AP - 111

FWGWMWP

2019

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

August 31, 2020

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

RE: RESPONSE TO APPROVAL WITH MODIFICATIONS FACILITY WIDE GROUND WATER MONITORING WORK PLAN – UPDATES FOR 2019
WESTERN REFINING SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-19-012

Dear Mr. Moore:

The New Mexico Environment Department (NMED) has reviewed the *Response to Approval with Modifications Facility Wide Ground Water Monitoring Work Plan – Updates for 2019* (Response), dated February 25, 2020 submitted on behalf of Marathon Petroleum Company dba Western Refining Southwest Inc., Gallup Refinery (the Permittee). The Permittee must address the following comment.

Comment 1

The Permittee's response to NMED's Approval with Modifications Comment 1 states, "[the issue associated with the direct discharge of the RO reject water] was previously addressed in a letter dated November 12, 2019." The Permittee's response to NMED's Comment 3 in the November 12, 2019 letter (*Hydrocarbon Seep Interim Measures 2019 Second Quarter Status Report*) states, "[t]he State of New Mexico has been aware of the discharge of the RO Reject to Pond 2 for some time. The Annual Groundwater Reports that are submitted to the NMED and

OCD contain data tables that summarize "general chemistry" of the pond water that includes a discussion of chlorides. Re-routing the RO Reject to Pond-9 from Pond-2 does not represent a substantial change in that process." However, New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) issued a letter requiring the Permittee to submit a discharge permit application on March 5, 2020. Considering that OCD was aware of the discharge, the basis for the OCD's directive is presumably not associated with the RO reject water discharge. NMED is not aware of other discharges at the facility except that from STP-1. In a response letter, explain the nature of all on-going surface discharges, if applicable.

The Permittee must address the comment above in this letter and submit a response letter no later than **December 31, 2020**.

If you have questions regarding this letter, please contact Michiya Suzuki of my staff at 505-476-6046.

Sincerely,

Dave Cobrain
Program Manager
Hazardous Waste Bureau

cc: M. Suzuki, NMED HWB
C. Chavez, OCD
L. King, EPA Region 6 (6LCRRC)
B. Moore, WRG

File: Reading File and WRG 2020 File
HWB-WRG-19-012

Marathon Petroleum Company LP

February 25, 2020

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

RE: Response to Approval with Modifications
Facility Wide Ground Water Monitoring Work Plan – Updates for 2019
Marathon Petroleum Company LP, Gallup Refinery
(dba Western Refining Southwest, Inc.)
EPA ID# NMD000333211
HWB-WRG-19-012

Dear Mr. Pierard:

Marathon Petroleum Company LP (dba Western Refining Southwest, Inc.) Gallup Refinery is submitting the enclosed responses to your comments dated November 15, 2019 on the referenced Work Plan. You will also find enclosed the revised page for Section 2.4.1.3, a redline copy of same, and the requested table with screening levels compared to MDLs. If there are any questions, please call Brain Moore at 505-726-9745.

Certification

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

Sincerely,
Marathon Petroleum Company LP, Gallup Refinery

Robert S. Hanks
Refinery General Manager

Enclosure

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

92 Giant Crossing Road
Jamestown, NM 87347

RESPONSE TO COMMENTS
November 15, 2019 Approval with Modifications
Facility Wide Ground Water Monitoring Work Plan
(September 2019)

NMED Comment 1:
The Permittee's response to NMED's Comment 4 states, "[d]ue to a leak in the pipeline that went to EP-2, the flow has been temporality diverted to EP-9." Comment 3 in NMED's *Response to Comments Approval - Hydrocarbon Seep Interim Measures 2019 Second Quarter Status Report,* dated September 20, 2019 states, "[c]larify whether the Permittee currently has an approval from New Mexico Department of Energy, Minerals, and Natural Resources (EMNRD) Oil Conservation Division (OCD) to use evaporation ponds (e.g., EP-9) for the discharge of the RO reject water. Additionally, it is not clear whether EMNRD OCD has agreed to the direct discharge of the RO reject water to Pond STP-1 because [the] wastewater treatment process associated with Pond STP-1 does not reduce the concentrations of constituents (e.g., chloride and sulfate) in the RO reject water. Clarify whether the Permittee has an approval from EMNRD OCD to route the RO reject water to Pond STP-1." The Permittee was required to submit a response letter to address the comment no later than **November 1, 2019.** This comment serves as a reminder.

MPC Response 1:
The comment is acknowledged and this was previously addressed in a letter dated November 12, 2019, which responded to NMED's comments on the Hydrocarbon Seep Interim Measures 2019 Second Quarter Status Report.

NMED Comment 2:
The Permittee's response to NMED's Comment 8 states, "[t]he Work Plan is not the proper document to summarize all of the detections in water samples that are collected pursuant to the Work Plan. This is done in the Annual Ground Water Monitoring Reports." It is appropriate to summarize detections in the Work Plan in order to evaluate proposed changes to the groundwater monitoring and sampling plan. When changes are proposed, present all data pertinent to the proposed changes. No response required.

MPC Response 2:
The comment is acknowledged.

NMED Comment 3:
The Permittee's response to NMED's Comment 12 states, "[t]he top of the Sonsela should be higher at OW-11 than at OW-63, not lower." Well OW-63 is located more than 500 feet east of well OW-11. Therefore, it is possible that the top of the Sonsela at OW-11 is lower than at OW-63 because it is dipping to the west/northwest. The Permittee further states, "[t]he water level elevation measured in OW-63 is generally consistent with that of surrounding wells ... " Since the water level elevations in the Sonsela and Chinle/Alluvium Interface are known to be notably different, a consistent water level measured in well OW-63 in comparison to that of the surrounding wells screened to the Chinle/Alluvium Interface indicates that well OW-63 is not screened within the Sonsela. Therefore, the well is not required to be replaced. No response required.

MPC Response 3:
The comment is acknowledged.

NMED Comment 4:

The Permittee's response to NMED's Comment 13 states, "[t]he discussion in Section 2.4.4 (page 15) is revised to refer to SPH." Since separate phase hydrocarbons (SPH) were detected during the third quarter of 2015, Section 2.4.1.3 that states, "[a] measurable level of SPH was identified in GWM-1 during the fourth quarter sampling event in 2015 through November 2018," must be revised for consistency. Revise the statement and provide a replacement page**.**

MPC Response 4:
The reference to the "fourth quarter sampling event in 2015" in Section 2.4.1.3 has been revised to refer to the "third quarter sampling event in 2015." The replacement page is enclosed.

NMED Comment 5:
The Permittee's response to NMED's Comment 17 states, "[t]he comment is acknowledged." Comment 17 states, "[s]ubmit the report summarizing the results of the inspection and repair of the NAPIS or submit an extension request." The Permittee's response to Comment 6 in the *Disapproval 2017 Annual Groundwater Monitoring Report,* dated July 5, 2019 states, "[t]he Gallup Refinery's wastewater treatment system will undergo a major upgrade. Although the exact date of the upgrade has not been established, the Gallup Refinery is on the MPC list of priority sites. Additionally, MPC has made the NMED aware of these plans and has shared the draft design information with the NMED. MPC will keep the NMED informed of the progress of this project." The Permittee's response to NMED's Comment 17 should have referenced the above response for clarity. Unless the plans for the upgrade are changed or canceled, the NAPIS report will not be required at this time.

MPC Response 5:
The comment is acknowledged and the plan for the upgrade has not been changed or canceled.

NMED Comment 6:
The Permittee's response to NMED's Comment 19 states, "(t]he requested table [that presents applicable screening levels and detection limits for the constituents of concern] is enclosed." However, the table is not provided in the Work Plan; submit the table no later than February 28, 2020.

MPC Response 6:
The requested table is enclosed.

with an addition of one pre-existing well, which has been labeled as MKTF-45, and is located in the vicinity of the site investigation. SPH has been measured in Marketing Tank Farm (MKTF) wells located west and northwest of the truck loading rack and marketing tank farm, extending northwest to the location of the hydrocarbon seep. The Gallup Refinery continues to further characterize potential source areas, recovery of liquids from the temporary sumps, and continued sampling of the monitoring wells for characterization and delineation purposes. All 45 wells were added to the Ground Water Monitoring Schedule (see Appendix B).

Additional soil staining was observed north, northwest of the sumps and these sites were excavated of approximately 38.26 tons of soil, which was sent to the Painted Desert Landfill for disposal.

Temporary retention ditches were installed to recover liquids from this area. From April 1, 2016 through December 31, 2018, approximately 611,530 gallons of liquid (hydrocarbon and ground water) have been recovered from this area via vacuum truck.

RECOVERY WELLS
MKTF-01 THRU MKTF-45

2.4.1.3 Aeration Basin

A measurable level of SPH was identified in GWM-1 during the third quarter sampling event in 2015.

2.4.1.4 French Drain Release

On February 6, 2018 a mixture of hydrocarbon and water was discovered flowing out of a 4-inch diameter PVC pipe that discharges into a stormwater drainage ditch south of STP-1. Sample analysis indicated the hydrocarbon was naphtha. The flow from the pipe was estimated to be 1.7 gallons per minute. The drainage ditch feeds into a small collection pond that is equipped with a drain valve. The valve was closed and no hydrocarbon was discharged from the pond. A catch basin was installed at the discharge point of the PVC pipe. Site personnel utilized a vacuum truck to transfer the discharge back into the Gallup Refinery.

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RECOVERY WELLS
MKTF-01 THRU MKTF-45

2.4.1.3 Aeration Basin

A measurable level of SPH was identified in GWM-1 during the third~~fourth~~ quarter sampling event in 2015.

2.4.1.4 French Drain Release

On February 6, 2018 a mixture of hydrocarbon and water was discovered flowing out of a 4-inch diameter PVC pipe that discharges into a stormwater drainage ditch south of STP-1. Sample analysis indicated the hydrocarbon was naphtha. The flow from the pipe was estimated to be 1.7 gallons per minute. The drainage ditch feeds into a small collection pond that is equipped with a drain valve. The valve was closed and no hydrocarbon was discharged from the pond. A catch basin was installed at the discharge point of the PVC pipe. Site personnel utilized a vacuum truck to transfer the discharge back into the Gallup Refinery.

Groundwater Screening Levels vs. Method Detection Limits
Marathon Petroleum Company - Gallup Refinery
Gallup, New Mexico

	New Mexico WQCC Standards	NMED Tap Water	NMED TapW_key	EPA Screening Levels.Tap Water	EPA TapW_key	MCL	MDL	Analytical Method
Metals (ug/l) TOTAL								
Antimony	**6**	7.26E+00	n	7.80	n	6	0.39	E200.8
Arsenic	**10**	8.55E-01	c	0.05	c	10	0.31	E200.8
Barium	**2000**	3.28E+03	n	3800	n	2000	0.65	E200.8
Beryllium	**4**	1.24E+01	n	25	n	4	0.28	E200.8
Cadmium	**5**	6.24E+00	n	9.20	n	5	0.74	E200.7
Chromium	**50**	5.70E+00	c	22000	n	100	1.53	E200.7
Cobalt	**50**	5.98E+00	n	6	n	-	3.09	E200.7
Cyanide	**200**	1.46	n	1.50	n	200	5.00	4500CN E-2011
Iron	**1000**	1.38E+04	n	14000	n	-	8.75	E200.7
Lead	**15**	-	-	15	L	15	0.05	E200.7
Manganese	**200**	2.02E+03	n	430	n	-	0.29	E200.8
Mercury	**2**	6.26E-01	n	0.63	n	2	0.04	E200.7
Nickel	-	**3.72E+02**	n	200	n	-	4.01	E200.7
Selenium	**50**	9.87E+01	n	100	n	50	0.48	E200.8
Silver	**50**	8.12E+01	n	94	n	-	1.42	E200.7
Vanadium	-	**6.31E+01**	n	86	n	-	1.30	E200.7
Zinc	**10000**	5.96E+03	n	6000	n	-	5.77	E200.7
Chloride	**250000**	-	-	-	-	-	62.50	E300
Fluoride	**1600**	1.18E+03	n	800	n	-	50.00	E300
Sulfate	**600000**	-	-	-	-	-	53.50	E300
Metals (ug/l) DISSOLVED								
Antimony (D)	**6**	7.26E+00	n	7.80	n	6	0.39	E200.8
Arsenic (D)	**10**	8.55E-01	c	0.05	c	10	0.10	E200.8
Barium (D)	**2000**	3.28E+03	n	3800	n	2000	0.65	E200.8
Beryllium (D)	**4**	1.24E+01	n	25	n	4	0.28	E200.8
Cadmium (D)	**5**	6.24E+00	n	9.20	n	5	0.55	E200.7
Chromium (D)	**50**	5.70E+00	c	22000	n	100	1.53	E200.7
Cobalt (D)	**50**	5.98E+00	n	6	n	-	3.09	E200.7
Iron (D)	**1000**	1.38E+04	n	14000	L	-	8.75	E200.7
Lead (D)	**15**	-	-	15	n	15	0.05	E200.8
Manganese (D)	**200**	2.02E+03	n	430	n	-	0.29	E200.7
Nickel (D)	-	**3.72E+02**	n	200	n	-	4.01	E200.7
Selenium (D)	**50**	9.87E+01	n	100	n	50	0.17	E200.8
Silver (D)	**50**	8.12E+01	n	94	n	-	0.94	E200.7
Vanadium (D)	-	**6.31E+01**	n	86	n	-	1.30	E200.7
Zinc (D)	**10000**	5.96E+03	n	6000	n	-	2.25	E200.7
Volatiles (ug/l)								
1,1,1,2-Tetrachloroethane	-	**5.74E+00**	c	5.70E-01	c	-	0.21	8260
1,1,1-Trichloroethane	**200**	8.00E+03	n	8.00E+03	n	200	0.17	8260
1,1,2,2-Tetrachloroethane	**10**	7.57E-01	c	7.60E-02	c	-	0.55	8260
1,1,2-Trichloroethane	**5**	4.15E-01	c	2.80E-01	c**	5	0.22	8260
1,1-Dichloroethane	**25**	2.75E+01	c	2.80E+00	c	-	0.14	8260
1,1-Dichloroethene	**7**	2.84E+02	n	2.80E+02	n	7	0.21	8260
1,1-Dichloropropene	-	-	-	-	-	-	0.16	8260
1,2,3-Trichlorobenzene	-	-	-	**7.00E+00**	n	-	0.30	8260
1,2,4-Trichlorobenzene (V)	**70**	3.98E+00	n	1.20E+00	c**	70	0.20	8260
1,2,4-Trimethylbenzene	-	-	-	**5.60E+01**	n	-	0.21	8260
1,2-Dibromoethane (EDB)	**0.05**	7.47E-02	c	7.50E-03	c	0.05	0.0049	8011
1,2-Dichlorobenzene (V)	**600**	3.02E+02	n	3.00E+02	n	600	0.30	8260
1,2-Dichloroethane (EDC)	**5**	1.71E+00	c	1.70E-01	c*	5	0.19	8260

Groundwater Screening Levels vs. Method Detection Limits
Marathon Petroleum Company - Gallup Refinery
Gallup, New Mexico

	New Mexico WQCC Standards	NMED Tap Water	NMED TapW_key	EPA Screening Levels.Tap Water	EPA TapW_key	MCL	MDL	Analytical Method
1,2-Dichloropropane	**5**	4.38E+00	c	8.50E-01	c*	5	0.21	8260
1,3,5-Trimethylbenzene	-	-	-	**6.00E+01**	n	-	0.19	8260
1,3-Dichlorobenzene (V)	-	-	-	-	-	-	0.25	8260
1,3-Dichloropropane	-	-	-	**3.70E+02**	n	-	0.20	8260
1,4-Dichlorobenzene (V)	-	4.82E+00	c	4.80E-01	c	**75**	0.29	8260
1-Methylnaphthalene (V)	-	**1.14E+01**	c	1.10E+00	c	-	0.31	8260
2,2-Dichloropropane	-	-	-	-	-	-	0.23	8260
2-Butanone	-	**5.56E+03**	n	5.60E+03	n	-	2.09	8260
2-Chlorotoluene	-	**2.33E+02**	-	2.40E+02	n	-	0.25	8260
2-Hexanone	-	-	-	**3.80E+01**	n	-	1.55	8260
2-Methylnaphthalene (V)	-	**3.51E+01**	n	3.60E+01	n	-	0.35	8260
4-Chlorotoluene	-	-	-	**2.50E+02**	n	-	0.23	8260
4-Isopropyltoluene	-	-	-	-	-	-	0.22	8260
4-Methyl-2-pentanone	-	**1.24E+03**	n	-	-	-	0.71	8260
Acetone	-	**1.41E+04**	n	1.40E+04	n	-	1.20	8260
Benzene	**5**	4.55E+00	c	4.60E-01	c*	5	0.17	8260
Bromobenzene	-	-	-	**6.20E+01**	n	-	0.24	8260
Bromodichloromethane	-	**1.34E+00**	c	1.30E-01	c	-	0.13	8260
Bromoform	-	**3.29E+01**	c	3.30E+00	c*	-	0.29	8260
Bromomethane	-	**7.54E+00**	n	7.50E+00	n	-	0.27	8260
Carbon disulfide	-	**8.10E+02**	n	8.10E+02	n	-	0.45	8260
Carbon Tetrachloride	**5**	4.55E+00	c	4.60E-01	c	5	0.14	8260
Chlorobenzene	-	7.76E+01	n	7.80E+01	n	**100**	0.19	8260
Chloroethane	-	**2.09E+04**	n	-	-	-	0.18	8260
Chloroform	**100**	2.29E+00	c	2.20E-01	c	-	0.12	8260
Chloromethane	-	**2.03E+01**	c	1.90E+02	n	-	0.32	8260
cis-1,2-DCE	**70**	3.65E+01	n	3.60E+01	n	70	0.19	8260
cis-1,3-Dichloropropene	-	**4.71E+00**	c	4.70E-01	c	-	0.14	8260
Dibromochloromethane	-	**1.68E+00**	c	8.70E-01	c	-	0.24	8260
Dibromomethane	-	-	-	**8.30E+00**	n	-	0.21	8260
Dichlorodifluoromethane	-	**1.97E+02**	n	2.00E+02	n	-	0.26	8260
Ethylbenzene	**700**	1.50E+01	c	1.50E+00	c	700	0.13	8260
Hexachlorobutadiene (V)	-	**1.39E+00**	c	1.40E-01	c*	-	0.31	8260
Isopropylbenzene	-	**4.47E+02**	n	4.50E+02	n	-	0.19	8260
Methyl tert-butyl ether (MTBE)	**100**	1.43E+02	c	1.40E+01	c	-	0.46	8260
Methylene Chloride	**5**	1.18E+02	c	1.10E+01	c**	5	0.15	8260
Naphthalene (V)	**30**	1.65E+00	c	1.70E-01	c*	-	0.28	8260
n-Butylbenzene	-	-	-	1.00E+03	-	-	0.23	8260
n-Propylbenzene	-	-	-	6.60E+02	-	-	0.21	8260
sec-Butylbenzene	-	-	-	2.00E+03	-	-	0.25	8260
Styrene	**100**	1.21E+03	n	1.20E+03	n	100	0.19	8260
tert-Butylbenzene	-	-	-	-	-	-	0.21	8260
Tetrachloroethene (PCE)	**5**	1.13E+02	c	1.10E+01	c**	5	0.15	8260
Toluene	**1000**	1.09E+03	n	1.10E+03	n	1000	0.35	8260
trans-1,2-DCE	**100**	9.32E+01	n	3.60E+02	n	100	0.18	8260
trans-1,3-Dichloropropene	-	**4.71E+00**	c	4.70E-01	c*	-	0.17	8260
Trichloroethene (TCE)	**5**	2.59E+00	c	4.90E-01	c**	5	0.17	8260
Trichlorofluoromethane	-	**1.14E+03**	n	5.20E+03	n	-	0.19	8260
Vinyl chloride	**2**	3.24E-01	c	1.90E-02	c	2	0.18	8260
Xylenes, Total	**620**	1.93E+02	n	1.90E+02	n	10000	0.45	8260
Semivolatiles (ug/l)								

Groundwater Screening Levels vs. Method Detection Limits
Marathon Petroleum Company - Gallup Refinery
Gallup, New Mexico

	New Mexico WQCC Standards	NMED Tap Water	NMED TapW_key	EPA Screening Levels.Tap Water	EPA TapW_key	MCL	MDL	Analytical Method
1,2,4-Trichlorobenzene	-	1.15E+01	c	1.20E+00	c	**70**	4.04	8270
1,2-Dichlorobenzene	**600**	3.70E+02	n	3.00E+02	n	600	4.77	8270
1,3-Dichlorobenzene	-	-	-	-	-	-	5.27	8270
1,4-Dichlorobenzene	**75**	4.82E+00	c	4.80E-01	c	75	4.42	8270
1,4-Dioxane	-	**4.59E+00**	c	4.60E-01	c	-	2.00	8270/8270SIM
1-Methylnaphthalene	-	**1.14E+01**	c	1.10E+00	c	-	3.07	8270
2,4,5-Trichlorophenol	-	**1.17E+03**	n	1.20E+03	n	-	2.97	8270
2,4,6-Trichlorophenol	-	**1.19E+01**	n	4.10E+00	c**	-	2.33	8270
2,4-Dichlorophenol	-	**4.53E+01**	n	4.60E+01	n	-	2.92	8270
2,4-Dimethylphenol	-	**3.54E+02**	n	3.60E+02	n	-	2.97	8270
2,4-Dinitrophenol	-	**3.87E+01**	n	3.90E+01	n	-	2.59	8270
2,4-Dinitrotoluene	-	**2.37E+00**	c	2.40E-01	c	-	2.00	8270
2,6-Dinitrotoluene	-	**4.85E-01**	n	4.90E-02	c	-	0.20	8270
2-Chloronaphthalene	-	**7.33E+02**	n	7.50E+02	n	-	3.07	8270
2-Chlorophenol	-	**9.10E+01**	n	9.10E+01	n	-	2.69	8270
2-Methylnaphthalene	-	**3.51E+01**	n	3.60E+01	n	-	3.02	8270
2-Methylphenol	-	-	-	**9.30E+02**	n	-	2.86	8270
2-Nitroaniline	-	-	-	**1.90E+02**	n	-	3.17	8270
2-Nitrophenol	-	-	-	-	-	-	2.97	8270
3,3´-Dichlorobenzidine	-	**1.25E+00**	c	1.30E-01	c	-	1.00	8270
3+4-Methylphenol	-	-	-	**9.30E+02**	n	-	3.58	8270
3-Nitroaniline	-	-	-	-	-	-	3.24	8270
4,6-Dinitro-2-methylphenol	-	**1.52E+00**	n	-	-	-	1.00	8270
4-Bromophenyl phenyl ether	-	-	-	-	-	-	3.00	8270
4-Chloro-3-methylphenol	-	-	-	-	-	-	3.41	8270
4-Chlorophenyl phenyl ether	-	-	-	-	-	-	2.44	8270
4-Nitroaniline	-	-	-	**3.80E+00**	c*	-	2.69	8270
4-Nitrophenol	-	-	-	-	-	-	7.57	8270
Acenaphthene	-	**5.35E+02**	n	5.30E+02	n	-	2.96	8310
Acenaphthylene	-	-	-	-	-	-	2.40	8310
Aniline	-	-	-	**1.30E+01**	c*	-	3.58	8270
Anthracene	-	**1.72E+03**	n	1.80E+03	n	-	2.66	8310
Benz(a)anthracene	-	**1.20E-01**	c	3.00E-02	c	-	0.10	8310
Benzo(a)pyrene	**0.2**	2.51E-01	c	2.50E-02	c	0.2	0.10	8310
Benzo(b)fluoranthene	-	**3.43E-01**	c	2.50E-01	c	-	0.10	8310
Benzo(g,h,i)perylene	-	-	-	-	-	-	2.23	8310
Benzo(k)fluoranthene	-	**3.43E+00**	c	2.50E+00	c	-	2.88	8310
Benzoic acid	-	-	-	**7.50E+04**	n	-	10.72	8270
Benzyl alcohol	-	-	-	**2.00E+03**	n	-	2.36	8270
Bis(2-chloroethoxy)methane	-	-	-	**5.90E+01**	n	-	2.60	8270
Bis(2-chloroisopropyl)ether	-	**9.81E+00**	c	-	-	-	3.86	8270
Bis(2-ethylhexyl)phthalate	-	5.56E+01	c	5.60E+00	c*	**6**	4.30	8270
Butyl benzyl phthalate	-	-	-	**1.60E+01**	c	-	3.33	8270
Carbazole	-	-	-	-	-	-	2.89	8270
Chrysene	-	**3.43E+01**	c	2.50E+01	c	-	2.79	8310
Dibenz(a,h)anthracene	-	**3.43E-02**	c	2.50E-02	c	-	0.03	8310
Dibenzofuran	-	-	-	**7.90E+00**	n	-	3.19	8270
Diethyl phthalate	-	**1.48E+04**	n	1.50E+04	n	-	2.87	8270
Dimethyl phthalate	-	**6.12E+02**	n	-	-	-	3.24	8270
Di-n-butyl phthalate	-	**8.85E+02**	n	-	-	-	2.71	8270
Di-n-octyl phthalate	-	-	-	-	-	-	3.52	8270

Groundwater Screening Levels vs. Method Detection Limits
Marathon Petroleum Company - Gallup Refinery
Gallup, New Mexico

	New Mexico WQCC Standards	NMED Tap Water	NMED TapW_key	EPA Screening Levels.Tap Water	EPA TapW_key	MCL	MDL	Analytical Method
Fluoranthene	-	**8.02E+02**	n	8.00E+02	n	-	2.41	8310
Fluorene	-	**2.88E+02**	n	2.90E+02	n	-	2.89	8310
Hexachlorobenzene	-	9.76E-02	c	9.80E-03	c	**1**	1.00	8270
Hexachlorobutadiene	-	**1.39E+00**	c	1.40E-01	c*	-	1.00	8270
Hexachlorocyclopentadiene	-	4.11E-01	n	4.10E-01	n	**50**	3.58	8270
Hexachloroethane	-	**3.28E+00**	c	3.30E-01	c**	-	2.00	8270
Indeno(1,2,3-cd)pyrene	-	**3.43E-01**	c	2.50E-01	c	-	0.20	8310
Isophorone	-	**7.81E+02**	c	7.80E+01	c	-	3.05	8270
Naphthalene	-	**1.65E+00**	c	1.70E-01	c*	-	1.00	8310
Nitrobenzene	-	**1.40E+00**	c	1.40E-01	c	-	1.00	8270
N-Nitrosodiphenylamine	-	**1.22E+02**	c	1.20E+01	c	-	2.38	8270
Phenanthrene	-	**1.70E+02**	n	-	-	-	2.78	8310
Pentachlorophenol	**1**	4.13E-01	c	4.10E-02	c	1	1.00	8270
Phenol	-	**5.76E+03**	n	5.80E+03	n	-	8.04	8270
Pyrene	-	**1.17E+02**	n	1.20E+02	n	-	2.50	8310
Pyridine	-	-	-	**2.00E+01**	n	-	9.60	8270
TPH (mg/l)								
Gasoline Range Organics (GRO)	-	**0.01**	-	-	-	-	0.01	8015
Diesel Range Organics (DRO)	-	**0.0167**	-	-	-	-	0.015	8015
Motor Oil Range Organics (MRO)	-	**0.0858**	-	-	-	-	**5**	8015

- No screening level available

Bolded value represents applicable screeening level for comparion to MDLs

EPA - Regional Screening Levels (Nov. 2018) -Tap Water

EPA - Regional Screening Levels (Nov. 2018) - MCL

NMED WQCC standards - Title 20 Chapter 6, Part 2, - 20.6.2.3101 Standards for Ground Water of 10,000 mg/l TDS Concentration or less (Dec. 2018)

NMED Tap Water Screening Level - Risk Assessment Guidance for Site Investigations and Remediation (March 2019)

MDL - method detection limit

5 bolded MDL indicates value is greater than screening level

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

November 15, 2019

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

RE: APPROVAL WITH MODIFICATIONS
[REVISED] FACILITY WIDE GROUND WATER MONITORING WORK PLAN – UPDATES FOR 2019
WESTERN REFINING SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-19-012

Dear Mr. Moore:

The New Mexico Environment Department (NMED) has reviewed the *[Revised] Facility Wide Ground Water Monitoring Work Plan – Updates for 2019* (Work Plan), dated September 2019, submitted on behalf of Marathon Petroleum Company dba Western Refining Southwest Inc., Gallup Refinery (the Permittee). NMED hereby issues this Approval with Modifications. The Permittee must address the following comments.

