AP - 111

Facility-Wide GW Monitoring Plan (FWGWMP)

2012

SUSANA MARTINEZ
Governor

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Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

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DAVE MARTIN
Secretary

BUTCH TONGATE
Deputy Secretary

JAMES H. DAVIS, Ph.D.
Director
Resource Protection Division

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

September 24, 2012

Mr. Ed Riege
Environmental Manager
Western Refining, Southwest Inc., Gallup Refinery
Route 3, Box 7
Gallup, New Mexico 87301

RE: DISAPPROVAL
FACILITY-WIDE GROUND WATER MONITORING
WORK PLAN, 2011 UPDATES
WESTERN REFINING COMPANY SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-12-002

Dear Mr. Riege:

The New Mexico Environment Department (NMED) has reviewed the *Facility-Wide Ground Water Monitoring Work Plan, 2011 Updates* (Work Plan), dated March 2012, submitted on behalf of Western Refining Company Southwest Inc., Gallup Refinery (Permittee) and hereby issues this notice of disapproval.

<u>Comment 1</u>

There are several issues regarding the figures included in the Work Plan. Figure 3, Figure 5 and 5b are difficult to read. Remove the hatching over the SWMUs in Figure 3. Increase the font size or do not bold the groundwater monitoring well labels so that they are legible. On Figure 5 remove the closed (abandoned) wells. The NAPIS wells are mis-labeled as KA-wells on all three figures; re-label them appropriately. Ensure that the figures include all of the groundwater monitoring and recovery wells. Use the same base map showing all groundwater and recovery wells for all of the figures. On Figures 5 and 5b, include the groundwater elevations along with the groundwater monitoring well designation labels so that the elevations and groundwater contours can be verified. Report the dates that the groundwater data were collected in the map legend. Revise the figures as needed.

Comment 2

The page numbering in the Table of Contents is incorrect. Appendix E is listed as page 50 and Appendix F and the Figures are listed as having page numbers in the 500s. Adjust the page numbers and revise the Table of Contents to reflect the correct numbering.

Comment 3

Do not include the February 9, 2009 letter *Facility Wide Groundwater Monitoring Work Plan* (Appendix A: Letter from NMED/HWB February 9). Remove Appendix A from the revised Work Plan. Delete all associated references in the text and, if the Appendix designations are changed, correct the text reference to other appendices and the Table of Contents, as necessary.

Comment 4

Appendix F contains a document titled *Stratigraphic Interpretation Report* from Peregrine GeoConnect dated March 2012. It is not clear why the report was included in the Work Plan. Remove Appendix F from the Work Plan and submit the stratigraphic report separately, if appropriate.

Comment 5

The Permittee proposes to change the sampling frequency and analytes for well OW-1; checking only for artesian conditions quarterly. The purpose of OW-1 is to act as an observation well to evaluate whether or not any constituents from the refinery are migrating from the refinery property. The Permittee must continue to check OW-1 for artesian flow conditions and sample for major cations, major anions, VOCs, DRO extended, WQCC metals, pH, EC, DO, ORP, temperature and TDS on quarterly basis. OW-1 is listed twice in Table 1 (Appendix D). Revise the table to delete the duplicate listing.

Comment 6

The Permittee proposes to change the sampling frequency of OW-50 and OW-52 from quarterly monitoring to annual monitoring. NMED concurs. Continue to sample for water quality parameters and the analytical suites listed in Table 1 (Appendix D). Modify Table 1 as necessary.

Comment 7

In Section 2.0 (Background Information), page 9, paragraph 3, the Permittee states, "Western is working with OCD and PTSB to place this line back in service." As noted in Comment 4 of NMED's September 2011 *Notice of Disapproval Facility Wide Groundwater Monitoring Work Plan*, Comment 4, OCD has determined that the pipe is not within its jurisdiction. Remove the reference to OCD from the revised Work Plan.

Comment 8
NMED's Comments 4 and 5 from the February 16, 2012 Second Notice of Disapproval Requirement to Resurvey Groundwater Monitoring Wells and Recovery Wells as well as Comment 2 from the May 18, 2012 Third Disapproval Requirement to Resurvey Groundwater Monitoring Wells and Recovery Wells required further edits to the Permittee's Well Elevation Summary Table. The Permittee included an unapproved Well Elevation Table as Appendix C in the Work Plan. Once the Well Elevation Summary Table has been approved, include it in the revised Work Plan. In addition, include the updated and corrected version of the Artesian Water Well table. NMED will not approve the Work Plan until the corrected tables have been approved and are included in the revised Work Plan. Additionally, base the groundwater elevation maps off of the correct groundwater elevation data in the revised Work Plan. Update Section 4.1 (Ground water Sampling Methodology), which references the tables, in the revised Work Plan.

Comment 9
Section 2.4 (Summary of contaminant releases that could contribute to possible ground water contamination), page 14, paragraph 3 contains a typographical error citing the year as 2021, instead of 2012. Revise the Work Plan to reflect the correct date.

Comment 10
In Section 2.4 (Summary of contaminant releases that could contribute to possible ground water contamination), page 15, paragraph 1, the Permittee states, "[t]he continued presence of water in GWM-2 and GWM-3 may be attributed to the fluctuation of ground water levels due to the increase in moisture this year." GWM-2 and GWM-3 were installed in fall 2005; the wells were deliberately installed as dry wells to observe whether or not the aeration basin leaks. Water was detected during the first quarter of groundwater sampling in 2008; water has been detected continuously since 2010. The past two years have experienced below normal precipitation. Either the groundwater levels have not been measured and recorded properly, or there is an increase in the elevation of the water table, or the aeration basin is leaking. The Permittee must base statements made in work plans and reports on data that can be substantiated, not based on conjecture. The Permittee is required to investigate the source of water for GWM-2 and GWM-3 as part of the Aeration Basin corrective action work plan.

Comment 11
There seems to be an issue between previously reported groundwater elevation data and the data presented in the Work Plan. For example, the Permittee previously reported the groundwater level for GWM-2 on 2/16/2011 (reported in an email on 2/17/2011) as having a total well depth of 18.97 feet and 17.94 feet as the depth of water. In Appendix C-1, page 41, table entitled "Well Data 2011 Annual/Quarterly Sampling 2011 DTB/DTW Measurements", for 2/16/2011,

GWM-2 is recorded as total depth of 18.81 feet with depth to groundwater 15.08 feet. The listed measurements do not correspond; if the measurements were corrected to account for the new survey data, the water column height should be the same. Ensure that the groundwater level measurements are accurate; revise the table as necessary. Include a footnote to the table stating that the depth to groundwater was adjusted using the new survey data.

