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AGWMR

2016

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NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

January 8, 2019

John Moore
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87301

RE: DISAPPROVAL
REVISED ANNUAL GROUNDWATER MONITORING REPORT
GALLUP REFINERY – 2016
WESTERN REFINING SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-17-008

Dear Mr. Moore:

The New Mexico Environment Department (NMED) has reviewed the *Revised Annual Groundwater Monitoring Report: Gallup Refinery - 2016* (Report), dated September 2018, submitted on behalf of Marathon Petroleum Company dba Western Refining Southwest Inc., Gallup Refinery (the Permittee). NMED hereby issues this Disapproval. The Permittee must address the following comments provided by both NMED and the New Mexico Energy Minerals and Natural Resources Department Oil Conservation Division (OCD):

Comment 1

An electronic version of the response to comments table was not included in the submittal. For all future submittals including the revised Report, provide both hard copies and an electronic version of the response to comments table along with other required documentation. In addition, the Permittee did not list sections, tables and/or figures in the Report where changes were made,

as required, in the response to comments table. Indicate where all changes were made to the Report in the response to comments table.

Comment 2
All revisions were not identified in the Redline Strikeout (RLSO) version. The RLSO version must identify where all revisions are made to the previous version of the Report, including the revisions made to the tables, charts and figures. Failure to provide an accurate RLSO version slows review, creates the potential for changes to be overlooked, and is misleading. Provide an accurate RLSO version of the revised Report.

Comment 3
The depth-to-water (DTW) measurement data for MKTF wells during the first and second quarters of 2016 are tabulated in Appendix B, *Field Inspection Logs*; however, DTW data for other wells are not tabulated. A table showing the 2016 DTW data for all groundwater monitoring wells must be included in the revised Report. In addition, the DTW tables must include the monitoring well depths, the screened intervals in each well, and the dates and times of measurement as required by the Permit Section IV.L.4.k (2).

Comment 4
The Permittee's response to NMED's *Disapproval* Comment 1 states, "[i]t is noted that Gallup Refinery is in the process of installing pneumatic pumps in all existing recovery wells in order to capture non-aqueous phase liquids (NAPL) as well as impacted groundwater." Prior to installation, the Permittee must submit a work plan to NMED for review. Refer also to Comment 9 in the NMED's *Disapproval for the Revised 2015 Annual Groundwater Monitoring Report,* dated January 4, 2019.

Comment 5
The Permittee's response to NMED's *Disapproval* Comment 4 states, "[i]t is noted that the Gallup Refinery intends to install an interim recovery system in the area to initiate the recovery of impacted groundwater until permanent system can be designed. See response to Item 2 above." The referenced Item 2 is pertaining to the installation of pneumatic pumps in the RW wells located in the tank farm area. Comment 4 pertains to the six recovery sumps (stand pipes) in the hydrocarbon seep area. Interim corrective measures have already been implemented at the hydrocarbon seep area. Clarify the intent of the statement in the revised Report.

Comment 6
The Permittee's response to NMED's *Disapproval* Comment 5 states, "[t]he text has been corrected to reference Table 9.1 and 9.2 as requested." Although the text was corrected, Tables 9.1 and 9.2 were not included. Include the tables in the revised Report.

Comment 7
The Permittee's response to NMED's *Disapproval* Comment 10, Item 7 states, "[t]he discussion has been modified to reflect that the lead concentrations in September and November 2014 exceeded the cleanup standard by a small margin." The lead concentrations in groundwater samples collected from well NAPIS-3 did not exceed standard in either September or November

2014. However, as stated in Comment 10.7, the lead concentrations in the groundwater samples collected from well NAPIS-3 exceeded standard during the third and fourth quarters of 2016. In addition, the text was incorrectly modified to address the exceedance of lead concentrations for well NAPIS-2 rather than NAPIS-3. The discussion is pertinent to NAPIS-3. Revise the response and the Report for accuracy.

Comment 8

The Permittee's response to NMED's *Disapproval* Comment 10, Item 8 states, "[t]he discussion has been modified to reflect the detection of the additional constituents." In Section 6.2.2, the Permittee states, "[i]n the fourth quarter well NAPIS-3 had detections below the applicable groundwater protection standards of naphthalene, 1,1-dicloroethane, 1,1-dichloroethene, isopropyl benzene, n-butyl benzene, sec-butyl benzene, and cis-bichloroethylene [sic]." These constituents were detected in the first quarter of 2016 rather than the fourth quarter. In addition, there is a typographical error (cis-bichloroethylene) in the statement. Revise the Report accordingly.

Comment 9

The Permittee's response to NMED's *Disapproval* Comment 11, Item 1 states, "[a] discussion of the analytical data obtained from the leak detection system has been added. Gallup Refinery submitted information to the NMED on July 16, 2018 documenting repairs to the NAPIS, therefore, it should be noted that samples collected from the LDUs are not perceived to be wastewater." Comment 11.1 directs the Permittee to include a discussion pertaining to metal detections in wastewater samples collected from West LDU; however, the discussion was not included in the revised Report. Include the discussion in the revised Report. In addition, the Permittee states that the water collected in the LDUs are not wastewater because the NAPIS was repaired. However, the repairs were conducted on September 1, and December 11, 2017. At the time when the samples were collected in 2016, the LDUs were not yet repaired; therefore, the statement is not applicable. Regardless, previous repairs on NAPIS indicated that the attempts did not completely prevent leakage in most cases. The completion of repairs is not always successful. In Section 6.2.3, the Permittee also states, "Artesian flow has been observed from the East LDU wells is the past. The liner of the treatment unit has been evaluated for leaks and appears to be water-tight. For these reasons it appears that the East LDU may have leaks that allow impacted groundwater to enter. Andeavor will further evaluate the possible source of the contaminants detected within the LDU." Explain what is meant by "Artesian flow has been observed from the East LDU." It should be noted that the LDUs are not screened wells; they are constructed with stainless steel pipes directly connected to the secondary containment wall of NAPIS. The Permittee's August 5, 2013 letter titled *API Separator Leak Detection Units,* states, "[t]he water table in this area is approximately 9 – 10 feet below the ground surface. NAPIS-1 total depth is 13.53 feet and NAPIS-2 total depth is 13.61 feet, and the East and West LDUs are approximately 8 – 9 feet below ground surface." Based on the information, groundwater unlikely intersects with the bottom of the LDUs. Even if groundwater intersects the bottom of the LDUs, it will not likely flow into the LDUs because of the nature of their construction unless there are holes in the outer walls of the LDUs. Therefore, the Permittee's discussion does not appear to make sense. Remove the discussion or provide additional details to support the discussion. Revise the Report accordingly.

Comment 10
NMED's *Disapproval* Comment 11, Item 2 states, "[t]he analytical results of VOCs for the third quarter of 2016 are not included in Table 8.10.3. Include the results for the third quarter of 2016 sampling in Table 8.10.3." The analytical results of VOCs for the third quarter of 2016 were not included. Include the results or explain why the results are not included in the revised Report. In Section 6.2.3, the Permittee states, "[c]oncentrations of 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene exceeded the EPA RSL and NMED standards in the East LDU in the first, second and third quarter of 2016." As stated in Comment 11.2, there are no NMED standards for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene. Revise the Report accordingly.

Comment 11
The Permittee's response to NMED's *Disapproval* Comment 11, Item 2 also states, "Tables associated with the Leak Detection Unit have been revised to reflect no cleanup standards exists for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene." The Permittee revised the tables by removing the EPA Regional Screening Levels (RSLs) for Tap Water; however, Comment 11, Item 2 states that there are no NMED standards for these compounds. It is appropriate to use EPA RSLs for these compounds. Include the EPA RSLs to evaluate concentrations of 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene. Revise the tables accordingly.

Comment 12
NMED's *Disapproval* Comment 12 states, "[t]he bis(2-ethylhexyl) phthalate concentrations detected in the groundwater samples collected from well OAPIS-1 were above the standard in 2016." The exceedance was not addressed in the Report. Address the exceedance in the revised Report.

Comment 13
The Permittee's response to NMED's *Disapproval* Comment 14 states, "MTBE samples will be scheduled for collection from STP1-NW." The response did not fully address Comment 14. MTBE has been analyzed for samples collected from well STP1-NW in the past. Comment 14 directs the Permittee to collect samples from STP-1 to compare MTBE concentrations between the samples collected from STP-1 and well STP1-NW and evaluate potential leaks from STP-1. Revise the response to fully address Comment 14.

Comment 14
The Permittee's response to NMED's *Disapproval* Comment 18 states, "[l]anguage acknowledging the detections has been added as well as proposed changes to sampling frequency and modifications to the sampling plan regarding frequency of sample collection for OW-50 and 52." Section 6.3.2 states that the Facility Groundwater Monitoring Plan will also be modified to reflect the more frequent sampling schedule as will Table 1, Section 10 (sampling frequency) of this report as well as the Facility Wide Groundwater Monitoring Plan. The referenced table (Table 1, Section 10) is not included in the Report. Include the table in the revised Report.

Comment 15
The Permittee's response to NMED's *Disapproval* Comment 20 states, "[t]he last report that included VOCs was submitted August 24, 2016 and no organic constituents were detected [in the

samples collected from the PW wells]." However, Section 6.4.1 of the Report states, "[t]here were a total of five organic constituents detected in PW-3 all at concentration below the applicable standards in 2016... 10 organic compounds were detected at concentration levels below the applicable standards in PW-4." The response contradicts the 2016 analytical results. Provide more detailed explanation for the response and provide a copy of the August 24, 2016 report.

Comment 16

The Permittee's response to NMED's *Disapproval* Comment 23, Item 1 states, "[w]ells contained SPH them [sic] are identified in the data summary tables. The requested revisions have been added to the report." The data tables of the 2016 third and fourth quarter measurements for the MKTF wells are not included. Include the data tables in the revised Report. In addition, Section 6.6 was revised to state, "[d]uring the fourth quarter 2016, SPH was detected in wells MKTF-01 (1.35'), MKTF-26 (1.39'), MKTF-23 (0.12'), MKTF-14 (1.10'), MKTF-13 (0.96'), MKTF-12 (0.29'), MKTF-37, MKTF-45 (0.46')." SPH was detected in other MKTF wells that were not listed in the statement during the first and second quarters of 2016 as well. Section 6.6 must include the discussion regarding the detections of SPH in the MKTF wells during all quarters of 2016. Revise the Report accordingly.

Comment 17

NMED's *Disapproval* Comment 23, Item 11 states, "[a]ccording to Table 8.17.1, the sulfate concentrations in the groundwater samples collected from wells MKTF-29 and MKTF-43 exceeded the standard in 2016. Include and discuss the exceedance in the revised Report." Although the Permittee's response states that the requested revisions have been added to the Report, the revisions were not included in the Report. Include and discuss the exceedance in the revised Report.

Comment 18

NMED's *Disapproval* Comment 23, Item 13 states, "[t]he total barium concentrations in the groundwater samples collected from wells MKTF-18 through MKTF-22 also exceeded the standard in 2016." The discussion regarding the exceedances in the samples collected from wells MKTF-18 and 22 were included in the Report; however, the exceedances in wells MKTF-19, 20 and 21 were not discussed. Include the discussion regarding the barium concentration exceedances in groundwater samples collected from wells MKTF-19, 20 and 21 in the revised Report.

Comment 19

NMED's *Disapproval* Comment 23, Item 17 states, "[b]utylbenzene is not listed in Table 8.17.4, *MKTF WELLS Semi-Volatile Organic Compound Analytical Result Summary*." Butylbenzene is listed as one of SVOCs that were detected above the standard in Section 6.6 of the Report; however, Table 8.17.4 does not list butylbenzene. Either the text of the Report in Section 6.6 or Table 8.17.4 must be corrected to resolve the discrepancy. Revise the Report accordingly.

Comment 20
The Permittee's response to NMED's *Disapproval* Comment 24 states, "Gallup Refinery is not aware of any discharges to the ponds that could result in such BTEX detections." However, BTEX concentrations have been detected in samples collected from the ponds. If there are no discharges to the ponds other than from STP-1, either the wastewater treatment system is not capable of removing BTEX or BTEX leached into the ponds from groundwater. Evaluate wastewater treatment system breakthrough for BTEX constituents. Also, compare the depths of the ponds where BTEX were detected to evaluate whether groundwater potentially leaches into the ponds. Since the ponds are unlined earthen structures, if groundwater potentially leaches into the ponds, the water stored in the ponds also may migrate to groundwater. In this case, the integrity of the ponds must be evaluated. Include the discussion in the revised Report.

Comment 21
The Permittee's response to NMED's *Disapproval* Comment 25, Item 5 states, "[t]he requested revisions were added to the report." Section 6.7.1 was revised to state, "[s]ee table 8.15.4 for a complete list of VOCs." However, the revision was incorrect. The revision must be made to state, "[s]ee Table 8.15.5 for a complete list of SVOCs" because the relevant text discusses the detection of SVOCs. Revise the Report accordingly.

Comment 22
The Permittee's response to NMED's *Disapproval* Comment 29 states, "[t]he requested revisions were added to the report." Section 7.1 was revised to state, "[f]ive organic constituents were detected at concentration levels below the applicable standards in 2016 (Benzoic acid, bis(2-ethylhexyl) phthalate, di-n-octyl phthalate, dimethyl phthalate, and phenol)." The revision was incorrect. The detection of phenol is not recorded while the pyrene concentration is reported as 0.0046 mg/L in the sample collected from well SMW-2 according to Table 8.3.4. Revise the Report accordingly.

Comment 23
NMED's *Disapproval* Comment 34 states, "[a] column listing barium concentrations is missing from Table 8.8.3. Include the column for barium concentrations on Table 8.8.3 in the revised Report." The column was still missing from the Report. Include the column for barium concentrations in the table in the revised Report.

Comment 24
The Permittee's response to NMED's *Disapproval* Comment 40 states, "[t]he source of the cyanide is unknown as it is not used as a feedstock in any of the processes at the refinery." Although cyanide is not used as a feedstock, Fluid Catalytic Cracking Unit (FCCU) may generate cyanides in the waste stream and some crude oil may contain cyanide. An increase of cyanide concentrations in the groundwater samples collected from well OAPIS-1 was observed and must be closely monitored.

Comment 25
The Permittee's response to NMED's *Disapproval* Comment 45 states, "[a]n attempt was made to locate all records of spills, leaks and releases in order to update the report. A revised summary

is provided in Appendix E of the attached report." Since no additional spill record was included between October 5, 2016 and the end of 2016, it is not clear which parts in the summary (Appendix E) were updated. Comment 45 requires the Permittee to clarify whether leaks, spills or releases have occurred between October 5, 2016 and December 31, 2016. The clarification is not provided. Indicate which parts in Appendix E were updated in the revised Report.

Comment 26

In Section 6.6, *Constituent Levels for MKTF Wells,* the Permittee states, "[c]hloride concentration exceedances above the standard (250 mg/L) were found in the following wells: MKTF-1, MKTF-2, MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTF-20, MKTF-15, MKTF-24, MKTF-25, MKTF-26, MKTF-27, MKTF-28, MKTF-30, MKTF-31, MKTF-32, MKTF-34, MKTF-38, MKTF-39, MKTF-40, MKTF-41, MKTF-42, MKTF-43, and MKTF-44 (Table 8.17.1)." MKTF-15 is listed twice. Remove the repetition from the revised Report.

Comment 27

In Section 6.6, *Constituent Levels for MKTF Wells,* the Permittee indicates the screening levels for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene as "no cleanup standard in guidance". Although there are no NMED standards for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, it is appropriate to use EPA RSLs for these compounds. Refer to Comment 11. Include the EPA RSLs to evaluate the detections of 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene. Revise the Report accordingly.

Comment 28

In Section 6.7.1, *Evaporation Ponds 1 through 12B,* the Permittee states, "[t]he presence of Escherichia coli in water is used as an indicator of fecal contamination, but recent reports indicate that soil populations can also be detected in tropical, subtropical, and some temperate environments. The presence of significant populations of naturalized populations of E. coli in temperate soils may confound the use of this bacterium as an indicator of fecal contamination." According to Section 1.3, *Site Characteristics,* at least three offsite ponds are present near the refinery. Propose to collect the water samples from the offsite ponds to compare e-coli concentrations in the water samples to the e-coli concentrations in ponds EP1 through EP12B, if necessary. Evaluate whether the cause of elevated e-coli concentrations is fecal in the revised Report, if necessary.

Comment 29

In Section 7.2, *Group B - Groundwater Monitoring,* the Permittee states, "[b]oth LDUs continue to be pumped on a regular basis. The East Bay of the LDU was out of service and closed in 2015. The presence of water in the East LDU during that period suggests that there may be an inflow of groundwater through an opening in the liner. Andeavor intends to conduct testing on the LDU to ascertain the source of the water in the East LDU. Recent water column measurements on the West LDU also indicate that the bay is leaking into the LDU, or that there is a source of inflow into the LDU. Plans are to inspect the east bay, place it back in service and then take the west bay out of service for inspection." It is not likely that groundwater flows into the LDUs. Refer to Comment 9. Remove the statement or provide additional details to support the statement. Revise the Report accordingly. In addition, clarify whether the inspection of the bays is

currently planned or the plans have already been already executed in 2017. If there are still on-going leaks (e.g., detection of wastewaters in the LDUs), the Permittee must propose to submit a work plan to inspect and repair the NAPIS.

The Permittee must address all comments in this Disapproval and submit a revised Report. Two bound hard copies and an electronic version of the revised Report must be submitted to NMED. In addition, include a red-line strikeout version in electronic format showing where all revisions to the Report have been made. The revised Report must be accompanied with a response letter that details where revisions have been made, cross-referencing NMED's numbered comments. The revised Report must be submitted to NMED no later than **April 5, 2019**.

If you have questions regarding this Disapproval, please contact Michiya Suzuki of my staff at 505-476-6059.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: K. Van Horn, NMED HWB
D. Cobrain, NMED HWB
M. Suzuki, NMED HWB
C. Chavez, OCD
L. King, EPA Region 6
B. Moore, WRG

File: Reading File and WRG 2018 File
HWB-WRG-17-008

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Delivered via Federal Express Mail

September 30, 2018

Mr. John E. Kieling
Bureau Chief, Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, NM 87505-6313

RE: RESPONSE TO COMMENTS
DISAPPROVAL 2015 ANNUAL GROUND WATER MONITORING REPORT
WESTERN REFINING SOUTHWEST INC, GALLUP REFINERY
EPA ID #NMD000333211
HWB-WRG-17-007

Dear Mr. Kieling:

Western Refining Southwest, Inc., Gallup Refinery ("Gallup Refinery") is in receipt of your letter dated January 31, 2018, which the New Mexico Environment Department (NMED) solicited responses to comments (RTC) regarding its review of the Gallup Refinery's *2015 Annual Ground Water Monitoring Report* (dated August 2016). Gallup Refinery's RTC are provided as an attachment to this letter. In addition, Gallup Refinery has made revisions to the report which is submitted as an enclosure that includes two hard copies and an electronic format via CD. A red-line strikeout version of the report that illustrates changes has been included on the CD, as well as the final version of the report and Gallup Refinery RTC. Also, the New Mexico Energy Minerals and Natural Resources Department Oil Conservation Division (OCD) has been provided a copy of this response for their consideration.

If you have any questions about the information being provided herein, please do not hesitate to contact Brian Moore by telephone at (505) 726-9745 or by email at Brian.Moore@andeavor.com.

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,

Daniel Statile
Vice President Refining
Western Refining Southwest, Inc. – Gallup Refinery

Enclosure

cc: C. Chavez (OCD via electronic submittal)

Comment Number	NMED Comment	Gallup Refinery Response
1	The Report was written and submitted before receipt of NMED's comments dated January 31, 2018 regarding the 2015 Annual Groundwater Monitoring Report. The Permittee must revise the Report to address NMED's comments regarding the 2015 Report, as many of the comments from the 2015 Report carry over to the 2016 Report. Revise the Report to address all previous comments in the 2015 Disapproval letter, where applicable as well as comments in this letter.	Comments from both the 2015 and 2016 Disapproval Letters are incorporated into the revised report. Specific responses to questions in the 2016 Disapproval Letter are addressed herein.
2	In the Executive Summary, pages 5 and 6, the Permittee states, "[h]ydrocarbon recovery from RW-1 has shown a steady decrease from 2005 through 2016. It is common for hydrocarbon recovery to decline over time, as the readily recoverable hydrocarbons [are] removed from the formation." However, in the Executive Summary, page 5, the Permittee also states, "[t]he SPH column thickness in RW-1 has increased during 2016." According to Table 9.1, Groundwater Measurements, SPH column thickness was measured as 2.50 feet on March 4, 2016 while it was measured as 4.14 feet on September 13, 2016. Although the volume of recoverable hydrocarbons is decreasing, separate phase hydrocarbon (SPH) may still be present as adsorbed phase near residual saturation levels in the soil matrix. Therefore, adsorbed SPH may be migrating through voids in the soil matrix. As a result, SPH column thickness in well RW-1 remains relatively constant with minor fluctuations and does not correlate with a decreasing trend in hydrocarbon recovery. Corrective measures implemented by the Permittee (a combination of hand-bailing and skimming with a bladder pump) is not likely to eliminate adsorbed SPH. As SPH is only observed in well RW-1 among all Group C wells, the SPH plume maybe localized and limited to this area. NMED's 2014 Groundwater Monitoring Report Disapproval Comment 18, dated June 20, 2016 required the Permittee to conduct an investigation of the OW-14 contaminant source and groundwater flow direction by installing a groundwater monitoring well north of well RW-1. The investigation has been completed; however, a report has not been submitted or reviewed by NMED. Further and more advanced remediation techniques maybe required to address SPH in the soil matrix. No revisions to the Report are required.	It is noted that Gallup Refinery is in the process of installing pneumatic pumps in all existing recovery wells in order to capture non-aqueous phase liquids (NAPL) as well as impacted groundwater. Once the recovery system has been in operation for a period of time, the migration of NAPL and impacted groundwater from the area should be mitigated. Additionally, a groundwater study will be conducted to design the most effective long term groundwater remediation system for the site.
3	In Section 2.2, Sampling Methods and Procedures, page 20, the Permittee states, "[d]econtamination water from field work was caught in an appropriate container and drained into the sewer system upstream of the NAPIS." In Section 6.3.3, Recovery Wells: RW-1, RW-2, RW-5, RW-6, page 38, the Permittee also states, "[p]urge water is collected and disposed upstream of the NAPIS." Although one of the sewer leaks was repaired in October 23, 2013, unidentified sewer leaks were still present in the sewer system according to the results of the September 2013 and May 2016 dye tests. Unless the Permittee has already implemented interim measures (immediate corrective actions) to address the leaks, the Permittee must not discharge wastewater into the sewer system upstream of the New American Petroleum Institute Separator (NAPIS). In addition, various organic and metal constituent concentrations in the samples collected from the leak detection units (LDU) exceeded their respective standards in 2016 according to Section 6.2.3, Leak Detection Units (LDU): East LDU, Oil Sump LDU, West LDU. These results indicate that the NAPIS has on-going leakage; therefore, the source of the leaks must be identified and repaired in the NAPIS. The Permittee must not dispose any investigation- derived waste (IDW) into the refinery sewer system until the issues are resolved.	The groundwater that is purged during sample collection activities is currently disposed of by discharging at the bundle pad which is part of the refinery sewer system and is upstream of the NAPIS. Evidence was presented to the NMED in a May 2018 meeting which demonstrated that the sewer system does not leak.
4	In Appendix A, Separate Phase Hydrocarbon Recovery Logs, the volume of recovered hydrocarbons from the six recovery sumps (stand pipes) is tabulated. The volume of recovered hydrocarbons is notably higher between July 6 and December 29, 2016 when compared to the recorded volumes prior to July 6, 2016. For example the volume of recovered hydrocarbons was recorded as 60 gallons in June 30, 2016 while the volume was recorded as 232 gallons in July 6, 2016. The only volumes exceeding 232 gallons prior to July 6, 2016 was recorded in September 3, 2013 when the recovery was initiated (682 and 367 gallons). A variance in field measurement or collection techniques after July 6, 2016 may have resulted in the sudden increase in the volume of recovered hydrocarbons. Provide an explanation regarding a variance in field measurement or collection techniques, if any, in the revised Report.	There has been no variation in field methods or collection techniques that would explain the variation in measured hydrocarbon recovery volumes. It is noted that the Gallup Refinery intends to install an interim recovery system in the area to initiate the recovery of impacted groundwater until a permanent system can be designed. See response to Item 2 above.