Comment 1

The Permittee's response to NMED's Comment 4 states, "[d]ue to a leak in the pipeline that went to EP-2, the flow has been temporality diverted to EP-9." Comment 3 in NMED's *Response to Comments Approval - Hydrocarbon Seep Interim Measures 2019 Second Quarter Status Report*, dated September 20, 2019 states, "[c]larify whether the Permittee currently has an approval from New Mexico Department of Energy, Minerals, and Natural Resources (EMNRD) Oil Conservation Division (OCD) to use evaporation ponds (e.g., EP-9) for the discharge of the

RO reject water. Additionally, it is not clear whether EMNRD OCD has agreed to the direct discharge of the RO reject water to Pond STP-1 because [the] wastewater treatment process associated with Pond STP-1 does not reduce the concentrations of constituents (e.g., chloride and sulfate) in the RO reject water. Clarify whether the Permittee has an approval from EMNRD OCD to route the RO reject water to Pond STP-1." The Permittee was required to submit a response letter to address the comment no later than **November 1, 2019**. This comment serves as a reminder.

Comment 2

The Permittee's response to NMED's Comment 8 states, "[t]he Work Plan is not the proper document to summarize all of the detections in water samples that are collected pursuant to the Work Plan. This is done in the Annual Ground Water Monitoring Reports." It is appropriate to summarize detections in the Work Plan in order to evaluate proposed changes to the groundwater monitoring and sampling plan. When changes are proposed, present all data pertinent to the proposed changes. No response required.

Comment 3

The Permittee's response to NMED's Comment 12 states, "[t]he top of the Sonsela should be higher at OW-11 than at OW-63, not lower." Well OW-63 is located more than 500 feet east of well OW-11. Therefore, it is possible that the top of the Sonsela at OW-11 is lower than at OW-63 because it is dipping to the west/northwest. The Permittee further states, "[t]he water level elevation measured in OW-63 is generally consistent with that of surrounding wells..." Since the water level elevations in the Sonsela and Chinle/Alluvium Interface are known to be notably different, a consistent water level measured in well OW-63 in comparison to that of the surrounding wells screened to the Chinle/Alluvium Interface indicates that well OW-63 is not screened within the Sonsela. Therefore, the well is not required to be replaced. No response required.

Comment 4

The Permittee's response to NMED's Comment 13 states, "[t]he discussion in Section 2.4.4 (page 15) is revised to refer to SPH." Since separate phase hydrocarbons (SPH) were detected during the third quarter of 2015, Section 2.4.1.3 that states, "[a] measurable level of SPH was identified in GWM-1 during the fourth quarter sampling event in 2015 through November 2018," must be revised for consistency. Revise the statement and provide a replacement page.

Comment 5

The Permittee's response to NMED's Comment 17 states, "[t]he comment is acknowledged." Comment 17 states, "[s]ubmit the report summarizing the results of the inspection and repair of the NAPIS or submit an extension request." The Permittee's response to Comment 6 in the *Disapproval 2017 Annual Groundwater Monitoring Report,* dated July 5, 2019 states, "[t]he Gallup Refinery's wastewater treatment system will undergo a major upgrade. Although the exact date of the upgrade has not been established, the Gallup Refinery is on the MPC list of

priority sites. Additionally, MPC has made the NMED aware of these plans and has shared the draft design information with the NMED. MPC will keep the NMED informed of the progress of this project." The Permittee's response to NMED's Comment 17 should have referenced the above response for clarity. Unless the plans for the upgrade are changed or canceled, the NAPIS report will not be required at this time.

Comment 6

The Permittee's response to NMED's Comment 19 states, "[t]he requested table [that presents applicable screening levels and detection limits for the constituents of concern] is enclosed." However, the table is not provided in the Work Plan; submit the table no later than **February 28, 2020**.

The Permittee must address all comments in this letter and submit a response letter, replacement page and table no later than **February 28, 2020**.

This approval is based on the information presented in the document as it relates to the objectives of the work identified by NMED at the time of review. Approval of this document does not constitute agreement with all information or every statement presented in the document.

If you have questions regarding this Approval with Modifications, please contact Kristen Van Horn of my staff at 505-476-6046.

Sincerely,

Dave Cobrain
Program Manager
Hazardous Waste Bureau

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

File: Reading File and WRG 2019 File
HWB-WRG-19-012

NEW MEXICO
ENVIRONMENT DEPARTMENT

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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

July 12, 2019

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

RE: DISAPPROVAL
FACILITY WIDE GROUND WATER MONITORING WORK PLAN – UPDATES FOR 2019
WESTERN REFINING SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-19-012

Dear Mr. Moore:

The New Mexico Environment Department (NMED) has reviewed the *Facility Wide Ground Water Monitoring Work Plan – Updates for 2019* (Work Plan), dated May 9, 2019, 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.

Comment 1

The Permittee included a red-line strikeout version with the Work Plan. A red-line strikeout version is only required to be submitted with a *revised* document and the Work Plan is a first-time submittal. It is expected that if the Permittee submits an updated Work Plan, that changes were made or the Work Plan was updated in accordance with RCRA Permit Section IV.C.2. A section in the Work Plan that outlines what changes or updates were made is sufficient. When the revised Work Plan is submitted, the Permittee must submit a red-line strikeout of the revisions along with the revised Work Plan.

Comment 2
A cover letter was not included with the Work Plan submittal. The Permittee must provide a cover letter briefly stating the purpose of the submission of the Work Plan in compliance with the Permit Section IV.C.2. The cover letter can also be an opportunity to highlight changes to the Work Plan. The cover letter must be included with the submittal and not as a separate document. Include a cover letter with the submission of the revised Work Plan and with all future work plans and reports.

Comment 3
Table of Contents, page vi, contains editorial errors. Sections 5.1.1, 5.2 and 5.2.1 in Table of Contents are not included in the Work Plan. Revise the Work Plan to include the missing sections and correct the errors in the Table of Contents.

Comment 4
Section 1.1, *Scope of Activities,* page 1, lists the boiler water (reverse osmosis (RO) reject water) inlet to Pond EP-2 as a sampling location in the monitoring group F. However, according to the *Hydrocarbon Seep Interim Measures 2019 1st Quarter Status Report,* dated April 30, 2019, approximately 45 gallons per minutes (gpm) of the RO reject water is discharged to Pond EP-9. Clarify whether the boiler water/RO reject water is discharged to Pond EP-2, EP-9, or both in the revised Work Plan. New Mexico Oil Conservation Division (OCD) requires all wastewater generated from the facility be routed to Pond STP-1; the water must not be discharged to any evaporation ponds directly. NMED's *Approval Hydrocarbon Seep Interim Measures 2019 1st Quarter Status Report,* dated May 29, 2019, requires the Permittee to provide information regarding the discharge of the water into Pond EP-9 by **July 18, 2019**.

Comment 5
In Section 2.1, *Background Information,* page 6, the Permittee states, "[t]he replaced [diesel] line runs above ground from the marketing area of the refinery for approximately 150 feet and continues underground to the Travel Center." During the June 5, 2019 facility visit, the Permittee stated that the line was no longer in use; however, the fact that the line is no longer in use is not stated in the Work Plan. Clarify whether or not the diesel line is currently in use in the revised Work Plan.

Comment 6
In Section 2.1, *Background Information,* page 6, the Permittee states, "[a] firefighting training facility is used to conduct employee firefighting training. Waste water from the facility, when training is conducted, is pumped into a tank which is then pumped out by a vacuum truck." Indicate whether the firefighting training involves the use of firefighting foams in the response letter.

Comment 7
In Section 2.1, *Background Information,* page 6, the Permittee states, "[s]pecifically, results from benzene analysis of the waste water samples sent to the Gallup Refinery's internal lab are monitored to manage the breakthrough from the GAC canisters." The Permittee is also required

to collect confirmation samples to be analyzed by an independent analytical laboratory. Clarify whether the samples are collected for the analysis by an independent analytical laboratory.

Comment 8

In Section 2.2, *Potential Receptors,* page 8, the Permittee states, "[a]nnual sampling results from 2009 through 2016 have indicated concentrations above screening levels in a single detection of sulfate in a sample collected at PW-3, a single detection of iron in a sample collected at PW-4, a single detection of Tetrachloroethene in a sample collected from PW-2 and a single detection of phenol in a sample collected at PW-3." According to the *2017 Annual Groundwater Monitoring Report,* dated January 24, 2019, the bis(2-ethylhexyl) phthalate concentration in the groundwater sample collected from well PW-4 exceeded the applicable screening level in 2017. Two organic constituents were detected in wells PW-2, PW-3 and PW-4 at concentrations below applicable standards in 2017. Five organic constituents were detected in well PW-3 and ten in well PW-4 at concentrations below the applicable standards in 2016. Since the groundwater extracted from these wells contains organic constituents and is used as a drinking water source, the Permittee must ensure that organic constituent concentrations do not exceed applicable standards in the water prior to use. Also, refer to Comment 20 in the *Disapproval 2016 Annual Groundwater Monitoring Report,* dated June 4, 2018. If the Permittee has already addressed the issue, provide the information in the revised Work Plan.

Comment 9

In Section 2.2, *Potential Receptors,* page 9, the Permittee states, "[b]oundary monitoring wells along the southwest to northwest perimeter of the facility have not shown any evidence of contaminants except for low concentrations of bis (2-ethylhexyl) phthalate detected in the following wells: BW-3B in 2009, BW-3C in 2011 and BW-1C in 2013. The contaminant detected is suspected to be a laboratory contaminant or possibly from the PVC pipe materials used as casing for these wells. No detection of bis (2-ethylhexyl) phthalate was detected in any of the boundary wells in 2018." Comment 3 in *Disapproval SMW-2 Area and Boundary Well Installation Report,* dated May 21, 2019 states that diesel range organics (DRO) were detected at low concentrations of 0.47 mg/L and 0.74 mg/L in groundwater samples collected at wells BW-4B and BW-5B and other organic constituents (e.g., MTBE, EDC) were detected in the groundwater sample collected from well BW-5C. These monitoring wells are located along the southwest to northwest perimeter of the facility. The Permittee's statement regarding the boundary wells contains discrepancies; resolve the discrepancies in the revised Work Plan.

Comment 10

In Section 2.4.1.2, *Hydrocarbon Seep,* page 12, the Permittee states, "[t]hrough 20187 [sic] a total of 1,500,231 gallons of liquid (hydrocarbon and ground water) have been recovered from these sumps." Correct the typographical error in the revised Work Plan.

Comment 11

In Section 2.4.1.3, *Aeration Basin,* page 13, the Permittee states, "[a] measurable level of SPH was identified in GWM-1 during the fourth quarter sampling event in 2015." The statement is misleading. A measurable level of SPH has been identified in GWM-1 from 2015 to the present. Clarify the statement in the revised Work Plan.

Comment 12
In Section 2.4.1.4, *French Drain Release,* page 14, the Permittee states, "[b]oring logs for the five new wells [OW-61 through 65] are provided in Appendix D." According to Appendix C-2, *Well Information – Survey Data, Screened Interval, Stratigraphic Unit,* the wells are screened across the Chinle/Alluvium Interface. Boring OW-63 was drilled several feet below the sandstone unit at 28 feet bgs which penetrates the Sonsela formation. Evaluate whether the well was screened within the Sonsela formation and provide a discussion for whether the groundwater elevation in the well is consistent with that of surrounding wells in the revised Work Plan. In addition, the screened interval of well OW-63 was installed above the sandstone unit; however, the filter pack extends from the bottom of the boring to above the top of the screen. The filter pack may serve as a conduit for groundwater migration between the Chinle/Alluvium interface and the Sonsela. In this case, the well must be replaced. The replacement well must be constructed to prevent correspondence between aquifers. Additionally, the boring logs do not include the ground surface elevations for the wells. Revise the logs to include the data; otherwise, survey the ground elevations at the well locations.

Comment 13
In Section 2.4.4, *Aeration Basin,* page 15, the Permittee states, "[i]n the third quarter of 2015, quarterly inspection of GWM-1 indicated the presence of an oily substance during gauging activities." In Section 2.4.1.3, *Aeration Basin,* page 13, the Permittee states, "[a] measurable level of SPH was identified in GWM-1 during the fourth quarter sampling event in 2015." The statement is contradictory. Revise the statement for accuracy in the revised Work Plan.

Comment 14
In Section 3.2, *Drainages,* pages 19-20, the Permittee states, "[storm water] [o]utfall 001 is located directly south of evaporation pond 8 on the western edge of the refinery's property boundary and equipped with four separate small diameter overflow pipelines, each with a manual flow valve for independent control. Outfall 002 is located north of the rail road loading rack on the eastern section of the facility," and "[a]t the new waste water treatment plant, there are three storm drains located on the south, southwest and west side of the waste water treatment plant which is connected to an underground storm culvert that exits on the northwest section of STP-1 into a conveyance ditch along the northern edge of pond 2 into a holding pond equipped with manual flow valves, located north of evaporation pond 3. The discharge from this holding pond then flows north-northwest towards the Outfall 001 area." The Permittee provides a good description of the storm water drainage system in the section. Provide figure that depicts the drainage system in the revised Work Plan.

Comment 15
In Section 3.3, *Vegetation Types,* page 20, the Permittee states, "[o]n alluvial fans on valley sides and drainage ways, the existing vegetation is usually alkali sacaton, western wheatgrass, Indian rice grass, blue grama, bottlebrush squirreltail, broom snakeweed, fourwing saltbush, threeawn, winterfat, mat muhly and spike muhly." During the site visit conducted in June 5, 2019, cattails were also observed along the drainage ways. Cattails are associated with wetlands. The presence of the plants indicates that the soils in the vicinity exhibit wetland characteristics. List cattails in the statement in the revised Work Plan, as appropriate.

Comment 16
In Section 4.1, *Ground Water Sampling Methodology,* page 23, the Permittee states, "Appendices C-2 and C-2.1 include well information for the non-MKTF wells and MKTF wells, respectively," and "Table C-2.1 is revised to include new monitoring wells installed in 2018." Appendix C-2.1 was not included in the Work Plan. Include Appendix C-2.1 in the revised Work Plan.

Comment 17
In Section 4.2, *Ground Water Sample Collection,* page 25, the Permittee states, "[a]ll purged ground water and decontamination water from monitoring wells will be drained into the refinery waste water treatment system upstream of the NAPIS." Comment 6 in the *Disapproval 2017 Annual Groundwater Monitoring Report,* dated March 21, 2019 states, "[a]lthough some parts of the NAPIS were repaired in 2018, the NAPIS must be re-inspected for potential leaks and repaired as necessary. A report that summarizes the results of the inspection and repair of the NAPIS must be submitted to NMED no later than **June 7, 2019**." The required report has not been submitted to NMED. Submit the report summarizing the results of the inspection and repair of the NAPIS or submit an extension request.

Comment 18
In Section 4.2.1, *Sample Handling,* page 25, the Permittee states, "[c]ollection of containerized ground water samples are in the order of most volatile to least volatile, such as: VOCs, SVOCs, metals, phenols, cyanide, sulfate, chloride, nitrate and nitrite." Comment 7 in the *Approval with Modifications [Revised] Investigation Report North Drainage Ditch and OW-29 & OW-30 Areas,* dated June 24, 2019 states, "[o]nsite nitrite analysis is acceptable with an appropriate field method to accommodate the short holding time. Propose to collect groundwater samples for nitrate and nitrite separately from all groundwater monitoring wells at the site and discuss the method for onsite nitrite analysis in the upcoming Facility-Wide Groundwater Monitoring Work Plan." In the revised Work Plan, propose to collect groundwater samples for nitrate and nitrite separately and discuss the method for onsite nitrite analysis, as necessary.

Comment 19
In Section 4.4.6.3, *Method Reporting Limits,* page 30, the Permittee states, "[d]etection limits that exceed established standards or screening levels and are reported as "not detected" will be considered data quality exceptions and an explanation for its acceptability for use will be provided." The Permittee is required to use the appropriate analytical labs and methods capable of achieving detection limits below the respective screening levels. Unless a reasonable explanation is provided, NMED cannot defend that the constituents are not present at the facility based on laboratory analyses that cannot achieve the appropriate detection limits. If the Permittee cannot provide data that meets the screening levels, it will not be possible to demonstrate that releases related to the site operations have not occurred. Provide a table that presents applicable screening levels and detection limits for the constituents of concern.

Comment 20
Section 6.1, *Requests for Modifications to Sampling Plan,* page 35 does not provide a sufficient discussion regarding the requested change to the Work Plan. For example, Comment 28 in the

Disapproval 2016, 2017 and 2018 Facility-Wide Ground Water Monitoring Work Plans, dated June 5, 2018 states, "[c]ollect 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." Appendix B, Table 1, *Groundwater Monitoring Schedule* was appropriately updated to collect the water samples from ponds EP-3, EP-12A and EP-12B for pesticides analysis. However, Appendix B, Table 2, *Requested/Approved Changes to the Groundwater Monitoring Schedule* indicates that pesticides analysis for the water samples is proposed to be continued in 2019. A discussion for why the pesticide analysis is proposed to be continued in 2019 must be included in Section 6.1 and Table 2. Review NMED's comments issued since June 2018 that require modifications to the Work Plan and provide the rationale for changes to the requested modifications in Section 6.1 and Table 2 of the Work Plan.

Comment 21
In Section 6.1, *Requests for Modifications to Sampling Plan,* page 35, the Permittee states, "[n]ew monitoring wells OW-61 through OW-65 have been added to the Sampling Plan. The proposed analytical suite for these five new wells includes the following: Volatile Organic Compounds; Semi-Volatile Organic Compounds; WQCC Metals – Total and Dissolved; GRO/DRO Extended; and Major Cations/Anions." NMED hereby approves the addition of the new wells to the monitoring schedule and the proposed analytical suite.

Comment 22
Chlorinated solvents have been detected in the groundwater samples collected at the Facility. The Permittee must prepare to analyze for 1,4-dioxane using EPA Method 8270 SIM for the groundwater samples collected from all monitoring wells where chlorinated solvents have been detected within the past ten years. Propose to analyze for 1,4-dioxane for two consecutive events in the revised Work Plan.

The Permittee must address all comments in this Disapproval and submit a revised Work Plan. Two bound hard copies and an electronic version of the revised Work Plan must be submitted to NMED. In addition, include a red-line strikeout version in electronic format showing where all revisions to the Work Plan have been made. The revised Work Plan must be accompanied with a response letter that details where revisions have been made, cross-referencing NMED's numbered comments. The revised Work Plan must be submitted to NMED no later than **September 13, 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 (6LCRRC)
B. Moore, WRG

File: Reading File and WRG 2019 File
HWB-WRG-19-012

Marathon Petroleum Company LP

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.

Robert S Hanks

Robert S. Hanks
Refinery General Manager

5-13-2019

Date

Reviewed by:

Brian K. Moore
Remediation Project Manager

Marathon Petroleum Company LP

Facility Wide Ground Water Monitoring Work Plan – Updates for 2019

Gallup Refinery
92 Giant Crossing Road
Gallup, NM 87301
(505) 722-3833

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.

_____ _____

Robert S. Hanks
Refinery General Manager

Date

Reviewed by:

_____

Brian K. Moore
Remediation Project Manager

Executive Summary

Marathon Petroleum Company LP (dba Western Refining Southwest, Inc.) conducts quarterly, semi-annual and annual ground water monitoring at its Gallup Refinery on a site wide basis. The Ground Water Monitoring Work Plan (Plan) documents any additions or revisions in ground water monitoring and also details the sampling procedures used.

This Plan divides the facility into six monitoring groups. Group A consists of the boundary wells situated along the northwest corner of the refinery property and monitoring wells around the land treatment area (LTU). Five new boundary wells (BW-4A, BW-4B, BW-5A, BW-5B, and BW-5C) were installed in 2017. Group B consists of a cluster of wells at the aeration basin and at the sanitary treatment pond 1 (STP-1) near the Waste Water Treatment Unit. One new well (OW-62) was installed in this area in 2018. Group C consists of the observation wells on the northeast section of the refinery including four product recovery wells. Four new wells (OW-61, OW-63, OW-64, and OW-65) were installed in this area in 2018. Group D includes the process/production wells and the four observation wells located on the south-southwest section of the property. Group E includes 44 permanent monitoring wells installed to delineate the extent of a hydrocarbon plume associated with a seep discovered in 2013 directly west of the crude tanks (T-101, 102); included in this group is a pre-existing well located directly west of the truck loading terminal. Group F includes the sampling requirements for the evaporation ponds and effluent from the sanitary treatment pond (STP-1).

The Gallup Refinery will periodically review facility-wide monitoring data and assess the monitoring program presented in this Plan. Revisions to the Plan, as necessary, will then be presented annually for agency review and approval. These revisions may include, but not be limited to a reduction or change in monitoring locations, monitoring frequency, and/or target chemicals to be analyzed.

The Gallup Refinery follows the most current approved sampling/monitoring schedule from NMED: *Approval with Modifications Revised Facility-Wide Ground Water Monitoring Work Plan, Gallup Refinery – Updates for 2018,* HWB WRG 18-002, dated September 21, 2018.

The Gallup Refinery has created a monitoring work plan with quality assurance practices and controls as well as standard procedures for sampling, and a schedule of activities to monitor ground water and surface water at select locations of the Gallup Refinery. The persons responsible for the implementation and oversight of this plan are:

Refinery General Manager

- Robert S. Hanks

Remediation Project Manager

- Brian K. Moore

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List of Acronyms

AL	Aeration Lagoon
API	American Petroleum Institute
BMP	Best Management Practices
BS	Blank Spike
BSD	Blank Spike Duplicate
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CFR	Code of Federal Regulations
DQO	Data Quality Objective
DRO	Diesel Range Organics
DTB	Depth to Bottom
DTW	Depth to Water
EP	Evaporation Pond
EPA	Environmental Protection Agency
FT.	Foot
FWGWMP	Facility Wide Ground Water Monitoring Plan
GPM	Gallons per minute
GRO	Gasoline Range Organics
HNO3	Nitric Acid
HWB	Hazardous Waste Bureau
IDW	Investigation Derived Waste
LDU	Leak Detection Unit
LTU	Land Treatment Unit
ML	Milliliter
MCL	Maximum Contaminant Level
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MTBE	Methyl Tert Butyl Ether
NAICS	North American Industry Classification System

List of Acronyms – Continued

NAPIS	New American Petroleum Institute Separator
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOI	Notice of Intent
OAPIS	Old American Petroleum Institute Separator
OW	Observation Well
OCD	Oil Conservation Division
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
PPM	Parts per million
PSTB	Petroleum Storage Tank Bureau
PVC	Polyvinyl Chloride
PW	Process Well
QA	Quality Assurance
QC	Quality Control
RW	Recovery Well
RCRA	Resource Conservation and Recovery Act
SIC	Standard Industrial Classification
SOP	Standard Operating Procedure
SPH	Separate Phase Hydrocarbon
STP	Sanitary Treatment Pond
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
SWPP	Storm Water Pollution Prevention Program
TOC	Total Organic Content
VOC	Volatile Organic Compound
WQCC	Water Quality Control Commission
WWTP	Waste water treatment plant

1.0 Introduction

This Facility-Wide Ground Water Monitoring Work Plan (Plan) has been prepared for the implementation of a ground water monitoring program at the Gallup Refinery owned by Marathon Petroleum Company and operated by Western Refining Southwest, Inc. ("Gallup Refinery" or "Facility").

1.1 Scope of Activities

This Plan has been prepared to collect data that will be used to characterize the nature and extent of potential impacts to ground water at the Gallup Refinery. The monitoring plan is designed to assist the facility in evaluating any levels of contaminants that exceed compliance standards. This Plan divides the facility into six groups for periodic monitoring:

GROUP A	GROUP B	GROUP C	GROUP D	GROUP E	GROUP F
BW-1A, 1B, 1C	GWM-1, 2, 3	OW-13, 14, 29, OW-30	PW-2, 3, 4	MKTF-01 thru MKTF-45	EP-2, 3, 4, 5, 6, 7, 8, 9
BW-2A, 2B, 2C	NAPIS 1, 2, 3, KA-3, OW-62	OW-50, 52, 53, OW-54, 55, 56, OW-57, 58, 61, OW-63, 64, 65	OW-1, 10		EP-11, 12A, 12B
BW-3A, 3B, 3C BW-4A, 4B BW-5A, 5B, 5C	OAPIS-1 OW-59, 60	RW-1, 2, 5, 6	OW-11, 12		STP-1 to EP-2, Boiler Water Inlet to EP-2
MW-1, 2, 4, 5	LDU (3)				
SMW-2, 4	STP1-NW, SW				

Group A consists of the boundary wells situated along the northwest corner of the refinery property and the monitoring wells around the LTU. Group B consists of a cluster of monitoring wells and leak detection units for the NAPIS at the aeration basin and at the sanitary treatment pond. Group C includes the observation wells located on the northeast section of the plant and includes recovery wells from which small quantities of free product has been continually removed. Group D includes the process/production wells and four observation wells located on the south, southwest section of the refinery property. Group E includes a total of 44 monitoring wells installed to delineate a hydrocarbon plume associated with a seep discovered west of the crude tank (Tank 101); included in this group is a pre-existing well located directly west of the truck loading terminal. Group F includes sampling requirements for the evaporation ponds and for the effluent from the sanitary treatment pond. Designated wells and sample points identified are monitored on a quarterly, semi-annual and annual basis following the procedures presented in this Plan.

The Gallup Refinery periodically reviews facility-wide monitoring data and evaluates the monitoring program presented in this Plan. Annual revisions to the Plan will be presented for agency review and approval. These revisions may include, but not be limited to, a reduction or change in monitoring locations, monitoring frequency, and/or target chemicals to be analyzed.

1.2 Facility Ownership and Operation

This Plan pertains to the Gallup Refinery located at Exit 39 on Interstate I-40. This refinery is located at Jamestown, New Mexico, approximately 17 miles east of Gallup. Figure 1 shows the regional location of the Gallup Refinery.

The owner is:

	Marathon Petroleum Company 539 South Main Street Findlay, OH 45840	(Parent Corporation)
Operator:	Western Refining Southwest Inc. Gallup Refinery 92 Giant Crossing Road Gallup, New Mexico 87301	(Postal Address)

Western Refining Southwest Inc. (physical address)
Gallup Refinery
I-40, Exit 39 (17 Miles East of Gallup, NM)
Jamestown, New Mexico 87347

The following regulatory identification and permit governs the Gallup Refinery:

- SIC code 2911 (petroleum refining) and NAICS code 32411 apply to the Gallup Refinery;
- U.S. EPA ID Number NMD000333211;
- New Mexico OCD Abatement Plan Number AP-111; and
- 2015 NPDES MSGP, ID #NMR053168.

The facility status is corrective action/compliance. Quarterly, semi-annual and annual ground water sampling is conducted at the facility to evaluate present contamination.

