Western Refining Southwest, Inc.
A subsidiary of Marathon Petroleum Corporation

I-40 Exit 39
Jamestown, NM 87347

December 15, 2020

Mr. Kevin Pierard, Chief
New Mexico Environmental
Department Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

RE: Response to Disapproval – Interim Measures Report
Hydrocarbon Seep Area
Response to Comment 12
Marathon Petroleum Company LP, Gallup Refinery
(dba Western Refining Southwest, Inc.)
EPA ID# NMD000333211
HWB-WRG-15-002

Dear Mr. Pierard:

Please find enclosed the discussed report from Comment 12 in the *Response to Disapproval, Interim Measures Report, Hydrocarbon Seep Area* regarding the anaerobic dechlorination pathway. If you have any questions or comments regarding the information contained herein, please do not hesitate to contact John Moore at 505-879-7643.

Certification

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

Sincerely,
Marathon Petroleum Company LP, Gallup Refinery

Robert S. Hanks

Robert S. Hanks
Refinery General Manager

Enclosure

cc: D. Cobrain, NMED HWB

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C. Chavez, OCD
G. McCartney, Marathon Petroleum Company
J. Moore, Marathon Gallup Refinery
H. Jones, Trihydro Corporation

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December 15, 2020

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

RE: Natural Attenuation Assessment and Proposed Workplan for the Hydrocarbon Seep Area
Marathon Petroleum Company, LP, Gallup Refinery
(dba Western Refining Southwest, Inc.)
EPA ID# NMD000333211

Dear Mr. Pierard,

Marathon Petroleum Company LP, Gallup Refinery (MPC) is submitting this letter in response to a request from the New Mexico Environment Department (NMED) Hazardous Waste Bureau for an assessment of natural attenuation in the hydrocarbon seep area at the Gallup refinery. This request was contained in a letter dated February 1, 2018, entitled *Disapproval, Interim Measures Report Hydrocarbon Seep Area, Western Refining Southwest Inc., Gallup Refinery, EPA ID# NMD000333211, HWB-WRG-15-002*. The area identified includes the Marketing Tank Farm area in the southwest portion of the refinery (Figure 1).

More specifically, the request is presented in NMED Comment 12, #2 - #5; relevant portions of which are excerpted as follows:

> *2. The field analytical parameters such as dissolved oxygen concentration and oxidation-reduction potential (ORP) must be evaluated and presented to support the argument that reducing conditions and anaerobic degradation are occurring. Also, the ratio of total and dissolved iron concentrations must be examined to support the argument…*
> *3. …Revise the Report to propose submittal of a work plan to investigate the occurrence of anaerobic dichlorination.*
> *4. The accumulation of vinyl chloride may be occurring based on the site's groundwater conditions. In the plan referenced in Item 3 above, propose to monitor and evaluate the groundwater for analytical parameters pertinent to the accumulation of degradation of vinyl chloride (e.g., concentrations of daughter products, dissolved oxygen, chloride, redox potential and pH)…*

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> *5. The Permittee must evaluate for the occurrence of hydrocarbon and MTBE degradation (e.g. concentrations of the electron acceptors, degradation byproducts, redox potential, and pH). Include all findings and interpretation of the existing data in the revised Report.*

Pursuant to the above request, this letter presents an evaluation of natural attenuation using existing monitoring well analytical data and proposes a workplan consisting of a similar evaluation of natural attenuation for future analyses, which would be included in annual reports, pending NMED approval.

Background

The Hydrocarbon Seep area is located in the western portion of the refinery to the southwest of the refinery tank farm. Historically, the Hydrocarbon Seep Area has been impacted by releases of petroleum hydrocarbons associated with refinery operation. Hydrocarbon seeps were discovered in 2013; subsequent Interim Measures activities identified the source, implemented source control measures, and characterized groundwater impacts.

Chlorinated hydrocarbons that have been detected above standards as part of routine quarterly sampling in the area include trichloroethene (TCE), 1,1-dichloroethane (1,1-DCA), and 1,2-dichloroethane (1,2-DCA), and vinyl chloride. Methyl tert-butyl alcohol (MTBE) has also been detected above standards. The TCE and 1,1-DCA may be associated with past degreasing operations at the refinery machine shop; 1,2-DCA is a lead scavenger compound that historically have been used in hydrocarbon fuels. MTBE was used as a fuel oxygenator. Figure 2 presents the most recent quarterly groundwater sampling results (3rd quarter 2020) for these constituents and benzene from the Hydrocarbon Seep Area, including detections of separate-phase hydrocarbon (SPH), also referred to as light non-aqueous phase liquid (LNAPL). Table 1 presents recent groundwater analytical data for monitoring wells in the Hydrocarbon Seep Area and nearby Marketing Tank Farm (MKTF) monitoring wells

Hydrogeology

Surface Conditions

Site topographic features include high ground in the southeast gradually decreasing to a lowland fluvial plain to the northwest. Elevations on the refinery property range from 7,040 feet to 6,860 feet. Surface soils within most of the area of investigation are primarily Rehobeth silty clay loam. Rehobeth soil properties include alkaline pH (ranging from 8 to 9 standard units) and salinity (naturally occurring and typically measuring up to approximately 8 mmhos/cm) (Marathon Petroleum Company 2019).

Local surface water features include the refinery evaporation ponds and a number of small ponds (one cattle water pond and two small unnamed spring fed ponds). The site is located in the

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Puerco River Valley, north of the Zuni Uplift with overland flows directed northward to the tributaries of the Puerco River. The Puerco River continues to the west to the confluence with the Little Colorado River. The South Fork of the Puerco River is intermittent and retains flow only during and immediately following precipitation events (Marathon Petroleum Company 2019).

Subsurface Conditions
The shallow subsurface soils consist of fluvial and alluvial deposits comprised of clay and silt with minor inter-bedded sand layers. Very low permeability bedrock (e.g., claystones and siltstones) underlie the surface soils and effectively form an aquitard. The Chinle Group, which is Upper Triassic, crops out over a large area on the southern margin of the San Juan Basin. The uppermost recognized local Formation is the Petrified Forest Formation and the Sonsela Sandstone Bed is the uppermost recognized regional aquifer (Marathon Petroleum Company 2019). Aquifer test of the Sonsela Bed northeast of Prewitt indicated a transmissivity of greater than 100 ft^2/day (Stone and others, 1983). The Sonsela Sandstone's highest point occurs southeast of the site and slopes downward to the northwest as it passes under the refinery. The Sonsela Sandstone forms a water-bearing reservoir with artesian conditions throughout the central and western portions of the refinery property.

The diverse properties and complex, irregular stratigraphy of the surface soils across the site cause a wide range of hydraulic conductivity ranging from less than 10^{-2} cm/sec for gravel like sands immediately overlying the Petrified Forest Formation to 10^{-8} cm/sec in the clay soils located near the surface (Western, 2009). Generally, shallow groundwater at the refinery follows the upper contact of the Petrified Forest Formation with prevailing flow from the southeast to the northwest.

In the Hydrocarbon Seep Area, three-dimensional geological modeling using available boring log information strongly suggests that the swale in the area of the hydrocarbon seep area is underlain by a corresponding swale in the shallow alluvium that likely influences shallow groundwater flow in this area. This is shown in Figure 3.

Natural Attenuation
Dissolved organic compounds can be degraded naturally in groundwater, with the rate dependent on the redox state of the groundwater and the presence of suitable electron receptors for microbial degradation (NJDEP 2012). Biodegradation under aerobic (oxidizing) conditions is generally faster than under anaerobic (reducing) conditions, but degradation occurs under both redox regimes.

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In general, reducing conditions are present in the subsurface where LNAPL and dissolved petroleum hydrocarbons are present in groundwater. This has been established by numerous studies (ITRC 2009, Lawrence 2006, and NJDEP 2012), and is generally recognized and accepted. This redox condition is caused by depletion of oxygen through aerobic biodegradation of the dissolved petroleum. A generalized diagram of typical hydrocarbon groundwater plume redox conditions is shown Figure 4. When a release of hydrocarbons occurs into groundwater, existing microbes catalyze reactions between the electron-donating carbon and the electron acceptors, in a sequence that is most favorable to the microbes (ITRC 2010). In general, the sequence of electron acceptor use is as follows:

$$O_2 > NO_3^- > Mn(III) \text{ or } Mn\ (IV) > Fe(III) > SO_4^{-2}$$

The presence of the oxidized inorganic compounds shown above indicates the potential for biodegradation. Moreover, the presence of the reduced forms of these species generally indicates active biodegradation.

The strongest reducing conditions are generally present in the source area of the hydrocarbon plume where LNAPL is present. More oxidizing (less reducing) conditions are generally present in the downgradient direction of the dissolved hydrocarbon plume, as shown in Figure 4. Figure 4 also shows the areas of the plume where redox conditions are sufficient to allow reduction of the indicated species.

Chlorinated organic compounds generally require anaerobic conditions for biodegradation. Figure 5 presents a list of chlorinated organic compounds and the likelihood of biodegradation through various degradation mechanisms/pathways. As shown in this figure, the primary mechanisms for biodegradation is reductive dechlorination and dichlorination.

More recent studies of MTBE aerobic biodegradation indicate that it is less recalcitrant than previously thought (Lawrence 2006). Anaerobic biodegradation proceeds more slowly under reducing conditions ranging from methanogenic to nitrate-reducing.

