

ASSESSMENT REPORT

PRODUCED WATER LINE RELEASE – INCIDENT ID NO. nAPP2107849827

RANA SALADA PAD-A TO SAN MATEO

EDDY COUNTY, NEW MEXICO

May 27, 2021

Prepared for:

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1.0 INTRODUCTION

1.1 General

Novo Oil & Gas Northern Delaware, LLC (Novo Oil & Gas) (Operator No. 372920) lease (Lease Number: NMNM91078) and operate facilities known as the “Rana Salada Pad A to San Mateo” located in Field Name Purple Sage – Wolfcamp, T23S, R28E, Section 1NE, in Eddy County, New Mexico. As part of production operations, Novo Oil & Gas filed and obtained a permit for an above ground temporary produced water line with the Bureau of Land Management (BLM). On March 3, 2021, field personnel for Novo Oil & Gas discovered a broken connection associated with the permitted temporary produced water line located northeast of County Road 605 (Refinery Road) at latitude N32.340822, longitude W-104.038850 (Figure 1). This assessment report has been prepared to document initial response actions, assessment activities, site characterization, and analytical results.

1.2 Release Details

The release from the temporary produce water line connection was identified quickly by Novo Oil & Gas personnel and the flow of water was immediately shut down. Novo Oil & Gas has estimated that approximately 200 barrels of produce water was released and approximately 175 barrels of the produced water was recovered using vacuum trucks. The justification for the quantity release is based on the following:

- Transfer rate at the time of release was 14,000 bbls/day;
- The release occurred for 20 minutes prior to shut off;
- $14,000 \text{ bbls/day} = 583.33 \text{ bbls/hour} = 9.72 \text{ bbls/minute}$
- $9.72 \text{ bbls/minute} \times 20 \text{ minutes} = 194.44 \text{ bbls}$
- Chloride concentration is assumed to be greater than 10,000 mg/L

Based on the location of the point of release, produced water generally flowed towards the north along each side of the heavy haul road. A small amount of produced water was release to the south of the road. The roadway consists of tightly compacted caliche material that has formed a dense surface for heavy equipment and large truck traffic. Much of the produce water flowed along the sides of the road as depicted on Figure 2. Following the release, Novo Oil & Gas personnel marked the perimeter of the release area with wooden stakes based on the observation of wet verses dry soil. This area is depicted on Figure 2.

It should be noted that the produced water release did occur outside of a lined containment area in an area where depth to groundwater is greater than 55 feet below ground surface. For the purpose of this assessment, chlorides were vertically delineated to 600 mg/kg. Per 19.15.29.11 (A) (5) (c) the produced water release is assumed to be greater than 10,000 mg/L; However, the quantity of produced water is known (provided above) and did not result in greater than 200 barrels of unrecovered produced water. The release resulted in approximately 25 barrels of unrecovered produced water.

1.3 Notification

Upon discovery of the release and initial response actions, Mr. Kurt Shipley notified the New Mexico Oil Conservation District (NMOCD) and regional Bureau of Land Management (BLM) spill hotlines. On March 3, 2021, Mr. Shipley provided a phone call to the NMOCD district office and left voicemail. Ms. Amalia Bustamante responded via email and indicated that she had forward the information to Mr. Mike Bratcher.

On that same day, Mr. Shipley contacted Mr. Jim Amos and submitted the BLM Major Undesirable Event Report to the BLM Carlsbad District Office and BLM Spill Hotline.

Novo Oil & Gas coordinated with Ms. Ramona Marcus at the NMOCD to formally submit the C-141 online. The C-141 Release Notification Form was submitted on March 19, 2021 and was issued NMOCD Regulatory ID No. nAPP2107849827.

2.0 RECEPTOR AND WATER SOURCES SURVEY

2.1 Wellhead Protection Discussion

During assessment activities, Altamira field personnel conducted a 0.5-mile radius search of the surrounding area to determine the presence of any known private or domestic water sources. During the search, no water well, springs, or other surface water bodies were identified within 0.5 miles of the release area. Altamira also reviewed available maps, satellite imagery, and reviewed the New Mexico Office of the State Engineers GIS database to search for known water wells. In review of the State Engineers GIS database, a single monitoring well (MW-1) was identified approximately 2,421 feet west of the release area. The monitoring well was installed on March 31, 2020 by WPX Energy (POD# C 04417 POD1) to a depth of 55 feet below ground surface, screened from 45-55 feet and noted as “dry”. No other wells or water wells were identified.