Comment 12

In Section 4.4.6.2 (Field Duplicates), the Permittee states, "[f]ield duplicates will not be collected on a routine basis, as there is sufficient data to establish outliers or suspect results through a trend analysis." Field duplicate groundwater samples must be obtained at a frequency of ten percent. At a minimum, one duplicate sample per sampling day must always be obtained. Revise the Work Plan accordingly.

Comment 13

In Appendix B (Gallup Field Sampling Collection and Handling Standard Procedures), describe the location along the well where the measurements will be taken. Revise the Work Plan to include this detail.

The Permittee must address all comments contained in this disapproval and submit a revised Work Plan to NMED and OCD on or before **November 14, 2012**. The revised Work Plan must be accompanied by a response letter that details where all revisions have been made, cross-referencing NMED's numbered comments. Also, include an electronic version of the Work Plan that shows where all revisions have been made in redline-strikeout format.

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

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain NMED HWB
K. Van Horn NMED HWB
C. Chavez OCD
C. Johnson WRG

File: Reading File and WRG 2012 File
WRG-12-002

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

September 24, 2012

Mr. Ed Riege
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
Route 3, Box 7
Gallup, New Mexico 87301

RE: APPROVAL WITH MODIFICATIONS
REQUIREMENT TO RESURVEY GROUNDWATER MONITORING WELLS AND RECOVERY WELLS
WESTERN REFINING COMPANY, SOUTHWEST, INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-11-003

Dear Mr. Riege:

The New Mexico Environment Department (NMED) has received Western Refining Company, Southwest Inc., Gallup Refinery's (Permittee) submittal titled, *Requirement to Resurvey Ground Water Monitoring Wells and Recovery Wells* (Report), dated June 12, 2012. NMED has reviewed the Report and hereby issues this Approval with the following modifications.

Comment 1

In Comment 3 of NMED's May 18, 2012 Third Notice of Disapproval (NOD), the Permittee was required to verify that all horizontal data from the June 2011 survey was correct and represented the actual locations of the monitoring wells surveyed. The Permittee cross referenced survey data from Sterling & Mataya Engineers collected on May 13, 1991 (May 1991) and data acquired by Lynn Engineering and Surveying collected on June 21, 2007 (June 2007) to verify the monitoring well locations. Survey data from the May 1991 survey was converted from NAD27 to NAD83; however, the Permittee did not provide conversions for all of the May 1991 survey data. Provide revised coordinate verification worksheets that include all monitoring wells from the May 1991 survey. In addition, there is a typographical error in the reported elevation for the OW-11 monitoring well conversion. The Permittee reports an elevation of 6923.59 feet and the May 1991 reports it as 6923.89 feet. Correct the typographical errors in revised coordinate verification worksheets.

Comment 2

In the *2011 Corrected Well Elevation Summary Table – Revision 3 (June 12, 2012)*, the Permittee did not report a stick-up length measurement for BW-1B in the "2011 Survey Stick-up Length (feet)" column. In addition, the Permittee did not define the asterisk from the OW-1 "2011 Measuring Point Description" column. Define the symbol in the "Notes" section or remove it from the revised data table. The Permittee is reminded that all data tables must be reviewed and corrected for errors prior to submission. Correct the typographical errors and provide a revised data table.

Comment 3

Comments 8 and 11 of NMED's September 24, 2012 Disapproval letter for the *Facility-Wide Ground Water Monitoring Work Plan - 2011 Updates* requires the Permittee to resubmit the tables in Appendix C with the approved survey data in the revised Work Plan. The Permittee must review these tables and ensure the correct information from this Report is incorporated into the final version of the tables in the revised Work Plan.

The Permittee must submit the revised data tables, replacement pages, and response letter with the required information addressing all the comments from this Approval with modifications to NMED by **October 9, 2012**.

If you have questions regarding this letter please contact Leona Tsinnajinnie of my staff at (505) 476-6057.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
K. Van Horn, NMED HWB
L. Tsinnajinnie, NMED HWB
C. Chavez, OCD
T. Larson, Western Refining Company, Gallup Refinery
C. Johnson, Western Refining Company, Gallup Refinery
A. Haines, Western Refining Company, El Paso, Texas

File: Reading File and WRG 2012 File
HWB-WRG-11-003

Western Refining
GALLUP

WN
NYSE

RECEIVED OCD
2012 JUN 13 P 1:04

Certified Return Receipt: #7010 1670 0001 3141 0187

June 12, 2012

Mr. John Kieling, Chief
NMED - Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, NM 87505-6303

RE: Third Notice of Disapproval
Requirement to Resurvey Ground Water Monitoring Wells and Recovery Wells
Western Refining Company, Southwest, Inc., Gallup Refinery
EPA ID #NMD000333211
HWB-WRG-11-003

Dear Mr. Kieling:

Western Refining Southwest, Gallup Refinery has prepared the following responses to the comments listed regarding the above referenced matter dated May 18, 2012.

Comment 1

NMED's Comments 2 and 3 from the second Notice of Disapproval (2nd NOD) dated February 12, 2012 required the Permittee to describe the accuracy and error associated with the survey method and instruments used during the survey event; however, the Permittee did not discuss this information in the response. The Permittee must discuss the accuracy and error associated with the survey method and instruments used during the survey event in the response letter to this disapproval.

Response: *The Leica 1200 GPS (Global Positioning System) Base and Rover with RTK technology is reliable at 99.99% for baselines up to 40 km. The system initializes within seconds and position updates every 0.05 second (20 Hz). Latency is rated at less than 0.03 second and has consistent cm-accuracy. The following specifications are listed for accuracies: Kinematic Horizontal: 10 mm + 1 ppm; Vertical: 20 mm + 1 ppm; Static (ISO 17123-8): Horizontal 5 mm + 0.05 ppm and vertical 10 mm + 0.05 ppm. Performance and accuracies can vary depending on number of satellites, satellite geometry, observation time, ephemeris, ionosphere, multipath, etc. (Specification sheet attached as Attachment 1).*

Comment 2

The Permittee continues to fail to provide a comprehensive and correct data table that summarizes the survey data. There are still several errors associated with *the 2011 Corrected Well Elevation Summary Table (Revision 2 – April 19, 2010) (2011 Table).* The following lists the errors associated with the table, revise the table as accordingly.

a. There are several instances where the previous stick-up length and the stick up length measurements collected during the 2011 survey (current) are significantly different. For example, BW-1B the previous measurement was 2.38 feet (ft) and the 2011 survey measurement is 0.68 ft. Explain the reason for the significant differences between the previous and current stick-up length measurements.

