESTOCK WATERING
Primary Status: DCL DECLARATION
Total Acres: 0 **Subfile:** -
Total Diversion: 3 **Cause/Case:** -
Owner: JAY ANTHONY
Owner: ANTHONY RANCH

Documents on File

Trn #	Doc	File/Act	Status		Transaction Desc.	From/ To	Acres	Diversion	Consumptive
			1	2					
600657	DCL	1997-02-05	DCL	PRC	CP 00860	T	0	3	

Current Points of Diversion

POD Number	Source	Q Q Q			(NAD83 UTM in meters)			Other Location Desc
		64	16	4	Sec	Tws	Rng	
CP 00860 POD1		3	2	26	26S	36E	666806	3543576*

An () after northing value indicates UTM location was derived from PLSS - see Help

Priority Summary

Priority	Status	Acres	Diversion	Pod Number	Source
12/31/1900	DCL	0	3	CP 00860 POD1	

Place of Use

Q Q Q Q				Acres	Diversion	CU	Use	Priority	Status	Other Location Desc
256	64	16	4							
				0	3		PLS	12/31/1900	DCL	NO PLACE OF USE GIVEN

Source

Acres	Diversion	CU	Use	Priority	Source Description
0	3		PLS	12/31/1900	GW

The data is furnished by the NMOSE/ISC and is accepted by the recipient with the expressed understanding that the OSE/ISC make no warranties, expressed or implied, concerning the accuracy, completeness, reliability, usability, or suitability for any particular purpose of the data.



PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

September 21, 2018

RAMONA HOVEY

Lonquist Field Services, LLC

3345 Bee Cave Road, Suite 201

Austin, TX 78746

RE: LEAVONWORTH AGI NO 1

Enclosed are the results of analyses for samples received by the laboratory on 09/14/18 15:10.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-18-11. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Total Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Cardinal Laboratories is accredited through the State of New Mexico Environment Department for:

Method SM 9223-B	Total Coliform and E. coli (Colilert MMO-MUG)
Method EPA 524.2	Regulated VOCs and Total Trihalomethanes (TTHM)
Method EPA 552.2	Total Haloacetic Acids (HAA-5)

Accreditation applies to public drinking water matrices for State of Colorado and New Mexico.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Celey D. Keene". The signature is written in a cursive, flowing style.

Celey D. Keene

Lab Director/Quality Manager

Analytical Results For:

Lonquist Field Services, LLC
3345 Bee Cave Road, Suite 201
Austin TX, 78746

Project: LEAVONWORTH AGI NO 1
Project Number: 32.03417495-103.22958316
Project Manager: RAMONA HOVEY
Fax To: (512) 732-9816

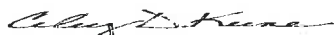
Reported:
21-Sep-18 17:00

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
CP- 00859 -POD 1	H802602-01	Water	14-Sep-18 13:12	14-Sep-18 15:10
CP- 00860 -POD 1	H802602-02	Water	14-Sep-18 13:31	14-Sep-18 15:10

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 Lonquist Field Services, LLC
 3345 Bee Cave Road, Suite 201
 Austin TX, 78746

 Project: LEAVONWORTH AGI NO 1
 Project Number: 32.03417495-103.22958316
 Project Manager: RAMONA HOVEY
 Fax To: (512) 732-9816

 Reported:
 21-Sep-18 17:00

CP- 00859 -POD 1
H802602-01 (Water)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories
Inorganic Compounds

Alkalinity, Bicarbonate	171		5.00	mg/L	1	8082501	AC	17-Sep-18	310.1	
Alkalinity, Carbonate	<1.00		1.00	mg/L	1	8082501	AC	17-Sep-18	310.1	
Chloride*	490		4.00	mg/L	1	8091303	AC	17-Sep-18	4500-Cl-B	
Conductivity*	2250		1.00	uS/cm	1	8091701	AC	17-Sep-18	120.1	
pH*	7.92		0.100	pH Units	1	8091701	AC	17-Sep-18	150.1	
Resistivity	4.44			Ohms/m	1	8091701	AC	17-Sep-18	120.1	
Specific Gravity @ 60° F	1.000		0.000	[blank]	1	8091710	AC	17-Sep-18	SM 2710F	
Sulfate*	223		50.0	mg/L	5	8091802	AC	18-Sep-18	375.4	
TDS*	1370		5.00	mg/L	1	8091202	AC	18-Sep-18	160.1	
Alkalinity, Total*	140		4.00	mg/L	1	8082501	AC	17-Sep-18	310.1	
Sulfide, total	<0.0100		0.0100	mg/L	1	8092104	AC	17-Sep-18	376.2	

Green Analytical Laboratories
Total Recoverable Metals by ICP (E200.7)

Barium*	0.085		0.050	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Calcium*	162		0.100	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Iron*	0.112		0.050	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Magnesium*	90.1		0.100	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Potassium*	9.56		1.00	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Sodium*	101		1.00	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 Lonquist Field Services, LLC
 3345 Bee Cave Road, Suite 201
 Austin TX, 78746

 Project: LEAVONWORTH AGI NO 1
 Project Number: 32.03417495-103.22958316
 Project Manager: RAMONA HOVEY
 Fax To: (512) 732-9816

 Reported:
 21-Sep-18 17:00

CP- 00860 -POD 1
H802602-02 (Water)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories
Inorganic Compounds