Evaluation of Current MNA Conditions

Table 1 presents recent groundwater analytical data from MKTF wells, including key organic and inorganic analytes, and pH. Table 2 presents oxidation reduction potential (ORP) field data from quarterly sampling from quarters 1, 3 and 4 in 2016 (Western 2017). The second quarter data were not available. Field measurement of ORP can be an indicator of the redox regime of groundwater, with the method of field measurement important to the absolute value of the results. In general, for more accurate measurements of ORP, a groundwater sampling pump and a flow-through cell for well purging and measuring ORP is preferred because this configuration

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eliminates contact with air. For the ORP data presented in Table 2, measurements were conducted using bailed water from a well, which was then placed into a container for ORP measurement. This procedure introduces oxygen, and actual in situ groundwater conditions would be expected to have a lower, more reducing ORP. Nevertheless, the data in Table 1 can be evaluated in a relative sense for trends.

Current conditions and available geochemical data provide evidence that reducing conditions are present in the Hydrocarbon Seep Area. These reducing conditions create a geochemical environment for the anaerobic biodegradation of petroleum hydrocarbons and may also be conducive to the anaerobic biodegradation of chlorinated hydrocarbons TCE, 1,1-DCA and 1,2-DCA.

Evidence for conditions favorable for anaerobic biodegradation of chlorinated compounds includes:

- Elevated benzene concentrations, indicating that a high dissolved hydrocarbon load is present and anaerobic conditions are likely. LNAPL is also present in several areas (Figure 1) which represents a continuing source for dissolved phase hydrocarbons.

- Detection of vinyl chloride, which is typically a byproduct of TCE degradation.

- Presence of dissolved iron and total iron, indicating likely presence of ferrous iron in response to reducing conditions and anaerobic biodegradation

- Depleted sulfate in wells with elevated benzene (e.g. MKTF-10, MKTF-16, MKTF-17), indicating reducing condition and sulfate reduction to sulfite as part of anaerobic biodegradation.

- Presence of manganese, indicating availability as an electron receptor for anaerobic biodegradation.

- Occasional detection of nitrite above detection limits, indicating reducing conditions and probable use of nitrate as an electron receptor for anaerobic biodegradation.

- Given the evidence for reducing conditions presented above, anaerobic degradation of MTBE is more likely than aerobic degradation

- pH conditions appear favorable for biodegradation

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- ORP measurements indicate reducing conditions are present, particularly for MKTF wells located in the paved areas where LNAPL (separate phase hydrocarbon [SPH]) is present (see Figure 1). Wells located to the west in unpaved areas without LNAPL and elevated dissolved hydrocarbon such as benzene are generally oxidizing.

Chloride concentrations are generally elevated in the MKTF wells, as shown in Table 1, but do not correlate with areas of elevated chlorinated organic compounds. In the absence of high chloride from other sources, elevated chloride can be used as an indicator of the biodegradation of chlorinated compounds (NJDEP 2012).

To date, insufficient monitoring well analytical data is available to perform a statistical analysis of concentration trends. As more date become available, contaminant trend plots can be developed and statistical analysis can be performed.

Proposed Workplan for Natural Attenuation Evaluation for Future Annual Reports
The proposed workplan to evaluate natural attenuation is presented in this section for NMED review and approval. MPC proposes that a natural attenuation evaluation section be completed on an annual basis using the existing quarterly sampling analyte list as shown in Table 3 as lines of evidence. These lines of evidence will include:

- Benzene, MTBE, 1,1-DCA, 1,2-DCA, TCE, and vinyl chloride analytical results
- Inorganic analyses including dissolved/total analyses for iron and manganese, nitrate/nitrate, pH and sulfate to determine their availability as terminal electron receptors and the redox state. A table of the results will be prepared.
- Field measurements conducted during quarterly sampling and well purging (pH, ORP and dissolved oxygen)
- As more data become available, and trends become evident, a Mann-Kendall statistical analysis will be performed to quantify contaminant concentration trends.

Tables will be added to future annual reports with these analytes, and a new section will be added to present these key data and to summarize natural attenuation progress, including trends in contaminant concentrations and key MNA indicators. MPC expects to initiate this the year following NMED approval.

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References

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Western. 2017. Annual Groundwater Monitoring Report Gallup Refinery – 2016 Western Refining, Gallup New Mexico, August 31, 2017.