Comment Number	NMED Comment	Gallup Refinery Response
5	In Section 3, Groundwater DTW/DTP Elevation, the Permittee states, "[g]roundwater elevation data were collected from the wells listed in Table 1, Section 10.0." Table 1 in Section 10 reports the approved groundwater monitoring schedule, not groundwater elevation data. Revise the Report to cite the correct references (Tables 9.1 and 9.2, Section 9).	The text has been corrected to reference Tables 9.1 and 9.2 as requested.
6	There are three issues in Section 6.1.1, Boundary Wells: BW-1A/1B/1C, BW-2A/2B/2C, BW- 3A/3B/3C, page 28:	
6.1	The Permittee states, "[f]luoride was detected above the WQCC standard of 1.6 mg/Lin BW-lC (2.4 mg/L), BW-2B (1.5 mg/L) and BW-2C (1.9 mg/L)." The fluoride concentration in the groundwater sample collected from well BW-2B was 1.5 mg/L, which was below the WQCC standard of 1.6 mg/L. Revise the Report accordingly.	The report has been revised to remove BW-2B from the discussion of fluoride detections above WQCC.
6.2	The Permittee states, "[t]he constituent [bis(2-ethylhexyl) phthalate] was not detected in any of the BW wells sampled in 2016." Even if bis(2-ethylhexyl) phthalate was not detected in any of the BW wells sampled in 2016, the sampling date and 2016 analytical results for bis (2-ethylhexyl) phthalate must be included in Table 8.1.4, BW-1C, BW-3B, BW-3C Semi Volatile Organic Compound Analytical Result Summary. Revise Table 8.1.4 in the Report accordingly. In addition, Appendix G, Hall Laboratory Analytical Data, includes a chain of custody (COC) form listing the requested analyses for BW wells on page 1,136; however, SVOC analysis (analysis for bis(2-ethylhexyl) phthalate) was not requested in the COC. Provide the laboratory reports that contain the analytical results for SVOC concentrations in the groundwater samples collected from the BW wells in 2016.	Approval to discontinue 8270 analysis, including bis(2-ethylhexyl) phthalate), for the BW wells was provided in an NMED letter dated July 24, 2015 (HWB-WRG-13-002, WRG-14-002, WRG-15-001), Comment 7(b)).
6.3	The Permittee states, "[a]s of 2016, SVOCs were removed from analytical requirement (Table 8.1.4)." Such a change must be proposed in the upcoming Facility-Wide Groundwater Monitoring Work Plan. The Permittee must continue to conduct all required analyses including SVOC analysis until the change is approved by the NMED. Therefore, remove the statement from the revised Report. Note that failure to follow the approved Facility -Wide Groundwater Work Plan or making unapproved changes to sampling requirements is a violation of the Permit.	In a letter dated July 24, 2015 (Approval with Modifications), the NMED states in Comment 7(b), "The Permittee may discontinue sampling for SVOCs, but must add analysis for GRO and DRO-extended." That statement was in reference to monitoring wells BW-lA, BW-1B, BW-lC, BW-2A, BW-2B, BW-2C, BW-3A, BW-3B, and BW-3C. Therefore, SVOC analyses have been dropped from those wells in accordance with the NMED letter.
7	In Section 6.1.2, Land Treatment Unit: MW-1, MW-2, MW-4, MW-5, SMW-2, SMW-4, page 29, the Permittee states, "[i]n 2016, five organic constituents were detected at concentration levels below the applicable standard (benzoic acid, bis(2-ethylhexyl) phthalate, di-n-octylphthalate, diethylphthalate, dimethylphthalate, phenol and pyrene) (Table 8.3.4)." There are seven detected compounds in the parenthesis although the Permittee states there were only five organic constituents. According to Tables 8.2.4 and 8.3.4, diethylphthalate was not detected in the groundwater samples collected from the Land Treatment Unit (LTU) wells. Revise the Report to address the discrepancy. In addition, Table 8.2.4, MW-1, MW-2, MW-4, MW-5 Volatile and Semi-Volatile Organic Compound Analytical Result Summary, does not contain a column for phenol as an analyte. Revise the table to include phenol, if phenol is one of the detected compounds.	Tables will not require modification as there was no phenol detected in any of the samples. The text has been revised to remove phenol from the discussion.

Comment Number	NMED Comment	Gallup Refinery Response
8	The chloride and sulfate concentrations in the groundwater sample collected from well SMW-2 were recorded as 2,500 and 1,300 mg/L, respectively according to Table 8.3.1, SMW-2, SMW-4 General Chemistry and DRO/GRO Analytical Result Summary. According to Table 8.15, Evaporation Ponds (EP-1 thru EP-12B) BTEX and General Chemistry Analytical Result Summary, the chloride and sulfate concentrations in the water sample collected from pond EP-2 were recorded as 3,000 and 1,600 mg/L, respectively in the August 2016 sampling event. According to Figure 10, 2016 Alluvium/Chinle Group Interface Water Elevation Map, the shortest distance between well SMW-2 and the northern perimeter of pond EP-2 is approximately 600 feet and the shallow groundwater flow direction indicates that well SMW-2 is directly positioned downgradient from pond EP-2. The comparable concentrations of chloride and sulfate and the groundwater flow direction suggest that pond EP-2 may be leaking along its northern perimeter or bottom and leaching into the shallow aquifer. The Permittee conducted an investigation of the chloride levels in well SWM-2 based on the approved work plan and indicated that the LTU was the potential source and there may be additional sources. The SMW- 2 Investigation Report has not been submitted to NMED for review. Potential leakage(s) from pond EP-2 may be one of the additional sources. Propose to investigate whether wastewater is leaking from the northern perimeter or bottom of pond EP-2 through a work plan. Installation of piezometers along the northern perimeter of pond EP-2 may help to determine whether leakage is occurring. No revision to the Report is required.	In accordance with the approved schedule, the referenced work plan for additional investigation was submitted to the NMED by August 30, 2018.
9	In Section 6.2.1, Groundwater Monitoring Wells (GWM-1, GWM-2, GWM-3), page 30, the Permittee states, "[i]n fourth quarter 2015, an SPH level was detected in GWM-1 and in all of 2016 and no groundwater samples were collected. Discussion for detected constituents will be for year 2015." Discussion for detected constituents for year 2015 was included in the 2015 Report; therefore, it is not necessary to discuss them again in the 2016 Report. Remove the discussion regarding the 2015 analytical results from the 2016 Report. Instead, discuss the fact that SPH was present in well GWM-1 throughout 2016. Since it is possible that the source of SPH may be aeration lagoons AL-1 and AL-2, the Permittee must propose to install a monitoring well downgradient from well GWM-1 to evaluate the extent of SPH in the shallow aquifer. The monitoring well could also serve as a sentinel well for the eastern perimeter of pond EP-2. Propose to install a monitoring well halfway between the eastern perimeter of pond EP-2 and well GWM-1 in a work plan.	Reference to 2015 groundwater analytical data has been removed from the discussion and has been replaced with a discussion of 2016 data. In accordance with the approved schedule, the referenced work plan was submitted to the NMED on August 30, 2018.
10	There are multiple issues in Section 6.2.2, Groundwater Monitoring Wells: NAPIS-1, NAPIS-2, and NAPIS-3, pages 32-33:	
10.1	The Permittee states, "BTEX constituents were not detected in NAPIS-3 with the exception of MTBE detected at 0.16 mg/L in the first quarter." The benzene concentration was recorded as 0.013 mg/L during the first quarter of 2016 and exceeded the standard of 0.005 mg/L. Toluene and ethylbenzene were detected below the standards for the groundwater sample collected from well NAPIS-3 during the first quarter of 2016. In addition, according to Table 8.8, NAPIS-1, NAPIS-2, NAPIS-3, KA-3 BTEX Analytical Result Summary, toluene was detected below the standard during the fourth quarter of 2016. Revise the Report accordingly.	The discussion has been modified to reflect applicable BTEX detections.
10.2	The Permittee states, "[i]n KA-3, benzene was detected in the first, second and third quarter of 2016 and low concentrations of ethylbenzene and MTBE have been detected in all of 2016 below applicable standards (Table 8.8)." According to Table 8.8, benzene was detected above the standard in the first, second and third quarters of 2016 and below the standard in the fourth quarter of 2016. Revise the Report to correct the statement.	The discussion has been modified to reflect applicable benzene detections.
10.3	The Permittee states, "DRO has been detected in the first and second quarter in NAPIS-2 and in the fourth quarter in NAPIS-3." However, DRO was not detected in the first or second quarter of 2016 in well NAPIS-2. Rather, according to Table 8.8.1, NAPIS-1, NAPIS-2, NAPIS-3, KA-3 General Chemistry and DROIGRO Analytical Result Summary, DRO was detected in the third and fourth quarters of 2016. Revise the Report accordingly.	The discussion has been modified to reflect applicable DRO detections.

Comment Number	NMED Comment	Gallup Refinery Response
10.4	The Permittee states, "[l]ow concentrations of fluoride, chloride, and sulfate have been detected in NAPIS-1 in 2016 (Table 8.8.1)." Although the statement is true, the Permittee failed to discuss the exceedance of the nitrate concentration standard in NAPIS-1 throughout 2016. Revise the Report to address the exceedance of the nitrate concentration standard.	The discussion has been modified to reflect applicable nitrate detections.
10.5	The Permittee states, "[f]luoride and chloride concentrations in NAPIS-3 also exceeded applicable standards in most of 2016 (Table 8.8.1)." Although the statement is true, the Report failed to discuss the exceedance of the nitrate concentration standard in NAPIS-3 during the first and second quarters of 2016. Revise the Report to address the exceedance of the nitrate cleanup level. Additionally, phosphorus was detected in the groundwater samples collected from well NAPIS-3 during the third and last quarters of 2016. Phosphorus had not been detected previously. Provide a discussion regarding the presence and cause of the phosphorous detection in the revised Report.	The discussion has been modified to reflect applicable discussion of detected constituents.
10.6	The Permittee states, "[f]luoride, chloride and sulfate concentrations in KA-3 have remained below the WQCC standard since June of 2013 (Table 8.8.1)." The chloride concentration in the groundwater sample collected from well KA-3 exceeded the standard during the September 2014 sampling event. Revise the Report accordingly.	The discussion has been modified to reflect that chlorides concentrations exceedance in September 2014.
10.7	The Permittee states, "[i]n NAPIS-3, arsenic, barium, chromium, iron and manganese were detected in the fourth quarter of 2016 at concentration levels above the applicable standards. Copper, lead, selenium, mercury and zinc were also detected at levels below the applicable standards in 2016 (Tables 8.8.2)." According to Table 8.8.2, NAPIS-1, NAPIS-2, NAPIS-3, KA-3 Total Metals Analytical Result Summary, the lead concentrations in the groundwater samples collected from well NAPIS-3 during the third and fourth quarters of 2016 exceeded the standard. Revise the Report accordingly.	The discussion has been modified to reflect that the lead concentrations in September and November 2014 exceeded the cleanup standard by a small margin.
10.8	The Permittee states, "[n]o VOCs have been detected in NAPIS-I and NAPIS-3 with the exception of low concentrations of 1,2,4-trimethylbenzene and 1,2-dichloroethane (EDC) detected in the fourth quarter." The 1-methylnaphthalene concentration in the groundwater sample collected from well NAPIS-3 during the first quarter of 2016 exceeded the standard. According to Table 8.8.4, NAPIS-1, NAPIS-2, NAPIS-3, KA-3 Volatile and Semi-Volatile Organic Compound Analytical Result Summary, naphthalene, 1,1-dichloroethane, 1,1-dichloroethene, isopropyl benzene, n-butyl benzene, sec-butyl benzene, and cis-dichloroethylene (cis-DCE) were also detected below their respective standards in the groundwater sample collected from NAPIS-3 during the first quarter of 2016. Revise the Report accordingly.	The discussion has been modified to reflect the detection of the additional constituents.
10.9	According to Section 10, Monitoring Schedule 2016, SVOCs analysis is required for the groundwater samples collected from wells NAPIS-I, 2, 3 and KA-3; however, SVOCs analysis was not conducted in 2016. Explain why the Permittee failed to conduct SVOCs analysis in 2016 in the revised Report. Additionally, resume SVOCs analyses for groundwater samples collected from the aforementioned wells during the next sampling event. Before any changes in the sampling schedule are implemented, the changes must be approved by NMED and OCD. Propose changes in the Facility-Wide Groundwater Monitoring Work Plan.	No samples were collected for SVOCs analysis from the NAPIS and KA-3 wells. This was due to the contract sample personnel not using the updated sample schedule. Collection of samples for SVOC analysis will resume in the third quarter 2018 in accordance with the approved plan.
10.10	The Permittee states, "[i]n KA-3, trace amounts of ten VOCs were detected, all at concentrations below the applicable standards." According to Table 8.8.4, the 1- methylnaphthalene concentration in the groundwater sample collected from well KA-3 exceeded the standard during the third quarter of 2016. Revise the Report accordingly.	The discussion has been modified to reflect the 1-methlnaphthalene concentration exceeded the applicable standard for the third quarter of 2016.
11	There are two issues in Section 6.2.3, Leak Detection Units (LDU): East LDU, Oil Sump LDU, West LDU, page 34:	
11.1	The Permittee states, "[t]he following metals (total and dissolved) have been detected at concentration levels above the applicable standard in 2016: Chromium, iron, and manganese. Low concentrations of arsenic, barium, copper, lead, selenium, mercury and zinc was also detected in the East LDU (Table 8.10.1 and 8.10.2)." Although the statement is accurate, the Permittee failed to include a discussion pertaining to metal detections in wastewater samples collected from West LDU. Include the discussion in the revised Report.	A discussion of the analytical data obtained from the leak detection system has been added. Gallup Refinery submitted information to the NMED on July 16, 2018 documenting repairs to the NAPIS, therefore it should be noted that samples collected from the LDUs are not percieved to be wastewater. Gallup Refinery will perform further investigation into locating a source of any leakage into the LDU.

Comment Number	NMED Comment	Gallup Refinery Response
11.2	The Permittee states, "[c]oncentrations of 1,2,4-trimethylbenzene and 1,3,5- trimethyl benzene exceeded the EPA RSL and NMED standards in the East LDU in the first, second and third quarter of 2016." The analytical results of VOCs for the third quarter of 2016 are not included in Table 8.10.3, LEAK DETECTION UNITS (East LDU, West LDU, Oil Sump LDU) Volatile Organic Compound Analytical Result Summary. Include the results for the third quarter of 2016 sampling in Table 8.10.3. In addition, the 2017 Risk Assessment Guidance for Investigations and Remediation (Guidance) does not list screening levels of 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene. Revise the statement and all applicable tables in the Report.	Tables associated with the Leak Detection Unit have been revised to reflect no cleanup standards exists for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene.
12	In Section 6.2.4, Groundwater Monitoring Well: OAPIS-1, page 35, the Permittee states, "[n]aphthalene, and 1-methylnaphthalene was also detected above the applicable standards in all of 2016. Low concentrations of 13 organic compounds were detected throughout 2016 all at levels below applicable standards." The naphthalene concentration in the groundwater sample collected from well OAPIS-1 during the first quarter of 2016 did not exceed the standard. The bis(2-ethylhexyl) phthalate concentrations detected in the groundwater samples collected from well OAPIS-1 were above the standard in 2016. Finally, according to Table 8.9.4, OAPIS-1 Volatile and Semi-Volatile Organic Compound Analytiqal Result Summary, a total of 14 (not 13) organic compounds were detected below the standard. Revise the Report accordingly.	The requested revisions to the report have been made.
13	There are three issues in Section 6.2.5, STP1-NW and STP1-SW, page 35:	
13.1	The Permittee states, "[c]hloride was detected above the applicable standard of 250 mg/L in the second, third and fourth quarter of 2016." Although the statement is accurate, the Permittee failed to discuss the exceedance for nitrate in the groundwater samples collected from well STPl-NW during the second, third and fourth quarters of 2016. Revise the Report to discuss the exceedances.	A statement has been added acknowledging the nitrate detection.
13.2	The Permittee states, "[b]arium, chromium, copper, selenium, mercury and zinc were also detected at concentration levels below the applicable standards [in STPl-NW]." According to Table 8.14.1, STP1-NW Total Metals Analytical Result Summary, silver was also detected at a concentration level below the standard in the groundwater sample collected from well STPl-NW. Revise the Report for accuracy.	A statement has been added acknowledging the silver detection.
13.3	The Permittee states, "[n]o VOCs or SVOCs have been detected [in STPl-NW]." Methyl tert-butyl ether (MTBE) was detected in the groundwater samples collected from well STPl-NW in 2016. Remove the statement from the revised Report.	The statement regarding VOCs has been removed.
14	In Section 6.2.5, STP1-NW and STP1-SW, page 35, the Permittee states, "[l]ow concentrations of MTBE were detected in all of 2016 below the applicable standard of 0.143 mg/L [in well STPl- NW]." MTBE was not detected in well STPl-NW previously and these detections may indicate that untreated wastewater is leaking from the sanitary treatment pond (STP-1). To NMED's knowledge, MTBE hasn't been used at the refinery since 2006. The source of the MTBE may be leaks in the wastewater system or a groundwater MTBE plume that has reached well STPl-NW. Collect untreated wastewater samples from STP-1 for MTBE analysis to compare with concentrations detected in well STPl-NW.	MTBE samples will be scheduled for collection from STP1-NW.

Comment Number	NMED Comment	Gallup Refinery Response
15	In Section 6.3.1, Observation Wells: OW-13, OW-14, OW-29 and OW-30, pages 36-37, the Permittee states, "[i]n OW-13, a low concentration of benzene was detected in the third quarter 2016 below the applicable standard (0.005 mg/L) and low concentrations ofMTBE continues to be detected at concentrations below the applicable standard of 0.143 mg/L." Well OW-13 is screened between 78 and 92 feet below ground surface (bgs) and installed in the Sonsela Sandstone. It should be noted that benzene has never been detected in well OW-13 prior to the third quarter of 2016. The benzene detection may indicate that the benzene plume is expanding from the shallow aquifer to the Sonsela. Additionally, the MTBE concentrations are steadily increasing in OW-13; for example, while the MTBE concentration was recorded as 0.004 mg/L in February 24, 2011, it increased to 0.044 mg/L in November 15, 2015. Although the MTBE concentration is still below the standard, the MTBE plume also appears to be expanding from the shallow aquifer to the Sonsela. Groundwater samples must be collected from the shallow aquifer in the vicinity of well OW-13 for the analysis of benzene and MTBE; these data will provide vital information to delineate the contaminant plumes and to develop corrective measures for the plumes. Comment 18.4 in the 2015 Disapproval letter has directed the Permittee to submit a work plan proposing to install a monitoring well screened across the Chinle-Alluvium interface in the vicinity of well OW-13 in order to investigate the extent of contamination.	Per the schedule recently submitted to the NMED, a work plan for evaluating the groundwater will be submitted for review by the NMED by October 30, 2018.
16	There are three issues in Section 6.3.1, Observation Wells: OW-13, OW-14, OW-29, and OW-30, page 37:	
16.1	The Permittee states, "[i]n OW-14, benzene and MTBE were above the applicable standard[s] of 0.005 mg/Land 0.143 mg/L with the highest level of benzene (8.7 mg/L) in the fourth quarter and 0.068 mg/L of MTBE in the first quarter 2016." According to Table 8.13, OW-13, OW-14, OW-29, OW-30, BTEX Analytical Result Summary, the MTBE concentration in the first quarter of 2016 is recorded as 0.68 mg/L. Revise the Report accordingly.	The correct concentration of 0.68 mg/L has been entered.
16.2	The Permittee states, "[a] low concentration of benzene was detected in the second quarter at l.2E-03 mg/L [in OW-30]." The higher benzene concentration was observed in the first quarter of 2016; according to Table 8.13, the concentration was recorded as 0.0031 mg/L (which is higher than l .2E-03 mg/L). Revise the Report to include the higher concentration of benzene.	The higher concentration of 0.0031 mg/L has been entered.
16.3	The Permittee states, "1-methylnaphthalene and naphthalene was detected in OW-14 in all of 2016 at concentrations above the EPA RSL for tap water standard of 0.0011 mg/L and 0.00165 mg/L (NMED Tap Water) for naphthalene. Nine other organic compounds were also detected at concentration levels below the applicable standards." According to Table 8.13.4, OW-13, OW-14, OW-29, OW-30 Volatile Organic Compound Analytical Result Summary, the methylene chloride concentration in the groundwater sample collected from well OW-14 during the first quarter of 2016 is recorded as 0.011 mg/L, exceeding the standard of 0.005 mg/L. Include the methylene chloride exceedance in the revised Report.	Language has been added to the report indicating the methylene chloride exceedance.
17	In Section 6.3.2, Observation Wells: OW-50 and OW-52, page 37, the Permittee states, [o]bservation wells OW-50 and OW-52 were installed upgradient from OW-13 and OW- OW-50 and OW-52 was to monitor groundwater upgradient from OW-13 and OW-29, these wells may be located cross-gradient relative to the piezometric groundwater flow direction. A change of flow direction from north to west may be occurring between well OW-13 (screened in the Sonsela formation) and OW-29 or there are insufficient data points to accurately determine flow direction. Comment 18.3 in the 2015 Disapproval letter required the submittal of a work plan to install a monitoring well, screened across the Chinle-Alluvium interface, between well OW-13 and well OW-29 to verify the groundwater flow direction.	In accordance with the schedule recently submitted to the NMED, a work plan for evaluating the groundwater will be submitted for review by the NMED by October 30, 2018.

Comment Number	NMED Comment	Gallup Refinery Response
18	In Section 6.3.2, Observation Wells: OW-50 and OW-52, page 38, the Permittee states, "BTEX, DRO, GRO, and MRO constituents have not been detected in either OW-50 or OW-52 since 2010 through 2016,.however a low concentration of MTBE was detected in both wells in 2016 in the fourth quarter. (Tables 8.5 and 8.5.1)." Current sampling frequency for wells OW-50 and OW-52 is on an annual basis and the sampling date is indicated as September 9, 2016 (third quarter), not the fourth quarter. Revise the Report accordingly. A breakthrough of MTBE is observed in both wells OW-50 and OW-52 in 2016. Future groundwater sampling for wells OW-50 and OW-52 must be conducted on a quarterly basis due to the breakthrough of MTBE and 1,2-dichloroethane (EDC). The contaminant plume may be migrating in a north, northwest direction with slower than anticipated mass transport velocity. Increase the sampling frequency in Section 10, Sampling Schedule for these wells in all future plans and reports. The change must also be proposed to the Facility-Wide Groundwater Monitoring Work Plan.	Language acknowledging the detections has been added as well as proposed changes to sampling frequency and modifications to the sampling plan regarding frequency of sample collection for OW-50 and -52.
19	The designation of "NL" is used for the mercury concentrations in groundwater samples collected from wells PW-2 and PW-3 during the 2016 sampling according to Table 8.6.1, PW-2, PW-3, PW-4, Total Metals Analytical Result Summary. No definition of "NL" is provided in the table. Provide a definition for "NL" in the revised Report.	"NL" signifies "not listed" on analytical summary report provided by the contract laboratory. A definition of "NL" has been added to Table 8.6.1.
20	In Section 6.4.1, Process Wells: PW-2, PW-3, PW-4, page 40, the Report states, "PW-2, PW-3, and PW-4 are all process/production wells which supply water to the refinery and domestic water to the company housing and Travel Center," and "[t]here were a total of five organic constituents detected in PW-3 all at concentration below the applicable standards in 2016... 10 organic compounds were detected at concentration levels below the applicable standards in PW-4." Although the concentrations of organic constituents have not exceeded the standards, the number of constituent detections is increasing. The Permittee must contact the Drinking Water Bureau to discuss the issue. Meanwhile, the groundwater collected from the wells should not be used for human consumption unless the water is appropriately treated. Provide a documentation pertaining to the water treatment in the revised Report. Otherwise, suspend use of the groundwater for human consumption.	The drinking water wells are sampled in accordance with a NMED Drinking Water Program schedule. The last report that included VOCs was submitted August 24, 2016 and no organic constituents were detected. However, the Drinking Water Program will be notified as required by applicable regulations of detections and will be consulted regarding any requirements for response actions.
21	There are two issues in Section 6.4.2, Observation Wells: OW-1 and OW-10, page 41:	
21.1	The Permittee states, "[l]ow concentrations of cations were detected in OW-1 throughout 2016 at concentration levels below the applicable standard and no DRO/GRO/MRO were detected... (Table 8.12.1)." Table 8.12.1, OW-1, OW-10 General Chemistry Analytical Result Summary reports the analytical results of anions, not cations. Revise the Report accordingly.	The statement has been revised accordingly.
21.2	The Permittee states, "[l]ow concentrations of the following metals were detected in both OW-1 and OW-10 in 2016 at concentration levels below applicable standards: Arsenic, barium, chromium, iron, leak, manganese, selenium, silver, mercury and zinc." There is a typographical error in the statement (leak). It should state "lead". Revise the Report to correct the error.	The spelling of "lead" has been corrected.
22	There are four issues in Section 6.4.3, Observation Wells: OW-11 and OW-12, page 42:	
22.1	The Permittee states, "[f]luoride and sulfate concentrations continue to exceed the applicable standards (1.6 mg/L and 600 mg/L, respectively) in OW-11." The fluoride concentration in the groundwater sample collected from well OW-11 is recorded as 1.6 mg/L and did not exceed the standard of 1.6 mg/L during the 2016 sampling event. Revise the Report accordingly.	The text has been revised as requested.
22.2	Although the phosphorous concentration in the groundwater sample collected from well OW-12 exceeded the standard in 2016 according to Table 8.4.1, OW-11, OW-12 General Chemistry Analytical Result Summary, the exceedance is not mentioned. Include a statement noting the phosphorous exceedance in the revised Report.	A statement acknowledging the exceedance has been added to Section 6.4.3.