Alkalinity, Bicarbonate	215		5.00	mg/L	1	8082501	AC	17-Sep-18	310.1	
Alkalinity, Carbonate	<1.00		1.00	mg/L	1	8082501	AC	17-Sep-18	310.1	
Chloride*	72.0		4.00	mg/L	1	8091303	AC	17-Sep-18	4500-Cl-B	
Conductivity*	773		1.00	uS/cm	1	8091701	AC	17-Sep-18	120.1	
pH*	7.72		0.100	pH Units	1	8091701	AC	17-Sep-18	150.1	
Resistivity	12.9			Ohms/m	1	8091701	AC	17-Sep-18	120.1	
Specific Gravity @ 60° F	0.9993		0.000	[blank]	1	8091710	AC	17-Sep-18	SM 2710F	
Sulfate*	108		25.0	mg/L	2.5	8091802	AC	18-Sep-18	375.4	
TDS*	446		5.00	mg/L	1	8091202	AC	18-Sep-18	160.1	
Alkalinity, Total*	176		4.00	mg/L	1	8082501	AC	17-Sep-18	310.1	
Sulfide, total	<0.0100		0.0100	mg/L	1	8092104	AC	17-Sep-18	376.2	

Green Analytical Laboratories
Total Recoverable Metals by ICP (E200.7)

Barium*	0.051		0.050	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Calcium*	60.1		0.100	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Iron*	0.959		0.050	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Magnesium*	22.4		0.100	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Potassium*	6.17		1.00	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	
Sodium*	54.0		1.00	mg/L	1	B809132	AES	21-Sep-18	EPA200.7	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

Lonquist Field Services, LLC
3345 Bee Cave Road, Suite 201
Austin TX, 78746

Project: LEAVONWORTH AGI NO 1
Project Number: 32.03417495-103.22958316
Project Manager: RAMONA HOVEY
Fax To: (512) 732-9816

Reported:
21-Sep-18 17:00

Inorganic Compounds - Quality Control
Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 8082501 - General Prep - Wet Chem
Blank (8082501-BLK1)

Prepared: 25-Aug-18 Analyzed: 27-Aug-18

Alkalinity, Carbonate	ND	1.00	mg/L							
Alkalinity, Bicarbonate	5.00	5.00	mg/L							
Alkalinity, Total	4.00	4.00	mg/L							

LCS (8082501-BS1)

Prepared: 25-Aug-18 Analyzed: 27-Aug-18

Alkalinity, Carbonate	ND	2.50	mg/L				80-120			
Alkalinity, Bicarbonate	302	12.5	mg/L				80-120			
Alkalinity, Total	250	10.0	mg/L	250		100	80-120			

LCS Dup (8082501-BSD1)

Prepared: 25-Aug-18 Analyzed: 27-Aug-18

Alkalinity, Carbonate	ND	2.50	mg/L				80-120		20	
Alkalinity, Bicarbonate	318	12.5	mg/L				80-120	4.84	20	
Alkalinity, Total	260	10.0	mg/L	250		104	80-120	3.92	20	

Batch 8091202 - Filtration
Blank (8091202-BLK1)

Prepared: 12-Sep-18 Analyzed: 13-Sep-18

TDS	ND	5.00	mg/L							
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LCS (8091202-BS1)

Prepared: 12-Sep-18 Analyzed: 13-Sep-18

TDS	490		mg/L	527		93.0	80-120			
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Duplicate (8091202-DUP1)

Source: H802574-08

Prepared: 12-Sep-18 Analyzed: 13-Sep-18

TDS	17000	5.00	mg/L		16400			3.47	20	
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Batch 8091303 - General Prep - Wet Chem
Blank (8091303-BLK1)

Prepared & Analyzed: 14-Sep-18

Chloride	ND	4.00	mg/L							
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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 Lonquist Field Services, LLC
 3345 Bee Cave Road, Suite 201
 Austin TX, 78746

 Project: LEAVONWORTH AGI NO 1
 Project Number: 32.03417495-103.22958316
 Project Manager: RAMONA HOVEY
 Fax To: (512) 732-9816

 Reported:
 21-Sep-18 17:00

Inorganic Compounds - Quality Control
Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 8091303 - General Prep - Wet Chem
LCS (8091303-BS1)

Prepared & Analyzed: 14-Sep-18

Chloride	100	4.00	mg/L	100	100	80-120
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LCS Dup (8091303-BSD1)

Prepared & Analyzed: 14-Sep-18

Chloride	104	4.00	mg/L	100	104	80-120	3.92	20
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Batch 8091701 - General Prep - Wet Chem
LCS (8091701-BS1)

Prepared & Analyzed: 17-Sep-18

pH	7.08		pH Units	7.00	101	90-110
Conductivity	49200		uS/cm	50000	98.4	80-120

Duplicate (8091701-DUP1)

Source: H802601-01

Prepared & Analyzed: 17-Sep-18

Conductivity	4420	1.00	uS/cm	4430	0.226	20
pH	7.03	0.100	pH Units	6.98	0.714	20
Resistivity	2.26		Ohms/m	2.26	0.226	20

Batch 8091710 - General Prep - Wet Chem
Duplicate (8091710-DUP1)

Source: H802601-01

Prepared & Analyzed: 17-Sep-18

Specific Gravity @ 60° F	1.001	0.000	[blank]	1.003	0.178	20
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Batch 8091802 - General Prep - Wet Chem
Blank (8091802-BLK1)

Prepared & Analyzed: 18-Sep-18

Sulfate	ND	10.0	mg/L
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Analytical Results For:

