NV

TIMBERWOLF ENVIRONMENTAL

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January 28, 2022

Mr. Cory Smith, Environmental Specialist
New Mexico Oil Conservation Division – District 3
1000 Rio Brazos Road
Aztec, New Mexico 87410

Re: Status Report – 4th Quarter 2021
San Juan 28-7 Unit 183M
Rio Arriba County, New Mexico
OCD Incident No. NCS1901627746

Dear Mr. Smith:

On behalf of Hilcorp Energy Company (Hilcorp), Timberwolf Environmental, LLC (Timberwolf) presents this report to document remedial activities conducted during the fourth quarter of 2021 (4Q21) at the San Juan 28-7 Unit 183M (Site).

Environmental Setting and Site Geology

The Site is situated on federal land managed by the Bureau of Land Management (BLM) in western Rio Arriba County, New Mexico (Figure 1). The area consists of sparse vegetative cover comprised primarily of scrub brush and native grasses. Area terrain is comprised of plateaus divided by canyons. The primary canyon in the area is Carrizo Canyon, which drains to the northwest into the San Juan River, approximately 19 miles from the Site (Figures 2 and 3).

The Site is situated along the rimrock of an unnamed side canyon to Carrizo Canyon. Average elevation at the Site is approximately 6,523 feet (ft) above mean sea level. The closest surface water is a first order tributary of Carrizo Creek, situated 1,500 ft southeast of the Site and 330 ft lower in elevation.

According to the U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS), the Site soil consists of the Vessilla-Menefee-Orlie complex, 2 to 30 percent slopes. The surface horizon is comprised of a sandy loam, underlain by bedrock encountered between 15 to 19 inches below ground surface (bgs). Native salinity of the soil is nonsaline to very slightly saline (0.0 to 2.0 millimhos per centimeter (mmhos/cm)).

Site History

Release Event

Corrosion near the base of the former oil tank resulted in the release of approximately 150 barrels (bbls) of oil and 7 bbls of produced water. All released fluid was contained by the berm. Standing fluid was recovered; the tank was removed from service and disposed off-site. The initial investigation identified the area of the former tank battery as the primary area of concern (AOC).

Hilcorp constructed a new tank battery northeast of the original tank battery. Tanks and interconnective piping were removed from the original tank battery.

Investigation and Site Characterization

A soil investigation, conducted during March 2019, revealed the constituents of concern (COC) were: total BTEX (i.e., benzene, toluene, ethylbenzene, and xylene) and total petroleum hydrocarbons (TPH). Impacted soil was horizontally and vertically delineated; the vertical extent of impacted soil was approximately 27 ft bgs. Additionally, the soil investigation revealed that subsurface soil is unconsolidated to a depth of 10 ft below ground surface (bgs) which is underlain by sandstone. Findings of the investigation are documented in Timberwolf's report entitled: *Site Characterization Report and Remedial Action Plan*, dated May 21, 2019.

Remediation – SVE System

To remediate hydrocarbon impacted soil, a soil vapor extraction (SVE) system was designed, constructed, and installed at the Site. System start-up date was 12/18/19. The SVE system is comprised of 11 SVE wells, four vent wells, and a SVE trailer. The SVE trailer is comprised of a regenerative blower (i.e., vacuum pump), hour meter, moisture separator and filter, sampling port, and a manifold with three independent legs. Additionally, the SVE trailer is equipped with a programmable automation panel to control valves for each manifold leg. A natural gas generator powers the trailer.

The SVE system creates a treatment field of approximately 0.15 acres and treats soil to a depth of approximately 30 ft bgs for a total volume of approximately 7,021 cubic yards of soil. The SVE wells, measured radius of influence of 25 ft, and leg configurations are shown in Figure 4.

