BW - 8

ANNUAL REPORT REVISIONS - UPDATES

2021

From: Ayarbe, John
To: Chavez, Carl J, EMNRD
Cc: "Pieter Bergstein (pieter@bergsteinenterprises.com)"; "susan@bergsteinenterprises.com"; Goetze, Phillip, EMNRD
Subject: [EXTERNAL] RE: BW-8 Residential Well Sample
Date: Wednesday, September 7, 2022 7:39:21 AM
Attachments: Salty Dog Brine Well Cavern Calculation 9-06-2022.pdf

CAUTION: This email originated outside of our organization. Exercise caution prior to clicking on links or opening attachments.

Hi Carl,

Attached is an updated brine cavern calculation sheet. We added the safety ratio like you asked. The ratio is 0.24, below the 0.5 threshold.

The water quality sample collected from the Ranch Headquarters Supply Well is believed to be representative of groundwater. We didn't see any indications of water treatment at the well. The chloride concentration in 2008 was 35.4 mg/L. The chloride concentration in June 2022 was 54 mg/L.

Thanks,

John P. Ayarbe
Senior Hydrogeologist

Daniel B. Stephens & Associates, Inc.
a Geo-Logic Company
Direct: (505) 353-9137
Mobile: (505) 280-4339

From: Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Sent: Tuesday, August 9, 2022 1:43 PM
To: Ayarbe, John <jayarbe@geo-logic.com>
Cc: 'Pieter Bergstein (pieter@bergsteinenterprises.com)' <pieter@bergsteinenterprises.com>; 'susan@bergsteinenterprises.com' <susan@bergsteinenterprises.com>; Goetze, Phillip, EMNRD <Phillip.Goetze@state.nm.us>
Subject: BW-8 Residential Well Sample

John,

Hi. Please confirm the water sample is representative of the groundwater and was not run through any residential water treatment system?

Thank you.

Carl J. Chavez ● UIC Group
Engineering Bureau
EMNRD - Oil Conservation Division
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505.660.7923
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From: Ayarbe, John <jayarbe@geo-logic.com>
Sent: Tuesday, August 9, 2022 12:41 PM
To: Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Cc: 'Pieter Bergstein (pieter@bergsteinenterprises.com)' <pieter@bergsteinenterprises.com>; 'susan@bergsteinenterprises.com' <susan@bergsteinenterprises.com>
Subject: RE: [EXTERNAL] SUBMITTAL of 2021 Annual Class III Well

Hi Carl,

We collected a water quality sample from the Ranch Well this June. It was the first opportunity to collect a sample from the well since we received your request. The sample was analyzed for chloride. The chloride concentration is low (54 mg/L) (attached). We will describe sampling of the Ranch Well in the semiannual report we are currently working on.

We'll include calculation of the safety ratio in the annual report from now on.

Thanks!

John P. Ayarbe
Senior Hydrogeologist

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From: Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Sent: Wednesday, August 3, 2022 8:38 AM
To: Ayarbe, John <jayarbe@geo-logic.com>
Cc: 'Pieter Bergstein (pieter@bergsteinenterprises.com)' <pieter@bergsteinenterprises.com>; 'susan@bergsteinenterprises.com' <susan@bergsteinenterprises.com>
Subject: RE: [EXTERNAL] SUBMITTAL of 2021 Annual Class III Well

John, et al.,

Good morning!

OCD is currently reviewing the Annual Report 2021.

OCD notices the Cavern Safety Ration (D/H: where D is max. estimated diam. of cavern & H is depth to casing shoe) is at about 0.15245 which is significantly below the 0.5 threshold. PAB Services should include the safety ratio based on cumulative brine production with the calculation from now on.

OCD could not locate the water quality data from the residence that was requested last year. Could you please provide the water quality sample from the residence to the OCD.

Thank you.

Carl J. Chavez ● UIC Group
Engineering Bureau
EMNRD - Oil Conservation Division
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505.660.7923
www.emnrd.nm.gov

From: Ayarbe, John <jayarbe@geo-logic.com>
Sent: Monday, May 9, 2022 9:21 AM
To: Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Cc: 'Pieter Bergstein (pieter@bergsteinenterprises.com)' <pieter@bergsteinenterprises.com>; 'susan@bergsteinenterprises.com' <susan@bergsteinenterprises.com>
Subject: [EXTERNAL] SUBMITTAL of 2021 Annual Class III Well

Hi Carl,

Attached is an electronic copy of the 2021 Annual Class III Well Report for the Salty Dog brine station. I'm submitting the report to you on behalf of PAB Services, Inc. The report was prepared in accordance with the requirements of discharge permit BW-8.