The refinery is situated on an 810-acre irregular shaped tract of land that is largely 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.

2.0 Background Information

2.1 Historical and Current Site Use

Built in the 1950's, the Gallup Refinery is located within a rural and sparsely populated section of McKinley County in Jamestown, New Mexico, 17 miles east of Gallup, New Mexico. The setting is a high desert plain on the western slope of the Continental Divide. The nearest population centers are the Flying J Travel Center (Travel Center) 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). The surrounding land is comprised primarily of public lands and is used for cattle and sheep grazing.

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 stock via a 4-inch diameter pipeline that comes in from the west along the Interstate 40 corridor from the Western Refining Southwest, Inc. - 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 Gallup Refinery is a crude oil refining and petroleum products manufacturing facility. The Standard Industrial Classification (SIC) code is 2911 and the North American Industry Classification System Code (NAICS) is 32411. There are no organic chemicals, plastics, or synthetic fibers manufactured that contribute to our process flow of waste water. The Gallup Refinery does not manufacture lubricating oils.

The refinery incorporates various processing units that convert 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 these feed stocks with hydrogen to make diesel fuel.
- Treater Unit - removes impurities from various intermediate and blending feed stocks to produce finished products that comply with sales specifications.
- Ammonium Thiosulfate Unit - accepts high H_2S and ammonia containing gas streams from the Amine and the Sour Water Stripper units, and converts these into a useful fertilizer product, ammonium thiosulfate.
- Sulfur Recovery Unit - converts and recovers various sulfur compounds from the gases and liquids produced in other processing units to create a solid elemental sulfur byproduct.
- Waste Water Treatment Plant - processes and treats 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, and residual fuel. In addition to the afore-mentioned 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 which are all located above ground. Capacity of these tanks range in size 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 racks are used at the refinery to load out finished products and also receive crude oil, other feed stocks, additives, and chemicals.

Gasoline is delivered to the Travel Center via tanker truck. An underground diesel pipeline exits between the refinery and the Travel Center. In 2013 the underground diesel line from Gallup

Refinery to the Travel Center was replaced and put back in service on February 3, 2014. The replaced line runs above ground from the marketing area of the refinery for approximately 150 feet and continues underground to the Travel Center.

A firefighting training facility is used to conduct employee firefighting training. Waste water from the facility, when training is conducted, is pumped into a tank which is then pumped out by a vacuum truck. The vacuum truck pumps the oily water into a process sewer upstream of the New API Separator (NAPIS).

The process waste water system is a network of curbing, paving, catch basins, and underground piping used to collect waste water from various processing areas within the refinery. The waste water effluent then flows into the equalization tanks and the NAPIS where the oil is separated from water based on the principle that, given a quiet surface, oil will float to the water surface where it can be skimmed off. The skimmed slop is passed to a collection chamber where it is pumped back into the refinery process. The clarified water is routed to a waste water treatment plant (WWTP) where benzene is removed via granular activated carbon (GAC) canisters that are placed at the effluent of the dissolved gas flotation (DGF) unit. WWTP operations alternate the configuration of these GAC canisters from a single setup to an in-series setup (i.e. primary and secondary canister). To help monitor the breakthrough of these GAC canisters, several waste water samples are taken at the effluent of the last GAC canister. Specifically, results from benzene analysis of the waste water samples sent to the Gallup Refinery's internal lab are monitored to manage the breakthrough from the GAC canisters. When benzene values exceed 0.4 ppm, one or more of the following actions are taken: GAC canister configuration is modified to an in-series set-up; GAC canister is replaced with fresh carbon; GAC canister effluent is recirculated back through the WWTP. The treated water flows from the GAC canisters into pond STP-1. STP-1 consists of two bays, north and south and each bay is equipped with five aerators per bay. Effluent from STP-1 then flows into Evaporation Pond 2 and gravitated to the rest of the ponds.

During episodes of unit upsets or major storm events, the waste water is held in one of the three equalization tanks, T-35, T-27 and T-28 which are used to handle large process and storm water

flows allowing the flow to the NAPIS to be controlled. These tanks are also used to store waste water if problems are encountered with the downstream equipment, i.e., NAPIS and the WWTP.

The storm water system is a network of valves, gates, berms, embankments, culverts, trenches, ditches, natural arroyos, and retention ponds that collect, convey, control, and release storm water that falls within or passes through refinery property. Storm water that falls within the processing areas is considered equivalent to process waste water and is sent to tanks T-35, T-27 and T-28 when needed before it reaches the NAPIS, WWTP, STP-1 and into Evaporation Pond 2 where flow is gravitated to the rest of the ponds. Storm water discharge from the refinery is very infrequent due to the arid desert-like nature of the surrounding geographical areas.

At the evaporation ponds, waste water is converted into vapor via solar and mechanical wind-effect evaporation via two 80 gallons per minute electrically driven evaporation pond spraying snow machines located between ponds 4 and 5. Two additional 66 GPM (gallons per minute) evaporation pond sprayers were installed in October 2014 between ponds 3 and 4 for a total of four evaporators. No waste water is discharged from the refinery to surface waters of the state. In September 2015, Gallup Refinery submitted a Notice of Intent requesting continued coverage under the 2015 NPDES Multi-Sector General Permit which was approved on October 8, 2015 (NMR053168). The refinery maintains a Storm Water Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) for effective storm water pollution prevention (updated September 2015). The refinery has constructed several new 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 and also to minimize the stormwater run-on from the I-40 interchange and the Travel Center onto refinery property.

2.2 Potential Receptors

Potential receptors at the facility also include those that may arise from future land uses. Currently, these include on-site workers, nearby residents, wildlife, and livestock.[1] The major route to exposure of humans would be from contaminants reaching a drinking water well. Other routes could be from showering, cooking, etc. with contaminated ground water, raising crops and vegetables with contaminated ground water, or getting exposed to or fishing in surface water that has commingled with shallow ground water. Exposure can also occur through contact with soils and/or plants that have become contaminated through contact with contaminated ground water. However, drinking water wells remain the primary route of possible exposure.

At this time, the nearest drinking water wells are located on-site at the southwest areas of the facility, at depths of approximately 3000 feet which are identified as process or production (PW) wells. These wells are designated as PW-2, PW-3, and PW-4 (See Figure 4 for location). These wells are operated by the facility to provide the refinery's process water and drinking water to nearby refinery-owned houses, to the refinery itself, and to the Travel Center. Currently, PW-2 is sampled every three years, PW-4 is sampled semi-annually and PW-3 is sampled on an annual basis. Annual sampling results from 2009 through 2016 have indicated concentrations above screening levels in a single detection of sulfate in a sample collected at PW-3, a single detection of iron in a sample collected at PW-4, a single detection of Tetrachloroethene in a sample collected from PW-2 and a single detection of phenol in a sample collected at PW-3.

Other than the on-site wells, there is no known drinking water wells located within a 4-mile radius of the site. The nearest drinking water wells that could be used by off-site residents are located to the northwest of the site at a distance slightly greater than 4-miles located within the Navajo community of Iyanbito (shown on the USGS Topographical Map - Gallup Quadrangle (Revised 1980)). These wells are northwest of the South Fork of the Puerco River which heads towards the southwest from immediately north of the facility. As the shallowest ground water will generally

[1] Note: There is extensive and regular patrolling by security personnel of the facility which operates 24-hours – therefore, we can discount the possibility of an inadvertent or deliberate intruder becoming exposed to contamination in groundwater that has reached the surface in some form.

flow in the direction of surface water flow, any possible shallow ground water contamination that left the facility either now or in the future would flow towards the southwest after leaving the facility and away from the community of Iyanbito. The Cibola National Forest lies in the south-east direction and there are no wells or residents in this protected area. Boundary monitoring wells along the southwest to northwest perimeter of the facility have not shown any evidence of contaminants except for low concentrations of bis(2-ethylhexyl)phthalate detected in the following wells: BW-3B in 2009, BW-3C in 2011 and BW-1C in 2013. The contaminant detected is suspected to be a laboratory contaminant or possibly from the PVC pipe materials used as casing for these wells. No detection of bis(2-ethylhexyl)phthalate was detected in any of the boundary wells in 2018.

Artesian conditions at some locations of the site lead to the possibility of ground water emerging onto the surface and thus being able to affect wildlife. No surface water on the site is used for human consumption or primary contact, such as immersion, or secondary contact, such as recreation. The man-made ponds on the site are routinely monitored and are a part of this Plan. Therefore, if they are in contact with shallow ground water that has exhibited elevated levels of contaminants, the Plan will detect any commingling of ground water and surface waters.

Fluctuating ground water elevations can smear contaminants into subsurface soil and rocks, and there is a possibility that plant roots could reach such contaminated soils and bio-concentrate contaminants creating another route of exposure to potential receptors, such as birds and animals that eat the plants. No food crops are currently grown on the site.

2.3 Type and characteristics of the waste and contaminants and any known and possible sources

The types of waste likely include – volatile and semi-volatile organic compounds, primarily hydrocarbons, but could include various other industrial chemicals such as solvents, acids, spent caustic solutions, and heavy metals present in spent chemicals and waste water. These wastes could be in the form of waste water, spent chemicals destined for off-site shipping and disposal packed in drums, sludge, and dry solids.

Most of the wastes and contaminants that could possibly reach ground water have the characteristic that they would biodegrade and naturally attenuate. However, any heavy metals present in dirt and sludge could possibly leach into ground water and would not biodegrade. There is a possibility also that certain long-lived chemicals would not biodegrade, or, if they did, it would be at a very slow rate. Possible sources include leaks from buried pipes, tanks, surface spills, and historical dumping of wastes in remote areas of the site.

All above-ground large tanks have leak detection or equivalent systems, such as radar gauges. Pumps that could leak hydrocarbons are within containment areas, and all tanks are located inside earthen bermed areas to contain spills. The NAPIS has double walls and a leak detection system installed.

Similarly, surface impoundments can serve as a source of possible ground water contamination. In the past, waste water from the railroad loading rack flowed to a settling and separation lagoon north of the rack and flow exited at the north end where water leaving the lagoon was distributed across a flat open site known as the fan-out area. The free flow of liquids led to subsurface soil contamination. This area is identified as SWMU No. 8 and has been cleaned up for a corrective action complete with controls status. Disposal of waste water into open fields is not practiced at the Gallup Refinery.

There are fourteen Solid Waste Management Units (SWMU) identified at the Gallup Refinery, and one closed land treatment area. On December 31, 2013, the RCRA Post-Closure Care Permit ("Permit") became effective under §20.4.1.901A(10) NMAC and identified an additional 20 Areas of Concern (AOCs) requiring corrective action as listed below.

RCRA (Resource Conservation and Recovery Act) Regulated Units

- Land Treatment Unit (LTU)

SWMUs (Solid Waste Management Units)

- SWMU 1 – Aeration Basin

- SWMU 2 – Evaporation Ponds
- SWMU 3 – Empty Container Storage Area
- SWMU 4 – Old Burn Pit
- SWMU 5 – Landfill Areas
- SWMU 6 – Tank Farm
- SWMU 7 – Fire Training Area
- SWMU 8 – Railroad Rack Lagoon
- SWMU 9 – Drainage Ditch and the Inactive Land farm
- SWMU 10 – Sludge Pits
- SWMU 11 – Secondary Oil Skimmer
- SWMU 12 – Contact Wastewater Collection System
- SWMU 13 – Drainage Ditch between North and South Evaporation Ponds
- SWMU 14 – API Separator

AOCs (Areas of Concern)

- AOC 15 – New API Separator
- AOC 16 – New API Separator Overflow Tanks
- AOC 17 – Railroad Loading/Unloading Facility
- AOC 18 – Asphalt Tank Farm (tanks 701-709, 713, 714)
- AOC 19 – East Fuel Oil Loading Rack
- AOC 20 – Crude Slop and Ethanol Unloading Facility
- AOC 21 – Main Loading Racks
- AOC 22 – Loading Rack Additive Tank Farm
- AOC 23 – Retail Fuel Tank Farm (tanks 1-7, 912, 913, 1001, 1002)
- AOC 24 – Crude Oil Tank Farm (tanks 101 and 102)
- AOC 25 – Tank 573 (Kerosene Tank)
- AOC 26 – Process Units
- AOC 27 – Boiler and Cooling Unit Area
- AOC 28 – Warehouse and Maintenance Shop Area
- AOC 29 – Equipment Yard and Drum Storage Area
- AOC 30 – Laboratory
- AOC 31 – Tanks 27 and 28
- AOC 32 – Flare and Ancillary Tanks (tanks Z85V2, Z85V3, Z84-T105)
- AOC 33 – Storm Water Collection System
- AOC 34 – Scrap Yard

Existing ground water monitoring wells effectively surround all of the above listed SWMUs and AOCs. The Permit was subsequently modified in September 2017, with SWMU 8 and AOCs 19 and 25 granted Corrective Action Complete status. AOC 32 was combined with SWMU 14 and AOC 33 was combined with SWMU 12. AOCs 20, 21, 22, and 23 are combined to make new AOC 35. The

schedule in Appendix E, Table E-1 was amended to reflect prior submittals, revised due dates and deferral of other units. A new Consent Order was executed in January 2017 and this resulted in 11 AOCs (AOC 16, 17, 18, 24, 26, 27, 28, 29, 30, 31, and 34) being removed from the Permit and transferred to the Consent Order for further evaluation.

2.4 Summary of contaminant releases that could contribute to possible ground water contamination.

Spills and leaks are known to have occurred on the site in various locations. Although most hydrocarbons are immediately picked up for recovery and contaminated soil is removed, some of the liquids present in a spill may enter the subsurface. With precipitation, there is the possibility that some of the contaminants could leach and reach ground water.

2.4.1 Separate Phase Hydrocarbons

2.4.1.1 Main Tank Farm

Separate phase hydrocarbons (SPH) floating on shallow ground water was found in the mid-1990s at the northeast end of the facility in the main tank farm. A series of recovery wells were installed and SPH has been recovered since the initial discovery. Recovery through hand-bailing continues on a quarterly basis. It is noted that observed SPH measurements may not accurately reflect site conditions. Elevated levels of benzene have also been found in the wells near RW-1 and possibly linked to past spills. Recovery wells in the main tank farm are listed as follows:

RECOVERY WELLS			
RW-1	RW-2	RW-5	RW-6

2.4.1.2 Hydrocarbon Seep

In June of 2013 during a routine inspection, a hydrocarbon seep was discovered in an isolated area approximately 100 yards west of Tank 101/102. A series of excavations were completed in the area of the seep including installation of six temporary sumps for bi-weekly hydrocarbon recovery. Through 20187 a total of 1,500,231 gallons of liquid (hydrocarbon and ground water) have been recovered from these sumps. To date a total of 44 permanent monitoring wells have been installed

with an addition of one pre-existing well, which has been labeled as MKTF-45, and is located in the vicinity of the site investigation. SPH has been measured in Marketing Tank Farm (MKTF) wells located west and northwest of the truck loading rack and marketing tank farm, extending northwest to the location of the hydrocarbon seep. The Gallup Refinery continues to further characterize potential source areas, recovery of liquids from the temporary sumps, and continued sampling of the monitoring wells for characterization and delineation purposes. All 45 wells were added to the Ground Water Monitoring Schedule (see Appendix B).

Additional soil staining was observed north, northwest of the sumps and these sites were excavated of approximately 38.26 tons of soil, which was sent to the Painted Desert Landfill for disposal.

Temporary retention ditches were installed to recover liquids from this area. From April 1, 2016 through December 31, 2018, approximately 611,530 gallons of liquid (hydrocarbon and ground water) have been recovered from this area via vacuum truck.

RECOVERY WELLS
MKTF-01 THRU MKTF-45

2.4.1.3 Aeration Basin

A measurable level of SPH was identified in GWM-1 during the fourth quarter sampling event in 2015.

2.4.1.4 French Drain Release

On February 6, 2018 a mixture of hydrocarbon and water was discovered flowing out of a 4-inch diameter PVC pipe that discharges into a stormwater drainage ditch south of STP-1. Sample analysis indicated the hydrocarbon was naphtha. The flow from the pipe was estimated to be 1.7 gallons per minute. The drainage ditch feeds into a small collection pond that is equipped with a drain valve. The valve was closed and no hydrocarbon was discharged from the pond. A catch basin was installed at the discharge point of the PVC pipe. Site personnel utilized a vacuum truck to transfer the discharge back into the Gallup Refinery.

A subsurface investigation was conducted during March 2018. Five monitor wells (OW-61 thru OW-65) were installed in effort to delineate the hydrocarbon plume that was discharging from the PVC pipe. During the 2018 quarterly gauging, SPH was detected in three of the monitor wells (OW-61, OW-64 and OW-65). Boring logs for the five new wells are provided in Appendix D.

2.4.2 Methyl Tert Butyl Ether

Methyl Tert Butyl Ether (MTBE) has not been used at the refinery since April 2006. Several monitoring wells were installed at various depths to monitor SPH and MTBE contaminant plumes from historical contamination. Historical analytical data for the observation wells (OW-14, 29 and 30) indicate the contaminant, MTBE has slowly been increasing over the years in these wells. Based on this information, New Mexico Environmental Department – Hazardous Waste Bureau (NMED-HWB) requested two Work Plans to further investigate the known MTBE plume at the Facility and investigate a suspected plume north of the tank farm (SWMU 6). Pursuant to NMED's February 23, 2016 Approval with Modifications of the *Investigation Work Plan OW-29 & OW-30 and North Drainage Ditch Areas*, wells OW-53, OW-54, OW-55, and OW-56 were installed. These observation wells (OW) are located downstream on the northeast section of the plant and are designated as follows.

OBSERVATION WELLS					
OW-13	OW-14	OW-29	OW-30	OW-50	OW-52
OW-53	OW-54	OW-55	OW-56		

2.4.3 NAPIS Unit

A unit at the southwest end of the facility that is used to recover and recycle oil back into the process has also – through leakage and spills – caused some MTBE and hydrocarbon contamination in shallow ground water. This unit is known as the NAPIS and was put into service in October 2004. The NAPIS has one up-gradient well NAPIS-1, located on the east side and three down-gradient

shallow monitoring wells, NAPIS-2, NAPIS-3 and KA-3, which are located along the west side. The NAPIS unit is also equipped with three leak detection units on the east and west bays and also at the oil sump section on the east bay and are designated as follows:

NAPIS WELLS				LEAK DETECTION UNITS		
NAPIS-1	NAPIS-2	NAPIS-3	KA-3	EAST LDU	WEST LDU	OIL SUMP LDU

2.4.4 Aeration Basin

The Aeration Basin, which is designated as SWMU No. 1 in the facility's RCRA Post-Closure Care Permit includes three cells, known as AL-1, AL-2 (lagoons) and holding pond 1 which is currently referred to as EP-1, although it is not an evaporation pond and is not part of the area covered by SWMU No. 2 – Evaporation Ponds. All three of these cells are no longer in service since the startup of the Waste Water Treatment Plant in 2012. All refinery waste water flow was diverted to the WWTP bypassing the lagoons and pond 1. The Gallup Refinery has experienced intermittent discharges of oil and oily water into the lagoons and spills to ground surface while it was in operation. Most of these occurrences were the result of unit upsets and or large storm events affecting the old API Separator.

Two ground water monitoring wells (GWM-1 and GWM-2) were installed immediately down gradient of the aeration lagoons in 2004 and 2005 in order to detect potential leakage from the aeration basin. GWM-3 was installed in 2005 on the northwest corner of pond 1 (EP-1).

Analysis of ground water samples collected at GWM-1 and GWM-2 have indicated several organic constituents at concentrations above the screening levels in ground water, which would indicate a potential for historical releases from the lagoons. In the third quarter of 2015, quarterly inspection of GWM-1 indicated the presence of an oily substance during gauging activities. NMED was notified of this finding and the Gallup Refinery was instructed to collect a hydrocarbon sample for fingerprint analysis (DRO/GRO and MRO). Gallup was also instructed to purge and gauge the well on a weekly basis to check the recharge rate. The initial measurement was made without the use of an oil/interface probe and the thickness of the hydrocarbon layer in the well was not

immediately known. Measured SPH thickness ranged from 0.35 to 0.45 feet in September, October and November 2015. On December 10, 2015, the Gallup Refinery sent a response to NMED–HWB concurring that the source of the hydrocarbons observed in GWM-1 is from the adjacent aeration lagoon.

Depth to water ranged from 21.83 feet to 21.42 feet during the quarterly monitoring in 2018. The measured thickness of SPH in 2018 ranged from 0.37 feet to 0.04 feet during the quarterly monitoring events.

GWM-2 and 3 upon installation in 2005 were found to be dry. Water was first detected in GWM-2 in the first quarter of 2008 and in GWM-3 in the third quarter of 2010. 24-hour notification of the finding was given to NMED and OCD respectively. Analyses of ground water samples collected from GWM-2 and GWM-3 have detected the presence of several constituents at concentration levels above applicable water quality standards such as fluoride, chloride, nitrates, and sulfates. MTBE is the only VOC to have been detected in GWM-2 or GWM-3, but at concentrations well below the screening level.

Quarterly inspections in 2011 and 2012 continued to indicate an increase in measurable water levels in GWM-2 and GWM-3, which was consistent with the increased levels in the lagoons and pond 1. In the second half of 2012 through early 2013 the levels in the lagoons and pond 1 began to decrease with cessation of gravitational flow between lagoons to pond 1 due in part to the start-up of the WWTP. Continued quarterly inspections indicated no water present in GWM-2 and GWM-3 in 2013 through 2017.

Both GWM-2 and GWM-3 have been included in the Aeration Basin Corrective Action Work Plan which began investigative soil and water sampling near the aeration basin in the third quarter of 2012 to support selection of a remedy for SWMU NO. 1 and determine the source of water detected in GWM-2 and GWM-3. Figure 4 shows the location of all of the active monitoring wells on the facility.

In February of 2012, the Gallup Refinery submitted a "Revised Investigation Work Plan Solid Waste Management Unit (SWMU) No. 1 Aeration Basin" to include sampling of soils and ground water surrounding the Aeration Basin to determine if there has been a release to the environment and to delineate any such release. In addition, information was collected to help determine the source of ground water that had been observed in monitoring wells GWM-2 and GWM-3. The work plan also included SWMU No. 14 Old API Separator soil and ground water sampling. A new well OAPIS-1 (SWMU 14-2) was installed on the northwest corner where the benzene strippers were located on July 17, 2012 by Enviro-Drill Inc. OAPIS-1 (SWMU 14-2) was added to the 2014 Monitoring Schedule.

In February of 2013, the influent to the aeration lagoons was routed to the new Waste Water Treatment Plant (WWTP) and rerouting of the Travel Center sanitary effluent was completed in June of 2013. The aeration lagoons and pond 1 (EP-1), are no longer in service.

WELLS AT THE AERATION BASIN			
GWM-1	GWM-2	GWM-3	OAPIS-1

2.4.5 North Drainage Ditch

On April 22, 2015, the Gallup Refinery notified NMED-HWB of the discovery of hydrocarbons in a drainage ditch in the northern portion of the refinery property. Surface water samples were collected from the standing water in the drainage ditch and concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected as well as methyl tert-butyl ether (MTBE), gasoline range organics (GRO) and diesel range organics (DRO). An investigation work plan was submitted to NMED for review on August 13, 2015 and was subsequently implemented in May 2016 with installation of well OW-56.

2.4.6 OW-14 Source Area

In correspondence dated May 11, 2015, NMED requested submittal of a work plan to investigate the source of contaminants present in groundwater monitoring well OW-14. Subsequently,

wells OW-57 and OW-58 were installed in 2016 pursuant to NMED's May 12, 2016 Approval with Modifications of the *Revised OW-14 Source Area Investigation Work Plan*.

3.0 Site Conditions

The Gallup Refinery is located within a rural and sparsely populated section of McKinley County. It is situated in the high desert plain on the western flank of the Continental Divide approximately 17 miles east of Gallup. The surrounding land is comprised primarily of public and private lands used for cattle and sheep grazing.[2]

3.1 Current site topography and location of natural and manmade structures

Local topography consists of a gradually inclined 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.

3.2 Drainages

Surface water in this region consists of the man-made evaporation ponds and aeration basins located within the refinery, a livestock watering pond (Jon Myer's Pond) located 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 contain water only during, and immediately after, the occurrence of precipitation.

There are several stormwater conveyance ditches located throughout the refinery which are directed to discharge into contained basins where it is collected and recycled for use as process water; collected and allowed to evaporate; diverted around regulated industrial activity or into two designated outfalls located on the east and west section of the property, identified as Outfall 001 and Outfall 002. Outfall 001 is located directly south of evaporation pond 8 on the western edge of the refinery's property boundary and equipped with four separate small diameter overflow

[2] See, for example, the web site of McKinley County at http://www.co.mckinley.nm.us/

pipelines, each with a manual flow valve for independent control. Outfall 002 is located north of the rail road loading rack on the eastern section of the facility. This outfall consists of a concrete barrier with a valve to control discharges from a deep ditch that collects/ponds the runoff from the rail rack loading area.

Directly west of the crude tank area, there is also a concrete barrier with a valve to control discharges from a culvert that carries stormwater flow from the truck loading rack area. This concrete barrier is located downstream of the "hydrocarbon seep area." The flow from this concrete barrier continues in a north-northwest direction alongside the southern bermed areas of evaporation ponds 3, 4, 5 and 6 and outward towards the Outfall 001 area. At the new waste water treatment plant, there are three storm drains located on the south, southwest and west side of the waste water treatment plant which is connected to an underground storm culvert that exits on the northwest section of STP-1 into a conveyance ditch along the northern edge of pond 2 into a holding pond equipped with manual flow valves, located north of evaporation pond 3. The discharge from this holding pond then flows north-northwest towards the Outfall 001 area.

3.3 Vegetation types

Surface vegetation consists of native xerophytic vegetation including grasses, shrubs, small junipers, and some prickly pear cacti. Average rainfall at the refinery is less than seven inches per year, although it can vary to slightly higher levels elsewhere in the county depending on elevation.

On alluvial fans on valley sides and drainage ways, the existing vegetation is usually alkali sacaton, western wheatgrass, Indian rice grass, blue grama, bottlebrush squirreltail, broom snakeweed, fourwing saltbush, threeawn, winterfat, mat muhly and spike muhly. On fan remnants on valley sides we usually find blue grama, western wheatgrass, Indian ricegrass, big sagebrush, galleta, bottlebrush squirreltail, fourwing saltbrush, needle and thread, one seed juniper, sand dropseed, spineless horsebrush, rabbitbrush, and two-needle pinyon.

3.4 Erosion features

The impacts of historic overgrazing are visible at the north-side of the facility, in the form of arroyos that formed when surface run-off cut through the ground and washed away soils that were not able to hold water with their ground cover lost to overgrazing. Now that the facility is fenced and no livestock grazing occurs on the site, vegetation has recovered in these areas. With the facility helping to bring back vegetation in its undeveloped areas the formation and deepening of erosion features on its land has decreased.

3.5 Subsurface conditions

3.5.1 Soil types and associations

Most of the soils found at the surface in the locations where wells are located consist of the Gish-Mentmore complex.[3] These soils occur in alluvial fans on valley sides and fan remnants on valley sides. The parent material for these soils is slope and fan alluvium derived from sandstone and shale. These are well drained soils with moderately slow (0.2 in/hr) to slow permeability (0.06 in/hr). In this association, the Gish and similar soils make up about 45 percent, the Mentmore and similar soils 35 percent, and minor components 20 percent. These minor components are - Berryhill and similar soils 10 percent and Anodize and similar soils 10 percent. The typical profile for these soils is – 0 to 2 inches fine sandy loam, 2 to 72 inches of various kinds of clay loam.

