GW - 28

AGWMR

2018

From:	Scott Crouch
To:	Chavez, Carl J, EMNRD; Cobrain, Dave, NMENV; Suzuki, Michiya, NMENV
Cc:	Moore, Brian
Subject:	[EXT] Response to Approval with Modifications - 2018 Gallup Annual Groundwater Monitoring Report
Date:	Monday, March 23, 2020 1:32:38 PM
Attachments:	image002.png Response to 1-22-20 Approv with Mods - 2018 Annual GW Report - MPC Gallup Refinery.pdf 2018 Annual GW Report - March replacement pages - 14 & 15.pdf Page 14 - 2018 Annual GW Report - March replacement pages - redline.pdf 2018 - 8.8.3 NAPIS-2 UPDATED PER COMMENTS.pdf MKTF-36 - Survey Data.pdf

Dave, Michiya:

On behalf of Marathon Petroleum Company – Gallup Refinery, please find attached the subject response and the various attachments. Due to COVID-19, we are not sending out hard copies at this time. We recently received direction from OCD that they are not currently accepting hard copies and I understand that you guys are working from home? Let us know when you are back in the office and ready for the hard copies.

Carl:

We will attempt to upload the attached files to your website.

Scott T. Crouch, PG
Senior Geologist

DiSorbo Consulting, LLC
8501 N. MoPac Expy., Suite 300 | Austin, Texas 78759

Direct: 512-693-4193 | Mobile: 512-297-3743
Email: scrouch@disorboconsult.com | Fax: 512-279-3118
www.disorboconsult.com

From: VanHorn, Kristen, NMENV <Kristen.VanHorn@state.nm.us>
Sent: Thursday, August 22, 2019 11:43 AM
To: Heidi Jones <hjones@trihydro.com>; Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>; Cobrain, Dave, NMENV <dave.cobrain@state.nm.us>; Suzuki, Michiya, NMENV <Michiya.Suzuki@state.nm.us>; Kieling, John, NMENV <john.kieling@state.nm.us>
Cc: Pietz, John <jpietz@trihydro.com>; Moore, Brian <BMoore1@Marathonpetroleum.com>; Moore, John <jmoore5@marathonpetroleum.com>; Scott Crouch <scrouch@disorboconsult.com>
Subject: RE: Action Items/Decision Items

Heidi-
The action items seem to cover what we discussed in the meeting. Thank you.

I included John, Dave, and Michiya on this reply so you'll have their email.

Thank you,
Kristen

Kristen Van Horn
Environmental Scientist/Specialist
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505
Phone: 505-476-6046
Kristen.VanHorn@state.nm.us
https://www.env.nm.gov/hazardous-waste/

From: Heidi Jones <hjones@trihydro.com>
Sent: Tuesday, August 20, 2019 7:23 PM
To: VanHorn, Kristen, NMENV <Kristen.VanHorn@state.nm.us>; Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Cc: Pietz, John <jpietz@trihydro.com>; Moore, Brian <BMoore1@Marathonpetroleum.com>; Moore, John <jmoore5@marathonpetroleum.com>; Scott Crouch <scrouch@disorboconsult.com>
Subject: [EXT] Action Items/Decision Items

Good Evening,
Attached are the action items and decision items we recorded last week. I don't have Michia, John, and Dave's email addresses, so Kristen if you could disseminate, I would appreciate it. Please let Brian know if you would like any edits.
Thanks,
Heidi

Heidi Jones, CES
Rocky Mountain South Team Leader

OUR SAFETY IS MY RESPONSIBILITY

1252 Commerce Drive
Laramie, Wyoming 82070
307/745-7474 (phone)
307/745-7729 (fax)
hjones@trihydro.com
www.trihydro.com

Marathon Petroleum Company LP

March 23, 2020

Mr. Kevin Pierard, Chief
New Mexico Environmental Department
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, NM 87SOS-6303

RE: Response to Approval with Modifications
Annual Ground Water Monitoring Report – 2018
Marathon Petroleum Company LP, Gallup Refinery
(dba Western Refining Southwest, Inc.)
EPA ID# NMD000333211
HWB-WRG-19-017