Lonquist Field Services, LLC
3345 Bee Cave Road, Suite 201
Austin TX, 78746

Project: LEAVONWORTH AGI NO 1
Project Number: 32.03417495-103.22958316
Project Manager: RAMONA HOVEY
Fax To: (512) 732-9816

Reported:
21-Sep-18 17:00

Inorganic Compounds - Quality Control
Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	----------------	--------------	-------

Batch 8091802 - General Prep - Wet Chem
LCS (8091802-BS1)

Prepared & Analyzed: 18-Sep-18

Sulfate	23.0	10.0	mg/L	20.0	115	80-120		
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LCS Dup (8091802-BSD1)

Prepared & Analyzed: 18-Sep-18

Sulfate	23.0	10.0	mg/L	20.0	115	80-120	0.304	20
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Batch 8092104 - General Prep - Wet Chem
Blank (8092104-BLK1)

Prepared & Analyzed: 17-Sep-18

Sulfide, total	ND	0.0100	mg/L					
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Duplicate (8092104-DUP1)

Source: H802601-01

Prepared & Analyzed: 17-Sep-18

Sulfide, total	0.0493	0.0100	mg/L	0.0439			11.6	20
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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 Lonquist Field Services, LLC
 3345 Bee Cave Road, Suite 201
 Austin TX, 78746

 Project: LEAVONWORTH AGI NO 1
 Project Number: 32.03417495-103.22958316
 Project Manager: RAMONA HOVEY
 Fax To: (512) 732-9816

 Reported:
 21-Sep-18 17:00

Total Recoverable Metals by ICP (E200.7) - Quality Control
Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch B809132 - Total Rec. 200.7/200.8/200.2
Blank (B809132-BLK1)

Prepared: 19-Sep-18 Analyzed: 21-Sep-18

Iron	ND	0.050	mg/L							
Calcium	ND	0.100	mg/L							
Potassium	ND	1.00	mg/L							
Sodium	ND	1.00	mg/L							
Barium	ND	0.050	mg/L							
Magnesium	ND	0.100	mg/L							

LCS (B809132-BS1)

Prepared: 19-Sep-18 Analyzed: 21-Sep-18

Sodium	3.30	1.00	mg/L	3.24		102	85-115			
Potassium	8.24	1.00	mg/L	8.00		103	85-115			
Barium	1.93	0.050	mg/L	2.00		96.5	85-115			
Calcium	4.07	0.100	mg/L	4.00		102	85-115			
Iron	3.96	0.050	mg/L	4.00		98.9	85-115			
Magnesium	20.1	0.100	mg/L	20.0		101	85-115			

LCS Dup (B809132-BSD1)

Prepared: 19-Sep-18 Analyzed: 21-Sep-18

Barium	1.94	0.050	mg/L	2.00		96.9	85-115	0.341	20	
Potassium	8.13	1.00	mg/L	8.00		102	85-115	1.29	20	
Calcium	4.06	0.100	mg/L	4.00		102	85-115	0.157	20	
Iron	3.94	0.050	mg/L	4.00		98.5	85-115	0.482	20	
Magnesium	20.0	0.100	mg/L	20.0		100	85-115	0.503	20	
Sodium	3.27	1.00	mg/L	3.24		101	85-115	1.09	20	

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
*	Chloride by SM4500Cl-B does not require samples be received at or below 6°C Samples reported on an as received basis (wet) unless otherwise noted on report

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Celey D. Keene, Lab Director/Quality Manager

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

+ Cardinal cannot accept verbal changes. Please for written changes to (575) 393-2326

CARDINAL LABORATORIES
SCALE INDEX WATER ANALYSIS REPORT

Company :	LONQUIST FIELD SERVICES, LLC	Date Sampled :	09/14/18
Lease Name :	LEAVONWORTH AGI NO 1	Company Rep. :	RAMONA HOVEY
Well Number :	CP-00859 POD 1 (H802602-01)		
Location :	32.03417495-103.22958316		

ANALYSIS

- | | | | |
|----|--|--------|------------------------------------|
| 1. | pH | 7.92 | |
| 2. | Specific Gravity @ 60/60 F. | 1.0000 | |
| 3. | CaCO ₃ Saturation Index @ 80 F. | -0.005 | |
| | @ 140 F. | +0.695 | 'Calcium Carbonate Scale Possible' |

Dissolved Gasses

- | | | | |
|----|------------------|-------|-----|
| 4. | Hydrogen Sulfide | 0.000 | PPM |
| 5. | Carbon Dioxide | ND | PPM |
| 6. | Dissolved Oxygen | ND | PPM |

Cations

- | | | / | Eq. Wt. | = | MEQ/L |
|-----|------------------|--------|---------|------|--------|
| 7. | Calcium (Ca++) | 162.00 | / | 20.1 | = 8.06 |
| 8. | Magnesium (Mg++) | 90.10 | / | 12.2 | = 7.39 |
| 9. | Sodium (Na+) | 101 | / | 23.0 | = 5.73 |
| 10. | Barium (Ba++) | 0.085 | / | 68.7 | = 0.00 |