Based on review of the FEMA Flood Map for the site area, the release area is not located within a 100-year flood zone.

2.2 Significant Watercourse Discussion

Altamira conducted a review of the significant watercourses nearest the release area. The Pecos River is located approximately 1.45 miles southwest of the release area. Salt Lake is located approximately 2.24 miles southeast of the release area. No other watercourses were identified within a 0.5-mile radius of the release area.

3.0 ASSESSMENT ACTIVITIES

Altamira-US, LLC (Altamira) on behalf of Novo Oil & Gas conducted soil assessment activities April 12-15, 2021 in the area of the produced water release to determine the degree of impact to soil. A total of 22 soil borings were installed to properly delineate the vertical and lateral extent of potential constituents of concern. Eight soil borings (SB-1 – SB-8) were installed within the known source/release area, 13 soil borings were installed to determine the lateral extent of potential impacts to soil (SB-9 – SB-21), and one soil boring (SB-22) was installed to serve as a background soil boring location (Figure 2).

3.1 Boring Installation & Soil Sampling Methodologies

Prior to site assessment activities, Novo Oil & Gas prepared and submitted the WR-07 Application for Permit to Drill Well w/No Water Right and the WD-08 Well Plugging Plan of Operations (Appendix A) through the New Mexico Office of the State Engineers Office. A State Line locate (811) was conducted to

notify utility companies to properly mark utilities in the radius of the work area. Altamira and Novo Oil & Gas also provided 48-hour notification to the NMOCD via phone and email and the BLM via phone and email.

Soil borings were installed using by White Drilling Company using an air rotary drill rig. Soil samples were collected using a combination of stainless-steel split spoon sampling device and cuttings (dependent on lithology). Soil boring SB-1 was advanced to a total depth of 55-feet below ground surface for the purpose of source delineation and determination of groundwater. Soil borings SB-2 through SB-21 were installed to a total depth of 15-feet below ground surface as source or lateral delineation borings. Soil boring SB-22 was installed approximately 75-feet west of the release area to a total depth of 20-feet below ground surface and served as a background soil boring/soil sample location for chlorides.

Soil samples were collected continuously from the surface to the total depth of each soil boring. Representative soil/rock from each two-foot interval was placed into a plastic bag, allowed to equilibrate and field screened with a photo-ionization detector (PID) for the presence of organic vapors. Soil samples were lithologically described and observations noted on soil boring logs (Appendix B). Soil samples were collected and submitted for laboratory analysis generally from the surface to the total depth of each soil boring in one-two-foot sample intervals. Soil samples were placed in laboratory provided containers, labeled, and maintained/preserved on ice in an insulated cooler with chain-of-custody documentation.

The soil sample analysis was initially conducted on the 0-1' and 3-4' sample intervals. If a constituent of concern exceeded the Assessment/Closure Criteria set forth 19.15.29 NMAC then the constituent in the next deeper sample interval was also analyzed until vertical delineation was achieved. Soil samples were submitted to Pace Analytical National in Mount Juliet, Tennessee for analysis. Soil samples were collected and submitted for analysis for the following:

- Chlorides – EPA 300.0
- TPH (GRO, DRO, MRO) – EPA SW-846 Method 8015M
- BTEX – EPA SW-846 Method 8260B

The initial soil sample interval 0-1 foot was analyzed for chlorides, TPH, and BTEX. If a constituent exceeded the allowable assessment/cleanup level, that constituent was analyzed in the next deeper sample interval.

Following installation of soil borings, White Drilling Company plugged each borehole per the specifications provided in the Well Plugging Plan and approved by the State of New Mexico Office of the State Engineer. Soil borings were plugged using a Type I/II cement-bentonite slurry per the specifications and tremied from the bottom of the borehole to the surface. A plugging record from soil boring SB-1 was provided to the State of New Mexico Office of the State Engineer. The plugging report is provided in Appendix D.

