Western Refining Southwest LLC
A subsidiary of Marathon Petroleum Corporation
I-40 Exit 39
Jamestown, NM 87347

November 28, 2022

Mr. Rick Shean, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

RE: North Drainage Ditch Area Investigation Work Plan Phase II
Western Refining Southwest LLC, D/B/A Marathon Gallup Refinery
EPA ID #NMD000333211
HWB-WRG-19-009

Dear Mr. Shean:

Western Refining Southwest LLC, D/B/A Marathon Gallup Refinery is submitting this "North Drainage Ditch Area Investigation Work Plan Phase II" as requested in the New Mexico Environment Department (NMED) "Approval with Modifications – North Drainage Ditch Area Investigation Report" letter dated April 25, 2022.

If you have any questions or comments regarding the information contained herein, please do not hesitate to contact Mr. John Moore at (505) 722-0205.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction of supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,
Western Refining Southwest LLC, D/B/A Marathon Gallup Refinery

Ruth A Cade

Ruth Cade
Vice President

Enclosure

pdfc: D. Cobrain, NMED HWB
L. Andress, NMED HWB
L. Barr, NMEC OCD
L. King, EPA Region 6
K. Luka, Marathon Petroleum Corporation
J. Moore, Marathon Gallup Refinery
H. Jones, Trihydro Corporation

North Drainage Ditch Area Investigation Work Plan Phase II

Western Refining Southwest LLC

(D/B/A Marathon Gallup Refinery)

Gallup, New Mexico

EPA ID# NMD000333211

November 28, 2022

Executive Summary

Western Refining Southwest LLC, D/B/A Marathon Gallup Refinery (Refinery) is submitting this Work Plan to further delineate soil contamination on the north side of the Refinery in an area identified as the North Drainage Ditch. The New Mexico Environment Department requested additional investigation of the North Drainage Ditch in Comment 6 of the "Approval with Modifications – North Drainage Ditch Area Investigation Report" letter dated April 25, 2022 (NMED 2022a).

Surface water samples and a groundwater sample collected in 2015 near the North Drainage Ditch detected the presence of constituents of concern (e.g., benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tert butyl ether (MTBE), and total petroleum hydrocarbons (TPH). An investigation of this area was subsequently conducted in 2016 through the collection of soil and groundwater samples along and beneath the North Drainage Ditch. The analyses of the samples further confirmed the petroleum hydrocarbon impacts in the area. This Work Plan will guide the second phase of investigation activities to further characterize impacts to soils through sampling soils at 9 soil borings. Soil samples will be analyzed for total TPH – diesel range organics, TPH – motor oil range organics, TPH – gasoline range organics, and total manganese, as outlined in Table 1. The Refinery will prepare an investigation report summarizing the sampling results within 120 days of the receipt of the analytical data.

Table of Contents

List of Figures

List of Tables

List of Appendices

List of Acronyms

%	percent
bgs	below ground surface
COC	chain of custody
DAF	dilution attenuation factor
DRO	diesel range organics
ft	foot or feet
GRO	gasoline range organics
MTBE	methyl tert butyl ether
MRO	motor oil range organics
NMED	New Mexico Environment Department
QA/QC	quality assurance/quality control
PID	photoionization detector
Refinery	Western Refining Southwest LLC, D/B/A Marathon Gallup Refinery
SL-SSL	soil leachate soil screening levels
SSL	soil screening level
SVOC	semi-volatile organic compounds
TPH	total petroleum hydrocarbons
VOC	volatile organic compounds

1.0 Introduction

The Western Refining Southwest LLC, D/B/A Marathon Gallup Refinery (Refinery), is located approximately 17 miles east of Gallup, New Mexico along the north side of Interstate Highway I-40 (Figure 1-1). The physical address is I-40, Exit #39 Jamestown, New Mexico 87347. The Refinery property covers approximately 810 acres. The Refinery was indefinitely idled in August 2020.

This Work Plan proposes additional delineation of New Mexico Environment Department (NMED) soil screening level (SSL) exceedances to the north/northwest of the Refinery tank farm, in the area identified as the North Drainage Ditch (Figure 1-2). As noted in the North Drainage Ditch Area Investigation Report (Western 2022) NMED SSL exceedances were identified for the following analytes: total petroleum hydrocarbons (TPH) – gasoline range organics (GRO), TPH - diesel range organics (DRO), TPH – motor oil range organics (MRO), and total manganese. NMED requested further investigation within the North Drainage Ditch area in Comment 6 of the "Approval with Modifications – North Drainage Ditch Area Investigation Report" letter dated April 25, 2022 (NMED 2022a).

2.0 Background

The Refinery property covers approximately 810 acres. Refinery operations were indefinitely idled in August 2020. While operating, the Refinery processed crude oil transported by pipeline or tanker truck from the Four Corners region. There is no record of waste or other contaminants being handled in the area of investigation. The North Drainage Ditch is part of a larger drainage feature that begins on the north side of the tank farm, extending north approximately 200 ft and passes beneath a dirt road after which it bifurcates into two smaller segments (one to the northeast and the other to the west). The western segment extends westward approximately 400 ft and then turns northwest through a low-lying area that is the focus of this investigation (Figure 1-2). Standing water has been periodically observed (ephemerally) in portions of the ditch.

First indications of potential impacts in the North Drainage Ditch area were documented during an October 2009 site inspection; during a routine inspection of the site drainage features, the ditch was discovered to have “non-moving water” with possible hydrocarbon staining and a diesel-like odor. A C-141 Release Form was submitted to the New Mexico Oil Conservation Division and NMED on October 20, 2009. The ditch was estimated to be 40 feet (ft) long.

