March 21, 2018 Reference No. 086242

Mr. Patrick Antonio
Navajo Nation Environmental Protection Agency
Post Office Box 339
Window Rock, Arizona 86515

Mr. Randolph Bayliss
Energy, Minerals, and Natural Resources Department
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Dear Mr. Antonio and Mr. Bayliss:

Re: 2018 Work Plan
Thoreau Compressor Station, AP-102
McKinley County, New Mexico

GHD Services, Inc. (GHD) submits this work plan on behalf of Transwestern Pipeline Company, LLC (Transwestern) for the Transwestern, Compressor Station 5 located in Thoreau, McKinley County, New Mexico. The Thoreau Compressor Station (Site) is located on the Navajo Nation within Section 20, Township 14 North, Range 13 West (Figure 1). The Site is regulated by the Navajo Nation Environmental Protection Agency (NNEPA) and New Mexico Oil Conservation Division (NMOCD).

1. Project Understanding

GHD understands that the facility is owned by Transwestern, although the surrounding property is owned by the Navajo Nation. Based on a review of records, the Site has been in active assessment and remediation since 1989.

Site contaminates of concern (COCs) consist of benzene, xylene and polychlorinated biphenyls (PCBs). The New Mexico Water Quality Control Commission (NMWQCC) regulatory limits for the Site are:

Constituent	NMWQCC Regulatory Limit (micrograms per Liter [µg/L])
Benzene	10
Xylenes	620
PCB	1

Benzene, toluene, ethylbenzene, and xylenes (BTEX) are present in soil and groundwater at the Site. Total petroleum hydrocarbons (TPH) are also present at the Site. GHD performed a bench scale study from samples collected at the Site in 2015. Based on the bench scale study, in situ chemical oxidation (ISCO) appears to be effective in reducing the concentration of these contaminants. The chemical oxidant that appeared to be the most cost effective based on the bench scale study was catalyzed sodium persulfate.

GHD performed groundwater sampling for monitoring wells 5 06C, 5 16B, 5 18B, 5 20B, 5 35B, 5 59, and soil vapor extraction well SVE 3 (Figure 2) on April 21, 2016. Benzene exceeded the NMWQCC limit of

10 ug/L in wells 5-16B, 35-B, and SVE-3 with the highest concentration of 4200 ug/L in SVE-3. Total xylenes exceeded the NMWQCC limit of 620 ug/L in wells 5-16B, 35-B, and SVE-3 with the highest concentration of 1100 ug/L in 5-16B. PCBs were not detected in sampled wells 5-6C and 5-59.

GHD injected air sparge wells A-1 and A-2 with sodium persulfate and sodium hydroxide December 20th to the 22nd, 2016. Approximately 1250 gallons of solution were injected over this time frame.

Annual groundwater monitoring occurred most recently on March 28, 2017. GHD continued ISCO injections of sodium persulfate and sodium hydroxide during three injection events in March, June and October 2017. The injections occurred in air sparge wells AS-1, AS-2, AS-4 and AS-10. To monitor the effectiveness of the injections, groundwater was sampled from MW 5-35B and SVE-3 prior to each injection event.

The results of the post-sampling injections show a general decrease in BTEX concentrations in the observation wells (SVE-3 and 5-35B). However, an increase in sulfate in the observation wells was not observed (see Table 1). Given the amount of sodium persulfate that was injected, an increase in the sulfate concentration would be expected to be observed in the well data.

GHD believes that the data indicates that the aquifer is experiencing an effect from the reduction in BTEX concentrations in the groundwater. However, the monitor wells that are being used for observation are too far away for a direct reduction in BTEX concentrations to be observed. Based on this GHD is proposing the following scope of work:

- Perform the annual monitoring event to include the air sparge wells that were used for ISCO injections (AS-1, AS-2, AS-4, and AS-10).
- Include analysis of sulfate, dissolved iron, and total iron for each of the wells sampled.

GHD will evaluate the results of the sampling event to assess the effectiveness of the injections that have been performed to date. Based on the assessment, GHD may recommend additional injections in different wells or possibly require the installation of additional injection wells. Based on this, GHD has prepared the following scope of services for 2018.

1.1 2018 Tasks

1.2 Task 1: Project Preparation

This task includes the preparation and submission of this work plan and other project preparation activities that occur after work plan approval, but before fieldwork mobilization. After receiving authorization to proceed from stakeholders, GHD will notify Transwestern a minimum of 48 hours prior to the commencement of field activities. Approval from the NMOCD and NNEPA will not be obtained for this work plan because the proposed scope of work has previously been approved by both agencies.