Response: *2011 Survey Stick-up lengths were determined by subtracting the 2011 Survey Well Casing Rim Elevation from the 2011 Ground Elevation Inside Steel Sleeve. Corrected values for the "stick-up" lengths would be subtracting the 2011 Survey Well Casing Rim Elevation from the 2011 Survey Ground Level Elevation. Column titled "2011 Ground Elevation Inside Steel Sleeve" has been removed as per Comment 2b below. Correction has been made to the table. (Attachment 2)*

b. The current stick-up length measurements do not seem to be correct. It appears that the Permittee calculated the stick up length by subtracting the "2011 Survey Well Casing Rim Elevation" from the "2011 Survey Ground Elevation inside Steel Sleeve." Revise the 2011 Table by correctly calculating the stick-up length by subtracting the "2011 Survey Well Casing Rim Elevation" from the "2011 Survey Ground Level Elevation." In addition, remove the column "2011 Survey Ground Elevation inside Steel Sleeve" from the table.

Response: *Column titled "2011 Survey Ground Elevation inside Steel Sleeve" has been removed from the table. The survey stick up length values have been revised by subtracting the "2011 Survey Well Casing Rim Elevation" from the "2011 Survey Ground Level Elevation." (Attachment 2)*

c. There appears to be a rounding error from the conversion of the previous stick-up length measurements from inches (in.) to ft. For example, the previous stick-up length measurement for BW-1A is 52.50 in. and the Permittee converted the measurement to 4.37 ft. It is actually 4.38 ft. Review all converted stick-up measurement data to ensure the calculated data are accurately reported in the 2011 Table.

Response: *Previous stick up length conversions have been corrected by converting the reported values in inches to feet (dividing by 12). (Attachment 2)*

d. Incorrect elevations are reported for the previous well casing bottom elevations for wells OW-50 and OW-52. Table 9.0 (Annual Well Data Summary Table) from the 2009 Annual Ground Water Monitoring Report reports well casing bottom elevations for wells OW-50 as 6977.37 ft and OW-52 as 6985.26 ft, respectively. The 2011 Table reports wells OW-50 as 6847.63 ft and OW-52 as 6828.53 ft, respectively. Review all elevation data from Table 9.0 and ensure all data are correctly reported in the 2011 Table.

Response: *Corrections have been made. (Attachment 2)*

e. Incorrect elevations are reported for the previous total well depths for wells MW-2 and SMW-4. Table 9.0 reports the total well depths for wells MW-2 as 138.94 ft below ground surface (bgs) and SMW-4 as 122.14 ft bgs. The 2011 Table reports the depths of the wells MW-2 as 140.24 ft bgs and SMW-4 as 72.20 ft bgs. Review all total well depth data from Table 9.0 and ensure all data are accurately reported in the 2011 Table.

Response: *All values reported in the 2011Corrected Well Elevation Summary Table has been cross checked with the 2009 Summary Table.*

f. There are significant differences between the previous and current well casing rim elevations. For example, OW-29 has a difference of 3.5 ft between the previous and current elevations. In Addition RW-6 has a 28.69 ft difference. Review the 2011 Table and explain why there are significant differences between the previous and current elevations and correct all errors.

Response: *It was determined in 2009 that ground level elevations were incorrectly reported as well casing rim elevations. Information was corrected using well logs available at the time and if there was no "rim casing elevation data" recorded the ground level elevation was entered as rim casing which accounts for the discrepancies noted. Discrepancies in rim casing elevations can also be attributed to type of instruments used, and where the measurement was taken with regard to rim casing at the time wells were installed. RW-6 elevation data was entered incorrectly. The previous elevation should read 6942.60 feet instead of 6972.60 feet. Corrections have been made to both the "Previous Ground Level Elevation (feet)" and the "Previous Well Casing Rim Elevation (feet)" to read as 6942.60 feet with a note explaining the change.*

g. Revise the 2011 Table to define all calculations performed in the table in the Notes section of the table. For example, the 2011 Survey Stick-up length was determined by subtracting the "2011 Survey Well Casing Rim Elevation" from the "2011 Survey Ground Level Elevation."

Response: *Notes section has been revised accordingly.*

Comment 3

There are significant errors associated with the reported location data in the 2009 Ground water Monitoring Report. Therefore, the Permittee must verify that all horizontal data provided (Northing and Easting) are correct and represent the actual locations of the monitoring wells surveyed.

Response: *"Significant errors" refers to elevation data as clarified by Ms. Leona Tsinnajinnie of NMED (e-mail dated May 23, 2012). The physical locations of all the active wells were field verified when survey was performed by DePauli Engineering on June 7, 2011. Several wells were cross referenced using the Corpscon v6.0.1, U.S. Army Corps of Engineers Coordinate Conversion Software to a common coordinate system by comparing survey information dated May 13, 1991 from Sterling & Mataya Engineers – Surveyors; Lynn Engineering & Surveying, Inc., dated June 21, 2007 and comparing this information to the survey conducted by DePauli Engineering on June 7, 2011. The survey information from 1991 used the North American Datum of 1927 (NAD 27) and the survey conducted by DePauli Engineering used the NAD 83 to collect coordinates. A cross reference is attached on several of the wells to confirm location points, conversions from NAD 27 to NAD 83 data and also technical data concerning grid shift and datum shift factors. Coordinate points do vary from 1991 to 2011 and that is a result of the type of survey instrument used, methodology and reference points used to gather measurements. Based on this information, requirement has been met to verify locations of the wells. (See Attachment 3 for supporting documents)*

Comment 4

In accordance with 40 CFR 270.11(d)(1), the Permittee must submit a statement indicating that the information provided was properly gathered and evaluated by qualified personnel. This statement must accompany all future reports. Submit this statement with the required information in the response to this disapproval.

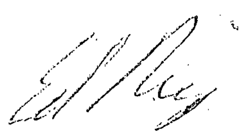
Response: *Certification has been added to this response letter.*

If you have any questions regarding Western's responses, please do not hesitate to contact Cheryl Johnson of my staff at (505) 722-0231.