Drill logs for various wells have been provided electronically to the NMED-HWB. From these well logs we can infer that the soils in the subsurface are generally composed of clays starting at the immediate subsurface, interbedded with narrow sand and silt layers. At about 100 to 150 feet, layers of mudstone, sandstone (from the Chinle Group, Petrified Forest Formation) and siltstone start to appear. Figure 3 shows a generalized relationship of soils in and around the Gallup Refinery.

[3] Soil Survey of McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties, Natural Resources Conservation Service (NRCS), US Department of Agriculture, available at - http://soildatamart.nrcs.usda.gov/Manuscripts/NM692/0/McKinley.Area%20NM.pdf

3.5.2 Stratigraphy

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 this surface layer is the Chinle Group, which consists of low permeability clay stones and siltstones. As such, the Chinle Group (Petrified Forest Formation) effectively serves as an aquiclude. Inter-bedded within the Chinle Group 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 Group. 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 Petrified Forest 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.

3.5.3 Presence and flow direction of ground water

Ground water flow within the Petrified Forest Formation is extremely slow and typically averages less than 10^{-10} centimeters per second (less than 0.01 feet per year). Ground water flow within the surface soil layer above the Petrified Forest 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 less than 10^{-2} centimeters per second in the gravelly sands immediately overlying the Petrified Forest Formation down to 10^{-8} centimeters per second in the clay soil layers located near the surface.

Shallow ground water located under refinery property generally flows along the upper contact of the Petrified Forest Formation. The prevailing flow direction is from the southeast and toward the northwest.

4.0 Investigation Methods

The purpose of this section is to describe the types of activities that will be conducted and the methods that will be used as part of this Plan. Appendix A provides a thorough discussion on actual sampling methods that will be used.

4.1 Ground Water Sampling Methodology

All monitoring wells scheduled for sampling during a ground water sampling event will be sampled within 15 working days of the start of the monitoring and sampling event, weather permitting.

Appendix C-1 is a summary of the fluid level data collected in 2018 for the non-MKTF wells. Appendix C-1.1 is a summary of the fluid level data collected in 2018 for the MKTF wells. Appendices C-2 and C-2.1 include well information for the non-MKTF wells and MKTF wells, respectively. The well information consists of the survey data, screened intervals, and stratigraphic unit in which the wells are screened Appendix C-3 includes well information for artesian wells also known as Process or Production wells (PW). Information provided for the artesian wells was gathered from well boring logs. These wells are encased and therefore measurement for depth to bottom was not field verified. Table C-2.1 is revised to include new monitor wells installed in 2018.

4.1.1 Well Gauging

At the beginning of each quarterly, semi-annual, or annual sampling event, all monitoring and recovery wells listed in Appendix B, Ground Water Monitoring Schedule, will be gauged to record the depth to SPH, if present, the DTW and the DTB of the well. The gauging will be performed using an oil/water interface probe attached to a measuring tape capable of recording measurements to the nearest 0.01 foot. Each monitoring well is field verified with the well number on the well casing or adjacent to the well to ensure that samples are collected at the correct well location. Wells also have a permanent marked reference point on the well casing from which ground water levels and well depths are measured.

Gauging measurements will be recorded on a field gauging form. Data obtained from the gauging will be reported in the annual ground water monitoring report. The data will be used to develop groundwater contour maps and SPH thickness isopleths which will also be included in the annual report.

4.1.2 Well Purging

Each monitoring well will be purged by removing ground water prior to sampling in order to ensure that formation water is being sampled. Generally, at least three well volumes (or a minimum of two if the well has low recharge rate) will be purged from each well prior to sampling. Field water quality measurements must stabilize for a minimum of three consecutive readings before purging will be discontinued. Field water quality measurements will include pH, electrical conductivity, temperature, dissolved oxygen (DO) mg/l, and oxidation-reduction potential (ORP). Field water quality measurement stability will be determined when field parameter readings stabilize to within ten percent between readings for three consecutive measurements. Once the readings are within ten percent, purging will stop and the well is ready for sample collection. The volume of ground water purged, the instruments used, and the readings obtained at each interval will be recorded on the field-monitoring log. Well purging and sampling will be performed using 1.5-inch x 3 foot and/or 3-inch x 3 foot disposable polyethylene bailers for ground water sampling and/or appropriately decontaminated portable sampling pumps.

4.2 Ground water Sample Collection

Ground water samples will be obtained from each well within 24 hours of the completion of well purging. Sample collection methods will be documented in the field monitoring reports. The samples will be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample handling and chain-of-custody (COC) procedures are described in more detail in Appendix A as well as decontamination procedures for reusable water sampling equipment.

All purged ground water and decontamination water from monitoring wells will be drained into the refinery waste water treatment system upstream of the NAPIS. The procedures for disposing materials are described in Appendix A.

Ground water samples are collected and analyzed for both total and dissolved metals. Ground water samples obtained for dissolved metals analysis will be filtered through disposable filters with a 0.45 micrometers mesh size.

4.2.1 Sample Handling

All sample containers are supplied by the contracted analytical laboratory and shipped to the Gallup Refinery in sealed coolers. Chemical preservation is also provided by the laboratory through pre-preserved bottle ware. Collection of containerized ground water samples are in the order of most volatile to least volatile, such as: VOCs, SVOCs, metals, phenols, cyanide, sulfate, chloride, nitrate and nitrite. Immediately after the samples are collected, they will be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard COC procedures as detailed in Appendix A will be followed for all samples collected. All samples will be submitted to the laboratory as soon as possible to allow the laboratory to conduct the analyses within the specified method holding times. Details of the general sample handling procedures are provided in Appendix A.

The following shipping procedures will be performed during each sampling event:

- Individual sample containers will be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drainage hole at the bottom of the cooler will be sealed and secured in case of sample container leakage.
- Each cooler or other container will be delivered directly to the analytical laboratory.
- Glass bottles will be separated in the shipping container by cushioning material to prevent breakage.
- Plastic containers will be protected from possible puncture during shipping using cushioning material.
- The COC form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.

- Signed and dated COC seals will be applied to each cooler prior to transport of samples from the site.

4.3 Analytical Methods

Ground water and surface water samples collected during the monitoring events will be analyzed using the specified analytical methods and for the constituents listed in Appendix B.

4.4 Quality Assurance Procedures

Contract analytical laboratories will maintain internal quality assurance programs in accordance with EPA and industry accepted practices and procedures. At a minimum, the laboratories will use a combination of standards, blanks, surrogates, duplicates, matrix spike/matrix spike duplicates (MS/MSD), blank spike/blank spike duplicates (BS/BSD), and laboratory control samples to demonstrate analytical Quality Assurance/Quality Control (QA/QC). The laboratories will establish control limits for individual chemicals or groups of chemicals based on the long-term performance of the test methods. In addition, the laboratories will establish internal QA/QC that meets EPA's laboratory certification requirements. The specific procedures to be completed are identified in the following sections.

4.4.1 Equipment Calibration Procedures and Frequency

The laboratory's equipment calibration procedures, calibration frequency, and calibration standards will be in accordance with the EPA test methodology requirements and documented in the laboratory's quality assurance (QA) and Standard Operating Procedures (SOP) manuals. All instruments and equipment used by the laboratory will be operated, calibrated, and maintained according to the manufacturers' guidelines and recommendations. Operation, calibration, and maintenance will be performed by personnel who have been properly trained in these procedures. A routine schedule and record of instrument calibration and maintenance will be kept on file at the laboratory.

4.4.2 Field QA/QC Samples

Field duplicates, field blanks, equipment rinsate blanks, reagent blanks and trip blanks may be obtained for quality assurance during sampling activities. The samples will be handled as described in Section 4.4.3.

Field duplicates will consist of two samples either split from the same sample device or collected sequentially. Field duplicate ground water samples will be collected at a frequency of one per ten regular samples and will be analyzed for the full set of analyses used for the regular sample collected. At a minimum, one duplicate sample per sampling day must always be obtained.

Field blanks shall be obtained at a frequency of no less that one per day per site or unit. Field blanks shall be generated by filling sample containers in the field with deionized water and submitting the samples, along with the groundwater or surface water samples, to the analytical laboratory for the appropriate analyses.

Equipment blanks shall be obtained for chemical analysis at the rate of five percent but no fewer than one rinsate blank per sampling day. Equipment rinsate blanks shall be collected at a rate of one per sampling day if disposable sampling apparatus is used. Rinsate samples shall be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinsate sample then shall be placed in the appropriate sample container and submitted with the groundwater or surface water samples to the analytical laboratory for the appropriate analyses.

Reagent blanks shall be obtained at a frequency of ten percent but no fewer than one per day per unit if chemical analyses requiring the use of chemical reagents are conducted in the field during water sampling activities.

Trip blanks will accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks will consist of a sample of analyte free deionized water placed in an appropriate sample container. Trip blanks will be analyzed at a frequency of one for each shipping container of samples.

4.4.3 Laboratory QA/QC Samples

Analytical procedures will be evaluated by analyzing reagent or method blanks, surrogates, MS/MSDs, BS/BSDs and/or laboratory duplicates, as appropriate for each method. The laboratory QA/QC samples and frequency of analysis to be completed will be documented in the cited EPA or other test methodologies. At a minimum, the laboratory will analyze laboratory blanks, MS/MSDs, BS/BSDs and laboratory duplicates at a frequency of one in twenty for all batch runs requiring EPA test methods and a frequency of one in ten for non-EPA test methods. Laboratory batch QA/QC samples will be project specific.

4.4.4 Laboratory Deliverables

The analytical data package will be prepared in accordance with EPA-established Level II analytical support protocol which will include:

- Transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any data quality exceptions, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report;
- Sample analytical results, including sampling date; date of sample extraction or preparation; date of sample analysis; dilution factors and test method identification; water sample results in consistent units (milligrams per liter or micrograms per liter); and detection limits for undetected analytes. Results will be reported for all field samples, including field duplicates and blanks, submitted for analysis;
- Method blank results, including reporting limits for undetected analytes;
- Surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only);
- Laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits;
- Sample COC documentation;
- Holding times and conditions;
- Conformance with required analytical protocol(s);
- Instrument calibration;
- Blanks;
- Detection/quantitative limits;
- Recoveries of surrogates and/or matrix spikes (MS/MSDs);
- Variability for duplicate analyses;
- Completeness; and,

- Data report formats.

Data deliverables provided by the laboratory that include analysis of organic compounds will also include the following:

- A cover letter referencing the procedure used and discussing any analytical problems, deviations, and modifications, including signature from authority representative certifying to the quality and authenticity of data as reported;
- A report of sample collection, extraction, and analysis dates, including sample holding conditions;
- Tabulated results for samples in units as specified, including data qualification in conformance with EPA protocol, and definition of data descriptor codes;
- Final extract volumes (and dilutions required), sample size, wet-to-dry weight ratios, and instrument practical detection/quantitative limit for each analyte;
- Analyte concentrations with reporting units identified, including data qualification and a description of the qualifiers;
- Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample; and,
- Recovery assessments and a replicate sample summary, including all surrogate spike recovery data with spike levels/concentrations for each sample and all MS/MSD results (recoveries and spike amounts).

4.4.5 Review of Field and Laboratory QA/QC Data

The sample data, field, and laboratory QA/QC results will be evaluated for acceptability with respect to the data quality objectives (DQOs). Each group of samples will be compared with the DQOs and evaluated using data validation guidelines contained in EPA guidance documents: Guidance Document for the Assessment of RCRA Environmental Data Quality, National Functional Guidelines for Organic Data Review, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses, and the most recent version of SW-846, and industry-accepted QA/QC methods and procedures.

The laboratory will notify the Gallup Refinery Project Manager of data quality exceptions within one business day of identifying the data quality exception in order to allow for sample re-analysis, if possible. The Gallup Refinery Project Manager will contact NMED within one business day of receipt of laboratory notification of data quality exceptions in order to discuss the implementations

and determine whether the data will still be considered acceptable, or if sample re-analysis or re-sampling is necessary.

4.4.6 Blanks, Field Duplicates, Reporting Limits and Holding Times

4.4.6.1 Blanks

The analytical results of field blanks and field rinsate blanks will be reviewed to evaluate the adequacy of the equipment decontamination procedures and the possibility of cross-contamination caused by decontamination of sampling equipment. The analytical results of trip blanks will be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. The analytical results of laboratory blanks will be reviewed to evaluate the possibility of contamination caused by the analytical procedures. If contaminants are detected in field or laboratory blanks, the sample data will be qualified, as appropriate.

4.4.6.2 Field Duplicates

Field duplicates will consist of two samples either split from the same sample device or collected sequentially. The analytical data quality objectives for precision shall be used for water duplicates.

4.4.6.3 Method Reporting Limits

Method reporting limits for sample analyses will be established at the lowest level practicable for the method and analyte concentrations and will not exceed ground water or surface water cleanup standards and screening levels. Detection limits that exceed established standards or screening levels and are reported as “not detected” will be considered data quality exceptions and an explanation for its acceptability for use will be provided.

4.4.6.4 Holding Times

Per EPA protocol the sampling, extraction, and analysis dates will be reviewed to confirm that extraction and analyses were completed within the recommended holding times. Appropriate data qualifiers will be noted if holding times are exceeded.

4.4.7 Representativeness and Comparability

4.4.7.1 Representativeness

Representativeness is a qualitative parameter related to the degree to which the sample data represent the relevant specific characteristics of the media sampled. Procedures will be implemented to assure representative samples are collected and analyzed, such as repeated measurements of the same parameter at the same location over several distinct sampling events. Any procedures or variations that may affect the collection or analysis of representative samples will be noted and the data will be qualified.

4.4.7.2 Comparability

Comparability is a qualitative parameter related to whether similar sample data can be compared. To assure comparability, analytical results will be reported in appropriate units for comparison with other data (past studies, comparable sites, screening levels, and cleanup standards), and standard collection and analytical procedures will be implemented. Any procedure or variation that may affect comparability will be noted and the data will be qualified.

4.4.8 Laboratory Reporting, Documentation, Data Reduction, and Corrective Action

Upon receipt of each laboratory data package, data will be evaluated against the criteria outlined in the previous sections. Any deviation from the established criteria will be noted and the data will be qualified. A full review and discussion of analytical data QA/QC and all data qualifiers will be submitted as appendices or attachments to the ground water monitoring reports. Data validation procedures for all samples will include checking the following, when appropriate:

- Holding times;
- Detection limits;
- Field equipment rinsate blanks;
- Field blanks;
- Field Duplicates;
- Trip blanks;
- Reagent blanks;
- Laboratory duplicates;

- Laboratory blanks;
- Laboratory matrix spikes;
- Laboratory matrix spike duplicates;
- Laboratory blank spikes;
- Laboratory blank spike duplicates; and
- Surrogate recoveries.

If significant quality assurance problems are encountered, appropriate corrective action will be implemented. All corrective action will be reported and the corrected data will be qualified.

5.0 Monitoring and Sampling Program

The primary objective of ground water monitoring is to provide data which will be used to assess ground water quality at and near the facility. Ground water elevation data will also be collected to evaluate ground water flow conditions. The ground water monitoring program for the facility will consist of sample collection and analysis from a series of monitoring wells, recovery wells, outfalls, and evaporation pond locations.

The monitoring network is divided into six investigation areas (Groups A, B, C, D, E, and F). The sampling frequency, analyses and target analytes will vary for each investigation area and the combined data from these investigation areas will be used to assess ground water quality beneath and immediately down-gradient of the facility and evaluate local ground water flow conditions.

Samples will not be collected from monitoring wells that have measurable SPH. For wells that are purged dry, samples will be collected if recharge volume is sufficient for sample collection within 24 hours. Wells not sampled due to insufficient recharge will be documented in the field log.

The following sections outline the monitoring program for each investigation area.

5.1 Group A Through Group F Sampling Locations

The location of the monitoring, recovery wells and leak detection units are shown in Figure 4. The following wells will be sampled (as described in Appendix B):

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-01 thru 45
BW-2A, 2B, 2C	NAPIS 1, 2, 3, KA-3	OW-50, 52, 53, 54	OW-1, 10	
	OW-62	OW-55, 56, 57, 58		
		OW-61, 63, 64, 65		
BW-3A, 3B, 3C	OAPIS-1	RW-1, 2, 5, 6	OW-11, 12	

BW-4A, 4B BW-5A, 5B, 5C	OW-59, 60
MW-1, 2, 4, 5	LDU (3)
SMW-2, 4	STP1-NW, SW

The Group F outfalls and ponds will be sampled (as described in Appendix B, Table 1). (Note: these outfalls are from one section of the waste water treatment system to another – they do not discharge to any location outside the facility).

GROUP F OUTFALLS
STP-1 to EP-2
Boiler Water Inlet to EP-2

GROUP F EVAPORATION PONDS		
Pond 1 – No longer in service	EP-5	EP-9
EP-2	EP-6	EP-11
EP-3	EP-7	EP-12A
EP-4	EP-8	EP-12B

6.0 Monitoring Program Revisions

Upon review of the analytical results from the monitoring events under this Plan, historic facility-wide monitoring data, available soil boring data, and other related information the Gallup Refinery will assess the monitoring program presented in this Plan. Revisions to the Plan, as necessary, will then be presented for agency review and approval on an annual basis. These revisions may include, but not be limited to, a reduction or change in monitoring locations, monitoring frequency, and/or target analytes listed in Appendix B, Table 1.

6.1 Requests for Modifications to Sampling Plan

New monitoring wells OW-61 through OW-65 have been added to the Sampling Plan. The proposed analytical suite for these five new wells includes the following:

- Volatile Organic Compounds;
- Semi-Volatile Organic Compounds;
- WQCC Metals – Total and Dissolved;
- GRO/DRO Extended; and
- Major Cations/Anions.

APPENDIX A

Appendix A
Gallup Refinery Field Sampling Collection and Handling Standard Procedures

Field Data Collection: Elevation and Purging

All facility monitoring wells and recovery wells are gauged as required throughout the year. Gallup does not have any recovery well pumps that need to be shut off and removed prior to water elevation measurements.

Each monitoring well is field verified with the well number on the well casing or adjacent to the well to ensure that samples are collected from the correct well location. Wells also have a permanent marked reference point on the well casing from which ground water levels and well depths are measured. The portable pump intake is lowered to the midpoint of the listed screened interval for each specific well using the markings identified on the pump hose which are set every ten feet. In wells with dedicated pumps, the pumps have been installed at the midpoint of the screened interval.

All water/product levels are measured to an accuracy of the nearest 0.01 foot using an oil/water interface meter. Water levels and well depths in the deeper wells are gauged with an electric water depth meter. After determining water levels, well volumes are calculated using the appropriate conversion factors for a given well based on its internal diameter. Volume is equal to the height of the liquid column times the internal cross-sectional area of the well.

Generally, at least three well volumes (or a minimum of two if the well has low recharge) are purged from each well prior to sampling. Field water quality parameters measured during purging (pH, electrical conductivity, temperature, and dissolved oxygen), must stabilize to within 10% for a minimum of three consecutive measurements before collection of ground water samples from each well.

Before sample collection can begin, the water collected from each monitoring well must be fresh aquifer water. Well evacuation replaces stagnant well water with fresh aquifer water. The water level in the well, total depth of well and thickness of floating product (if any) will be measured using an oil/water interface meter. If product is present, a ground water sample is not obtained.

If a well is pumped or bailed dry before two or three well volumes can be evacuated, it requires only that sufficient time elapse for an adequate volume of water to accumulate for the sampling event. The first sample will be tested for pH, temperature, specific conductivity and dissolved oxygen (mg/L). The well will be retested for pH, temperature, specific conductivity and dissolved oxygen (mg/L) after sampling as a measure of purging efficiency and as a check on the stability of the water samples over time. All well evacuation information will be recorded in a log book.

Wells MW-1, MW-2, MW-4, MW-5, BW-1C, BW-2A, BW-2B, BW-3B, BW-4B, BW-5B, BW-5C, SMW-4, OW-1, OW-10, OW-13, OW-14, OW-29 and OW-30 are each equipped with a dedicated electrical pump. Wells SMW-2, OW-11, OW-12, OW-50, and OW-52 are purged and sampled using a portable Grundfos pump. The remaining wells are hand-bailed if the presence of water is detected. If SPH is detected in any of these wells, no samples are collected.

Purged well water from wells is collected in 55-gallon drums, buckets, or totes and drained to the process sewer upstream of the NAPIS. The water is treated in the refinery's waste water treatment system.

Sampling Equipment at Gallup Refinery

The following sampling equipment is maintained at the Gallup Refinery and used by the sampling personnel:

- Heron Instruments 100 ft. DipperT electric water depth tape complying with US GGG-T-106E, EEC Class II.
- Pall Corporation Acro 50A 0.45 micron disposable filter used with 60 ml disposable syringes for filtering water in the field.
- YSI pH/Conductivity meter Model 63, calibrated with a one-point, two-point, or three-point calibration procedure using pH standards of 7, 4 and 10.

- IQ Scientific Instruments, pH/Temperature/Conductivity/ Dissolved Oxygen meter, Model IQ1806LP.
- Grundfos 2-inch pumps with Grundfos 115-volt AC–to-DC converter.
- WaterMark Oil Water Interface Meter (100 ft), Model 101L/SMOIL, S/N 01-5509.

Calibration and maintenance procedures will be performed according to the manufacturer's specifications. In the event an instrument becomes inoperable, an instrument similar to the inoperable instrument will be used.

Order of Collection

Samples will be collected in the order listed below:

Parameter	**Bottle Type**
VOC	40 ml VOA vials (HCl)
TPH	40 ml VOA vials (HCl)
TPH	250 ml glass amber bottle
EDB and EDC	40 ml VOA vials ($Na_2S_2O_3$)
SVOC	1 liter glass amber bottle
Total Metals	250 ml plastic bottle (HNO_3)
Dissolved Metals	125 ml plastic bottle (HNO_3)
Major Cations/Anions	125 ml plastic bottle (HNO_3)
Major Cations/Anions	125 ml plastic bottle (H_2SO_4)
Major Cations/Anions	125 ml plastic bottle
BOD	1 liter plastic bottle
TDS	500 ml plastic bottle
COD	500 ml plastic bottle (H_2SO_4)
Cyanide	500 ml plastic bottle (NaOH)
Pesticides	1 liter glass amber bottle
E-Coli	100 ml plastic

*Pre-filtration bottle for dissolved metals which is subsequently filtered in the field and transferred to a pint plastic bottle with HNO_3 preservative.

Filtration

Ground water samples are filtered prior to dissolve metals analysis. For dissolved metals, sample water is poured into a jar and then extracted with a syringe. The syringe is then used to force the sample water through a 0.45 micron pore filter into the proper sample bottle to collect dissolved metals samples. Filtration must be performed within two hours of sample collection. Pour the filtrate into a sample bottle containing HNO_3 preservative.

For samples destined for total metals analysis, do not filter the sample, and preserve with HNO_3 to pH <2 in the field.

Sampling personnel carry a cell phone when gathering ground water and other water samples. While sampling procedures are generally well known and the appropriate sample bottles are ordered to match each sampling event, occasional questions do arise from unforeseen circumstances which may develop during sampling. At such times, sampling personnel contact Hall Environmental Analytical Laboratory to verify that sampling is correctly performed.

Sample Handling Procedures

At a minimum, the following procedures will be used when collecting samples:

- Neoprene, nitrile, or other protective gloves will be worn when collecting samples. New disposable gloves will be used to collect each sample.
- All samples collected for chemical analysis will be transferred into clean sample containers supplied by the analytical laboratory. The sample container will be clearly marked. Sample container volumes and preservation methods will be in accordance with the most recent standard EPA and industry accepted practices for use by accredited analytical laboratories. Sufficient sample volume will be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis.
- Sample labels and documentation will be completed for each sample.

Immediately after the samples are collected, they will be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described in Section 4.2.1 of this Plan, will be followed for all samples collected. All samples will be submitted to the laboratory to allow the laboratory to conduct the analyses within the method holding times.

General Well Sampling Procedures

For safety protection and sampling purity, rubber gloves or disposable nitrile gloves are worn and changed between each activity.

Prepare for sampling event by making out sample bottle labels and have bottles separated into plastic bags for each well to be sampled and placed in an ice chest ready to take into the field. Bring along a note book and sample log. Document weather conditions, sample date and time. Fill in label with location, date, time, analysis, preservative, and your name. Start sampling by adjusting converter speed for each well. Affix sample label and fill bottle according to lab instructions. For samples intended for VOC analysis, use bottles with septa lids, fill bottle to neck and add final amount of water with cap to form meniscus. Turn bottles upside down to examine for bubbles, if bubbles are detected in the vial, repeat collection procedure. If no bubbles show, secure lids and pack in bubble wrap and place in cooler until sampling is completed.

Decontaminate equipment that is not dedicated for use in a particular well. Refrigerate completed samples until shipping to lab. Be sure to check holding times and arrange for appropriate shipping method. Be sure that the field effort is adequately staffed and equipped. Check QA/QC requirements before departing—QA/QC samples require additional equipment and supplies.

Surface Water Sample Collection

At the evaporation ponds, samples will be collected as a grab sample at the pond edge near the inlets. This location will be noted in the field notebooks. The sampler will avoid disturbing sediment and gently allow the sample container to fill making sure that undue disturbance does not allow volatile contaminants to be lost. The sample bottle will be used for the sample collection in a shallow location near the bank. If a separate bottle and/or bailer are used to refill the sample container, this will be duly noted in the field log books. The decision to use a separate bottle/bailer will be made, if at all, by the sampler and the reasons for doing so will be noted in the field log book.

Upon arrival at the field site, the sampler will set out safety equipment such as traffic cones and signs (if required). The vehicle will be parked a sufficient distance away so as to prevent sample contamination from emissions. Appropriate sample containers and gloves must be used for the type of analyses to be performed.

Decontamination Procedures

The objective of the decontamination procedures is to minimize the potential for cross-contamination.

The majority of field equipment used for ground water sampling will be disposable and, therefore, not require decontamination. In order to prevent cross-contamination, field equipment that comes into contact with water or soil will be decontaminated between each sampling location. The decontamination procedure will consist of washing the equipment with a non-phosphate detergent solution (examples include Fantastik™, Liqui-Nox®), followed by two rinses of distilled water and air dried.

Decontamination water and rinsate will be contained and disposed of the same way as purge water, as described in Section 4.2. Decontamination procedures and the cleaning agents used will be documented in the daily field log.

Field Equipment Calibration Procedures

Field equipment requiring calibration will be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. Calibration checks will be conducted daily and the instruments will be recalibrated if necessary. Calibration measurements will be recorded in the daily field logs.

If field equipment becomes inoperable, its use will be discontinued until the necessary repairs are made. A properly calibrated replacement instrument will be used in the interim. Instrumentation used during sampling events will be recorded in the daily field logs.

Collection and Management of Investigation Derived Waste

Investigation derived waste (IDW) generated during each groundwater sampling event may include purge water, decontamination water, excess sample material, and disposable sampling equipment. All water from all wells generated during sampling and decontamination activities will

be temporarily stored in labeled 55-gallon drums until placed in the refinery wastewater treatment system upstream of the API separator. All other solid waste generated during sampling activities (including sampling gloves, tubing, etc.) will be disposed of with the Refinery's general municipal waste.

Documentation of Field Activities

Daily field activities, including observations and field procedures, will be recorded using indelible ink on field sampling forms. The original field forms will be maintained at the Gallup Refinery. Completed forms will be maintained in a bound and sequentially numbered field file for reference during field activities. The daily record of field activities will include the following information:

- Well ID/ Evaporation pond location/ Outfall
- 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

Sample Custody

All samples collected for analysis will be recorded in the field report or data sheets. Chain-of-custody forms will be completed at the end of each sampling day, prior to the transfer of samples off site, and will accompany the samples during shipment to the laboratory. A signed and dated custody seal will be affixed to the lid of the shipping container. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form will be signed as received by the laboratory, and the conditions of the samples will be recorded on the form. The original chain-of-custody form will remain with the laboratory. The Gallup Refinery will maintain copies of

all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records will be included with all draft and final laboratory reports submitted to NMED and OCD.