Tables

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	Benzene (εg/L)	Trichloro-ethene (εg/L)	1,1-Dichloro-ethane (εg/L)	1,2- Dichloro-ethane (εg/L)	MTBE (εg/L)	Vinyl Chloride (εg/L)	Chloride (mg/L)	Iron, Dissolved (mg/L)	Iron, Total (mg/L)	Manganese, Dissolved (mg/L)	Manganese, Total (mg/L)	Nitrogen, Nitrate (εg/L)	Nitrogen, Nitrite (εg/L)	Sulfate (mg/L)
MKTF-02	03/28/19	**620**	ND(20)	**16**	**6.9**	**47**	**13**	1400	0.42	**1.6**	1.6	**1.5**	--	--	52
	05/06/19	**950**	ND(20)	**19**	**6.4**	**49**	**19**	1600	3	**3.9**	1.8	**1.9**	ND(500)	ND(500)	61
	08/23/19	**990**	ND(20)	**27**	**12**	**51**	**28**	2000	2.4	**9.1**	2	**2.3**	ND(500)	ND(2000)	150
	11/19/19	**360**	ND(5)	**15**	**4.7**	**23**	**17**	--	--	**5.7**	--	**2.9**	--	--	--
	02/25/20	**780**	ND(5)	**6.5**	**2**	9.1	**5**	1300	0.34	**2**	3	**3**	ND(500)	ND(500)	160
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/21/20	**4000**	ND(1)	**21**	ND(1)	**61**	**27**	1000	0.22	0.99	1.9	**2**	ND(500)	ND(500)	64
MKTF-04	05/13/19	**770**	**0.87**	**5.4**	**1.6**	**1700**	ND(5)	260	4.5	**8**	1.6	**1.6**	ND(500)	ND(500)	5.6
	08/21/19	**530**	**0.83**	**13**	**1.5**	**1600**	ND(1)	220	1.5	**5.9**	2	**2.2**	120	ND(500)	16
	10/30/19	**930**	ND(5)	**5.5**	ND(5)	**1800**	ND(5)	210	5.4	**7.6**	1.5	**1.6**	ND(500)	ND(500)	2.9
	03/03/20	**800**	ND(5)	**9.1**	**2.3**	**2100**	ND(5)	220	1.4	**6**	1.8	**1.9**	ND(500)	ND(500)	9.3
MKTF-09	05/13/19	**3200**	ND(10)	**6.8**	ND(10)	**310**	ND(10)	250	3.2	**3.8**	4.6	**4.8**	ND(500)	ND(500)	8.1
	08/28/19	**3500**	ND(20)	**14**	ND(20)	**420**	ND(20)	230	3.8	**4.5**	4.4	**4.5**	ND(500)	ND(500)	12
	11/18/19	**3700**	ND(10)	**11**	ND(10)	**450**	ND(10)	220	2.4	**3.4**	4.2	**4.3**	ND(500)	ND(500)	25
	03/03/20	**3300**	ND(20)	**19**	ND(20)	**530**	ND(20)	290	1.4	**2.7**	3.9	**4**	ND(500)	ND(500)	43
MKTF-10	05/13/19	**5500**	ND(50)	**27**	ND(50)	**24**	**23**	460	8.4	**8.9**	3.4	**3.6**	ND(500)	ND(500)	ND(2.5)
	08/22/19	**4600**	ND(10)	**37**	ND(10)	**19**	**10**	960	7.9	**11**	5.4	**5.6**	100	ND(500)	ND(2.5)
	10/30/19	**5500**	ND(10)	**31**	ND(10)	**17**	**10**	1000	14	**15**	6.2	**6.3**	ND(500)	ND(500)	ND(2.5)
	03/03/20	**4800**	ND(10)	**47**	ND(10)	9.4	**8.9**	970	7.2	**12**	5.4	**5.5**	ND(500)	ND(500)	ND(2.5)
MKTF-11	05/13/19	**6100**	ND(50)	**55**	ND(50)	**46**	**44**	760	3.1	**5**	2.4	**2.6**	ND(500)	ND(500)	6.3
	08/21/19	**9100**	ND(10)	**39**	ND(10)	**28**	**28**	620	3.4	**3.9**	2	**1.9**	ND(500)	**570**	1.8
	10/30/19	**13000**	ND(20)	**27**	ND(20)	**41**	**23**	750	3.6	**4.9**	2.8	**2.5**	ND(500)	ND(500)	4.4
	03/03/20	**6000**	ND(20)	**35**	ND(20)	**59**	**27**	1500	5.2	**8.5**	4.8	**4.6**	ND(500)	ND(500)	19
MKTF-13	03/26/19	**3500**	ND(20)	ND(20)	ND(20)	**440**	ND(20)	390	24	**25**	5.1	**4.7**	--	--	0.75
	05/09/19	**3200**	ND(20)	ND(20)	ND(20)	**480**	ND(20)	400	25	**35**	5.3	**6.1**	ND(500)	ND(500)	1.1
	10/29/19	**4700**	ND(20)	ND(20)	ND(20)	**330**	ND(20)	290	15	**20**	4.6	**4.7**	ND(500)	ND(500)	0.59
MKTF-15	05/13/19	**18000**	ND(50)	**25**	ND(50)	**68**	**26**	3900	26	**31**	8.2	**8.4**	ND(500)	ND(2000)	0.44
MKTF-16	02/20/19	**21000**	ND(100)	**53**	ND(100)	**610**	ND(100)	590	2	**5.8**	1.7	**1.7**	ND(500)	ND(500)	0.41
	05/14/19	**14000**	ND(100)	ND(100)	ND(100)	**620**	ND(100)	960	5.8	**5.8**	2.6	**3**	ND(500)	ND(500)	0.68
	08/22/19	**9800**	ND(100)	**64**	ND(100)	**550**	ND(100)	--	--	--	--	--	--	--	--
	08/30/19	--	--	--	--	--	--	1800	21	**24**	7.1	**6.8**	ND(500)	ND(2000)	ND(2.5)
	10/30/19	**15000**	ND(100)	**69**	ND(100)	**620**	ND(100)	1700	15	**17**	5.5	**4.9**	ND(500)	ND(500)	ND(2.5)
MKTF-17	05/09/19	**2200**	ND(5)	ND(5)	ND(5)	**4300**	ND(5)	100	0.27	**5.4**	3	**3.1**	ND(500)	ND(500)	15
	08/20/19	**870**	ND(5)	ND(5)	ND(5)	**4300**	ND(5)	140	0.37	**3**	2.8	**3**	ND(500)	ND(500)	14
	10/29/19	**12000**	ND(5)	ND(5)	ND(5)	**2500**	ND(5)	240	0.45	**4.8**	3.5	**3.4**	ND(500)	ND(500)	6.2
MKTF-18	05/16/19	**140**	ND(2)	ND(2)	ND(2)	**130**	ND(2)	190	2	**3.8**	2.1	**2.2**	ND(500)	ND(500)	ND(2.5)
	10/29/19	**160**	ND(2)	ND(2)	ND(2)	**88**	ND(2)	220	0.65	**3.4**	2.1	**2**	ND(500)	ND(500)	0.57
	02/06/20	**190**	ND(2)	0.51	ND(2)	**110**	ND(2)	200	2.7	**9.8**	2.9	**3.7**	ND(500)	ND(500)	ND(2.5)
MKTF-19	05/09/19	**1800**	ND(20)	ND(20)	ND(20)	**7800**	ND(20)	140	11	**15**	2.4	**2.7**	ND(500)	ND(500)	0.31
	08/19/19	**1400**	ND(20)	ND(20)	ND(20)	**8300**	ND(20)	140	11	**19**	2.3	**2.7**	ND(500)	ND(500)	ND(2.5)
	10/29/19	**1600**	ND(20)	ND(20)	ND(20)	**7900**	ND(20)	130	10	**15**	2.4	**2.4**	ND(500)	ND(500)	0.5
MKTF-20	02/20/19	**2100**	ND(10)	ND(10)	ND(10)	**220**	ND(10)	760	47	**58**	5.5	**5.5**	ND(500)	ND(500)	11
	05/14/19	**2300**	ND(10)	ND(10)	ND(10)	**32**	ND(10)	3400	22	**25**	9	**8.5**	ND(500)	ND(2000)	36
	08/21/19	**4800**	ND(10)	ND(10)	ND(10)	**35**	ND(10)	3300	20	**19**	8.1	**7.5**	ND(500)	**3300**	2.8
	11/05/19	**2400**	ND(10)	ND(10)	ND(10)	**170**	ND(10)	140	2.2	**4.3**	2.1	**2**	ND(500)	ND(500)	1.7
	02/05/20	**620**	ND(10)	ND(10)	ND(5)	5.7	ND(10)	--	--	--	--	--	--	--	--
MKTF-21	02/20/19	**2000**	ND(20)	ND(20)	ND(20)	**15**	ND(20)	4600	57	**63**	14	**15**	ND(500)	**1600**	880
	05/14/19	**2400**	ND(20)	ND(20)	ND(20)	**290**	ND(20)	540	33	**42**	5.6	**5.7**	ND(500)	ND(500)	6.9
USEPA RSL Tap Water HQ 0.1		0.46	0.28	2.8	0.17	14	0.019	NA	NA	1.4	NA	0.043	3,200	200	NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	pH, Field (Std Units)
MKTF-02	03/28/19	--
	05/06/19	--
	08/23/19	--
	11/19/19	--
	02/25/20	--
	09/15/20	6.72
	09/21/20	--
MKTF-04	05/13/19	--
	08/21/19	--
	10/30/19	--
	03/03/20	--
MKTF-09	05/13/19	--
	08/28/19	--
	11/18/19	--
	03/03/20	--
MKTF-10	05/13/19	--
	08/22/19	--
	10/30/19	--
	03/03/20	--
MKTF-11	05/13/19	--
	08/21/19	--
	10/30/19	--
	03/03/20	--
MKTF-13	03/26/19	--
	05/09/19	--
	10/29/19	--
MKTF-15	05/13/19	--
MKTF-16	02/20/19	--
	05/14/19	--
	08/22/19	--
	08/30/19	--
	10/30/19	--
MKTF-17	05/09/19	--
	08/20/19	--
	10/29/19	--
MKTF-18	05/16/19	--
	10/29/19	--
	02/06/20	--
MKTF-19	05/09/19	--
	08/19/19	--
	10/29/19	--
MKTF-20	02/20/19	--
	05/14/19	--
	08/21/19	--
	11/05/19	--
	02/05/20	--
MKTF-21	02/20/19	--
	05/14/19	--
USEPA RSL Tap Water HQ 0.1		NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	Benzene (εg/L)	Trichloro-ethene (εg/L)	1,1-Dichloro-ethane (εg/L)	1,2- Dichloro-ethane (εg/L)	MTBE (εg/L)	Vinyl Chloride (εg/L)	Chloride (mg/L)	Iron, Dissolved (mg/L)	Iron, Total (mg/L)	Manganese, Dissolved (mg/L)	Manganese, Total (mg/L)	Nitrogen, Nitrate (εg/L)	Nitrogen, Nitrite (εg/L)	Sulfate (mg/L)
MKTF-21	08/22/19	**5400**	ND(20)	ND(20)	ND(20)	**290**	ND(20)	230	16	**21**	3.4	**3.3**	ND(500)	ND(500)	6.2
	11/05/19	**5600**	ND(20)	ND(20)	ND(20)	**29**	ND(20)	2300	8.3	**9**	6.2	**5.8**	ND(500)	ND(500)	19
	02/05/20	**58**	ND(5)	ND(5)	ND(5)	**50**	ND(5)	--	--	--	--	--	--	--	--
MKTF-22	05/09/19	**3500**	ND(20)	**11**	ND(20)	**3300**	ND(20)	170	7.3	**11**	2.6	**3.1**	ND(500)	ND(500)	13
	08/20/19	**3200**	ND(20)	**13**	ND(20)	**2700**	ND(20)	200	6.8	**8.5**	2.6	**2.9**	ND(500)	ND(500)	4.7
	10/24/19	**3400**	ND(20)	**13**	ND(20)	**2600**	ND(20)	190	6.8	**12**	2.9	**2.9**	ND(500)	ND(500)	2.9
MKTF-23	10/29/19	**4800**	ND(100)	**61**	ND(100)	**330**	**53**	440	0.16	0.51	2	**1.9**	ND(500)	ND(500)	1.7
MKTF-24	05/06/19	**3000**	ND(20)	**47**	**6.6**	**110**	**22**	1000	5.7	**8.3**	2.3	**2.6**	ND(500)	ND(500)	42
	08/23/19	**4100**	ND(20)	**53**	ND(20)	**110**	**38**	800	1.6	**5.3**	2.2	**2.1**	ND(500)	**800**	34
	10/23/19	**5000**	ND(20)	**33**	**9.3**	**110**	**37**	660	0.59	0.9	2.4	**2.3**	ND(500)	ND(500)	20