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,

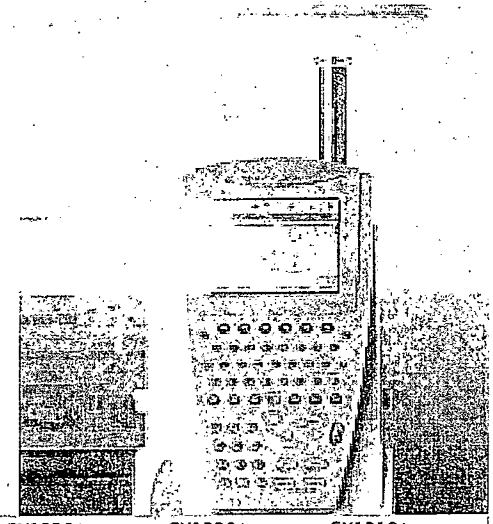


Ed Riege
Environmental Manager

cc: K. Van Horn, NMED HWB w/attach
C. Chavez, OCD w/attach
C. Johnson, Western-Gallup

Attachment 1

Leica GPS1200+ Technical specifications and system features



GPS1200+ receivers	GX1230+ GNSS/ ATX1230+ GNSS	GX1220+ GNSS	GX1230+	GX1220+	GX1210+
GNSS technology	SmartTrack+	SmartTrack+	SmartTrack	SmartTrack	SmartTrack
Type	Triple frequency	Triple frequency	Dual frequency	Dual frequency	Single frequency
Channels	120 channels L1/L2/L5 GPS L1/L2 GLONASS E1/E5a/ E5b/ Alt-BOC Galileo Compass[1] 4 SBAS	120 channels L1/L2/L5 GPS L1/L2 GLONASS E1/E5a/ E5b/ Alt-BOC Galileo Compass[1] 4 SBAS (with DGPS option)	16 L1 + 16 L2 GPS 4 SBAS	16 L1 + 16 L2 GPS 4 SBAS (with DGPS option)	16 L1 GPS 4 SBAS (with DGPS option)
Upgrade to GX1230+ GNSS	-	Yes	Yes	Yes	Yes
RTK	SmartCheck+	No	SmartCheck	No	No
Status indicators	3 LED indicators for GX1200+: power, tracking, memory				

GPS1200+ receivers	GX1230+ (GNSS)/ GX1220+ (GNSS)	GX1210+	ATX1230+ GNSS
Ports	1 power port, 3 serial ports, 1 controller port, 1 antenna port		1 power/controller port, *Bluetooth*® Wireless-Technology port
Supply voltage,	Nominal 12 VDC		Nominal 12 VDC
Consumption	4.6 W receiver + controller + antenna		1.8 W
Event input and PPS	Optional: 1 PPS output port 2 event input ports	Optional: 1 PPS output port 2 event input ports	
Standard antenna	SmartTrack+ AX1203+ GNSS	SmartTrack AX1201	SmartTrack+ ATX1230+ GNSS
Built-in groundplane	Built-in groundplane	Built-in groundplane	Built-in groundplane

The following apply to all receivers except where stated.

Power supply	Two Li-Ion 4.4 Ah/7.4 V plug into receiver. One Li-Ion 2.2 Ah/7.4 V plugs into ATX1230+ GNSS and RX1250.
Plug-in Li-Ion batteries Same for GNSS and TPS	Power receiver + controller + SmartTrack antenna for about 17 hours (for data logging). Power receiver + controller + SmartTrack antenna + low power radio modem or phone for about 11 hours (for RTK/DGPS). Power SmartAntenna + RX1250 controller for about 6 hours (for RTK/DGPS)
External power	External power input 10.5 V to 28 V.
Weights	Receiver 1.20 kg. Controller 0.48 kg (RX1210) and 0.75 kg (RX1250). SmartTrack antenna 0.44 kg. SmartAntenna 1.12 kg. Plug-in Li-Ion battery 0.11 kg (2.2 Ah) and 0.2 kg (4.4 Ah) Carbon fiber pole with SmartTrack antenna and RX1210 controller: 1.80 kg. All on pole: carbon fiber pole with SmartAntenna, RX1250 controller and plug-in batteries: 2.74 kg.

Temperature ISO9022 MIL-STD-810F	Operation:	Receiver	−40° C to +65° C
		Antennas	−40° C to +70° C
		Controllers	−30° C to +65° C
		Controller RX1250c	−30° C to +50° C
	Storage:	Receiver	−40° C to +80° C
		Antennas	−55° C to +85° C
		Controllers	−40° C to +80° C
		Controller RX1250c	−40° C to +80° C
Humidity ISO9022, MIL-STD-810F	Receiver, antennas and controllers Up to 100 % humidity.		
Protection against water, dust and sand IP67, MIL-STD-810F	Receiver, antennas and controllers: Waterpoof to 1 m temporary submersion. Dust tight		
Shock/drop onto hard surface	Receiver: withstands 1 m drop onto hard surface. Antennas: withstand 1.5 m drop onto hard surface.		
Topple over on pole	Receiver, antennas and controllers: withstand fall if pole topples over.		
Vibrations ISO9022 *MIL-STD-810F*	Receiver, antennas and controllers: withstand vibrations on large construction *machines. No loss of lock.*		

[1] The Compass signal is not finalized, although, test signals have been tracked with

SmartTrack+ **Advanced GNSS measurement technology**	Time needed to acquire all satellites after switching on: typically about 50 seconds. Re-acquisition of satellites after loss of lock (e.g. passing through tunnel): typically within 1 second. Very high sensitivity: acquires more than 99 % of all possible observations above 10 degrees elevation. Very low noise. Robust tracking. Tracks weak signals to low elevations and in adverse conditions. Multipath mitigation. Jamming resistant. Measurement precision: Carrier phase on L1: 0.2 mm rms. On L2: 0.2 mm rms. Code (pseudorange) on L1 and L2: 20 mm rms.
SmartCheck+ **Advanced, long range RTK technology**	Initialization typically 8 seconds. Position update rate selectable up to 20 Hz. Latency < 0.03 secs. Range 40 km or more in favorable conditions. Self checking.
Accuracies	Kinematic Horizontal: 10 mm + 1 ppm Vertical: 20 mm + 1 ppm Static (ISO 17123-8) Horizontal: 5 mm + 0.5 ppm Vertical: 10 mm + 0.5 ppm Reliability: 99.99 % for baselines up to 40 km. Formats supported for transmission and reception: Leica proprietary (Leica, Leica 4G), CMR, CMR+, RTCM V2.1/2.2/2.3/3.0/3.1.
Reference station networks	RTK rover fully compatible with Leica's Spider i-MAX & MAX formats, VRS and Area Correction (FKP) reference station networks.
DGPS GX1230+ (GNSS), ATX1230+ GNSS, GX1220+ (GNSS) – standard GX1210+ – optional	DGPS, includes support of MSAS, WAAS, EGNOS and GAGAN. RTCM V2.1/2.2/2.3/3.0/3.1. formats supported for transmission and reception. Baseline rms: typically 25 cm rms with suitable reference station.
Position update rate and latency	Applies to RTK, DGPS and navigation positions. Update rate selectable from 0.05 sec (20 Hz) to 1 sec. Latency less than 0.03 secs.
NMEA output	NMEA 0183 V3.00 and Leica proprietary.
Post-processing with Leica Geo Office software **All GPS1200+ receivers**	Horizontal: 10 mm + 1 ppm, kinematic Vertical: 20 mm + 1 ppm, kinematic Horizontal: 5 mm + 0.5 ppm, static Vertical: 10 mm + 0.5 ppm, static For long lines with long observations Horizontal: 3 mm + 0.5 ppm, static Vertical: 6 mm + 0.5 ppm, static
Notes on performance and on accuracies	Figures quoted are for normal to favorable conditions. Performance and accuracies can vary depending on number of satellites, satellite geometry, observation time, ephemeris, ionosphere, multipath etc.