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22.3	The Permittee states, "[t]he following metals (total and dissolved) were detected at concentrations below the applicable standards in OW-11 and OW-12 in 2016: Arsenic, barium, chromium, iron, lead, manganese, selenium, and mercury." According to Table 8.4.3, OW-11, OW-12 Dissolved Metals Analytical Result Summary, the dissolved zinc concentrations in the groundwater samples collected from wells OW-11 and OW-12 were also detected during the 2016 sampling event. Revise the Report accordingly. The Permittee states, "[n]o organic compounds were detected in OW-11 or OW-10 in 2016 (table 8.4.4)." This section discusses analytical results for wells OW-11 and OW- 12, not OW-10. Revise the Report accordingly.	Text regarding the zinc detection was added. The reference to OW-10 was removed.
23	There are multiple issues in Section 6.6, Constituent Levels for MKTF Wells, pages 43 and 44:	
23.1	The observation of SPH in MKTF wells must be included in the list of bullet points. Revise the Report accordingly.	Wells containing SPH them are identified in the data summary tables. The requested revisions have been added to the report.
23.2	The Permittee states, "[b]enzene concentrations exceeded the standard of 0.005 ing!L in the following wells: MKTF-1, MKTF-2, MKTF-4, MKTF-9, MKTF-10, MKTF-11, MKTF-15 through MKTF-26." According to Table 8.17, MKTF Wells BTEX Analytical Results, the benzene concentrations also exceeded the standard in the samples collected from wells MKTF-35 through MK.TF-37, and MKTF-39 during the 2016 sampling events. Revise the Report for accuracy.	The requested revisions have been added to the report.
23.3	The Permittee states, "[t]he greatest benzene concentration (23 mg/L) during 2016 occurred in well MKTF-16 during quarter four (Table 8.17)." The benzene concentration of 23 mg/L was detected in the groundwater sample collected from well MKTF-16 in the third quarter of 2016, not the fourth quarter of 2016. In addition, the highest benzene concentration (24 mg/L) detected during 2016 was found in a sample collected from well MKTF-15 during the third quarter of 2016, not MKTF-16. Revise the Report accordingly.	The requested revisions have been added to the report.
23.4	The Permittee states, "[e]thylbenzene concentrations exceeded the standard of 0.7 mg/L in the following wells: MKTF-1, MKTF-4, MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTP-19 and MKTF-20." The ethylbenzene concentration also exceeded the standard of 0.7 mg/Lin the samples collected from well MK.TF-36 during the 2016 sampling events. According to Table 8.17, the ethylbenzene concentrations did not exceed the standard in the samples collected from well MKTF-11 in 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.5	The Permittee states, "[t]he highest [ethylbenzene] concentration (1.7 mg/L) occurred in MKTF-10 during the first, third, and fourth quarters of2016." The highest ethylbenzene concentration (2.1 mg/L) occurred in well MKTF-15 during the fourth quarter of 2016 according to Table 8.17. Revise the Report accordingly.	The requested revisions have been added to the report.
23.6	The Permittee states, "[t]he highest [total xylenes] concentration (9.2 mg/L) occurred in well MKTF-20 in the fourth quarter 2016." According to Table 8.17, the highest total xylenes concentration occurred in well MKTF-20 in the first and fourth quarters of 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.7	The Permittee states, "MTBE concentrations exceeded the standard of 0.143 mg/Lin the following wells: MKTF-1, MKTF-4, MKTF-9, MKTF-16, MKTF-17, and MKTF-19 through MKTF-25, MKTF-32, MKTF-33, and MKTF-36." According to Table 8.17, The MTBE concentration in the groundwater sample collected from well MKTF-2 also exceeded the standard during the fourth quarter of 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.8	The Permittee states, "[t]he constituent DRO and GRO was detected in MKTF-1 through MKTF-25, MKTF-36, MKTF-37, MKTF-39 and MKTF-42." According to Table 8.17.1, MKTF WELLS General Chemistry Analytical Results, the constituent DRO and GRO were also detected in well MKTF-35 during the first quarter of 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.9	The Permittee states, "[c]hloride concentration exceedances above the standard (250 mg/L) were found in the following wells: MK.TF-1, MKTF-2, MKTF-4, MK.TF-10, MKTF-11, MKTF-16, MKTF-20, MKTF-27, MKTF-28, MKTF-30, MKTF-31, MKTF-32, MKTF-34, MKTF-39, MKTF-40, MKTF-41, MKTF-42 and MKTF-43." The chloride concentrations in the groundwater samples collected from well MKTF-4 did not exceed the standard in 2016. According to Table 8.17.1, the chloride concentrations in groundwater samples collected from wells MKTF-15, MK.TF-24, MK.TF-25, MKTF-26, MK.TF-38, and MK.TF-44 exceeded the standard during the 2016 sampling events. Revise the Report accordingly.	The requested revisions have been added to the report.

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23.10	According to Table 8.17.1, the fluoride concentrations in the groundwater samples collected from wells MKTF-2 and MKTF-20 exceeded the standard in 2016. Include and discuss the exceedance in the revised Report.	The requested revisions have been added to the report.
23.11	According to Table 8.17.1, the sulfate concentrations in the groundwater samples collected from wells MKTF-29 and MKTF-43 exceeded the standard in 2016. Include and discuss the exceedance in the revised Report.	The requested revisions have been added to the report.
23.12	According to Table 8.17.1 the nitrate concentrations in the groundwater samples collected from wells MKTF-34 and MKTF-43 exceeded the standard in 2016. Include and discuss the exceedance in the revised Report.	The requested revisions have been added to the report.
23.13	The Permittee states, "[t]otal metals above applicable standards were detected in the following wells: Barium (1.0 mg/L): MKTF-2, MKTF-4, MKTF-10, MK.TF-11, MK.TF- 15, MK.TF-16, MKTF-24, MKTF-25, MKTF-33, MK.TF-35, MKTF-36, MKTF-39." According to Table 8.17.2, MKTF WELLS Total Metals Analytical Result Summary, the total barium concentrations in the groundwater samples collected from wells MKTF-18 through MKTF-22 also exceeded the standard in 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.14	The Permittee states, "[t]otal metals above applicable standards were detected in the following wells: Lead (0.015 mg/L): MKTF-19, MK.TF-22, MK.TF-24, MKTF-25, MK.TF-30, and MK.TF-35." According to Table 8.17.2, the total lead concentrations in the groundwater samples collected from wells MKTF-26, MKTF-40 and MKTF-44 also exceeded the standard in 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.15	The Permittee states, "[d]issolved metals concentrations above applicable standards were noted in the following wells (Table 8.17.3): Iron: MKTF-1, MKTF-4, MKTF-9, MKTF- 10, MKTF-11, MK.TF-15, MKTF-16, MKTF-18, MKTF-19, MKTF-20, MK.TF-21, MKTF-22, MK.TF-23, MK.TF-35, MK.TF-36, MK.TF-37 and MKTF-39." According to Table 8.17.3, MKTF WELLS Dissolved Metals Analytical Result Summary, the dissolved iron concentrations in the groundwater samples collected from well MKTF-37 did not exceed the standard in 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.16	According to Table 8.17.3, the dissolved selenium concentrations in the groundwater samples collected from wells MKTF-41 and MK.TF-43 exceeded the standard in 2016. Include and discuss the exceedance in the revised Report.	The requested revisions have been added to the report.
23.17	The Permittee states, "[f]ourteen semi volatile organic compounds were detected that exceeded applicable standards in 2016 and are listed as follows: Aniline, Benz(a)anthracene, Bis(2-ethylhexyl) phthalate, Butylbenzene, 2,4 dimethylphenol, Fluorene, 1-methyl naphthalene, 2-methylnaphthalene, 2-methylphenol, 3+4-methylphenol, Naphthalene, Pentachlorophenol, Phenanthrene, Phenol." Butylbenzene is not listed in Table 8.17.4, MKTF WELLS Semi-Volatile Organic Compound Analytical Result Summary. Include the compound on the table in the revised Report. Additionally, according to Table 8.17.4, the butyl benzyl phthalate concentrations in the groundwater samples collected from many MKTF wells exceeded the standard in 2016. Revise the Report accordingly.	The requested revisions have been added to the report.
23.18	The Permittee states, "[f]ifteen volatile organic compounds were detected in the MKTF wells in 2016 at concentration levels above the applicable standards and are listed as follows: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,2-dichloroethane (EDC), 1- methylnaphthalene, Bromomethane, Cis1,2-DCE, 1,1-Dichloroethane, 1,1- Dichloroethene, Methylene chloride, Tetrachloroethene (PCE), 1,1,1-Trichloroethane, Trichloroethene (TCE), Vinyl-Chloride." According to Table 8.17.5, MKTF WELLS Volatile Organic Compounds Analytical Results, the naphthalene, methylnaphthalene, and 2-hexanone concentrations in the groundwater samples collected from the MKTF wells also exceeded the standards in 2016. Revise the Report accordingly. In addition, the Guidance does not list screening levels for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene. Revise the statement and all applicable tables in the Report.	The requested revisions have been added to the report.

Comment Number	NMED Comment	Gallup Refinery Response
24	Since all of the wastewater generated at the facility, including the small flow from the Pilot Travel Center, is directed to the STP-1 and the treated water from the STP-1 is discharged to evaporation pond EP-2, all waters stored in pond EP-2 and subsequent ponds (EP-3, EP-4, etc.) should only contain treated water from the STP-1. Additionally, the reverse osmosis water no longer discharges to pond EP-2. Therefore, constituents related to petroleum products should not be present in the evaporation ponds. However, the benzene concentrations in the water samples collected from ponds EP-2 and EP-3 were recorded as 0.024 and 0.0084 mg/L, respectively, exceeding the standard of 0.005 mg/L in the 2016 sampling events. Further, according to Table 8.15, EVAPORATION PONDS (EP-1 thru EP-12B) BTEX and General Chemistry Analytical Result Summary, one or more benzene, toluene, ethylbenzene, xylenes (BTEX) constituents were detected at concentrations below the standards in ponds EP-2, EP-3, EP-4, EP-5, and EP-12B in 2016. Despite these constituent exceedances and detections in evaporation ponds, according to Table 8.16, STP-1 TO EP-2 (EP-2 INLET) BTEX, DRO/GRO, TDS Analytical Result Summary, the BTEX and MTBE concentrations in effluent samples collected from the STP-1 remained below detection limits in 2016. Based on the effluent sample results, the constituents must have entered into the ponds from somewhere other than STP-1. Provide an explanation for the exceedances and detections of BTEX constituents in the revised-Report. If there are any discharges to the evaporation ponds from sources other than STP-1, cease the discharges immediately, direct all wastewater flows to STP-1, and provide the information pertaining to the discharges to OCD and NMED.	Gallup Refinery is not aware of any discharges to the ponds that could result in such BTEX detections.
25	There are multiple issues in Section 6.7.1, Evaporation Ponds 1 through 12B, pages 45 and 46:	
25.1	The Permittee states, "[t]oluene, ethylbenzene, total xylenes and MTBE have been detected at concentration levels below applicable standards in the following evaporation ponds: EP-2, EP-3, EP-4 and EP-12B." The MTBE concentration was not detected in any evaporation ponds in 2016. Revise the Report accordingly. Additionally, according to Table 8.15, detections of benzene at concentrations below the standard were observed in ponds EP-4, EP-5 and EP-12B during the 2016 sampling events. Include these detections in the revised Report.	The requested revisions were added to the report.
25.2	The Permittee states, "[i]n 2016, BOD concentrations exceeded the general requirement of the 20 NMAC 6.2.3103 (<30 mg/L) in each of the evaporation ponds except for EP-7 and EP-9." According to Table 8.15.1, EVAPORATION PONDS (EP-1 thru EP-12B) BOD/CODIE-COLI Analytical Result Summary, the biological oxygen demand (BOD) concentrations in water samples collected from ponds EP-7 and EP-9 were recorded as 41 and 37 mg/L, respectively exceeding the standard of 30 mg/L in 2016. However, the BOD concentrations in the water samples collected from ponds EP-8 and EP-11 did not exceed the standard in 2016. Revise the Report accordingly.	The requested revisions were added to the report.
25.3	According to Table 8.15.1, e-coli bacteria concentrations in the water samples collected from ponds EP-2, EP-3, EP-4, EP-12A, and EP-12B exceeded the standard in 2016. Address the exceedances in the revised Report.	The requested revisions were added to the report.
25.4	The Permittee states, "[m]etals (total and dissolved): Arsenic, iron and manganese have been detected in the several of the evaporation ponds in 2016 above the WQCC and EPA MCL listed standards." According to Table 8.15.2, EVAPORATION PONDS (EP-1 thru EP-12B) Total Metals Analytical Result Summary, the total selenium concentrations in the water samples collected from ponds EP-7, EP-8, EP-9 and EP-11 exceeded the standard in 2016. The dissolved selenium concentrations in the water samples collected from ponds EP-2, EP-7, EP-8, EP-9 and EP-11 exceeded the standard in 2016 according to Table 8.15.3, EVAPORATION PONDS (EP-1 thru EP-12B) Dissolved Metals Analytical Result Summary. Include a statement describing these exceedances in the revised Report.	The requested revisions were added to the report.
25.5	The Permittee states, "[s]ee table 8.15.5 for a complete list of VOCs." Table 8.15.5, EVAPORATION PONDS (EP-1 thru EP-12B) Semi Volatile Organic Compound Analytical Result Summary lists analytical results for SVOCs. Revise the Report accordingly.	The requested revisions were added to the report.

Comment Number	NMED Comment	Gallup Refinery Response
26	According to Table 8.15.4, EVAPORATION PONDS (EP-1 thru EP-12B) Volatile Organic Compound Analytical Result Summary, the bromomethane concentrations in the water samples collected from ponds EP-3, EP-12A and EP-12B are recorded as 0.016, 0.04 and 0.038 mg/L, respectively exceeding the standard of 0.00754 mg/L in 2016. Since bromomethane is highly volatile, nearly all environmental releases of bromomethane partition into the air. When bromomethane is detected in surface water bodies, pesticides may have been used extensively nearby. Collect water samples from ponds EP-3, EP-12A and EP-12B for pesticides analysis using EPA Method 8081A during the 2018 sampling events. Unless pesticide constituents are detected, the pesticides analysis may be discontinued in 2019. The change must be proposed to the Facility-Wide Groundwater Monitoring Work Plan.	Samples from ponds EP-3, EP-12A and EP-12B will be analyzed for pesticides using EPA Method 8081A during the next sampling event and each sampling event at the Evaporation Ponds thereafter for the remainder of 2018. The previously approved sampling plan for 2018 will be amended to reflect the addition of this analysis for the selected ponds.
27	There are two issues in Section 6.7.5, Outfall STPJ to EP-2 Inlet, page 47:	
27.1	The Permittee states, "DRO was detected in all of 2016 and no GRO or MRO was detected." According to Table 8.16, STP-1 TO EP-2 (EP-2 INLET) BTEX, DRO/GRO, TDS Analytical Result Summary, the GRO concentration in the water sample collected from the outfall of STP-1 was detected at 0.22 mg/L during the August 2016 sampling event. Revise the Report accordingly.	The requested revisions were added to the report.
27.2	The Permittee states, "[t]he TDS concentration of 5100 mg/L exceeded the standard of 1,000 mg/L in the third quarter of 2016." The TDS concentrations also exceeded the standards during the second and fourth quarters of 2016. Revise the Report accordingly.	The requested revisions were added to the report.
28	Table 8.16.3, STP-1 TO EP-2 (EP-2 INLET) TOTAL METALS ANALYSIS and Table 8.16.4, STP-1 TO EP-2 (EP-2 INLET) DISSOLVED METALS ANALYSIS only depict analytical results for 2014. Since 2014, the concentrations of total and dissolved metals have not been measured in samples collected from the outfall of STP-1. Since several metals concentrations exceed the standards in evaporation ponds, effluent from STP-1 may contain metals. Resume analyses for total and dissolved metals for samples collected from the outfall of STP-1. The change must be proposed in the Facility-Wide Groundwater Monitoring Work Plan.	The collection of samples will resume in future sampling events. Samples will be analyzed for total and dissolved metals as indicated in Tables 8.16.3 and 8.16.4. The previously approved sampling plan for 2018 will be amended to reflect the addition of these analyses.
29	In Section 7.1, Group A, page 49, the Permittee states, "[f]ive organic constituents were detected [from the SMW wells] at concentration levels below the applicable standards in 2016. (Benzoic acid, bis(2-ethylhexyl) phthalate, di-n-octylphthalate, diethylphthalate, dimethylphthalate, phenol and pyrene)." According to Table 8.3.4, diethylphthalate and phenol were not detected from the SMW wells in 2016. Revise the Report accordingly.	The requested revisions were added to the report.
30	In Section 7.2, Group B- Groundwater Monitoring, page 49, the Permittee states, "[b]enzene concentrations from all 2016 sampling events at GWM-1 have exceed applicable standards." Since SPH was present in well GWM-1 during all of the 2016 sampling events, groundwater samples were not collected for constituent analysis; thus, benzene concentrations were not evaluated in 2016. Revise the Report accordingly.	The reference to analytical data for GWM-1 was removed and replaced with a statement that it was not sampled in 2014 due to the presence of SPH.
31	In Section 7.2, Group B- Groundwater Monitoring, page 49, the Permittee states, "[i]n the fourth quarter 2016, an SPH level was detected in GWM-1 and in all of 2016 and no ground water samples were collected." SPH appeared in well GMW-1 for the first time during the last quarter of 2015. Revise the Report accordingly.	The requested revisions were added to the report.
32	In Section 7.2, Group B - Groundwater Monitoring, page 50, the Permittee states, "NAPIS-1 continues to indicate detections of MTBE at concentrations below applicable standards, fluctuating from 0.002 mg/L to a low of 0.00032 mg/L [in 2016]." According to Table 8.8, a breakthrough of MTBE was observed in well NAPIS-1 in the first quarter of 2016. Revise the Report to indicate that MTBE had not been detected in well NAPIS-1 prior to 2016.	The requested revisions were added to the report.
33	In Section 7.2, Group B- Groundwater Monitoring, page 50, the Permittee states, "[f]luoride and chloride continue to be detected in NAPIS-2 and NAPIS-3." The fluoride and chloride concentrations in wells NAPIS-2 and NAPIS-3 continue to be detected in wells NAPIS-1, NAPIS-2, NAPIS-3 and KA-3 in 2016. However, according to Table 8.8.1, only groundwater samples collected from wells NAPIS-2 and NAPIS-3 had concentrations that exceeded standards. Revise the Report accordingly.	The requested revisions were added to the report.

Comment Number	NMED Comment	Gallup Refinery Response
34	In Section 7.2, Group B - Groundwater Monitoring, page 50, the Permittee states, "[m]etals (total and dissolved) continue to be detected in all of the wells through 2016 with barium, iron and manganese detected in all wells [NAPIS-1, 2, 3 and KA-3]." According to Table 8.8.3, the dissolved iron concentrations were not detected in the groundwater samples collected from well NAPIS-1 in 2016 while other metals (e.g., arsenic, selenium) were detected. Revise the Report accordingly. In addition, a column listing barium concentration is missing from Table 8.8.3. Include the column for barium concentrations on Table 8.8.3 in the revised Report.	The requested revisions were added to the report.
35	According to Table 8.8.4, NAPIS-1, NAPIS-2, NAPIS-3, KA-3 Volatile and Semi-Volatile Organic Compound Analytical Result Summary, SVOC analysis was conducted for groundwater samples collected from wells NAPIS-1, 2, 3 and KA-3 in 2016. Section 10, Monitoring Schedule, requires SVOC analysis for groundwater samples collected from the aforementioned wells. The Permittee must resume SVOC analysis for groundwater samples collected from these wells in 2018. In the revised Report, discuss this and any other deviations from the Facility-Wide Groundwater Monitoring Work Plan.	The following language has been added to the report: "No samples were collected for SVOCs analysis from the NAPIS and KA-3 wells. This was due to the contract sampler not using the updated sample schedule. The collection of samples for SVOC analysis will resume in the third quarter of 2018." Also, see response to Comment 10.9.
36	In Section 7.2, Group B- Groundwater Monitoring, page 50, the Permittee states, "13 VOCs were detected in NAPIS-2 all at concentration levels below applicable standards, except 1- methylnaphthalene and naphthalene." According to Table 8.8.4, 14 VOCs were detected in the groundwater samples collected from well NAPIS-2 in 2016. Revise the Report accordingly.	The requested revisions were added to the report.
37	In Section 7.2, Group B- Groundwater Monitoring, page 50, the Permittee states, "[n]ine VOCs were detected in NAPIS-3 at concentration levels below applicable standards and only 1- methylnaphthalene was detected above screening levels." According to Table 8.8.4, 12 VOCs were detected in the groundwater samples collected from well NAPIS-3 in 2016. Revise the Report accordingly.	The requested revisions were added to the report.
38	In Section 7.2, Group B- Groundwater Monitoring, page 50, the Permittee states, "[i]n KA-3 ten VOCs were detected at concentration levels below applicable standards." According to Table 8.8.4, the 1-methylnaphthalene and naphthalene concentrations in the groundwater samples collected from well KA-3 exceeded the standards in 2016. Include a statement noting the exceedances in the revised Report.	The requested revisions were added to the report.
39	In Section 7.2, Group B - Groundwater Monitoring, page 50, the Permittee states, "[i]n the third quarter 2016, there was not enough water for sample collection. Recent water column measurements on the West LDU indicate that the bay is leaking into the LDU. The East LDU also contains water but it has been out of service for the last year." Water samples were collected from both East and West LDUs in the third quarter of 2016. Correct the discrepancy in the revised Report. In addition, the East LDU was out of service for the last year (2015). Clarify that East Bay of the NAPIS was empty in 2015. If so, explain why water was present in the East LDU in 2015. The presence of water in the LDU indicates that leakage may be occurring from the NAPIS; therefore, the source of the leaks must be identified and repaired in timely manner. See Comment 3.	The requested revisions/clarifications have been added to the report. Also, see response to Comment 3.
40	In Section 7.2, Group B- Groundwater Monitoring, page 50, the Permittee states, "[n]o significant deviations from past analytical with the exception of cyanide detected in the fourth quarter at a concentration level above the WQCC standard of 0.2 mg/L reading 0.504 mg/L [in OAPIS-1]." Provide information regarding the uses of cyanide at the facility and an explanation for the increase in cyanide concentrations in the fourth quarter groundwater sample collected from well OAPIS-1 in the revised Report.	The source of the cyanide is unknown as it is not used as a feedstock in any of the processes at the refinery.
41	In Section 7.3, Group C- Groundwater Monitoring, page 51, the Permittee states, "[a]n investigation work plan was initiated concerning OW-14 contaminant plume migration." Incorporate Comments 18 and 39 in the 2015 Disapproval letter and Comments 15, 17 and 18 in this letter in an investigation work plan to address contaminant plume migration in the vicinity of well OW-14.	As stated in the response to items 15, 17, and 18, in accordance with the schedule recently submitted to the NMED, a work plan for evaluating the groundwater will be submitted for review by the NMED by October 30, 2018.