3.2 Determination of Depth to Water

Soil boring SB-1 was installed at the point of release and was advanced to a depth of 55-feet below ground surface. The purpose of advancing soil boring SB-1 to 55-feet was to determine if groundwater was present below 50-feet. During boring advancement, variations of dry unconsolidated soil and sandstone were observed (refer to Appendix B – Boring Record SB-1). After reaching total depth (dry at 55-feet), the hole

was allowed to stay open for a period of time and then air was used to blow the hole out to provide a second verification that moisture was not present.

Additionally, a monitoring well located approximately 2441 feet west of the site area was installed by WPX Energy on March 31, 2020. The monitoring well was set at 55-feet below ground surface and screened from 45-55 feet. The provided well information indicated the hole/well was dry.

Based on the lines of evidence provided above, groundwater appears to be deeper than 55-feet below ground surface in the area of the release.

4.0 ANALYTICAL RESULTS

As discussed above, soil borings and soil samples from SB-1 through SB-8 were installed and collected in the known release area (along the axis of the release flow path). Soil borings and associated soil samples from SB-9 through SB-21 were installed and collected to provide lateral delineation of constituents of concern. A summary of all analytical results is provided on Table 1. Analytical data reports are provided in Appendix F.

4.1 Chloride Results

Analytical results for chlorides within the known release flow path ranged from 12.6 mg/kg to 4,800 mg/kg (Figure 3). Chloride concentrations exceeded 600 mg/kg in soil samples at soil borings SB-1, SB-3, SB-7 and SB-8. Chloride concentrations in soil samples collected at soil boring SB-1 and SB-3 exceeded 600 mg/kg in the 0-1 foot sample interval, but attenuated to less than 600 mg/kg in the 3-4 foot sample interval, indicating vertical delineation was achieved at three feet below ground surface at these two locations. Subsequent step-out soil borings installed to provide lateral delineation at the SB-1 and SB-3 locations exhibited chloride concentrations less than 600 mg/kg, indicating lateral delineation has been achieved.

Chloride concentrations in soil samples collected at soil boring SB-7 exceeded 600 mg/kg in the 0-1 foot, 3-4 foot, and 4-6 foot sample intervals and attenuated to less than 600 mg/kg in the 6-8 foot sample interval, indicating vertical delineation was achieved at six feet below ground surface at soil boring SB-7. Subsequent step-out soil borings installed to provide lateral delineation at the SB-7 location exhibited chloride concentrations less than 600 mg/kg, indicating lateral delineation has been achieved.

Chloride concentrations in soil samples collected at soil boring SB-8 exceeded 600 mg/kg in the 0-1 foot, and 3-4 foot sample intervals and attenuated to less than 600 mg/kg in the 4-6 foot sample interval, indicating vertical delineation was achieved at four feet below ground surface at soil boring SB-8. Subsequent step-out soil borings installed to provide lateral delineation at the SB-8 location exhibited chloride concentrations less than 600 mg/kg, indicating lateral delineation has been achieved.

Chloride concentrations in all other source area soil borings and lateral delineation soil borings are less than 600 mg/kg.

4.2 TPH Results

TPH was analyzed on the 0-1 foot soil sample from each soil boring. TPH was fractionated into the GRO/DRO/MRO ranges. For the purpose of assessment and in accordance with regulatory guidance, TPH

concentrations were compared to an assessment level of 100 mg/kg. Analytical results show low level concentrations of TPH were detected; however, concentrations of TPH are below 100 mg/kg in all soil samples submitted for laboratory analysis. Since TPH concentrations were below the applicable assessment level in all soil samples, analysis of TPH on deeper soil samples was not necessary.

4.3 BTEX Results

BTEX was analyzed on the 0-1 foot soil sample from each soil boring. For the purpose of assessment and in accordance with regulatory guidance, benzene and total BTEX concentrations were compared to an assessment level of 10 mg/kg and 50 mg/kg, respectively. Analytical results show a very low concentration of benzene was detected only in soil sample SB-3 (0-1') of 0.00407 mg/kg, which is below the 10 mg/kg assessment level. Benzene was not detected in any of the other soil samples submitted for laboratory analysis. BTEX concentrations were detected in soil samples from soil boring SB-1, SB-2 and SB-3; however, detected concentrations were below the applicable assessment level of 50 mg/kg. Total BTEX was not detected in any of the other soil samples submitted for laboratory analysis. Since benzene and total BTEX concentrations were below the applicable assessment level in all soil samples, analysis of benzene and total BTEX on deeper soil samples was not necessary.