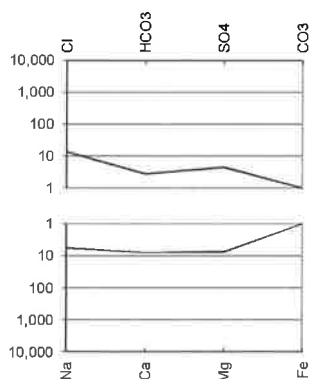
Anions

- | | | | | | |
|-----|----------------------------------|-----|---|------|---------|
| 11. | Hydroxyl (OH-) | 0 | / | 17.0 | = 0.00 |
| 12. | Carbonate (CO ₃ =) | 0 | / | 30.0 | = 0.00 |
| 13. | Bicarbonate (HCO ₃ -) | 171 | / | 61.1 | = 2.80 |
| 14. | Sulfate (SO ₄ =) | 223 | / | 48.8 | = 4.57 |
| 15. | Chloride (Cl-) | 490 | / | 35.5 | = 13.80 |

Other

- | | | | | | |
|-----|-------------------------------------|-------|------------|------|-------------|
| 16. | Total Iron (Fe) | 0.112 | / | 18.2 | = 0.01 |
| 17. | Total Dissolved Solids | 1,370 | | | |
| 18. | Total Hardness As CaCO ₃ | 776.0 | | | |
| 19. | Calcium Sulfate Solubility @ 90 F. | 1,403 | | | |
| 20. | Resistivity (Measured) | 4.440 | Ohm/Meters | @ 77 | Degrees (F) |

Logarithmic Water Pattern



PROBABLE MINERAL COMPOSITION

COMPOUND	Eq. Wt.	X	MEQ/L	=	mg/L
Ca(HCO ₃) ₂	81.04	X	2.80	=	227
CaSO ₄	68.07	X	4.57	=	311
CaCl ₂	55.50	X	0.69	=	38
Mg(HCO ₃) ₂	73.17	X	0.00	=	0
MgSO ₄	60.19	X	0.00	=	0
MgCl ₂	47.62	X	7.39	=	352
NaHCO ₃	84.00	X	0.00	=	0
NaSO ₄	71.03	X	0.00	=	0
NaCl	58.46	X	5.73	=	335

ND = Not Determined

CARDINAL LABORATORIES

SCALE INDEX WATER ANALYSIS REPORT

Company : LONQUIST FIELD SERVICES, LLC	Date Sampled : 09/14/18
Lease Name : LEAVONWORTH AGI NO 1	Company Rep. : RAMONA HOVEY
Well Number : CP-00860 POD 1 (H802602-02)	
Location : 32.03417495-103.22958316	

ANALYSIS

- | | | |
|-----------------------------------|--------|------------------------------------|
| 1. pH | 7.72 | |
| 2. Specific Gravity @ 60/60 F. | 0.9993 | |
| 3. CaCO3 Saturation Index @ 80 F. | -0.336 | |
| @ 140 F. | +0.364 | 'Calcium Carbonate Scale Possible' |

Dissolved Gasses

- | | | |
|---------------------|-------|-----|
| 4. Hydrogen Sulfide | 0.000 | PPM |
| 5. Carbon Dioxide | ND | PPM |
| 6. Dissolved Oxygen | ND | PPM |

Cations

- | | | / | Eq. Wt. | = | MEQ/L |
|---------------------|-------|---|---------|---|-------|
| 7. Calcium (Ca++) | 60.10 | / | 20.1 | = | 2.99 |
| 8. Magnesium (Mg++) | 22.40 | / | 12.2 | = | 1.84 |
| 9. Sodium (Na+) | 54 | / | 23.0 | = | 2.93 |
| 10. Barium (Ba++) | 0.051 | / | 68.7 | = | 0.00 |

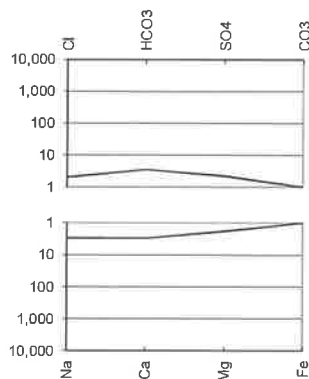
Anions

- | | | | | | |
|-------------------------|-----|---|------|---|------|
| 11. Hydroxyl (OH-) | 0 | / | 17.0 | = | 0.00 |
| 12. Carbonate (CO3=) | 0 | / | 30.0 | = | 0.00 |
| 13. Bicarbonate (HCO3-) | 215 | / | 61.1 | = | 3.52 |
| 14. Sulfate (SO4=) | 108 | / | 48.8 | = | 2.21 |
| 15. Chloride (Cl-) | 72 | / | 35.5 | = | 2.03 |

Other

- | | | | | | |
|--|--------|------------|------|-------------|------|
| 16. Total Iron (Fe) | 0.959 | / | 18.2 | = | 0.05 |
| 17. Total Dissolved Solids | 446 | | | | |
| 18. Total Hardness As CaCO3 | 242.0 | | | | |
| 19. Calcium Sulfate Solubility @ 90 F. | 1,490 | | | | |
| 20. Resistivity (Measured) | 12.900 | Ohm/Meters | @ 77 | Degrees (F) | |

Logarithmic Water Pattern



PROBABLE MINERAL COMPOSITION

COMPOUND	Eq. Wt.	X	MEQ/L	=	mg/L
Ca(HCO3)2	81.04	X	2.99	=	242
CaSO4	68.07	X	0.00	=	0
CaCl2	55.50	X	0.00	=	0
Mg(HCO3)2	73.17	X	0.53	=	39
MgSO4	60.19	X	0.00	=	0
MgCl2	47.62	X	1.31	=	62
NaHCO3	84.00	X	0.00	=	0
NaSO4	71.03	X	2.21	=	157
NaCl	58.46	X	0.72	=	42