	11/19/19	--	--	--	--	--	--	--	--	--	--	--	ND(500)	ND(500)	--
	02/25/20	**2900**	ND(20)	**38**	**10**	**110**	**28**	940	0.08	**1.9**	1.9	**2.2**	120	ND(500)	27
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/19/20	**6100**	ND(20)	**41**	ND(20)	**120**	**37**	950	0.26	**32**	1.9	**4.4**	--	--	35
MKTF-25	05/06/19	**370**	**12**	**140**	**6.1**	**290**	**7**	860	0.21	**4.7**	1.8	**2.2**	ND(500)	ND(500)	52
	08/27/19	**130**	**13**	**130**	**10**	**850**	ND(5)	1100	0.25	**1.8**	3.6	**3.9**	ND(500)	**880**	68
	10/23/19	**370**	**11**	**110**	**9.1**	**880**	**3.3**	1400	0.28	**10**	5.4	**5.8**	ND(500)	ND(500)	73
	11/18/19	--	--	--	--	--	--	--	--	--	--	--	14	ND(2000)	--
	02/27/20	**420**	**12**	**100**	**8.8**	**620**	**4.2**	980	0.13	**5.6**	3.2	**3.4**	--	--	76
MKTF-27	03/28/19	ND(1)	ND(1)	ND(1)	ND(1)	1.8	ND(1)	3500	0.12	1.1	0.011	**0.077**	--	--	1200
	05/06/19	ND(1)	ND(1)	0.83	**0.33**	**19**	ND(1)	4000	0.023	**2.2**	0.17	**0.7**	**5500**	ND(2000)	980
	08/21/19	**9.7**	ND(1)	1.6	ND(1)	**24**	ND(1)	3400	0.0089	1.1	0.32	**0.58**	2800	**3200**	770
	10/23/19	ND(1)	ND(1)	1.1	**0.53**	14	ND(1)	2900	0.017	0.19	0.048	**0.13**	1200	ND(500)	570
	02/25/20	ND(1)	ND(1)	0.43	ND(1)	6	ND(1)	7000	0.029	1.3	0.065	**0.32**	**5700**	ND(2000)	1100
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/20/20	**0.86**	ND(1)	1.3	**0.39**	**29**	ND(1)	2700	0.015	0.21	0.23	**0.45**	560	ND(2000)	520
MKTF-28	03/28/19	ND(1)	ND(1)	ND(1)	ND(1)	0.82	ND(1)	420	0.022	1.4	0.0036	**0.094**	--	--	180
	05/06/19	ND(1)	ND(1)	ND(1)	ND(1)	0.74	ND(1)	470	0.029	**3.9**	0.004	**0.26**	1100	ND(500)	200
	08/21/19	ND(1)	ND(1)	ND(1)	ND(1)	4.5	ND(1)	470	ND(0.02)	0.79	0.023	**0.074**	910	**490**	180
	10/22/19	ND(1)	ND(1)	ND(1)	ND(1)	4.9	ND(1)	460	0.023	**1.6**	0.037	**0.12**	560	ND(500)	190
	02/25/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	570	ND(0.02)	**2**	0.00042	**0.11**	260	ND(500)	160
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/20/20	ND(1)	ND(1)	ND(1)	ND(1)	2.3	ND(1)	630	0.012	0.51	0.015	**0.088**	250	ND(500)	130
MKTF-29	03/28/19	ND(1)	ND(1)	ND(1)	ND(1)	4.1	ND(1)	190	0.02	0.57	0.59	**0.6**	--	--	540
	05/06/19	ND(1)	ND(1)	ND(1)	ND(1)	4.8	ND(1)	260	0.016	1.2	0.66	**0.71**	ND(500)	ND(500)	540
	08/23/19	ND(1)	ND(1)	ND(1)	ND(1)	8.6	ND(1)	610	0.0092	0.27	1.1	**1.1**	97	**460**	440
	10/22/19	ND(1)	ND(1)	0.56	ND(1)	12	ND(1)	1000	ND(0.02)	0.66	2	**2.1**	ND(500)	ND(500)	320
	11/18/19	--	--	--	--	--	--	--	--	--	--	--	72	ND(2000)	--
	02/25/20	ND(1)	ND(1)	0.45	ND(1)	**15**	ND(1)	1500	ND(0.02)	0.04	2.5	**2.4**	ND(500)	ND(500)	230
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/20/20	ND(1)	ND(1)	0.29	ND(1)	**19**	ND(1)	18000	0.012	0.033	4.2	**4.5**	140	ND(2000)	160
MKTF-30	03/28/19	ND(1)	**1.6**	**27**	**1.1**	1.3	ND(1)	410	0.043	**9.5**	0.0065	**0.41**	--	--	510
	05/06/19	ND(1)	**2.1**	**36**	**1.2**	1.8	ND(1)	410	0.012	**5.3**	0.0099	**0.21**	ND(500)	ND(500)	540
	08/23/19	ND(1)	**2.6**	**39**	**1.7**	1	ND(1)	480	ND(0.02)	**7**	0.0014	**0.95**	220	**370**	570
	10/23/19	ND(1)	**3**	**47**	**2.1**	1.5	ND(1)	480	0.013	**4.9**	0.0013	**0.5**	ND(500)	ND(500)	480
	11/18/19	--	--	--	--	--	--	--	--	--	--	--	160	ND(2000)	--
	02/27/20	ND(1)	**2.6**	**35**	**1.6**	2	ND(1)	520	ND(0.02)	**1.9**	0.0011	**0.27**	140	ND(500)	530
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
USEPA RSL Tap Water HQ 0.1		0.46	0.28	2.8	0.17	14	0.019	NA	NA	1.4	NA	0.043	3,200	200	NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	pH, Field (Std Units)
MKTF-21	08/22/19	--
	11/05/19	--
	02/05/20	--
MKTF-22	05/09/19	--
	08/20/19	--
	10/24/19	--
MKTF-23	10/29/19	--
MKTF-24	05/06/19	--
	08/23/19	--
	10/23/19	--
	11/19/19	--
	02/25/20	--
	09/15/20	7.55
	09/19/20	--
MKTF-25	05/06/19	--
	08/27/19	--
	10/23/19	--
	11/18/19	--
	02/27/20	--
MKTF-27	03/28/19	--
	05/06/19	--
	08/21/19	--
	10/23/19	--
	02/25/20	--
	09/15/20	6.81
	09/20/20	--
MKTF-28	03/28/19	--
	05/06/19	--
	08/21/19	--
	10/22/19	--
	02/25/20	--
	09/15/20	7.35
	09/20/20	--
MKTF-29	03/28/19	--
	05/06/19	--
	08/23/19	--
	10/22/19	--
	11/18/19	--
	02/25/20	--
	09/15/20	7.07
	09/20/20	--
MKTF-30	03/28/19	--
	05/06/19	--
	08/23/19	--
	10/23/19	--
	11/18/19	--
	02/27/20	--
	09/15/20	7.52
USEPA RSL Tap Water HQ 0.1		NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	Benzene (εg/L)	Trichloro-ethene (εg/L)	1,1-Dichloro-ethane (εg/L)	1,2- Dichloro-ethane (εg/L)	MTBE (εg/L)	Vinyl Chloride (εg/L)	Chloride (mg/L)	Iron, Dissolved (mg/L)	Iron, Total (mg/L)	Manganese, Dissolved (mg/L)	Manganese, Total (mg/L)	Nitrogen, Nitrate (εg/L)	Nitrogen, Nitrite (εg/L)	Sulfate (mg/L)
MKTF-30	09/20/20	ND(1)	**1.6**	**36**	**1.6**	3.5	ND(1)	510	ND(0.02)	**3.3**	0.0016	**0.44**	110	ND(500)	520
MKTF-31	02/20/19	**1**	**6.1**	**52**	**30**	**120**	ND(1)	760	ND(0.02)	**1.7**	0.017	**0.06**	ND(500)	ND(500)	65
	05/06/19	0.45	**4.1**	**35**	**19**	**90**	ND(1)	1200	ND(0.02)	**2.1**	0.011	**0.052**	250	ND(500)	110
	08/23/19	**0.72**	**4.8**	**39**	**23**	**110**	ND(1)	820	0.027	**2**	0.021	**0.074**	ND(500)	**910**	82
	10/22/19	**0.6**	**4.4**	**36**	**21**	**100**	**0.46**	770	ND(0.02)	**3.8**	0.015	**0.17**	95	ND(500)	72
	11/18/19	--	--	--	--	--	--	--	--	--	--	--	52	ND(2000)	--
	02/25/20	**0.92**	**5.7**	**39**	**28**	**180**	ND(1)	820	ND(0.02)	1	0.016	**0.059**	ND(500)	ND(500)	68
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/19/20	**0.66**	**5.8**	**48**	**24**	**190**	ND(1)	550	0.05	**3.3**	0.061	**0.14**	--	--	59
MKTF-32	02/13/19	ND(2)	ND(2)	**13**	**15**	**840**	ND(2)	420	ND(0.02)	0.17	0.059	**0.079**	ND(500)	ND(500)	89
	05/07/19	ND(2)	**0.34**	**13**	**14**	**740**	ND(2)	450	0.023	**1.5**	0.071	**0.12**	ND(500)	**300**	93
	08/20/19	0.31	0.28	**14**	**15**	**610**	ND(1)	400	ND(0.02)	1.2	0.11	**0.11**	410	ND(500)	92
	10/23/19	0.36	ND(2)	**12**	**14**	**670**	ND(2)	400	0.059	**5.5**	0.043	**0.16**	ND(500)	ND(500)	90
	02/27/20	ND(2)	ND(2)	**10**	**13**	**900**	ND(2)	400	ND(0.02)	0.44	0.074	**0.1**	ND(500)	ND(500)	91
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/21/20	ND(2)	ND(2)	**15**	**13**	**1100**	ND(2)	370	ND(0.02)	ND(0.05)	0.16	**0.065**	ND(500)	ND(500)	84
MKTF-33	05/09/19	ND(1)	ND(1)	ND(1)	ND(1)	**300**	ND(1)	110	0.016	**4.4**	0.081	**0.32**	160	ND(500)	240
	08/20/19	ND(1)	ND(1)	ND(1)	ND(1)	**730**	ND(1)	110	0.12	**2.6**	0.44	**0.57**	140	ND(500)	170
	10/24/19	ND(2)	ND(2)	ND(2)	ND(2)	**670**	ND(2)	110	0.052	**4.5**	0.38	**0.48**	ND(500)	ND(500)	190
	02/28/20	**82**	ND(2)	ND(2)	ND(2)	**800**	ND(2)	130	0.032	0.93	0.31	**0.34**	310	ND(500)	170
MKTF-34	05/09/19	ND(1)	**0.49**	ND(1)	ND(1)	ND(1)	ND(1)	890	0.021	0.94	0.00082	0.024	**9700**	ND(500)	60
	08/19/19	ND(1)	**0.89**	ND(1)	ND(1)	ND(1)	ND(1)	740	ND(0.02)	**2**	ND(0.002)	**0.045**	**9700**	ND(500)	110
	10/29/19	ND(1)	**1**	ND(1)	ND(1)	0.58	ND(1)	450	ND(0.02)	1.3	0.00044	0.033	**14000**	ND(500)	200
	02/05/20	ND(1)	**0.4**	ND(1)	ND(1)	ND(1)	ND(1)	560	ND(0.02)	0.92	0.001	0.03	**16000**	ND(500)	82
	02/28/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	860	ND(0.02)	1.1	0.00059	0.037	**12000**	ND(500)	57
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/16/20	ND(1)	**0.89**	ND(1)	ND(1)	ND(1)	ND(1)	490	1.9	**21**	0.078	**0.41**	**8400**	ND(500)	120
MKTF-35	05/16/19	**14**	ND(1)	ND(1)	ND(1)	**42**	ND(1)	250	3.6	**4.5**	3.3	**3.7**	ND(500)	ND(500)	80
	08/19/19	**22**	ND(1)	ND(1)	ND(1)	**26**	ND(1)	190	3.1	**9.8**	2.8	**4**	ND(500)	ND(500)	79
	10/29/19	**56**	ND(1)	0.68	ND(1)	**120**	ND(1)	220	3.4	**8.3**	2.9	**3.5**	ND(500)	ND(500)	36