5.0 CONCLUSIONS

Assessment activities have been conducted in accordance with NMAC 19.15.29 and are complete. Novo Oil & Gas reported at produced water release of approximately 200 barrels based on the justification provided in Section 1.2. Novo was able to recovery approximately 175 barrels of the released produced water. The release area was immediately marked using wooden stakes to delineation wet verses dry soils. A total of 21 soil borings was installed for the vertical and lateral delineation of chlorides, TPH, benzene, and total BTEX. Analytical results do indicate chloride concentrations exceed the 600 mg/kg assessment level in shallow soils at SB-1, SB-3, SB-7, and SB-8. Vertical and lateral delineation of chlorides has been defined. Based on the analytical results for TPH, benzene and total BTEX, no further evaluation of TPH, benzene or total BTEX is necessary.

Based on the analytical results, it appears that shallow soils in the upper 3-4 feet in the area of soil borings SB-1, SB-3, SB-7 and SB-8 will require remediation due to elevated chloride concentrations over 600 mg/kg. Novo Oil & Gas has prepared a remediation plan for agency approval, which will be submitted at the same time as this assessment report. Novo Oil & Gas will wait on comments and approval from the NMOCDC regarding the remediation plan prior to initiating active remediation. This assessment report and the approved remediation plan will be submitted to the BLM for their review and comment.

TABLES

Table 1
Analytical Data Results Summary - Soil Samples (mg/kg)
Novo Oil Gas - Rana Salada Produced Water Release Leak
Near Loving, New Mexico

Analyte		Chloride	BTEX	Benzene	TPH (low)	TPH (C10-28)	TPH (C28-36)	TPH
Method		300.0	8260B	8260B	8015D	8015M	8015M	8015M
Table I - Closure Criteria (0-4')		600	50	10	-	-	-	100
Sample ID	Sample Date							
SB-1 (0-1')	4/13/2021	6140	0.00724 (J)	<0.000612	1.97 (J)	30.8	34.5	67.27
SB-1 (3-4')	4/13/2021	170	0.0017 (J)	<0.000567	<0.657	<1.67	0.495 (J)	0.495 (J)
SB-2 (0-1')	4/13/2021	23.2	<0.00157	<0.000565	0.758 (J)	2.8 (J)	11	14.558
SB-2 (3-4')	4/13/2021	260	0.00134 (J)	<0.000677	<0.788	<1.82	0.456 (J)	0.465 (J)
SB-3 (0-1')	4/14/2021	1270	0.00559	0.00407	1.66 (J)	4.91	16.1	22.67
SB-3 (3-4')	4/14/2021	210	-	-	-	-	-	-
SB-4 (0-1')	4/14/2021	30.2	<0.00156	<0.00056	<0.649	11.7	27.6	39.3
SB-4 (3-4')	4/14/2021	246	-	-	-	-	-	-
SB-5 (0-1')	4/14/2021	87.3	<0.00142	<0.000509	1.15 (J)	5.47	14.2	20.82
SB-5 (3-4')	4/14/2021	107	-	-	-	-	-	-
SB-6 (0-1')	4/15/2021	194	<0.00159	<0.000572	<0.665	<1.79	2.36 (J)	2.36 (J)
SB-6 (3-4')	4/15/2021	12.6 (J)	-	-	-	-	-	-
SB-7 (0-1')	4/15/2021	2610	<0.00147	<0.000526	<0.611	4.32	9.83	14.15
SB-7 (3-4')	4/15/2021	2200	-	-	<0.681	<1.70	2.59 (J)	2.59 (J)
SB-7 (4-6')	4/15/2021	1870	-	-	-	-	-	-
SB-7 (6-8')	4/15/2021	88	-	-	-	-	-	-
SB-7 (8-10')	4/15/2021	29.8	-	-	-	-	-	-
SB-8 (0-1')	4/15/2021	3300	<0.0016	<0.000576	<0.671	1.9 (J)	6.32	8.22
SB-8 (3-4')	4/15/2021	4800	-	-	<0.819	<1.91	0.446 (J)	0.446 (J)
SB-8 (4-6')	4/15/2021	323	-	-	-	-	-	-
SB-9 (0-1')	4/14/2021	63.2	<0.00151	<0.000543	2.76 (J)	8.74	23.2	34.7
SB-9 (3-4')	4/14/2021	72.6	-	-	-	-	-	-
SB-10 (0-1')	4/14/2021	210	<0.00162	<0.000584	2.52 (J)	4.35	9.82	16.69