ND = Not Determined

APPENDIX B

APPENDIX C

C-101

District I
1625 N. French Dr., Hobbs, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720
District III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy Minerals and Natural Resources
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-101
Revised July 18, 2013

☐ AMENDED REPORT

APPLICATION FOR PERMIT TO DRILL, RE-ENTER, DEEPEN, PLUGBACK, OR ADD A ZONE

¹ Operator Name and Address Salt Creek Midstream, LLC 20329 State Highway 249 Houston, TX 77070		² OGRID Number 373554 ³ API Number 30-025-
⁴ Property Code	⁵ Property Name Leavenworth AGI	⁶ Well No. 1

⁷ Surface Location

UL - Lot	Section	Township	Range	Lot Idn	Feet from	N/S Line	Feet From	E/W Line	County
O	23	26S	36E		973	South	1,836	East	Len

⁸ Proposed Bottom Hole Location

UL - Lot	Section	Township	Range	Lot Idn	Feet from	N/S Line	Feet From	E/W Line	County

⁹ Pool Information

Pool Name SWD; SILURIAN-DEVONIAN	Pool Code 97869
-------------------------------------	--------------------

Additional Well Information

¹¹ Work Type N	¹² Well Type AGI	¹³ Cable/Rotary R	¹⁴ Lease Type Private	¹⁵ Ground Level Elevation 2,915'
¹⁶ Multiple N	¹⁷ Proposed Depth 18,600	¹⁸ Formation Silurian-Devonian	¹⁹ Contractor TBD	²⁰ Spud Date ASAP
Depth to Ground water 400'		Distance from nearest fresh water well 3802'		Distance to nearest surface water +1 mi

☒ We will be using a closed-loop system in lieu of lined pits

²¹ Proposed Casing and Cement Program

Type	Hole Size	Casing Size	Casing Weight/ft	Setting Depth	Sacks of Cement	Estimated TOC
Surface	30"	24"	216.3 lb/ft	3,250'	7,310 sks	Surface
Intermediate	20"	16"	97.0 lb/ft	5,150'	4,375 sks	Surface
Intermediate	14.75"	11.875"	71.8 lb/ft	12,500'	3,655 sks	Surface
Production	10.625"	9.625"	70.3 lb/ft	16,450'	1,050 sks	Surface
Tubing	N/A	5.5"	17 lb/ft	16,400'	N/A	N/A

Casing/Cement Program: Additional Comments

See attached schematic.

²² Proposed Blowout Prevention Program

Type Double Hydraulic/ Blinds, Pipe	Working Pressure 10,000 psi	Test Pressure 8,000 psi	Manufacturer TBD (Schaffer/Cameron)
²³ I hereby certify that the information given above is true and complete to the best of my knowledge and belief. I further certify that I have complied with 19.15.14.9 (A) NMAC <input type="checkbox"/> and/or 19.15.14.9 (B) NMAC <input checked="" type="checkbox"/> , if applicable. Signature:		OIL CONSERVATION DIVISION Approved By:	
Printed name: Stephen L. Pattee, P.G.		Title:	
Title: Consulting Engineer- Agent for Salt Creek Midstream, LLC		Approved Date:	Expiration Date:
E-mail Address: steve@lonquist.com			
Date: 9/13/2018	Phone: 512-600-1774	Conditions of Approval Attached	

C-102

District I
 1825 N. French Dr., Hobbs, NM 88240
 Phone: (575) 363-6144 Fax: (575) 393-0730
 District II
 311 S. First St., Artesia, NM 88210
 Phone: (575) 749-1283 Fax: (575) 749-9720
 District III
 1009 Rio Pecos Road, Aztec, NM 87418
 Phone: (505) 334-6179 Fax: (505) 334-6179
 District IV
 1270 N. Dr. Pecos Dr., Pecos, NM 87355
 Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
 Energy, Minerals & Natural Resources Department
 OIL CONSERVATION DIVISION
 1220 South St. Francis Dr.
 Santa Fe, NM 87505

Form C-102
 Revised August 1, 2011
 Submit one copy to appropriate
 District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

¹ APN Number	² Well Code	³ Pool Name
	97069	SWD, SILURIAN-DEVONIAN
⁴ Property Code	⁵ Property Name	⁶ Well Number
	Leavenworth AGI	1
⁷ OGRID No.	⁸ Operator Name	⁹ Elevation
	Salt Creek Midstream, LLC	2915'

¹⁰ Surface Location

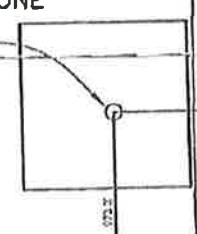
UL or lot no.	Section	Township	Range	Lot No.	Feet from the	North/South line	Feet from the	East/West line	County
0	23	26S	36E		973.2'	SOUTH	1,836.0'	EAST	LEA

¹¹ Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot No.	Feet from the	North/South line	Feet from the	East/West line	County


¹² Drilled Area	¹³ Joint or Tied	¹⁴ Consolidation Code	¹⁵ Order No.
25			

No allowable will be assigned to this completion until all interests have been consolidated or a non-standard unit has been approved by the division.

23	<p>STATE OF NEW MEXICO</p> <p>SECTION 23,</p> <p>FRACTIONAL TOWNSHIP 26 SOUTH RANGE 36 EAST</p> <p>GEODETIC COORDINATES NAD83</p> <p>LAT. = 32°01'27.08587"</p> <p>LONG. = 103°14'00.12667"</p> <p>NEW MEXICO STATE PLANE COORDINATES NAD83 NM EAST ZONE</p> <p>N: 374274.62</p> <p>E: 882233.15</p> <p>WELL LOCATION LEAVENWORTH AGI NO. 1 SHL</p> 	23
----	---	----

" OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or an undivided interest in the land in which the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore recorded by this division.