Comment Number	NMED Comment	Gallup Refinery Response
42	In Section 7.3, Group C - Groundwater Monitoring, page 51, the Permittee states, "[c]ontinue with current sampling requirements. No changes required [for OW-50 and OW-52]." Although groundwater samples have been collected annually, future sampling must be conducted on a quarterly basis due to the detections of MTBE and EDC in these wells. Additionally, the Permittee must add analysis for 1,2-dibromoethane (EDB) in all monitoring wells where ECD has been detected. The analytical method used must be capable of detecting EDB at concentrations less than 0.004 micrograms per liter (e.g., EPA Method 8011). Update the sampling frequency and analytical suites in Section 10, Sampling Schedule for these wells in all future plans and reports. The change also must be incorporated into the Facility-Wide Groundwater Monitoring Work Plan. See Comment 18.	Sampling frequency will be changed to quarterly, as requested, and will be noted in the updated Facility Wide Groundwater Sampling Work Plan. Analyses for MTBE and EDB will be added to the analytical requirements and the analytical method for detecting EDB will be EPA Method 8011, as requested.
43	In Section 7.5, Group E- Groundwater Monitoring, page 53, the Permittee states, "[o]f the 44 wells installed, eleven MKTF wells have been identified having an SPH level." According to Table 9.1, Groundwater Measurements, SPH was identified in wells MKTF-1, MKTF-3, MKTF- 5, MKTF-6, MKTF-7, MKTF-8, MKTF-12, MKTF-13, MKTF-14, MKTF-15, MKTF-13, MKTF-26, MKTF-36, and MKTF-37 in 2016. Therefore, 14 MKTF wells have been identified having an SPH level. Revise the Report accordingly.	The requested revision was added to the report.
44	In Section 8, Data Tables, some values are expressed with scientific notation while others are expressed with decimal notation. All values must be expressed consistently; when decimal notation is used to indicate an applicable standard value, use the same decimal notation to express all analytical values in the tables. Also, some values may be more appropriate to be reported in parts per billion (micrograms per liter) rather than parts per million (milligrams per liter). Use the same units to report both detected concentrations and screening levels. Revise the Report accordingly.	All analytical summary tables now have results consistently presented in mg/L.
45	In Appendix E, Summary of All Leaks, Spills and Releases, the last record is dated October 5, 2016. Clarify whether no leaks, spills or releases have occurred between October 5, 2016 and December 31, 2016, and update Appendix E in the revised Report, as necessary. Additionally, it appears that most releases that occurred at the facility in 2016 were not reported to NMED. In the event of a release, the Permittee is required to submit a copy of the initial release notification to NMED and OCD in accordance with Part IV.B.4.a of the Permit.	An attempt was made to locate all records of spills, leaks and releases in order to update the report. A revised summary is provided in Appendix E of the attached report. It should be noted that Gallup Refinery enterd into an Order on Consent with NMED on January 20, 2017 subsequent to negotions that involved discussion of historic spills which resulted in Areas of Concern to be identifed in the Order and will require reporting according to the schedule.
46	The Permittee included Section 8, Data Tables, in the electronic version; however, data tables must also be included in the paper copies. The hard copy and electronic copy must be the same with the exception of providing analytical reports in electronic format only. In the revised Report and all future reports and plans, provide data tables in the paper copies.	Section 8 (Data Tables) of the report should have contained hard copies of all tables. The copy that we will submit in response to this request for information will contain a hard copy of all tables.

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Delivered via Federal Express Mail

September 30, 2018

Mr. John E. Kieling
Bureau Chief, Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, NM 87505-6313

RE: RESPONSE TO COMMENTS
DISAPPROVAL 2016 ANNUAL GROUND WATER MONITORING REPORT
WESTERN REFINING SOUTHWEST INC, GALLUP REFINERY
EPA ID #NMD000333211
HWB-WRG-17-008

Dear Mr. Kieling:

Western Refining Southwest, Inc., Gallup Refinery ("Gallup Refinery") is in receipt of your letter dated June 4, 2018, which the New Mexico Environment Department (NMED) solicited responses to comments (RTC) regarding its review of the Gallup Refinery's *2016 Annual Ground Water Monitoring Report* (dated August 31, 2017). Gallup Refinery's RTC are provided as an attachment to this letter. In addition, Gallup Refinery has made revisions to the report which is submitted as an enclosure that includes two hard copies and an electronic format via CD. A red-line strikeout version of the report that illustrates changes has been included on the CD, as well as the final version of the report and Gallup Refinery RTC. Also, the New Mexico Energy Minerals and Natural Resources Department Oil Conservation Division (OCD) has been provided a copy of this response for their consideration.

If you have any questions about the information being provided herein, please do not hesitate to contact Brian Moore by telephone at (505) 726-9745 or by email at Brian.Moore@andeavor.com.

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.

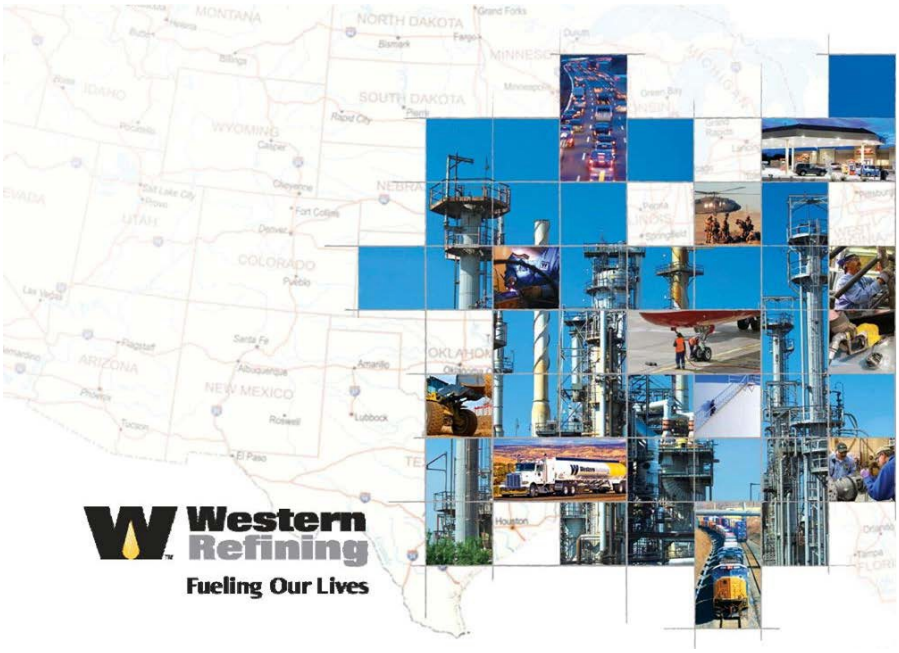
Sincerely,

Daniel Statile
Vice President Refining
Western Refining Southwest, Inc. – Gallup Refinery

Enclosure

cc: C. Chavez (OCD via electronic submittal)

Revised: Annual Groundwater Monitoring Report Gallup Refinery – 2016



Western Refining
Gallup, New Mexico
September 2018

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.

Daniel J. Statile
Vice President, Gallup Refinery

Date

Reviewed by:

Bill Bailey
Environmental Sup=or

8-29-17
Date

Prepared by:

Cheryl Johnson
Envi[redacted]

8/29/17
Date

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APPENDICES

LIST OF ACRONYMS

AC	Alternating Current
AL	Aeration Lagoon
API	American Petroleum Institute
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BW	Boundary Well
COC	Chain of Custody
COD	Chemical Oxygen Demand
DC	Direct Current
DGF	Dissolved Gas Flotation
DO	Dissolved Oxygen
DRO	Diesel Range Organics
DTB	Depth to Bottom
DTP	Depth to Product
DTW	Depth to Water
EP	Evaporation Pond
EPA	Environmental Protection Agency
FT	Foot/Feet
FWGWMP	Facility Wide Groundwater Monitoring Plan
GPM	Gallons per Minute
GRO	Gasoline Range Organics
GWM	Groundwater Monitoring Well
HP	Horse Power
HWB	Hazardous Waste Bureau
IDW	Investigation Derived Waste
ISE	Ion Selective Electrode
LDU	Leak Detection Unit
LPG	Liquefied Petroleum Gas
LTU	Land Treatment Unit
MCL	Maximum Contaminant Level
MPPE	Macro Porous Polymer Extraction
MRO	Motor Oil Range Organics
MTBE	Methyl Tert Butyl Ether
mg/L	Milligrams/liter

LIST OF ACRONYMS - continued

MV	Millivolts
MW	Monitoring Well
NAIC	North American Industry Classification System
NAPIS	New American Petroleum Institute Separator
NAPL	Non Aqueous Petroleum Liquid
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOD	Notice of Disapproval
NPDES	National Pollutant Discharge Elimination System
OBSM	Oil Bearing Secondary Material
OCD	Oil Conservation Division
OW	Observation Well
ORP	Oxidation Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbon
PSTB	Petroleum Storage Tank Bureau
PVC	Polyvinyl Chloride
PW	Process Well
RCRA	Resource Conservation and Recovery Act
<RL	Less than the Applicable standards Detection Limit
RSL	Regional Screening Level
RW	Recovery Well
SMW	Shallow Monitoring Well
SPH	Separate Phase Hydrocarbon
STP	Sanitary Treatment Pond
SVOC	Semi-volatile Organic Compound
SMWU	Solid Waste Management Unit
SWPPP	Storm Water Pollution and Prevention Plan
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbon
µm	Micrometer
UPS	United Parcel Service
VOC	Volatile Organic Compounds
WQCC	Water Quality Control Commission
WWTP	Waste Water Treatment Plant
YTD	Year to Date

EXECUTIVE SUMMARY

The Annual Groundwater Monitoring Report for 2016 (Report) incorporates all of the field monitoring, sampling, and inspection of active wells located on the facility. Analytical data and field notes are incorporated into this report to show any changes or discoveries of various constituents found in the groundwater collected for sampling. On February 15, 2012, Groundwater Discharge Permit GW-032 was rescinded by the Oil Conservation Division (OCD) of New Mexico. We are: however, required to continue to abate pollution of groundwater pursuant to 19.15.30 NMAC (Remediation) under case number AP-111 with remediation activities already in place under Groundwater Discharge Permit GW-032. Monitoring and field work activities conducted for 2016 followed the guidelines of the "Approval with Modifications, Annual Facility-Wide Ground Water Monitoring Report: Gallup Refinery 2013, HWB-WRG-14-006", dated May 18, 2016 from New Mexico Environmental Department Hazard Waste Bureau (NMED HWB).

GROUNDWATER MONITORING

There are 87 monitoring wells located throughout the refinery property that are subject to the ground water monitoring program. The groundwater program consists of a number of sampling locations, target analyses, and monitoring frequencies which are monitored on a quarterly, semi-annual, and annual basis. A brief analytical summary is included while a more detailed summary is discussed in Section 7. In addition to the monitoring wells, there are three leak detection units (LDUs) at the new API Separator (NAPIS). These monitoring wells and LDUs have been grouped as follows:

GROUP A	GROUP B	GROUP C	GROUP D	GROUP E
BW-1A, 1B, 1C	GWM-1, 2, 3	OW-13, 14, 29, 30	PW-2, 3, 4	MKTF-1 thru
BW-2A, 2B, 2C	NAPIS-1, 2, 3, KA-3	OW-50, 52	OW-1, 10	MKTF-45
BW-3A, 3B, 3C	OAPIS-1	RW-1, 2, 5, 6	OW-11, 12	
MW-1, 2, 4, 5	East LDU, West LDU, Oil Sump LDU			
SMW-2, 4	STP1-NW, STP1-SW			

GROUP A – WELLS

There are a total of nine boundary wells located on the northwest section of the refinery property. Three (BW-1A, 1B, 1C) are located between evaporation ponds 7 and 8, and three (BW-2A, 2B, 2C) are located on the west end of evaporation pond 11. BW-3A, 3B, 3C are located on a flat terrain directly northwest of Evaporation pond 12A. Three of the nine wells (BW-1A, BW-1B, and BW-3A) continue to indicate no water level since original installation in 2003 and 2004.

- No benzene, toluene, ethylbenzene, or total xylenes (BTEX) or methyl tert butyl ether (MTBE) constituents have been detected in any of the boundary wells to date.
- Bis(2-ethylhexyl)phthalate was first detected in BW-3B in 2009, BW-3C in 2011, and in BW-1C in 2013. The detection of this organic compound is suspected to be a laboratory contaminant or possibly from the polyvinyl chloride (PVC) pipe materials used in the well. Subsequent annual sample results have indicated non-detectable levels of the organic constituent in each of these wells.

Within this area of the refinery, three Resource Conservation Recovery Act (RCRA) land treatment units (LTU) exist. Each of the three LTU cells measure 480 feet x 240 feet and received hazardous waste application until 1990. Non-hazardous waste application ceased in 1993. Each section is diked and encompasses a surface area of 2.6 acres.

The MW series (MW-1, 2, 4, and 5) and SMW series (SMW-2, 4) of wells were installed to monitor the detection of hazardous constituents from the LTU in groundwater. On the northern edge (downgradient) of the LTU are three monitoring wells (MW-1, SMW-4 and MW-2) and along the eastern edge of the LTU are two monitoring wells (MW-5 and SMW-2). MW-4 is located on the northwest corner of evaporation pond 2 (EP-2) and was installed as a background monitoring well. A summary of the laboratory analyses for these wells through 2016 includes:

- Detection of MTBE in low concentrations in SMW-2 from 2008 through 2016.
- Manganese has been detected at concentration levels above the WQCC standard since 2012 in SMW-2.

In addition to the annual sampling requirements, the LTU monitoring wells are on a once every ten year sample schedule per the RCRA Post-Closure Care Permit. The next RCRA Post-Closure Care Permit sample event is scheduled to occur in 2019.

GROUP B – WELLS

The Group B wells are located near the aeration basin. Wells GWM-1, GWM-2 and GWM-3 are located on the west edge of Aeration Lagoon 2 (AL-2) and Pond 1. The NAPIS-2, NAPIS-3, and KA-3 wells are adjacent to the west bay of the New American Petroleum Institute Separator (NAPIS) and NAPIS-1 is located upgradient on the southeast side of the east bay of the NAPIS. There are three leak detection units (LDU) located on the east and west bay of the NAPIS, identified as follows:

- West LDU is located on the west bay of the NAPIS unit;
- The Oil Sump LDU is located on the northeast section of the east bay of the NAPIS unit; and
- East LDU is located on the southeast section of the east bay of the NAPIS unit.

In July 2012, a well (OAPIS-1) was installed on the northwest side of the Old API Separator. The installation of this well resulted from the Solid Waste Management Units (SMWU) No. 1, Aeration Basin and SMWU No. 14, Old API Separator site investigation. The investigation work was implemented to determine if there had been a release from the aeration basin or Old API Separator and to delineate impacts associated with any such releases. Information collected from this site investigation is also used to track groundwater in monitoring wells GWM-2 and GWM-3.

Two monitoring wells (STP1-NW and STP1-SW) were installed at the new sanitary treatment pond in May of 2014. STP1-NW is located on the west end of the north bay of STP-1, and STP1-SW is located on the southwest corner of the south bay of STP-1. Both of these wells were added to the ground water sampling plan, however, STP1-SW has remained dry since it was installed.

A brief summary of laboratory analyses for the Group B wells for 2016 is listed below:

GWM 1, GWM-2, GWM-3

- No groundwater was present in GWM-2 and GWM-3 in 2016.
- No samples have been collected from GWM-1 since the third quarter 2015 due to the detection of an SPH level.

NAPIS-1, NAPIS-2, NAPIS-3, and KA-3

- Elevated concentrations of MTBE continue to be detected in NAPIS-2 throughout most of 2016. MTBE was also detected above the screening level in first quarter 2016 in NAPIS-3 and benzene was detected slightly above the screening level in KA-3 in the third quarter of 2016.

- DRO/GRO have been detected in NAPIS-2 in 2016 and DRO in NAPIS-3 in the fourth quarter 2016 and GRO in KA-3 in all four quarters of 2016.
- Barium, iron and manganese were detected in NAPIS-2 at concentration levels exceeding the applicable standards in 2016.
- Iron was detected in all four quarters of 2016 in NAPIS-3 at concentration levels exceeding the WQCC standards. Iron was detected in KA-3 in the fourth quarter of 2016 at concentration level exceeding the WQCC standard.
- Manganese was detected in all four quarters of 2016 above the applicable standard in KA-3 NAPIS-2 and NAPIS-3.
- Naphthalene and 1-methylnaphthalene were detected exceeding the applicable standards for NAPIS-2 in the third quarter of 2016.

East LDU, West LDU and Oil Sump LDU

- No water has been detected in the Oil Sump LDU since June 2013.
- Benzene and xylenes were detected in the East and West LDUs at levels exceeding applicable standards in 2016.
- In 2016, chromium, iron, and manganese have been detected in concentrations exceeding applicable standards in both the East and West LDUs.
- The organic constituents 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene have shown concentrations exceeding applicable standards in both the East and West LDUs in 2016.

OAPIS-1

- Benzene and MTBE have exceeded the applicable standards since 2013.
- Concentrations of fluoride and chloride, DRO and GRO have shown exceedances in OAPIS-1 since 2013.
- Arsenic, iron, and manganese have exceeded applicable standards in OAPIS-1 since 2013. Cyanide exceeded the screening level in the fourth quarter of 2016.
- Detections of 1,2-Dichloroethane (EDC), 1-methylnaphthalene and bis(2-ethylhexyl) phthalate have been detected in concentrations exceeding applicable standards in 2016.

STP1-NW and STP1-SW

- No water has been detected in STP1-SW since its installation in 2014.
- There were no detections of BTEX, MTBE, DRO, GRO, or MRO above applicable standards in 2016 in STP-1 NW.
- Chloride exceeded applicable standards in 2016 and iron was detected in the first and second quarter of 2016 at concentration levels which exceeded applicable standards.

GROUP- C WELLS

Group C wells include six observation wells and four recovery wells. Observation well OW-14 is adjacent to the liquefied petroleum gas (LPG) compound while OW-13, OW-29, and OW-30 are located north of the tank farm. Observation wells OW-50 and OW-52 were installed in 2009 per NMED and monitors the potential for contaminant migration offsite. Recovery well RW-1 is located within the tank farm east of Tank 568 while RW-2 is located on the southwest side of Tank 576. Recovery well RW-5 and RW-6 are located northeast of Tank 345. The recovery wells were installed during a subsurface investigation conducted between 1987 and 1992 near the tank farm. BTEX concentrations and separate-phase hydrocarbons (SPH) were detected in the ground water and SPH recovery continues quarterly. When applicable, recovery is completed using a disposable hand-bailer in RW-5 and RW-6 and completed in RW-1 using a portable submersible pump. Measureable SPH has not been detected in RW-2. SPH was not detected in RW-5 and RW-6 during all of 2016. The SPH column thickness in RW-1 has increased during 2016.

A summary of the observation wells and recovery well laboratory analyses through 2016 is as follows:

OW-13, OW-14, OW-29, OW-30, OW-50, and OW-52

- Benzene has exceeded the EPA MCL standard in OW-14 since 2008 through 2016. MTBE concentrations have shown exceedances in OW-14, OW-29, and OW-30 since 2007 (2010 for OW-29) through 2016. No BTEX or MTBE constituents have been detected in OW-13, OW-50, and OW-52 above screening levels.
- Chloride has been detected above applicable standard in OW-14 from 2013 through 2016.
- DRO and GRO have been detected in OW-14, OW-29 and OW-30 in 2016.

RW-1, RW-2, RW-5, and RW-6

- BTEX concentrations have exceeded standards in RW-1 and RW-2 since 2011. RW-5 and RW-6 have exceeded standards for benzene from 2011 to present. Total xylenes concentrations exceeded the standard for RW-6 from 2012 through 2016.
- During 2016, the organic constituents 1,2,4-trimethylbenzene exceeded the applicable standards in RW-2. In RW-5 and RW-6, the organic constituents 1,2,4-trimethylbenzene, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene concentrations exceeded the applicable standards in 2016.

Hydrocarbon recovery from RW-1 has shown a steady decrease from 2005 through 2016. It is common for hydrocarbon recovery to decline over time, as the readily recoverable hydrocarbons is removed from the

formation. From a review of the hydrocarbon recovery log for RW-1 in Appendix A, it appears the recovery pump was initially (Feb 2005) operated in a continuous mode while recovery rates were higher. In March 2005, the recovery of SPH was reported at 48 to 74 gallons per week. By July and August, the reported recovery had declined to 18 to 28 gallons for an approximate three week recovery period. In December 2005, the recovery for two weeks had declined to five gallons of SPH. With the declining recovery volumes of SPH, the recovery method was changed to hand bailing in 2007. The recovery method reverted to using a bladder pump in 2008; however, due to the low recovery volumes the recovery was conducted in conjunction with purging the well for sampling and the pump was not operated on a continuous basis.

An increase in measured product thickness was recorded starting in 2013. The level measured in October 2012 was 0.09 feet and showed a sustained increase over time to 4.93 feet in November of 2014. A similar increase in SPH thickness occurred in late 2007 through 2009, with the product thickness decreasing to less than 0.6 feet through late 2012. In 2014, total hydrocarbon recovery is estimated at 8.5 gallons in 53 gallons of water purged compared to the 2005 estimate of 431 gallons of hydrocarbons in 1,210 gallons of water. A drop-in 3" diameter x 24" long bladder pump with suction at the top of the pump was used to purge water/hydrocarbons from this well until pump lost suction. The recovery well was never completely purged dry due to suction of the submersible pump being at the top, which left approximately 24" of product/water level remaining in RW-1. The recovered water/hydrocarbon mixture was pumped into a 55 gallon drum and the visible hydrocarbon layer thickness was measured and estimated as to volume of hydrocarbons recovered in gallons (not an accurate assessment) No measureable hydrocarbons have been detected in RW-2 since its been installed. SPH has not been detected in RW-5 and RW-6 since February 2009 and November 2011, respectively.

GROUP D WELLS

The Group D wells can be found within the refinery property and include three process/production wells (PW-2, PW-3 and PW-4) and four observation wells (OW-1, OW-10, OW-11, and OW-12). The process/production wells are used to provide process water for the refinery and drinking water for both the refinery and the Travel Center. PW-2 is located on the central west side of the refinery directly west of Evaporation Pond 6 (EP-6). PW-3 is centrally located on the refinery property north of the maintenance

shop and west of the domestic water tank Z-86-T2 and PW-4 is located south of the Pilot Lift Station. Each of the PW wells is screened at a depth of 1,000 feet. The observation well OW-1 is found west of PW-2 and is a flowing artesian well. Observation well OW-10 is located east of Evaporation Pond 9 (EP-9), OW-11 is located on the west side of the main access road, and OW-12 is centrally located west of the refinery tank farm.

A summary of the Group D Wells laboratory analyses through 2016 are as follows:

PW-2, PW-3, and PW-4

- No BTEX or MTBE constituents were detected in the process wells in 2016.
- Low concentrations of fluoride, chloride and sulfate were detected in PW-3.
- Low concentrations of arsenic, barium and iron were detected in PW-3 and PW-4 in 2016 at concentration levels below applicable standards.
- Two organic constituents were detected at levels below applicable standards in PW-3 and PW-4 in 2016 (bis(2-ethylhexyl) phthalate and di-n-octylphthalate). Low concentrations of 1,2,4 trimethylbenzene, 1,3,5 trimethylbenzene, naphthalene, 1-methyl naphthalene, 2-methylnaphthalene, benzoic acid, diethyl phthalate and dimethyl phthalate were also detected in PW-4 in the first half of 2016.

OW-1, OW-10, OW-11, and OW-12

- Low concentrations of benzene and ethylbenzene were detected in OW-1 during the last quarter of 2016, and low concentrations of MTBE were detected in OW-1 and OW-10 during all four quarters in 2016.
- Iron concentrations exceeded the WQCC standard in OW-1 during the third quarter of 2016.
- Chloride concentrations exceeded the WQCC standard in OW-10 in 2016.

GROUP E WELLS

To date, a total of 44 monitoring wells (MKTF-1 through MKTF-44) have been installed to aid in delineating the extent of a hydrocarbon seep discovered in 2013 in an isolated area approximately 100 yards west of the crude tanks T-101 and T-102. A pre-existing well located in the seep investigation site area located on the west end of the loading rack was added to the marketing wells and has been labeled as MKTF-45. Site investigations have included excavations within the seep area, soil/water samples, and the installation of six temporary sumps to recover the non-aqueous phase liquid (NAPL). Liquid recovery from the six sumps in 2016 is estimated at 366,287 gallons of NAPL and ground water. A hole was identified in the refinery's waste water process sewer line near the bundle cleaning pad and an underground leaking transmix transfer

line was also identified in the vicinity. Interim measures are on-going to identify any other potential sources of the hydrocarbon seep. An estimated 11.2 gallons of hydrocarbons was recovered from eleven of the MKTF wells in 2015. Hydrocarbon recovery from six temporary sumps is on-going. The measured SPH thickness is shown on Figure 13.