Table 1
Analytical Data Results Summary - Soil Samples (mg/kg)
Novo Oil Gas - Rana Salada Produced Water Release Leak
Near Loving, New Mexico

SB-10 (3-4')	4/14/2021		229	-	-	-	-	-	-
SB-11 (0-1')	4/14/2021		26.1	<0.0017	<0.00061	<0.71	<1.85	6.81	6.81
SB-11 (3-4')	4/14/2021		448	-	-	-	-	-	-
SB-12 (0-1')	4/13/2021		31.3	<0.00137	<0.000492	<0.572	<1.62	6.97	6.97
SB-12 (3-4')	4/13/2021								
SB-13 (0-1')	4/14/2021		319	<0.00157	<0.000565	2.17 (J)	<1.69	6.71	8.88
SB-14 (0-1')	4/14/2021		12.3 (J)	<0.00154	<0.000554	1.73 (J)	<1.64	1.32 (J)	3.05
SB-14 (3-4')	4/14/2021		68.4	-	-	-	-	-	-
SB-15 (0-1')	4/14/2021		56.7	<0.00161	<0.000578	<0.672	17.9	40.3	58.2
SB-15 (3-4')	4/14/2021		142	-	-	-	-	-	-
SB-16 (0-1')	4/15/2021		23.5	<0.00159	<0.00057	2.27 (J)	2.95 (J)	13.1	18.32
SB-16 (3-4')	4/15/2021		238	-	-	-	-	-	-
SB-17 (0-1')	4/15/2021		202	<0.00155	<0.000556	<0.647	14.9	42.2	57.1
SB-17 (3-4')	4/15/2021		393	-	-	-	-	-	-
SB-18 (0-1')	4/15/2021		<9.46	<0.00143	<0.000513	1.17 (J)	1.99 (J)	18.6	21.76
SB-18 (3-4')	4/15/2021		18.8 (J)	-	-	-	-	-	-
SB-19 (0-1')	4/15/2021		17.1 (J)	<0.00203	<0.000729	<0.847	2.99 (J)	16.2	19.19
SB-19 (3-4')	4/15/2021		116	-	-	-	-	-	-
SB-20 (0-1')	4/15/2021		10.5	<0.00152	<0.000546	<0.636	4.48	15.2	19.68
SB-20 (3-4')	4/15/2021		12 (J)	-	-	-	-	-	-
SB-21 (0-1')	4/14/2021		20.9	<0.00145	<0.00052	1.33 (J)	1.72 (J)	9.13	12.18
SB-21 (3-4')	4/14/2021		13.3 (J)	-	-	-	-	-	-

Notes:

All results are in mg/kg

Closure Criteria Soils - Table I of 19.15.29.12 NMAC

TPH - Total Petroleum Hydrocarbons - includes GRO, DRO, MRO

Table 1
Analytical Data Results Summary - Soil Samples (mg/kg)
Novo Oil Gas - Rana Salada Produced Water Release Leak
Near Loving, New Mexico