Signature:  Date: 8-20-18


Printed Name: Stephen Pattee, P.G.

Email Address: steve@longquist.com

"SURVEYOR CERTIFICATION

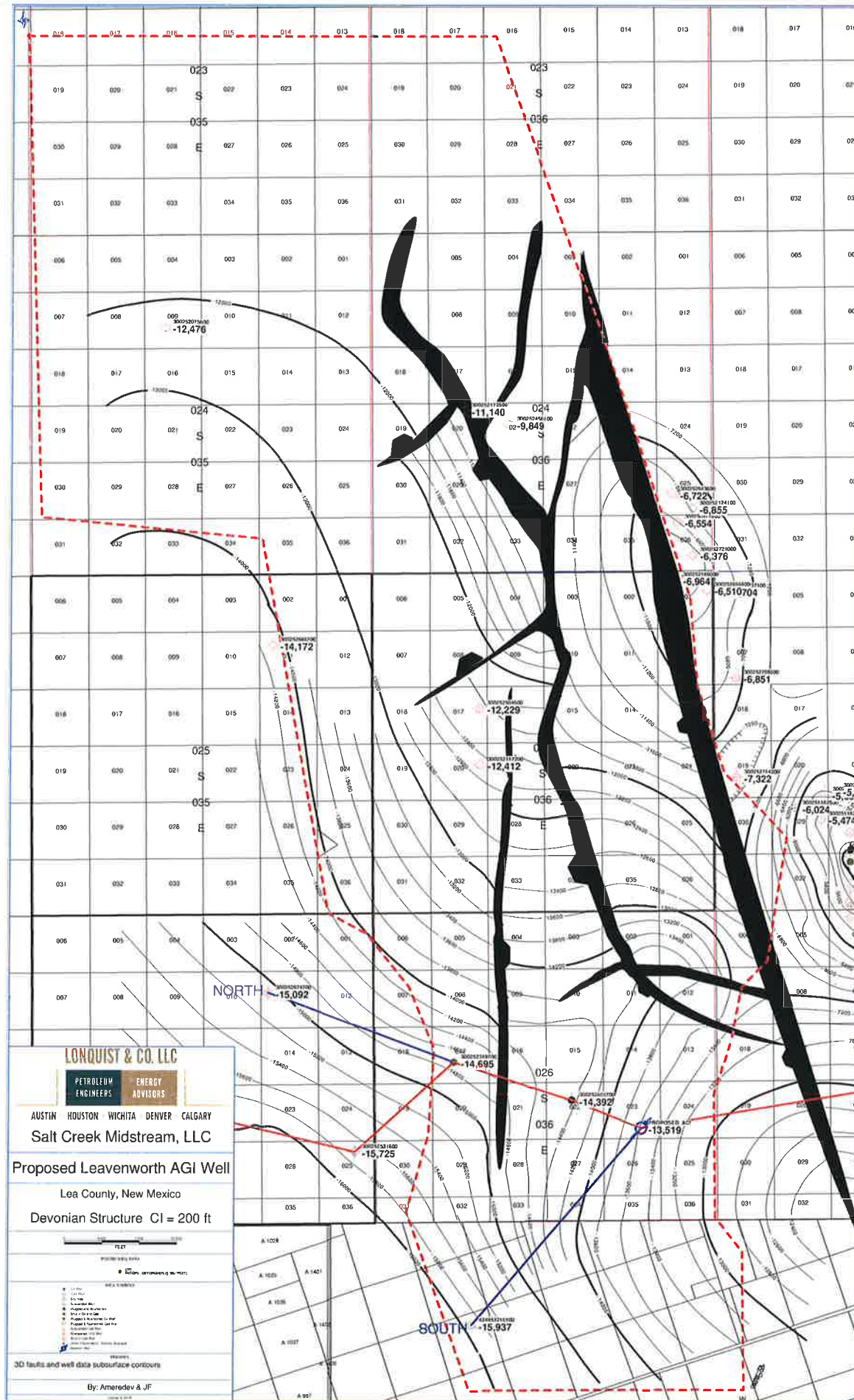
I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

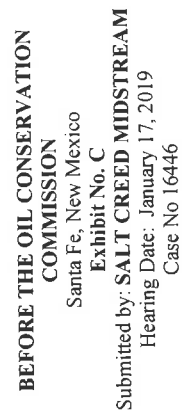
Date of Survey: JULY, 2018

Signature of Licensed Professional Surveyor: 