The work conducted is documented in the following reports:

- *Site Characterization Plan,* dated 03/05/19
- *Site Characterization and Remedial Action Plan*, dated 05/21/19
- *Status Report – 4th Quarter 2019,* dated 01/31/20
- *Status Report – 1st Quarter 2020,* dated 04/30/20
- *Status Report – 2nd Quarter 2020,* dated 09/03/20
- *Status Report – 3rd Quarter 2020,* dated 11/25/20
- *Status Report – 4th Quarter 2020,* dated 01/28/21
- *Status Report – 1st Quarter 2021,* dated 05/05/21
- *Status Report – 2nd Quarter 2021,* dated 07/28/21
- *Status Report – 3rd Quarter 2021,* dated 10/29/20

SVE System Operations

The SVE system was designed with three independent legs (i.e., Leg 1, Leg 2, and Leg 3). Legs 1 and 3 provide vacuum extraction to the deep SVE wells; Leg 2 is piped to the shallow wells. The automation panel was programmed to oscillate between Legs 1, 2, and 3 every four hours for continuous 24-hr operations. Programmed runtimes are presented in Table 1 below.

Table 1. Programmed Runtimes and Leg Configurations

Leg	SVE Wells and Location	Scheduled Runtime
Leg 1	Deep Wells SVE7, SVE8, and SVE9 Eastern side of treatment zone	4 hours
Leg 2	Shallow Wells SVE1, SVE2, SVE3, and SVE4	4 hours
Leg 3	Deep Wells SVE5, SVE6, SVE10, and SVE11 Central and Western side of treatment zone	4 hours
Leg 1	Deep Wells SVE7, SVE8, and SVE9 Eastern side of treatment zone	4 hours
Leg 2	Shallow Wells SVE1, SVE2, SVE3, and SVE4	4 hours
Leg 3	Deep Wells SVE5, SVE6, SVE10, and SVE11 Central and Western side of treatment zone	4 hours

SVE – soil vapor extraction well

Water and condensate are collected in the moisture separator, which is fitted with a 1-inch PVC pipe to transfer fluids to an open-top tank fitted with bird netting. Half (0.5) gallon of water/condensate was recovered during 4Q21.

Runtime, flow rates, and percentage of runtime for 4Q21 are documented in Table 2 below.

Table 2. System Runtime and Flow Rates – 4Q21

Measurement	Leg 1	Leg 2	Leg 3	Total
Runtime (hours)	860	320	855	2,035
Runtime (min)	51,600	19,200	51,300	122,100
Average CFM	20	5	10	--
Runtime Percentage	42.3%	15.7%	42.0%	100%

* – total hours 2,107 calculated by subtracting hours due to frozen valves; assuming only half runtime during a 6-day period
min – minutes
CFM – cubic feet per minute

The 4Q21 had 2,208 hours in the quarter. The SVE system was shut-in for 7 hours for routine maintenance; reducing the available quarterly hours to 2,201. The system ran for 2,179 hours; however, between 12/08/21 and 12/14/21, valves were frozen in the closed position. Therefore, 144 hours were subtracted from the quarterly runtime, yielding a revised quarterly total runtime of 2,035 hours.

The frozen valves were manually cleared of ice on 12/14/21. Therefore, runtime percentage for 4Q21 was 92.5%. During 4Q21, Hilcorp personnel conducted five (5) operation and maintenance (O&M) events and Timberwolf personnel conducted two (2) O&M events. A field log of O&M events and maintenance performed is provided in the attached Table A-1.

Mass Removal

Timberwolf used the results from the soil gas analysis (collected by Hilcorp on 03/23/21), flow rates, and runtimes to calculate constituent mass removal. Mass removal of GRO and BTEX and associated recovered volume for 4Q21 are presented in Table 3 below; cumulative totals are provided in the attached Table A–2.