2.1 Submittal History

The following documents have been submitted and received for the North Drainage Ditch area:

1. C-141 Release Form - submitted October 20, 2009
2. Notification of Potential Hydrocarbon Discovery - submitted April 22, 2015
3. Requirement, Submittal of Work Plan - received May 12, 2015
4. Investigation Work Plan - submitted August 13, 2015
5. Investigation Report - submitted August 20, 2018
6. Disapproval, Investigation Report - received February 8, 2019
7. Investigation Work Plan - submitted April 26, 2019
8. Response to Disapproval, Investigation Report - submitted May 13, 2019
9. Approval with Modifications, Revised Investigation Report - received June 24, 2019
10. Disapproval, Investigation Work Plan - received June 24, 2019
11. Response to Approval with Modifications, Investigation Report - submitted July 30, 2019
12. Response to Disapproval, Investigation Work Plan - submitted September 20, 2019

13. Response to Approval with Modifications, Investigation Report - submitted December 2, 2019
14. Approval, Response to Approval with Modifications, Investigation Report - received January 16, 2020
15. Approval with Modifications, Investigation Report - received March 4, 2021
16. Response to Approval with Modifications, Investigation Report - submitted March 29, 2021
17. Investigation Report - submitted December 17, 2021
18. Approval with Modifications, Investigation Report - submitted April 25, 2022
19. Response to Approval with Modifications, Investigation Report - submitted August 31, 2022

2.2 Historical Sampling and Results

After standing water was found in the area in 2009, soil and surface water samples were collected and analyzed following the submittal of the C-141 Form (Western 2015). The surface water samples were analyzed for TPHs by Method 418.1. The soil samples were analyzed for semi-volatile organic compounds (SVOCs) by Method 8270, metals using the Toxicity Characteristic Leaching Procedure, and TPH by Method 418.1. The surface water samples indicated the presence of TPH; however, at the time of sampling, no applicable screening levels had been established. The soil results were mostly non-detect at the respective reporting limits. With analytical results below applicable screening levels, and due to the ephemeral nature of the water, no further action was taken.

Surface water observed in the ditch in 2015. Surface water samples were collected and sampled for volatile organic compounds (VOC), TPH, and metals. Benzene, xylenes, methyl tert butyl ether (MTBE), 1,2,4-trimethlybenzene, 1,3,5-trimethylbenzene, total arsenic, naphthalene, and total barium were detected at concentrations above applicable screening levels. To further investigate the surface water analytical results, three soil borings (NDD-1, NDD-2, and NDD-3) were completed in the area. One boring (NDD-3) encountered groundwater at 11 ft- below ground surface (bgs), and sample was collected and analyzed for VOCs, SVOCs, and TPH. MTBE and 1,2-dichloroethane were detected at concentrations above applicable screening levels (Western 2018).

Due to TPH and metals detections in samples collected in 2015, continued investigative work was planned and conducted in 2016. Temporary wells were completed in four boreholes (NDD-4, NDD-6, NDD-11 and NDD-16) and four permanent monitoring wells (OW-53, OW-54, OW-55, and OW-56) were installed. During initial sampling efforts, both groundwater and soil samples from the well installations indicated exceedances of applicable screening levels for multiple constituents. The permanent monitoring wells have continued to be sampled quarterly, with the exception of OW-53 which has remained dry since its installation. Analytical results for the permanent monitoring wells have continued to exceed the applicable screening levels for multiple constituents and are discussed in the Annual Groundwater Reports.

Additional sampling, conducted in 2019, centered around elevated total manganese concentrations observed in historical soil sample results. Samples were collected to assess if the crude oils processed at the facility resulted in the elevated manganese concentrations observed in the North Drainage Ditch. The results of the sampling effort indicated that the crude oils did not contribute to the elevated total manganese concentrations (NMED 2020).

Results from investigation efforts from 2015 through 2017 were detailed in the North Drainage investigation report submitted to NMED in 2018 (Western 2018). Following the submittal of the 2018 investigation report, NMED requested an additional investigation Work Plan to further characterize the area (NMED 2019). In 2019, a Work Plan was submitted to further characterize soil and groundwater in and around the ditch, assess the area up-gradient, and determine the down-gradient extent of TPHs and metals in groundwater (MPC 2019). This Work Plan was revised and approved with modifications by NMED on March 4, 2021, for the August 2021 investigation (NMED 2021a).

Results from the August 2021 sampling event were detailed in the "North Drainage Ditch Area Investigation Report" (Western 2021). The observed groundwater conditions were generally similar to the petroleum hydrocarbon and metal concentrations observed in the surrounding observation wells. No further groundwater investigations are planned for the North Drainage ditch area as the groundwater quality will be monitored and addressed with the underlying plume in the area. NMED level exceedances were identified in the soil borings for the following analytes: TPH-DRO, TPH-GRO, TPH-MRO, and manganese. Additional delineation sampling was recommended in the "North Drainage Ditch Area Investigation Report" (Western 2021) and in NMED's subsequent response (NMED 2022a).

3.0 Site Conditions

This section provides a summary of the surface and subsurface conditions in the North Drainage Ditch area.

3.1 Surface Conditions

Site topographic features include high ground in the southeast gradually decreasing to a lowland fluvial plain to the northwest. Elevations on the Refinery property range from 7,040 ft to 6,860 ft. The North Drainage Ditch area is at an approximate elevation of 6,920 ft above mean sea level.

The North Drainage Ditch essentially ends (i.e., there is no clearly defined channel) approximately 90 feet north of the access road. Thereafter, surface water appears to flow north, along the east side of a dirt road, before crossing over the road.

Surface soils within most of the area of investigation are primarily Rehobeth silty clay loam. Rehobeth soil properties include a pH ranging from 8 to 9 standard units and salinity (naturally occurring and typically measuring up to approximately 8 millimhos per centimeter.

3.2 Subsurface Conditions

Based on existing boring logs, shallow subsurface fluvial and alluvial soils are comprised of primarily clays and silts with minor inter-bedded sand layers. Very low permeability bedrock (e.g., clay stones and siltstones) underlie the surface soils and effectively form an aquitard. The Chinle Group, from the Upper Triassic period, crops out over a large area on the southern margin of the San Juan Basin. The uppermost recognized local Formation is the Petrified Forest Formation. The Sonsela Sandstone Bed is the uppermost recognized regional aquifer. Aquifer tests of the Sonsela Bed northeast of Prewitt indicated a transmissivity of greater than 100 square ft per day (Stone et al., 1983). The Sonsela Sandstone's highest point occurs southeast of the Refinery and slopes downward to the northwest as it passes under the Refinery. Due to the confinement of the Chinle Formation aquitard, the Sonsela Sandstone bed acts as a water-bearing reservoir and is artesian at its lower extremis. Artesian conditions exist through much of the central and western portions of the Refinery property.