	02/06/20	**6100**	ND(10)	ND(10)	ND(10)	**320**	ND(10)	240	0.065	**2.1**	2	**2**	ND(500)	ND(500)	ND(2.5)
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/16/20	**4000**	ND(10)	ND(10)	ND(10)	**160**	ND(10)	360	4.2	**13**	3.1	**5**	ND(500)	ND(500)	ND(2.5)
MKTF-36	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/18/20	**9700**	ND(20)	ND(20)	ND(20)	**940**	ND(20)	240	11	**12**	1.6	**1.8**	110	ND(500)	ND(2.5)
MKTF-37	05/14/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	240	ND(0.02)	**1.6**	2.2	**2**	**3700**	ND(500)	600
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/17/20	**1300**	**96**	**8.1**	**5.4**	**33**	ND(5)	190	11	**24**	1.2	**1.6**	ND(500)	ND(500)	2.1
MKTF-38	06/27/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	330	ND(0.02)	**4.1**	2.3	**2.5**	**4800**	ND(500)	600
	08/20/19	ND(1)	0.25	ND(1)	ND(1)	0.56	ND(1)	360	ND(0.02)	0.83	2.4	**2.6**	**5500**	ND(500)	560
	03/05/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	290	ND(0.02)	**3.8**	0.72	**1.4**	**12000**	150	420
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/19/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	630	0.17	**4.4**	0.32	**1.3**	--	--	450
MKTF-39	06/05/19	**9.1**	ND(1)	0.41	ND(1)	ND(1)	**0.44**	9000	27	**27**	10	**10**	ND(500)	ND(2000)	140
	08/20/19	**8.3**	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	8900	25	**28**	9.6	**9.5**	--	--	4.5
	11/05/19	**10**	ND(1)	0.49	ND(1)	ND(1)	ND(1)	7500	29	**32**	6.8	**6.7**	--	--	1.2
	02/05/20	**9.4**	ND(2)	0.45	ND(2)	ND(2)	ND(2)	7500	23	**33**	6	**6.7**	--	--	1.3
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
USEPA RSL Tap Water HQ 0.1		0.46	0.28	2.8	0.17	14	0.019	NA	NA	1.4	NA	0.043	3,200	200	NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	pH, Field (Std Units)
MKTF-30	09/20/20	--
MKTF-31	02/20/19	--
	05/06/19	--
	08/23/19	--
	10/22/19	--
	11/18/19	--
	02/25/20	--
	09/15/20	6.43
	09/19/20	--
MKTF-32	02/13/19	--
	05/07/19	--
	08/20/19	--
	10/23/19	--
	02/27/20	--
	09/14/20	7.91
	09/21/20	--
MKTF-33	05/09/19	--
	08/20/19	--
	10/24/19	--
	02/28/20	--
MKTF-34	05/09/19	--
	08/19/19	--
	10/29/19	--
	02/05/20	--
	02/28/20	--
	09/14/20	7.42
	09/16/20	--
MKTF-35	05/16/19	--
	08/19/19	--
	10/29/19	--
	02/06/20	--
	09/14/20	6.72
	09/16/20	--
MKTF-36	09/14/20	6.87
	09/18/20	--
MKTF-37	05/14/19	--
	09/14/20	7.04
	09/17/20	--
MKTF-38	06/27/19	--
	08/20/19	--
	03/05/20	--
	09/14/20	7.8
	09/19/20	--
MKTF-39	06/05/19	--
	08/20/19	--
	11/05/19	--
	02/05/20	--
	09/15/20	6.74
USEPA RSL Tap Water HQ 0.1		NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	Benzene (εg/L)	Trichloro-ethene (εg/L)	1,1-Dichloro-ethane (εg/L)	1,2- Dichloro-ethane (εg/L)	MTBE (εg/L)	Vinyl Chloride (εg/L)	Chloride (mg/L)	Iron, Dissolved (mg/L)	Iron, Total (mg/L)	Manganese, Dissolved (mg/L)	Manganese, Total (mg/L)	Nitrogen, Nitrate (εg/L)	Nitrogen, Nitrite (εg/L)	Sulfate (mg/L)
MKTF-39	09/19/20	**18**	ND(2)	0.63	ND(2)	ND(2)	**0.44**	6200	25	**29**	4.1	**4.5**	--	--	2.6
MKTF-40	02/20/19	ND(1)	ND(1)	1	**0.28**	ND(1)	ND(1)	3100	0.035	**2.7**	0.0029	**0.053**	ND(500)	ND(2000)	550
	05/06/19	ND(1)	ND(1)	0.66	ND(1)	ND(1)	ND(1)	3200	0.034	**3.7**	0.0019	**0.063**	ND(500)	**3300**	560
	08/22/19	ND(1)	ND(1)	0.78	ND(1)	ND(1)	ND(1)	3500	0.098	**6.9**	0.0068	**0.25**	81	ND(2000)	500
	10/22/19	ND(1)	ND(1)	0.76	**0.44**	0.72	ND(1)	2800	0.032	**2.3**	0.021	**0.056**	170	ND(2000)	540
	11/19/19	--	--	--	--	--	--	--	--	--	--	--	ND(500)	ND(2000)	--
	02/28/20	ND(1)	ND(1)	0.64	**0.37**	0.76	ND(1)	2900	0.01	**7.7**	0.00047	**0.38**	140	ND(2000)	530
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/19/20	ND(1)	ND(1)	0.79	ND(1)	0.58	ND(1)	3000	0.013	**7.2**	0.00091	**0.33**	--	--	450
MKTF-41	02/13/19	ND(1)	ND(1)	**4.3**	**3.7**	0.99	ND(1)	840	ND(0.02)	0.16	0.0085	0.014	**5600**	ND(500)	61
	05/07/19	ND(1)	ND(1)	**3**	**2.5**	0.87	ND(1)	910	ND(0.02)	0.73	0.0023	0.028	**4800**	**780**	62
	08/22/19	ND(1)	ND(1)	**3.9**	**3.3**	1.2	ND(1)	840	0.022	**7.3**	0.0024	**0.45**	**4800**	ND(500)	59
	10/23/19	ND(1)	ND(1)	**3.1**	**3**	1.3	ND(1)	800	0.0091	**2.2**	0.0013	**0.067**	**4800**	ND(500)	58
	02/27/20	ND(1)	ND(1)	**3.3**	**3.1**	1.2	ND(1)	880	ND(0.02)	0.039	0.0051	0.008	**5300**	190	61
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/21/20	ND(1)	ND(1)	**5.2**	**4.1**	1	ND(1)	770	ND(0.02)	0.02	0.006	0.0064	**5400**	**250**	60
MKTF-42	02/13/19	**17**	ND(1)	0.69	**2.3**	4.4	ND(1)	1100	ND(0.02)	0.17	0.044	**0.055**	150	ND(500)	87
	05/07/19	**7**	ND(2)	ND(2)	**1.6**	4	ND(2)	1100	0.037	0.15	0.11	**0.12**	70	**910**	89
	08/22/19	**9.6**	ND(2)	ND(2)	**1.9**	4.1	ND(2)	1000	0.049	0.16	0.11	**0.11**	ND(500)	**850**	89
	10/23/19	**11**	ND(2)	1.1	**2.3**	4.4	ND(2)	940	0.03	0.19	0.1	**0.11**	ND(500)	ND(500)	83
	02/27/20	**22**	ND(1)	0.74	**2.4**	4.2	ND(1)	1100	ND(0.1)	0.069	0.05	**0.051**	ND(500)	ND(500)	84
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/21/20	**29**	ND(1)	1.2	**4.3**	3.5	ND(1)	880	ND(0.02)	0.031	0.041	0.042	120	ND(500)	100
MKTF-43	02/13/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	4300	0.011	**1.7**	0.3	**1.1**	**22000**	ND(2000)	410
	05/08/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	3600	ND(0.02)	1.4	0.53	**0.71**	**19000**	ND(2000)	340
	08/22/19	0.35	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	5100	ND(0.02)	**3.3**	0.77	**1.1**	**18000**	ND(2000)	560
	10/24/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	5100	0.014	**3**	0.45	**1.1**	**12000**	ND(2000)	540
	02/27/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	5600	0.0097	**1.7**	0.0079	**0.47**	**11000**	ND(2000)	640
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/21/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	6900	ND(0.02)	0.3	1.7	**1.4**	**3500**	ND(2000)	790
MKTF-44	02/13/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1500	0.025	**6.7**	0.0027	**0.14**	**9900**	**350**	89
	05/08/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	2400	ND(0.02)	0.82	0.00049	0.024	**14000**	ND(2000)	72
	08/22/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1500	--	0.082	--	0.0031	**9000**	ND(500)	84
	10/24/19	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	810	0.017	**4**	0.0015	**0.11**	**4900**	ND(500)	91
	03/05/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	830	ND(0.02)	**14**	0.00032	**0.32**	**4600**	ND(500)	100
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/21/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	780	1.8	**17**	0.08	**0.32**	**5500**	ND(500)	96
MKTF-46	03/06/20	0.4	ND(1)	0.67	ND(1)	ND(1)	ND(1)	560	ND(0.02)	**1.9**	0.15	**0.34**	**9400**	ND(500)	250
	09/14/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/17/20	ND(1)	ND(1)	0.51	ND(1)	ND(1)	ND(1)	610	0.023	**17**	0.19	**3.4**	**7700**	ND(500)	250
MKTF-47	03/06/20	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	380	ND(0.02)	**1.6**	0.00059	**0.075**	**11000**	ND(500)	320
MKTF-49	03/05/20	**20000**	ND(5)	ND(5)	ND(5)	11	ND(5)	1000	5	**18**	5.3	**6.8**	130	ND(500)	ND(2.5)
	09/15/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	09/20/20	**23000**	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	1100	9	**16**	6	**6.1**	130	ND(500)	ND(2.5)
MKTF-50	03/05/20	**12000**	ND(5)	ND(5)	ND(5)	4.5	ND(5)	360	1.6	**5.3**	1.3	**1.5**	ND(500)	ND(500)	ND(2.5)
USEPA RSL Tap Water HQ 0.1		0.46	0.28	2.8	0.17	14	0.019	NA	NA	1.4	NA	0.043	3,200	200	NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 1. MNA ANALYTICAL DATA
MARATHON PETROLEUM COMPANY, GALLUP, NEW MEXICO