Professional Surveyor: DON M. BRADY 22499

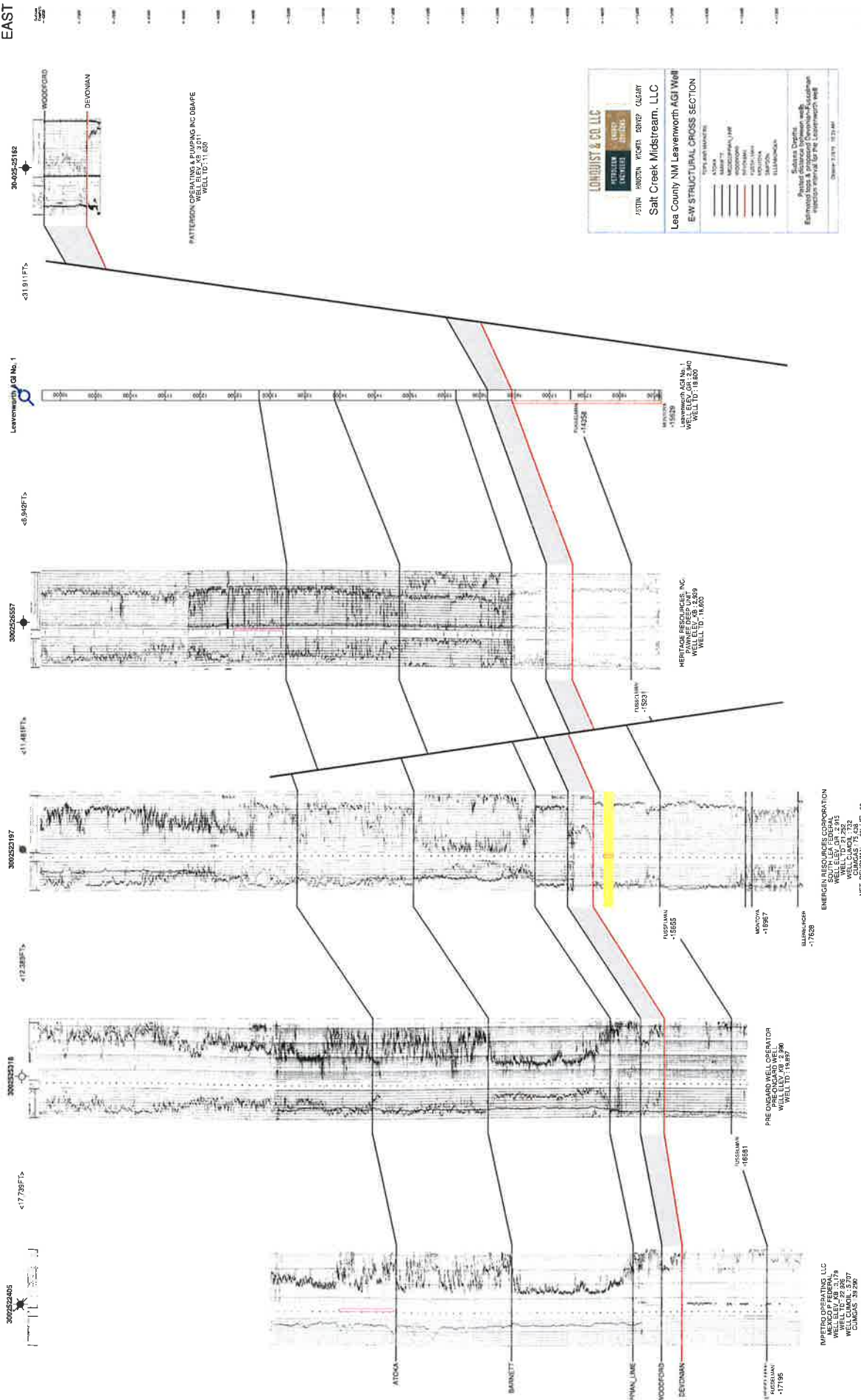
Certification Number: DON M. BRADY 22499





WEST

EAST



SOUTH



WELL ELEV_K8 : 2.9
WELL TD : 22.300

**BEFORE THE OIL CONSERVATION
COMMISSION**
Santa Fe, New Mexico
Exhibit No. E
Submitted by: **SALT CREED MIDSTREAM**
Hearing Date: January 17, 2019
Case No 16446



Modeling Plume Migration in Support of the Permit Application for the Proposed Leavenworth AGI Well, Lea County, New Mexico

The following comments were prepared in support of the testimony of Peter W. Jordan, Ph.D., Lonquist & Co., LLC, regarding computer modeling to project migration of the plume from waste injection of acid gas by Salt Creek Midstream, LLC, via the Leavenworth AGI Well in Lea County.

SWIFT Model and Implementation for this Study

The model program “Sandia Waste Isolation, Flow and Transport” (SWIFT) was used for predictive modeling of plume migration in the injection interval, during the 25-year service life of the Leavenworth AGI Well, and for 25 years subsequent to shut-in. The following subsections describe the SWIFT model and input parameters.

BRIEF DESCRIPTION OF THE SWIFT FOR WINDOWS MODEL

The following description of the SWIFT model is extracted from the manual for the Windows implementation of SWIFT, “Theory and Implementation for SWIFT for Windows, the Sandia Waste-Isolation Flow and Transport Model for Fractured Media”, HSI GeoTrans, February 21, 2000.

SWIFT for Windows (Sandia Waste Isolation, Flow and Transport Code) is a fully transient, three-dimensional, finite difference code that solves the coupled equations for transport in geologic media. The processes considered are:

- fluid flow
- heat transport
- dominant-species miscible displacement (referred to as “brine”)
- trace-species miscible displacement (referred to as “radionuclides”)

The first three processes are coupled via fluid density and viscosity. Together they provide the velocity field required in the third and fourth processes. This document describes the extensions of the capabilities of SWIFT (Reeves and Cranwell, 1981) and SWIFT II (Reeves, et al., 1984) to include fractured media.