Dear Mr. Pierard:

Marathon Petroleum Company LP (dba Western Refining Southwest, Inc.) Gallup Refinery is submitting the enclosed responses to your comments dated January 22, 2020 on the referenced Report. You will also find enclosed revised pages 14 and 15, redline of changes on page 14, revised Table 8.8.3 (NAPIS-2) and a new survey for MKTF-36. If there are any questions, please call Brian Moore at 505-726-9745.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or 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,
Marathon Petroleum Company LP, Gallup Refinery

Robert S. Hanks
Refinery General Manager

Enclosure

cc D. Cobrain NMED
C. Chavez NMOCD
B. Moore Marathon Gallup Refinery

92 Giant Crossing Road
Jamestown, NM 87347

RESPONSE TO COMMENTS
January 22, 2020 Approval with Modifications
Annual Ground Water Monitoring Report - 2018
(September 2019)

NMED Comment 1:
In the Executive Summary, *Group A - Wells*, page 2, the Permittee states, "[g]asoline range organics (GRO) were detected in low concentrations in BW-5C in the first and third quarters." Comment 4 in NMED's *Disapproval Annual Groundwater Monitoring Report: Gallup Refinery - 2017,* dated March 21, 2019 states, "since specific sources of hydrocarbon constituents are unknown, the Permittee must compare the DRO and GRO concentrations to the screening level of unknown oil." The Permittee appropriately compares the total petroleum hydrocarbon (TPH) gasoline range organics (GRO) concentrations with the screening level of unknown oil in the Report. However, NMED's *Soil Screening Guidance for Human Health Risk Assessments* (Guidance) was updated in February 2019. The groundwater screening level for unknown oil was increased from 0.0398 mg/L to 0.0858 mg/L while a much lower groundwater screening level for gasoline (0.0101 mg/L) was established in the 2019 Guidance. The TPH-GRO concentrations in the groundwater samples collected from well BW-SC during the first and third quarters of 2018 are recorded as 0.034 mg/Land 0.024 mg/L, respectively; therefore, exceeding the screening level of 0.0101 mg/L. The Report is not required to be revised at this time. However, the Permittee must include the groundwater screening level of 0.0101 mg/L for TPH-GRO in all future reports and work plans.

MPC Response 1:
The comment is acknowledged.

NMED Comment 2:
In the Executive Summary, *Group A - Wells*, page 2, the Permittee states, "1,1-Dichloroethane and 1,2-dichloroethane were detected in low concentrations at BW-5B and BW-5C." Comment 22 in NMED's *Disapproval Facility Wide Ground Water Monitoring Work Plan- Updates for 2019*, dated July 12, 2019, states, "[c]hlorinated solvents have been detected in the groundwater samples collected at the Facility. The Permittee must prepare to analyze for 1,4-dioxane using EPA Method 8270 SIM for the groundwater samples collected from all monitoring wells where chlorinated solvents have been detected within the past ten years. Report the analytical results for 1,4-dioxane and provide the discussion regarding the detection of 1,4-dioxane in the subsequent 2019 annual groundwater monitoring report." In addition, Comment 32 in NMED's *Disapproval Annual Groundwater Monitoring Report; Gallup Refinery - 2017,* dated March 21, 2019, states, "[i]n addition, if [1,2-dichloroethane] EDC was newly detected in groundwater samples collected from wells during 2017 and [1,2-dibromoethane] EDB analysis was not yet proposed for the wells in the 2018 Facility-wide Groundwater Work Plan, propose to conduct EDB analysis using EPA Method 8011 in the 2019 Facility-wide Groundwater Work Plan." These comments carry over to future groundwater work plans and monitoring reports. No response required.

MPC Response 2:
The comment is acknowledged.

NMED Comment 3:
In the Executive Summary, *Group B - Wells, NAPIS-1, NAPIS-2, NAPIS-3, and KA-3*, page 3, the Permittee states, "[a]ccess to the wells was not permitted during the third and fourth quarters due to high concentrations of H2S in the atmosphere." Explain whether the high concentration of H2S persisted throughout the quarters or it coincided with the dates when sampling was scheduled in a response letter. If the scheduled sampling dates coincided with the dates when high concentrations of H2S was observed in

the atmosphere, the sampling could have been delayed and sampling events been conducted on a different date. The Permittee must conduct the required sampling and change the scheduled sampling dates as necessary, if the H2S concentrations are too high to allow personnel to conduct the sampling event on the scheduled sampling timeframe.