Controllers RX1210/RX1250	High contrast, 1/4 VGA display with colour option (RX1250) Touch screen, 11 lines x 32 characters. Windows CE 5.0 on RX1250. Full alphanumeric QWERTY keypad. Function keys and user definable keys. Illumination for screen and keys. Can also be used with TPS1200+ for alphanumeric input and extensive coding.
Operation with controller Same for GNSS and TPS	Via keypad and/or via touch screen. Graphical operating concept. Function keys and user definable keys. All information displayed.
Displayed information	All information displayed: status, tracking, data logging, database, RTK, DGPS, navigation, survey, stakeout, quality, timer, power, geographical, cartesian, grid coordinates etc.
Graphical display of survey Same for GNSS and TPS	Graphical display (plan) of survey. Zooming. Can access surveyed points directly via touch screen.
Stakeout display Same for GNSS and TPS	Graphical with zoom. Digital, polar and orthometric. Accuracy: 10 mm + 1 ppm at 20 Hz (0.05 sec) update rate. No degradation with high update rates.
Operation without controller GX1200+ only	Automatic on switching on. LED status indicators. For reference stations and static measurements.
Data logging Same cards used for GNSS and TPS **Capacity**	On CompactFlash cards: 256 MB and 1 GB Optional internal receiver memory: 256 MB. 64 MB sufficient for (30 % less for GPS/GLONASS): About 500 hours L1 + L2 data logging at 15 sec rate. About 2 000 hours L1 + L2 data logging at 60 sec rate. About 90 000 RTK points with codes.
Data management Same for GNSS and TPS	User definable job management. Point identifiers, coordinates, codes, attributes etc. Search, filter and display routines. Multi point averaging. Five types of coding systems cover all requirements.
Coordinate systems Same for GNSS and TPS	Ellipsoids, projections, geoidal models, coordinate, transformations, transformation parameters, country specific coordinate systems. Fully support of RTCM 3.1 coordinate system transfer.
Application programs Same for GNSS and TPS	Standard: Full range of COGO functions. Hidden point. Optional: RoadRunner, Reference Line, DTM Stakeout, Reference Plane, Area Division and X-Section Survey, DXF Export, LandXML Export and Volume Calculations
Programmable Same for GNSS and TPS	User programmable in GeoC++. Users can write and upload programs for their own special requirements and applications.
Communication **Data links**	One or two of the following devices can be connected: Radio modem, GSM, GPRS, CDMA. Different frequencies and/or formats can be received and transmitted.