Surface soils generally consist of fluvial and alluvial deposits, primarily clay and silt with minor inter-bedded sand layers. Below the surface layer is the Chinle Formation, which consists of very low permeability clay stones and siltstones that comprise the shale of this formation. As such, the Chinle Formation effectively serves as an aquitard. Interbedded within the Chinle Formation is the Sonsela Sandstone bed, which represents the uppermost potential aquifer in the region. The Sonsela Sandstone bed lies within and parallels the dip of the Chinle Formation. As such, its high point is located southeast of the Refinery, and it slopes downward to the northwest as it passes under the Refinery.

Groundwater flow within the Chinle Formation is extremely slow and typically averages less than 10^{-10} centimeters per second (cm/sec) (i.e., less than 0.01 ft per year). Groundwater flow within the surface soil layer, above the Chinle Formation, is highly variable due to the presence of complex and irregular stratigraphy including sand stringers, cobble beds, and dense clay layers. As such, hydraulic conductivity may range from 10^{-8} cm/sec (approximately 0.01 ft per year) in the clay soil layers located near the surface and up to 10^{-2} cm/sec (approximately 10,000 ft per year) in the gravelly sands immediately overlying the Chinle Formation.

Shallow groundwater located under Refinery property generally flows along the upper contact of the Chinle Formation. Although the prevailing regional flow direction is from the southeast and toward the northwest, in the tank farm area flow is in a northeasterly direction, and in the southern marketing area flow is generally in a westerly direction.

The diverse properties, and complex irregular stratigraphy of the surface soils across the Refinery cause a wide range of hydraulic conductivity ranging from less than 10^{-2} cm/sec (approximately 10,000 ft per year) for gravel-like sands immediately overlying the Petrified Forest Formation to 10^{-8} cm/sec (approximately 0.01 ft per year) in the clay soils located near the surface. Generally, shallow groundwater at the Refinery follows the upper contact of the Petrified Forest Formation (Chinle Group) with prevailing flow from the southeast to the northwest, although localized areas may have varying flow directions based on the subsurface geology.

Groundwater in the area of the North Drainage Ditch flows from the east to the west. Surveying for the permanent monitoring wells was completed in January 2022. The survey data will be included in the 2022 Annual Groundwater Report and incorporated into the site-wide potentionmetric surface map. Up-gradient of the North Drainage Ditch includes the eastern boundary of the refinery and the tank farm.

4.0 Scope of Activities

The investigative activities proposed in this Work Plan will be conducted to further delineate the impacts to soils within the North Drainage Ditch that were identified during the August 2021 investigation.

Soil borings will be completed with a hollow-stem auger at 9 locations within the North Drainage Ditch area. Soil borings will be advanced to the alluvium/Chinle subsurface group (local aquitard). The proposed soil borings consist of two soil borings 25 ft to the south and southwest of NDD-SB-1, two soil borings 25 ft to the south and southwest of NDD-SB-3, and five soil borings starting 25 ft to the northeast of NDD-SB-3. Proposed soil boring locations are shown in Figure 2-1. All soil borings will be drilled to a minimum depth of five feet below the deepest interval in which constituents were detected above applicable screening levels in borings completed in August 2021. If there is field evidence of impacts at greater depths (e.g., PID readings, odor, staining, etc.), then the soil boring will be advanced deeper to achieve full vertical delineation. Soil borings will be advanced until no impacts are observed, or groundwater is reached, whichever occurs first. If there is evidence of lateral migration or evidence that delineation is not complete, additional borings will be completed as time allows during the investigation. If additional delineation is necessary a subsequent investigation will take place. NMED will be notified of the need for any additional boings as soon as practicable.

Soil borings will be continuously logged, and field-screened on 2-ft intervals for evidence of contaminants using a photoionization detector (PID), beginning with a surface sample (0.5 – 1 ft bgs). Analytical samples will be collected from four intervals: the surface (0.5 – 1 ft bgs), just above the water table (if encountered), the bottom of boring, and in the zone with the highest PID reading. Soil samples will be analyzed using methods detailed in Section 5.1. Constituents listed in Section 5 were selected as indicator parameters based on previous soil investigation work within the North Drainage Ditch.

Analytical results will be compared to applicable NMED Residential, Industrial, and Construction Worker soil screening levels (SSLs) (NMED 2022b). All samples will be compared to Residential SSLs; samples collected between 0 – 1 ft bgs will be compared to Industrial SSLs; samples collected from depths greater than 1 ft bgs will be compared to Construction Worker SSLs. The Refinery is in the process of developing background concentrations of inorganic constituents in soil. If background soil values have been approved by NMED at the time of screening results of this investigation, analytical results will be compared to the approved soil background value for manganese. Per NMED SSL guidance, soil leachate-based SSLs (SL-SSL) with a dilution attenuation factor (DAF) of 20 will be compared to the maximum reported concentration as a first step screening assessment. However, the Refinery has known impacts to groundwater, including the presence of separate phase hydrocarbons and an associated smear zone which can act as a long-term source to groundwater. For organic contaminants, vadose zone sources of hydrocarbons are expected to deplete before smear zone sources. The expectation for shorter longevity in the vadose zone can be attributed to several factors, including greater air saturation and less contaminant mass. Diffusive transport is faster in soils with higher air saturation (ITRC 2009), suggesting that mass removal of VOCs is faster in the vadose zone. The combination of less contaminant mass,

faster transport rates, and high degradation potential suggest that shorter longevity in the vadose zone is a reasonable assumption. Therefore, it follows that soils overlying the smear zone may not require an interim response for the purpose of protecting groundwater. The Refinery proposes to conduct a holistic migration to groundwater analysis on a site-wide basis. As such, the results of the first step screening assessment reported on the tables are not further discussed in the text, and the ratios (maximum reported concentration divided by the SL-SSL) will not be reported.