Marathon Petroleum Company LP

APPENDIX B

APPENDIX C

APPENDIX D

Marathon Petroleum Company LP

FIGURES

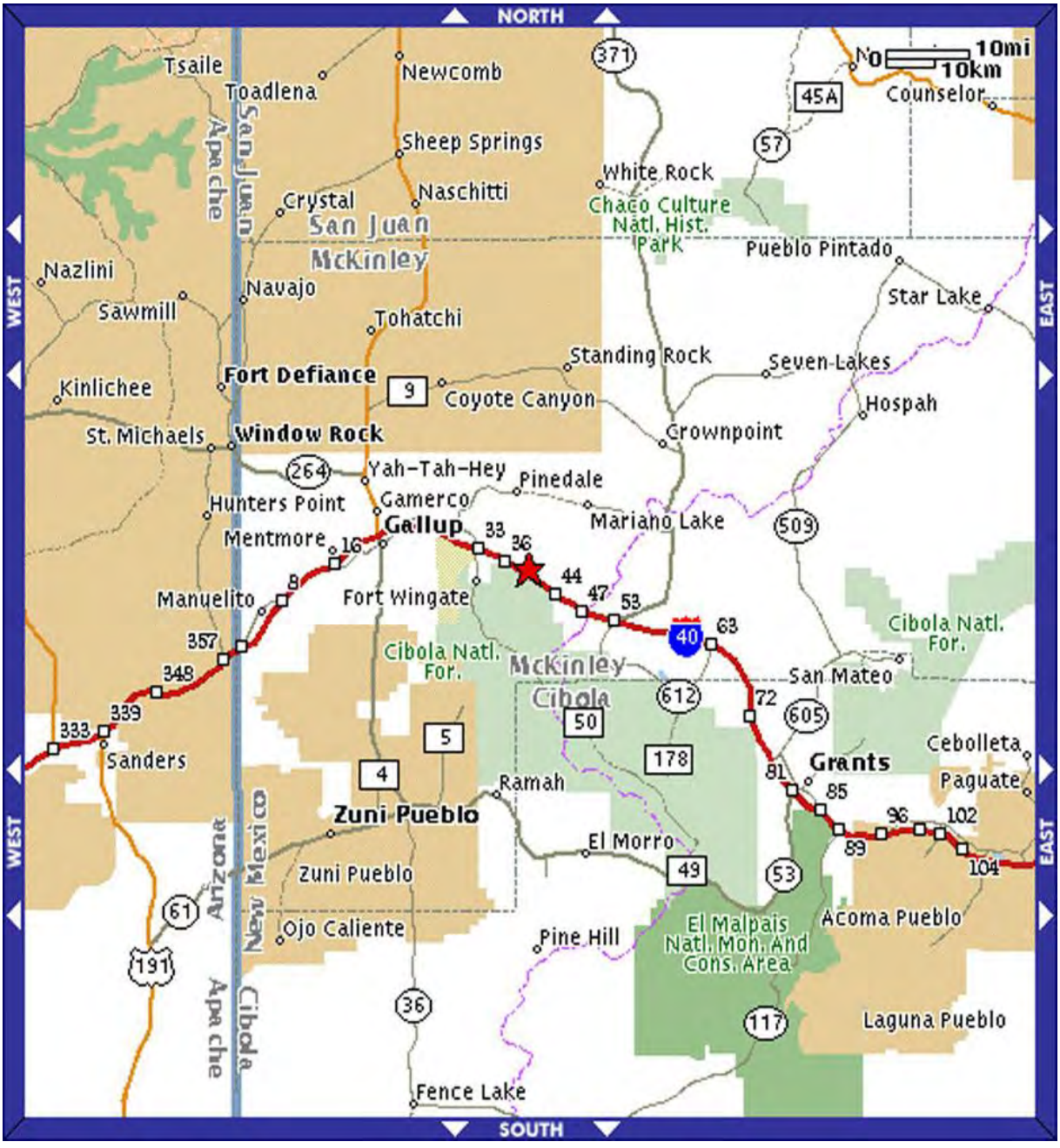


Figure 1: Regional map showing the location of the Gallup Refinery (red star along Interstate-40, 20 miles east of the City of Gallup).

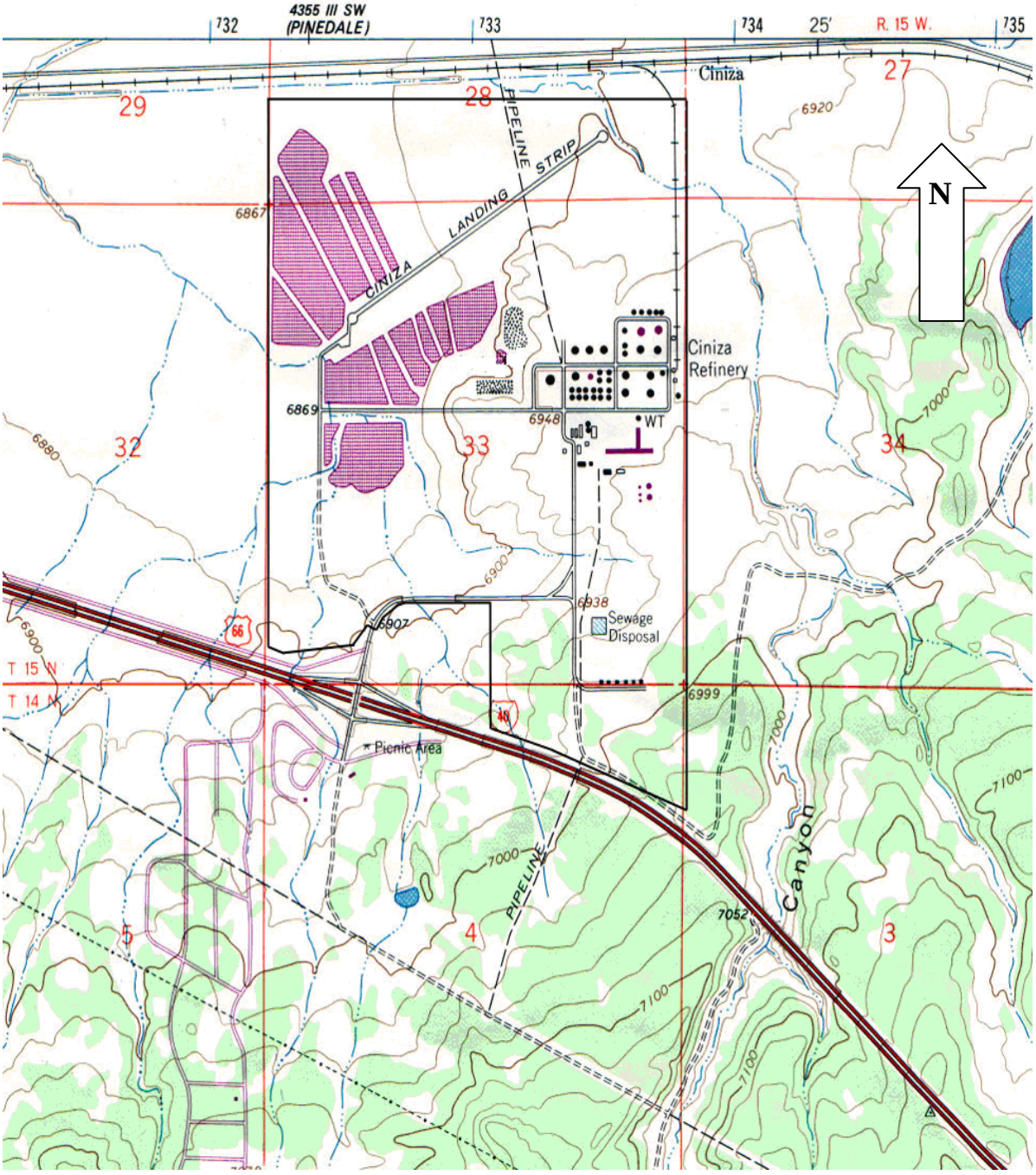


Figure 2: Topographic Map of the Gallup Refinery Site - USGS Topographical Map - Gallup Quadrangle (Revised 1980)

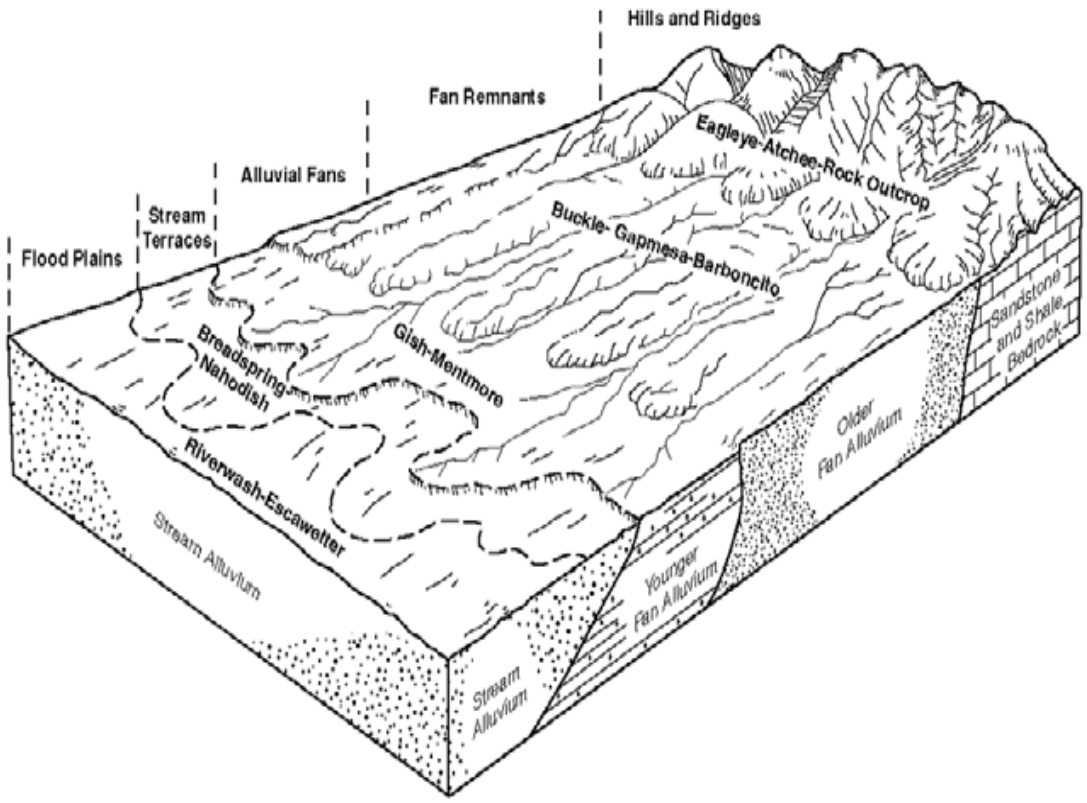
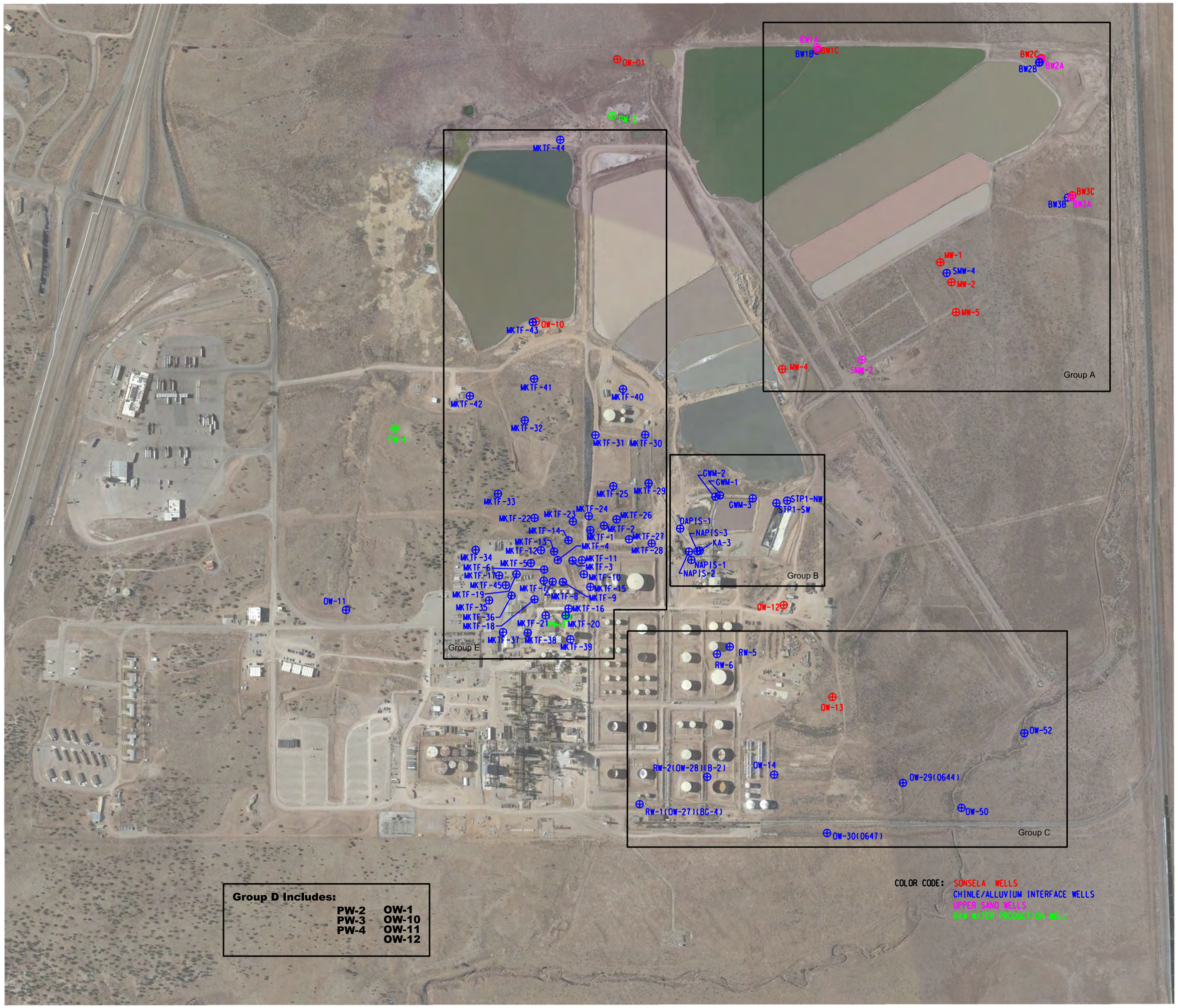


Figure 3: Generalized relationship of soils in the Gallup Refinery area: from NRCS/USDA Soil Survey of McKinley County.



psi
4601 Ripley
El Paso, Texas
79922
915-584-1317

1"=500'

Project #: 0625859

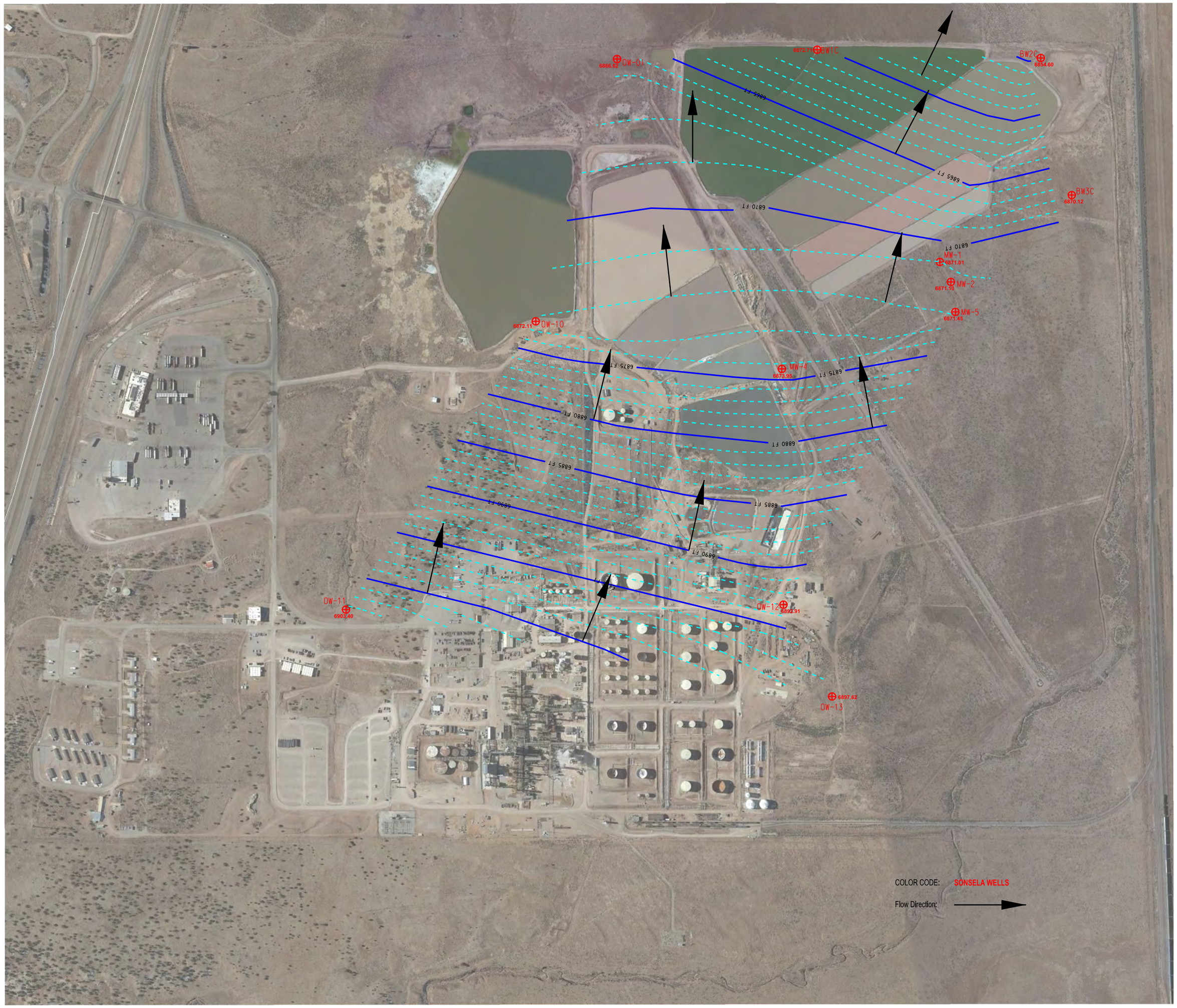
Figure 4

FACILITIES AND WELL GROUPS

WESTERN REFINING - GALLUP REFINERY

Western Refining - Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87347

Date: February 26, 2015



psi
4601 Ripley
El Paso, Texas
79922
915-584-1317

1"=500'

Project #: 0625859

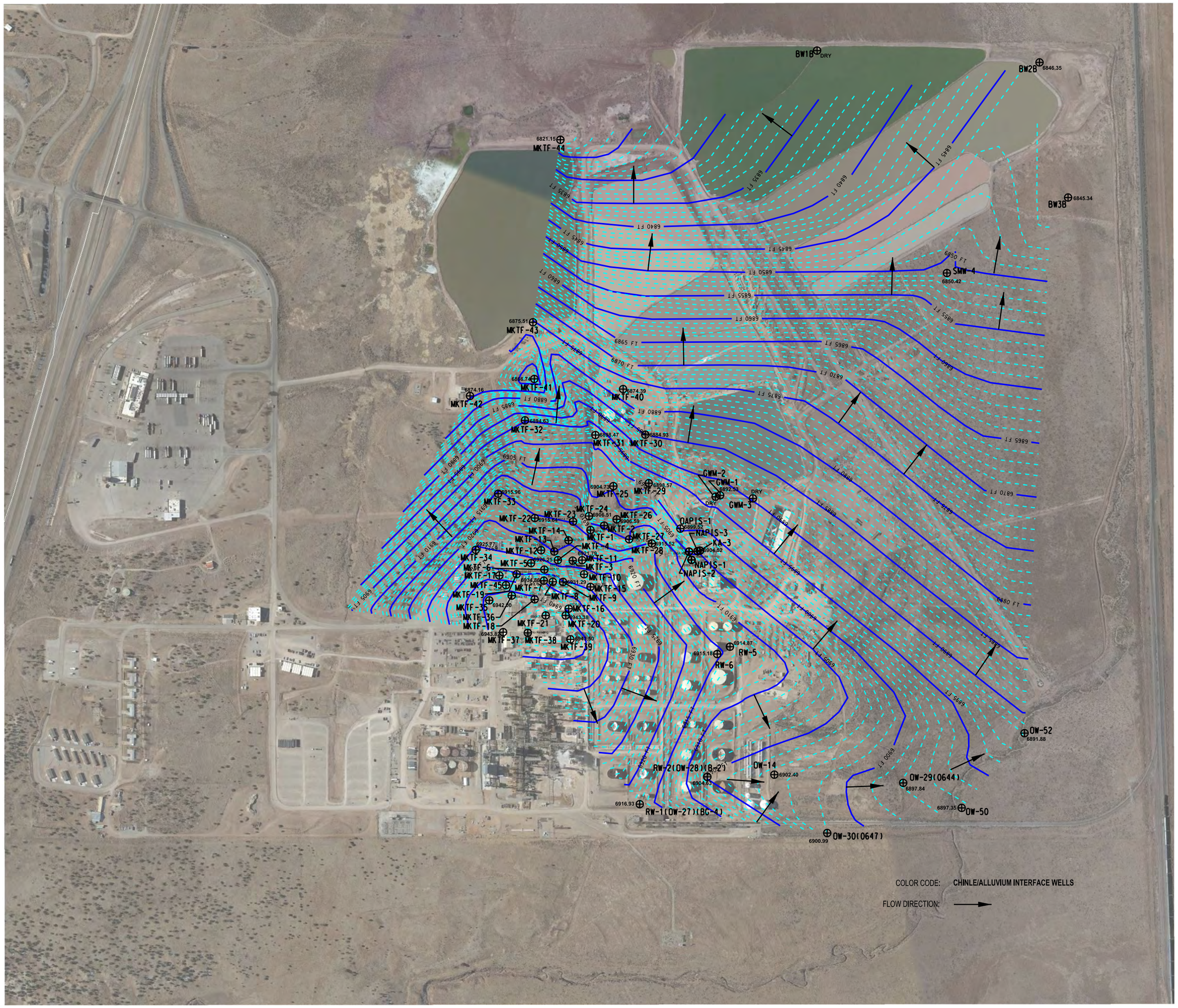
Figure 5

Sonsela Water Elevation Map 2014

WESTERN REFINING - GALLUP REFINERY

Western Refining - Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87347

Date: February 26, 2015



psi
4601 Ripley
El Paso, Texas
79922
915-584-1317

1"=500'

Project #: 0625859

Figure 6

Alluvium/Chinle Gp Interface Water Elevation Map

WESTERN REFINING - GALLUP REFINERY

Western Refining - Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87347

Date: February 26, 2015

Appendix B - Table 1
Gallup Refinery - Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
NAPI Secondary Containment (3 units)	Q	NA	NA	BTEX+MTBE, GRO/DRO extended, WQCC Metals or check for fluids
NAPI Inlet	Q	NA	NA	BTEX+MTBE, GRO/DRO extended, WQCC Metals
RW-1	Q	X	NA	Measure DTW, DTP (Hydrocarbon recovery). Sample for BTEX, MTBE, GRO/DRO extended if no SPH is detected
RW-2	Q	X	NA	Same as RW-1
RW-5	Q	X	NA	Same as RW-1
RW-6	Q	X	NA	Same as RW-1
OW-1	Q	X	pH, EC, DO, ORP, Temp, TDS	Visual check for artesian flow conditions: Sample for Major Cations/Anions, WQCC Metals, VOCS (Methods 8260 & 8011 for 1,2-dibromethane), GRO/DRO extended
OW-10	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-1
OW-13	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), WQCC Metals, GRO/DRO extended
OW-14	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), WQCC Metals, GRO/DRO extended
OW-29	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-30	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-53	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-54	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-55	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-56	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-57	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-58	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14
OW-59	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals
OW-60	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-59
OW-61	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions
OW-62	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions
OW-63	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions
OW-64	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions
OW-65	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions
GWM-1	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), GRO/DRO extended, WQCC Metals
GWM-2	Q	X	NA	Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for GRO/DRO extended, Major Cations/Anions, VOCs
GWM-3	Q	X	NA	Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for VOCS, GRO/DRO extended, Major Cations/Anions
NAPIS-1 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, BTEX+MTBE, SVOCS, GRO/DRO extended, WQCC Metals
NAPIS-2 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as NAPIS-1
NAPIS-3 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as NAPIS-1 and Method 8011 for 1,2-dibromoethane
KA- 3 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as NAPIS-1

Appendix B - Table 1
Gallup Refinery - Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
OAPIS-1	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), SVOCS, GRO/DRO extended, WQCC Metals, Major Cations/Anions, Cyanide
STP1-NW	Q	X	NA	Major Cations/Anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals
STP1-SW	Q	X	NA	Major Cations/Anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals
STP-1 TO EP-2 (EP-2 Inlet)	Q	NA	NA	VOCS, GRO/DRO extended, BOD, COD, TDS, WQCC Metals, TSS
Boiler Water (Reverse Osmosis) inlet to EP-2	SA	NA	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions
Pond 1 [2]				NO LONGER IN SERVICE
Evaporation Pond 2 [2]	SA		pH, EC, DO, ORP, Temp, TDS	General Chemistry, VOCS, SVOCS, BOD, COD, E-Coli Bacteria, WQCC Metals
Evaporation Pond 3 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2 and pesticides by Method 8081A
Evaporation Pond 4 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 5 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 6 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 7 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 8 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 9 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 11 [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
Evaporation Pond 12A [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-3
Evaporation Pond 12B [2]	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-3
Any temporary Pond containing fluid	SA		pH, EC, DO, ORP, Temp, TDS	Same as EP-2
BW-1A	Annual (A)	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, WQCC METALS, GRO/DRO extended
BW-1B	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-1C	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-2A	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-2B	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-2C	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-3A	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-3B	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-3C	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-4A	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-4B	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-5A	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A
BW-5B	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), WQCC METALS, GRO/DRO extended
BW-5C	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-5B

Appendix B - Table 1
Gallup Refinery - Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
MW-1	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, GRO/DRO extended, WQCC Metals, Cyanide, SVOCS
MW-2	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH, EC, DO, ORP, Temp, TDS	Same as MW-1
MW-4	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH, EC, DO, ORP, Temp, TDS	Same as MW-1
MW-5	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH, EC, DO, ORP, Temp, TDS	Same as MW-1
OW-11	A	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, WQCC Metals, GRO/DRO extended
OW-12	A	X	pH, EC, DO, ORP, Temp, TDS	VOCS, WQCC Metals, GRO/DRO extended
OW-50	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), GRO/DRO extended, WQCC Metals, General Chemistry
OW-52	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (methods 8260 & 8011 for 1,2-dibromoethane) , GRO/DRO extended, WQCC Metals, General Chemistry
SMW-2	A	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, GRO/DRO extended, WQCC Metals, Cyanide, SVOCS
SMW-4	Annual and every 10 years beginning in 2009 per RCRA Post Closure Permit	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals, Cyanide
PW-3	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite
PW-2	Every 3 years. Starting in 2008	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite
PW-4	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite
MKTF-01	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions
MKTF-02	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-03	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions
MKTF-04	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-05	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-06	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-07	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-08	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-09	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-10	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-11	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-12	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-13	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-14	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-15	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03

Appendix B - Table 1
Gallup Refinery - Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
MKTF-16	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-17	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-18	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-19	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-20	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-21	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-22	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-23	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-24	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-25	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-26	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-27	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-28	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-29	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-30	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-31	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-32	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-33	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-34	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-35	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-36	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-37	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-38	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-39	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-40	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-41	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-42	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01
MKTF-43	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-44	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03
MKTF-45	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03

DEFINITIONS:

DO- Dissolved Oxygen	DTW - Depth to Water	MW - Monitor Well	DRO - Diesel Range Organics	BTEX - Benzene, Toluene, Ethylbenzene, Xylenes, plus Methyl Tert-Butyl Ether (MTBE) - EPA Method 8021+MTBE

Appendix B - Table 1
Gallup Refinery - Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
ORP - Oxygen Reduction Potential	DTP - Depth to Product	OW - Observation Well	MRO - Motor oil range organics	General Chemistry - pH, specific conductance, cations, Anions
Temp - Temperature	DTB - Depth to Bottom	RW - Recovery Well	GRO - Gasoline Range Organics	WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved
EC - Electrical or Specific Conductivity	EP - Evaporation Pond	NA - Not Applicable	MKTF - Marketing Tank Farm Well	VOC - Volatile Organic Compounds - EPA Method 8260, must include MTBE
TDS - Total Dissolved Solids	BW - Boundary Well		PW - Raw Water Production Well	SVOC - Semi-Volatile Organic Compounds - EPA Method 8270, must include phenol

NOTES:

1. NAPIS-1, NAPIS-2, NAPIS-3, and KA-3: Detection of product during quarterly monitoring must comply with Section II.F.2 (24-hour reporting) of NMED Post-Closure Care Permit
2. Sample using the State of New Mexico approved analytical methods as required by 20.6.4.14 NMAC, as amended through February 16, 2006 (use methods 9221-E, until EPA approves 40 CFR 136 Methods (Colilert, Colilert-18, m-Coliblue24, membrane filter method)). Parameters are subject to change. Evaporation pond samples must be collected at the inlet where waste water flows into the evaporation ponds.