MPC Response 3:
There have been extended periods with elevated concentrations of H2S that have prevented sampling. Additional efforts will be made to complete the required sampling during the required quarter if access is physically possible.

NMED Comment 4:
In the Executive Summary, *Additional Sites Monitored, Evaporation Ponds EP-1 through EP-12B,* page 7, the Permittee states, "[t]he constituent chloromethane was detected in EP-11 above the NMED Tap Water standard in 2018." Chloromethane was used as an additive for leaded gasoline. Explain whether chloromethane was previously used in the Facility in the response letter**.**

MPC Response 4:
There is no known documented historical use of chloromethane at the refinery.

NMED Comment 5:
In the Executive Summary, *Additional Sites Monitored, Evaporation Ponds EP-1 through EP-12B,* page 7, the Permittee states, "[p]esticides were not detected in the samples collected from EP-3, EP-12A, and EP-12B in 2018." Comment 26 in the NMED's *Disapproval 2017 Annual Groundwater Monitoring Report: Gallup Refinery-2016,* dated June 4, 2018, states, "[u]nless pesticide constituents are detected [from ponds EP-3, EP-12A, and EP-12B], the pesticides analysis may be discontinued in 2019." Accordingly, the Permittee may discontinue the pesticide analysis in 2019. No response required.

MPC Response 5:
The comment is acknowledged.

NMED Comment 6:
In Section 1.2, *Background Information,* page 13, the Permittee states, "[t]he microbes degrade most of the hydrocarbons into carbon dioxide and water. Five 15-hp mechanical aerators provide aeration in each bay (North and South) in STP-1. Effluent from STP-1 then flows into evaporation pond 2 (EP-2) and is gravitated to the rest of the ponds." The Executive Summary, *Additional Sites Monitored, Outfall STP1 to EP-2,* pages 7 and 8, states that the DRO and GRO concentrations exceeded the applicable standards in the samples collected from outfall STP-1 to EP-2. The wastewater in STP-1 must be treated to the level where all organic constituents are below the applicable standards. However, the Permittee's *Response to Disapproval Annual Groundwater Monitoring Report Gallup Refinery- 2017,* dated July 5, 2019, stated that the wastewater treatment system will be upgraded. Therefore, an implementation of corrective measures may be deferred until the system is upgraded.

MPC Response 6:
The comment is acknowledged.

NMED Comment 7:
In Section 1.3, *Site Characteristics,* page 14, the Permittee states, "[s]urface vegetation consists of native xerophytic vegetation including grasses, shrubs, small junipers and some prickly pear cacti." Comment 15 in the NMED's *Disapproval Facility Wide Ground Water Monitoring Work Plan - Updates for 2019,*

dated July 12, 2019, states, "[d]uring the site visit conducted in June 5, 2019, cattails were also observed along the drainage ways. Cattails are associated with seeps or wetlands. The presence of the plants indicates that the soils in the vicinity exhibit wetland characteristics." List cattails in the statement and provide a replacement page.

MPC Response 7:
Cattails have been added to the discussion on page 14 and the revised replacement pages 14 and 15 are enclosed. A redline copy of the changes is also enclosed.

NMED Comment 8:
In Section 2.2, *Sampling Method and Procedures,* page 18, the Permittee states, "[f]ield water quality measurements must stabilize for a minimum of three consecutive readings taken at 2 to 5-minute intervals, within the following limits before purging will be discontinued and sampling may begin: dissolved oxygen (DO) (10%), specific conductance (10%), temperature (10%), and pH (10%)." The required sampling method and procedures were not followed. For example, the last three dissolved oxygen (DO) readings collected from well MKTF-25 during the first quarter of 2018 are recorded as 39.7%, 30.5% and 25.5% according to Appendix B, *Field Inspection Logs.* The readings were not stabilized with the criterion prior to collecting the samples. Provide a justification for why the method and procedures were not followed; yet, the sampling results were deemed acceptable in the response letter. Additionally, all future DO data must be reported within units of mg/L, rather than %DO.