Table 3. Mass Removal and Associated Volume – 4Q21

Constituent	Mass Removal by Leg (kg)[1]			Total Mass Removed[2] (lbs)	Recovered Volume[3] (bbl)
	Leg 1	Leg 2	Leg 3		
GRO	19.32	1.80	9.60	67.57	0.25
Benzene	0.74	0.07	0.37	2.60	NC
Toluene	5.26	0.49	2.61	18.40	NC
Ethylbenzene	0.41	0.04	0.20	1.43	NC
Xylenes	4.40	0.41	2.19	15.40	NC

[1]Calculation = minutes ran * CFM * Concentration (mg/m^3) * 1 M^3/35.3147 ft^3 *1g/1000 mg * 1 kg/1000 g
[2]Calculation = [Leg 1 + Leg 2 + Leg 3] * 2.2 lbs/kg
[3]Calculation = lbs / 6.42 lb/gal / 42 gal/bbl
GRO = from TPH (GC/MS) Low Fraction (i.e., gasoline range organics)
kg – kilograms
bbl -barrel
lbs – pounds
NC – not calculated
Assumptions:

- API Gravity = 52
- Concentrations of VOCs in soil gas vapor have remained static since the collection of SVE gas sample
- Hour meter reading for end of quarter was calculated based on hour reading from 01/05/22

In-situ Bioremediation

On 12/14/21, Timberwolf personnel treated the deeper strata via the induction vent wells with Biowash®, a biodegradable surfactant. The Biowash lowers surface tension which increases both volatility and surface area of soil.

On 12/15/21, Timberwolf personnel returned to the Site to conduct a microbial treatment via the induction vent wells to further enhanced bioremediation within the deeper strata. The automation was programmed so that only the deep wells (i.e., Legs 1 and 3) were active to maximize oxygenation in the deeper zone and to promote bioremediation.

Summary

System runtime during 4Q21 was 92.5% of total available hours in 4Q21 (Note: 100% runtime would have been achieved if not for frozen valves). Microbes and surfactants were added to deeper strata to facilitate and promote bioremediation. Mass removal calculations indicated 0.25 bbls of GRO recovered during 4Q21.

Further Actions – First Quarter 2022

During 1Q22, the following activities are planned for the Site:

- Reprogram SVE automation back to regular schedule
- Conduct bi-weekly Site O&M to ensure proper system function and drain any water/condensate accumulation in the moisture separator as needed
- Collect a quarterly soil vapor gas sample and analyze for TO-15, GRO, oxygen, and carbon dioxide
- Prepare a 1Q22 status report

If you have any questions regarding this report, please call us at 979-324-2139.

