AP - 51

SAMPLING REPORT

1/9/2012

AECOM
1601 Prospect Parkway
Fort Collins, Colorado 80525

970-493-8878 tel
970-493-0213 fax

January 9, 2012

Daniel Sanchez
Jim Griswold
Brandon Powell

New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

Subject: Results of Off-site Groundwater Sampling for November 2011

Gentlemen:

The Oil Conservation Division (OCD) requested an investigation plan for the Former Caribou Refinery In Kirtland, New Mexico in a letter dated November 8, 2011. The investigation plan request was the outcome of a meeting with Maverik Country Stores, Inc. (Maverik) and AECOM on November 4, 2011 during which project activities and progress within the New Mexico Water Quality Control Commission Regulations were discussed. The November 8, 2011 letter from OCD included a request for an investigation work plan to propose procedures to fully delineate soil and groundwater contamination in areas beyond the existing slurry wall. In concert with the annual monitoring event and in response to OCD's request for additional delineation, AECOM sampled a series of wells located cross and downgradient of the site in November in addition to the wells that are routinely sampled annually. The results of this groundwater sampling are presented in this letter submittal. The results indicate that the former refinery is not impacting downgradient groundwater quality, including at the monitoring well locations where OCD specifically requested additional data during the meeting to augment the downgradient delineation. Given that we have already obtained the requested data now, we are submitting that data to OCD with this transmittal in lieu of a work plan to obtain the same data.

As discussed with OCD on November 4, 2011, annual groundwater sampling was scheduled for completion in November. The sampling was conducted on November 16 and 17, 2011. Prior to sampling, a review was conducted to identify all monitoring wells that could potentially be sampled in addition to the annually sampled wells. Maverik requested the sampling of all viable wells in the area that Mr. Brandon Powell with OCD had indicated were of interest during the November 4th meeting. The monitoring wells included MW-3, MW-5, MW-7, MW-8, MW-14, and MW-15. In addition to increasing the number of wells sampled during this event, two other tasks were identified to fulfill data needs. The first task was to examine the Westside irrigation ditch and the second task was to monitor any NAPL present in Roland Jackson's wells.

In addition to the nine annually sampled monitoring wells, monitoring wells MW-3, MW-5, MW-7, MW-14, and MW-15 were sampled in conjunction with the November 2011 sampling event. MW-8 was visited but not sampled because the homeowner that owns the property where MW-8 is located was not at home during the sampling event. Consequently, MW-8 was gauged for depth to groundwater but not sampled. **Figure 1** shows the locations of the additional monitoring wells sampled. The analytical results for the five additional monitoring wells, found on **Table 1**, demonstrate that no constituents were detected in these monitoring wells, with the exception of estimated concentrations of 1,4-Dichlorobenzene and Chloroform in

monitoring well MW-15. Estimated concentrations of 1,4-Dichlorobenzene and Chloroform found in MW-15 were 0.25 µg/l and 0.27 µg/l, respectively; these data are currently undergoing a data validation process, and it is possible that these qualified estimates may be dismissed by the data validators. The results of this sampling demonstrate that there is no migration of constituents from the former refinery to the five additional monitoring wells. **Table 2** presents the results of the annual groundwater monitoring for the wells that are routinely sampled each year, and these data will be further reported and described in the upcoming annual report. . The annual report will also include the raw laboratory data reports and validated analytical laboratory reports for all of the samples collected in November 2011.

During the November 2011 groundwater sampling event, a visual inspection of the Westside irrigation ditch was conducted to examine the ditch for any evidence of petroleum impacts. The ditch is filled in for much of the study area; however, there is a small section of the ditch that remains open where it parallels the north and south sides of County Road 6100. No evidence of petroleum impacts was observed in the open section of the Westside irrigation ditch. **Figure 1** has been updated to clearly illustrate the filled-in sections of the Westside irrigation ditch.

During the November 2011 groundwater sampling event, four attempts were made to obtain permission to access Roland Jackson's wells. Two attempts were made to obtain permission from Mr. Jackson on November 16, 2011 and two more attempts were made again on November 17, 2011. It appeared that the home was occupied; but no one came to the door despite repeated attempts at knocking on the front door and ringing the doorbell at the Jackson residence. Since we were unable to make contact with Mr. Jackson to obtain his permission, no NAPL thickness or depth to groundwater measurements were collected from the wells on Roland Jackson's property.