MPC Response 8:
Other criteria (i.e., specific conductance, temperature, and pH) had stabilized within the specified criteria and thus the sample was collected. Future DO data will be reported in mg/l.

NMED Comment 9:
In Section 2.2, *Sampling Method and Procedures,* page 18, the Permittee states, "[g]roundwater samples obtained for dissolved metals analysis are filtered through a 0.45 µm (micrometer) mesh size disposable filter on site." Previously, the Permittee stated that the groundwater samples were so turbid that the syringe filters quickly became unusable. In order *to* resolve the issue, Comment 1 in the NMED's *Approval with Modifications [Revised] SMW-2 Area and Boundary Well Installation Report,* dated October 31, 2019 was provided stating, "[c]oarser paper filters with pore size more than 100 micron meters (µm) may be used as an initial step of the filtration process to remove larger suspended solids. The smaller syringe filters may be used to collect the samples for dissolved metals analysis. Use the sequential filtration process for dissolved metals sampling, where applicable." This comment serves as a reminder. No response required.

MPC Response 9:
The comment is acknowledged.

NMED Comment 10:
In Section 3, *Groundwater DTW/DTP,* page 23, the Permittee states, "[g]roundwater elevation data were collected from the wells listed in Table 1, Section 10.0." Table 1 in Section 10 lists monitoring schedule for 2018. The referenced tables are included in Section 9. Revise the statement and provide a replacement page.

MPC Response 10:
The statement on page 23 is correct. The reference is to the list of wells for which groundwater elevation data are collected and that list is in Table 1 of Section 10. It is not a reference the actual data, which is included in Section 9.

NMED Comment 11:
In Section 6, *Groundwater Monitoring Results*, page 26, the Permittee states, "[d]ue to requirements for field preservation of samples, some samples have the results for nitrite and nitrate reported as a single value of nitrogen." The Permittee's *Response to Disapproval Facility Wide Ground Water Monitoring Work Plan - Updates for 2019*, dated September 11, 2019, stated that a new field test method was added *to* report nitrite separately. Incorporate the measure in the future sampling events. This comment serves as a reminder. No response required.

MPC Response 11:
The comment is acknowledged.

NMED Comment 12:
In Section 6.2.2, *Groundwater Monitoring Wells: NAPIS-1, NAPIS-2, NAPIS-3, and KA-3*, page 31, the Permittee states, "[i]n NAPIS-2, chromium (dissolved), barium (total), iron (total and dissolved), and manganese (total and dissolved) were detected at concentration levels exceeding applicable standards in 2018." According *to* Table 8.8.3, the chromium concentration in the groundwater sample collected from well NAPIS-2 in April 30, 2018 was recorded as 1.6 mg/L significantly exceeding the applicable standard of 0.05 mg/L. Chromium concentrations were not previously detected in the groundwater samples collected from well NAPIS-2. In the response letter, provide an explanation for possible causes of the sudden increase in 2018 and an analysis of the trend in chromium level with the data collected in 2019. If the causes are not known and the chromium level did not decline in 2019, include hexavalent chromium analysis for the groundwater samples collected from well NAPIS-2 in the two subsequent sampling events in 2020 and report the results no later than October 30, 2020**.**

MPC Response 12:
Reviewing the analytical report (Lab Id No. 1805106-005) we find that the table had an incorrect entry and the actual result for chromium is <0.006 mg/l. A replacement page for NAPIS-2 in Table 8.8.3 is enclosed.

NMED Comment 13:
In Section 6.3.4, *Recovery Wells: RW-1, RW-2, RW-5, and RW-6*, page 40, the Permittee states, "[n]one of the wells [RW-1, RW-2, RW-5, and RW-6] were gauged in the fourth quarter due to the installation of a fluid recovery pump in each well." Since the groundwater level was depressed due to the fluid recovery operation, the Permittee must halt the pumping operation at least 48 hours prior to conducting depth measurements in these wells. Include the provision in the future groundwater monitoring events.