Appendix B - Table 2
Gallup Refinery - Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2019 Requested Changes	Rationale for Requested Changes
NAPI Secondary Containment (3 units)	Q	NA	NA	BTEX+MTBE, GRO/DRO extended, WQCC Metals or check for fluids	None	
NAPI Inlet	Q	NA	NA	Same as above (SAA)	None	
RW-1	Q	X	NA	Measure DTW, DTP (Hydrocarbon recovery) Sample for BTEX + MTBE, GRO/DRO extended. Sample only if no SPH is detected.	None	
RW-2	Q	X	NA	Same as RW-1	None	
RW-5	Q	X	NA	Same as RW-1	None	
RW-6	Q	X	NA	Same as RW-1	None	
OW-1	Q	X	pH-, EC, DO, ORP, Temp, TDS	Visual check for artesian flow conditions: Sample for Major Cations/Anions, WQCC Metals, VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), GRO/DRO extended	None	
OW-10	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-1	None	
OW-13	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), WQCC Metals, GRO/DRO extended	None	
OW-14	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), WQCC Metals, GRO/DRO extended	None	
OW-29	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-30	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-53	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-54	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-55	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-56	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-57	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-58	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-14	None	
OW-59	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals	None	
OW-60	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-59	None	
OW-61	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions	Add to Monitoring Schedule	New Well

Appendix B - Table 2
Gallup Refinery - Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2019 Requested Changes	Rationale for Requested Changes
OW-62	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions	Add to Monitoring Schedule	New Well
OW-63	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions	Add to Monitoring Schedule	New Well
OW-64	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions	Add to Monitoring Schedule	New Well
OW-65	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions	Add to Monitoring Schedule	New Well
GWM-1	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS (methods 8260 and 8011 for 1,2-dibromoethane), GRO/DRO extended, WQCC Metals	None	
GWM-2	Q	X	NA	Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for GRO/DRO extended, Major Cations/Anions, VOCS	None	
GWM-3	Q	X	NA	Same as GWM-2	None	
NAPIS-1 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, BTEX+MTBE, SVOCS, GRO/DRO extended, WQCC Metals	None	
NAPIS-2 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as NAPIS-1	None	
NAPIS-3 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as NAPIS-1 and Method 8011 for 1,2-dibromoethane	None	
KA-3 [1]	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as NAPIS-1	None	
OAPIS-1	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS (Methods 8260 and 8011), SVOCS, GRO/DRO extended, WQCC Metals, Cyanide	None	
STP1-NW	Q	X	NA	Major Cations/Anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals	None	
STP1-SW	Q	X	NA	Same as STP1-NW	None	
Boiler Water (Reverse Osmosis)inlet to EP-2	SA	NA	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions	None	
Pond 1 [2]		NA		NO LONGER IN SERVICE	None	
Evaporation Ponds 2 - 9 [2]	SA	NA	pH, EC, DO, ORP, Temp, TDS	General Chemistry, VOCS, SVOCS, BOD, COD, E-Coli Bacteria, WQCC Metals and Pesticides by method 8081A for EP-3)	None	
Evaporation Pond 11 [2]	SA	NA	pH, EC, DO, ORP, Temp, TDS	Same as EP-2	None	

Appendix B - Table 2
Gallup Refinery - Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2019 Requested Changes	Rationale for Requested Changes
Evaporation Pond 12A [2]	SA	NA	pH, EC, DO, ORP, Temp, TDS	Same as EP-2, and Pesticides by method 8081A	None	
Evaporation Pond 12B [2]	SA	NA	pH , EC, DO, ORP, Temp, TDS	Same as EP-2, and Pesticides by method 8081A	None	
Any temporary Pond containing fluid	SA	NA	pH, EC, DO, ORP, Temp, TDS	Same as EP-2	None	
STP-1 TO EP-2 (EP-2 Inlet)	Q	NA	NA	VOCS, GRO/DRO extended, BOD, COD, TDS, WQCC Metals, TSS	Add TSS	Per NMED comment 17 in 3-21-2019 Disapproval Annual GW Monitoring Report 2017
BW-1A	A	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, WQCC METALS, GRO/DRO extended	None	
BW-1B	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-1C	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-2A	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-2B	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-2C	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-3A	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-3B	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-3C	A	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-4A	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	Change to Quarterly	
BW-4B	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	Change to Quarterly	
BW-5A	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-1A	None	
BW-5B	Q	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS (8260 & 8011 for 1,2-dibromoethane) , WQCC METALS, GRO/DRO extended	Change to Quarterly and Add Method 8011	Per Comment 32 of 3-21-2019 Disapproval Annual GW Monitoring Report 2017
BW-5C	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as BW-5B	Change to Quarterly and Add Method 8011	Per Comment 32 of 3-21-2019 Disapproval Annual GW Monitoring Report 2017

Appendix B - Table 2
Gallup Refinery - Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2019 Requested Changes	Rationale for Requested Changes
MW-1	A	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, SVOCs, GRO/DRO extended, WQCC Metals, Cyanide	None	
MW-2	A	X	pH, EC, DO, ORP, Temp, TDS	Same as MW-1	None	
MW-4	A	X	pH, EC, DO, ORP, Temp, TDS	Same as MW-1	None	
MW-5	A	X	pH, EC, DO, ORP, Temp, TDS	Same as MW-1	None	
OW-11	A	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, WQCC Metals, GRO/DRO-extended	None [4]	
OW-12	A	X	pH, EC, DO, ORP, Temp, TDS	VOCS, WQCC Metals, GRO/DRO extended	None	
OW-50	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane) , GRO/DRO extended, WQCC Metals, GEN CHEM.	None	
OW-52	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as OW-50	None	
SMW-2	A	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, SVOCs, GRO/DRO extended, WQCC Metals, Cyanide	None	
SMW-4	A	X	pH, EC, DO, ORP, Temp, TDS	Major Cations/Anions, VOCS, SVOCS, GRO/DRO extended, WQCC Metals, Cyanide	None	
PW-3	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite	None	
PW-2	Every 3 years. Starting in 2008	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite	None	
PW-4	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, Cyanide, Nitrate, Nitrite	None	
MKTF-01	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS (Methods 8260 & 8011 for 1,2-dibromoethane), SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions. Ground water samples will not be collected if SPH is present in any of the wells.	None	
MKTF-02	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-03	Q	X	pH, EC, DO, ORP, Temp, TDS	VOCS, SVOCS, WQCC Metals, GRO/DRO extended, Major Cations/Anions	None	None
MKTF-04	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-05	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-06	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	

Appendix B - Table 2
Gallup Refinery - Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2019 Requested Changes	Rationale for Requested Changes
MKTF-07	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-08	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-09	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-10	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-11	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-12	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-13	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-14	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-15	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-16	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-17	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-18	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-19	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-20	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-21	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-22	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-23	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-24	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-25	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-26	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-27	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-28	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	

Appendix B - Table 2
Gallup Refinery - Requested/Approved Changes to the Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency (Q - Quarterly A - Annual SA - Semi-Annual)	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite	2019 Requested Changes	Rationale for Requested Changes
MKTF-29	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-30	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-31	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-32	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-33	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-34	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-35	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-36	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-37	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-38	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-39	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-40	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-41	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-42	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-01	None	
MKTF-43	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-44	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	
MKTF-45	Q	X	pH, EC, DO, ORP, Temp, TDS	Same as MKTF-03	None	

DEFINITIONS:

STP-1 TO EP-2 - Sample collected at the inlet to Evaporation Pond 2 from STP-1
NAPIS 1 = (KA-1R); NAPIS-2 = (KA-2R), NAPIS-3 = KA-3R) - monitor wells positioned around NAPIS to detect leakage
DO- Dissolved Oxygen; ORP - Oxygen Reduction Potential; Temp - Temperature; EC - Electrical or Specific Conductivity
TDS - Total Dissolved Solids; VOC - Volatile Organic Compounds-EPA Method 8260, must include MTBE

SVOC - Semi-Volatile Organic Compounds - EPA Method 8270, must include phenol
DRO - Diesel Range Organics - EPA Method 8015B (or as modified); GRO - Gasoline Range Organics - EPA Method 8015B (or as modified)
BTEX - Benzene, Toluene, Ethylbenzene, Xylene, plus Methyl Tert-Butyl Ether (MTBE) - EPA Method 8021+MTBE
General Chemistry - pH, specific conductance, cations, Anions
DTW - Depth to Water; DTP - Depth to Product; EP - Evaporation Pond; BW - Boundary Wells
GWM wells - located around the aeration lagoons to detect leakage
MW - Monitor Well; OW - Observation Well; RW - Recovery Well; PW - Raw Water Production Well
WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved
NA - Not Applicable

NOTES:

1) NAPIS 1, NAPIS 2, NAPIS 3, KA-3: Detection of product during quarterly monitoring must comply with Section II.F.2 (twenty-four hour reporting) of NMED Post-Closure Care Permit
2) Sample using the State of New Mexico approved analytical methods as required by 20.6.4.14 NMAC, as amended through February 16, 2006 (use methods 9221-E and 9221-F, until EPA approves 40 CFR 136 methods. (Colilert, Colilert - 18, m-Coliblue24, membrane filter method)). Parameters are subject to change. Evaporation Pond samples must be collected at the inlet where waste water flows into the evaporation ponds.

APPENDIX C-1
2018 FLUID LEVEL MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevation (ft)	Well Casing Rim Elevation (ft)	Stick-up Length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground Water Elevation [3] (ft)	Corrected Water Table[1] Elevation (factor 0.8) (ft)
11/10/03	BW-1A	08/15/18	2.00	6,883.17	6,885.12	1.95	6,847.50	42.61	ND	NA	DRY	DRY	NA
10/28/03	BW-1B	08/15/18	2.00	6,883.17	6,885.78	2.61	6,818.33	73.55	ND	NA	DRY	DRY	NA
11/10/03	BW-1C	08/15/18	2.00	6,883.17	6,885.68	2.51	6,749.29	145.29	ND	NA	12.90	6,872.78	NA
11/10/03	BW-2A	08/15/18	2.00	6,871.88	6,874.69	2.81	6,807.12	67.57	ND	NA	32.34	6,842.35	NA
10/28/03	BW-2B	08/15/18	2.00	6,871.66	6,874.50	2.84	6,782.24	92.26	ND	NA	28.25	6,846.25	NA
10/28/03	BW-2C	08/15/18	2.00	6,872.90	6,875.30	2.40	6,722.46	152.84	ND	NA	20.85	6,854.45	NA
06/15/04	BW-3A	08/15/18	2.00	6,875.94	6,878.39	2.45	6,826.04	52.38	ND	NA	DRY	DRY	NA
10/15/03	BW-3B	08/15/18	2.00	6,876.16	6,878.59	2.43	6,809.19	69.40	ND	NA	33.35	6,845.24	NA
07/20/04	BW-3C	08/15/18	2.00	6,875.72	6,877.95	2.23	6,723.40	154.55	ND	NA	8.18	6,869.77	NA
06/29/17	BW-4A	02/26/18	2.00	6,870.67	6,873.18	2.51	6,909.47	38.80	ND	NA	DRY	DRY	NA
		04/25/18	2.00	6,870.67	6,873.18	2.51	6,909.47	38.80	ND	NA	DRY	DRY	NA
		08/15/18	2.00	6,870.67	6,873.18	2.51	6,909.47	38.80	ND	NA	DRY	DRY	NA
		11/07/18	2.00	6,870.67	6,873.18	2.51	6,908.97	38.30	ND	NA	DRY	DRY	NA
06/29/17	BW-4B	02/26/18	2.00	6,870.62	6,873.23	2.61	6,934.12	63.50	ND	NA	38.43	6,834.80	NA
		04/25/18	2.00	6,870.62	6,873.23	2.61	6,934.12	63.50	ND	NA	43.60	6,829.63	NA
		08/15/18	2.00	6,870.62	6,873.23	2.61	6,934.12	63.50	ND	NA	39.05	6,834.18	NA
		11/13/18	2.00	6,870.62	6,873.23	2.61	6,934.12	63.50	ND	NA	44.87	6,828.36	NA
06/29/17	BW-5A	02/26/18	2.00	6,874.39	6,877.00	2.61	6,897.41	23.02	ND	NA	DRY	DRY	NA
		04/25/18	2.00	6,874.39	6,877.00	2.61	6,897.41	23.02	ND	NA	DRY	DRY	NA
		08/15/18	2.00	6,874.39	6,877.00	2.61	6,897.41	23.02	ND	NA	DRY	DRY	NA
		11/13/18	2.00	6,874.39	6,877.00	2.61	6,897.41	23.02	ND	NA	DRY	DRY	NA

APPENDIX C-1
2018 FLUID LEVEL MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevation (ft)	Well Casing Rim Elevation (ft)	Stick-up Length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground Water Elevation [3] (ft)	Corrected Water Table[1] Elevation (factor 0.8) (ft)
06/29/17	BW-5B	02/26/18	2.00	6,874.32	6,876.82	2.50	6,935.77	61.45	ND	NA	10.28	6,866.54	NA
		04/25/18	2.00	6,874.32	6,876.82	2.50	6,935.77	61.45	ND	NA	9.75	6,867.07	NA
		08/15/18	2.00	6,874.32	6,876.82	2.50	6,935.77	61.45	ND	NA	10.04	6,866.78	NA
		11/13/18	2.00	6,874.32	6,876.82	2.50	6,935.77	61.45	ND	NA	10.57	6,866.25	NA
06/29/17	BW-5C	02/26/18	2.00	6,874.22	6,876.85	2.63	6,950.57	76.35	ND	NA	2.63	6,874.22	NA
		04/25/18	2.00	6,874.22	6,876.85	2.63	6,950.57	76.35	ND	NA	2.55	6,874.30	NA
		08/15/18	2.00	6,874.22	6,876.85	2.63	6,950.57	76.35	ND	NA	3.32	6,873.53	NA
		11/13/18	2.00	6,874.22	6,876.85	2.63	6,950.57	76.35	ND	NA	3.49	6,873.36	NA
10/14/81	MW-1	08/15/18	5.00	6,876.63	6,878.12	1.49	6,747.29	130.83	ND	NA	7.75	6,870.37	NA
		12/05/2018 [2]	5.00	6,876.63	6,878.12	1.49	6,747.29	130.83	ND	NA	7.36	6,870.76	NA
10/15/81	MW-2	08/15/18	5.00	6,878.39	6,880.30	1.91	6,742.82	137.48	ND	NA	9.35	6,870.95	NA
		12/05/2018 [2]	5.00	6,878.39	6,880.30	1.91	6,742.82	137.48	ND	NA	16.63	6,863.67	NA
10/16/81	MW-4	08/15/18	5.00	6,879.89	6,881.63	1.74	6,759.91	121.72	ND	NA	7.71	6,873.92	NA
		12/05/2018 [2]	5.00	6,879.89	6,881.63	1.74	6,759.91	121.72	ND	NA	7.83	6,873.80	NA
07/21/86	MW-5	08/15/18	4.00	6,880.20	6,882.83	2.63	6,752.00	130.83	ND	NA	11.51	6,871.32	NA
		12/05/2018 [2]	4.00	6,880.20	6,882.83	2.63	6,752.00	130.83	ND	NA	16.80	6,866.03	NA
09/26/85	SMW-2	08/15/18	2.00	6,881.63	6,883.97	2.34	6,831.17	52.80	ND	NA	24.49	6,859.48	NA
09/25/85	SMW-4	08/15/18	2.00	6,877.63	6,879.52	1.89	6,809.84	69.68	ND	NA	29.04	6,850.48	NA
		12/05/2018 [2]	2.00	6,877.63	6,879.52	1.89	6,809.84	69.68	ND	NA	29.25	6,850.27	NA
01/05/81	OW-1*	02/27/18	4.00	6,866.32	6,866.62	0.30	6,772.07	94.55	ND	NA	1.45	6,865.17	NA
		04/25/18	4.00	6,866.32	6,866.62	0.30	6,772.07	94.54	ND	NA	1.80	6,864.82	NA
		08/14/18	4.00	6,866.32	6,866.62	0.30	6,772.07	94.55	ND	NA	1.80	6,864.82	NA
		11/07/18	4.00	6,866.32	6,866.62	0.30	6,772.07	94.55	ND	NA	1.33	6,865.29	NA

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Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevation (ft)	Well Casing Rim Elevation (ft)	Stick-up Length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground Water Elevation [3] (ft)	Corrected Water Table[1] Elevation (factor 0.8) (ft)
11/25/80	OW-10*	02/27/18	4.00	6,873.67	6,874.91	1.24	6,814.58	60.33	ND	NA	1.98	6,872.93	NA
		04/25/18	4.00	6,873.67	6,874.91	1.24	6,814.58	60.13	ND	NA	1.86	6,873.05	NA
		08/15/18	4.00	6,873.67	6,874.91	1.24	6,814.58	60.13	ND	NA	2.41	6,872.50	NA
		11/08/18	4.00	6,873.67	6,874.91	1.24	6,814.58	60.33	ND	NA	2.50	6,872.41	NA
09/25/81	OW-11	08/15/18	4.00	6,922.05	6,923.51	1.46	6,857.72	65.79	ND	NA	19.20	6,904.31	NA
12/15/80	OW-12	08/15/18	4.00	6,939.57	6,940.69	1.12	6,811.84	128.85	ND	NA	46.50	6,894.19	NA
12/10/80	OW-13	02/28/18	4.00	6,918.95	6,920.07	1.12	6,820.92	99.15	ND	NA	20.50	6,899.57	NA
		04/26/18	4.00	6,918.95	6,920.07	1.12	6,820.92	99.00	ND	NA	20.41	6,899.66	NA
		08/14/18	4.00	6,918.95	6,920.07	1.12	6,820.92	102.00	ND	NA	20.70	6,899.37	NA
		11/06/18	4.00	6,918.95	6,920.07	1.12	6,820.92	99.15	ND	NA	20.70	6,899.37	NA
12/17/80	OW-14	02/27/18	4.00	6,924.55	6,926.65	2.10	6,880.13	46.52	ND	NA	21.80	6,904.85	NA
		04/26/18	4.00	6,924.55	6,926.65	2.10	6,880.13	46.75	ND	NA	21.75	6,904.90	NA
		08/14/18	4.00	6,924.55	6,926.65	2.10	6,880.13	46.78	ND	NA	21.95	6,904.70	NA
		11/06/18	4.00	6,924.55	6,926.65	2.10	6,880.13	46.52	ND	NA	21.82	6,904.83	NA
08/23/96	OW-29	02/27/18	4.00	6,913.89	6,917.00	3.11	6,865.92	51.08	ND	NA	17.12	6,899.88	NA
		04/26/18	4.00	6,913.89	6,917.00	3.11	6,865.92	51.90	ND	NA	16.98	6,900.02	NA
		08/14/18	4.00	6,913.89	6,917.00	3.11	6,865.92	52.40	ND	NA	17.52	6,899.48	NA
		11/06/18	4.00	6,913.89	6,917.00	3.11	6,865.92	51.08	ND	NA	17.22	6,899.78	NA
08/28/96	OW-30	02/28/18	4.00	6,921.81	6,924.69	2.88	6,874.79	49.90	ND	NA	21.33	6,903.36	NA
		04/26/18	4.00	6,921.81	6,924.69	2.88	6,874.79	50.20	ND	NA	21.28	6,903.41	NA
		08/15/18	4.00	6,921.81	6,924.69	2.88	6,874.79	51.40	ND	NA	21.70	6,902.99	NA
		12/03/18	4.00	6,921.81	6,924.69	2.88	6,874.79	49.90	ND	NA	21.30	6,903.39	NA
10/05/09	OW-50	08/14/18	2.00	6,912.63	6,914.21	1.58	6,850.21	65.25	ND	NA	15.12	6,899.09	NA

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Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevation (ft)	Well Casing Rim Elevation (ft)	Stick-up Length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground Water Elevation [3] (ft)	Corrected Water Table[1] Elevation (factor 0.8) (ft)
		11/07/18	2.00	6,912.63	6,914.21	1.58	6,850.21	64.00	ND	NA	15.20	6,899.01	NA
10/05/09	OW-52	08/15/18	2.00	6,906.53	6,907.68	1.15	6,829.94	79.00	ND	NA	14.52	6,893.16	NA
		11/07/18	2.00	6,906.53	6,907.68	1.15	6,829.94	77.74	ND	NA	14.44	6,893.24	NA
05/31/16	OW-53	02/21/18	2.00	6,911.93	6,914.38	2.45	6,945.83	33.90	ND	NA	DRY	NA	NA
		04/26/18	2.00	6,911.93	6,914.38	2.45	6,945.83	33.90	ND	NA	DRY	NA	NA
		08/15/18	2.00	6,911.93	6,914.38	2.45	6,945.84	33.91	ND	NA	DRY	NA	NA
		11/06/18	2.00	6,911.93	6,914.38	2.45	6,945.83	33.90	ND	NA	DRY	NA	NA
06/01/16	OW-54	02/21/18	2.00	6,916.36	6,918.92	2.56	6,947.23	30.87	ND	NA	18.05	6,900.87	NA
		04/26/18	2.00	6,916.36	6,918.92	2.56	6,946.06	29.70	ND	NA	17.83	6,901.09	NA
		08/14/18	2.00	6,916.36	6,918.92	2.56	6,945.98	29.62	ND	NA	18.23	6,900.69	NA
		11/06/18	2.00	6,916.36	6,918.92	2.56	6,947.42	31.06	ND	NA	17.90	6,901.02	NA
06/01/16	OW-55	02/21/18	2.00	6,921.01	6,923.25	2.24	6,951.96	30.95	ND	NA	17.80	6,905.45	NA
		04/26/18	2.00	6,921.01	6,923.25	2.24	6,951.93	30.92	ND	NA	17.61	6,905.64	NA
		08/14/18	2.00	6,921.01	6,923.25	2.24	6,951.71	30.70	ND	NA	17.94	6,905.31	NA
		11/06/18	2.00	6,921.01	6,923.25	2.24	6,951.91	30.90	ND	NA	17.72	6,905.53	NA
06/01/16	OW-56	02/21/18	2.00	6,917.79	6,920.18	2.39	6,936.38	18.59	ND	NA	12.84	6,907.34	NA
		04/26/18	2.00	6,917.79	6,920.18	2.39	6,936.38	18.59	ND	NA	12.62	6,907.56	NA
		08/14/18	2.00	6,917.79	6,920.18	2.39	6,936.38	18.59	ND	NA	13.82	6,906.36	NA
		11/06/18	2.00	6,917.79	6,920.18	2.39	6,936.37	18.58	ND	NA	14.05	6,906.13	NA
10/05/16	OW-57	02/19/18	2.00	6,930.64	6,933.10	2.46	6,958.99	28.35	ND	NA	19.88	6,913.22	NA
		04/25/18	2.00	6,930.64	6,933.10	2.46	6,958.70	28.06	ND	NA	20.02	6,913.08	NA
		08/15/18	2.00	6,930.64	6,933.10	2.46	6,958.71	28.07	ND	NA	20.16	6,912.94	NA
		11/29/18	2.00	6,930.64	6,933.10	2.46	6,958.99	28.35	ND	NA	20.30	6,912.80	NA

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Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevation (ft)	Well Casing Rim Elevation (ft)	Stick-up Length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground Water Elevation [3] (ft)	Corrected Water Table[1] Elevation (factor 0.8) (ft)
10/03/16	OW-58	02/20/18	2.00	6,934.71	6,934.50	-0.21	6,982.33	47.62	ND	NA	24.52	6,909.98	NA
		04/25/18	2.00	6,934.71	6,934.50	-0.21	6,982.21	47.50	ND	NA	24.25	6,910.25	NA
		08/16/18	2.00	6,934.71	6,934.50	-0.21	6,982.20	47.49	ND	NA	24.48	6,910.02	NA
		11/29/18	2.00	6,934.71	6,934.50	-0.21	6,982.21	47.50	ND	NA	24.27	6,910.23	NA
06/29/17	OW-59	02/21/18	2.00	6,887.63	6,889.73	2.10	6,926.18	38.55	ND	NA	24.00	6,865.73	NA
		04/26/18	2.00	6,887.63	6,889.73	2.10	6,926.11	38.48	ND	NA	24.05	6,865.68	NA
		08/14/18	2.00	6,887.63	6,889.73	2.10	6,926.15	38.52	ND	NA	24.13	6,865.60	NA
		11/06/18	2.00	6,887.63	6,889.73	2.10	6,926.13	38.50	ND	NA	23.90	6,865.83	NA
06/29/17	OW-60	02/21/18	2.00	6,891.06	6,893.51	2.45	6,937.12	46.06	ND	NA	16.26	6,877.25	NA
		04/26/18	2.00	6,891.06	6,893.51	2.45	6,937.21	46.15	ND	NA	16.52	6,876.99	NA
		08/14/18	2.00	6,891.06	6,893.51	2.45	6,937.48	46.42	ND	NA	16.52	6,876.99	NA
		11/06/18	2.00	6,891.06	6,893.51	2.45	6,936.76	45.70	ND	NA	16.25	6,877.26	NA
03/14/18	OW-61	03/21/18	4.00	6,960.91	6,963.57	2.66	6,992.59	31.68	16.71	0.09	16.80	6,946.77	6946.84
		04/24/18	4.00	6,960.91	6,963.57	2.66	6,992.58	31.67	17.22	0.82	18.04	6,945.53	6946.19
		08/16/18	4.00	6,960.91	6,963.57	2.66	6,992.61	31.70	17.40	4.70	22.10	6,941.47	6945.23
		11/29/18	4.00	6,960.91	6,963.57	2.66	6,992.91	32.00	17.95	4.05	22.00	6,941.57	6944.81
03/15/18	OW-62	03/21/18	4.00	6,934.73	6,937.36	2.63	6,966.30	31.57	ND	NA	22.93	6,914.43	NA
		04/24/18	4.00	6,934.73	6,937.36	2.63	6,966.31	31.58	ND	NA	23.14	6,914.22	NA
		08/15/18	4.00	6,934.73	6,937.36	2.63	6,966.32	31.59	ND	NA	23.70	6,913.66	NA
		11/29/18	4.00	6,934.73	6,937.36	2.63	NM	NM	ND	NA	23.99	6,913.37	NA
03/14/18	OW-63	03/21/18	4.00	6,932.34	6,935.06	2.72	6,964.52	32.18	ND	NA	20.19	6,914.87	NA
		04/24/18	4.00	6,932.34	6,935.06	2.72	6,964.52	32.18	ND	NA	20.33	6,914.73	NA
		08/16/18	4.00	6,932.34	6,935.06	2.72	6,964.54	32.20	ND	NA	20.60	6,914.46	NA