Attachment 2

2011 CORRECTED WELL ELEVATION SUMMARY TABLE
Revision 3 - June 12, 2012

Date of Installation	Well ID Number	2011 Survey Measurement date[1]	Previous Casing Diameter (Inch)	2011 Verified Casing Diameter[2] (Inch)	Previous Ground Level Elevation (feet)	2011 Survey Ground Level Elevation[1] (feet)	Previous Well Casing Rim Elevation (feet)	2011 Survey Well Casing Rim Elevation[1] (feet)	2011 Measuring Point Description[1]	Previous Stick-up length[3] (feet)	2011 Survey Stick-up Length[4] (feet)	Previous Well Casing Bottom Elevation (feet)	2011 Survey Well Casing Bottom Elevation[5] (feet)	Previous Total Well Depth (feet)	2011 Survey Total Well Depth[6] (feet)	Screened Interval Depth Top to Bottom[7] (feet)	Previous Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[8]
11/10/2003	BW-1A	6/7/2011	2.00	2.00	6,876.73	6,874.10	6,876.73	6,876.68	North edge PVC casing	4.38	2.58	6,836.73	6,839.06	40.00	37.62	30 - 35	Chinle/Alluvium	Upper Sand
10/28/2003	BW-1B	6/7/2011	2.00	2.00	6,876.91	6874.13[9]	6,876.91	6,876.94	North edge PVC casing	2.39	#VALUE!	6,811.71	6,809.49	67.55	67.45	54.6 - 64.6	Chinle/Alluvium	Chinle/Alluvium Interface
11/10/2003	BW-1C	6/7/2011	2.00	2.00	6,876.75	6,873.95	6,876.75	6,876.78	North edge PVC casing	4.52	2.83	6,719.75	6,740.39	157.00	136.39	125 -135	Sonsela Sandstone	Sonsela
11/10/2003	BW-2A	6/7/2011	2.00	2.00	6,874.72	6,871.88	6,874.72	6,874.69	North edge PVC casing	4.27	2.81	6,809.22	6,807.12	65.50	67.57	55 - 65	Chinle/Alluvium	Upper Sand
10/28/2003	BW-2B	6/7/2011	2.00	2.00	6,874.58	6,871.66	6,874.58	6,874.50	North edge PVC casing	4.50	2.84	6,784.08	6,782.24	90.50	92.26	80 - 90	Sonsela sandstone	Chinle/Alluvium Interface
10/28/2003	BW-2C	6/7/2011	2.00	2.00	6,875.40	6,872.90	6,875.40	6,875.30	North edge PVC casing	2.98	2.40	6,724.40	6,722.46	151.00	152.84	139.5 - 149.5	Sonsela sandstone	Sonsela
6/15/2004	BW-3A	6/7/2011	2.00	2.00	6,878.22	6,875.94	6,878.22	6,878.39	North edge PVC casing	3.00	2.45	6,828.22	6,826.04	52.60	52.35	39.5 - 49.5	Chinle/alluvium	Upper Sand
10/15/2003	BW-3B	6/7/2011	2.00	2.00	6,878.79	6,876.16	6,878.79	6,878.59	North edge PVC casing	3.15	2.43	6,803.79	6,809.19	75.00	69.40	63 - 73	Chinle/alluvium	Chinle/Alluvium Interface
7/20/2004	BW-3C	6/7/2011	2.00	2.00	6,878.08	6,875.72	6,878.08	6,877.95	North edge PVC casing	2.69	2.23	6,723.08	6,723.40	155.00	154.55	144.5 - 154.5	Sonsela sandstone	Sonsela
1/5/1981	OW-1	6/7/2011	4.00	4.00	6,868.00	6,866.32	6,868.45	6866.62[10]	North edge PVC casing*	1.92	0.30[10]	6,773.96	6,772.07	94.04	94.55	89.3 - 99.3	Sonsela sandstone	Sonsela
11/25/1980	OW-10	6/7/2011	4.00	4.00	6,872.00	6,873.67	6,875.12	6,874.91	North edge PVC casing	1.59	1.24	6,804.00	6,814.58	68.00	60.33	40 - 60	Chinle/alluvium	Sonsela
9/25/1981	OW-11	6/7/2011	4.00	4.00	6,923.89	6,922.05	6,923.51	6,923.51	North edge PVC casing	2.08	1.46	6,857.27	6,857.72	66.62	65.79	43 - 65	Chinle/alluvium	Sonsela
12/15/1980	OW-12	6/7/2011	4.00	4.00	6,940.43	6,939.57	6,940.43	6,940.69	North edge PVC casing	1.88	1.12	6,795.43	6,811.84	145.00	128.85	117.8 - 137.8	Sonsela sandstone	Sonsela
12/10/1980	OW-13	6/7/2011	4.00	4.00	6,920.12	6,918.95	6,920.12	6,920.07	North edge PVC casing	4.79	1.12	6,820.12	6,820.92	100.00	99.15	78.2 - 98.2	Sonsela sandstone	Sonsela
12/17/1980	OW-14	6/7/2011	4.00	4.00	6,926.64	6,924.55	6,926.64	6,926.65	North edge PVC casing	2.25	2.10	6,881.64	6,880.13	45.00	46.52	35 - 45	Chinle/alluvium	Chinle/Alluvium Interface
8/23/1996	OW-29	6/7/2011	4.00	4.00	6,913.50	6,913.89	6,913.50	6,917.00	North edge PVC casing	3.88	3.11	6,864.50	6,865.92	49.00	51.08	37.5 - 47.5	Chinle/alluvium	Chinle/Alluvium Interface
8/28/1996	OW-30	6/7/2011	4.00	4.00	6,921.60	6,921.81	6,921.60	6,924.69	North edge PVC casing	4.85	2.88	6,873.20	6,874.79	48.40	49.90	37.9 - 47.9	Chinle/alluvium	Chinle/Alluvium Interface
10/5/2009	OW-50	6/7/2011	2.00	2.00	6,914.37	6,912.63	6,914.37	6,914.21	North edge PVC casing	2.71	1.58	6,977.37	6,850.21	63.00	64.00	48 - 63	Chinle/alluvium	Chinle/Alluvium Interface
10/5/2009	OW-52	6/7/2011	2.00	2.00	6,906.26	6,906.53	6,907.68	6,907.68	North edge PVC casing	2.21	1.15	6,985.26	6,829.94	79.00	77.74	64 - 79	Chinle/alluvium	Chinle/Alluvium Interface
10/14/1981	MW-1	6/7/2011	5.00	5.00	6,878.52	6,876.63	6,878.15	6,878.12	North edge PVC casing	1.25	1.49	6,746.50	6,747.29	132.02	130.83	117.72 - 127.72	Chinle/Alluvium	Sonsela
10/15/1981	MW-2	6/7/2011	5.00	5.00	6,878.40	6,878.39	6,880.84	6,880.30	North edge PVC casing	1.88	1.91	6,741.90	6,742.82	138.94	137.48	112 - 122	Chinle/alluvium	Sonsela
10/16/1981	MW-4	6/7/2011	5.00	5.00	6,882.54	6,879.89	6,882.20	6,881.63	North edge PVC casing	2.31	1.74	6,760.40	6,759.91	122.14	121.72	101 - 121	Sonsela sandstone	Sonsela
7/21/1986	MW-5	6/7/2011	4.00	4.00	6,883.32	6,880.20	6,882.93	6,882.83	North edge aluminum casing	2.02	2.63	6,750.30	6,752.00	133.02	130.83	115 - 125	Sonsela sandstone	Sonsela
3/28/1995	RW-1	6/7/2011	4.00	4.00	6,943.50	6,942.86	6,943.50	6,946.06	North edge PVC casing	4.42	3.20	6,900.50	6,903.02	43.00	43.04	25 - 40	Chinle/alluvium	Chinle/Alluvium Interface
3/29/1995	RW-2	6/7/2011	4.00	4.00	6,927.20	6,926.40	6,927.20	6,928.53	North edge PVC casing	3.58	2.13	6,889.20	6,888.73	38.00	39.80	26.1 - 36.1	Chinle/alluvium	Chinle/Alluvium Interface
8/27/1997	RW-5	6/7/2011	4.00	4.00	6,942.50	6,941.53	6,942.50	6,943.57	West Edge PVC Casing (Existing Mark)	2.92	2.04	6,902.50	6,903.98	40.00	39.59	29.5 - 39.5	Chinle/alluvium	Chinle/Alluvium Interface
8/27/1997	RW-6	6/7/2011	4.00	4.00	6942.6[11]	6,941.96	6942.6[11]	6,944.01	North edge PVC casing	2.58	2.05	6,933.80	6,903.11	38.80	40.90	28.5 - 38.5	Chinle/alluvium	Chinle/Alluvium Interface
9/26/1985	SMW-2	6/7/2011	2.00	2.00	6,884.44	6,881.63	6,884.11	6,883.97	North edge aluminum casing	4.54	2.34	6,827.10	6,831.17	57.34	52.80	34.31 - 54.31	Chinle/alluvium	Chinle/Alluvium Interface and Upper Sand
9/25/1985	SMW-4	6/7/2011	2.00	2.00	6,882.54	6,877.63	6,882.73	6,879.52	North edge aluminum casing	3.83	1.89	6,760.40	6,809.84	122.14	69.68	51.7 - 71.7	Chinle/alluvium	Chinle/Alluvium Interface