MPC Response 13:
The comment is acknowledged and future groundwater monitoring events will be conducted after fluid recovery pumps have been turned off for a minimum of 48 hours. It is noted that approval for operation of the new recovery pumps was not granted in 2018 and thus there was no impact on the fluid levels.

NMED Comment 14:
In Section 6.3.4, *Recovery Wells: RW-1, RW-2, RW-5, and RW-6*, page 42, the Permittee states, "[n]o SPH was recovered from RW-5 and RW-6, as new recovery wells were installed, but approval to begin use of the pumps was not granted in 2018." The *NMED's Approval with Modifications Response to Disapproval (Response to Approval with Modifications May 1, 2019) Interim Groundwater Recovery System Work Plan*, dated August 6, 2019, stated, "[t]he Response did not adequately address NMED's May 29, 2019 Disapproval comments; however, because soil and groundwater are already affected by contaminants in the area proposed for the interim groundwater recovery system and the Permittee's plan will likely not

adversely affect conditions, the Permittee may proceed with the proposed groundwater recovery system," and "[t]he first interim status report must be submitted to NMED no later than three months after the recovery system start up." In the response letter, provide a proposed date when the required first interim status report will be submitted to NMED.

MPC Response 14:
Due to winter weather conditions making recovery from the recently installed pumps impractical, the actual initiation of recovery operations has not yet occurred. We anticipate that temperatures will climb above freezing in May, thus suggesting an interim status report could be provided by August 2020.

NMED Comment 15:
In Section 6.4, *Constituent Levels in Group D Monitoring Wells,* page 42, the Permittee states, "[t]he Group D wells include three process/production wells, PW-2, PW-3, and PW-4 that supply water to the refinery and for domestic uses." NMED was notified that the leak from well PW-3 was scheduled to be investigated in December 2019. If the investigation was completed, present the findings in a separate report.

MPC Response 15:
The field phase of the investigation has been completed and the information is currently being reviewed. Upon completion of the data review, a separate report on the findings will be submitted.

NMED Comment 16:
In Section 6.5, *Constituent Levels in Group E Monitoring Wells,* page 45, the Permittee states, "[t]he asphalt in the area of MKTF-36 has been destroyed by truck traffic. MKTF-36 could not be located during the fourth quarter 2018 for gauging or sampling." SPH and high level of constituent concentrations have been detected from well MKTF-36. Well MKTF-36 is critically positioned to delineate the extent of the plumes and also serves to monitor leak detection from the truck loading rack. If well MKTF-36 can be located and repaired, continue to monitor the well. Otherwise, propose to submit a work plan to replace the well in the response letter.

MPC Response 16:
Well MKTF-36 was recently located and a new surface completion was installed allowing continued use of the well.

NMED Comment 17:
In Section 6.5, *Constituent Levels in Group E Monitoring Wells,* page 46, the Permittee states, "Vinyl Chloride [concentrations exceeded the applicable standard in the groundwater samples collected from wells] MKTF-2, MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTF-24, and MKTF-25." The detection of vinyl chloride may be indicative of the occurrence of reductive dichlorination of highly chlorinated compounds. The vinyl chloride concentrations in the groundwater samples collected from well MKTF-2 appear to be increasing. Since vinyl chloride is more toxic than its parent compounds, an accumulate of the compound must be prevented. The Permittee proposed to submit a separate submittal that evaluates natural attenuation of chlorinated solvents in the *Response to Approval with Modifications 2017 Annual Groundwater Report,* dated November 12, 2019. NMED concurs with the Permittee's proposal. The evaluation must be submitted no later than November 1, 2020.

MPC Response 17:
The comment is acknowledged.

NMED Comment 18:

In Section 6.6.1, *Evaporation Ponds EP-1 through EP-12B,* page 49, the Permittee states, "[b]enzene was detected above the applicable standard in evaporation pond EP-2 in the first semi-annual event 2018 (Table 8.15). Benzene was detected at concentrations below the applicable standard in EP-2, EP-3, EP-4, EP-5, and EP-12B (Table 8.15)." Benzene should not be present in the evaporation ponds. The wastewater treatment system is underperforming. It appears that the wastewater treatment system and the aerators in STP-1 are not effectively treating the benzene (see Comment 6).