Location ID	Date Sampled	pH, Field (Std Units)
MKTF-39	09/19/20	--
MKTF-40	02/20/19	--
	05/06/19	--
	08/22/19	--
	10/22/19	--
	11/19/19	--
	02/28/20	--
	09/15/20	7.01
	09/19/20	--
MKTF-41	02/13/19	--
	05/07/19	--
	08/22/19	--
	10/23/19	--
	02/27/20	--
	09/14/20	8.23
	09/21/20	--
MKTF-42	02/13/19	--
	05/07/19	--
	08/22/19	--
	10/23/19	--
	02/27/20	--
	09/14/20	8.27
	09/21/20	--
MKTF-43	02/13/19	--
	05/08/19	--
	08/22/19	--
	10/24/19	--
	02/27/20	--
	09/14/20	6.86
	09/21/20	--
MKTF-44	02/13/19	--
	05/08/19	--
	08/22/19	--
	10/24/19	--
	03/05/20	--
	09/14/20	7.91
	09/21/20	--
MKTF-46	03/06/20	--
	09/14/20	7.15
	09/17/20	--
MKTF-47	03/06/20	--
MKTF-49	03/05/20	--
	09/15/20	6.91
	09/20/20	--
MKTF-50	03/05/20	--

USEPA RSL Tap Water HQ 0.1	NA

Notes:
MNA - monitored natural attenuation
ug/L - micrograms per liter
mg/L - milligrams per liter
Std Units - Standard Units
USEPA RSL Tap Water 0.1 - United States Environmental Protection Agency Regional Screening Levels for Tap Water, Hazard Quotient 0.1, May 2020
pH results only shown for 3rd Quarter 2020 sampling event

TABLE 2. 2016 ORP FIELD DATA
MARATHON GALLUP REFINERY, GALLUP, NEW MEXICO

Well	Q1 2016, mV	Q3 2016, mV	Q4 2016, mV
MKTF- 1	-99.7	NM	NM
MKTF- 2	-79.7	-63.2	0.9
MKTF- 4	-109.7	-116.7	-85.1
MKTF- 9	-112.6	-117.2	-77.5
MKTF- 10	-59.6	-104.1	-86.6
MKTF- 11	-116.1	115.9	-82.4
MKTF- 15	NM	-106.5	-79.7
MKTF- 16	-112.3	-122.7	-89.2
MKTF- 17	-73.9	NM	-9.5
MKTF- 18	-123.6	-143.3	-20.1
MKTF- 19	-104.3	NM	-93.8
MKTF- 20	-96.9	-138.0	-92.0
MKTF- 21	-89.4	-95.2	-81.9
MKTF- 22	-100.7	-96.7	-46.7
MKTF- 23	-93.9	NM	NM
MKTF- 24	-14.1	48.2	75.5
MKTF- 25	5.0	3.3	60.6
MKTF- 26	-12.1	NM	NM
MKTF- 27	61.4	82.6	128.1
MKTF- 28	55.3	88.6	110.2
MKTF- 29	6.5	-1.8	44.2
MKTF- 30	54.7	21.5	40.4
MKTF- 31	41.0	66.5	114.7
MKTF- 32	36.2	88.0	158.4
MKTF- 33	19.5	70.2	27.7
MKTF- 34	42.0	18.3	51.3
MKTF- 35	-106.1	-132.1	-102.3
MKTF- 37	NM	-159.2	NM
MKTF- 38	-54.0	-30.2	50.0
MKTF- 39	-109.5	-121.1	-78.6
MKTF- 40	58.5	103.0	224.1
MKTF- 41	44.9	79.4	174.8
MKTF- 42	-1.8	60.2	129.6
MKTF- 43	82.6	164.9	179.7
MKTF- 44	11.2	80.7	199.1

Notes:

NM - Not measured

Second quarter data not available in 2016 Annual Report

TABLE 3. EXISTING GROUNDWATER QUARTERLY SAMPLING ANALYSES AND MNA APPLICABILITY
MARATHON GALLUP REFINERY, GALLUP, NEW MEXICO

Analyte	Method of Analysis	Significance for MNA	Utility for MNA Analyses
BTEX	Laboratory	Decreasing trends indicate natural attenuation	Monitor trends
1,1-DCA, 1,2-DCA	Laboratory	Decreasing trends indicate natural attenuation	Monitor trends
TCE	Laboratory	Decreasing trends indicate natural attenuation	Monitor trends
Chloride	Laboratory	End product of 1,1-DCA and 1,2-DCA degradation	Monitor trends, but dissolved salts may mask trends
Nitrate	Laboratory	Potential electron receptor for biodegradation	Presence indicates potential for biodegradation
Nitrite	Laboratory	Form of nitrate reduced by biodegradation	Presence indicates possible biodegradation
Sulfate	Laboratory	Potential electron receptor for biodegradation	Monitor trends
Iron	Laboratory	Potential electron receptor for biodegradation	Monitor trends
Manganese	Laboratory	Potential electron receptor for biodegradation	Monitor trends
Vinyl chloride	Laboratory	Biodegradation product of TCE	Monitor trends
pH	Field	Neutral range 6-8 required for biodegradation	Monitor level and trends
DO	Field	Presence required for aerobic biodegradation	Monitor level and trends
ORP	Field	Indicates redox state for biodegradation	Monitor level and trends

Notes:
MNA - Monitored Natural Attenuation
BTEX - benzene, toluene, ethylbenzene, xylenes
DO - dissolved oxygen
ORP - oxidation reduction potential
1,1-DCA - 1,1-dichloroethane
1,2-DCA - 1,2-dichloroethane
TCE - trichloroethylene