5.0 Investigation Methods

Soils will be visually inspected and classified in general accordance with American Society for Testing and Materials D2487 (Unified Soil Classification System) and D2488 (Description and Identification of Soils). Detailed boring logs and sampling logs will be compiled in the field by qualified staff. Soil samples will be field screened using a PID for evidence of VOCs. PID results will be recorded on the boring logs and used to identify additional sample intervals.

5.1 Soil Sample Collection Procedures

Soil samples will be collected in accordance with the "Standard Operating Procedure – Soil Sampling" (Appendix A). Details related to sample collection will be documented on the boring log field forms (Appendix B). General observations recorded on the field forms for each soil sample location will include sampling start and end times, weather, site conditions, sampling team members, and other personnel present. Sample-specific information will include field sample identification, time of sample collection, initial and final sample depth, collection method, sample type (i.e., composite or aliquot), soil classification and characteristics, any deviations from or clarification of sampling procedures, and other observations.

All reusable sampling equipment will be decontaminated prior to installing a boring and collecting a new sample. All equipment will be decontaminated with Simple Green™ (or equivalent) using a four-stage decontamination system consisting of a two detergent/water washes and two deionized water rinses and recorded in the field logbook.

PID readings will be collected at 2-ft intervals, beginning with a surface sample (6 to 12 inches bgs). At each 2-ft interval, the sample will be collected from the sampling equipment and split into two aliquots. Aliquot #1 will be placed into a plastic bag and used for PID screening. Aliquot #2 will be placed into a second plastic bag, sealed, placed in a cooler, and stored on ice for potential laboratory analysis. Aliquot #1 materials will not be submitted for laboratory analysis.

Aliquot #1 will be shaken gently to expose the soil to the air trapped in the container. Aliquot #1 will be allowed to rest while vapors equilibrate. Headspace vapors will be measured by inserting the probe of the PID in a small opening in Aliquot #1's plastic bag. The maximum PID value will be recorded on the field boring log for each interval. Note that if samples are cold (i.e., below 32 degrees Fahrenheit), they will be warmed in a heated building and/or vehicle before screening.

After collecting the PID reading, samples will be selected from 6 to 12 inches bgs, just above the water table (if encountered), the bottom of the boring, and the interval with the highest PID reading. Aliquot #2 materials from the selected depths will be transferred into the appropriate sample container, labeled, and placed in a cooler containing bagged ice. Before shipment, each cooler will be packed with ice and a laboratory-provided trip blank. A chain of custody (COC) form will accompany each sample shipment. Coolers will be sealed and delivered to an accredited laboratory.

A summary of the proposed soil sampling activities is provided below:

1. Installation of 9 soil borings, visual screening/logging, and collection of soil samples.
2. Collection of a maximum of 36 analytical samples from:
    - The surface (0.5 to 1 ft bgs)
    - Just above the water table, if groundwater is encountered
    - The bottom of the boring
    - The zone with the highest PID reading above the water table.
3. Collection of PID readings at the surface and every 2 ft until boring termination
4. Submit samples to an accredited laboratory. Soil samples will be analyzed for the constituents outlined in Table 1.
5. Compare analytical soil data with applicable NMED Residential, Construction Worker, and Industrial SSLs.

5.2 Data Quality and Validation

Quality assurance/quality control (QA/QC) samples will be collected during sampling to monitor the validity of the sample collection procedures. Field duplicates will be collected at a rate of 10 percent (%) or at a minimum of 1 per day. Equipment blanks will be collected from re-usable equipment at a rate of 10% or at a minimum of 1 per day. One trip blank per cooler will accompany the samples to the laboratory. The field duplicates, equipment blanks, and trip blanks will be submitted to the laboratory along with the soil samples. Field duplicates and equipment blanks will be analyzed for the same constituents as the soil samples; trip blanks will be analyzed for VOCs. QA/QC samples will be recorded on the field forms and the COCs. All data will undergo Tier II data validation.

COC and shipment procedures will include the following:

- COC will be completed at the end of each sampling day, prior to the transfer of samples off site.
- Individual sample containers will be packed to prevent breakage and transported in a sealed cooler with ice, or suitable coolant/other industry-wide accepted method. The drainage hole at the bottom of the cooler will be sealed, and temperature blanks will be included with each shipping container.
- Each cooler will be delivered directly to the analytical laboratory.
- Glass bottles will be separated in the shipping container by cushioning material, and plastic containers will be protected from possible puncture using cushioning material to prevent breakage.

- The COC and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Signed and dated custody seals will be used to seal the sample shipping containers prior to transport in conformance with United States Environmental Protection Agency protocol.
- Upon receipt of the samples at the laboratory, the custody seals will be broken, COCs signed as received, and condition of the samples recorded.
- The original COC will remain with the laboratory, and copies will be returned to the relinquishing party and be maintained on-site.

5.3 Data Evaluation and Waste Management

All soil analytical results will be compared to applicable NMED Residential SSLs. Soil analytical results from samples collected from 0-1 ft bgs will be compared to applicable NMED Industrial SSLs. Soil analytical results from samples collected from deeper than 1 ft bgs will be compared to applicable NMED Construction Worker SSLs. The results will be presented to NMED in a subsequent investigation report, according to the schedule proposed in Section 6. Soil recovered during sampling will be placed in drums, labeled, and stored on the 90-Day Pad. Waste characterization will be conducted prior to disposal. Waste characterization analysis will include testing for TPH-DRO, TPH-GRO, TPH-MRO by Method 8015, and total manganese by Method 6010/6020. Any wastes determined to be hazardous will be disposed of accordingly.

6.0 Schedule

Pending NMED approval, the Refinery anticipates the investigation to be completed during 2023. Once the investigation has been completed, the Refinery will prepare an investigation report summarizing the sampling results and investigation conclusions within 120 days of the receipt of the analytical data.

7.0 References

ITRC. 2009. Evaluating Natural Source Zone Depletion at Sites with LNAPL. ITRC LNAPL Team. April.

New Mexico Environment Department (NMED). 2019. Disapproval, Investigation Report North Drainage Ditch and OW-29 & OW-30 Areas. Western Refining Southwest Inc. Gallup Refinery, NMD000333211, HWB-WRG-18-002. February 8.