Please let me know if you have questions.

Thanks!

John P. Ayarbe
Senior Hydrogeologist

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DBS&A
Daniel B. Stephens & Associates, Inc.

Calculation Cover Sheet

Project Name Salty Dog Brine Well Cavern Characterization Project Number DB19.1198.00

Calculation Number 1 Discipline Hydrology No. of Sheets 2

PROJECT:

Salty Dog

SITE:

Salty Dog Brine Station, Lea County, New Mexico

SUBJECT:

Brine Well Cavern Characterization

SOURCES OF DATA:

1. Monthly fresh and brine water report forms
2. Laboratory analytical reports for brine and freshwater sampling
3. Historical documents and information

The above data sources are referenced and summarized in the main body of the *2021 Annual Class III Well Report, Salty Dog Brine Station*.

SOURCES OF FORMULAE & REFERENCES:

New Mexico Energy, Minerals and Natural Resources Department (NMEMNRD). Undated. Example Salt Cavern Characterization. Emailed to DBS&A from NMENMRD on December 7, 2018.

Daniel B. Stephens & Associates, Inc. (DBS&A). 2021. *2021 Annual Class III Well Report, Salty Dog Brine Station, Lea County, New Mexico*. Prepared for the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division, Environmental Bureau, Santa Fe, New Mexico. May 9, 2021.

☐ Preliminary Calculation ☒ Final Calculation Supersedes Calculation No. _____

Rev. No.	Revision	Calculation By	Date	Checked By	Date	Approved By	Date

DBS&A
Daniel B. Stephens & Associates, Inc.

Calculation Sheet

Project No. DB19.1198.00 Date 9/6/2022

Subject Brine Well Cavern Characterization Sheet 2 of 2

By J. Kessler Checked By J. Ayarbe Calculation No. 1

1. Purpose

Calculate the estimated height, estimated floor diameter, and safety ratio of the brine cavern at the Salty Dog Brine Station.

2. Given

1. Volume of the brine cavern at the end of 2021:

Volume = 1,047,132 barrels (bbl)

Value based on historical and present brine production data, as presented in the main body of the 2021 Annual Class III Well Report, Salty Dog Brine Station.

2. Equation for the volume of a cone:

$$Volume = \frac{\pi \times radius^2 \times height}{3}$$

3. Brine well construction (Figure 1):

Casing is set at 1,877 feet below ground surface (feet bgs). Tubing was set at 2,610 feet bgs in 2018, when the brine well was repaired. Figure 1 is a schematic of the brine well.

3. Method

Cavern height calculated as the difference between the bottom of the well casing of 1,877 feet bgs and the 2018 tubing depth of 2,610 feet bgs.

Floor diameter calculated by solving for radius in the cone-volume equation.

Safety ratio is the floor diameter divided by the cavern height.

DBS&A
Daniel B. Stephens & Associates, Inc.

Calculation Sheet

Project No. DB19.1198.00 Date 9/6/2022

Subject Brine Well Cavern Characterization Sheet 3 of 2

By J. Kessler Checked By J. Ayarbe Calculation No. 1

4. Solution

$$Cavern\ height = 2{,}610 \text{ feet} - 1{,}877\ feet = 733\ feet$$

Cavern floor diameter:

$$1\ bbl = 5.614584 \text{ acre-feet}$$

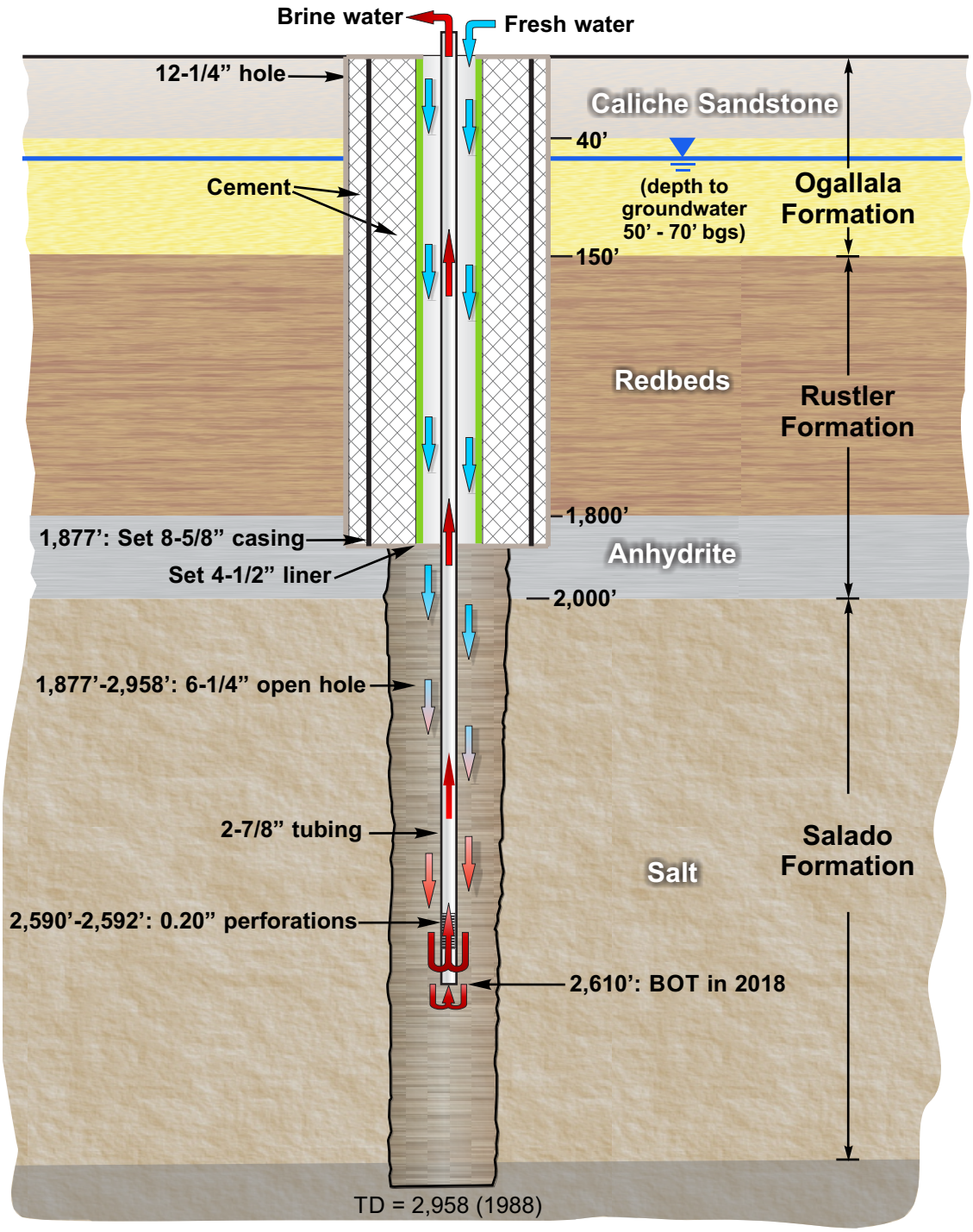
$$radius = \sqrt{\frac{3 \times Volume}{\pi \times height}} = \sqrt{\frac{3 \times 1{,}047{,}132\ bbl}{\pi \times 733\ feet} \times \frac{5.614584 ft^3}{bbl}} = 87.52\ feet$$

$$diameter = 2 \times radius = 2 \times 87.52\ feet = 175.0\ feet$$

Brine cavern safety ratio:

$$Safety\ Ratio = \frac{Diameter}{Height} = \frac{175.0\ feet}{733\ feet} = 0.24$$

Salty Dog Brine Well



Notes:

1. BOT = Bottom of tubing
2. Figure not to scale

Sources:

1. Completion data based on OCD well reports
2. Lithology from Salty Dog (1988)

S:\Projects\ES08.0118_Salty_Dog_2018\VR_drawings\Fig03_Generalized_brine_well_schematic.cdr

DBS&A
Daniel B. Stephens & Associates, Inc.
3/29/2021 DB19.1198

SALTY DOG BRINE STATION

Generalized Brine Well Schematic

Figure 1

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 Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

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

COMMENTS

Action 141553

COMMENTS

Operator: SALTY DAWG TRUCKING LLC 5760 40TH STREET, UNIT C LUBBOCK, TX 79407	OGRID: 329783
	Action Number: 141553
	Action Type: [UF-DP] Brine Facility Discharge Plan (DISCHARGE PLAN BRINE EXTRACTION)

COMMENTS

Created By	Comment	Comment Date
cchavez	Annual Report 2021 Revisions/Updates 9/7/2022	9/8/2022

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
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CONDITIONS

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Operator: SALTY DAWG TRUCKING LLC 5760 40TH STREET, UNIT C LUBBOCK, TX 79407	OGRID: 329783
	Action Number: 141553
	Action Type: [UF-DP] Brine Facility Discharge Plan (DISCHARGE PLAN BRINE EXTRACTION)

CONDITIONS

Created By	Condition	Condition Date
cchavez	None	9/8/2022