MPC Response 18:
The comment is acknowledged.

NMED Comment 19:
In Section 6.6.4, *Outfall BW to EP-2,* page 51, the Permittee states, "BW is defined as reverse osmosis water coming from the boiler unit. The flow from the boiler unit previously discharged into EP-2 through a 4-inch PVC pipe. The reverse osmosis water no longer discharges to EP-2 and has been rerouted back into the units for reuse. No samples were collected in 2018." The Permittee's *Response to Comments Approval - Hydrocarbon Seep Interim Measures 2019 Second Quarter Status Report,* dated September 5, 2019 states, "[t]his brings us to the current day where the RO Reject *is* again discharged to Pond 9 while design is currently being conducted for total replacement. Once the replacement installation is completed (anticipated in 2nd or 3rd quarter of 2020), it is anticipated that the remainder of the line will be abandoned, and the new line will carry the RO reject water to pond STP-1." Clarify whether the RO Reject is a retentate and BW is a permeate generated from the reverse osmosis unit. If so, the RO Reject would contain high concentrations of total dissolved solids. The RO Reject is currently discharging directly to pond EP-9; RO Reject discharge samples must be collected from the outfall and analytical results must be reported in the future reports. Additionally, even if the RO Reject is routed to pond STP-1, the concentrations of total dissolved solids are unlikely to be reduced. When the wastewater treatment system is upgraded, the issues associated with the elevated total dissolved solids concentrations must be addressed.

MPC Response 19:
As explained in our response to Comment 1 in the November 12, 2019 response to NMED's comments on the *Hydrocarbon Seep Interim Measures 2019 Second Quarter Status Report,* use of the sample IDs of "Boiler Water" (BW) and "RO Reject" for identification are synonymous. Some persons collecting samples called them "Boiler Water" others called them "RO Reject". However, all samples consisted of "RO Reject" water and none of them contain the permeate.

NMED Comment 20:
In Section 7.2, *Group 8- Groundwater Monitoring,* page 55, the Permittee states, "[n]o changes [in current monitoring schedule is] required [for LDUs] as repairs were recently conducted in 2018 to ensure no active leaks from the NAPIS." Since water is detected in the East and West LDUs, both the east and west bays are leaking through the secondary containment wall. Although some parts of the NAPIS were repaired in 2018, the NAPIS must be repaired or replaced.

MPC Response 20:
The comment is acknowledged.