2011 CORRECTED WELL ELEVATION SUMMARY TABLE
Revision 3 - June 12, 2012

Date of Installation	Well ID Number	2011 Survey Measurement date[1]	Previous Casing Diameter (Inch)	2011 Verified Casing Diameter[2] (Inch)	Previous Ground Level Elevation (feet)	2011 Survey Ground Level Elevation[1] (feet)	Previous Well Casing Rim Elevation (feet)	2011 Survey Well Casing Rim Elevation[1] (feet)	2011 Measuring Point Description[1]	Previous Stick-up length[3] (feet)	2011 Survey Stick up Length[4] (feet)	Previous Well Casing Bottom Elevation (feet)	2011 Survey Well Casing Bottom Elevation[5] (feet)	Previous Total Well Depth (feet)	2011 Survey Total Well Depth[6] (feet)	Screened Interval Depth Top to Bottom[7] (feet)	Previous Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[8]
7/8/2004	GWM-1	6/7/2011	2.00	2.00	6,912.65	6,910.22	6,912.65	6,912.61	North edge PVC casing	3.88	2.39	6,888.95	6,886.41	23.70	26.20	17.5 - 23.5	Chinle/alluvium	Chinle/Alluvium Interface
9/25/2005	GWM-2	6/7/2011	2.00	2.00	6,913.17	6,910.32	6,913.17	6,913.09	North edge PVC casing	4.75	2.77	6,896.97	6,894.28	18.97	18.81	3.2 - 16.2	Chinle/alluvium	Chinle/Alluvium Interface
9/25/2005	GWM-3	6/7/2011	2.00	2.00	6,912.65	6,907.35	6,912.65	6,910.25	North edge PVC casing	4.85	2.90	6,896.15	6,892.45	17.94	17.80	3 - 15	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-1	6/7/2011	2.00	2.00	6,918.43	6,913.62	6,918.43	6,913.86	North edge PVC casing	0.29	0.24	6,904.40	6,900.33	14.00	13.53	3.7 - 13.7	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-2	6/7/2011	2.00	2.00	6,917.27	6,913.40	6,917.27	6,912.65	North edge PVC casing	0.10	-0.75	6,902.80	6,899.04	14.50	13.61	4.2 - 14.2	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-3	6/7/2011	2.00	2.00	6,917.31	6,913.38	6,917.31	6,912.76	North edge PVC casing	0.29	-0.62	6,886.60	6,882.34	30.70	30.42	25.4 - 30.4	Chinle/alluvium	Chinle/Alluvium Interface
6/11/2007	KA-3	6/7/2011	2.00	2.00	6,917.17	6,913.29	6,917.17	6,912.52	North edge PVC casing	0.17	-0.77	6,892.40	6,889.32	25.00	23.20	15 - 25	Chinle/alluvium	Chinle/Alluvium Interface

NOTES:

1) Surveyed by DePauli Engineering & Surveying, LLC on June 7, 2011 at request of NMED due to discrepancies on well casing and ground level elevations.
2) Field verified using a tape measure by Gallup Refinery field technician.
3) Original measurements were given in inches and converted to feet by dividing by 12.
4) Stick up length is determined by subtracting 2011 Survey Ground Level Elevation from 2011 Survey Well Casing Rim Elevation.
5) 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.
6) Total well depth was determined using a bottom sensing meter, Testwell Water level meter with bottom sensing indicator.
7) 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.
8) Stratigraphic interpretation conducted by Peregrine Geoconnect to re-evaluate the named zones they produce water from. Tables were updated to reflect correct stratigraphic zone.
9) BW-1B 2011 Survey Ground Level Elevation is to the lowest concrete pad elevation surrounding the well.
10) OW-1 original stick up length was measured to the top of the pvc casing which is connected to the well shroud with a rubber coupling. 2011 survey measurement was taken to the top segment of pvc casing not connected to the rubber coupling. (Coupling is where elevation is referenced)
11) RW-6 elevation data was originally entered incorrectly as 6972.6 feet. Correct elevation is 6942.6 feet.
12) NAPIS 2, 3 and 4 well shroud is located below ground level therefore values entered in "2011 Survey Stick-Up Length (feet)" indicate a negative value.
13) Previous measurements and elevations are from the Well Data Summary Table from the 2009 Annual Ground Water Monitoring Report.

Attachment 3

Attachment 3

Western Refining Company - Gallup Refinery

Coordinate Verification

24 May 2012

INPUT	OUTPUT
State Plane, NAD27	State Plane, NAD83
3003 - New Mexico West, U.S. Feet	3003 - New Mexico West, U.S. Feet
Vertical - NAVD88, U.S. Feet	Vertical - NAVD88, U.S. Feet

Accuracies of conversions from NAD 27 to NAD 83 are typically 12 to 18 cm.

MW-4

1/6

	Input		Output
Northing/Y:	1635066.25	Northing/Y:	1635125.485
Easting/X:	321602.07	Easting/X:	2544510.099
Elevation/Z:	6882.54	Elevation/Z:	6882.540
Convergence:	-0 20 52.64584	Convergence:	-0 20 53.96608
Scale Factor:	0.999953091	Scale Factor:	0.999953166
Combined Factor:	0.999624001	Combined Factor:	0.999627292

Grid Shift (U.S. ft.): X/Easting = 2222908.0, Y/Northing = 59.2

Datum Shift (m.): Delta Lat. = 2.607, Delta Lon = 57.266

SMW-2

2/6

	Input		Output
Northing/Y:	1635592.65	Northing/Y:	1635651.884
Easting/X:	321542.80	Easting/X:	2544450.829
Elevation/Z:	6884.44	Elevation/Z:	6884.440
Convergence:	-0 20 53.12879	Convergence:	-0 20 54.44912
Scale Factor:	0.999953115	Scale Factor:	0.999953190
Combined Factor:	0.999623934	Combined Factor:	0.999627225

Grid Shift (U.S. ft.): X/Easting = 2222908.0, Y/Northing = 59.2

Datum Shift (m.): Delta Lat. = 2.602, Delta Lon = 57.266

MW-2

3/6

	Input		Output
Northing/Y:	1636184.06	Northing/Y:	1636243.294
Easting/X:	321035.35	Easting/X:	2543943.374
Elevation/Z:	6880.84	Elevation/Z:	6880.840
Convergence:	-0 20 56.76713	Convergence:	-0 20 58.08765
Scale Factor:	0.999953322	Scale Factor:	0.999953398
Combined Factor:	0.999624314	Combined Factor:	0.999627605