Sincerely,
Timberwolf Environmental, LLC

(for)
Michael Morse
Project Scientist

Jim Foster
President

Attachments: Figures
Attached Tables

Cc: Kate Kaufman, Hilcorp Energy Company

Figures

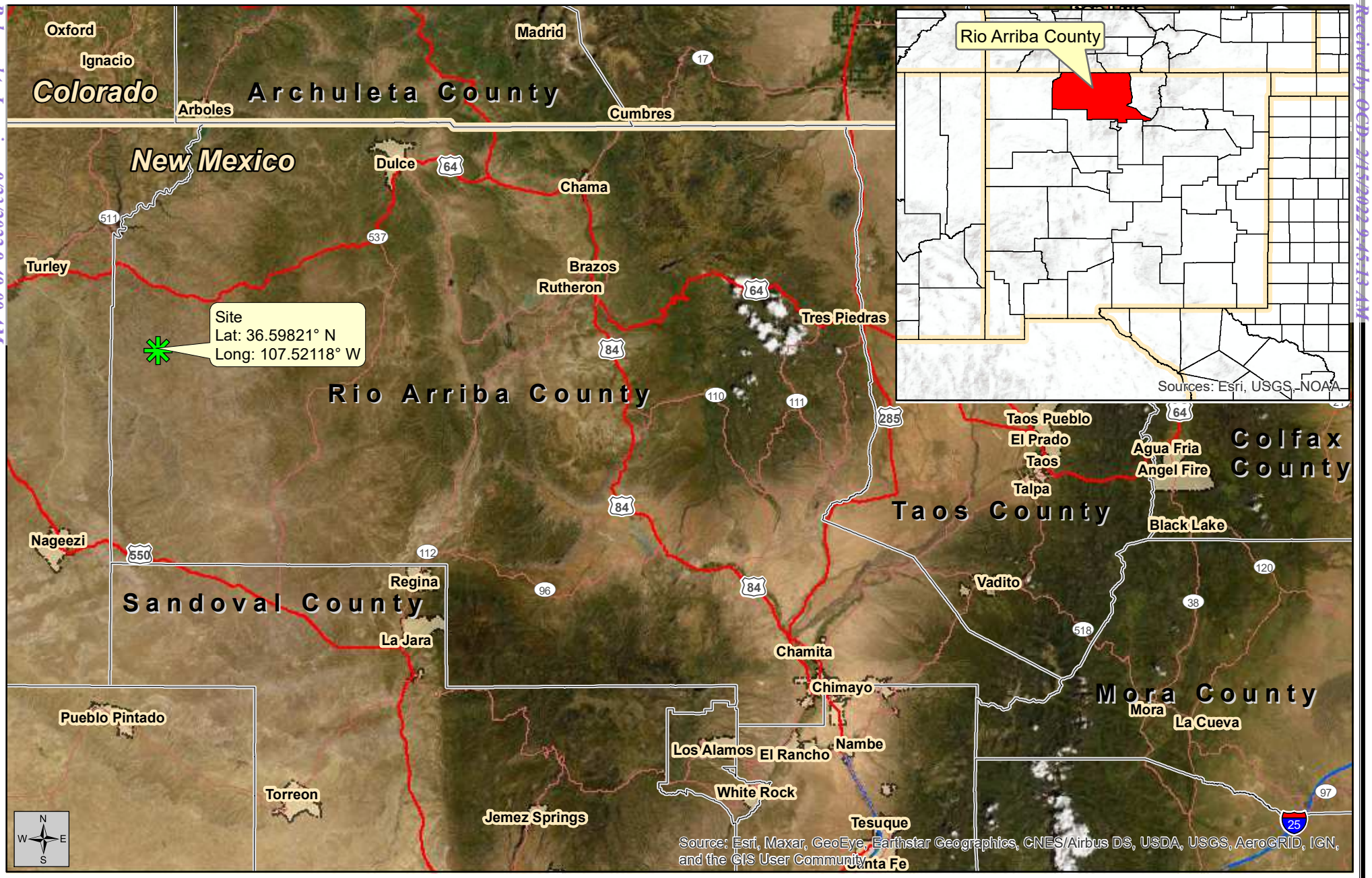

Figure 1
Site Location Map

Status Report - 4th Quarter 2021

January 13, 2022

1:1,250,000

0 20 40 60 80 100 120 Miles

San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

TIMBERWOLF ENVIRONMENTAL

Created By:
Kevin Cole
TE Project No.: HEC-190007

Datum: NAD83