The MKTF wells are sampled quarterly. BTEX, MTBE, DRO, GRO, total and dissolved metals and several VOCs and SVOCs have been detected in many of the wells above the referenced standards. See Tables 8.15 thru 8.15.5 (Appendix G) for a complete list of constituents analyzed.

ADDITIONAL SITES MONITORED

The new waste water treatment plant (WWTP) and the new holding pond Sanitary Treatment Pond (STP-1) were completed and put in service in May of 2012. All waste water flow was routed to the WWTP in May 2012 and in January 2013, the demolition and removal of the benzene strippers was completed. Pilot effluent was routed to the WWTP in June of 2013 and the aeration lagoons and pond 1 were taken out of service and no longer received any flow. All influent and effluent sampling continued between lagoons and pond 1 as long as there was continued gravitational flow.

Outfall BW to EP-2

- Reverse Osmosis (RO) water from the boiler unit was re-routed back into the process and no longer discharges to evaporation pond 2.
- First quarter 2016 samples indicate sulfate was the only constituent that exceeded applicable WQCC standards.

Outfall STP1 to EP-2

- The EP-2 Inlet designation was changed to STP1 to EP-2 in the second half of 2012 as flow to the aeration lagoons and pond 1 were diverted to the new WWTP. Aeration lagoons and pond 1 were taken out of service and no longer receiving flow. STP-1 effluent now flows into the northeast corner of EP-2. The outfall is sampled on a quarterly basis.
- DRO concentrations were detected in 2016 and TDS concentrations have exceeded the WQCC applicable standard since 2010.
- Three volatile organic compounds were detected at below applicable standards in 2016.

ADDITIONAL APPLICABLE STANDARDS REQUIREMENTS

The Discharge Permit was rescinded by NM-OCD on February 15, 2012; however Gallup is still required to continue with abatement of pollution of groundwater pursuant to 19.15.30 NMAC (Remediation), under Abatement Plan AP-111, with remediation activities already in place.

SECTION 1

INTRODUCTION

The 2016 Annual Groundwater Monitoring Report has been prepared to describe monitoring and remediation activities undertaken throughout 2016. Groundwater sampling is performed on a quarterly, semi-annual and annual basis and includes sampling of the evaporation ponds located on the northwest section of the refinery property. The activities completed include analysis of all active monitoring wells and evaporation ponds. The data generated is used to characterize the nature and extent of impacts to the groundwater at the refinery from historical releases and to monitor any levels of constituents that exceed applicable standards.

This report presents the results of the groundwater monitoring activities and contains the following information:

- Scope of activities
- Sampling methods and procedures
- Groundwater elevation surveys
- Regulatory criteria
- Groundwater monitoring results
- Conclusions and recommendations

1.1 FACILITY OWNERSHIP, OPERATION AND LOCATION

This report pertains to the Western Refining Southwest Inc., Gallup Refinery, located at Exit 39 on Interstate I-40, approximately 17 miles east of Gallup, New Mexico, in Jamestown, New Mexico. Figure 1 shows the regional location of the refinery.

Owner: Western Refining (Parent Corporation)
123 West Mills Avenue, El Paso, TX 79901

Operator: Western Refining Southwest, Inc. (Postal address)
Gallup Refinery
92 Giant Crossing Road, Gallup, NM 87301

Western Refining Southwest, Inc. (Physical address)
Gallup Refinery
I-40, Exit 39, Jamestown, New Mexico 87347

The following regulatory identification and permit governs the Gallup Refinery:

- SIC code 2911 (Petroleum Refining) applies to the Gallup Refinery
- U.S. EPA ID Number NMD000333211 RCRA Post-Closure Care Permit
- OCD Abatement Plan, number AP-111
- 2015 NPDES MSGP, ID #NMR053168

The refinery status is corrective action/compliance. Annual, semi-annual, and quarterly groundwater sampling is conducted at the refinery to evaluate present conditions. The refinery is situated on an 810 acre irregular shaped tract of land that is substantially located within the lower one-quarter of Section 28 and throughout Section 33 of Township 15 North, Range 15 west, of the New Mexico Prime Meridian. A small component of the property lies within the northeastern one-quarter of Section 4 of Township 14 North, Range 15 West. Figure 2 is a topographic map showing the general layout of the refinery in comparison to the local topography.

1.2 2 BACKGROUND INFORMATION

The refinery primarily receives crude oil via two 6-inch diameter pipelines; two pipelines from the Four Corners Area enter the refinery property from the north. In addition, the refinery also receives natural gasoline feed stocks via a 4-inch diameter pipeline that comes in from the west along the Interstate 40 corridor from the Wingate Plant, formerly Conoco gas plant. Crude oil and other products also arrive at the site via railroad cars. These feed stocks are then stored in tanks until refined into products.

The refinery incorporates various processing units that refine crude oil and natural gasoline into finished products. These units are briefly described as follows:

- Crude Distillation Unit: separates crude oil into various fractions; including gas, naphtha, light oil, heavy oil, and residuum
- Fluidized Catalytic Cracking Unit (FCCU): dissociates long-chain hydrocarbon molecules into smaller molecules, and essentially converts heavier oils into naphtha and lighter oils.
- Alkylation Unit: combines specific types of hydrocarbon molecules into a high octane gasoline blending component.
- Reforming Unit: breaks up and reforms low octane naphtha molecules to form high octane naphtha.
- Hydro Treating Unit: removes undesirable sulfur and nitrogen compounds from intermediate feed stocks, and also saturates the feed stocks with hydrogen to make diesel fuel.
- Additional Treater Units: remove impurities from various intermediate and blending feed stocks to produce finished products that comply with sales specifications.
- A set of Acid Gas Treating and Sulfur Recovery Units: convert and recover various sulfur compounds from other processing units in order to produce either ammonium thiosulfate or a solid elemental sulfur byproduct.
- Waste Water Treatment Plant – process and treat refinery waste and storm water before releasing to treatment ponds.

As a result of these processing steps, the refinery produces a wide range of petroleum products including propane, butane, unleaded gasoline, diesel, kerosene, and residual fuel. In addition to the aforementioned processing units, various other equipment and systems support the operation of the refinery and are briefly described as follows:

- Storage tanks are used throughout the refinery to hold and store crude oil, natural gasoline, intermediate feed stocks, finished products, chemicals, and water. These tanks are all located aboveground and the capacity ranges from 80,000 barrels to less than 1,000 barrels.
- Pumps, valves, and piping systems are used throughout the refinery to transfer various liquids among storage tanks and processing units.
- A railroad spur track and a railcar loading rack are used to transfer feed stocks and products from refinery storage tanks into and out of railcars.
- Several tank truck loading areas are used at the refinery to load out finished products and also may receive crude oil, other feed stocks, additives, and chemicals.

Gasoline and diesel are delivered to the Travel Center via tanker truck. An underground diesel pipeline exists between the refinery and the Travel Center. As a result of an off-refinery release in 2011, the pipeline was purged of product, filled with nitrogen and temporarily taken out of service. Western worked with the

NMED – PSTB (Petroleum Storage Tank Bureau) and the NM OCD (Oil Conservation Division) to place this line back in service. In 2013 the underground diesel line from the Gallup Refinery to the Travel Center was replaced. The replaced line runs above ground from the marketing area of the refinery for approximately 150 feet and continues underground to the Travel Center. The diesel line was re-commissioned and put back in service on February 3, 2014.

A designated area is used to conduct employee firefighting training. During these training activities waste water and/or wash water drains directly into a dedicated tank that is located in the vicinity. The waste water is removed via vacuum truck and drained into a process sewer leading to the NAPIS after each training exercise. Oily water and sludge is transferred via vacuum truck to the NAPIS for processing and oil-water separation. The process waste water system is a network of curbing, paving, catch basins, and underground piping that collects waste water effluent and stormwater runoff from various processing areas within the refinery. The waste water effluent flows into T-27, T-28 and into T-35 (which works in parallel to T-27 and T-28) and into the NAPIS which provides the first stage oil-water separation where the removal of free oil is separated from waste water by gravity. The clarified water is routed to the waste water treatment plant (WWTP) Dissolved Gas Flotation (DGF) system which provides the second stage oil-water separation process. The DGF process involves the pressurization of waste water in the presence of air or nitrogen, creating a super-saturated solution called coagules that are carried to the surface. The float is removed to disposal by mechanical float scrapers and the effluent is recycled back to the flotation chamber. The skimmed float is sent to the DGF float management system, “float tanks”. Oily solids collected in the float tanks are recycled through the refining process (on-site) or handled as a K048 listed hazardous waste for proper disposal.

The clarified effluent from the DGF system was designed with the Macro Porous Polymer Extraction (MPPE) system however, the MPPE unit did not perform as expected from a flow rate standpoint. It removed benzene efficiently, but became plugged so that flow rates decreased below adequate levels. In December 2014, the MPPE was removed from service and replaced with the carbon canister system. The two systems ran in parallel for three months in the second half of 2014 followed by trial with carbon canisters for two months before the MPPE was removed from service. Flow rates up to 500 GPM can now be achieved through the carbon system. The waste water that passes through the carbon canisters

discharges into the sanitary treatment pond (STP-1). STP-1 has two bays, north and south and each bay is equipped with five aerators. The treated waste water is mixed with air in order to oxidize any remaining organic constituents and increase the dissolved oxygen concentration available in the water for growth of bacteria and other microbial organisms. The 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 initial startup of the new WWTP was in May of 2012 which resulted in the decommissioning of Benzene Strippers 1, 2, and 3, and the Aeration Lagoons 1 and 2 (AL-1 and AL-2). In November of 2012, the benzene strippers were taken off-line permanently and completely demolished in January of 2013. At the evaporation ponds, waste water is converted into vapor via solar and mechanical wind-effect evaporation. There are a total of four evaporators located at the ponds. Two 80 GPM, electrically driven water evaporators are located between evaporation ponds 4 and 5 and two additional 66 GPM sprayers were installed between ponds 3 and 4 in October 2014. No waste water is discharged from the refinery to surface waters of the U.S. All treated waste water is routed into several evaporation ponds which have large surface areas that are designed to efficiently evaporate water by sunlight and exposure to the changing ambient temperatures.

The stormwater system is a network of valves, gates, berms, embankments, culverts, trenches, ditches, natural arroyos, and retention ponds that collect, convey, control, treat, and release stormwater that falls within or passes through refinery property. Stormwater that falls within the processing areas is conveyed through the same underground piping system that collects waste water effluent from various processing areas with the refinery. The stormwater effluent from within the process areas follows the same flow pattern and treatment as described in the process waste water flow system (T-27 → T-28 → T-35 → NAPIS → WWTP → STP-1 → EP-2 → Evaporation Ponds).

Stormwater discharge from the refinery is infrequent due to the arid desert-like nature of the surrounding geographical area. Gallup Refinery maintains a Storm Water Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) for effective storm water pollution prevention and control. The refinery has constructed several berms in various areas and improved outfalls (installed barrier dams

equipped with gate valves) to minimize the possibility of potentially impacted runoff leaving the refinery property.

1.3 SITE CHARACTERISTICS

Built in the 1950's, the refinery is located within a rural and sparsely populated section of McKinley County, Jamestown, New Mexico, and located 17 miles east of Gallup, New Mexico. The setting is a high desert plain on the western slope of the Continental Divide. The surrounding land is comprised primarily of public lands and is used for cattle and sheep grazing at a density of less than six cattle or 30 sheep per section. The nearest population centers are the Flying J Travel 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 consists of native xerophytic vegetation including grasses, shrubs, small junipers and some prickly pear cacti. 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. Inter-

bedded 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.

SECTION 2

SCOPE OF ACTIVITIES 2016

The 2016 quarterly and annual groundwater sampling, and semi-annual evaporation pond sampling was conducted by DiSorbo Consulting Services and Western. The third quarter groundwater sampling was combined with the annual sampling event per approval from NMED and OCD and conducted in August and September 2016. The following is a list of monitoring and inspections completed for 2016:

- Separate Phase Hydrocarbon Recovery Logs – Appendix A
- Field Inspection Logs–Appendix B
- Applicable Standards – Appendix C
- Summary of EPA/NMED/RCRA Activity – Appendix D
- Summary of all leaks, spills and releases – Appendix E
- Temporary Land Farm Semi-Annual Sampling – Appendix F
- Hall Laboratory Analytical Data – Appendix G
- Data Tables – Section 8
- Well Data DTW/DTB Measurements (Elevations) – Section 9
- Quarterly, Semiannual, Annual Inspections Summary – Section 10

2.1 MONITORING AND SAMPLING PROGRAM

The primary objective of groundwater monitoring program is to analyze groundwater samples collected and use data to assess groundwater quality at and near the refinery. Groundwater elevation data was collected to evaluate groundwater flow conditions. The groundwater monitoring program for the refinery consists of sample collection and analysis from a series of monitoring, recovery, boundary, process, and shallow monitoring wells. In addition, surface water samples are collected at the evaporation pond locations.

The groundwater monitoring network is separated into five investigation areas (Group A, Group B, Group C, Group D, and Group E) plus the evaporation ponds and effluent from STP-1 to Pond 2. The sampling frequency, analyses and target analytes vary for each investigation areas. The combined data from these investigation area were used to assess groundwater quality beneath and immediately down-gradient of the refinery, and to evaluate local groundwater flow conditions. Samples were collected annually from all monitoring wells with the exception of recovery and/or monitoring wells that had a measurable separate-phase hydrocarbon (SPH) level. At wells that were purged dry, samples were collected if recharge volume was sufficient for sample collection within a 24-hour period. Wells not sampled due to insufficient recharge were documented in the field logs.

Daily field activities, including observations and field procedures, were recorded for each activity and are maintained at the refinery. Field logs include the following information:

- Sample Location Identification
- Date
- Start and finish sampling time
- Field team members, including visitors
- Weather conditions
- Daily activities and times conducted
- Observations
- Record of samples collected with sample designations
- Photo log (if needed)
- Field monitoring data, including health and safety monitoring (if needed)
- Equipment used and calibration records, if appropriate
- List of additional data sheets and maps completed
- An inventory of the waste generated and the method of storage or disposal
- Signature of personnel completing the field record

All samples collected for analysis are recorded in the field report or data sheets. Chain-of-Custody (COC) forms are completed at the end of each sampling day, prior to the transfer of samples off-site. The signed copy of the COC is placed inside sample containers with the samples and shipped to the laboratory. A custody seal is affixed to the lid of the shipping container. Copies of all COC forms generated are kept at the refinery.

2.2 2 SAMPLING METHODS AND PROCEDURES

Each monitoring well was gauged for depth to water (DTW), total depth, and depth to product (DTP), if applicable, to determine the amount of water to purge. A minimum of two well volumes is purged from each well prior to sampling. If water level is at a minimum or the well has a low recharge rate, the well is allowed to recharge within 24 hours before a sample is collected. For wells that are not supplied with dedicated pumps, a portable pump is lowered slowly into the well to minimize disturbance to a depth of the midpoint of the screened interval of the well. The pump controller is started at a slow rate and gradually increased until water is discharged. Field 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%), pH (10%).

Groundwater samples were obtained from each well within 24 hours of the completion of well purging. The samples were transferred to an appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample collection methods have been documented in the field monitoring reports. Weather conditions, the volume of groundwater purged, description of water, the instruments used, and the water quality readings obtained at each interval were recorded on the field-monitoring log.

Well purging and sampling were performed using disposable polyethylene bailers and/or appropriate portable sampling pumps where applicable. Some of the wells have dedicated pumps installed where a controller is used to power the submersible pump to purge water. In shallow wells, new disposable bailers were used for each well to hand bail purge water and retrieve water samples. All purged groundwater was collected in 55 gallon drum(s) and/or 5 gallon bucket(s) and drained into the refinery waste water treatment system upstream of the NAPIS. Groundwater samples intended for metals analysis were submitted to the laboratory as total and dissolved metals samples.

At a minimum, the following procedure was followed when collecting/shipping samples:

- Protective eye wear (safety glasses, goggles and or face shield)
- Neoprene, nitrile, or other protective gloves are worn when collecting samples. New disposable gloves are used to collect samples at each sample point.

- All samples collected for chemical analysis are transferred into clean sample containers supplied by the analytical laboratory. Sample containers are clearly marked and labeled.
- Groundwater samples obtained for dissolved metals analysis are filtered through a 0.45 µm (micrometer) mesh size disposable filter on site.
- Samples are labeled, sealed, placed in cooler with ice until they are shipped via United Parcel Service (UPS) Red, Federal Express Overnight or personally delivered to the analytical laboratory.
- Standard COC procedures are followed for all samples collected. The COC form and sample request form are shipped inside the sealed storage container to be delivered to the laboratory, signed and dated.
- Field duplicates and trip blanks are obtained for quality assurance during sampling activities. Trip blanks accompany laboratory sample bottles and shipping and storage containers intended for volatile organic compound (VOC) analyses. Trip blanks consist of a sample of analyte free de-ionized water placed in an appropriate sample container. Trip blanks are analyzed at a frequency of one for each shipping event involving twenty or more samples.

In order to prevent cross-contamination, field equipment that came into contact with water or soil was decontaminated before each sampling event. The decontamination procedure for the portable pump consists of rinsing/washing the equipment with a detergent water mixture followed by two rinses before use in another well. Any equipment that came in contact with each well, such as data loggers or tape measure, was decontaminated with a detergent water mixture and rinsed with distilled water before each use. Decontamination of equipment when feasible is done at the bundle pad where decontamination water is drained into the sewer system.

Decontamination water from field work was caught in an appropriate container and drained into the sewer system upstream of the NAPIS.

2.2.1 EQUIPMENT

- A submersible bladder pump 2 inch, 115 volt AC to DC converter, Grundfos Redi-flo2 constructed of stainless steel with check valve and 1/2 in. Teflon tubing, adjustable rate controller powered by a gas generator is used to purge groundwater from monitoring wells. Equipment is located downwind and at least 20 feet from the well so that exhaust fumes do not cross-contaminate the samples.
- Water level instrument used is a WaterMark Oil Water Interface Meter 100 feet, Model 101L/SMOIL. This instrument measures water and hydrocarbon level; indication is a steady audible tone for water and hydrocarbon indication is an erratic audible tone.

- Parameter Instrument – YSI Model 556 MPS Multi Probe System which simultaneously measures DO, conductivity, temperature, and optional pH and ORP (Oxidation Reduction Potential). As a backup, we also have an IQ Scientific Instrument, Model IQ180GLP which measures pH, DO, TDS (Total Dissolved Solids), conductivity, salinity, ISE (Ion Selective Electrode), mV (Millivolts) and temperature.
- Disposable Bailers – Polyethylene bailer 1.5 inches X 36 inches overall length (OAL) with a capacity of approximately 1 liter and 3 inches X 36 inches OAL. Individually sealed packaging, single check valve bailer with slide in angle cut nozzle for sample removal. A new bailer is used for each well that requires hand bailing for purging and sample retrieval.
- Field equipment parameter instruments were calibrated to known standards in accordance with the manufacturers' recommended schedules and procedures. Calibration checks are conducted before a sampling event and the instruments recalibrated as deemed necessary. Calibration of equipment was noted in the daily field logs.
- If field equipment becomes inoperable, a properly calibrated replacement instrument is used in the interim. Type of instrumentation used during a sampling event is recorded in the daily field logs.

2.3 ~~3~~ COLLECTION AND MANAGEMENT OF INVESTIGATION DERIVED WASTE

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Investigation derived waste (IDW) generated during each groundwater sampling event includes purged water, decontamination water, excess sample material, and disposable sampling equipment. All water purged from monitoring wells generated during sampling and decontamination activities was temporarily stored in a labeled 55-gallon drum(s) and/or 5 gallon bucket(s) and then drained into the refinery sewer system upstream of the NAPIS.

2.4 ~~4~~ COLLECTION OF SURFACE WATER SAMPLES

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At the evaporation ponds, grab samples were collected near the inlets (pond edge). This location was noted in the field notebooks. For outfalls, a grab sample was collected at the pipe end, and recorded in the field log.

2.5 ~~5~~ ANALYTICAL METHODS

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Groundwater and surface water samples collected during the monitoring events were analyzed for the constituents listed in Table 1, Section 10.0. In addition, the WQCC standard was used for total and dissolved metals analysis.

2.6 PERIMETER INSPECTION

Perimeter inspections are part of the daily routine for refinery personnel to report any hydrocarbon staining, spills or any release that could result in material leaving the property boundary

2.7 REMEDIATION ACTIVITIES

A site investigation of the refinery tank farm network conducted in 1987 indicated high concentrations of BTEX constituents in the groundwater as well as hydrocarbons. As a result of the findings from additional site investigations conducted from 1987 through 1990, four recovery wells (RW-1, RW-2, RW-5, and RW-6) were installed to recover the SPH. SPH has been recovered from RW-1 using a submersible bladder pump and from RW-5 and RW-6 by hand-bailing using a disposable polyethylene bailer. Tables in Appendix A summarizes measurements, volume of product and water purged and also provides year to date (YTD) product purged from each well. RW-2 is listed as a recovery well but to date no visible hydrocarbon layer or odor has been observed in this well during quarterly inspections.

In RW-1 a bladder pump was used to pump out SPH on a quarterly basis into a labeled 55-gallon drum. The visible layer of floating product in the drum was measured with a tape measure and calculated as best as possible for the volume of product recovered. In RW-5 and RW-6, a 3 foot disposable hand bailer was used to extract product and water from the wells. Bailed water was collected in a 5-gallon bucket and the visible layer of floating product was then measured with a tape measure to estimate volume of SPH recovered. The purged water was drained into the refinery waste water treatment system upstream of the NAPIS.

Although the SPH thickness level in RW-1 has generally increased since the first quarter of 2013, hydrocarbon recovery from RW-1 has shown a general decrease from 2005 through 2016. In 2016, total hydrocarbon recovery is estimated at 8.5 gallons in 53 gallons of water purged compared to the 2005 estimate of 431 gallons of hydrocarbons in 1,210 gallons of water. No measureable hydrocarbons have been detected in RW-2 since the well was installed. RW-5 and RW-6 have shown a steady decrease in hydrocarbons since 2005 and no SPH has not been detected since February 2009 and November 2011, respectively. Hydrocarbon recovery logs are included in Appendix A.

On June 26, 2013, notification of the discovery of a hydrocarbon seep to the land surface was made to NMED and OCD. Shortly after the seep was initially discovered, fourteen soil excavations were completed in the area of the seep to help identify the presence of hydrocarbons in the shallow subsurface. The

excavations confirmed the presence of hydrocarbons throughout the immediate area of the seep and to the east and south of the seep. Six of the excavations were found to have sufficient hydrocarbons to warrant completion as temporary recovery sumps. A six-inch PVC well screen was placed into each of these six excavations and backfilled with coarse gravel to create temporary sumps to allow for safe, continued recovery of liquids. The sumps range in depth from approximately 8 to 10 feet and are estimated to be 4 feet wide by 6 feet long. The area has been identified as the “Hydrocarbon Seep”, located directly west of crude Tanks 101 and 102. Response actions have included installation of six temporary sumps (S1 – S6), and to date a total of 44 permanent monitoring wells (MKTF-1 through MKTF-44) have been installed to monitor ground water impacts. From June 2013 through December 2016 total hydrocarbon recovery is estimated to be 14,552 gallons and 899,480 gallons of water from the sumps. Of the 44 permanent monitoring wells installed, eleven (MKTF 3, 5, 6, 7, 8, 12, 13, 14, 15, 36, 37) wells had measureable layers of product in 2016. Initial hydrocarbon recovery from these wells conducted in February and June 2015 is estimated at 11.2 gallons. No hydrocarbon recovery was done in 2016. The wells identified to have a product layer will be pumped on a more frequent basis to determine recharge rate and recovery of hydrocarbons.

SECTION 3

GROUNDWATER DTW/ DTP ELEVATION

Groundwater elevation data were collected from the wells listed in Tables 9.1 and 9.2~~1~~, Section ~~10~~9.0. A summary of field measurements (DTW, DTP) taken during the quarterly, semi-annual and annual inspections is included in Section 9. Groundwater levels and SPH column thickness measurements (from the RW series of wells as well as the MKTF wells) were collected quarterly to monitor groundwater elevation and product column thickness fluctuations over time. Maps were generated using elevation data collected from surveys conducted by DePauli Engineering and from Hammon Enterprises Inc., professional surveyor and data from the 2016 field inspection logs.

Field notes and measurement data were recorded in field logs for each well for 2016 and are located in Appendix B. The DTW and DTP levels were measured to the nearest 0.01-ft. The depth to groundwater and SPH column thickness are recorded relative to the surveyed well casing rim or other surveyed datum. A corrected water table elevation is provided in wells containing SPH by adding 0.8 times the measured SPH column thickness to the measured water table elevation (Section 9).