NMED. 2020. Approval, Response to Approval with Modifications – Comment No. 6, [Revised] Investigation Report North Drainage Ditch and OW-29 & OW-30 Areas, Western Refining Southwest Inc. Gallup Refinery, NMD000333211, HWB-WRG-18-002. January 16.

NMED. 2021. Approval with Modifications, [Revised] Investigation Work Plan North Drainage Ditch Area. Western Refining Southwest LLC, Gallup Refinery, EPA ID #NMD000333211, HWB-WRG-19-009. March 4.

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NMED. 2022b. Risk Assessment Guidance for Investigations and Remediation, Volume I Soil Screening Guidance for Human Health Risk Assessments. June 22.

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Stone, W. J., Lyford, F. P., Frenzel, P. F., Mizell, N. H., and Padgett, E. T. 1983. Hydrogeology and Water Resources of San Juan Basin, New Mexico. Socorro, New Mexico Bureau of Mines and Mineral Resources Hydrologic Report 6, 70 p.

Western Refining Southwest Inc. (Western). 2015. Investigation Work Plan, OW Series Wells and Contaminant Plume Migration, Hydrocarbon Discovery North Drainage Ditch. Western Refining Southwest Inc. Gallup Refinery, NMD000333211, HWB-WRG-MISC. August 13.

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Western. 2021. North Drainage Ditch Area Investigation Report, Western Refining Southwest LLC, Marathon Gallup Refinery, EPA ID #NMD000333211, HWB-WRG-19-009. December 17.

Western. 2022. Response to Approval with Modifications, Revised North Drainage Ditch Area Investigation Report. Western Refining Southwest LLC, Marathon Gallup Refinery, EPA ID #NMD000333211, HWB-WRG-19-009. August 31.

Figures

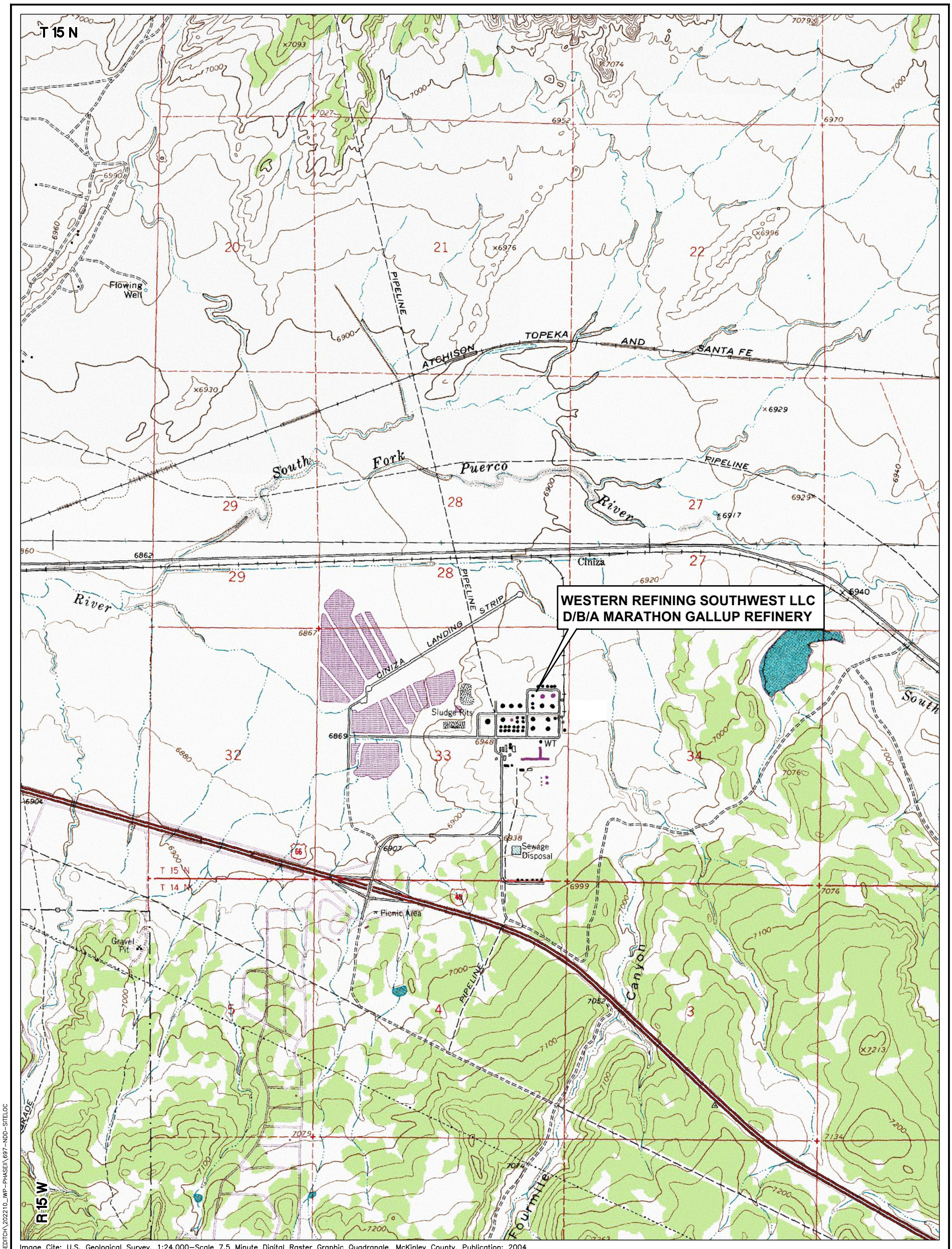
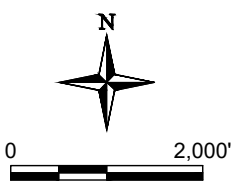


Image Cite: U.S. Geological Survey, 1:24,000–Scale 7.5 Minute Digital Raster Graphic Quadrangle, McKinley County, Publication: 2004

NOTE:

SITE LEGAL DESCRIPTION - TOWNSHIP 15 NORTH, RANGE 15 WEST, SECTION 33, LOWER QUARTER SECTION 28, AND NORTHEAST QUARTER SECTION 4.