Maverik has completed the sampling as described above including specific locations identified by Mr. Powell as necessary to meet the needs of OCD in determining the presence or absence of impacts to groundwater down or cross gradient from the Former Caribou Refinery. In our Stage I Investigation Report dated June 2006, the conclusion stated that there were no downgradient impacts from the former Caribou Refinery operations, and that no further sampling of downgradient wells was warranted. The 2011 annual groundwater sampling results including the results from sampling the additional off-site downgradient wells support this conclusion and indicate further investigation of off-site groundwater is not warranted. The slurry wall impoundment is functioning as designed and no off-site migration of constituents of concern is occurring.

Sincerely,

Jason Jayroe
Project Manager

Jenny Phillips
Senior Program Manager

Tables

Table 1 – Groundwater Sampling Results, Additional Monitoring Wells
Table 2 – Groundwater Sampling Results, Annual Monitoring Wells

Figures

Figure 1 – Site Monitoring Well Location Map

Cc: Dennis Riding, Maverik

Table 1 Groundwater Results, Additional Monitoring Wells Maverik Country Stores, Inc. (Former Caribou Refinery)

Chemical Name	Unit	MW-3	MW-5	MW-7	MW-14	MW-15
1,1,1,2-Tetrachloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichloropropane	µg/l	<2.5	<2.5	<2.5	<2.5	<2.5
1,2,4-Trichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromo-3-chloropropane	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dibromoethane (EDB)	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethene (total)	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloropropane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	**0.25 J**
2,2-Dichloropropane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone (MEK)	µg/l	<6.0	<6.0	<6.0	<6.0	<6.0
2-Chlorotoluene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorotoluene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
4-Isopropyltoluene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-pentanone	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	µg/l	<10	<10	<10	<10	<10
Benzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Bromobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	µg/l	<1.0	<1.0	<1.0	<1.0	**0.27 J**
Chloromethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0
cis-1,2-Dichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromomethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0
Ethylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl tert-butyl ether	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0
Methylene chloride	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0
m-Xylene & p-Xylene	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0
Naphthalene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
n-Butylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
n-Propylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
sec-Butylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
tert-Butylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	µg/l	<3.0	<3.0	<3.0	<3.0	<3.0
Trichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0
Vinyl chloride	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:

J - Estimated result. Result is less than RL

B - Chemical found in Blank

Bold - Detected result

Table 2 Groundwater Results, Annually Sampled Monitoring Wells Maverik Country Stores, Inc. (Former Caribou Refinery)

Chemical Name	Unit	MW-09	MW-10	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22
1,1,1,2-Tetrachloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichloropropane	µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
1,2,4-Trichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene	µg/l	<1.0	<1.0	<1.0	**3.3**	**0.34 J**	<1.0	<1.0	<1.0	**1.1**
1,2-Dibromo-3-chloropropane	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dibromoethane (EDB)	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethene (total)	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloropropane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2,2-Dichloropropane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone (MEK)	µg/l	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
2-Chlorotoluene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorotoluene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Isopropyltoluene	µg/l	<1.0	<1.0	<1.0	**0.48 J**	<1.0	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-pentanone	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	µg/l	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	µg/l	<1.0	<1.0	<1.0	**34**	<1.0	<1.0	<1.0	<1.0	**5.9 J**
Bromobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Notes:

J - Estimated result. Result is less than RL

B - Chemical found in Blank

Bold - Detected result

Table 2 Groundwater Results, Annually Sampled Monitoring Wells Maverik Country Stores, Inc. (Former Caribou Refinery)

