May 12, 2008

Hope Monzeglio
Environmental Specialist
New Mexico Environmental Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Re: Gallup Refinery Groundwater Confirmation Monitoring Report

Dear Hope:

Please find enclosed the Gallup Refinery Groundwater Confirmation Monitoring Report, Monitoring Wells OW-14 and OW-30 prepared by Gannett Fleming. Please contact me at 505-722-0217 if you have any questions regarding this report.

Sincerely,

Ed Riege

Environmental Superintendent
Western Refining
Gallup Refinery

C: Carl Chavez OCD

Gaurav Rajen Western Refining

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2155 Louisiana Boulevard, NE
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Gannett Fleming

May 2, 2008

Mr. Ed Riege
Western Gallup Refinery
Rt. 3 Box 7
Gallup, NM 87301

Re: Gallup Refinery Groundwater Confirmation Monitoring Report,
Monitoring Wells OW-14 and OW-30

Dear Mr. Riege:

Gannett Fleming, Inc. West (GFW) has prepared this Groundwater Monitoring Report for the groundwater sampling activities recently completed at the Western Refinery located near Gallup, New Mexico. The activities were completed in accordance with the our proposal, dated February 7, 2008, in order to verify the results of a recent groundwater sampling event performed by Western Refining Company (Western). Western has detected Methy Tertiary Butyl Ether (MTBE) above New Mexico Water Quality Control Commission (WQCC) standards in two groundwater monitoring wells, and requested third-party confirmation of the detection. This letter report has been prepared in response to that request.

BACKGROUND

The Western Refinery is located near Gallup, New Mexico as shown on Figure 1. The refinery has been performing annual groundwater monitoring in several wells at the facility. The monitoring has analyzed groundwater samples for Volatile Organic Compounds (VOCs) by EPA Method 8260B. In the groundwater sampling events performed by Western on December 28, 2007 and January 2, 2008, MTBE was detected in two groundwater monitor wells, OW-14 and OW-30, above the WQCC standard of 100 μg/l, and benzene was detected above the standard of 10 μg/ in OW-14. These well locations are shown on Figure 2. These two monitor wells are generally down gradient from Tank 568, the former MTBE storage tank at the refinery. However, these two wells are also in the vicinity of SWMU #8 and SWMU #9, and near the rail spur at the east side of the refinery. It is our understanding that MTBE had been delivered to the refinery on that rail spur in the past. GFW was told the integrity of Tank 568 was tested and confirmed in 2006. Although there is no documentation of a release, other than the MTBE detection in these two wells, refinery personnel have said MTBE could have been released near the Tank 568 location. GFW was also told that Tank 568 is located over a gasoline product plume that is being remediated by a pump and treat system. The trend of MTBE concentrations, measured by Western in the annual monitoring events for this two wells, is shown on Table 1.

Table 1. Recent MTBE Concentrations (µg/l)		
Date	**OW-14**	**OW-30**
12/8/2004	65	2.5
9/27/2005	77	< 2.5
10/27/2006	16	18
12/28/2006	180	18
12/28/2007	NA	290
1/2/2008	920	NA

According to refinery personnel, the use of MTBE at this refinery was discontinued on March 31, 2006. All MTBE was removed from the refinery in the third quarter of 2006. MTBE was stored in Tank 568 until January 11, 2006, and blended into the gasoline in the product trucks prior to delivery to the various retail distributors. No product/MTBE mixture was stored in Tank 568. MTBE was also stored in Marketing Tank #6 directly north of the tanker loading rack, but this tank is located a considerable distance away from the area in which MTBE has been detected.

The monitoring well boring logs and well completion diagrams for OW-14 and OW-30 show that the wells are completed to depths, respectively, of 45.0 and 48.1 feet below the ground surface (bgs) (Appendix A). According to these boring logs, the wells are completed in the Triassic Chinle Formation, comprised of reddish brown silty, sandy clay; with interbeds of silt and very fine sands. The wells are screened in the sandy zones, which are the water-bearing zones within the Chinle Formation. Based on the geologic cross sections constructed from drilling logs at the refinery (Appendix A), these zones are intermittent, somewhat discontinuous, and vary in thickness, being about 15 feet thick in OW-14. This cross section shows the zone encountered in OW-14 to be continuous with the area beneath Tank 568, but ending just north of OW-30.