All water/product levels are measured to an accuracy of the nearest 0.01-ft using a WaterMark Oil Water Interface Meter, Model 101L/SMOIL (100 ft.). After the water level is determined, the well volume is calculated using the height of the liquid column and the internal cross sectional area of the well. The purge volume is a minimum of two times the well volume.

Groundwater and SPH levels were measured in all wells within 48 hours of the start of groundwater sampling activities. All manual extraction of SPH and water from recovery wells, observation wells, and collection wells is discontinued for 48 hours prior to the measurement of water and SPH levels. Figure 6 (Section 11) shows the locations of all active wells.

SECTION 4

REGULATORY CRITERIA

Laboratory analytical data is compared to the most current regulatory standards (Appendix C) at time of submission of report.

- New Mexico 20NMAC 20.6.2.3103 (WQCC). Standards for Groundwater of 10,000 mg/L TDS Concentration or Less
- EPA 40 CFR 141.62. National Primary Drinking Water Regulations (Updated MAY 2016) (EPA MCL)
- NMED Tap Water Screening Levels (JULY 2015)
- EPA Regional Screening Levels set for Residential Risk-Based Screening Levels (EPA RSL) for Tap Water (Ross) (MAY 2016)

SECTION 5

GROUNDWATER ELEVATIONS

Groundwater elevations are depicted in the following maps using data from the 2016 quarterly and annual sampling events. In addition, graphs of the water levels are included in Figures 11 – 11.4, 11-A and 11-B

- Figure 7 (Section 11) presents a south-north geologic profile (east side of the refinery) showing contours of monitoring wells with reference to stratigraphic locations in which the water bearing zones are located.

- Figure 8 (Section 11) presents a south-north section on the west side of the refinery showing contours of monitoring wells with reference to stratigraphic locations in which the water bearing zones are located.

- Figure 14 (Section 11) represents a geologic profile for the west-east well locations.

SECTION 6

GROUNDWATER MONITORING RESULTS

All analytical data tables referenced in the following subsections are included in Section 8 of this report. Bold and highlighted values indicate a constituent exceeds a listed standard(s). Due to requirements for field preservation of samples, some samples have the results for nitrite and nitrate reported as a single value of nitrogen. In these instances, the value is conservatively listed for both nitrite and nitrate and a comparison is made between the reported concentration and the regulatory standards for both nitrite and nitrate. This may result in false indication of nitrite exceeding the regulatory standard. Plots of the reported concentrations are provided in a series of Figures numbered 15 through 17. Appendix G - Laboratory data for 2016 sampling events is provided on attached CD.

~~6~~1 6.1~~1~~ CONSTITUENT LEVELS IN GROUP A MONITORING WELLS

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Group A wells are located within the northwest corner of the refinery property. Nine monitoring wells are situated along the refinery boundary and six monitoring wells are within the RCRA LTU area.

6.1.1 BOUNDARY WELLS (BW -1A/1B/1C, BW-2A/2B/2C, BW-3A/3B/3C)

The nine boundary wells (BW), downgradient of the refinery property, are screened within three different stratigraphic units. BW-1A, BW-2A, and BW-3A are screened within the Upper Sand stratigraphic unit (Figure 12); BW-1B, BW-2B, and BW-3B are screened in the Chinle/Alluvium Interface stratigraphic unit (Figure 10); and BW-1C, BW-2C and BW-3C are screened within the Sonsela stratigraphic unit (Figure 9).

The BW-1A, BW-1B, and BW-1C wells are located on the elevated dike separating evaporation pond 7 (EP-7) and evaporation pond 8 (EP-8). BW-2A, 2B, and 2C are located on the northwest edge of evaporation pond 11 (EP-11) and BW-3A, 3B, and 3C are located in the field north of evaporation ponds 12A and 12B (EP-12A and EP-12B). The boundary wells are sampled on an annual basis and evaluated for the following analytes: 8260B plus MTBE, gasoline range organics, (GRO), diesel range organics (DRO) and motor oil range organics (MRO), major cations/anions, and WQCC metal (total and dissolved). No water level was

detected in wells BW-1A, BW-3A, and BW-1B. The boundary wells were sampled and/or inspected on the following dates:

WELL ID	DATE	WELL ID	DATE	WELL ID	DATE
BW-1A	9/8/16	**BW-2A**	9/8/16	**BW-3A**	9/8/16
BW-1B	9/8/16	**BW-2B**	9/8/16	**BW-3B**	9/8/16
BW-1C	9/8/16	**BW-3C**	9/8/16	**BW-3C**	9/8/16

- No BTEX or MTBE constituents were detected in BW-1C, 2A, 2B, 2C, 3B or 3C in 2016. (Table 8.1).
- Fluoride was detected above the WQCC standard of 1.6 mg/L in BW-1C (2.4 mg/L), ~~BW-2B (1.5 mg/L)~~ and BW-2C (1.9 mg/L). Low concentrations of chloride, sulfate and bromide were detected in each of the BW wells sampled in 2016. Phosphorus exceeded applicable standards in BW-1C, BW-2A and BW-3B (Table 8.1.1).
- Low concentrations of total and dissolved metals were detected in each of the BW wells in 2016 at concentration levels below the applicable standards. (Tables 8.1.2 and 8.1.3)
- Bis(2-ethylhexyl)phthalate was detected in BW-1C in 2013, in BW-3B in 2009, and BW-3C in 2011 and may possibly be a lab contaminant or from the PVCC pipe materials used as casing in these wells. The constituent was not detected in any of the BW wells sampled in 2016. As of 2016, SVOCs were removed from analytical requirement (Table 8.1.4).

6.1.2 LAND TREATMENT UNIT (MW-1, MW-2, MW-4, MW-5, SMW-2, and SMW-4)

The LTU groundwater monitoring wells include MW-1, MW-2, MW-4, MW-5, SMW-2, and SMW-4. MW-1, SMW-4, and MW-2 are located downgradient along the north edge of the closed RCRA LTU. MW-5 and SMW-2 are located on the eastern perimeter of the LTU and MW-4 is located upgradient (south) of the LTU. MW-1, MW-2, MW-4, MW-5 are screened within the Sonsela stratigraphic unit. SMW-4 is screened within the Chinle/Alluvium Interface and SMW-2 is screened in both the Chinle/Alluvium Interface and Upper Sand stratigraphic units.

The LTU monitoring wells are sampled on an annual basis. In addition, MW-1, MW-2, MW-4, and MW-5, SMW-2 and SMW-4 are sampled every 10 years to comply with the RCRA Post Closure Permit. Annual samples were analyzed for the following analytes: 8260B plus MTBE, DRO, GRO, MRO, major cations/anions, WQCC metals (total and dissolved), cyanide, VOCs and SVOCs.

Annual sampling and inspections for 2016 on the LTU monitoring wells were completed on the following dates:

WELL ID	DATE	WELL ID	DATE
MW-1	9/7/16	**SMW-2**	9/9/16
MW-2	9/7/16	**SMW-4**	9/9/16
MW-4	9/7/16		
MW-5	9/7/16		

The next 10 year RCRA Post Closure Permit sampling event for MW-1, MW-2, MW-4, MW-5, SMW-2 and SMW-4 is scheduled to occur in 2019. The following analytes are evaluated during the RCRA Post Closure Permit sample event: modified Skinner List for VOCs, SVOCs, total petroleum hydrocarbons (TPH), DRO, GRO, MRO, metals to include mercury and cyanide, and major cations/anions with pH and conductance.

- No BTEX or MTBE have been detected in any of the MW wells. (Table 8.2)
- Low concentrations of fluoride, chloride and sulfate were detected in the MW wells in 2016 at concentration levels below the applicable standards.
- Metals (total and dissolved) was also detected in concentrations below the applicable standards in all of the MW wells in 2016.
- Several organic compounds were detected at low concentrations in 2016 in all of the MW wells (bis (2-ethylhexyl)phthalate, benzoic acid, d-n-octylphthalate, dimethylphthalate, ~~phenol~~ and pyrene),
- No concentrations of BTEX or MTBE was detected in any of the SMW wells, with the exception of SMW-2 which has had low concentrations of MTBE below the applicable standard of (0.143 mg/L). (Table 8.3).
- In SMW-2, chloride and sulfate were detected above the WQCC standards since 2011. Low concentrations of fluoride, chloride and sulfate have been detected in SMW-4. GRO was also detected in both SMW wells. (Table 8.3.1)
- Low concentrations of metals (total and dissolved) have been detected in both wells, with manganese exceeding the WQCC standard of 0.2 mg/L in 2016. (Table 8.3.2 – 8.3.3)
- In 2016, five organic constituents were detected at concentration levels below the applicable standard (benzoic acid, bis(2-ethylhexyl) phthalate, di-n-octylphthalate, ~~diethylphthalate,~~ dimethylphthalate, ~~phenol~~ and pyrene). (Tables 8.3.4).

6.2 CONSTITUENT LEVELS IN GROUP B MONITORING WELLS

There are ten monitoring wells in Group B, not including the three leak detection units. These wells are located within the aeration basin west of the refinery tank farm. Group B includes three groundwater monitoring wells (GWM), four monitoring wells for the New American Petroleum Institute Separator (NAPIS), three leak detection units (LDU), OAPIS-1 installed in 2012 as a result of the Solid Waste Management Units (SMWU) No. 1, Aeration Basin and SMWU No. 14, Old API Separator site investigation. Two new monitoring wells (STP1-NW and STP1-SW) installed on the west end of the sanitary treatment pond (STP-1) in May 2014.

6.2.1 GROUNDWATER MONITORING WELLS (GWM-1, GWM-2, GWM-3)

The GWM series of wells are all screened in the Chinle/Alluvium Interface stratigraphic unit. GWM-1 and GWM-2 are located on the west side of the aeration basin straddling the dike that separates AL-2 and EP-1. Downgradient from GWM-1 and GWM-2 is GWM-3 located on the northwest corner of EP-1. These wells are inspected and sampled on a quarterly basis. No groundwater has been detected in GWM-2 and GWM-3 in 2014, 2015 and 2016. In fourth quarter 2015, an SPH level was detected in GWM-1 and in all of 2016 and no ground water samples were collected. ~~Discussion for detected constituents will be for year 2015.~~

Groundwater samples from GMW-1 were analyzed for the following constituents: BTEX, MTBE, DRO, GRO, MRO, major cations/anions, WQCC total and dissolved metals, and VOCs and SVOCs.

Quarterly inspections and sampling of the GMW wells were completed on the following dates:

WELL ID	QTR 1	QTR 2	QTR 3	QTR 4
GWM-1	3/1/16	6/7/16	9/13/16	11/14/16
GWM-2	3/1/16	6/7/16	9/13/16	11/14/16
GWM-3	3/1/16	6/7/16	9/13/16	11/14/16

- No groundwater sample was collected from GWM-1 in all of 2016 due to the detection of SPH.
- No ground water samples were collected from GWM-2 and GWM-3 in all of 2016, wells are dry.
- Elevated concentration levels of benzene above the EPA MCL standard of 0.005 mg/L have been detected in GWM-1 since 2010 thru third quarter 2015, with the highest concentration recorded in the fourth quarter 2014 at 0.012 mg/L. Concentrations of ethylbenzene, toluene, xylenes, and MTBE remain within the applicable standards for GWM-1 (Table 8.7).

- DRO and GRO were detected in GWM-1 from 2010 through 2015 and in the fourth quarter 2015, MRO was detected in GWM-1 at 18 mg/L
- Fluoride and chloride have been detected in GWM-1 exceeding the WQCC standard (1.6 mg/L) since 2006 in GWM-1 with the exception of quarter four in 2011.
- Fluoride and chloride have also been detected in GWM-2 and GWM-3 at levels above the WQCC standards from 2010 thru 2013.
- Concentrations of total and dissolved arsenic, iron, and manganese in GWM-1 have exceeded applicable standards since 2008. Low concentrations of barium, chromium, lead, selenium and zinc have been detected in prior years. Total and dissolved barium and total lead concentrations, were detected within the applicable standards for all of 2015. Concentrations of the remaining total and dissolved metals did not exceed the applicable standards during 2015 (Tables 8.7.2 and 8.7.3).
- Concentrations of VOCs and SVOCs detected above the applicable standards in third quarter 2015 in GWM-1 include; naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, benz(a)anthracene, benzo(a)pyrene, chrysene, fluorene, phenanthrene, and pyrene. (Table 8.7.4) No organic constituents have been detected in GWM-2 and GWM-3.

GWM-2 and GWM-3 were installed and developed in 2005. The wells are checked quarterly for the presence of water. If water is detected, NMED and OCD are notified within 24 hours of discovery. The water is purged from the well and re-measured to calculate the potential recharge rate. Groundwater samples are collected when water level is sufficient.

Groundwater was first observed in GWM-2 during the first quarter of 2008. The depth to water was 18.45 feet with an estimated water column height of 0.36 feet. Samples were collected and the well was bailed dry. GWM-2 did not recharge and remained dry until the third quarter of 2010. GWM-2 continued to recharge as samples were collected throughout 2011, 2012, and most of 2013. GWM-2 has had an insufficient volume for sampling since the fourth quarter of 2013 and remained dry throughout 2016. GWM-3 has remained dry since 2013. In late 2012 through early 2013, rerouting of the flow to the WWTP caused a reduction in the levels in the aeration lagoons and gravitational flow between the lagoons to pond 1 ceased.

6.2.2 GROUNDWATER MONITORING WELLS: NAPIS-1, NAPIS-2, NAPIS-3, AND KA-3

The NAPIS groundwater monitoring wells are located east of the aeration lagoons. NAPIS-1 is an upgradient well located on the southeast side of the separator. The NAPIS-2 monitoring well is located in the southwest corner of the bay to the separator, and NAPIS-3 is located in the northwest corner. KA-3 is located between NAPIS-2 and NAPIS-3 on the west side of the bay to the separator unit. These wells are

screened in the Chinle/Alluvium stratigraphic unit with three of the wells (NAPIS-2, NAPIS-3, and KA-3) installed subsurface.

The NAPIS and KA wells are sampled on a quarterly basis. In agreement with OCD and approved by NMED, the third quarter sampling is combined with the annual sampling event. Groundwater samples were analyzed for the following parameters: BTEX, MTBE, major cations/anions, WQCC total and dissolved metals, and VOCs and SVOCs.

WELL ID	QTR 1	QTR 2	QTR 3	QTR 4
NAPIS-1	3/1/16	6/7/16	9/1/16	11/14/16
NAPIS-2	3/1/16	6/7/16	9/1/16	11/14/16
NAPIS-3	3/1/16	6/7/16	9/1/16	11/14/16
KA-3	3/3/16	6/6/16	9/1/16	11/14/16

- BTEX and MTBE have remained below the applicable standards since 2008 for NAPIS-1. Benzene and MTBE concentrations in NAPIS-2 have exceeded the applicable standards since 2008 and remained in exceedance for 2016. BTEX constituents were ~~not~~ detected in NAPIS-3 ~~with the exception of~~ along with MTBE being detected at 0.16 mg/L in the first quarter. Benzene was detected in NAPIS-3 at a concentration of 0.013 mg/L in the first quarter, which exceeds the cleanup standard of 0.005 mg/L. The benzene concentrations for the remainder of the year were <0.001 mg/L at NAPIS-3 for the remainder of the year.
- In KA-3, benzene was detected above the cleanup standard of 0.005 mg/L in the first, second and third quarter of 2016 and low concentrations (below the cleanup standards) of ethyl benzene and MTBE have been detected in all of 2016 below applicable standards. (Table 8.8).
- DRO has been detected in the ~~first~~third and ~~second~~fourth quarter in NAPIS-2 and in the fourth quarter in NAPIS-3. Detections of GRO in NAPIS-2 and KA-3 continues and in all of 2016. No MRO has been detected in any of the NAPIS or KA wells. (Table 8.8.1).
- Low concentrations of fluoride, chloride, nitrites, nitrates and sulfate have been detected in NAPIS-1 in 2016 (Table 8.8.1).
- Fluoride and chloride concentrations in NAPIS-2 have exceeded the WQCC standards of 1.6 mg/L and 250 mg/L, respectively, for Q2, Q3, and Q4 2016. Fluoride concentrations were at acceptable levels in the first quarter while chloride levels were at 330 mg/L in the first quarter (Table 8.8.1).
- Fluoride ~~and~~, chloride, nitrate and nitrite concentrations in NAPIS-3 also exceeded applicable standards in ~~most~~ various quarters of 2016. (Table 8.8.1). The fluoride cleanup goal of 1.6 mg/L was exceeded in the third and fourth quarters. Chlorides exceeded the cleanup goal of 250 mg/L in all four quarters. The cleanup goals for nitrites (10 mg/L) and nitrates (10 mg/L) were exceeded in the first and second quarters. Phosphate was also detected in the third and fourth quarters, but not at levels that exceeded any regulatory limits. The probable source of

the phosphates is uncertain. The only other well in the vicinity of NAPIS-3 that had a detection of phosphate was OW-12, in September 2016. Since OW-12 is up gradient of NAPIS-3, it is possible that the source of the phosphate is in an up gradient direction.

- Fluoride~~, chloride~~ and sulfate concentrations in KA-3 have remained below the WQCC standard since June of 2013. Chlorides concentrations had only one exceedance during that same time in September 2014 of 790 ppm. (Table 8.8.1).

- Detection of total metals include manganese in NAPIS-1 for all of 2016 at concentration levels above the WQCC standard of 0.2 mg/L and trace amounts of arsenic, barium, iron, lead, selenium, mercury and zinc were detected in 2016 in NAPIS-1. In NAPIS-2, barium, iron and manganese

also had high concentrations detected in all of 2016. Low concentrations of arsenic, chromium, copper, ~~lead,~~ selenium, mercury and zinc were detected, all at levels below the applicable standards. Lead concentrations were below the cleanup standard in the first and second quarters, but were slightly above the cleanup standard in the third and fourth quarters~~.~~ (Table 8.8.2).

- In NAPIS-3, arsenic, barium, chromium, iron and manganese were detected in the fourth quarter of 2016 at concentration levels above the applicable standards. Copper, lead, selenium, mercury and zinc were also detected at levels below the applicable standards in 2016. (Tables 8.8.2).

- In KA-3, barium and iron were detected at high concentrations in the fourth quarter 2016. Manganese was detected at levels exceeding applicable standards in all of 2016. Arsenic, copper, lead, selenium, mercury and zinc were also detected at levels below the applicable standards in 2016. (Tables 8.8.2 and 8.8.3).

- No VOCs have been detected in NAPIS-1 and NAPIS-3 with the exception of low concentrations of 1,2,4-trimethylbenzene, ~~and~~ 1,2-dichloroethane (EDC) and 1-methylnaphthalene detected in the fourth quarter. In NAPIS-2, 12 organic compounds were detected in 2016 all at concentrations below the applicable standards and 1-methylnaphthalene and naphthalene were detected at levels exceeding applicable standards in 2016. In the fourth quarter well NAPIS-3 had detections below the applicable groundwater protection standards of naphthalene, 1,1-dicloroethane, 1,1-dichloroethene, isopropyl benzene, n-butyl benzene, sec-butyl benzene, and cis-bichloroethylene.

- In KA-3, trace amounts of ten VOCs were detected, ~~all~~ most at concentrations below the applicable standards. It is noted that the 1- methylnaphthalene concentration in the groundwater sample collected from well KA-3 exceeded the standard during the third quarter of 2016. See Table 8.8.4 for the complete list.

6.2.3 LEAK DETECTION UNITS (LDU): EAST LDU, OIL SUMP LDU, WEST LDU

The NAPIS secondary containment units otherwise known as leak detection units (LDU) are installed on the east and west bay of the NAPIS unit. The East LDU is located on the southeast corner in the east bay of the NAPIS unit between the unit and NAPIS-1. The Oil Sump LDU is located on the northeast side of the East LDU. The West LDU is located in the southwest corner of the west bay of the NAPIS unit. The LDUs were monitored in 2010 as part of the 2010 Facility Wide Groundwater Monitoring Work Plan (FWGWMP).

The LDU are sampled and inspected on a quarterly basis. In agreement with OCD and approved by NMED, the third quarter sampling was combined with the annual sample event. The LDUs were sampled for the following analytes in 2016: BTEX, MTBE, DRO, GRO, MRO, WQCC total and dissolved metals, and VOCs. Oil Sump LDU was dry all four quarters 2016 and therefore not sampled. There was not enough water in the East and West LDU for sample collection in the third quarter of 2016. Quarterly inspections and sampling were completed for the LDU wells on the following dates:

SAMPLE ID	QTR 1	QTR 2	QTR 3	QTR 4
EAST LDU	3/1/16	6/7/16	9/6/16	11/17/16
WEST LDU	3/1/16	6/7/16	9/6/16	11/17/16

OIL SUMP LDU	3/1/16	6/7/16	9/6/16	11/17/16

- Benzene was detected in the East LDU at concentration levels above the applicable standard and low concentrations of toluene, ethyl benzene, total xylenes and MTBE were also detected. DRO and GRO was also detected in 2016 in the East LDU (Table 8.10).
- In the West LDU, benzene exceeded applicable standards in all of 2016. Toluene, ethyl benzene, total xylenes, and MTBE were also detected at concentration levels below the applicable standards. DRO and GRO were also detected in 2016. (Table 8.10).
- No samples were collected from the Oil Sump LDU since the second half of 2013; no water level has been observed.
- The following metals (total and dissolved) have been detected at concentration levels above the applicable standard in 2016: Chromium, iron, and manganese. Low concentrations of arsenic, barium, copper, lead, selenium, mercury and zinc was also detected in the East LDU. (Table 8.10.1 and 8.10.2).
- Concentrations of 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene exceeded the EPA RSL and NMED standards in the East LDU in the first, second and third quarter of 2016. Concentrations of 1,2,4-trimethylbenzene, exceeded EPA RSL and NMED standards in the West LDU in the second quarter 2016. (Table 8.10.3).
- Artesian flow has been observed from the East LDU wells is the past. The liner of the treatment unit has been evaluated for leaks and appears to be water-tight. For these reasons it appears that the East LDU may have leaks that allow impacted groundwater to enter. Andeavor will further evaluate the possible source of the contaminants detected within the LDU.

6.2.4 GROUNDWATER MONITORING WELL: OAPIS-1

The OAPIS-1 groundwater monitoring well was installed in 2012 on the southeast edge of AL-2 as a result of the Investigation Work Plan for SMWU No. 1 (Aeration Basin) and SMWU No. 14 (Old API Separator). The OAPIS–1 well is screened in the Chinle/Alluvium Interface stratigraphic unit. The OAPIS-1 well was added to the quarterly sample schedule in 2013. In agreement with OCD and as approved by NMED, the third quarter sample event was combined with the annual sample event.

In 2016, groundwater samples were collected from OAPIS-1 for the following analytes: BTEX, MTBE, DRO, GRO, MRO, major cations/anions, WQCC total and dissolved metals, cyanide, VOCs and SVOCs.

The OAPIS-1 well was inspected and sampled on the following dates in 2016:

WELL ID	QTR 1	QTR 2	QTR 3	QTR 4
OAPIS-1	3/1/16	6/7/16	9/1/16	11/14/16

- Benzene and MTBE concentrations exceeded the EPA MCL standards (0.005 mg/L and 0.143 mg/L, respectively) for each quarterly sample event in 2016. Concentrations of toluene, ethylbenzene and total xylenes were also present but remained below the applicable standard in 2016 (Table 8.9).

- In 2016, DRO and GRO concentrations were detected in all of 2016. Chloride concentrations exceeded the WQCC standards of 250 mg/L, and fluoride was also above the applicable standard of 1.6 mg/L in the first quarter. (Table 8.9.1).

- The following metals (arsenic, iron, and manganese) exceeded the applicable standards in 2016 and total cyanide was detected at 0.504 mg/L in the fourth quarter 2016. Barium, chromium, copper, lead, selenium, mercury and zinc were also detected at levels below the applicable standards in 2016. (Table 8.9.2).

- In the first quarter of 2016, 1,2-dichloroethane(EDC) was detected 0.0062 mg/L exceeding the EPA MCL standard of 0.005 mg/L. ~~Naphthalene, and~~ 1-methylnaphthalene was ~~also~~ detected above the applicable standards in all of 2016. Low concentrations of 14~~3~~ organic compounds were detected throughout 2016 all at levels below applicable standards. See Table 8.9.4 for a complete list of VOCs and SVOCs..

6.2.5 STP1-NW and STP1-SW

Monitoring well STP1-NW is located on the west end of the north bay (STP-1) and STP1-SW is located on the southwest corner of the south bay of STP-1. These wells were installed in May of 2013. Ground water samples were analyzed for the following analytes: 8260B plus MTBE, DRO, GRO, MRO, major cations/anions, WQCC total and dissolved metals, cyanide and SVOCs.