Figures

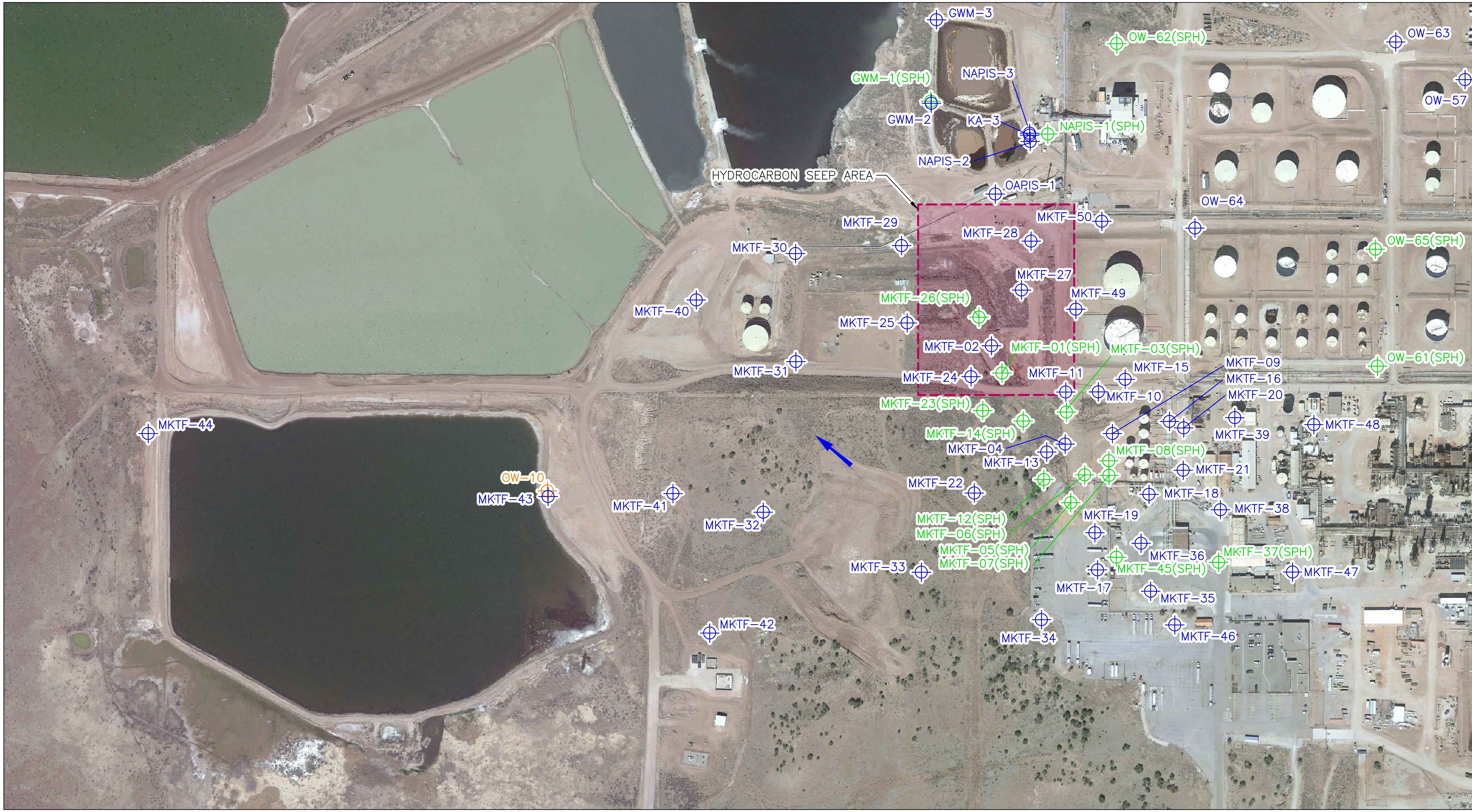
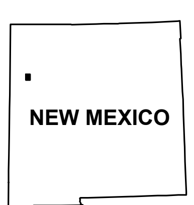


Image Citation: Google Earth Pro Imagery, Publication: March 2016.



QUADRANGLE LOCATION

NOTE:
SITE LEGAL DESCRIPTION - TOWNSHIP 15 NORTH, RANGE 15 WEST, SECTION 33

EXPLANATION

OW-10	SONSELA WELL AND DESIGNATION
MKTF-42	CHINLE/ALLUVIUM INTERFACE WELL AND DESIGNATION
MKTF-45	SPH MONITORING WELL AND DESIGNATION
	GENERAL GROUNDWATER FLOW DIRECTION
	HYDROCARBON SEEP AREA
SPH	SINGLE-PHASE HYDROCARBON

N

0 300'

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FIGURE 1

MKTF AREA
SITE MAP

MARATHON PETROLEUM CORP.
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO

Drawn By: REP	Checked By: CF	Scale: 1" = 300'	Date: 11/23/20	File: 697-MNA-SITE-202011

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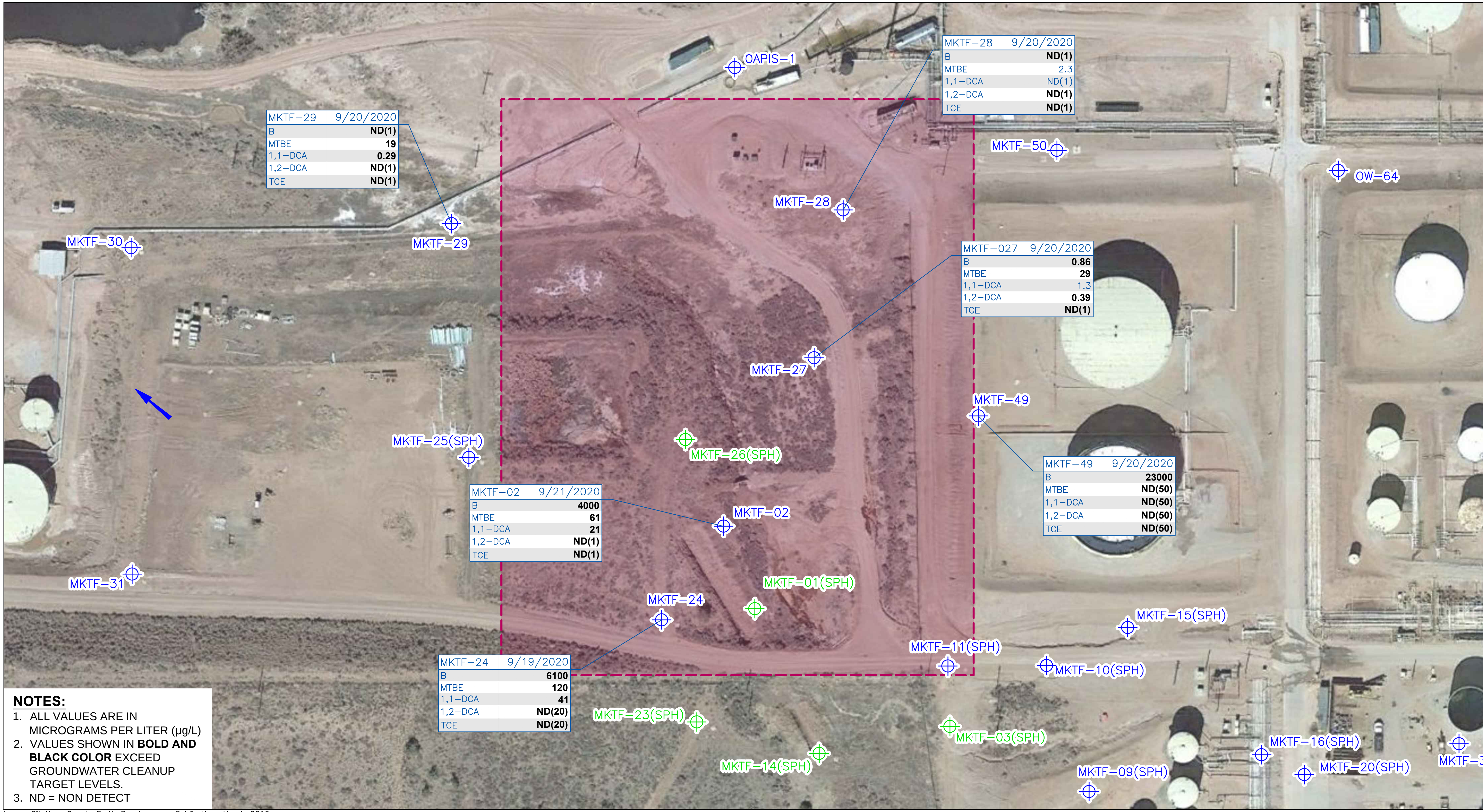

NOTES:
1. ALL VALUES ARE IN MICROGRAMS PER LITER (µg/L)
2. VALUES SHOWN IN **BOLD AND BLACK COLOR** EXCEED GROUNDWATER CLEANUP TARGET LEVELS.
3. ND = NON DETECT

Image Citation: Google Earth Pro Imagery, Publication: March 2016.

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ANALYTE TABLE EXPLANATION

WELL DESIGNATION	MKTF-02	9/21/2020 (SAMPLE DATE)
Benzene	B	0.46
Methyl tert-Butyl Ether	MTBE	14
1,1-Dichloro-ethane	1,1-DCA	2.8
1,2-Dichloro-ethane	1,2-DCA	0.17
Trichloro-Ethene	TCE	0.28

VALUES SHOWN ARE GROUNDWATER CLEANUP TARGET LEVELS

EXPLANATION

- MKTF-42 — CHINLE/ALLUVIUM INTERFACE WELL AND DESIGNATION
- MKTF-45 — SPH MONITORING WELL AND DESIGNATION
- GENERAL GROUNDWATER FLOW DIRECTION
- HYDROCARBON SEEP AREA
- SPH — SINGLE-PHASE HYDROCARBON

N

0 100'