8.8.3 NAPIS-1, NAPIS-2, NAPIS-3, KA-3

Dissolved Metals Analytical Result Summary

STANDARDS			PARAMETERS								
			Arsenic (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Selenium (mg/L)	Uranium (mg/L)	Zinc (mg/L)
WQCC 20 NMAC 6.2.3103 (DEC 2018)			**0.01**	**0.05**	**1.0**	**1.0**	**0.015**	**0.2**	**0.05**	**0.03**	**10.0**
40 CFR 141.62 MCL			0.01	0.1	1.3	NE	0.015	NE	0.05	0.03	NE
NMED Tap Water (MAR 2019)			0.000855	0.0057	0.7898	13.8	NE	2.02	0.0987	0.0592	5.96
EPA RSL for Tap Water (NOV 2018)			0.000052	NE	0.8	14	0.015	0.43	0.1	0.004	6
WELL ID	**DATE SAMPLED**	**METHOD**									
NAPIS-2	04/30/18	200.7/200.8	0.0045	<0.006	<0.006	**1.8**	<0.0005	**0.91**	0.0049	0.00016	0.005
	02/09/18	200.7/200.8	0.0047	<0.006	<0.006	**1.6**	<0.0005	**1.10**	0.0040	0.00029	0.005
	12/04/17	200.7/200.8	0.0049	<0.006	<0.002	**1.8**	<0.0005	**0.94**	0.0045	0.00017	0.010
	09/05/17	200.7/200.8	0.0054	0.0017	<0.006	0.56	<0.0025	**0.89**	<0.02	0.00054	0.026
	06/01/17	200.7/200.8	0.0035	<0.006	<0.006	0.52	0.00021	**0.86**	<0.01	0.00070	0.018
	02/21/17	200.7/200.8	0.0053	<0.006	<0.006	0.88	<0.0005	**0.97**	0.0047	NA	0.020
	11/14/16	200.7/200.8	0.0085	<0.006	<0.006	**1.5**	0.0003	**1.1**	0.0078	0.0005	<0.01
	09/01/16	200.7/200.8	0.0075	<0.006	<0.006	**1.6**	<0.0005	**1.1**	0.0066	0.0003	0.170
	06/07/16	200.7/200.8	0.0086	<0.006	<0.006	**1.8**	<0.0005	**1.1**	0.0062	0.0009	0.055
	10/28/15	200.7/200.8	0.0084	<0.006	<0.006	**1.8**	<0.0005	**1.2**	0.0097	<0.0005	0.022
	08/11/15	200.7/200.8	0.0072	<0.006	<0.006	**1.4**	<0.0025	**1.2**	<0.005	<0.0025	<0.01
	06/02/15	200.7/200.8	<0.01	<0.006	<0.006	**1.2**	<0.01	**1.1**	<0.01	<0.01	<0.01
	03/10/15	200.7/200.8	<0.01	<0.006	<0.006	**1.9**	<0.001	**1.0**	<0.01	<0.001	<0.01
	11/11/14	200.7/200.8	0.0076	<0.006	<0.006	**1.8**	<0.001	**1.3**	0.0062	<0.001	0.019
	09/11/14	200.7/200.8	0.0070	<0.006	<0.006	**1.6**	<0.01	**1.2**	0.0110	<0.01	0.047
	06/05/14	200.7/200.8	0.0064	<0.006	<0.006	**2.6**	<0.005	**1.4**	0.0100	<0.001	<0.01
	03/10/14	200.7/200.8	0.0053	<0.006	<0.006	**1.8**	<0.001	**1.2**	<0.005	<0.001	0.012
	11/12/13	200.7/200.8	0.0077	<0.006	<0.006	**1.8**	<0.001	**1.3**	0.0080	<0.001	<0.01
	09/09/13	200.7/200.8	0.0069	<0.006	<0.006	**2.6**	<0.005	**1.3**	0.0060	<0.01	0.021
	06/12/13	200.7/200.8	0.0068	<0.006	<0.006	**1.7**	<0.001	**1.6**	0.0071	<0.001	0.010
	03/18/13	200.7/200.8	0.0062	<0.006	<0.006	**1.1**	<0.005	**1.2**	0.0024	<0.002	<0.01
	11/28/12	200.7/200.8	0.0083	<0.006	<0.006	**2.9**	<0.001	**1.8**	0.0034	<0.001	0.011
	08/21/12	200.7/200.8	**0.0140**	<0.006	<0.006	**1.9**	<0.005	**1.6**	**3.4000**	<0.001	0.016
	06/12/12	200.7/200.8	0.0089	<0.006	<0.006	**2.7**	<0.005	**1.6**	0.0047	<0.001	0.180
	03/20/12	200.7/200.8	0.0093	<0.006	<0.006	**3.0**	<0.005	**1.5**	0.0042	<0.001	0.070
	12/14/11	200.7/200.8	0.0089	<0.006	<0.006	**3.2**	<0.005	**1.3**	0.0028	<0.001	<0.01
	09/27/11	200.7/200.8	**0.0110**	<0.006	<0.006	**2.2**	<0.005	**1.2**	0.0050	<0.001	0.015
	06/15/11	200.7/200.8	**0.0120**	<0.006	<0.006	**3.2**	<0.005	**1.3**	0.0095	<0.001	0.041
	03/02/11	200.7/200.8	**0.0130**	<0.006	<0.006	**4.8**	<0.005	<0.002	<0.05	<0.001	<0.01
	11/02/10	6010B	<0.1	<0.006	<0.006	**2.9**	<0.005	**1.2**	<0.05	NA	NA
	09/15/10	6010B	<0.02	<0.006	<0.006	**3.7**	<0.005	**1.0**	<0.05	<0.001	NA
	06/10/10	6010B	<0.02	<0.006	NA	NA	<0.005	NA	<0.05	NA	NA
	03/08/10	6020A	0.0047	<0.001	<0.001	**3.8**	<0.001	**1.1**	<0.001	<0.001	0.053