The STP1-NW and STP1-SW wells were inspected and sampled on the following dates in 2016:

WELL ID	QTR 1	QTR 2	QTR 3	QTR 4
STP1-NW	3/2/16	6/7/16	9/9/16	11/14/16
STP1-SW	3/2/16	6/7/16	9/9/16	11/14/16

- No samples collected from STP1-SW as this well has remained dry.

- There were no BTEX, DRO, GRO, or MRO constituents detected in 2016 in STP1-NW. Low concentrations of MTBE were detected in all of 2016 below the applicable standard of 0.143 mg/L. (Table 8.14).

- Chloride was detected above the applicable standard of 250 mg/L in the second, third and fourth quarter of 2016.

- Nitrates were detected at concentration above the appropriate cleanup level in the second, third and fourth quarters of 2016.

- Silver was detected at a concentration below the applicable cleanup standard in November 2016.

- Arsenic, iron, lead and manganese were detected above the applicable standards in the fourth quarter 2016. Barium, chromium, copper, selenium, mercury and zinc were also detected at concentration levels below the applicable standards. (Tables 8.14.1).

- No ~~VOCs or~~ SVOCs ~~have been~~ were detected~~.~~ Only one VOC (MTBE) was detected in 2016.

6.3 CONSTITUENT LEVELS IN GROUP C MONITORING WELLS

The Group C wells include six observation wells (OW-13, OW-14, OW-29, OW-30, OW-50, and OW-52) located on level terrain northeast of the refinery tank farm, and four recovery wells (RW-1, RW-2, RW-5, and RW-6) located within the refinery tank farm. Observation wells OW-50 and OW-52 were installed in 2009 to monitor potential migration of constituents. The recovery wells were installed between 1987 and 1990 and have been used to recover SPH.

6.3.1 OBSERVATION WELLS: OW-13, OW-14, OW-29, and OW-30

The observation wells OW-14, OW-29, and OW-30 are screened in the Chinle/Alluvium Interface; observation well OW-13 is screened in the Sonsela stratigraphic unit. OW-13 is downgradient (north) of the tank farm and OW-14 is upgradient and adjacent to the LPG tank farm. OW-29 is located directly north of OW-14 and OW-30 is situated northeast of OW-14 along the east side of the railroad spur entering the refinery property from the north. These observation wells are sampled quarterly and in agreement with OCD, approved by NMED, the third quarter sampling event is combined with the annual sampling requirement per the OCD discharge permit.

Groundwater samples were collected from these observation wells and submitted for laboratory analyses of the following analytes: BTEX, MTBE, DRO, GRO, MRO, major cations/anions, WQCC total and dissolved metals, and VOCs.

Observation wells OW-13, OW-14, OW-29, and OW-30 were sampled on the following dates in 2016:

WELL ID	QTR 1	QTR 2	QTR 3	QTR 4
OW-13	3/4/16	6/6/16	8/31/16	11/15/16
OW-14	3/4/16	6/6/16	8/31/16	11/15/16
OW-29	3/4/16	6/6/16	8/31/16	11/15/16
OW-30	3/8/16	6/6/16	8/31/16	11/14/16

- In OW-13, a low concentration of benzene was detected in the third quarter 2016 below the applicable standard (0.005 mg/L) and low concentrations of MTBE continues to be detected at

concentrations below the applicable standard of 0.143 mg/L. Toluene, ethylbenzene and xylenes were all non-detected for 2016. (Table 8.13)

- In OW-14, benzene and MTBE were above the applicable standard of 0.005 mg/L and 0.143 mg/L with the highest level of benzene (8.7 mg/L) in the fourth quarter and 0.~~0~~68 mg/L of MTBE in the first quarter 2016.
- OW-29 sampling results indicate levels above the applicable standard of 0.143 mg/L for MTBE in all of 2016, with the highest reading of 3.4 mg/L occurring in the fourth quarter. Benzene was detected in the fourth quarter only above the applicable standard of 0.005 mg/L and in the fourth quarter, ethylbenzene was recorded at 0.0011 mg/L; below the applicable standard of 0.7 mg/L. Toluene and total xylenes were all non-detect for 2016. (Table 8.13).
- In OW-30, MTBE was detected above the applicable standard of 0.143 mg/L in all of 2016, with the highest reading of 3.5 mg/L in the first and fourth quarter. A low concentration of benzene was detected in the second quarter at 0.0031~~1.2E-03~~ mg/L. No detections of toluene, ethylbenzene or xylenes in 2016. (Table 8.13).
- GRO was detected in OW-13, OW-14, OW-29 and OW-30 in all of 2016 and DRO was detected only in OW-14 in 2016. (Table 8.13.1).
- Metals (total and dissolved). No metals were detected in OW-13 that exceeded applicable standards in 2016. (Table 8.13.1).
- Metals (total and dissolved). Arsenic, barium, iron and manganese were detected at concentration levels above applicable standards in 2016 in OW-14.
- Metals (total and dissolved). In OW-29, manganese was detected at levels above the applicable standard of 0.2 mg/L in all of 2016.
- No metals (total and dissolved) were detected exceeding the applicable standards in 2016 in OW-30.
- In OW-13, 1,2-dichloroethane (EDC) was detected in all of 2016 at concentration levels below the applicable standard of 0.005 mg/L. (Table 8.13.4).
- 1-methylnaphthalene and naphthalene was detected in OW-14 in all of 2016 at concentrations above the EPA RSL for tap water standard of 0.0011 mg/L and 0.00165 mg/L (NMED Tap Water) for naphthalene. Methylene chloride was also detected at 0.011 mg/L which exceeds the cleanup standard of 0.005 mg/L Nine other organic compounds were also detected at concentration levels below the applicable standards. See Table 8.13.4 for a complete list.
- No organic compounds detected were exceeding applicable standards in OW-29 and OW-30 in all of 2016. See Table 8.13.4 for a complete list.

6.3.2 OBSERVATION WELLS: OW-50 and OW-52

Observation wells OW-50 and OW-52 were installed upgradient from OW-13 and OW-29 in 2009 to monitor possible migration of MTBE. The two observation wells are screened in the Chinle/Alluvium Interface stratigraphic unit. A request to change the 2010 FWGWMP sample frequency from quarterly to annual for OW-50 and OW-52 was approved by NMED in 2012 (2011 Updates, Comment 6).

However, due to the detection of MTBE and 1,2-dichloroethane (EDC) in both wells in 2016, the sampling frequency will be reverted back to quarterly to ensure timely detection of concentration changes and plume migration. The facility Groundwater Monitoring Plan will also be modified to reflect the more frequent sampling schedule as will Table 1, Section 10 (sampling frequency) of this report as well as the Facility Wide Groundwater Monitoring Plan.

In 2016, groundwater samples were collected from observation wells OW-50 and OW-52 for the following analytes: BTEX, MTBE, DRO, GRO, MRO, major anions/cations, WQCC total and dissolved metals, and VOCs.

Observation wells OW-50 and OW-52 were sampled on the following dates during the third quarter in 2016:

WELL ID	SAMPLE DATE
OW-50	9/9/16
OW-52	9/9/16

- BTEX, DRO, GRO, and MRO constituents have not been detected in either OW-50 or OW-52 since 2010 through 2016, however a low concentration of MTBE was detected in both wells in 2016 in the fourth quarter. (Tables 8.5 and 8.5.1).
- Low concentrations of fluoride, chloride and sulfate were detected in 2016 but remain below the applicable standards (Table 8.5.1).
- Low concentrations of total and dissolved arsenic, barium, iron, lead, manganese, selenium, mercury and zinc have been detected in OW-50 and OW-52 in 2016 and are at concentration levels below the applicable standards (Tables 8.5.2 and 8.5.3).
- 1,2-dichloroethane (EDC) was the only organic compound (other than MTBE) detected in 2016 in OW-50 and OW-52 at concentration levels below the EPA MCL standard of 0.005 mg/L. (Table 8.5.4).

6.3.3 RECOVERY WELLS: RW-1, RW-2, RW-5, RW-6

The recovery wells RW-1, RW-2, RW-5, and RW-6 are shallow wells installed in the refinery tank farm located in the east-central portion of the refinery property. The recovery wells are screened within the Chinle/Alluvium Interface stratigraphic unit and are used to recover SPH. RW-1 is located east of Tank 716; RW-2 is located between Tanks 574 and 576; and RW-5 and RW-6 are located in the northwest corner of the tank farm, east of Tanks 337 and 345.

Quarterly inspections for the RW wells include product recovery of SPH using disposable bailers in RW-5 and RW-6, and a portable 2-inch bladder pump for RW-1. Hydrocarbon thickness is measured prior to being removed. Purge water is collected and disposed upstream of the NAPIS. Hydrocarbon recovery is estimated based on measurements and observations.

The RW wells were added to the annual sampling schedule in 2011, per the Approval with Modifications in the 2010 FWGWMP. For 2016, the wells were sampled and evaluated for the following analytes: BTEX, MTBE, DRO, GRO, and MRO.

The recovery wells were inspected and sampled in 2016 on the following dates:

WELL ID	QTR 1	QTR 2	QTR 3	QTR 4
RW-1	3/4/16	6/8/16	9/13/16	11/16/16
RW-2	3/4/16	6/8/16	9/13/16	11/16/16
RW-5	3/4/16	6/7/16	9/13/16	11/16/16
RW-6	3/4/16	6/7/16	9/13/16	11/16/16

- No samples were collected from RW-1 due to SPH levels
- BTEX and MTBE concentrations exceeded applicable standards in RW-2 in 2016. Benzene exceeded the applicable standard in RW-5 and benzene and total xylenes concentrations exceeded applicable standards in RW-6. Concentrations of toluene, total xylenes and ethyl benzene were detected in RW-5 and RW-6 which did not exceed applicable standards. (Table 8.11).
- DRO and GRO concentrations were detected in RW-2, RW-5 and RW-6 in all of 2016 with the highest concentration of GRO in RW-2 (160 mg/L – first quarter), and DRO (14 mg/L in second and third quarters) in RW-2.

Hydrocarbon recovery from RW-1 has shown a steady decrease from 2005 through 2016. In 2016, total hydrocarbon recovery is estimated at 8.5 gallons in 53 gallons of water purged compared to the 2005 estimate of 431 gallons of hydrocarbons in 1,210 gallons of water. No measureable hydrocarbons have been detected in RW-2 since the well was installed. RW-5 and RW-6 have shown a steady decrease in hydrocarbons since 2005. No measureable SPH has been detected in RW-5 and RW-6 since February 2009 and November 2011.

6.4 CONSTITUENT LEVELS IN GROUP D MONITORING WELLS

The 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. These process wells reach approximately 1,000 feet and are screened in the San Andreas/Yeso aquifer. Additionally, Group D also includes four observations wells OW-1, OW-10,

OW-11, and OW-12. The OW-1 and OW-10 wells are located in the northwest portion of the refinery and are considered artesian wells. OW-11 is located near the entrance of the refinery and OW-12 is west of the tank farm in the surplus yard.

6.4.1 PROCESS WELLS: PW-2, PW-3, PW-4

PW-2, PW-3 and PW-4 are all process/production wells which supply process water to the refinery and domestic water to the company housing and Travel Center. PW-2 is located west of evaporation pond 6 (EP-6). PW-3 is centrally located directly north of the maintenance shop, and PW-4 is located on the southern edge of the refinery property and adjacent to the Pilot Lift Station.

Production well PW-2 is on a staggered 3-year sampling schedule, PW-3 is sampled on an annual basis since 2010 due to the detection of 2-methylnaphthalene exceeding the applicable standard in 2008. In 2013, three organic compounds were detected in PW-4 at very low concentrations and per NMED directive (HWB-WRG-14-006), sampling of this well was switched to semi-annual to begin in 2017 to collect additional data. Ground water samples are collected or the following analytes: BTEX, MTBE, nitrate, WQCC total and dissolved metals, and VOCs and SVOCs.

The process well PW-3 was sampled in 2016 on the following dates:

WELL ID	DATE
PW-3	8/31/16
PW-4	6/10/16; 8/31/16

- No BTEX or MTBE constituents were detected in PW-3 or PW-4 in 2016 (Table 8.6).
- Low concentrations of the following metals (total and dissolved) were detected in both wells in 2016: Arsenic, barium, iron, lead, manganese, selenium, and zinc at levels below the applicable standards (Table 8.6.1 and 8.6.2). Cyanide was at non-detectable levels in both wells.
- There were a total of five organic constituents detected in PW-3 all at concentrations below the applicable standards in 2016. See Table 8.6.3 for a complete list.
- In 2016, 10 organic compounds were detected at concentration levels below the applicable standards in PW-4.

6.4.2 OBSERVATION WELLS: OW-1 AND OW-10

Observation well OW-1 is an artesian well located on the west side of EP-6. Well OW-10 is located downgradient from OW-1 on the east side of EP-9. Wells OW-1 and OW-10 are screened in the Sonsela stratigraphic unit. Inspection requirements for these two wells were modified in 2010, per the 2010 FWGWMP, and included sampling on a quarterly basis. In agreement with OCD, approved by NMED, the third quarter sampling was combined with the annual sampling event. In 2016, groundwater samples from OW-1 and OW-10 were evaluated for the following analytes: BTEX, MTBE, DRO, GRO, MRO, major cations/anions, WQCC total and dissolved metals, VOCs.

Groundwater samples were collected from OW-1 and OW-10 in 2016 on the following dates:

WELL ID	QTR 1	QTR 2	QTR 3	QTR 4
OW-1	3/3/16	6/6/16	9/6/16	11/15/16
OW-10	3/3/16	6/6/16	9/6/16	11/15/16

- Low concentrations of benzene, ethyl benzene and MTBE were detected in OW-1 in 2016 below applicable standards. Only the constituent MTBE was detected in OW-10 in all of 2016 at concentration levels below the applicable standard of 0.143 mg/L (NMED Tap Water). (Table 8.12).
- Low concentrations of ~~cat~~anions were detected in OW-1 throughout 2016 at concentration levels below the applicable standard and no DRO/GRO/MRO were detected. OW-10 had exceedances of chloride in all of 2016 above the WQCC Standard of 250 mg/L. GRO was detected in the first, second and fourth quarters of 2016 in OW-10. (Table 8.12.1).
- Total metals (Iron and manganese) were detected at concentration levels above the applicable standards in OW-1 in 2016.
- Metals (total and dissolved): Low concentrations of the following metals were detected in both OW-1 and OW-10 In 2016 at concentration levels below applicable standards: Arsenic, barium, chromium, iron, lea~~d~~k, manganese, selenium, silver, mercury and zinc. See Table 8.12.1 and 8.12.2 for a complete list.
- In 2016 no VOCs were detected in OW-1, however in OW-10 four organic compounds were detected at concentrations below the applicable standards and are listed as follows: 1,1-Dichloroethane, 1,1-dichloroethene, 1,2-dichloroethane (EDC) and cis-1,2-DCE. (Table 8.12.4).

6.4.3 OBSERVATION WELLS: OW-11 AND OW-12

Observation well OW-11 is located within the refinery property (southeast) on the west side of the main entrance. Well OW-12 is located within the surplus or bone yard located west and slightly north of the primary tank farm. OW-11 and OW-12 are screened in the Sonsela stratigraphic unit.

Well inspections and sampling are conducted annually. In 2016, groundwater samples from the two wells were evaluated for the following analytes: BTEX, MTBE, major anions/cations, GRO, DRO, MRO, WQCC total and dissolved metals, VOCs, and SVOCs. Observation well OW-11 and OW-12 were sampled in the third quarter of 2016 on the following dates:

WELL ID	DATE
OW-11	9/9/16
OW-12	9/8/16

- BTEX and MTBE have not been detected in OW-11 and OW-12 since 2006 and remained non-detect for 2016 (Table 8.4).
- ~~Fluoride and s~~Sulfate concentrations continue to exceed the applicable standards (~~1.6 mg/L and~~ 600 mg/L~~, respectively~~) in OW-11. (Table 8.4.1).
- GRO, DRO and MRO were not detected in OW-11 and OW-12 in 2016 (Table 8.4.1).
- The following metals (total and dissolved) were detected at concentrations below the applicable standards in OW-11 and OW-12 in 2016: Arsenic, barium, chromium, iron, lead, manganese, selenium, and mercury. (Tables 8.4.2 and 8.4.3). As noted in Table 8.4.1, the phosphate concentration (0.37 mg/L) exceeded the applicable standard (4.0 x 10^{-4} mg/L) during this sampling event. A dissolved zinc concentration of 0.0091 mg/L was also reported or OW-11, which is well below the standard of 10 mg/L.
- No organic compounds were detected in OW-11 ~~or OW-10~~ in 2016 (Table 8.4.4).

6.5 CONSTITUENT LEVES IN GROUP E MONITORING WELLS

To date, a total of 44 monitoring wells (MKTF-1 through MKTF-44) have been installed to aid in delineating the extent of a hydrocarbon seep discovered in 2013, directly west of crude tanks T-101 and T102. During the investigation, a pre-existing well (labeled as MKTF-45) was found directly west of the truck-loading rack. Each of the wells has been constructed into permanent monitoring wells, and these wells are designated as Group E wells.

6.6 CONSTITUENT LEVELS FOR MKTF WELLS

In 2016, groundwater samples were collected from the MKTF wells and evaluated for the following analytes: BTEX, MTBE, DRO, GRO, MRO, major cations/anions, metals, VOCs, and SVOCs. Wells that had a hydrocarbon layer were not sampled.

- During the fourth quarter 2016, SPH was detected in wells MKTF-01 (1.35'), MKTF-26 (1.39'), MKTF-23 (0.12'), MKTF-14 (1.10'), MKTF-13 (0.96'), MKTF-12 (0.29'), MKTF-37, MKTF-45 (0.46').

- During 2016, ~~B~~benzene concentrations exceeded the standard of 0.005 mg/L in the following wells: MKTF-1, MKTF-2, MKTF-4, MKTF-9, MKTF-10, MKTF-11, MKTF-15 through MKTF-26, MKTF-35, MKTF-36, MKTF=37 and MKTF-39. The greatest benzene concentration (23 mg/L) during 2016 occurred in well MKTF-1~~6~~5 during quarter ~~four~~three (Table 8.17).

- Toluene concentrations exceeded the standard of 0.75 mg/L in the following wells: MKTF-1, MKTF-10, MKTF-11, MKTF-15, and MKTF-23. The highest toluene concentration (23 mg/L) occurred in well MKTF-10 in the first quarter 2016. (Table 8.17).

- Ethylbenzene concentrations exceeded the standard of 0.7 mg/L in the following wells: MKTF-1, MKTF-4, MKTF-10, MKTF-~~11~~36, MKTF-15, MKTF-16, MKTF-19 and MKTF-20. The highest concentration (~~1.7~~2.1 mg/L) occurred in MKTF-1~~0~~5 during the ~~first, third and~~ fourth quarters of 2016. (Table 8.17).

- Total xylenes concentrations exceeded the standard of 0.62 mg/L in the following wells: MKTF-1, MKTF-4, MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTF-19 MKTF-20, MKTF-21, MKTF-23, and MKTF-37. The highest concentration (9.2 mg/L) occurred in well MKTF-20 in the first and fourth quarters 2016. (Table 8.17).

- MTBE concentrations exceeded the standard of 0.143 mg/L in the following wells: MKTF-1, MKTF-2,
  MKTF-4, MKTF-9, MKTF-16, MKTF-17, and MKTF-19 through MKTF-25, MKTF-32, MKTF-33, and MKTF-36. The highest concentration (10.0 mg/L) occurred in well MKTF-19 in the fourth quarter 2016 (Table 8.17).

- The constituent DRO and GRO was detected in MKTF-1 through MKTF-25, MKTF-35, MKTF-36, MKTF-37, MKTF-39 and MKTF-42. GRO was also detected in MKTF-26, through MKTF-35, MKTF-38, MKTF-43, and MKTF-44. There were no detectable concentrations of MRO in any of the MKTF wells. (Table 8.17.1).

- Chloride concentration exceedances above the standard (250 mg/L) were found in the following wells: MKTF-1, MKTF-2, ~~MKTF-4,~~ MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTF-20, MKTF-15, MKTF-24, MKTF-25, MKTF-26, MKTF-27, MKTF-28, MKTF-30, MKTF-31, MKTF-32, MKTF-34, MKTF-38, MKTF-39, MKTF-40, MKTF-41, MKTF-42, ~~and~~ MKTF-43, and MKTF-44. (Table 8.17.1).

- The fluoride standard of 1.6 mg/L was narrowly exceeded in wells MKTF-2 (1.8 to 2.7 mg/L) and MKTF-20 (2.1 to 3.1 mg/L) in 2016.

- The nitrate standard of 10 mg/L was exceeded in MKTF-34 (18 mg/L) and MKTF-43 (62 mg.L). Although each well only exceeded the standard in one quarter of the year, it represents the first exceedance of nitrate for either well.

- Total metals above applicable standards were detected in the following wells:: Table 8.17.2):
  - Arsenic (0.01 mg/L): MKTF-11, MKTF-16, MKTF-19, MKTF-20, MKTF-21, MKTF- 23, MKTF-24, MKTF-36, MKTF-43 and MKTF-44.
  - Barium (1.0 mg/L): MKTF-2, MKTF-4, MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTF-18, MKTF-22, MKTF-24, MKTF-25, MKTF-33, MKTF-35, MKTF-36, MKTF-39.
  - Chromium (0.05 mg/L): MKTF-24
  - Iron (1.0 mg/L): MKTF-1 through MKTF-44.
  - Lead (0.015 mg/L): MKTF-19, MKTF-22, MKTF-24, MKTF-25, MKTF-26, MKTF-30, ~~and~~ MKTF-35, MKTF-40, and MKTF-44.
  - Manganese (0.2 mg/L): All wells with the exception of MKTF-34.
  - Selenium (0.05 mg/L): MKTF-43.
  - Sulfate (600 mg/L): MKTF-29 and MKTF-43.

- Dissolved metals concentrations above applicable standards were noted in the following wells (Table 8.17.3):
  - Arsenic: MKTF-4, MKTF-11, MKTF-16, MKTF-19, MKTF-20, MKTF-21, MKTF-36, and MKTF-43.
  - Barium: MKTF-1, MKTF-4, MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTF-18, MKTF-19, MKTF-20, MKTF-21, MKTF-22, MKTF-36, and MKTF-39.
  - Iron: MKTF-1, MKTF-4, MKTF-9, MKTF-10, MKTF-11, MKTF-15, MKTF-16, MKTF-18, MKTF-19, MKTF-20, MKTF-21, MKTF-22, MKTF-23, MKTF-35, MKTF-36, ~~MKTF-37~~ and MKTF-39.
  - Manganese: All wells with the exception of MKTF-28, MKTF-30, MKTF-31, MKTF-32, MKTF-33, and MKTF-34, MKTF-40, MKTF-41 and MKTF-44.
  - Selenium: Wells MKTF-41 (0.06 mg/L) and MKTF-43 (0.091) exceeded the groundwater protection standard in 2016.

Fourteen semi volatile organic compounds were detected that exceeded applicable standards in 2016 and are listed as follows: See Table 8.17.4 for the complete list.

- Aniline
- Benz(a)anthracene
- Bis(2-ethylhexyl)phthalate
- Butylbenzene
- Butylbenzulphthalate
- 2,4 dimethylphenol
- Fluorene
- 1-methyl naphthalene
- 2-methylnaphthalene
- 2-methylphenol
- 3+4-methylphenol
- Naphthalene
- Pentachlorophenol
- Phenanthrene
- Phenol

Fifteen volatile organic compounds were detected in the MKTF wells in 2016 at concentration levels above the applicable standards and are listed as follows: See Table 8.17.5 for the complete list.

- 1,2,4-trimethylbenzene (no cleanup standard in guidance)
- 1,3,5-trimethylbenzene (no cleanup standard in guidance)

- 1,2-dichloroethane (EDC)
- 1-methylnaphthalene
- Bromomethane
- Cis1,2-DCE
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 2-Hexanone
- Methylene chloride
- Methyl Naphthalene
- Naphthalene
- Tetrachloroethene (PCE)
- 1,1,1-Trichloroethane
- Trichloroethene (TCE)
- Vinyl Chloride

6.7 CONSTITUENT LEVELS FOR EVAPORATION PONDS, INFLUENTS, AND EFFLUENTS

There are eleven evaporation ponds located within the northwest section of the refinery. Evaporation pond 1 is more commonly known as Pond 1 and is considered separate from the remaining SMWU No. 2 Evaporation Ponds. Pond 1, which is out of service, is separated by a dike along the north side of aeration lagoon 1 (AL-1) and aeration lagoon 2 (AL-2), and was used as a holding pond for the aeration lagoons. Evaporation ponds 2 through 6 are separated by dikes and are located west of AL-2. Evaporation pond 9 (EP-9) is to the south and is separated from EP-2 through EP-6 by a two-track road. Evaporation ponds 7, 8, 11, 12A, and 12B are also separated by dikes and are located on the northwest corner of the refinery. In addition to the evaporation ponds, there is one effluent points that is routinely monitored.