1.3 Task 2: Sulfate Baseline Annual Groundwater Monitoring

GHD will perform an annual groundwater monitoring event to monitor ongoing conditions at the Site. After review of data collected during 2017 annual and injection monitoring events it has been determined that although decreases in BTEX constituents were observed, elevated levels of sulfate typical of post injection monitoring were not observed. In order to better assess the need for further injections GHD is recommending a Site-wide sampling to include wells typically sampled during the annual monitoring event (5-02C, 5-06C, 5-16B, 5-18B, 5-20B, 5-35B, 5-59, and soil vapor extraction well SVE-3) as well as air sparge wells utilized for injections (AS-1, AS-2, AS-4 and AS-10).

An oil/water interface probe will be used to measure groundwater depths and check for the presence of LNAPL in each of the Site monitoring wells. Before and after each use, the oil/water interface probe will be cleaned with an Alconox®/deionized water solution and rinsed with deionized water.

Monitoring wells will be purged and sampled using a dedicated, disposable polyethylene bailer. Field parameters including groundwater temperature, pH, conductivity, and oxidation/reduction potential (ORP) will be collected using an appropriate multi-parameter groundwater quality meter.

Following collection, groundwater samples will be labeled, placed on ice, and submitted to Hall Environmental Analysis Laboratory (HEAL) for analyses of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8260 and sulfate by EPA Method 6010. Groundwater samples from monitoring wells 5-06C and 5-59 will also be analyzed for PCBs by EPA Method 8082.

Generated purge water will be temporarily stored in poly tanks on Site. The purge water will be sampled for the presence of PCBs. If laboratory analyses do not indicate the presence of PCBs, the water will be disposed of in the oil waste water tank used for Transwestern processes. If the analytical results show evidence of PCBs in the purged water, the water will be disposed of at a Transwestern approved waste disposal facility.

Information obtained from the sampling event will be reviewed by GHD and the GHD ITG to evaluate the need for modified/further ISCO injections during 2018. The information obtained from the sampling event will be included in the 2018 Annual Report.

If further injections are recommended a work plan outlining the suggestions and associated cost will be submitted to Transwestern for approval. Any changes to injection methods/procedures outside of those that have previously been approved by the NMOCD and the NNEPA would also be presented for approval prior to proceeding with the injections.

1.3.1 Task 3: 2018 Annual Report Preparation

GHD will prepare an annual report summarizing the annual groundwater monitoring data and any field activities performed throughout the 2018 calendar year. The annual report will include tabulated analytical and gauging data, groundwater gradient and isopleth maps for contaminants of concern from the annual event and recommendations for future activities at the Site.

A draft final version of the Annual Report will be submitted to Transwestern for review. The final report will incorporate comments received from Transwestern and it will be submitted to NNEPA and NMOCD as a final report following receipt of comments from Transwestern.

2. Schedule

GHD submits this work plan to the NMOCD and NNEPA for their review and files. Since this work has been previously approved by both regulatory agencies, approval will not be sought prior to performing field work. GHD appreciates the opportunity to submit this work plan to assist in the management, assessment, and remediation of the Thoreau Compressor Station project.

Please feel free to contact either of us at 505-884-0672 if you have questions or comments.