Historic ground water levels provided to GFW by Western show water levels in OW-30 fluctuating between 21 and 26 feet bgs, but water level in OW-14 fairly constant at about 27 to 27.5 feet bgs. Based on a 2004 contour map provided by Western, groundwater gradient is to the north at this location, at about 0.01 ft/ft (Appendix A). Just north of OW-14, however, gradient decreases to about 0.0042 ft/ft, which may be a result of pinching out the water-bearing zone of OW-14 and OW-30, and monitoring points farther downgradient measuring water levels in a different zone. However, water level data for 2005 shows this flow direction reversed from that shown for 2004 and 2006.

WELL INSPECTION AND FIELD MONITORING

Western contracted with GFW to perform one round of independent confirmation sampling of monitor wells OW-14 and OW-30 to check for the presence of MTBE in those two wells. The wells were inspected and sampled by GFW on February 25, 2008. GFW's field sampler visually verified the well conditions to ensure their integrity has been maintained and the MTBE detections were not a result of surface infiltration due to a deterioration of the well construction. For both OW-14 and OW-30, the well casing protection and surface completion were verified to be in good condition, the rubber sealing gasket on OW-30 and threaded PVC cap on OW-14 were undamaged, and there was no free water in the protective casing and the interior of the well. Both wells were unlocked by Western personnel.

The water levels measured by GFW on February 25, 2008 were 25.4 feet bgs for OW-14 and 23.6 feet bgs for OW-30. Based on the ground surface elevations at the well locations reported on the well logs, the groundwater elevations are approximately 6897.6 at OW-14 and 6898.1 at OW-30. These elevations mean the flow direction would be opposite that shown on the groundwater contour map in Appendix A (i.e., flow from OW-30 to OW-14). The well measurements made during GFW's groundwater sampling are summarized in Table 2 (attached). Since only two monitoring points were measured for this study, a groundwater contour map could not be constructed, and GFW has relied on the historic contour map and gradient, although that data is inconsistent with the groundwater elevations determined as part of this study.

The reason for the discrepancy in groundwater flow directions is not apparent from the available information. It is possible that the water-bearing zones are discontinuous between monitoring points, or the flow direction has been reversed due to groundwater extraction near OW-14 in conjunction with the reported pump and treat of the product plume. Further determination of the groundwater situation was beyond the scope of this project.

LABORATORY ANALYTICAL RESULTS

GFW measured the depth to groundwater in both of the wells using an electronic water/PSH interface probe. No phase-separated hydrocarbons (PSH) were detected in either well. Three casing volumes of water were then purged from each well prior to collecting groundwater samples. Temperature, pH, and conductance were measured for stabilization during the purging. Purging and sampling were performed using dedicated polyethylene bailers, and the field parameters were recorded on field logs.

Groundwater samples were then collected by transferring directly into clean sample containers provided by the analytical laboratory. Because the analyses were for VOCs, GFW carefully filled the vials and checked them to make sure no bubbles appeared within the vials. The sample containers were labeled and the chain-of-custody was completed. The samples were then placed on ice and stored in the laboratory-provided sample coolers. The samples were delivered to Hall Environmental Analysis Laboratory (HEAL) upon completion of the sampling. Table 3 at the end of this report is a summary of the analytical laboratory results from this round of sampling and the historical results provided by Western. The complete laboratory package from HEAL, including the completed chain-of-custody form, is included in Appendix B.

The laboratory results from GFW's sampling event showed that both OW-14 and OW-30 contained MTBE at concentrations higher than the WQCC standards for groundwater. In addition, benzene was detected over the WQCC standard in OW-14. Minor amounts of xylene and EDC were also detected, although the concentrations are well below the WQCC standard.

SOURCE EVALUATION

The results of this groundwater sampling confirm that MTBE is present in the groundwater at the locations of OW-14 and OW-30. The trends shown on Table 3 show an increase in MTBE over time in both wells, although the latest sampling showed a decrease in MTBE in OW-14 between January and February 2008. However, the benzene concentration continued to increase.