Imagery Source: ESRI
Vector Source: ESRI and TE

Site

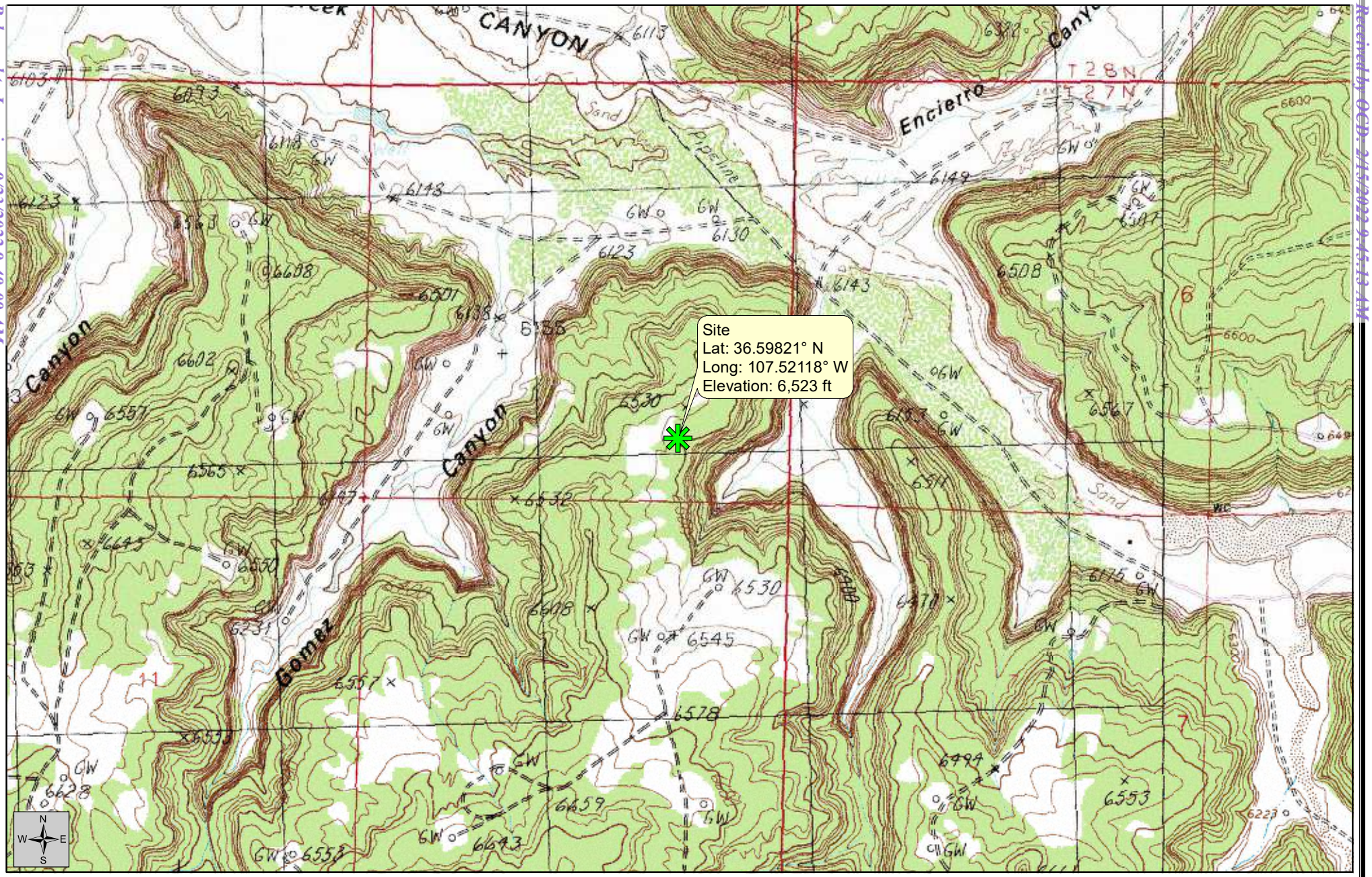

Figure 2
Topographic Map

Status Report - 4th Quarter 2021

January 13, 2022

1:24,000

0 0.5 1 1.5 2 Miles

San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

TIMBERWOLF ENVIRONMENTAL

Created By:
Kevin Cole
TE Project No.: HEC-190007

Datum: NAD83
Imagery Source: USGS
Quads: Gould Pass and Santos Peak
Vector Source: TE

Site

Figure 3 **Aerial Map**	**Status Report - 4th Quarter 2021**	**January 13, 2022**