Sincerely,

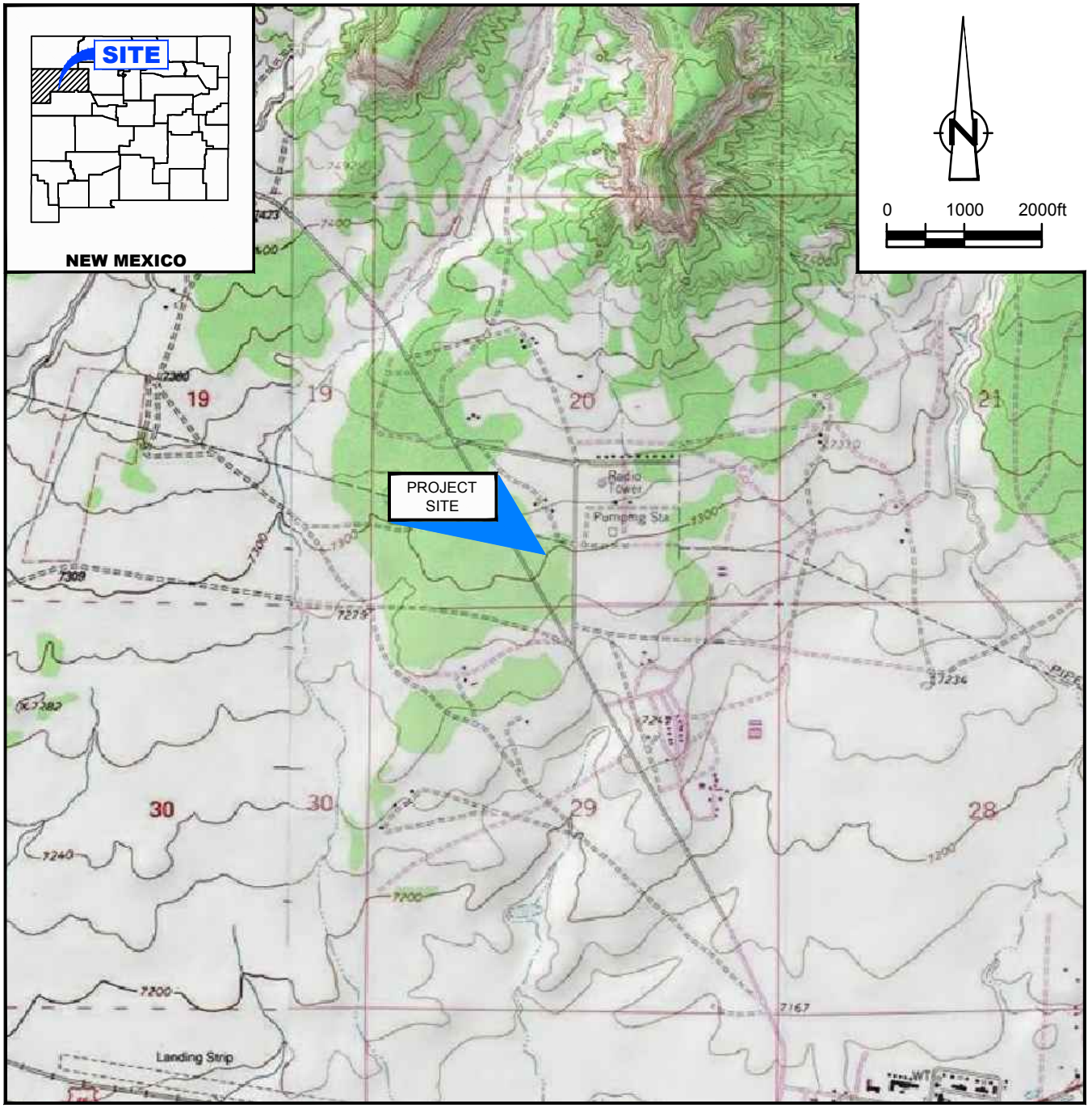
GHD

Christine Mathews
Project Scientist/Coordinator

Bernard Bockisch, PMP
Senior Project Manager

CM/md/1

Encl.



SOURCE: USGS 7.5 MINUTE QUAD
"BELL LAKE AND TIP TOP WELLS, NEW MEXICO"