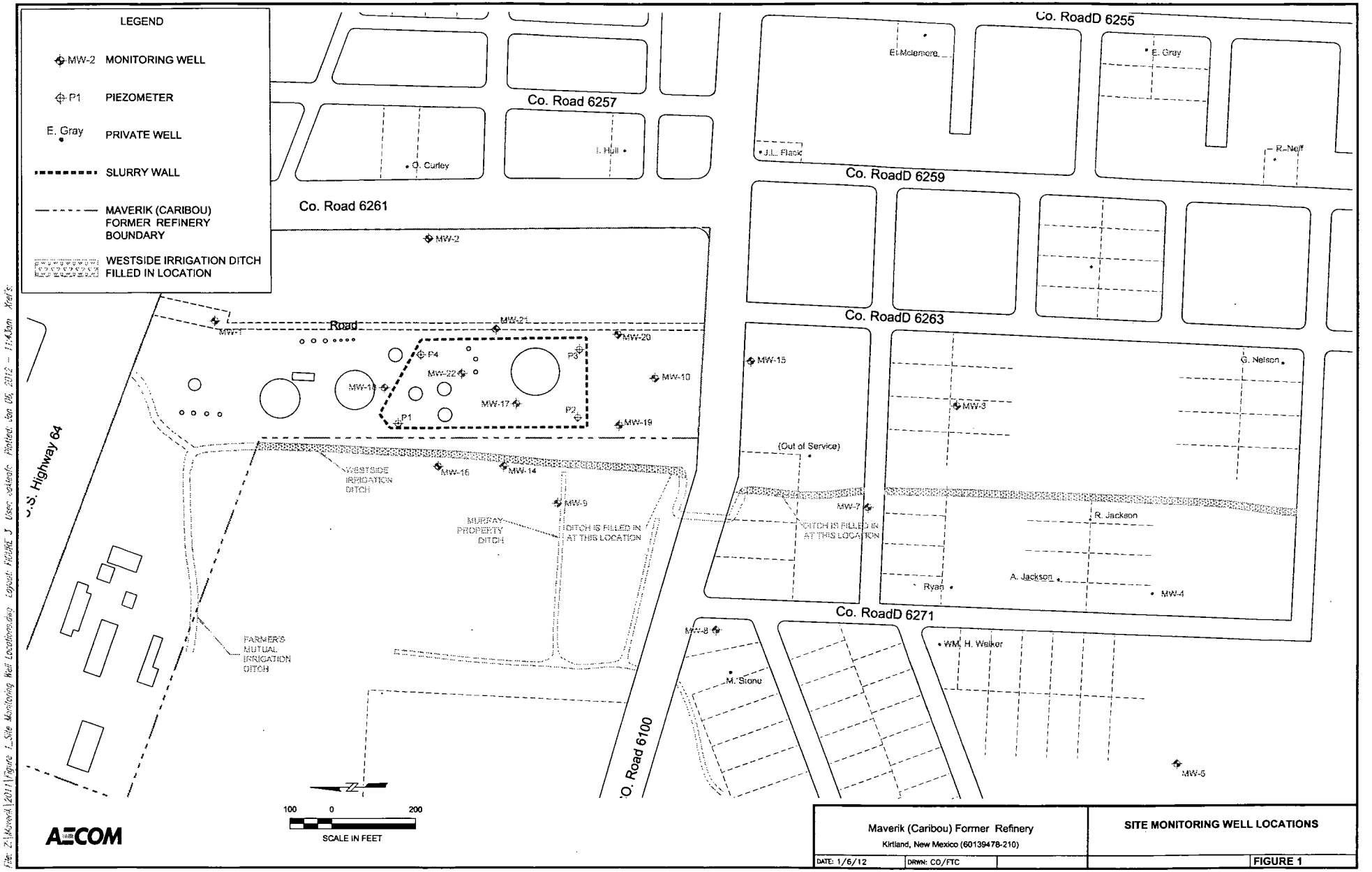
Chemical Name	Unit	MW-09	MW-10	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22
Bromoform	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
cis-1,2-Dichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromomethane	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Ethylbenzene	µg/l	<1.0	<1.0	<1.0	**4**	<1.0	<1.0	<1.0	<1.0	**3.1 J**
Hexachlorobutadiene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	µg/l	<1.0	<1.0	<1.0	**0.44 J**	**0.28 J**	<1.0	<1.0	<1.0	**0.92 J**
Methyl tert-butyl ether	µg/l	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methylene chloride	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
m-Xylene & p-Xylene	µg/l	<2.0	<2.0	<2.0	**8.1**	<2.0	<2.0	<2.0	<2.0	<2.0
Naphthalene	µg/l	<1.0	<1.0	<1.0	**0.60 J**	<1.0	<1.0	<1.0	<1.0	<1.0
n-Butylbenzene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
n-Propylbenzene	µg/l	<1.0	<1.0	<1.0	**0.39 J**	**0.19 J**	<1.0	<1.0	<1.0	**1.6**
o-Xylene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
sec-Butylbenzene	µg/l	<1.0	<1.0	<1.0	**0.70 J**	**0.47 J**	<1.0	<1.0	<1.0	<1.0
Styrene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
tert-Butylbenzene	µg/l	<1.0	<1.0	<1.0	**0.20 J**	**0.97 J**	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	µg/l	<1.0	<1.0	<1.0	**0.42 J**	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	µg/l	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Trichloroethene	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	µg/l	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Vinyl chloride	µg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	µg/l	<2.0	<2.0	<2.0	**8.1**	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:

J - Estimated result. Result is less than RL

B - Chemical found in Blank

Bold - Detected result



File: Z:\Maverik\2011\Figure 1_Site Monitoring Well Locations.dwg Layout: FIGURE 1 User: cokeefe Plotted: Jan 06, 2012 - 11:43am Kraft