Based on our understanding of the activities and infrastructure around these two well locations, as reported to GFW by refinery employees, possible sources of the MTBE might be:

- an historic release from MTBE unloading operations at the rail spur;
- MTBE from Solid Waste Management Unit (SWMU) #8 and #9;
- MTBE release from Tank 568; or
- a release from mixing operations (MTBE and product) in or around the tank farm.

GFW understands that MTBE was delivered to the refinery using the rail spur near the east property boundary. If MTBE were released along the rail spur near Tank 568, it could be the source of the current MTBE detections in OW-14 and OW-30. Based on the groundwater gradient discussed earlier, the migration route would be from Tank 568 to OW-14 to OW-30, and that could explain the MTBE detection first in OW-14 and then in OW-30.

SWMU #8 was the railroad rack lagoon, overflow ditch and fan out area, and SWMU #9 was sludge pits. It is our understanding that SWMU #9 underwent voluntary bioremediation and capping, and a No Further Action (NFA) finding was obtained for that SWMU. The chemical analyses for samples taken by Western from SWMU #8 have not detected MTBE. Because of this, and because both SWMUs are between OW-14 and OW-30, and downgradient of OW-14, it appears unlikely that these SWMUs are the source of the MTBE.

It was reported by Western that Tank 568 was used to store MTBE in the past, but is no longer. In addition GFW was told that the integrity of Tank 568 was recently verified. Because that tank is upgradient of OW-14 where MTBE concentrations were first detected, this appears to be a likely source of the MTBE. GFW was told Tank 568 contained only MTBE, and the MTBE was mixed with product in the product tanker trucks, so the tank itself should not be the source of benzene also detected in OW-14. However, GFW was told the tank sits over a product plume that is being remediated. Although GFW does not know the details of that remediation, it is possible that the benzene is coming from the product plume and MTBE from the former MTBE tank. If the tank was the source of MTBE in OW-14, and the decrease in MTBE concentration in OW-14 is the beginning of a downward trend, the MTBE may be a small plume migrating to the north. In that case, the MTBE concentrations may continue to decrease over time since MTBE is no longer used at the refinery and the source has been removed.

The final apparent source is from releases during mixing operations of gasoline with MTBE that may have occurred in and around the MTBE tank. Further research into the use of MTBE at the refinery would need to be conducted in order to verify this as a source. Releases from such mixing operations could also explain the benzene detection in OW-14. Typically, in soil contaminated with gasoline containing MTBE additive, the MTBE is the first contaminant to be detected due to its higher solubility, higher vapor pressure, and lower soil adsorption potential as compared to benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds, other gasoline constituents commonly found with MTBE. Since benzene has also been detected above the WQCC standard in OW-14, gasoline treated with MTBE could be a source of the detected MTBE.

POTENTIAL RECEPTORS

Based on GFW's search of the NM Office of the State Engineers iWaters database, the closest water supply wells are approximately 2,800 and 4,000 feet away from the MTBE contaminate plume. The NMDOT has two wells for construction of public works approximately 2,800 feet west of the contaminated area, and Chindi Peavy has a non-domestic livestock well approximately 4,000 feet north of the plume. Using the hydraulic gradient of the groundwater between OW-30 and these locations (0.0042 ft/ft) and an assumed average hydraulic conductivity of for sandstone (1.0×10^{-5} cm/sec), the calculated groundwater movement rate is approximately 2.1 feet/year. Assuming groundwater is flowing directly to the wells, we estimate it would take 1,300 years for the MTBE to reach the NMDOT wells and 1,900 years to reach the Chindi Peavy well. These calculations assume the water-bearing zone in OW-14 and OW-30 is continuous to these supply wells, which is unlikely given the discontinuous nature of the sandstone layers, and the fact that most of the water for this area is supplied by wells from deeper aquifers. Therefore, it appears that there are no receptors that are immediately threatened by the MTBE in OW-14 and OW-30. It should also be noted that the historic water level data shows the groundwater elevations in those two wells to be nearly the same, with the gradient sometimes to the north and sometimes to the south.