1:10,000

0 0.25 0.5 0.75 1 Miles

San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

TIMBERWOLF ENVIRONMENTAL

Created By:
Kevin Cole
TE Project No.: HEC-190007

Datum: NAD83
Imagery Source: ESRI
Vector Source: TE

Site

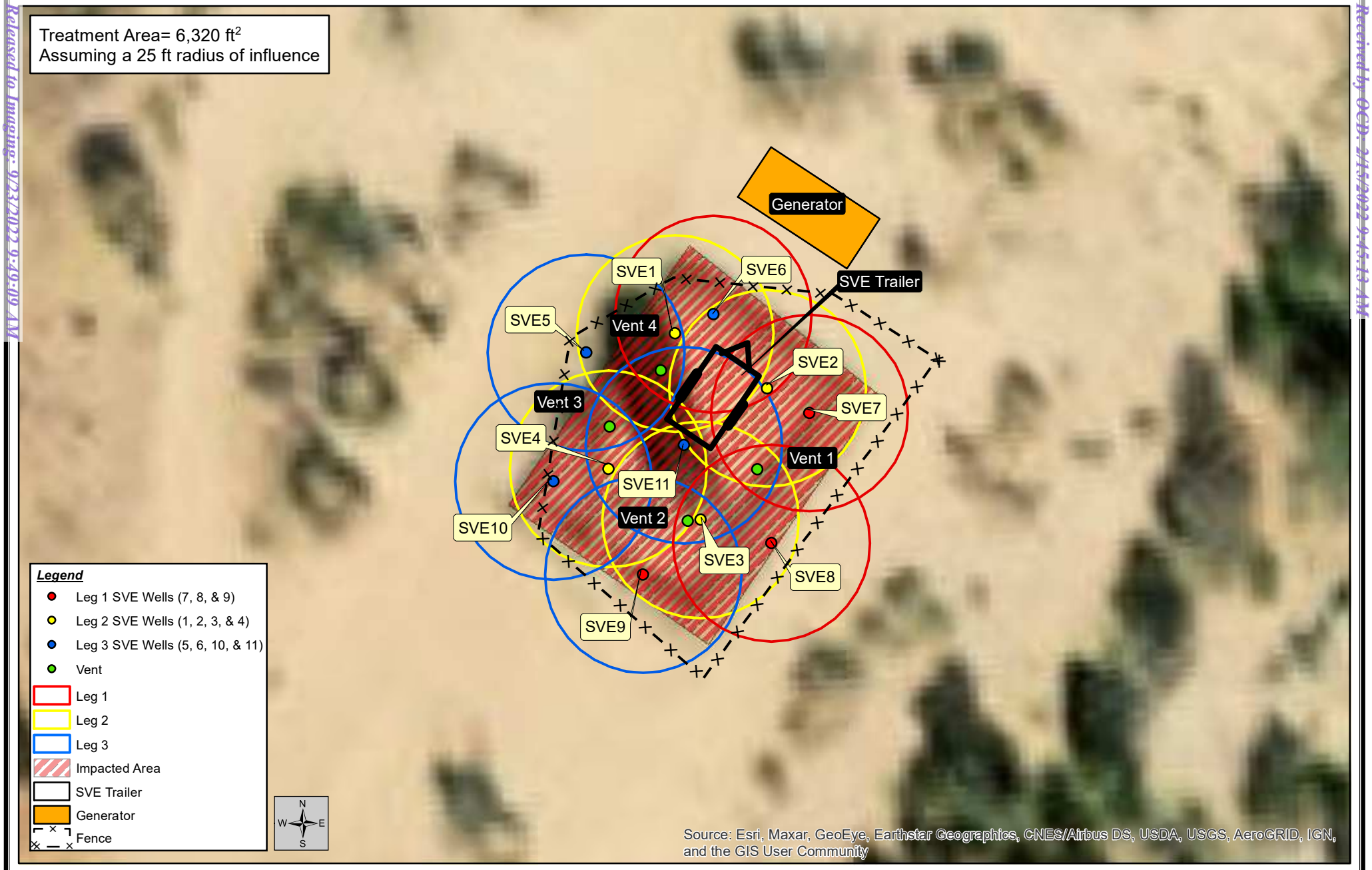

Figure 4
SVE System Overview

Status Report - 4th Quarter 2021

January 13, 2022

1:250

0 25 50 75 100 125 Feet

TIMBERWOLF ENVIRONMENTAL

Created By:
Kevin Cole
TE Project No.: HEC-190007

San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)
Hilcorp Energy Company
Rio Arriba County, New Mexico