BTEX - Benzene, Toluene, Ethylbenzene, Xylenes

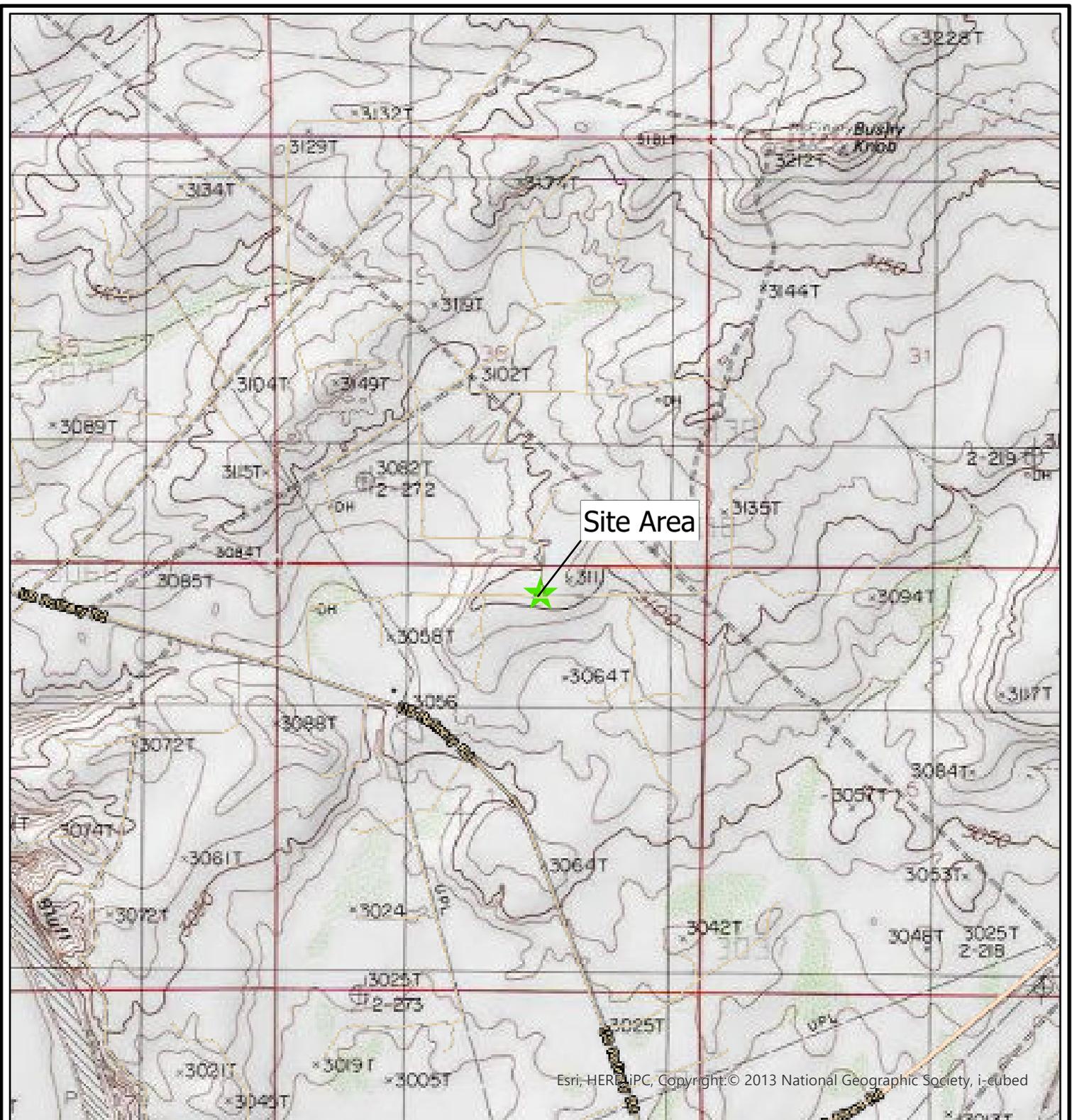
< number is the SDL (not detected above the sample detection limit)

J - result is less than the MQL but greater than or equal to the SDL and the concentration is an estimated value

Bold indicates that a COC was detected

Shading indicates that a detected result exceeded the RRC Screening levels

FIGURES



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FIGURE TITLE
Site Area Topo Map