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		11/29/18	4.00	6,932.34	6,935.06	2.72	6,964.34	32.00	ND	NA	20.95	6,914.11	NA
03/16/18	OW-64	03/21/18	4.00	6,945.07	6,947.40	2.33	6,972.69	27.62	ND	NA	7.72	6,939.68	NA
		04/24/18	4.00	6,945.07	6,947.40	2.33	6,972.70	27.63	ND	NA	7.85	6,939.55	NA
		08/16/18	4.00	6,945.07	6,947.40	2.33	6,972.42	27.35	ND	NA	7.51	6,939.89	NA
		11/29/18	4.00	6,945.07	6,947.40	2.33	NM	NM	8.06	0.05	8.11	6,939.29	6939.33
03/12/18	OW-65	03/21/18	4.00	6,951.62	6,954.05	2.43	6,993.28	41.66	23.40	0.20	23.60	6,930.45	6930.61
		04/24/18	4.00	6,951.62	6,954.05	2.43	6,993.27	41.65	23.61	2.74	26.35	6,927.70	6929.89
		08/16/18	4.00	6,951.62	6,954.05	2.43	6,993.28	41.66	24.96	1.68	26.64	6,927.41	6928.75
		11/29/18	4.00	6,951.62	6,954.05	2.43	6,991.62	40.00	24.05	7.75	31.80	6,922.25	6928.45
07/08/04	GWM-1	02/12/18	2.00	6,910.22	6,912.61	2.39	6,886.41	26.20	21.83	0.37	22.20	6,890.41	6890.71
		04/26/18	2.00	6,910.22	6,912.61	2.39	6,886.41	26.38	21.85	0.40	22.25	6,890.36	6890.68
		08/15/18	2.00	6,910.22	6,912.61	2.39	6,886.41	26.42	21.50	0.04	21.54	6,891.07	6891.10
		11/19/18	2.00	6,910.22	6,912.61	2.39	6,886.41	26.20	21.42	0.13	21.55	6,891.06	6891.16
09/25/05	GWM-2	02/12/18	2.00	6,910.32	6,913.09	2.77	6,894.28	19.05	ND	NA	DRY	DRY	NA
		04/26/18	2.00	6,910.32	6,913.09	2.77	6,894.28	19.01	ND	NA	DRY	DRY	NA
		08/15/18	2.00	6,910.32	6,913.09	2.77	6,894.28	19.04	ND	NA	DRY	DRY	NA
		11/19/18	2.00	6,910.32	6,913.09	2.77	6,894.28	18.81	ND	NA	DRY	DRY	NA
09/25/05	GWM-3	02/12/18	2.00	6,907.35	6,910.25	2.90	6,892.45	18.05	ND	NA	DRY	DRY	NA
		04/26/18	2.00	6,907.35	6,910.25	2.90	6,892.45	18.02	ND	NA	DRY	DRY	NA
		08/15/18	2.00	6,907.35	6,910.25	2.90	6,892.45	18.04	ND	NA	DRY	DRY	NA
		11/19/18	2.00	6,907.35	6,910.25	2.90	6,892.45	17.80	ND	NA	DRY	DRY	NA
03/14/08	NAPIS-1	02/12/18	2.00	6,913.62	6,913.86	0.24	6,900.33	13.53	6.15	1.95	8.10	6,905.76	NA
		04/25/18	2.00	6,913.62	6,913.86	0.24	6,900.33	13.76	6.58	1.24	7.82	6,906.04	NA

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		08/15/18 [3]	2.00	6,913.62	6,913.86	0.24	6,900.33	NM	NM	NA	NM	NA	NA
		11/08/18 [3]	2.00	6,913.62	6,913.86	0.24	6,900.33	NM	NM	NA	NM	NA	NA
03/14/08	NAPIS-2	02/09/18	2.00	6,913.40	6,912.65	-0.75	6,899.04	14.60	ND	NA	8.25	6,904.40	NA
		04/26/18	2.00	6,913.40	6,912.65	-0.75	6,899.04	14.52	ND	NA	8.58	6,904.07	NA
		08/15/18 [3]	2.00	6,913.40	6,912.65	-0.75	6,899.04	NM	NM	NA	NM	NA	NA
		11/08/18 [3]	2.00	6,913.40	6,912.65	-0.75	6,899.04	NM	NM	NA	NM	NA	NA
03/14/08	NAPIS-3	02/09/18	2.00	6,913.38	6,912.76	-0.62	6,882.34	31.60	ND	NA	9.70	6,903.06	NA
		04/26/18	2.00	6,913.38	6,912.76	-0.62	6,882.34	31.51	ND	NA	9.60	6,903.16	NA
		08/15/18 [3]	2.00	6,913.38	6,912.76	-0.62	6,882.34	NM	NM	NA	NM	NA	NA
		11/08/18 [3]	2.00	6,913.38	6,912.76	-0.62	6,882.34	NM	NM	NA	NM	NA	NA
06/11/07	KA-3	02/09/18	2.00	6,913.29	6,912.52	-0.77	6,889.32	24.30	ND	NA	8.40	6,904.12	NA
		04/26/18	2.00	6,913.29	6,912.52	-0.77	6,889.32	24.24	ND	NA	8.50	6,904.02	NA
		08/15/18 [3]	2.00	6,913.29	6,912.52	-0.77	6,889.32	NM	NM	NA	NM	NA	NA
		11/08/18 [3]	2.00	6,913.29	6,912.52	-0.77	6,889.32	NM	NM	NA	NM	NA	NA
07/17/12	OAPIS-1	02/09/18	2.00	6,914.37	6,916.73	2.36	6,888.37	27.78	ND	NA	12.60	6,904.13	NA
		04/26/18	2.00	6,914.37	6,916.73	2.36	6,888.37	27.75	ND	NA	12.42	6,904.31	NA
		08/15/18	2.00	6,914.37	6,916.73	2.36	6,888.37	27.86	ND	NA	11.60	6,905.13	NA
		11/19/18	2.00	6,914.37	6,916.73	2.36	6,888.37	27.78	ND	NA	11.89	6,904.84	NA
05/06/14	STP1-NW	02/09/18	2.00	6,904.50	6,904.47	-0.03	6,854.47	49.73	ND	NA	20.55	6,883.92	NA
		04/26/18	2.00	6,904.50	6,904.47	-0.03	6,854.47	49.65	ND	NA	20.64	6,883.83	NA
		08/15/18	2.00	6,904.50	6,904.47	-0.03	6,854.47	49.78	ND	NA	20.92	6,883.55	NA
		11/19/18 [3]	2.00	6,904.50	6,904.47	-0.03	6,854.47	NM	NM	NA	NM	NA	NA
05/06/14	STP1-SW	02/09/18 [3]	2.00	6,904.50	6,904.47	-0.03	6,854.47	NM	NM	NA	ND	NA	NA

APPENDIX C-1
2018 FLUID LEVEL MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevation (ft)	Well Casing Rim Elevation (ft)	Stick-up Length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground Water Elevation [3] (ft)	Corrected Water Table[1] Elevation (factor 0.8) (ft)
		04/26/18 [3]	2.00	6,904.50	6,904.47	-0.03	6,854.47	NM	NM	NA	NM	NA	NA
		08/15/18 [3]	2.00	6,904.50	6,904.47	-0.03	6,854.47	NM	NM	NA	NM	NA	NA
		11/19/18 [3]	2.00	6,904.50	6,904.47	-0.03	6,854.47	NM	ND	NA	NM	NA	NA
03/28/95	RW-1	02/13/18	4.00	6,942.86	6,946.06	3.20	6,903.02	43.04	26.94	0.28	27.22	6,918.84	6919.064
		04/25/18	4.00	6,942.86	6,946.06	3.20	6,903.02	43.35	26.94	0.27	27.21	6,918.85	6919.066
		08/16/18	4.00	6,942.86	6,946.06	3.20	6,903.02	43.45	27.44	0.26	27.70	6,918.36	6918.568
		11/07/18 [4]	4.00	6,942.86	6,946.06	3.20	6,903.02	NM	NM	NA	NM	NA	NA
03/29/95	RW-2	02/19/18	4.00	6,926.40	6,928.53	2.13	6,888.73	40.00	ND	NA	20.00	6,908.53	NA
		04/25/18	4.00	6,926.40	6,928.53	2.13	6,888.73	39.99	ND	NA	20.03	6,908.50	NA
		08/16/18	4.00	6,926.40	6,928.53	2.13	6,888.73	40.00	ND	NA	20.10	6,908.43	NA
		11/07/18 [4]	4.00	6,926.40	6,928.53	2.13	6,888.73	NM	NM	NA	NM	NA	NA
08/27/97	RW-5	02/09/18	4.00	6,941.53	6,943.57	2.04	6,903.98	39.59	25.50	8.10	33.60	6,909.97	6916.45
		04/25/18	4.00	6,941.53	6,943.57	2.04	6,903.98	39.59	26.62	5.72	32.34	6,911.23	6915.806
		08/16/18	4.00	6,941.53	6,943.57	2.04	6,903.98	39.51	27.20	5.38	32.58	6,910.99	6915.294
		11/07/18 [4]	4.00	6,941.53	6,943.57	2.04	6,903.98	NM	NM	NA	NM	NA	NA
08/27/97	RW-6	02/09/18	4.00	6,941.96	6,944.01	2.05	6,903.11	40.90	25.65	7.40	33.05	6,910.96	NA
		04/25/18	4.00	6,941.96	6,944.01	2.05	6,903.11	40.83	26.93	4.76	31.69	6,912.32	6916.128
		08/16/18	4.00	6,941.96	6,944.01	2.05	6,903.11	40.85	27.43	4.35	31.78	6,912.23	6915.71
		11/07/18 [4]	4.00	6,941.96	6,944.01	2.05	6,903.11	NM	NM	NA	NM	NA	NA

DEFINITIONS:

DTB - Depth to Bottom
DTW - Depth to Water
SPH = Separate Phase Hydrocarbons
* Wells also checked for Artesian flow conditions.

NA = Not Applicable NS = Not Surveyed NM = Not Measured
Negative number in Stick up Length column indicates well is flushmount and located at or below ground level.
Depth to Water Column - if 0.00 is indicated - means water is at top of casing (full) under artesian flow conditions.
Dry indicates no water was detected.

NOTES:

APPENDIX C-1
2018 FLUID LEVEL MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	Ground Level Elevation (ft)	Well Casing Rim Elevation (ft)	Stick-up Length (ft)	Well Casing Bottom Elevation (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground Water Elevation [3] (ft)	Corrected Water Table[1] Elevation (factor 0.8) (ft)

1. Corrected Water Table Elevation applies only if SPH thickness column measurement exists. (0.8 X SPH thickness + Groundwater Elevation)
2. 10-Year Post Closure Sampling Event for the LTU (Land Treatment Unit)
3. Was not able to gauge or sample wells around the NAPIS Unit due to high H2S readings.
4. Did not gauge or sample wells due to recovery apparatus installed on all the RW wells.

APPENDIX C-2
WELL INFORMATION - SURVEY DATA, SCREENED INTERVAL, STRATIGRAPHIC UNIT

Date of Installation	Well ID Number	Survey Measurement date	Verified Casing Diameter (Inch)	Survey Ground Level Elevation (feet)	Survey Well Casing Rim Elevation (feet)	Measuring Point Description	Survey Stick up Length (feet)	Survey Well Casing Bottom Elevation (feet)	Survey Total Well Depth (feet)	Screened Interval Depth Top to Bottom (feet)	Stratigraphic unit in which screen exists
10/11/03	BW-1A [2]	09/15/14	2.00	6,883.17	6,885.12	North edge PVC casing	1.95	6,839.06	46.06	38 - 43	Upper Sand
10/28/03	BW-1B [2]	09/15/14	2.00	6,883.17	6,885.78	North edge PVC casing	2.61	6,809.49	76.29	63.4 - 73.4	Chinle/Alluvium Interface
10/11/03	BW-1C [2]	09/15/14	2.00	6,883.17	6,885.68	North edge PVC casing	2.51	6,740.39	145.29	133.9 - 143.9	Sonsela
10/11/03	BW-2A	07/06/11	2.00	6,871.88	6,874.69	North edge PVC casing	2.81	6,807.12	67.57	55 - 65	Upper Sand
10/28/03	BW-2B	07/06/11	2.00	6,871.66	6,874.50	North edge PVC casing	2.84	6,782.24	92.26	80 - 90	Chinle/Alluvium Interface
10/28/03	BW-2C	07/06/11	2.00	6,872.90	6,875.30	North edge PVC casing	2.40	6,722.46	152.84	139.5 - 149.5	Sonsela
06/15/04	BW-3A	07/06/11	2.00	6,875.94	6,878.39	North edge PVC casing	2.45	6,826.04	52.35	39.5 - 49.5	Upper Sand
10/15/03	BW-3B	07/06/11	2.00	6,876.16	6,878.59	North edge PVC casing	2.43	6,809.19	69.40	63 - 73	Chinle/Alluvium Interface
07/20/04	BW-3C	07/06/11	2.00	6,875.72	6,877.95	North edge PVC casing	2.23	6,723.40	154.55	144.5 - 154.5	Sonsela
06/14/17	BW-4A	03/16/18	2.00	6,870.67	6,873.18	North edge PVC casing	2.51	6,834.38	38.80	21 - 36	Upper Sand
06/16/17	BW-4B	03/16/18	2.00	6,870.62	6,873.23	North edge PVC casing	2.61	6,809.73	63.50	41 - 61	Chinle/Alluvium Interface
06/23/17	BW-5A	03/16/18	2.00	6,874.39	6,877.00	North edge PVC casing	2.61	6,854.00	23.00	10 - 20	Upper Sand
06/23/17	BW-5B	03/16/18	2.00	6,874.32	6,876.82	North edge PVC casing	2.5	6,815.37	61.45	48 - 58	Chinle/Alluvium Interface
06/21/17	BW-5C	03/16/18	2.00	6,874.22	6,876.85	North edge PVC casing	2.63	6,800.50	76.35	64.5 - 74.5	Sonsela
10/14/81	MW-1	6/7/2011	5.00	6,876.63	6,878.12	North edge PVC casing	1.49	6,747.29	130.83	117.72 - 127.72	Sonsela
10/15/81	MW-2	6/7/2011	5.00	6,878.39	6,880.30	North edge PVC casing	1.91	6,742.82	137.48	112 - 122	Sonsela
10/16/81	MW-4	6/7/2011	5.00	6,879.89	6,881.63	North edge PVC casing	1.74	6,759.91	121.72	101 - 121	Sonsela
07/21/86	MW-5	6/7/2011	4.00	6,880.20	6,882.83	North edge aluminum casing	2.63	6,752.00	130.83	115 - 125	Sonsela
09/26/85	SMW-2	6/7/2011	2.00	6,881.63	6,883.97	North edge aluminum casing	2.34	6,831.17	52.80	34.31 - 54.31	Chinle/Alluvium Interface and Upper Sand
09/25/85	SMW-4	6/7/2011	2.00	6,877.63	6,879.52	North edge aluminum casing	1.89	6,809.84	69.68	51.7 - 71.7	Chinle/Alluvium Interface
05/01/81	OW-1 [1]	6/7/2011	4.00	6,866.32	6,866.62	North edge PVC casing	0.30	6,772.07	94.55	89.3 - 99.3	Sonsela
11/25/80	OW-10	6/7/2011	4.00	6,873.67	6,874.91	North edge PVC casing	1.24	6,814.58	60.33	40 - 60	Sonsela
09/25/81	OW-11	6/7/2011	4.00	6,922.05	6,923.51	North edge PVC casing	1.46	6,857.72	65.79	43 - 65	Sonsela
12/15/80	OW-12	6/7/2011	4.00	6,939.57	6,940.69	North edge PVC casing	1.12	6,811.84	128.85	117.8 - 137.8	Sonsela
10/12/80	OW-13	6/7/2011	4.00	6,918.95	6,920.07	North edge PVC casing	1.12	6,820.92	99.15	78.2 - 98.2	Sonsela
12/17/80	OW-14	6/7/2011	4.00	6,924.55	6,926.65	North edge PVC casing	2.10	6,880.13	46.52	35 - 45	Chinle/Alluvium Interface
08/23/96	OW-29	6/7/2011	4.00	6,913.89	6,917.00	North edge PVC casing	3.11	6,865.92	51.08	37.5 - 47.5	Chinle/Alluvium Interface

APPENDIX C-2
WELL INFORMATION - SURVEY DATA, SCREENED INTERVAL, STRATIGRAPHIC UNIT

Date of Installation	Well ID Number	Survey Measurement date	Verified Casing Diameter (Inch)	Survey Ground Level Elevation (feet)	Survey Well Casing Rim Elevation (feet)	Measuring Point Description	Survey Stick up Length (feet)	Survey Well Casing Bottom Elevation (feet)	Survey Total Well Depth (feet)	Screened Interval Depth Top to Bottom (feet)	Stratigraphic unit in which screen exists
08/28/96	OW-30	6/7/2011	4.00	6,921.81	6,924.69	North edge PVC casing	2.88	6,874.79	49.90	37.9 - 47.9	Chinle/Alluvium Interface
05/10/09	OW-50	6/7/2011	2.00	6,912.63	6,914.21	North edge PVC casing	1.58	6,850.21	64.00	48 - 63	Chinle/Alluvium Interface
05/10/09	OW-52	6/7/2011	2.00	6,906.53	6,907.68	North edge PVC casing	1.15	6,829.94	77.74	64 - 79	Chinle/Alluvium Interface
05/26/16	OW-53	07/27/16	2.00	6,911.93	6,914.38	North edge PVC casing	2.45	6,880.48	33.90	16 - 31	Chinle/Alluvium Interface
05/25/16	OW-54	07/27/16	2.00	6,916.36	6,918.92	North edge PVC casing	2.56	6,887.88	31.04	13 - 28	Chinle/Alluvium Interface
05/24/16	OW-55	07/27/16	2.00	6,921.01	6,923.25	North edge PVC casing	2.24	6,892.55	30.70	13 - 28	Chinle/Alluvium Interface
05/24/16	OW-56	07/27/16	2.00	6,917.79	6,920.18	North edge PVC casing	2.39	6,901.59	18.59	6 - 16	Chinle/Alluvium Interface
09/21/16	OW-57	04/27/17	2.00	6,930.64	6,933.10	North edge PVC casing	2.46	6,904.75	28.35	15 - 25	Chinle/Alluvium Interface
09/22/16	OW-58	04/27/17	2.00	6,934.71	6,934.50	North edge PVC casing	-0.21	6,887.00	47.50	38 - 48	Chinle/Alluvium Interface
06/29/17	OW-59	03/16/18	2.00	6,887.63	6,889.73	North edge PVC casing	2.1	6,851.23	38.50	20 - 35	Chinle/Alluvium Interface
06/29/17	OW-60	03/16/18	2.00	6,891.06	6,893.51	North edge PVC casing	2.45	6,847.96	45.55	25 - 45	Chinle/Alluvium Interface
08/07/04	GWM-1	07/06/11	2.00	6,910.22	6,912.61	North edge PVC casing	2.39	6,886.41	26.20	17.5 - 23.5	Chinle/Alluvium Interface
09/25/05	GWM-2	07/06/11	2.00	6,910.32	6,913.09	North edge PVC casing	2.77	6,894.28	18.81	3.2 - 16.2	Chinle/Alluvium Interface
09/25/05	GWM-3	07/06/11	2.00	6,907.35	6,910.25	North edge PVC casing	2.90	6,892.45	17.80	3 - 15	Chinle/Alluvium Interface
03/14/08	NAPIS-1	07/06/11	2.00	6,913.62	6,913.86	North edge PVC casing	0.24	6,900.33	13.53	3.7 - 13.7	Chinle/Alluvium Interface
03/14/08	NAPIS-2 [4]	10/17/16	2.00	6,918.29	6,917.87	North edge PVC casing	-0.42	6,903.54	14.33	4.2 - 14.2	Chinle/Alluvium Interface
03/14/08	NAPIS-3 [4]	10/17/16	2.00	6,918.30	6,918.07	North edge PVC casing	-0.23	6,886.95	31.12	25.4 - 30.4	Chinle/Alluvium Interface
11/06/07	KA-3 [4]	10/17/16	2.00	6,918.20	6,917.61	North edge PVC casing	-0.59	6,893.51	24.10	15 - 25	Chinle/Alluvium Interface
07/17/12	OAPIS-1	02/04/13	2.00	6,916.50	6,916.73	Northwest edge PVC casing	0.23	6,890.73	26.00	14 - 26	Chinle/Alluvium Interface
06/05/14	STP1-NW [3]	09/15/14	2.00	6,904.50	6,904.47	North edge top of PVC	-0.03	6,854.47	50.00	20 - 50	Chinle/Alluvium Interface
06/05/14	STP1-SW [3]	09/15/14	2.00	6,912.40	6,912.38	North edge top of PVC	-0.02	6,880.38	32.00	15 - 30	Chinle/Alluvium Interface
03/28/95	RW-1	07/06/11	4.00	6,942.86	6,946.06	North edge PVC casing	3.20	6,903.02	43.04	25 - 40	Chinle/Alluvium Interface
03/29/95	RW-2	07/06/11	4.00	6,926.40	6,928.53	North edge PVC casing	2.13	6,888.73	39.80	26.1 - 36.1	Chinle/Alluvium Interface
08/27/97	RW-5	07/06/11	4.00	6,941.53	6,943.57	West Edge PVC Casing (Existing Mark)	2.04	6,903.98	39.59	29.5 - 39.5	Chinle/Alluvium Interface
08/27/97	RW-6	07/06/11	4.00	6,941.96	6,944.01	North edge PVC casing	2.05	6,903.11	40.90	28.5 - 38.5	Chinle/Alluvium Interface

APPENDIX C-2
WELL INFORMATION - SURVEY DATA, SCREENED INTERVAL, STRATIGRAPHIC UNIT

Date of Installation	Well ID Number	Survey Measurement date	Verified Casing Diameter (Inch)	Survey Ground Level Elevation (feet)	Survey Well Casing Rim Elevation (feet)	Measuring Point Description	Survey Stick up Length (feet)	Survey Well Casing Bottom Elevation (feet)	Survey Total Well Depth (feet)	Screened Interval Depth Top to Bottom (feet)	Stratigraphic unit in which screen exists
2019 ADDITIONS TO THE FACILITY WIDE GROUNDWATER MONITORING PLAN											
3/14/18	OW-61	04/23/19	4.00	6,960.91	6,963.57	North edge PVC casing	2.66	6,924.77	38.80	8 - 28	Chinle/Alluvium Interface
3/15/18	OW-62	04/23/19	4.00	6,934.73	6,937.36	North edge PVC casing	2.63	6,873.86	63.50	8 - 28	Chinle/Alluvium Interface
3/14/18	OW-63	04/23/19	4.00	6,932.34	6,935.06	North edge PVC casing	2.72	6,912.06	23.00	9 - 29	Chinle/Alluvium Interface
3/16/18	OW-64	04/23/19	4.00	6,945.07	6,947.40	North edge PVC casing	2.33	6,885.95	61.45	4 - 24	Chinle/Alluvium Interface
3/12/18	OW-65	04/23/19	4.00	6,951.62	6,954.05	North edge PVC casing	2.43	6,877.70	76.35	17 - 37	Chinle/Alluvium Interface

DEFINITIONS:
NA = Not applicable
Survey of all wells conducted in June 2011, unless otherwise noted
Stick up length is determined by subtracting 2011 Survey Ground Level Elevation from 2011 Survey Well Casing Rim Elevation. Negative values indicate well is a flush mount. 2011 Survey Well Casing Bottom Elevation is determined by subtracting the 2011 Survey Well Casing Rim Elevation from the 2011 Survey Total Well Depth Measurement.
Total well depth was determined using a bottom sensing meter, Testwell Water level meter with bottom sensing indicator.
Screened interval for each well was verfied to the well boring logs. Settlement may have occurred since installation of well which is why total well depth is higher or equal to the screened interval levels.

NOTES:

APPENDIX C-3
WELL INFORMATION - SURVEY DATA, SCREENED INTERVAL, STRATIGRAPHIC UNIT
ARTESIAN WATER WELLS

Date of Installation	Well ID Number	Submersible pump depth (feet)	Casing Diameter (Inch)	Well Head Elevation Mark* (North) (feet)	Well Head Elevation Mark* (West) (feet)	Well Head Elevation Mark* (Z) (feet)	Measuring Point Description	Total Well Depth (feet)	Well Casing Bottom Elevation[1] (feet)	Stratigraphic unit	Aquifer
9/24/1956	PW-2	800	16.0	3,300.40	4,694.28	162.78	1st Discharge tee or elbow	1,075.00	2,225.40	Chinle	San Andreas/Yeso Aquifer
April 1979	PW-3	900	14.0	2,932.83	1,387.79	248.00	1st Discharge tee or elbow	1,030.00	1,902.83	Chinle	San Andreas/Yeso Aquifer
11/12/1999	PW-4	750	12.0[2]	1,895.73	2,979.78	178.51	1st Discharge tee or elbow	1,020.00[3]	819.73	Chinle	San Andreas/Yeso Aquifer

NOTES:
* Basis of survey Refinery Control Point at 1000W, 2575N, plant elevation = 254.87 feet and MSL elevation = 6959.41 feet.

1) Well casing bottom elevation using Well Head Elevation Mark (North) as reference point.
2) Actual well casing diameter is 12 inches. The 176 feet of 24 inch steel casing is the actual cemented support for development of the well.
3) The actual total well depth is 1020 feet with additional 56 feet x 7-7/8 inch diameter open exploratory hole which was accounted for as total well depth of 1076 feet.

At the time of the survey by DePauli Engineering the artesian wells were not included as these wells have never been listed on the summary table or had questionable elevations. These wells are sampled every three years and are not required to be gauged when sampling. A copy of an original survey dated February 13, 2003 conducted by DePauli Engineering is attached for reference.