Datum: NAD83
Imagery Source: ESRI
Vector Source: TE

Attached Tables

Table A-1. Operation and Maintenance Events
Status Report 4th Quarter 2021
San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)

Date	Hour Meter (hrs)	Water/Condenstate Recovered (gal)	Maintenance Performed
10/05/21	6720.7	0	• Hilcorp operator performed SVE system O&M checks • All system functions operating correctly • Timberwolf personnel not on site
10/19/21	7056.2	0.5	• Hilcorp operator performed SVE system O&M checks • Leg 1 hose connection on outside of trailer was broken, switched to spare • Timberwolf personnel not on site
11/02/21	7368.2	0	• Hilcorp operator performed SVE system O&M checks • Timberwolf personnel not on site
11/17/21	7729.6	0	• Hilcorp operator performed SVE system O&M checks • Timberwolf personnel not on site
12/08/21	8232.6	0	• Hilcorp operator performed SVE system O&M checks • System automation not opening/closing two of the three system manifold valves • Heat tape was not operational • Timberwolf personnel not on site
12/14/21	8380.7	0	• Jim Foster with Timberwolf performed SVE system O&M checks • System down for approximately 1 hour for O&M • Fuses replaced in automation panel to get the two system manifold valves back operational • Valves manually opened to break up ice causing manifold valves to stick closed • Automation was turned off and leg 1 and 3 (i.e., deep wells) were manually opened prior to Biowash treatment • Subsurface soil was treated with Biowash via the 4 vent wells
12/15/21	N/A	0	• Jim Foster with Timberwolf performed SVE system O&M checks • System down for approximately 15 minutes for O&M • Adjusted heat tape to improve prevention of icing • Added heat tape to leg 2 and 3 • Leg 1 and 3 were manually opened, microbes were added to the vent wells in order to treat the deep interval • Automation was set to cycle only the deep intervals (i.e., leg 1 and leg 3) and not the shallow interval (i.e., leg 2). • Heat tape on separator was turned off due to lack of power outlets to run automation and all heat tape.
01/05/22	8899.7	0	• Kurt Hoekstra with Hilcorp performed SVE system O&M checks • Note: This hour meter reading will be utilized to determine hour meter reading at end of 4Q21

gal - gallons
hrs - hours

Table A-2. Cumulative Mass Removal
Status Report 4th Quarter 2021
San Juan 28-7 Unit 183M (OCD Incident No. NCS1901627746)

Quarter	Constituent (lbs)					Recovered Volume (bbl)
	Benzene	Toluene	Ethylbenzene	Xylene	GRO	GRO
4Q19	18.5	32.4	0.73	6.27	1,017	3.77
1Q20	5.01	18.01	0.48	3.65	403.47	1.50
2Q20	6.66	23.95	0.64	4.85	536.65	1.99
3Q20	14.82	53.32	1.43	10.80	1,194.72	4.43
4Q20	1.71	6.16	0.16	1.25	138.07	0.51
1Q21	22.85	82.18	2.20	16.65	1,841.41	6.83
2Q21	2.13	15.09	1.17	12.63	55.43	0.21
3Q21	2.51	17.78	1.38	14.88	65.30	0.24
4Q21	2.60	18.40	1.43	15.40	67.57	0.25
Total	76.79	267.29	9.62	86.38	5,319.62	19.73

mass (mg) removed equation = ((CFM*volatile*runtime in minutes)/(35.3147))
lbs - pounds
bbl - barrels

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

CONDITIONS

Action 81596

CONDITIONS

Operator:	OGRID:
HILCORP ENERGY COMPANY 1111 Travis Street Houston, TX 77002	372171
	Action Number: 81596
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

CONDITIONS

Created By	Condition	Condition Date
nvelez	Accepted for the record. See App ID 125796 for most updated status.	9/23/2022