DOCUMENT TITLE
Site Location Topo Map

CLIENT
CLIENT: NOVO Oil & Gas - Rana Salada

LOCATION
Loving, New Mexico

DATE 4/26/2021

SCALE 1:1000

DESIGNED BY BH

APPROVED BY BH

DRAWN BY KLT

PROJECT NUMBER

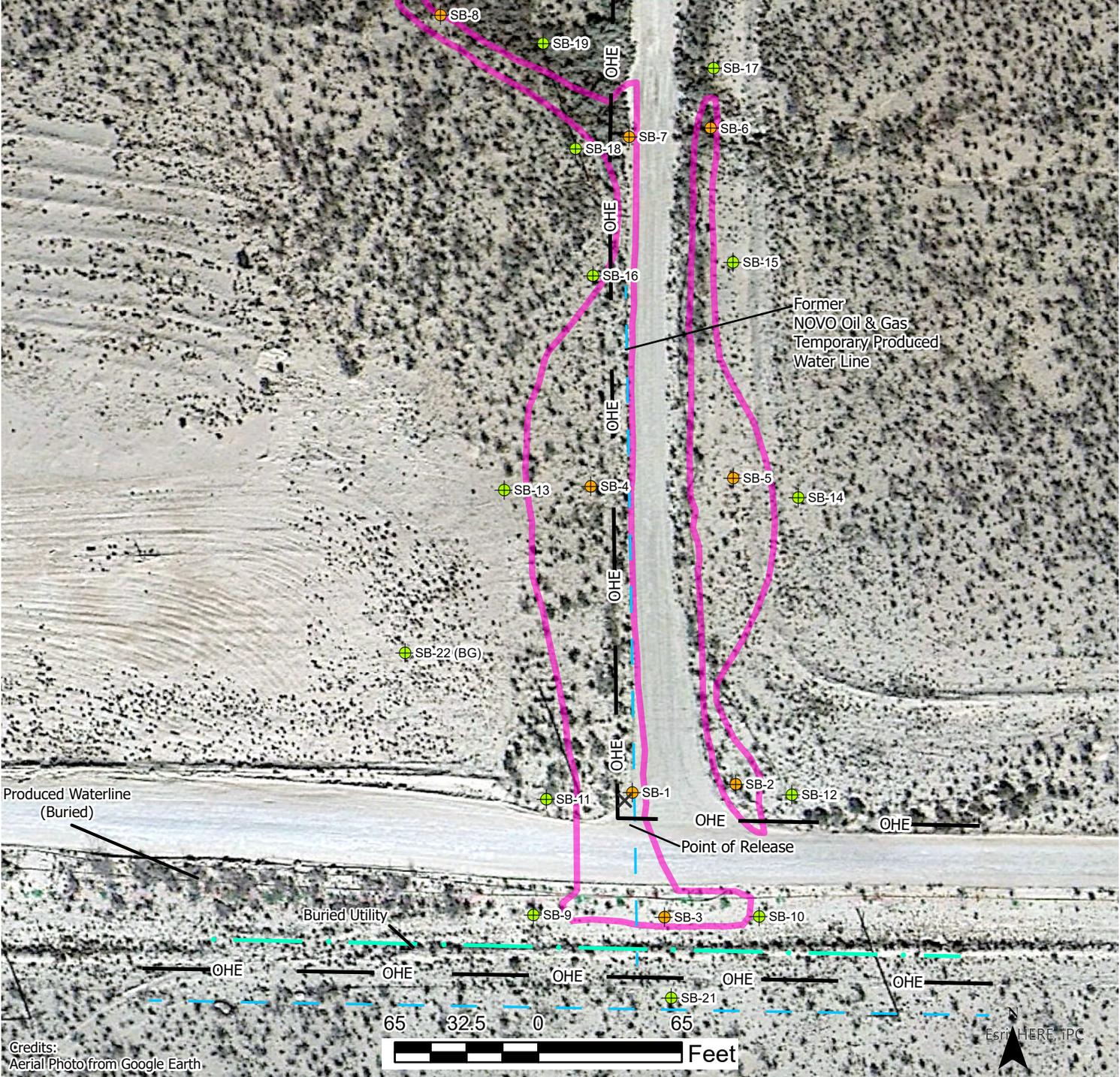
NVONM2102

FIGURE NUMBER

1

Bore Holes
SB-1 -Soil Boring-1

-  Soil Bore
-  Source Area Bore
-  Release Area
-  Over Head Electric Power Lines