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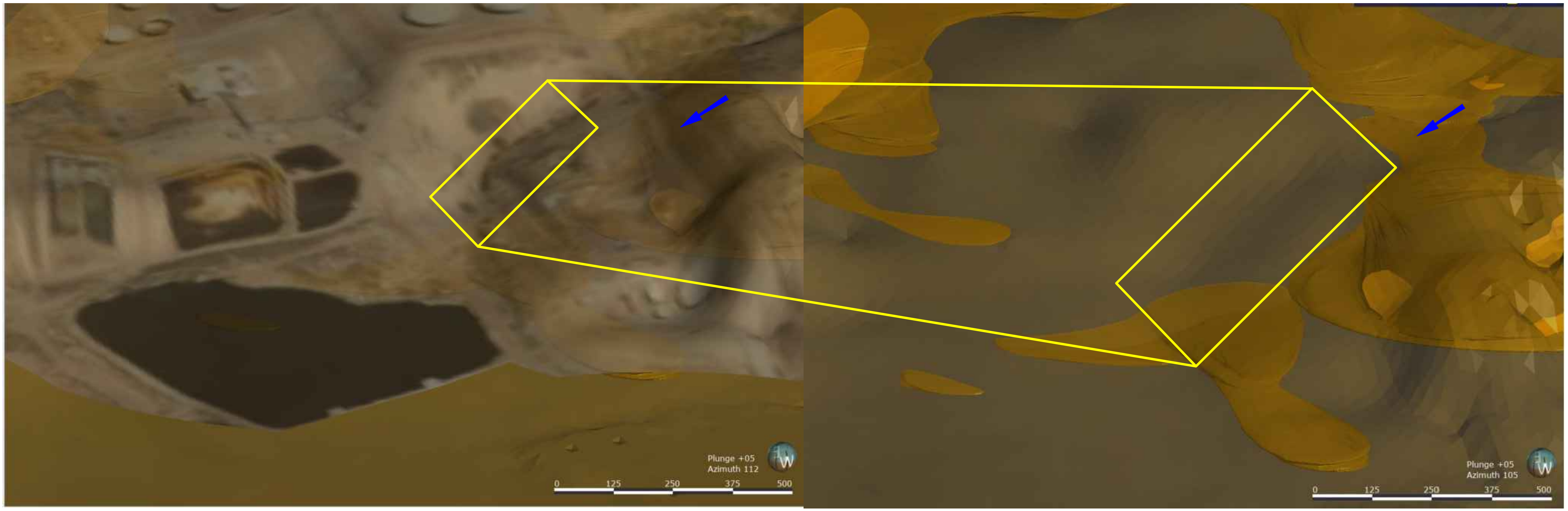
FIGURE 2

THIRD QUARTER 2020 MNA ANALYTICAL DATA

MARATHON PETROLEUM CORP.
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO

Drawn By: REP	Checked By: CF	Scale: 1" = 100'	Date: 11/24/20	File: 697-MNA-GWDATA-202009



LOCAL SURFACE TOPOGRAPHY SHOWING SWALE IN THE HYDROCARBON SEEP AREA
EAST VIEW, X5 VERTICAL EXAGGERATION

GEOLOGICAL MODEL SHOWING SWALE IN SHALLOW ALLUVIAL DEPOSITS (FINE - DARK, COARSE - LIGHT)
IN THE HYDROCARBON SEEP AREA EAST VIEW, X5 VERTICAL EXAGGERATION

EXPLANATION

GENERAL GROUNDWATER FLOW DIRECTION

N

0 ~250'

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FIGURE 3

3D MODELING OF LOCAL GEOLOGY IN THE HYDROCARBON SEEP AREA

MARATHON PETROLEUM CORP.
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO

Drawn By: REP	Checked By: CF	Scale: 1" = ~250'	Date: 11/23/20	File: 697-MNA-3DMODEL-202011

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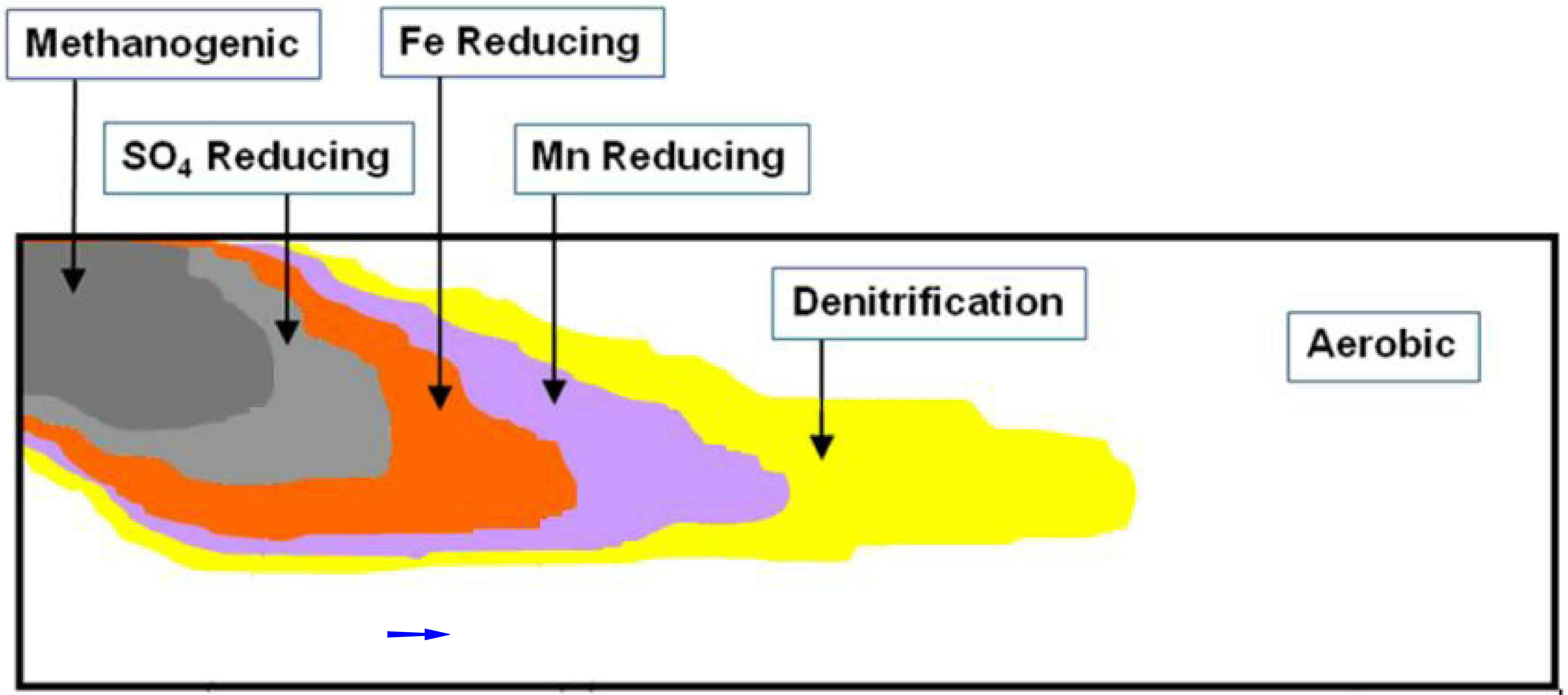

EXPLANATION

←	GENERAL GROUNDWATER FLOW DIRECTION
FE	IRON
MN	MANGANESE
SO4	SULFATE

Source: After ITRC 2010

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FIGURE 4

REDUCING REGIMES IN A TYPICAL HYDROCARBON GROUNDWATER PLUME

**MARATHON PETROLEUM CORP.
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO**

Drawn By: REP	Checked By: CF	Scale: NONE	Date: 11/23/20	File: 697-MNA-REDREGIME-202011

Reactions

Contaminant	RD	DC	ACM	ANCM	ADM	ANDM	DHC	AH
PCE	●							
TCE	●							
1,2-DCE	●					○		
VC	●					○		
1,1,2,2-TeCA	●	●					●	
1,1,2-TCA	●	●					◒	
1,2-DCA	●	●					◒	◒
1,1-DCA	●						◒	

Key:

● Highly Likely to occur

◒ Highly likely to occur, but a slow rate

○ May occur under specific conditions

▢ Highly Unlikely to occur

DCA - DICHLOROETHANE
DCE - DICHLOROETHENE
PCE - PERCHLOROETHENE
TCE - TRICHLOROETHENE
TeCA - TETRACHLOROETHANE
VC - VINYL CHLORIDE

REACTIONS

ACM	Aerobic Co-Metabolism
ANCM	Anaerobic Co-Metabolism
ADM	Aerobic Direct Metabolism
ANDM	Anaerobic Direct Metabolism
DHC	Dehydrochlorination (abiotic)
AH	Abiotic Hydrolysis
DC	Dichloroelimination (biotic)
RD	Reductive Dechlorination (hydrogenolysis)

Source: Adopted from TRUEX, ET AL 2007

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FIGURE 5

DEGRADATION REACTIONS IN ANAEROBIC CONDITIONS

MARATHON PETROLEUM CORP.
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO

Drawn By: REP	Checked By: CF	Scale: NONE	Date: 11/23/20	File: 697-MNA-DEGRADATION-202011

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Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

COMMENTS

Action 19482

COMMENTS

Operator:	OGRID:	Action Number:	Action Type:
WESTERN REFINING SOUTHWEST, IN 6700 Jefferson NE, Suite A-1 Albuquerque, NM87109	705791	19482	DISCHARGE PERMIT

Created By	Comment	Comment Date
cchavez	Permittee Hydrocarbon Seep 12-15-2020.	03/02/2021

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 19482

CONDITIONS OF APPROVAL

Operator:	OGRID:	Action Number:	Action Type:
WESTERN REFINING SOUTHWEST, IN 6700 Jefferson NE, Suite A-1 Albuquerque, NM87109	705791	19482	DISCHARGE PERMIT

OCD Reviewer	Condition
cchavez	None