QUADRANGLE LOCATION



Trihydro CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

FIGURE 1-1

SITE LOCATION AND TOPOGRAPHIC MAP
NORTH DRAINAGE DITCH INVESTIGATION WORK PLAN PHASE II
WESTERN REFINING SOUTHWEST LLC
D/B/A MARATHON GALLUP REFINERY
GALLUP, NEW MEXICO

Drawn By: KML	Checked By: BB	Scale: 1" = 2,000'	Date: 9/21/22	File: 697-NDD-SITELOC

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Image Cite: DigitalGlobe © CNES (2021) Distribution Airbus DS © Microsoft Corporation, BING Imagery

EXPLANATION

NDD	NORTH DRAINAGE DITCH
———	NORTH DRAINAGE DITCH BOUNDARY
— — —	APPROXIMATE PROPERTY BOUNDARY

N

0 500'

Trihydro CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

FIGURE 1-2

NORTH DRAINAGE DITCH INVESTIGATION AREA
NORTH DRAINAGE DITCH INVESTIGATION WORK PLAN PHASE II

WESTERN REFINING SOUTHWEST LLC
D/B/A MARATHON GALLUP REFINERY
GALLUP, NEW MEXICO

Drawn By: KML	Checked By: BB	Scale:1" = 500'	Date: 9/21/2022	File: 697-NDD-REFINERY-202208

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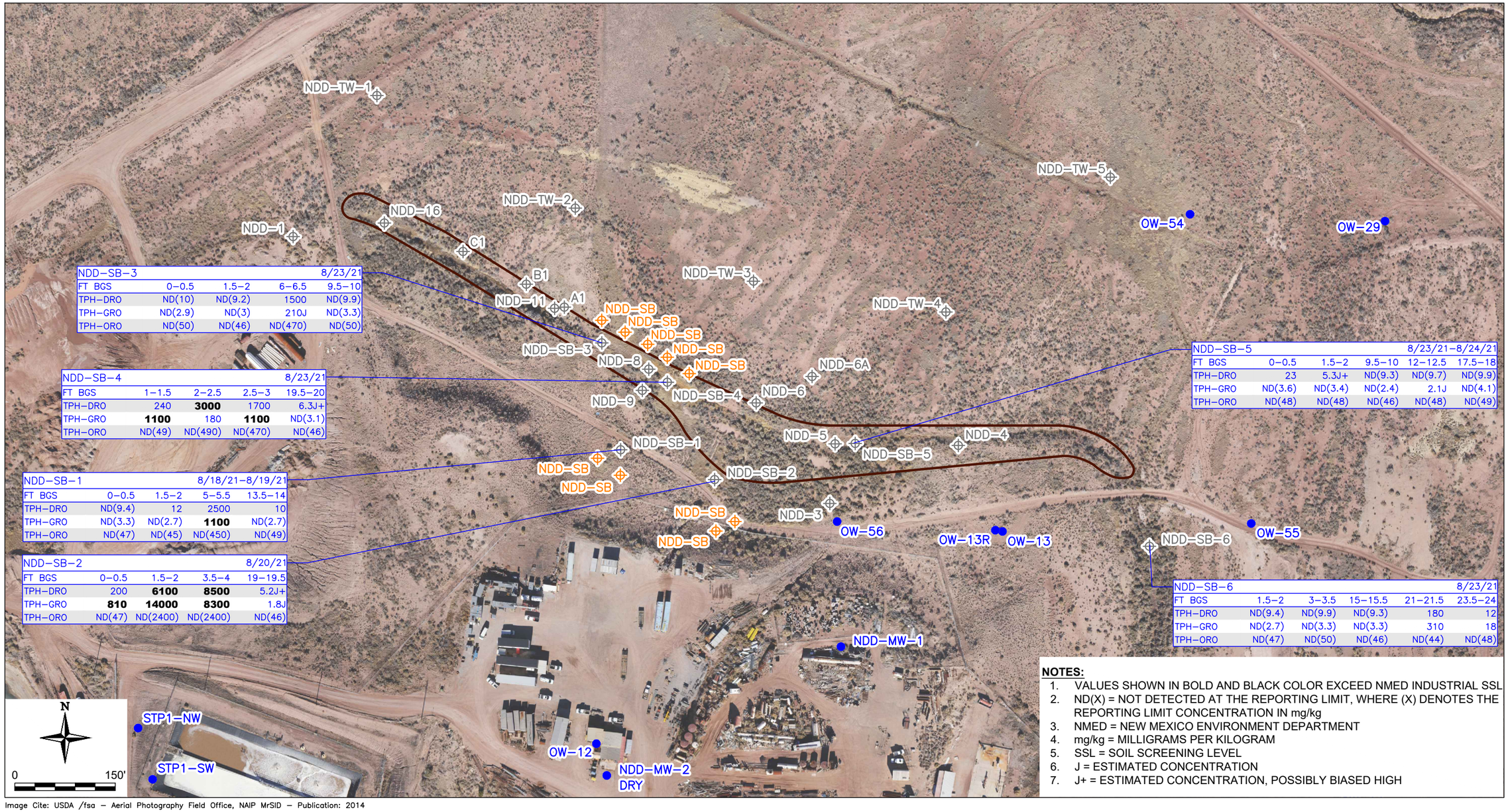

NDD-SB-3				8/23/21
FT BGS	0-0.5	1.5-2	6-6.5	9.5-10
TPH-DRO	ND(10)	ND(9.2)	1500	ND(9.9)
TPH-GRO	ND(2.9)	ND(3)	210J	ND(3.3)
TPH-ORO	ND(50)	ND(46)	ND(470)	ND(50)

NDD-SB-4				8/23/21
FT BGS	1-1.5	2-2.5	2.5-3	19.5-20
TPH-DRO	240	**3000**	1700	6.3J+
TPH-GRO	**1100**	180	**1100**	ND(3.1)
TPH-ORO	ND(49)	ND(490)	ND(470)	ND(46)

NDD-SB-1				8/18/21-8/19/21
FT BGS	0-0.5	1.5-2	5-5.5	13.5-14
TPH-DRO	ND(9.4)	12	2500	10
TPH-GRO	ND(3.3)	ND(2.7)	**1100**	ND(2.7)
TPH-ORO	ND(47)	ND(45)	ND(450)	ND(49)