APPLICATIONS OF SWIFT FOR WINDOWS

Because the SWIFT for Windows code is general, it has many possible applications. They include, but are not limited to, the following:

- nuclear waste isolation in both fractured and porous geologic media
- injection of industrial wastes into saline aquifers
- heat storage in aquifers
- in-situ solution mining
- migration of contaminants from landfills
- disposal of municipal wastes
- salt-water intrusion in coastal region brine disposal from petroleum-storage facilities
- brine disposal as a byproduct of methane production from geopressured aquifers
- determination of aquifer transport parameters from well-test data

Modeling Plume Migration in Support of the Permit Application for the Proposed Leavenworth AGI Well, Lea County, New Mexico

The SWIFT model solves for mass and energy transport and accumulation among (for the option using Cartesian coordinates) rectangular “grid cells”. Temperature, concentration of dissolved constituents and pressure are predicted across the grid, based on the initial state, analytical boundary conditions imposed at the surfaces, and mass / energy inputs (injection).

Projections from the SWIFT model are accepted by the Federal US EPA, as part of the process to petition for an exemption to operate a hazardous waste disposal well, and by the Railroad Commission of Texas, in support of permitting for acid gas injection wells.

SWIFT IMPLEMENTATION FOR THE LEAVENWORTH MODELING STUDY

The process to complete predictive modeling of Leavenworth AGI Well consisted of the following steps:

- Determine geometric size and configuration of the model space, including:

- Number of layers and vertical height of injection interval(s)

A single layer 80.5 feet thick was used. This corresponds to the summed net thickness of porous intervals within the completion interval.

- Horizontal dimensions of the grid.

The model grid was a square, centered on the proposed location of the Leavenworth AGI Well. This square extended 20,489 feet (3.88 miles) in each direction.

The model grid is comprised of rectangular “cells” or spatial increments for which flows of fluid and energy are calculated at each face. Dimensions of cells were increased progressively outward from the central cell where the AGI well was located, in order to represent the required horizontal dimensions. The central cell was 25 feet by 25 feet, and the most peripheral cells at the corners were 904 feet by 904 feet.

- Geo-Reference of the Model Space, Relative to Factors Driving Plume Drift

- Density Drift and Geological Structure:

The supercritical acid gas to be injected is less dense than the connate brine of the injection zone. This density difference causes the plume to migrate up-dip. Up-dip on the geological structure is in a roughly east-southeast direction, with an azimuth of 17° south of east, and an average slope of 9.37°. The positive Y-direction of the grid was oriented in this direction, and the depth of the center of each cell was adjusted, relative to the completion zone of the AGI well, according to this 9.37° slope.

Nominal directions along the grid axis are termed east-southeast, south-southwest, west-northwest, and north-northeast in this report.

- Displacement of the Plume from Injection via Wells Located within a 12-Mile Radius

Modeling Plume Migration in Support of the Permit Application for the Proposed Leavenworth AGI Well, Lea County, New Mexico

Active brine disposal wells completed in the Devonian or Fusselman formations were identified, within a 12-mile radius. The net direction of displacement from these wells is 66° south of east, at a rate, estimated as the vector sum of displacements of these off-site injection wells, is 23.1 feet per year.

The influence of these brine disposal wells was represented with a series of ten injection wells, placed in an arc that was centered in a location to displace the plume in the above direction.

- Define boundary conditions imposed at the lateral surfaces of the grid.
 - For Leavenworth AGI Well, the analytical “Carter-Tracy” representation of an infinite-acting aquifer is utilized at each vertical surface, at the edge of the grid.
 - Top and bottom surfaces are no-flow boundaries.

MODEL PARAMETERS

Model parameters are listed below:

Parameter (units)	Value
Net thickness ('):	80.5'
Porosity (prop.):	0.08
Permeability (md):	10 md
BHT (°F):	185°F at 16,459'
Brine Spec. Gravity	1.148
Viscosity (cP):	0.548
Original BHP (psi; top of Inj. Interval at 11,996')	7930 psi
Matrix Compressibility (psi ⁻¹)*	3.00E-06
Brine Compressibility (psi ⁻¹)*	3.40E-06
Table 1. Model Parameters	

* R.C. Earlougher Jr., 1977 “Advances in Well Test Analysis”, Society of Petroleum Engineers

Composition and Physical Properties of Supercritical Acid Gas

The Salt Creek facility has been designed to produce a relatively uniform stream of acid gas comprised of the following molar composition:

Modeling Plume Migration in Support of the Permit Application for the Proposed Leavenworth AGI Well, Lea County, New Mexico

Compound (mole %)	Mole Fraction
CO ₂	79.77
H ₂ S	19.50
H ₂ O	0.05
CH ₄	0.34
C2+	0.34
Table 2. Injectate Composition	

The following physical properties were estimated for acid gas, under conditions listed in Table 1.

Std Vapor Volumetric Flow	MMSCFD	60.51
Fluid Volumetric Flow at Formation Conditions	ft ³ / day	129,994
Fluid Density	lb / ft ³	51.739
Dynamic Viscosity	cP	0.08756
Table 3. Injectate Physical Properties		

Model Results: Plume Dimensions

Projected extends of the plume at the end of the service life of the well, 25 years, and after 25 years of subsequent drift (total of 50 years) are depicted in the accompanying Exhibit “Plume Projected by Swift at End of the 25-Year Service Life and after 50 Years Total”.

Plume dimensions are listed in Table 4, below:

Direction	Distance from AGI Well to 1% Concentration Contour
25 Years	
North-Northwest	9,171
East-Northeast	10,778
South-Southeast	11,522
West-Southwest	11,054
50 Years	
North-Northwest	8,789
East-Northeast	11,882
South-Southeast	13,018
West-Southwest	12,266
Table 4. Plume Dimensions	