DiSorbo
Environmental Consulting Firm

Andeavor
Gallup Refinery - French Drain Release
WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Augers
Sampling Method	: Split Spoon 2'
Comments	:
Total Depth	: 32'
Ground Water	: 18' BGL
Start Date	: 3-13-2018
Finish Date	: 3-13-2018

WELL NO. OW-61

(Sheet 1 of 2)

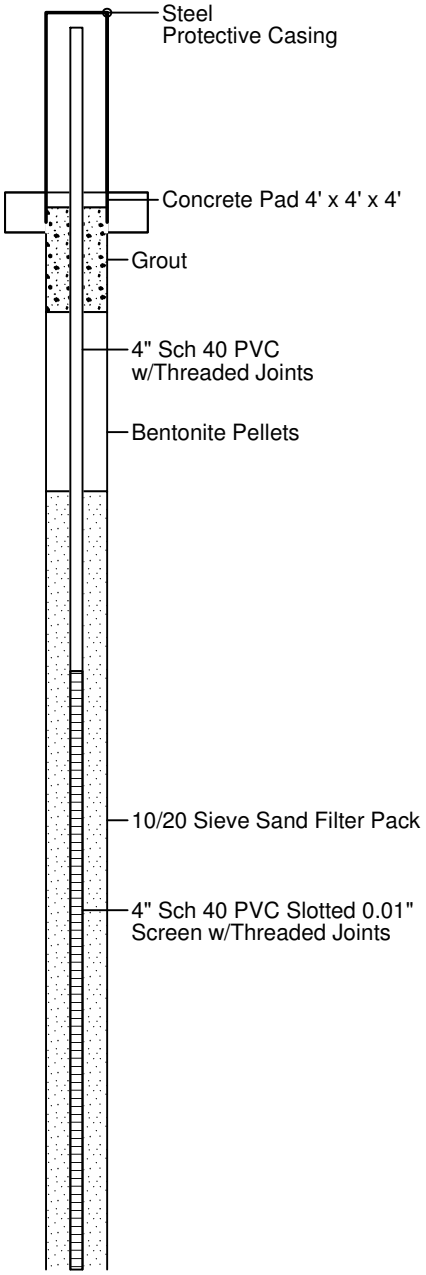
Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N35° 29' 21.0"
E	: W108° 25' 33.2"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
-2							
-1							
0							Hydroexcavated Location - Borehole open to 10' - no water
1							
2							
3					0		
4							
5							
6							
7							
8							
9							
10							SANDY SILT, very fine, loose, moist, gravel present, brown, strong chemical odor,
11	1563			ML	90		
12							GRAVELLY SILTY SAND, fine, loose, moist, 20 mm gravel present, brown, strong odor,
13	869			SM	80		
14							GRAVELLY SILTY SAND, SIMILAR TO ABOVE (STA), very moist, tan and brown, strong odor,
15	1081			SM	70		
16							GRAVELLY SILTY SAND, STA, increase in gravel, large sandstone gravel in core, moist to very moist,very light tan, strong odor,
17	1115			SM	60		
18							

Saturation
▼ Saturation

Completion Results

OW-61



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Andeavor
Gallup Refinery - French Drain Release
WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Augers
Sampling Method	: Split Spoon 2'
Comments	:
Total Depth	: 32'
Ground Water	: 18' BGL
Start Date	: 3-13-2018
Finish Date	: 3-13-2018

WELL NO. OW-61

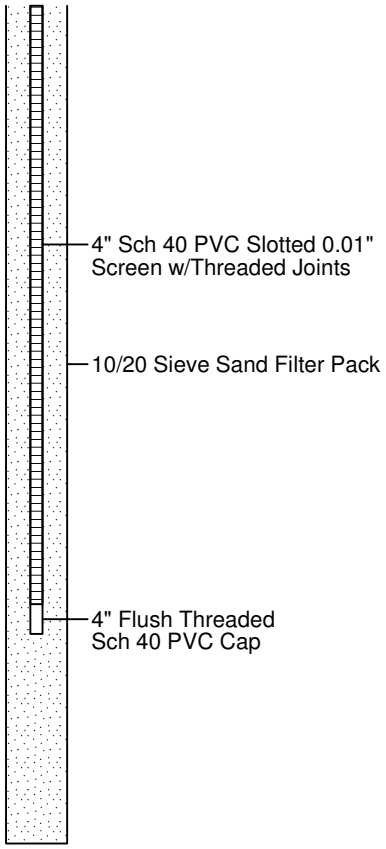
(Sheet 2 of 2)

Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N35° 29' 21.0"
E	: W108° 25' 33.2"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
18		▼ Saturation					
19	1702			SC	20		GRAVELLY CLAYEY SAND, fine to coarse grain sand with brown clay, soft, very damp gravel (10-20 mm), saturated at base,
20							
21	1269			SM	60		SILTY SAND, medium, loose, trace clay and gravel, saturated, dark brown, strong odor,
22				SM	60		SILTY SAND, STA, saturated,
23	1638			CL	60		GRAVELLY SANDY CLAY, low, soft, gravel throughout, damp to saturated in seams, brown, strong odor,
24							
25	1538			CL	50		GRAVELLY CLAY, low, firm, damp, dark blueish grey, strong odor,
26							
27	377			CL	40		GRAVELLY CLAY, STA, trace very fine grain sand, damp,very stiff, odor,
28							
29	298			CL	60		SILTY CLAY, low, very stiff, trace sand and very small gravel, damp, grey to light grey, odor,
30							
31	60.9			CL	70		SILTY CLAY, STA, damp, light grey and pink.
32							
33							
34							
35							
36							
37							
38							

Completion Results

OW-61



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Gallup Refinery - French Drain Release
WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Augers
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 40'
Ground Water	: Not Encountered
Start Date	: 03/15/2018
Finish Date	: 03/15/2018

WELL NO. OW-62

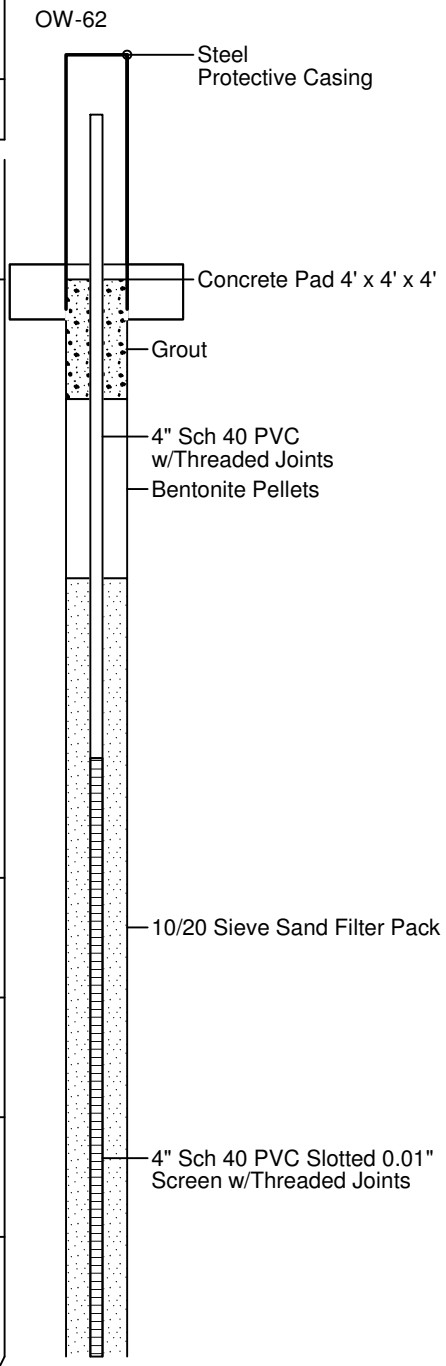
(Sheet 1 of 3)

Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 30.6"
E	: W 108° 25' 42.8"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Rec overy (%)	Sample	DESCRIPTION
0							Hydroexcavated to 10' - Collapsed to 9' - no fluid,
10	0			ML	50		CLAYEY SILT, very fine, stiff, dry, crumbly, no odor, light brown,
12	0.1			CL	50		SILTY CLAY, SIMILAR TO ABOVE (STA), , increase in clay content,
14	0.3			CL	60		SANDY SILTY CLAY, low, firm, damp, very fine grain sand seams, brown, no odor,
16				CL	80		SANDY CLAY, low, firm, damp,brown, no odor,
17	0.3			GW	80		SANDY GRAVEL, 20 to10 mm gravel with coarse grain sand, loose, damp,brown, no odor,

Saturation
▼ Saturation

Completion Results



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WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Augers
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 40'
Ground Water	: Not Encountered
Start Date	: 03/15/2018
Finish Date	: 03/15/2018

WELL NO. OW-62

(Sheet 2 of 3)

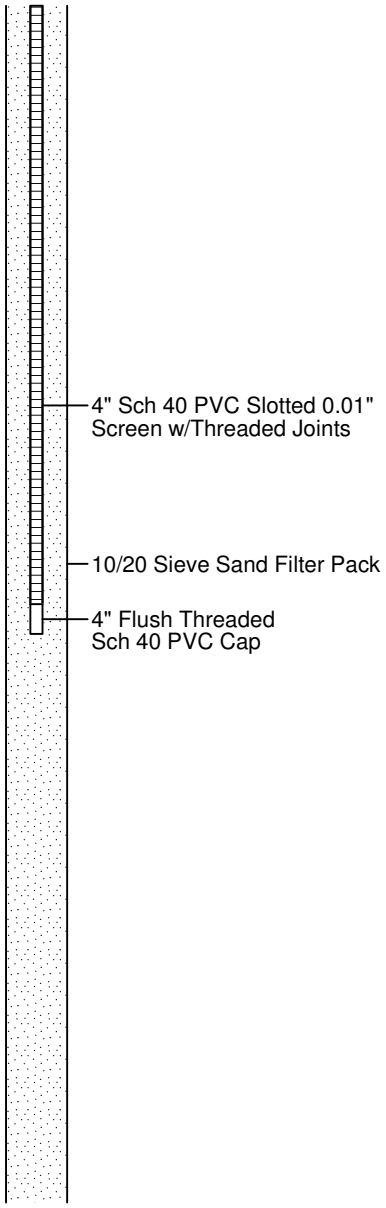
Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 30.6"
E	: W 108° 25' 42.8"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Rec overy (%)	Sample	DESCRIPTION
18							
19	3380			GC	80		CLAYEY SANDY GRAVEL, STA except clay present, very moist, hydrocarbon (HC) odor, ,
20							
21	82.9			GC	70		CLAYEY SANDY GRAVEL, STA, damp to moist, HC odor,
22							
23	33			CL	60		SILTY CLAY, low, soft, trace sand,calcareous, damp to moist, reddish brown, HC odor,
24							
25	800			CL	70		SILTY CLAY, low, stiff, damp,reddish brown, HC odor,
26							
27	555			CL	80		SILTY CLAY, STA, calcareous, odor,
28							
29	56			CH	90		CLAY, high, very stiff, damp,reddish brown, faint odor,
30							
31	351			CL	90		SILTY CLAY, low, firm/crumbly, damp,reddish brown, trace grey, no odor,
32							
33	125			CL	90		SILTY CLAY, STA,
34							
35	159			CL	90		SILTY CLAY, STA,
36							
37	91			CL	90		SILTY CLAY, STA,
38							

Saturation
▼ Saturation

Completion Results

OW-62



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Gallup Refinery - French Drain Release
WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Augers
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 40'
Ground Water	: Not Encountered
Start Date	: 03/15/2018
Finish Date	: 03/15/2018

WELL NO. OW-62

(Sheet 3 of 3)

Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 30.6"
E	: W 108° 25' 42.8"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Rec overy (%)	Sample	DESCRIPTION
38							
39	44			CL	90		SILTY CLAY, STA.
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							

Saturation
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Completion Results

OW-62

10/20 Sieve Sand Filter Pack

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WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollw-Stem Auger
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 32
Ground Water	: 16'/25'
Start Date	: 03/14/2018
Finish Date	: 03/14/2018

WELL NO. OW-63

(Sheet 1 of 2)

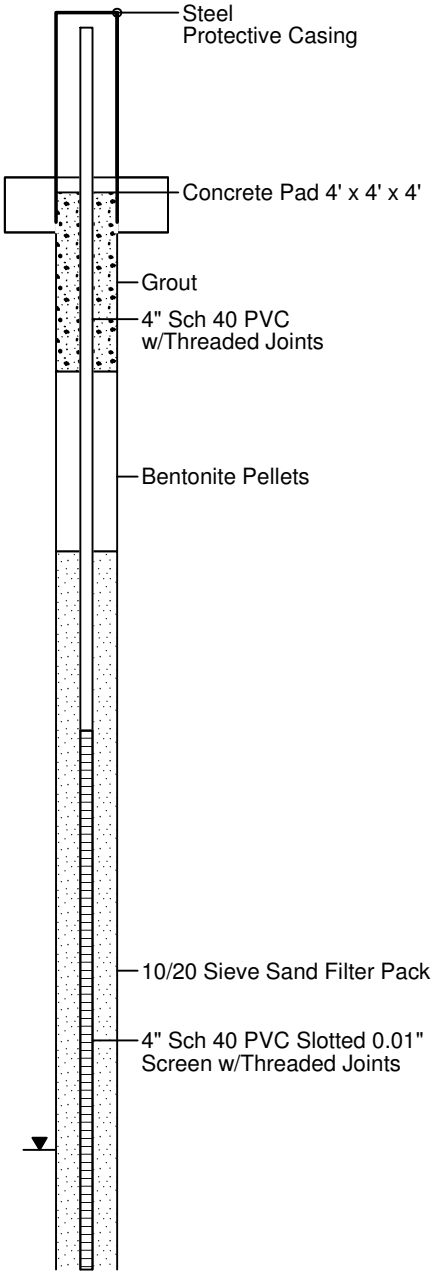
Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 30.7"
E	: W 108° 25' 32.6"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							Hydroexcavated to 10'-borehole open, no water
10							SILTY CLAY, low, firm, damp,brown with light tan silt in seams,
11	1.2			CL	90		
12							SILTY CLAY, SIMILAR TO ABOVE (STA),
13	0.9			CL	50		
14							SILTY CLAY, STA, trace fine sand in seams,
15	1.3			CL	60		
16							SILTY SAND, fine, compact, very moist to saturated, brown,
17	2.5			SM	80		

Saturation
▼ Saturation

Completion Results

OW-63



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Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollw-Stem Auger
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 32
Ground Water	: 16'/25'
Start Date	: 03/14/2018
Finish Date	: 03/14/2018

WELL NO. OW-63

(Sheet 2 of 2)

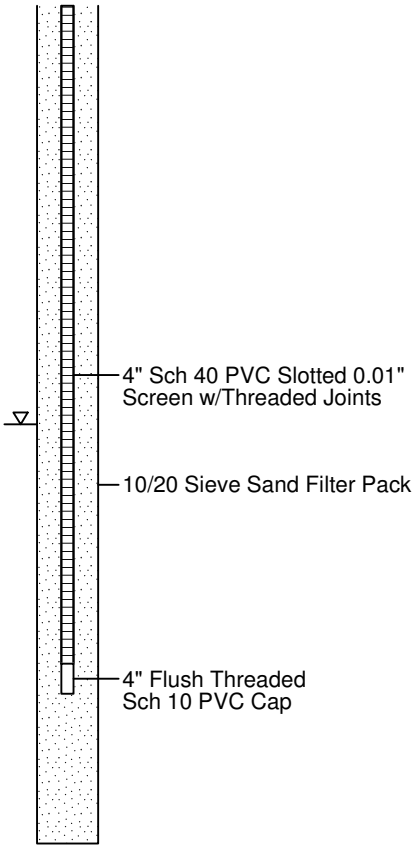
Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 30.7"
E	: W 108° 25' 32.6"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
18							
19	428			CL	80		SANDY SILTY CLAY, low, firm, damp, occasional gravel, brown, odor,
20							
21	652			CL	80		SILTY SANDY CLAY, STA, moist in sand seams at base, odor,
22							
23	275			CL	70		SILTY SANDY CLAY, STA, odor,
24				CH	70		CLAY, high, soft to firm,damp,brown, odor,
	39			CH	90		CLAY, STA, odor,
25		▽					
	28			GC	90		CLAYEY GRAVEL, sandstone gravel in pink/brown/olive green clay and silt, coarse sand present, saturated, odor,
26							
27	150			GC	90		CLAYEY GRAVEL, STA, saturated, odor,
28							
29	40				90		WEATHERED SANDSTONE, very dense, dry, grey to light purple, faint odor,
30							
31	10.9				50		WEATHERED SANDSTONE, STA, grey and light purple.
32							
33							
34							
35							
36							
37							
38							

Saturation
▼ Saturation

Completion Results

OW-63



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Gallup Refinery - French Drain Release
WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Pilot Hole 7 1/4 HSA
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 44' BGL
Ground Water	: Not Encountered
Start Date	: 03/05/2018
Finish Date	: 03/05/2018

WELL NO. OW-64

(Sheet 1 of 3)

Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 25.1"
E	: W 108° 25' 39.9"

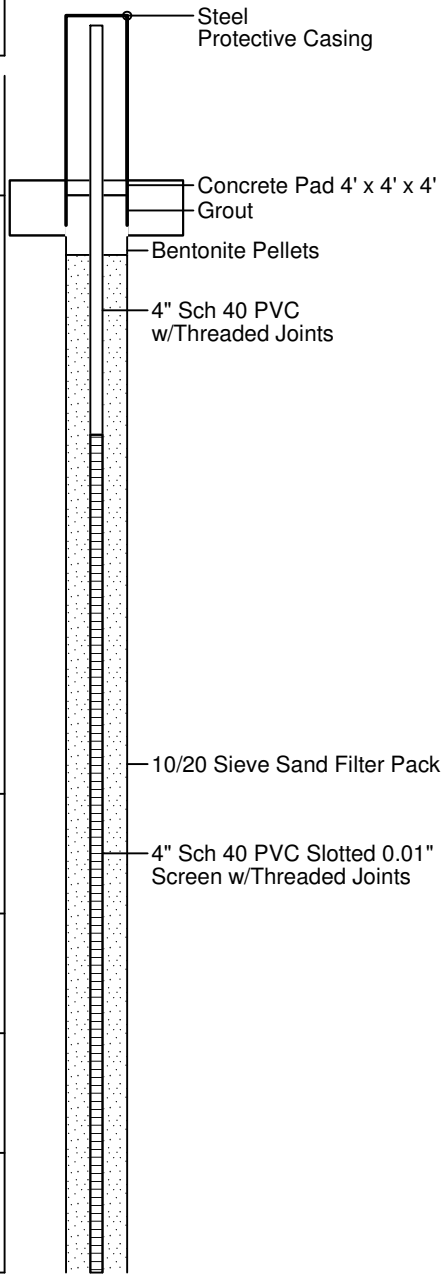
Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
-2							
-1							
0							Hydroexcavated to 10' BGL, sloughed to 8' BGL, water in hole at 5.20' BGL, no separate phase hydrocarbon (SPH) detected,
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							SILTY CLAY, low, firm, damp, brown and
11	280			CL	50		grey, faint hydrocarbon (HC) odor,
12							SILTY CLAY, SIMILAR TO ABOVE (STA), faint
13	267			CL	70		HC odor,
14							SILTY CLAY, low to moderate, stiff,
15	308			CL	80		calcareous near and at base, damp,brown, grey to greyish white, faint HC odor,
16							SILTY CLAY, STA, increase in plasticity,
17	137			CL	50		mostly grey-trace brown,faint HC ordor,
18							

Saturation

▼ Saturation

Completion Results

OW-64



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WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Pilot Hole 7 1/4 HSA
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 44' BGL
Ground Water	: Not Encountered
Start Date	: 03/05/2018
Finish Date	: 03/05/2018

WELL NO. OW-64

(Sheet 2 of 3)

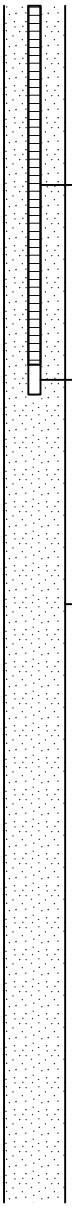
Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 25.1"
E	: W 108° 25' 39.9"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
18							
19	47			CL	70		SILTY CLAY, moderate, firm, damp, brown-trace grey, faint odor,
20							
21	133			CL	70		SILTY CLAY, STA, reddish brown to grey at 20.5', faint odor,
22							
23	20			CL	60		SILTY CLAY, moderate, firm to stiff, damp,grey, faint odor,
24							
25	17			CL	80		SILTY CLAY, STA, stiff,
26							
27	75			CL	70		SILTY CLAY, STA, stiff, calcareous at base, reddish brown and grey, greenish grey,
28							
29	74			CL	60		SILTY CLAY, low, stiff/crumbly, damp, dark reddish brown and grey, no odor,
30							
31	35			CL	60		SILTY CLAY, STA, very stiff, no odor,
32							
33	20			CL	40		SILTY CLAY, low, very stiff, damp, dark reddish brown, balck shale at base, no odor,
34							
35	30			ML	40		CLAYEY SILT, sandstone gravel (cobble) at top of interval, low, firm/crumbly, dry/damp, brown, no odor,
36							
37	8			ML	50		SILTY CLAY,low, very stiff, dry/damp, brown, no odor,
38							

Saturation
▼ Saturation

Completion Results

OW-64



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WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Pilot Hole 7 1/4 HSA
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 44' BGL
Ground Water	: Not Encountered
Start Date	: 03/05/2018
Finish Date	: 03/05/2018

WELL NO. OW-64

(Sheet 3 of 3)

Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 25.1"
E	: W 108° 25' 39.9"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
38							
39	12			ML	70		SILTY CLAY, STA,
40							
41	8			ML	60		SILTY CLAY, STA,
42							
43	6			ML	60		SILTY CLAY, STA.
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							

Saturation
▼ Saturation

Completion Results

OW-64

10/20 Sieve Sand Filter Pack

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Gallup Refinery - French Drain Release
WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Auger
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 40' BGL
Ground Water	: 20' BGL
Start Date	: 03/09/2018
Finish Date	: 03/09/2018

WELL NO. OW-65

(Sheet 1 of 3)

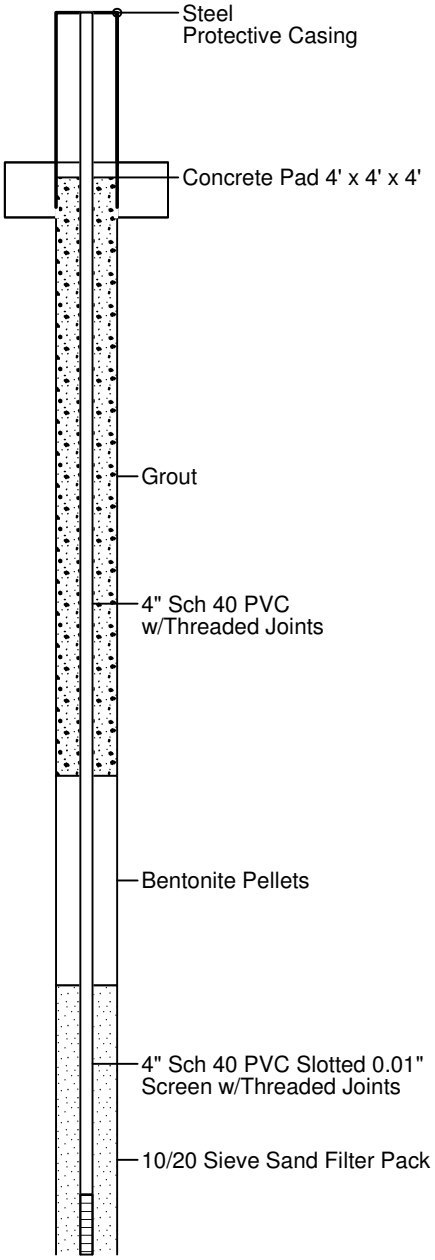
Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 24.5"
E	: W 108° 25' 33.3"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0				CL	100		Cleared borehole to 5', 1" asphalt and base, SILTY CLAY, low, stiff, damp, mixed with gravelly sand, brown, no order,
5	17.4			SW	100		GRAVELLY SAND, fine to coarse, loose, damp, gravel <10 mm, brown, no odor,
6				SW	80		GRAVELLY SAND, SIMILAR TO ABOVE (STA), clayey sand at base, very damp, brown, odor,
7	23						
8				SM	90		SILTY SAND, medium to coarse, loose, very damp, brown, odor,
9	12						
10				SM	80		CLAYEY GRAVELLY SAND, fine to coarse, compact, gravelly clay lense 2" thick at 11', brown, odor,
11	16						
12				SM	70		SILTY SAND, medium, loose, very damp, brown, odor,
13	66						
14				GC	60		CLAYEY GRAVEL, <10 mm gravel in brown clay, coarse sand throughout, very damp, odor,
15	822						
16				SM	60		SILTY SAND, fine, loose, very damp to moist, hydrocarbon (HC) odor,
17	885						
18							

Saturation
▼ Saturation

Completion Results

OW-65



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Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Auger
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 40' BGL
Ground Water	: 20' BGL
Start Date	: 03/09/2018
Finish Date	: 03/09/2018

WELL NO. OW-65

(Sheet 2 of 3)

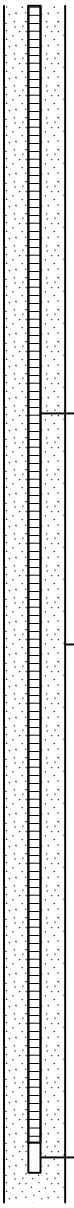
Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 24.5"
E	: W 108° 25' 33.3"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
18							
19	1195	▼		GC	50		CLAYEY GRAVEL, 40 mm sandstone cobbles (tan and green) in brown clay, coarse sand throughout, damp,odor,
20				GC	60		CLAYEY GRAVEL, STA, moist to saturated in sand, water in split spoon,
21							
22				GC	90		CLAYEY GRAVELLY SAND, coarse sand with 10 mm gravel, loose/soft, saturated, brown, HC odor,
23							
24				SC	80		CLAYEY SAND, coarse, loose, very soft, trace gravel, saturated, brown, odor,
25							
26				SC	80		CLAYEY SAND, fine to medium, compact, moist, dark brown, HC odor,
27							
28				CL	80		SILTY CLAY, low, very soft, damp,dark brown, strong HC odor,
29				SC	80		CLAYEY SAND, fine, compact, saturated/oily, dark brown, saturated/oily,
30				SC	60		CLAYEY SAND, STA, HC odor,
31							
32				SC	80		CLAYEY SAND, STA, increase in clay at base, becomes moist,
33							
34				SM	90		SILTY SAND, medium to coarse, loose, gravelly (<5 mm) at base, saturated, dark brown, HC odor,
35							
36				SW	80		GRAVELLY SAND, coarse, loose, trace clay-gravel (10 mm), saturated, dark brown, HC odor,
37				CL	80		SANDY CLAY, low, firm, trace gravel, damp, dark brown, HC odor,
38							

Saturation
▼ Saturation

Completion Results

OW-65



12-13-2018 C:\Users\cholmes\Documents\M-Tech\samples\Western Refinery\French Drain Release Inv WEST18012\OW-65.bor

DiSorbo Consulting, LLC

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DiSorbo
Environmental Consulting Firm

Andeavor
Gallup Refinery - French Drain Release
WEST18012

Geologist	: Tracy Payne
Driller	: Enviro-Drill, Inc./Cohagan
Drilling Rig	: CME75
Drilling Method	: Hollow-Stem Auger
Sampling Method	: 2' Split Spoon
Comments	:
Total Depth	: 40' BGL
Ground Water	: 20' BGL
Start Date	: 03/09/2018
Finish Date	: 03/09/2018

WELL NO. OW-65

(Sheet 3 of 3)

Elev., TOC (ft.msl)	:
Elev., PAD (ft. msl)	:
Elev., GL (ft. msl)	:
Site Coordinates	:
N	: N 35° 29' 24.5"
E	: W 108° 25' 33.3"

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
38							
39				CL	40		SANDY CLAY, STA.
40							
41							
42							
43							
44							
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47							
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51							
52							
53							
54							
55							
56							
57							
58							

Saturation
▼ Saturation

Completion Results

OW-65

10/20 Sieve Sand Filter Pack

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