NDD-SB-2				8/20/21
FT BGS	0-0.5	1.5-2	3.5-4	19-19.5
TPH-DRO	200	**6100**	**8500**	5.2J+
TPH-GRO	**810**	**14000**	**8300**	1.8J
TPH-ORO	ND(47)	ND(2400)	ND(2400)	ND(46)

NDD-SB-5					8/23/21-8/24/21
FT BGS	0-0.5	1.5-2	9.5-10	12-12.5	17.5-18
TPH-DRO	23	5.3J+	ND(9.3)	ND(9.7)	ND(9.9)
TPH-GRO	ND(3.6)	ND(3.4)	ND(2.4)	2.1J	ND(4.1)
TPH-ORO	ND(48)	ND(48)	ND(46)	ND(48)	ND(49)

NDD-SB-6					8/23/21
FT BGS	1.5-2	3-3.5	15-15.5	21-21.5	23.5-24
TPH-DRO	ND(9.4)	ND(9.9)	ND(9.3)	180	12
TPH-GRO	ND(2.7)	ND(3.3)	ND(3.3)	310	18
TPH-ORO	ND(47)	ND(50)	ND(46)	ND(44)	ND(48)

NOTES:

1. VALUES SHOWN IN BOLD AND BLACK COLOR EXCEED NMED INDUSTRIAL SSL
2. ND(X) = NOT DETECTED AT THE REPORTING LIMIT, WHERE (X) DENOTES THE REPORTING LIMIT CONCENTRATION IN mg/kg
3. NMED = NEW MEXICO ENVIRONMENT DEPARTMENT
4. mg/kg = MILLIGRAMS PER KILOGRAM
5. SSL = SOIL SCREENING LEVEL
6. J = ESTIMATED CONCENTRATION
7. J+ = ESTIMATED CONCENTRATION, POSSIBLY BIASED HIGH

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EXPLANATION

- STP1-SW — MONITORING WELL LOCATION AND DESIGNATION
- NDD-SB — PROPOSED SOIL BORING LOCATION
- NDD-3 — HISTORICAL SOIL BORING LOCATION AND DESIGNATION
- NORTH DRAINAGE DITCH BOUNDARY
- TPH — TOTAL PETROLEUM HYDROCARBONS

CONSTITUENT TABLE EXPLANATION

SAMPLE LOCATION	NDD-SB-2	8/20/2021 (SAMPLE DATE)
FEET BELOW GROUND SURFACE	FT BGS	1
TPH DIESEL RANGE ORGANICS	TPH-DRO	1000 / 3000
TPH GASOLINE RANGE ORGANICS	TPH-GRO	100 / 500
TPH OIL RANGE ORGANICS	TPH-ORO	1000 / 3000

NMED RESIDENTIAL SSL (mg/kg) / NMED INDUSTRIAL SSL (mg/kg)

Trihydro CORPORATION
1252 Commerce Drive
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FIGURE 2-1

PROPOSED SOIL BORING / HISTORIC SAMPLING LOCATIONS WITH HISTORIC TPH SOIL ANALYTICAL RESULTS NORTH DRAINAGE DITCH INVESTIGATION WORK PLAN PHASE II

WESTERN REFINING SOUTHWEST LLC D/B/A MARATHON GALLUP REFINERY GALLUP, NEW MEXICO

Drawn By: KLM	Checked By: BB	Scale:1" = 150'	Date: 8/19/2022	File: 697-NDD-BORINGLOC-202208

\\TRIHYDRO.COM\CLIENTS\TON\MARATHON\CADD\GALLUP_REPORTS\SITEWIDE\NORTHDRAINAGEDITCH\20221_IWP-PHASEII\697-NDD-BORINGLOC-202208

Table

TABLE 1. PROPOSED SOIL SAMPLE CONSTITUENT LIST
NORTH DRAINAGE DITCH INVESTIGATION WORK PLAN PHASE II
WESTERN REFINING SOUTHWEST LLC, D/B/A MARATHON GALLUP REFINERY, GALLUP, NEW MEXICO

Sample Matrix	Constituent	Method
Soil	TPH-DRO	8015
	TPH-GRO	8015
	TPH-MRO	8015
	Total Manganese	6010/6020

DRO - Diesel range organics
GRO - Gasoline range organics
MRO - Motor oil range organics
TPH - Total petroleum hydrocarbons

Appendix A – Standard Operating Procedure – Soil Sampling

memorandum

To: Sampling Team Members
From: Project Manager
Date: November 15, 2022
Re: Standard Operating Procedure – Soil Sampling

1.0 INTRODUCTION

Soil sampling related to site characterization and site clean-up is expected to involve source sampling of potentially impacted soils for characterization and profiling. Soil sampling is expected to occur around the Western Refining Southwest LLC (D/B/A Marathon Gallup Refinery) (Refinery) Process Area.

All personnel involved in soil sampling projects are required to review this Standard Operating Procedure (SOP) before sampling to ensure the continued generation of reliable data. This SOP is based on experience gained from collecting soil samples and the latest information available in guidance manuals. This SOP may be updated as additional experience and information are acquired.

2.0 PRE-FIELD ACTIVITIES

Several activities will be conducted prior to departure for the project site. A project team will be assigned, and the members will begin coordinating the sample collection event with the Refinery. Field equipment will be inventoried and organized. Access to the areas to be sampled will be confirmed, and provisions made to secure the necessary equipment for delivery to the project site.

3.0 PREPARATION

The Project Manager will review the relevant sampling and analysis plans and work plans to determine if any documents need to be brought to the site during monitoring. The Project Manager will also evaluate whether any changes have been made to the sampling and analytical procedures and notify the appropriate personnel.

The Sampling Team Members will review available surface water level data before leaving for the sampling site. This preparation ensures that the proper equipment and personnel are available at the site. All field screening equipment will be inspected prior to departure, ensuring that it is in proper working order. For soil sampling, the only field monitoring equipment used will be a photoionization detector (PID) and it will be calibrated and operated according to manufacturer's recommendations.