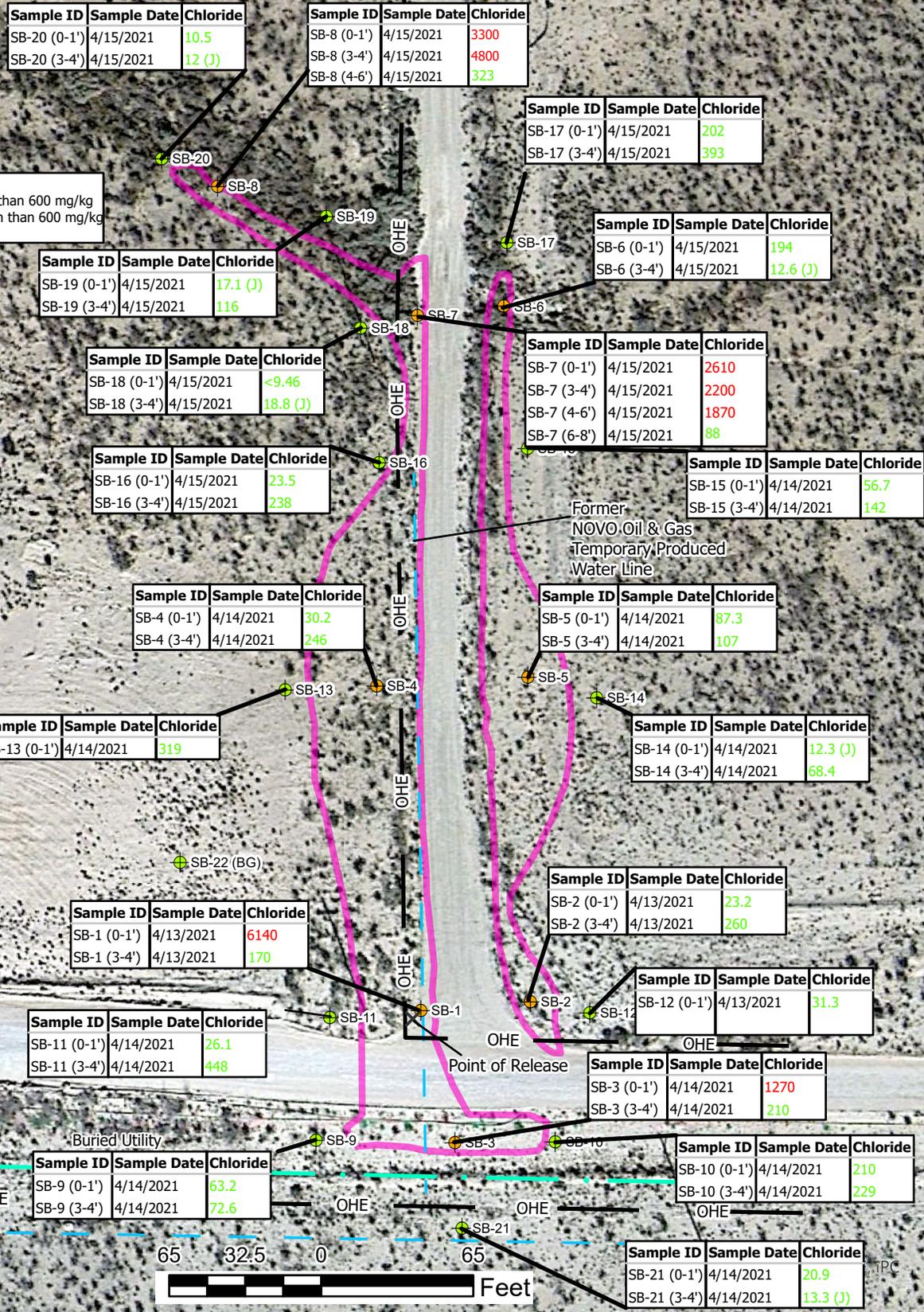
Credits:
 Aerial Photo from Google Earth

	FIGURE TITLE Site Plan – Soil Boring Location Map Produced Water Release	DATE 5/18/2021
	DOCUMENT TITLE Soil Sample locations and Release Area	SCALE 1:65
CLIENT CLIENT: NOVO Oil & Gas - Rana Salada	DESIGNED BY BH	APPROVED BY BH
	DRAWN BY KLT	PROJECT NUMBER NVONM2102
LOCATION Loving, New Mexico	FIGURE NUMBER 2	

Bore Holes
 SB-1 -Soil Boring-1

- Soil Bore
- Source Area Bore
- Release Area
- OHE - Over Head Electric Power Lines

mg/kg – milligrams per kilogram
 5,345 – chloride concentration greater than 600 mg/kg
 27 – chloride concentration less than 600 mg/kg



Credits:
 Aerial Photo from Google Earth



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FIGURE TITLE Chloride Concentration Map (mg/kg)	DATE 5/18/2021
DOCUMENT TITLE Soil Sample locations and Release Area	SCALE 1:65
CLIENT CLIENT: NOVO Oil & Gas - Rana Salada	DESIGNED BY BH
LOCATION Loving, New Mexico	APPROVED BY BH
	DRAWN BY KLT
	PROJECT NUMBER NVONM2102
	FIGURE NUMBER 3