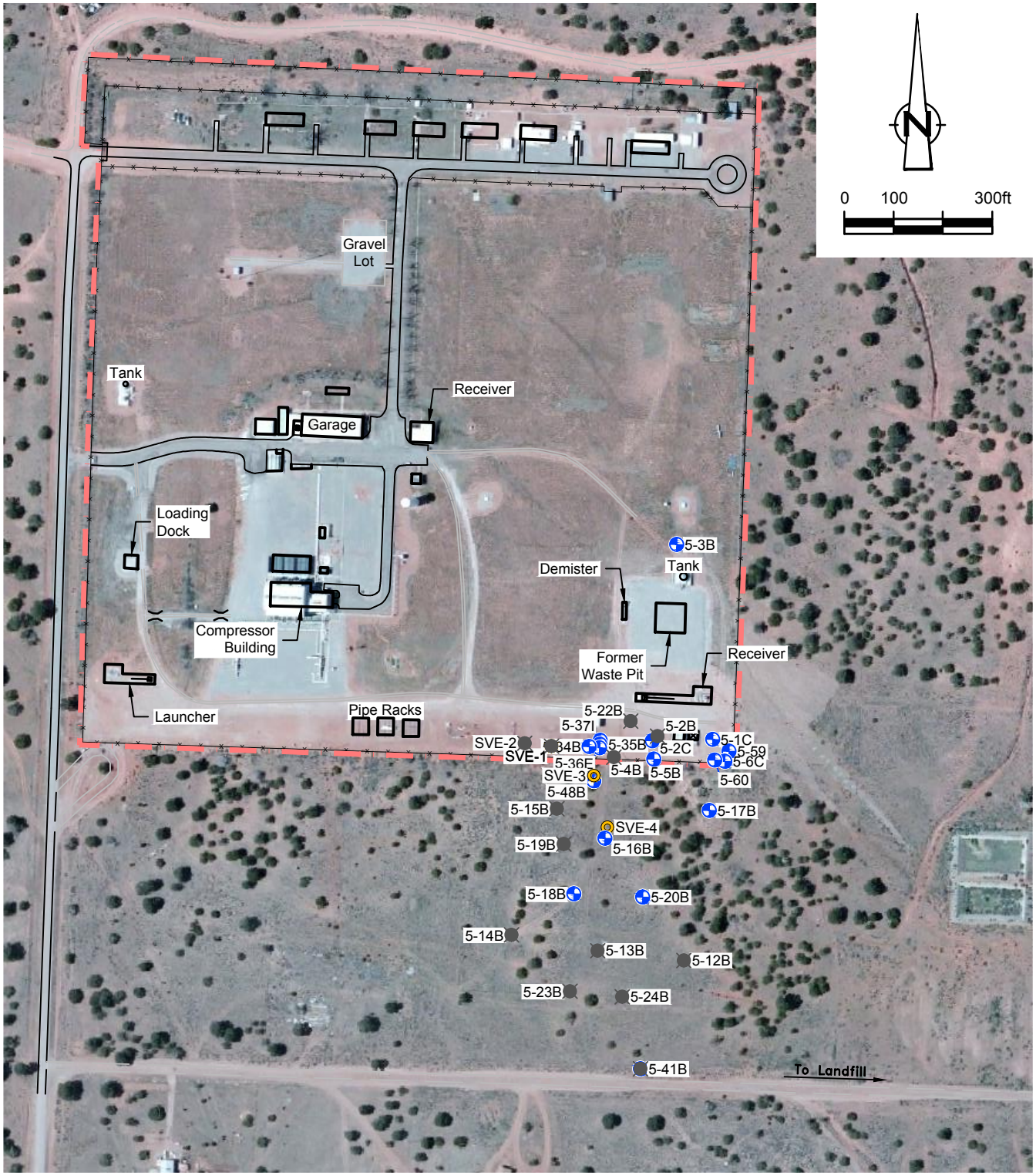
LAT/LONG: 35.4262° NORTH, 108.2360° WEST
COORDINATE: NAD83 DATUM, U.S. FOOT
STATE PLANE ZONE - NEW MEXICO WEST

Figure 1

SITE LOCATION MAP
THOREAU COMPRESSOR STATION
McKINLEY COUNTY, NEW MEXICO
Transwestern Pipeline Company, LLC

GHD

086242-00(003)GN-DL001 JUL 14/2015



LEGEND

- Monitor Well Location
- SVE Well Location
- Plugged and Abandoned Monitoring Well
- Approximate Station Boundary
- Fence Line

Figure 2

SITE DETAIL MAP
THOREAU COMPRESSOR STATION
McKINLEY COUNTY, NEW MEXICO
Transwestern Pipeline Company, LLC

Table 1

Summary of Analytical Results for ISCO Monitoring
Thoreau Compressor Station No. 5
McKinley County, New Mexico

Well ID	Sample Date	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Sulfate (mg/L)	Dissolved Iron (mg/L)	Total Iron (mg/L)
SVE-3	4/21/2016	**4200**	< 10	220	830	< 2.5	3.2	40
	3/28/2017	**4300**	< 20	160	2900	< 0.50	0.43	--
	6/20/2017	**5700**	< 20	270	4600	0.67	4.1	19
	9/22/2017	**3400**	< 8.0	120	2200	< 2.5	3.6	13
5-35B	4/21/2016	**2100**	< 100	90	780	7.3	8.5	36
	3/28/2017	**1800**	< 50	< 50	490	3.4	2.1	--
	6/20/2017	**1300**	< 20	28	250	5.2	3.2	22
	9/22/2017	**1300**	8.7	25	250	2.9	8.2	28
NNEPA Standard		**5**	**1000**	**700**	**10000**	**NE**	**NE**	**NE**

Notes:

NNEPA = Navajo Nation Environmental Protection Agency
mg/L = milligrams per liter
< 2.5 = Below Laboratory Detection Limit of 2.5 mg/L
BOLD = Concentrations that exceed the NNEPA groundwater quality standard