RECOMMENDATION

The regulations of the NM Oil Conservation Division (OCD) require abatement of contaminants present in groundwater above WQCC standards. There are exceptions to this if the water has a Total Dissolved Solids (TDS) of greater than 10,000 mg/l, if no present or reasonably foreseeable beneficial use would be impaired by contamination, or if the contamination is being addressed under another regulatory program, such as the Resource Conservation and Recovery Act (RCRA). If abatement is required, the first step is submission to OCD of a Stage 1 abatement plan in accordance with 19.15.1.19 NMAC.

The MTBE detected in OW-14 and OW-30 appears to be migrating generally to the north (downgradient), but does not appear to be threatening any receptors at this time. Because MTBE is reportedly no longer used or stored at the refinery, the MTBE source appears to have been removed and is no longer contributing MTBE to the groundwater. However, MTBE is present in these two wells above the WQCC standard. In addition, benzene is present in OW-14 above WQCC the standard. Because the source has been removed, no receptors are immediately threatened, and the MTBE concentration in OW-14 appears to be decreasing, GFW recommends continued monitoring of OW-14 and OW-30 to assess the trend of the contaminants and evaluate the need for a Stage 1 Abatement Plan.

GFW recommends quarterly monitoring in OW-13, OW-14, OW-30, and OW-29 to monitor the contaminant plume and evaluate the need for abatement of the MTBE. If the source has been removed, the contaminant concentration in OW-14 should be expected to continue declining, and the concentration in OW-30 should increase slightly as the plume passes, and then also decrease. OW-29 is downgradient from OW-14 and OW-30, and can be used as a sentinel well to monitor the MTBE before it migrates off the refinery boundary. The analytical report for the groundwater sampling conducted on January 2, 2008 shows MTBE in OW-13 and OW-29, although both are below the WQCC standard. MTBE in OW-29 was at a concentration of 4.3 μg/l, whereas the standard is 100 μg/l. The MTBE detections in OW-13 and OW-29 may indicate a larger area of MTBE in groundwater than just the area around OW-14. And although 1-2 Dichloroethane (EDC) was below WQCC standard, it was detected in OW-14, and should be monitored since it is a compound commonly associated with gasoline.

Should the concentrations of MTBE increase in any of these four wells, the need for more active groundwater abatement should be considered. If the benzene concentration increases or other BTEX compounds appear, the situation should also be re-evaluated. To monitor natural attenuation of the MTBE, Western could consider also monitoring for Tertiary Butyl Alcohol (TBA), which is a degradation product of MTBE.

CLOSING

If you have any questions regarding this monitoring report, please call me at (505) 265-8468 or email me at mbrazie@gfnet.com.