6.7.1 EVAPORATION PONDS 1 THROUGH 12B

Samples have been collected annually from Pond 1 and EP-2 through EP-8 since 2007. In 2011, EP-9, EP-11, EP-12A, and EP-12B were added to the sample list, per the 2010 FWGWMP, and the sample frequency was increased to semi-annually for all of the ponds. Pond 1 is no longer in service.

In 2016, samples were collected from the evaporation ponds for the following analytes: BTEX, MTBE, major anions/cations, biochemical oxygen demand (BOD), chemical oxygen demand (COD), e-coli bacteria, WQCC total and dissolved metals, and VOCs and SVOCs. EP-2 through EP-9, EP-11, EP-12A, and EP-12B were sampled in 2016 on the following dates:

SAMPLE LOCATION	DATE	DATE
Ponds 2 – 12B	3/8/16	8/29/16

- Benzene was detected above the applicable standard of 0.005 mg/L in evaporation ponds (EP-2 and EP-3) in 2016. Benzene concentrations below the applicable standard were detected in EP-4, EP-5 and EP-12. Toluene, ethylbenzene, and total xylenes ~~and MTBE~~ have been detected at concentration levels below applicable standards in the following evaporation ponds: EP-2, EP- 3, EP-4 and EP-12B. (Table 8.15).

- Concentrations of fluoride, chloride, and sulfates exceeded the applicable WQCC standards in each evaporation pond during 2016 (Table 8.15). In 2016, BOD concentrations exceeded the general requirement of the 20 NMAC 6.2.3103 (<30 mg/L) in each of the evaporation ponds except for EP-~~8~~7 and EP-119. COD concentrations exceeded the general requirement (<125 mg/L) in each of the ponds.

- E-coli bacteria counts above the standard of 500 organisms per 100 ml of water were encountered in EP-2, EP-3, EP-4, EP-12A and EP-12B. Andeavor is unaware of any untreated wastewater that would carry this indicator organism being discharged into the evaporation ponds but will further investigate this occurrence. It is worth noting that a study published in 2006 (Ishii, S., Ksoll, WB, Hicks, RE, and Sadowsky, MJ; Presence and Growth of Naturalized Escherichia coli in Temperate Soils from Lake Superior Watershed; PubMed.gov; Jan. 2006; 72(1), pgs. 612-621) identified e-coli bacteria that occurred naturally in the soils and would seem to make the use of e-coli as an indicator organism of limited use. The publication states: "The presence of Escherichia coli in water is used as an indicator of fecal contamination, but recent reports indicate that soil populations can also be detected in tropical, subtropical, and some temperate environments. The presence of significant populations of naturalized populations of E. coli in temperate soils may confound the use of this bacterium as an indicator of fecal contamination." Since the evaporation ponds are unlined, earthen structures, it may be possible that the e-coli bacteria are not a good indicator of fecal contamination.

- Metals (total and dissolved): Arsenic, iron, ~~and~~ manganese and selenium have been detected in ~~the~~ several of the evaporation ponds in 2016 above the WQCC and EPA MCL listed standards. See Table 8.15.2 for a complete list.

- The constituent bromomethane was detected in EP-3, EP-12A and EP-12B above the NMED Tap Water standard of 0.00754 mg/L in 2016. See Table 8.15.4 for the complete list.

- Two SVOCs were detected exceeding the applicable standards in the following evaporation ponds in 2016: EP-2, EP-3, EP-4, EP-12A and EP-12B = bis (2-ethylhexyl)phthalate and Phenol in EP-2, EP-3, EP-4, EP-5, EP-6 and EP-12B. See Table 8.15.5 for the complete list.

- Four SVOCs were also detected exceeding applicable standards in EP-8 and are listed as follows: Ben(a)anthracene, benzo(a)pyrene, Benzo(b)fluoranthene and indeno(1,2,3-cd)pyrene. See table 8.15.~~5~~6 for a complete list of VOCs.

6.7.2 INFLUENTS: AL-1, AL-2, AND EP-1

The start-up of the new WWTP occurred in May 2012. By the end of June 2012, all of the processed water going into AL-1 was re-routed to the WWTP, via Tank 35 and the NAPIS unit, with the exception of the Pilot lift station. Some gravitational flow continued from AL-1 to AL-2 and from AL-2 to Pond 1 (EP-1) through the second half of 2013.

The aeration lagoons and pond 1 are no longer in service and no samples were collected in 2016.

6.7.3 EFFLUENTS: AL-2 TO EP-1, PILOT, AND NAPIS

All effluents have been non-existent since June 2013 due to re-routing waters to the WWTP. The last effluent sample from AL-2 was in June 2013. The Pilot effluent was rerouted in June 2013 while the NAPIS unit was re-routed mid-June 2012. No effluent analyses are available for 2016.

6.7.4 OUTFALL BW TO EP-2

BW is defined as reverse osmosis water coming from the boiler unit. The flow from the boiler unit discharges 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 2016.

6.7.5 OUTFALL STP1 to EP-2 Inlet

The EP-2 Inlet designation was changed to STP1 to EP-2 in the second half of 2012 due to the startup of the new WWTP and the new sanitary treatment pond (STP-1). STP-1 effluent now flows into the northeast corner of EP-2. Sampling of STP1 to EP-2 inlet was changed to quarterly beginning the second quarter of 2016 per NMED directive dated May 18, 2016, and sampled for the following analytes: BTEX, MTBE, VOCs, GRO, DRO, MRO, BOD, COD, and TDS.

- No BTEX and MTBE constituents were detected in all of 2016. DRO was detected in all of 2016 and ~~no~~ GRO was detected in the third quarter. ~~or~~ MRO was not detected. The TDS concentrations ~~of 5100 mg/L~~ exceeded the standard of 1,000 mg/L in the second, third, and fourth quarter of 2016. (Table 8.16).
- BOD and COD concentrations exceeded the applicable standards in 2016 (Tables 8.16.1).
- Three organic compounds were detected in 2016: (Acetone, 2-Butanone, Carbon Disulfide) all at concentrations below the applicable standards No other VOCs were detected in 2016 (Tables 8.16.2).

6.8 ADDITIONAL SAMPLING AND/OR CHANGES

Requirements by NMED per directive dated May 18, 2016 (HWB-WRG-14-006)

- The permittee must sample PW-4 during the next scheduled sampling event and then semi-annually thereafter;
- Since EDC is a lead scavenger, the Permittee must add analysis for 1,2-Dibromethane (EDB) in all monitoring wells where EDC has been detected.
- Permittee must include analysis for MTBE, EDC and EDB at OW-1 starting with the next round of quarterly sampling.
- The Permittee must sample the EP-2 inlet on a quarterly basis
- The Permittee may discontinue analysis for uranium in all wells
- The Permittee must edit Table 1 to remove the statement “[a]ll wells including Recovery Wells.”
- Permittee must submit a work plan and/or additional information for the following:
  - The Permittee must prepare a work plan for installation of a replacement well and propose to properly abandon OW-1.
  - Additionally, the Permittee must submit a work plan to propose additional wells downgradient of the Evaporation Ponds per OCD’s requirement (Comment 8).

SECTION 7

CONCLUSIONS AND RECOMMENDATIONS

This section is an overview of the analytical water quality data collected to identify potential impacts to the groundwater and determine if further monitoring or site investigations are required.

7.1 GROUP A

The boundary wells (BW-1A, BW-1B, BW-1C, BW-2A, BW-2B, BW-2C, BW-3A, BW-3B, and BW-3C) located in the northwest corner of the refinery along the west sides of evaporation ponds 7, 8 and 11 have not shown any detection of BTEX or MTBE constituents during annual sampling events. Three of the nine wells (BW-1A, BW-1B, and BW-3A) continue to indicate no water level since their original installation in 2003 and 2004. Fluoride concentrations were detected above WQCC standards in BW-1C, BW-2B, and BW-2C, which may be naturally occurring in the groundwater. No VOCs were detected in any of the BW wells in 2016. SVOC analytical requirement was discontinued from the BW annual sampling event per approval from NMED dated July 24, 2015.

RECOMMENDATION: *Continue with current monitoring schedule. There have been no significant changes or discoveries of contaminants that warrant any changes.*

The MW (MW-1, MW-2, MW-4, and MW-5) series of wells are located around the RCRA LTU. No detectable concentration levels of BTEX or MTBE constituents have been found in the groundwater samples collected from these wells. No metals (total or dissolved) exceeded the applicable standards; however, very low concentrations of arsenic, barium, lead, manganese, selenium and mercury were detected in most of the MW series of wells. There were five organic compounds detected in the MW wells at low concentration levels below applicable standards (bis (2-ethylhexyl)phthalate, benzoic acid, d-n-octylphthalate, dimethylphthalate and pyrene. These wells are also monitored under the RCRA Post Closure Permit on a 10-year cycle. The first cycle was completed in 2009/2010.

RECOMMENDATION: *Continue with current monitoring schedule and the RCRA 10 year monitoring.*

The SMW (SMW-2, SMW-4) wells are also located around the RCRA LTU and are screened in the Chinle/Alluvium Interface stratigraphic unit. These wells are also monitored under the RCRA Post-Closure Permit on a 10-year cycle. The first cycle was completed in 2009/2010. No detectable concentration levels of BTEX constituents were found in these wells from 2006 through 2016. MTBE was detected in SMW-2 at concentration levels below the NMED Tap Water standard of 0.143 mg/L. SMW-2 also had elevated chloride and sulfate levels, and manganese was detected exceeding the WQCC standard in both SMW-2 and SMW-4. Five organic constituents were detected at concentration levels below the applicable standards in 2016. (Benzoic acid, bis(2-ethylhexyl)phthalate, di-n-octylphthalate, ~~diethylphthalate,~~ dimethylphthalate, and phenol ~~and pyrene~~).

RECOMMENDATION: *Continue with current monitoring schedule and the RCRA 10 year monitoring.*

7.2 GROUP B – GROUNDWATER MONITORING

~~Benzene concentrations from all 2016 sampling events at GWM-1 have exceed applicable standards. This would indicate the potential for historical releases from the aeration lagoons and/or other nearby SWMUs (e.g., Old API Separator).~~ GWM-1 contained SPH throughout 2016 and was not sampled. There was an insufficient volume of water in GWM-2 during the fourth quarter of 2013 for sample collection, and the well was reported dry for all of 2014 and 2016. GWM-3 was dry during 2013, 2014 and 2016.

RECOMMENDATION: *Continue with current monitoring schedule. There have been no significant changes or discoveries of contaminants that warrant any changes.*

The GWM wells located at the aeration lagoons were not sampled in 2016. GWM-2 and GWM-3 had no detection of a water level since 2014 through 2016. In the fourth quarter 2015~~6~~, an SPH level was detected in GWM-1 and in all of 2016 and no ground water samples were collected. Wells continue to be checked on a quarterly basis.

RECOMMENDATION: *Continue with current inspection schedule. Monitor GWM-1 on a more regular basis: gauging water/SPH level, purge dry to check for recharge rate and monitor level of SPH after each purge.*

~~At the NAPIS wells, there is no significant deviation in the detection of contaminants at the wells.~~ In 2016 well NAPIS-1 recorded ~~continues to indicate~~ detect~~ions~~able concentrations of MTBE for the first time. However, the ~~at~~ detected concentrations were below applicable standards, fluctuating from 0.002 mg/L to a low of 0.000873~~2~~ mg/L. No changes in NAPIS-2, NAPIS-3 or KA-3, continued detection of Benzene and MTBE. Fluoride and~~&~~ chloride continue to be detected in NAPIS-1, NAPIS-2 and NAPIS-3 and~~AND~~ KA-3. However, the applicable water quality standards for fluoride and chloride were exceeded only in wells NAPIS-2 and NAPIS-3. Metals (total and dissolved) continue to be detected in all of the wells through 2016~~ with barium, iron and manganese detected in all wells~~. Metals that were detected in various wells at concentrations above the applicable cleanup standard included iron, manganese, and uranium. Arsenic, selenium, and zinc were present at concentrations below applicable regulatory standards. No samples were collected for SVOC analysis from the NAPIS or KA-3 wells. This was due to the contract sampler not using the updated sampling schedule. The collection of samples for SVOC analysis will resume in the third quarter of 2018. No VOCs were detected in NAPIS-1 above screening levels; 14~~3~~ VOCs were detected in NAPIS-2 all at concentration levels below applicable standards, except 1-methylnaphthalene and naphthalene. Twelve~~Nine~~ VOCs were detected in NAPIS-3 at concentration levels below applicable standards and only 1-methylnaphthalene was detected above screening levels. In KA-3 ten VOCs were detected. Most were at concentration levels below applicable standards, however, 1-methylnaphthalene and naphthalene were detected at concentrations above applicable standards~~.~~

RECOMMENDATION: *Continue with current inspection schedule. No changes required.*

There are three leak detection units on the NAPIS Unit which are inspected for fluid level. Quarterly inspections of the units have indicated the continued presence of fluids in the East LDU and West LDU. The Oil Sump LDU has not had any detection of fluid since the second half of 2013. Both LDUs continue to be pumped on a regular basis. ~~In the third quarter 2016, there was not enough water for sample collection.~~ The East Bay of the LDU was out of service and closed in 2015. The presence of water in the East LDU during that period suggests that there may be an inflow of groundwater through an opening in the liner. Andeavor intends to conduct testing on the LDU to ascertain the source of the water in the East LDU. Recent water column measurements on the West LDU also indicate that the bay is leaking into the LDU, or that there is a source of inflow into the LDU~~. The East LDU also contains water but it has been out of service for the last year.~~ Plans are to inspect the east bay, place it back in service and then take the west bay out of service for inspection.

RECOMMENDATION: *Continue with current inspection schedule. No changes required.*

A new well was installed on July 17, 2012, designated as OAPIS-1. The installation of this well is from a site investigation conducted according to the Investigation Work Plan Solid Waste Management Unit (SMWU) No. 1 Aeration Basin and SMWU No. 14 Old API Separator. No significant deviations from past analytical with the exception of cyanide detected in the fourth quarter at a concentration level (0.504 mg/L) above the WQCC standard of 0.2 mg/L. ~~reading 0.504 mg/L~~. The source of the cyanide is uncertain as it is not a feedstock used by the refinery in any of it's processes.

RECOMMENDATION: *Continue with current inspection schedule. No changes required.*

7.3 GROUP C – GROUNDWATER MONITORING

Groundwater monitoring activities from the Group C wells (northeast side of the Refinery) have shown that an MTBE plume exists in the area of OW-13, OW-14, OW-29, and OW-30. In March of 2010, dedicated pumps were installed in all four wells to prevent possible cross contamination from sampling equipment and or field activities. Although concentration levels of MTBE in OW-13 does not exceed the applicable standard of 0.143 mg/L, sample data indicates a steady increase of MTBE from year to year. Of the four wells OW-14 is the only well where two constituents (benzene and MTBE) have been consistently detected in the groundwater samples collected since 2006 that have exceeded the applicable standards. These two constituents continued to increase from year to year through 2016. OW-14 is located down-gradient from two recovery wells RW-1 and RW-2. RW-1 is the only well where hydrocarbons are continually recovered.

Downgradient from OW-14 is OW-29 and OW-30 and the analytical data from both of these wells indicates that MTBE is present in the groundwater at concentration levels exceeding the NMED Tap Water standard of 0.143 mg/L since March of 2010 in OW-29 and December 2007 in OW-30. Analytical data for these four wells indicate a steady increase of MTBE concentration levels indicating that the MTBE plume is slowly migrating in a northerly direction down-gradient from RW-1 and RW-2. The stratigraphic units in which these wells are screened is the Chinle/Alluvium Interface.

RECOMMENDATION: *An investigation work plan was initiated concerning OW-14 contaminant plume migration. Additional soil borings and wells were installed in the tank farm area and results are being evaluated. Continue with current sampling requirements. No changes required.*

Two new wells (OW-50 and OW-52) were installed in October 2009 downgradient of OW-13, OW-14 and OW-29 to monitor possible migration of MTBE in a north, north-east direction. No detectable concentration levels of BTEX or MTBE constituents were detected in OW-50 and OW-52 through 2015, however, during the annual sampling event in 2016, MTBE was detected in low concentrations in both OW-50 and OW-52 and 1,2-dichloroethane (EDC) was also detected in both wells at concentration levels below the applicable standard of 0.005 mg/L.

RECOMMENDATION: *Due to the detection of MTBE and EDC in wells OW-50 and OW-52, sampling frequency for these wells will be changed to a quarterly basis. This will also be noted in the Facility Wide*

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Groundwater Sampling Work Plan. Both MTBE and EDC will be added to the analytical requirements for each well. Analysis for EDC will be conducted using EPA Method 8011. ~~Continue with current sampling requirements. No changes required.~~

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The inspection of the four recovery wells (RW-1, RW-2, RW-5 and RW-6) will continue as scheduled along with SPH recovery. No changes in product recovery are required and will continue with scheduled quarterly inspections. Product recovery continues in RW-1 as there is a measureable hydrocarbon column thickness. Field notes indicate that although the SPH thickness level in RW-1 has generally increased since the first quarter of 2013, hydrocarbon recovery has shown a general decrease from 2005 through 2016. Total hydrocarbon recovery is estimated at 8.5 gallons for 2016 compared to 431 gallons in 2005. Hydrocarbon recovery is done only during quarterly inspections because of the decline in hydrocarbons observed in the well when it first began in 2005 when the well was continuously pumped. Additional information regarding characteristics of RW-1 will be collected during field work from the approved Work Plan for investigation at OW-14. RW-5 and RW-6 product recovery has also been declining. From 2010 through 2016, no product has been recovered from RW-5 and no product was recovered from RW-6 from 2012 to 2016. Although there is no measureable product level in RW-5 and RW-6, both wells will continue to be bailed as there is evidence of hydrocarbons in the wells from observing the bailed water (slight odor with a visible sheen).

RECOMMENDATION: *Continue with current inspection/sampling schedule. No changes required.*

7.4 GROUP D – GROUNDWATER MONITORING

PW-2, PW-3 and PW-4 are all process/production wells that are all set at around 1000 feet. All three of these wells are sampled every three years with the exception of PW-3 which was changed to annual in 2009 due to the detection of 2-methylnaphthalene in January 2008. Although the samples collected in August 2008 were all non-detect, it was determined by NMED that annual sampling was required for PW-3. PW-4 was switched to semi-annual sampling in the second half of 2016 per NMED directive (HWB-WRG-14-06) due to the detection of VOCs. In 2016 10 VOCs were detected at low concentration levels below the applicable standards. PW-2 remains on a three-year sample event and next scheduled sample date for PW-2 is 2017.

RECOMMENDATION: *Continue with current inspection/sampling schedule. No changes required.*

OW-1 is a flowing artesian well located on the west section of the refinery property. Historically, OW-1 is a relatively clean well; however, very low concentrations of benzene, toluene, total xylenes, and MTBE were detected for the first time in the fourth quarter of 2015. Only MTBE continued to be detected throughout 2016.

OW-10 is completed in the Sonsela Aquifer and is located directly east of evaporation pond 9 (EP-9). No BTEX constituents were detected in all of 2016 in OW-10 with the exception of MTBE at concentrations below the applicable standard of 0.143 mg/L. Due to the detection of MTBE in OW-10, NMED and OCD has requested that an additional boundary monitoring well be installed. Four organic compounds were detected in 2016: 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethane (EDC) and cis-1,2-DCE, all at concentration levels below the applicable standards.

RECOMMENDATION: *Continue with current inspection/sampling schedule. No changes required.*

Observation well OW-11 is located within the refinery property (southeast) on the west side of the main entrance and OW-12 is located within the surplus yard located west and slightly north of the primary tank farm. OW-11 and OW-12 are screened in the Sonsela stratigraphic unit. There was no detection of BTEX, MTBE, GRO/DRO/MRO or VOC constituents in 2016. Fluoride and sulfate were detected above screening levels in OW-11, which is an up-gradient background monitoring well.

RECOMMENDATIONS: *Continue with current sampling schedule.*

7.5 GROUP E – GROUNDWATER MONITORING

To date, a total of 44 permanent monitoring wells (MKTF-1 through MKTF-44) have been installed to aid in delineating the extent of a hydrocarbon seep discovered in 2013, directly west of crude tanks T-101 and T-102. During the investigation, a pre-existing well (labeled as MKTF-45) was found directly west of the truck-loading rack. The MKTF wells are sampled quarterly. BTEX, MTBE, DRO, GRO, total and dissolved metals, and several VOCs and SVOCs have been detected in many of the wells above the referenced standards. Of the 44 wells installed, ~~eleven~~ fourteen MKTF wells have been identified having an SPH level.

RECOMMENDATIONS: *Continue with current sampling schedule in 2017. This will establish a clear baseline of at least three years of quarterly monitoring in most MKTF wells. It is recommended to reduce the monitoring frequency in 2018, as many of the analytical results indicate little change over the monitoring period, such that continued quarterly monitoring is not warranted. At the wells identified as having an SPH level, begin a routine hydrocarbon recovery effort to evaluate recharge rate and record volumes of water and SPH recovered. Continue on-going recovery at existing sumps.*

7.6 ADDITIONAL MONITORING

- Continue with the sampling requirements of the most current approved Facility Wide Groundwater Monitoring Work Plan.
- In order to prevent duplication and potential conflict of documentation, recommendations and/or changes to monitoring requirements will be included in future investigation work plans.
- Submit the Annual Groundwater Monitoring Report on or before September 1 of every year.
- Submit recommendations to change or modify sampling requirements as needed.
- Conduct site assessments as required when spills/leaks are discovered.

SECTION 8

DATA TABLES

8.1 BW-1A/B/C, BW-2A/B/C, BW-3A/B/C
8.2 MW-1, MW-2, MW-4, MW-5
8.3 SMW-2, SMW-4
8.4 OW-11, OW-12
8.5 OW-50, OW-52
8.6 PW-2, PW-3, PW-4
8.7 GWM-1, GWM-2, GWM-3
8.8 NAPIS-1, NAPIS-2, NAPIS-3, KA-3
8.9 OAPIS-1
8.10 LEAK DETECTION UNITS (East LDU, West LDU, Oil Sump LDU)
8.11 RW-1, RW-2, RW-5, RW-6
8.12 OW-1, OW-10
8.13 OW-13, OW-14, OW-29, OW-30
8.14 STP-1NW and STP-1SW
8.15 EVAPORATION PONDS 1 - 12B
8.16 STP-1 to EP-2
8-17 MKTF-1 thru MKTF-45

COMPLETE DATA TABLES ON ATTACHED CD.

SECTION 9

WELL DATA DTW/ DTB MEASUREMENTS

The 2016 Well Data DTB/DTW Measurements has been updated with survey information submitted to and approved by NMED per notification received “Approval with Modifications, Requirement to Resurvey Groundwater Monitoring Wells and Recovery Wells issued on September 26, 2012. Western was required to resurvey the monitoring wells due to discrepancies found in applicable standards ground level elevation, well casing elevation, well casing bottom elevation and stick up lengths. All monitoring wells were surveyed by a licensed professional surveyor, DePauli Engineering on June 7, 2011, April 2014, September 2014, December 2014, and January 2016. The Well Data Table is attached as Section 9.1.

The additional wells from the hydrocarbon seep (MKTF series) and the two new wells STP1-NW and STP1-SW were surveyed by Hammon Enterprises Inc., professional surveyor on September 15, 2014, December 16, 2014 and on December 16, 2014.

SECTION 10

2016 MONITORING SCHEDULE

Table 1 in Section 10 details the approved Ground Water Monitoring Schedule for all wells at Gallup Refinery and details the analytical suite required for each sample site location.

FIGURES

APPENDIX A

SEPARATE PHASE HYDROCARBON RECOVERY LOGS

APPENDIX B

FIELD INSPECTION LOGS

APPENDIX C

APPLICABLE STANDARDS

APPENDIX D

SUMMARY OF EPA/NMED/RCRA ACTIVITY

APPENDIX E

SUMMARY OF ALL LEAKS, SPILLS AND RELEASES

APPENDIX F

TEMPORARY LAND FARM ANALYTICAL RESULTS

(ON ATTACHED CD)

APPENDIX G

HALL LABORATORY ANALYTICAL DATA

(ON ATTACHED CD)


Western
Refining