The PID will be checked to ensure that the PID has the appropriate lamp strength for the investigation. The lamp to be used in a PID is a 10.6 electron volt (eV) lamp, which will ionize compounds with ionization potentials from 8.0 eV to 10.6 eV. The range of 8.0 eV to 10.6 eV is representative of gasoline- and diesel-type constituents. For example, benzene, naphthalene, and toluene have ionization potentials of 9.25 eV, 8.13 eV, and 8.82 eV, respectively (see link below). A list of ionization potentials

for a variety of compounds has been published by RAE systems, the manufacturer of the PID most used by Trihydro. The list can be found at the following link: https://gastech.com/sites/default/files/RAE%20Systems%20Technical%20Note%20106%20v14%20Correction%20Factors.pdf.

4.0 EQUIPMENT

The following equipment is recommended for soil sampling:

- Required personal protective equipment (PPE), listed in the site-specific health and safety plan (HASP)
- Soil sampling devices (e.g., hand auger, hand shovel, drill rig, etc.)
- Sampling beaker, bottles, labels, and preservatives
- Gloves
- Chain-of-custody/sample-analysis-request forms
- PID
- Global Positioning System (GPS) unit
- Opaque Cooler(s) and bagged ice or frozen Blue Ice
- Detergent or solvent for cleaning monitoring equipment
- Brushes dedicated for decontamination
- Decontamination containers dedicated for wash, rinse 1, and rinse 2
- Paper towels
- Trash bags
- Field logbook

5.0 SAMPLE COLLECTION

A critical aspect of any sampling program is selection and implementation of an appropriate sampling technique. Selection of equipment and technique should be appropriate for the volume of material required and the type of analysis to be performed. In general, the sampling equipment and technique will be chosen to minimize, to the extent possible, the amount of handling a sample will undergo prior to analysis. In many cases, the material to be sampled will be easy to access, and simple "grab" samples collected using a shovel, trowel, or drive sampler are appropriate. In other cases, such as underwater or heavily saturated samples, the soils may be difficult to access, and sampling will involve the use of

specialized soil sampling equipment. Specific analytical requirements and sampling frequencies are specified in the work plan.

Soil samples located in dry areas will be collected from representative locations using a decontaminated drive sampler equipped with clean brass or stainless steel sampling rings, a thin-walled tube sampler, or a shovel or hand trowel. The sampling device will be driven completely into the material manually or using a manually operated auger, drive hammer, or mallet. The sampling device will then be extracted from the material using a shovel or trowel as needed. If used, filled sampling rings or the thin-walled tube will then be removed from the sampling device and immediately sealed on both ends with teflon sheeting and plastic caps. Otherwise, the material will be placed directly from the trowel or other appropriate sampling device into a clean glass jar. The jar will be filled completely to minimize headspace (by tamping during filling), and immediately sealed with a teflon-lined lid.

If necessary, several cores may be collected from each location to provide adequate sample volume for the laboratory. The sample containers will be labeled with indelible ink. Filled sample containers will be wiped dry and placed in a cooler with ice (or equivalent) for storage at the time of collection. Enough ice and protective packing material should be used to cool the samples to 4 degrees Celsius and ensure that the container remains intact prior to final packing and shipment.

Field screening may involve the use of a PID. In this case, the sample will be split into two aliquots. The bag containing Aliquot #1 will be sealed and shaken gently to expose the soil to the air trapped in the container. The sealed container will be allowed to rest while vapors equilibrate. Vapors present within the sample bag's headspace will be measured by inserting the probe of the instrument in a small opening in the bag. The PID value and the ambient air temperature will be recorded on the field boring log for each interval. Aliquot #1 used strictly for PID screening only. Aliquot #2 will be placed into a second plastic bag, sealed, placed in a cooler, and stored on ice for potential laboratory analysis.

The Aliquot #2 materials that correspond to the sample depths selected for laboratory analysis will be transferred into the appropriate glass sample jar, labeled, and placed in a cooler. Before shipment, each cooler will be packed with ice and a laboratory-provided trip blank. A chain of custody form will accompany each sample shipment. Coolers will be sealed and delivered to an accredited laboratory. Note that if samples are cold (i.e., below 32 degrees Fahrenheit) they will be sealed in airtight bags and warmed in a heated building and/or vehicle before screening. All samples shall be screened as close to the same ambient temperature as possible to obtain consistent results.

Sampling devices will be decontaminated between sampling locations using a four-stage decontamination system consisting of a two detergent/water washes and two deionized water rinses. Sample locations will be recorded with a GPS unit to accurately map the sampling locations.

Field logbooks, soil sampling field log, and photograph logs will provide a written record of field data gathered, field observations, field equipment calibrations, the samples collected for analysis, and sample custody. Color photographs will be used to substantiate and augment the field notes, if necessary. Field records will be maintained in the project file.

697-082-003

Appendix B – Example Boring Log

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Lithology Log Sheet ___ of ___

Project Name	Project Number	Site ID	LOCID
Drilling Company	Driller	Ground Elevation	Total Drilled Depth
Drilling Equipment	Drilling Method / Borehole Diameter	Date/Time Drilling Started	Date/Time Total Depth Reached
Type of Sampling Device		Water Level (bgs) First / Final	
Sample Hammer Type / Driving Wt. / Drop		Geologist/Engineer	Checked by/Date
Weather		Other Personnel Present	
Site Conditions			
Location Description (include sketch in field logbook)			

Depth	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	ASTM Code	Lithology	Water Content	Estimate % of Gr	Sa	Fi	Remarks (Include all sample types, times, and depth, odor, organic vapor measurements, etc.)

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Lithology Log (continued) Sheet ___ of ___

LOCID

Depth	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	ASTM Code	Lithology	Water Content	Estimate % of Gr	Sa	Fi	Remarks (Include all sample types & depth, odor, organic vapor measurements, etc.)

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 161703

CONDITIONS

Operator: Western Refining Southwest LLC 539 South Main Street Findlay, OH 45840	OGRID: 267595
	Action Number: 161703
	Action Type: [UF-DP] Discharge Permit (DISCHARGE PERMIT)

CONDITIONS

Created By	Condition	Condition Date
scwells	Accepted for Record Retention Purposes-Only	11/28/2022