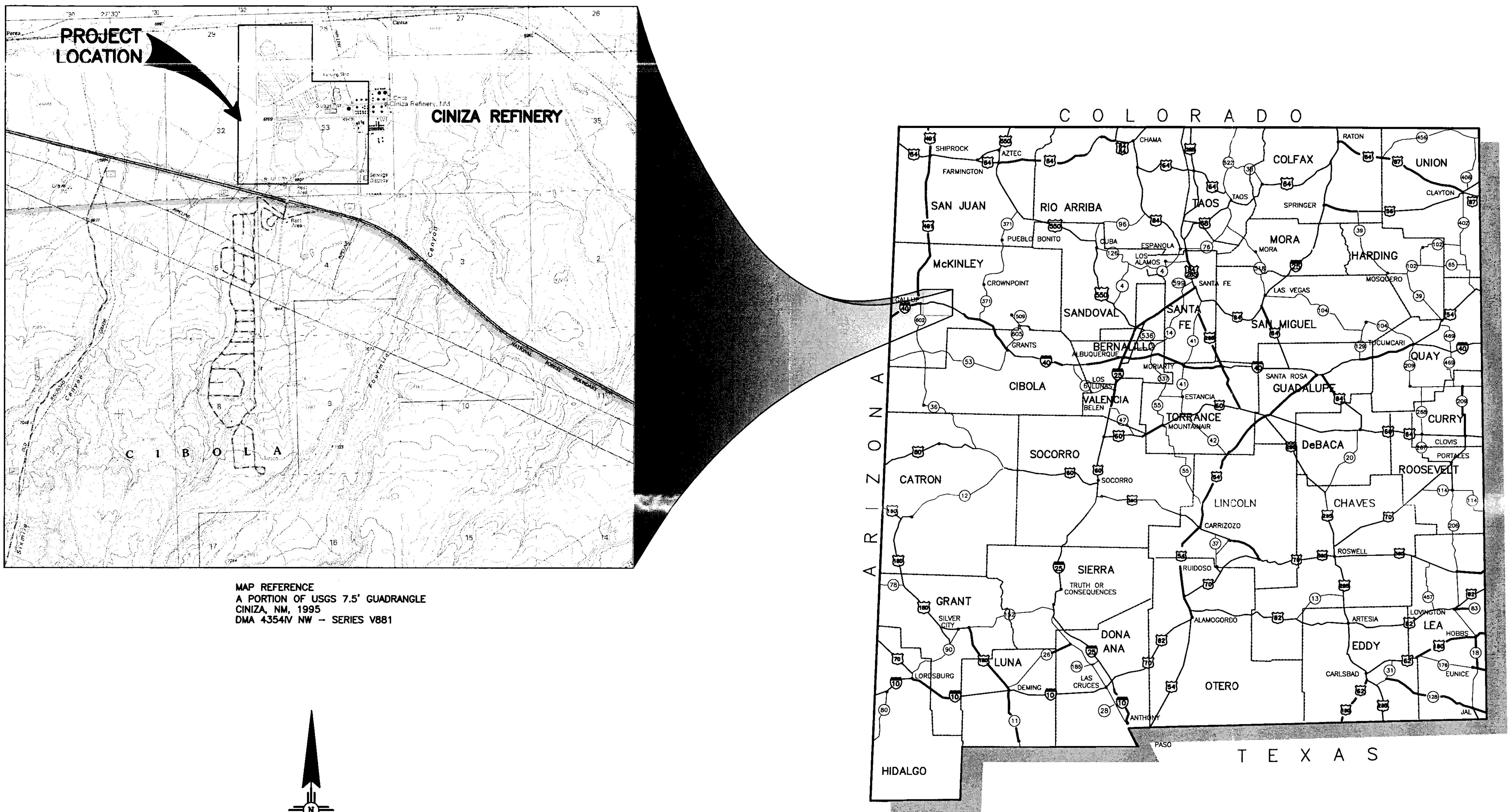
Sincerely,
GANNETT FLEMING WEST, INC.

Mike E. Brazie

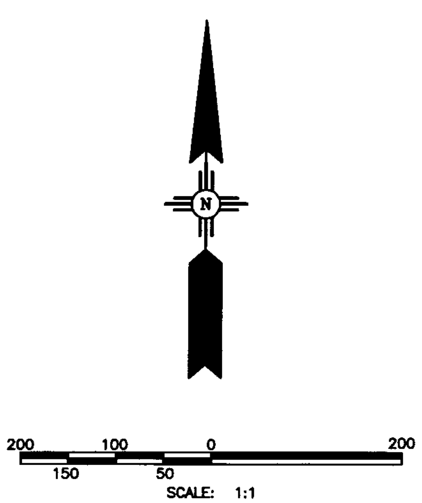
Mike E. Brazie, P.E.
Vice President

cc: Mr. Allen Hains, Western Refining Company

Attached:
- Figure 1 – Location Map
- Figure 2 – Site Plan Layout
- Table 2 – Well Construction Details and Groundwater Elevations
- Table 3 – Summary of Groundwater Analytical Results
- Appendix A – Historical Background Data
- Appendix B – Laboratory Analytical Report



MAP REFERENCE
A PORTION OF USGS 7.5' GUADRANGLE
CINIZA, NM, 1995
DMA 4354IV NW – SERIES V881



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REVISIONS (OR CHANGE NOTICES)