Center (formerly Pilot) refueling plaza, the Interstate 40 highway corridor, and a small cluster of residential homes located on the south side of Interstate 40, approximately 2 miles southwest of the refinery (Jamestown). Surface vegetation mainly consists of native xerophytic vegetation including grasses, shrubs, small junipers and some prickly pear cacti. Cattails are located in a few restricted locations in drainage features and the Sanitary Lagoon. Average rainfall is less than ten inches per year with the maximum average precipitation occurring during the month of August.

Local topography consists of an incline down-slope from high ground in the southeast to a lowland fluvial plain in the northwest. The highest point on refinery property is located at the southeast corner boundary (elevation approximately 7,040 feet) and the lowest point is located at the northwest corner boundary (elevation approximately 6,860 feet). The refinery processing facility is located on a flat man-made terrace at an elevation of approximately 6,950 feet.

Surface water in this region consists of man-made evaporation ponds and aeration basins located within the refinery, a livestock watering pond (Jon Myer's Pond) located one mile east of the refinery, two small unnamed spring fed ponds located south of the refinery, and the South Fork of the Puerco River and its tributary arroyos. The various ponds and basins typically contain water consistently throughout the year. The South Fork of the Puerco River and its tributaries are intermittent and generally only contain water during, and immediately after, the occurrence of precipitation.

The 810 acre refinery property site is located on a layered geologic formation. 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. 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.

Groundwater flow within the Chinle Formation is extremely slow and typically averages less than 10^{-10} centimeters per second (less than 0.01 feet 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} centimeters per second in the clay soil layers located near the surface and up to 10^{-2} centimeters per second in the gravelly sands immediately overlying the Chinle

Formation. Figure 4 depicts the regional surface water flows are in a westerly direction and Figure 5 depicts surface water bodies and flow lines.

Shallow groundwater located under refinery property generally flows along the upper contact of the Chinle Formation. Although the prevailing flow direction is from the southeast and toward the northwest; a subsurface ridge has been identified and is thought to deflect some flow in a northeasterly direction in the vicinity of the refinery tank farm.

Center (formerly Pilot) refueling plaza, the Interstate 40 highway corridor, and a small cluster of residential homes located on the south side of Interstate 40, approximately 2 miles southwest of the refinery (Jamestown). Surface vegetation mainly consists of native xerophytic vegetation including grasses, shrubs, small junipers and some prickly pear cacti. Cattails are located in a few restricted locations in drainage features and the Sanitary Lagoon. Average rainfall is less than ten inches per year with the maximum average precipitation occurring during the month of August.

Local topography consists of an incline down-slope from high ground in the southeast to a lowland fluvial plain in the northwest. The highest point on refinery property is located at the southeast corner boundary (elevation approximately 7,040 feet) and the lowest point is located at the northwest corner boundary (elevation approximately 6,860 feet). The refinery processing facility is located on a flat man-made terrace at an elevation of approximately 6,950 feet.

Surface water in this region consists of man-made evaporation ponds and aeration basins located within the refinery, a livestock watering pond (Jon Myer's Pond) located one mile east of the refinery, two small unnamed spring fed ponds located south of the refinery, and the South Fork of the Puerco River and its tributary arroyos. The various ponds and basins typically contain water consistently throughout the year. The South Fork of the Puerco River and its tributaries are intermittent and generally only contain water during, and immediately after, the occurrence of precipitation.

The 810 acre refinery property site is located on a layered geologic formation. 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. 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.

Groundwater flow within the Chinle Formation is extremely slow and typically averages less than 10^{-10} centimeters per second (less than 0.01 feet 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} centimeters per second in the clay soil layers located near the surface and up to 10^{-2} centimeters per second in the gravelly sands immediately overlying the Chinle