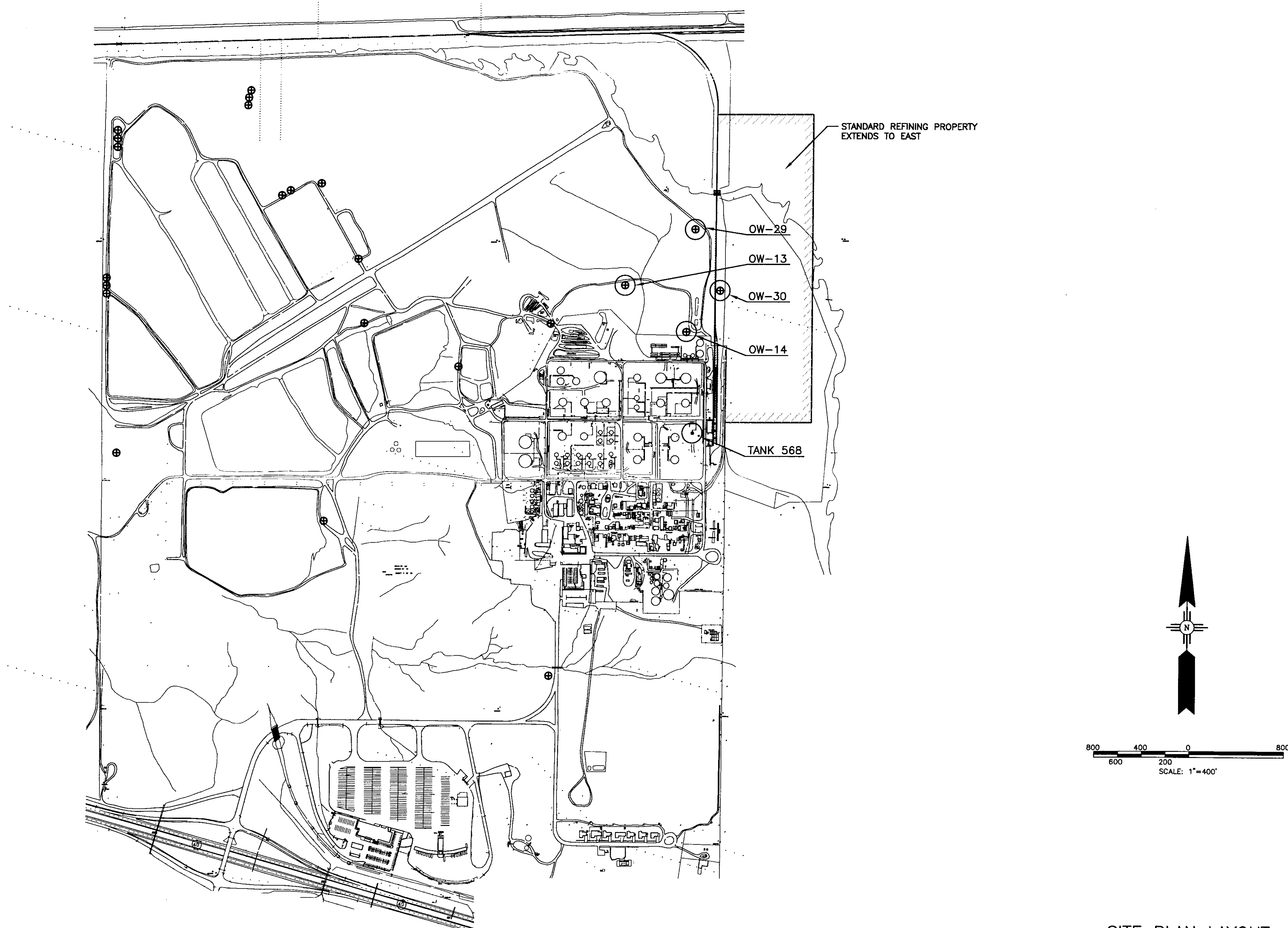
GIANT – WESTERN REFINING COMPANY
SITE GRADING

LOCATION MAP

ENGR. FILE : ______

Gannett Fleming West, Inc.

FIGURE 1



SITE PLAN LAYOUT