Grid Shift (U.S. ft.): X/Easting = 2222908.0, Y/Northing = 59.2

Datum Shift (m.): Delta Lat. = 2.596, Delta Lon = 57.271

SMW-4

4/6

	Input		Output
Northing/Y:	1636153.54	Northing/Y:	1636212.774
Easting/X:	320974.85	Easting/X:	2543882.873
Elevation/Z:	6880.08	Elevation/Z:	6880.080
Convergence:	-0 20 57.18807	Convergence:	-0 20 58.50860
Scale Factor:	0.999953347	Scale Factor:	0.999953422
Combined Factor:	0.999624375	Combined Factor:	0.999627667

Grid Shift (U.S. ft.): X/Easting = 2222908.0, Y/Northing = 59.2

Datum Shift (m.): Delta Lat. = 2.597, Delta Lon = 57.272

Remark: Verification required by NMED to cross check 2011 Survey conducted by DePauli to previous survey (Sterling Mataya 1991)

Corpscon v6.0.1, U.S. Army Corps of Engineers

Western Refining Company - Gallup Refinery

Coordinate Verification

24 May 2012

INPUT	OUTPUT
State Plane, NAD27 3003 - New Mexico West, U.S. Feet Vertical - NAVD88, U.S. Feet	State Plane, NAD83 3003 - New Mexico West, U.S. Feet Vertical - NAVD88, U.S. Feet

Accuracies of conversions from NAD 27 to NAD 83 are typically 12 to 18 cm.

MW-1

5/6

	Input		Output
Northing/Y:	1636112.13	**Northing/Y:**	1636171.364
Easting/X:	320903.76	**Easting/X:**	2543811.783
Elevation/Z:	6878.52	**Elevation/Z:**	6878.520
Convergence:	-0 20 57.68198	**Convergence:**	-0 20 59.00253
Scale Factor:	0.999953376	**Scale Factor:**	0.999953452
Combined Factor:	0.999624478	**Combined Factor:**	0.999627770

Grid Shift (U.S. ft.): X/Easting = 2222908.0, Y/Northing = 59.2

Datum Shift (m.): Delta Lat. = 2.597, Delta Lon = 57.273

OW-11

6/6

	Input		Output
Northing/Y:	1632185.21	**Northing/Y:**	1632244.448
Easting/X:	323167.68	**Easting/X:**	2546075.724
Elevation/Z:	6923.59	**Elevation/Z:**	6923.590
Convergence:	-0 20 41.29121	**Convergence:**	-0 20 42.61069
Scale Factor:	0.999952454	**Scale Factor:**	0.999952529
Combined Factor:	0.999621402	**Combined Factor:**	0.999624690

Grid Shift (U.S. ft.): X/Easting = 2222908.0, Y/Northing = 59.2

Datum Shift (m.): Delta Lat. = 2.634, Delta Lon = 57.250

Remark: Verification required by NMED to cross check 2011 Survey conducted by DePauli to previous survey (Sterling Mataya 1991)

Corpscon v6.0.1, U.S. Army Corps of Engineers

Western Refining Company - Gallup Refinery

Coordinate Verification

31 May 2012

INPUT	OUTPUT
State Plane, NAD83	State Plane, NAD83
3003 - New Mexico West, U.S. Feet	3003 - New Mexico West, U.S. Feet
Vertical - NAVD88, U.S. Feet	Vertical - NAVD88, U.S. Feet

NAPIS-1 (KA-1R) — 1/4

	Input	Output
Northing/Y:	1634587.51	1634587.510
Easting/X:	2545700.49	2545700.490
Elevation/Z:	6918.43	6918.430
Convergence:	-0 20 45.54012	-0 20 45.54012
Scale Factor:	0.999952681	0.999952681
Combined Factor:	0.999625090	0.999625090

Grid Shift (U.S. ft.): X/Easting = 0.0, Y/Northing = 0.0

NAPIS-2 (KA-2R) — 2/4

	Input	Output
Northing/Y:	1634565.05	1634565.050
Easting/X:	2545647.32	2545647.320
Elevation/Z:	6917.27	6917.270
Convergence:	-0 20 45.91059	-0 20 45.91059
Scale Factor:	0.999952702	0.999952702
Combined Factor:	0.999625167	0.999625167

Grid Shift (U.S. ft.): X/Easting = 0.0, Y/Northing = 0.0

KA-3 — 3/4

	Input	Output
Northing/Y:	1634583.87	1634583.870
Easting/X:	2545645.49	2545645.490
Elevation/Z:	6917.17	6917.170
Convergence:	-0 20 45.92581	-0 20 45.92581
Scale Factor:	0.999952703	0.999952703
Combined Factor:	0.999625173	0.999625173

Grid Shift (U.S. ft.): X/Easting = 0.0, Y/Northing = 0.0

NAPIS-3 (KA-3R) — 4/4

	Input	Output
Northing/Y:	1634589.80	1634589.800
Easting/X:	2545645.10	2545645.100
Elevation/Z:	6917.31	6917.310
Convergence:	-0 20 45.92930	-0 20 45.92930
Scale Factor:	0.999952703	0.999952703
Combined Factor:	0.999625166	0.999625166

Grid Shift (U.S. ft.): X/Easting = 0.0, Y/Northing = 0.0

Remark: Verification required by NMED to corss check 2011 Survey conducted by DePauli Engineering to previous survey conducted by l

Corpscon v6.0.1, U.S. Army Corps of Engineers

Sterling & Mataya

Engineers - Surveyors

Gallup, New Mexico 87301

(505) 863-5440

D.E. Sterling, P.E. & L.S.
W.P. Mataya, L.S.

601 W. Aztec
P.O. Box 876

May 13, 1991

Well No.	Elevation Top Inside Pipe at V Notch	New Mexico State Plane Coordinates (west zone) X	Y	Point No. S & M Map (9-29-89)
SMW-6	6880.71	320,839.52	1,635,867.66	532
SMW-5	6878.02	320,778.61	1,636,054.28	530
MW-1	6878.52	320,903.76	1,636,112.13	529
SMW-4	6880.08	320,974.85	1,636,153.54	528
MW-2	6880.84	321,035.35	1,636,184.06	527
MW-5	6883.32	321,233.03	1,636,212.58	526
SMW-3	6884.56	321,397.90	1,635,948.75	524
SMW-2	6884.44	321,542.80	1,635,592.65	523
SMW-1	6883.29	321,501.32	1,635,501.43	522
MW-4	6882.54	321,602.07	1,635,066.25	539
OW-11	6923.89	323,167.68	1,632,185.21	645

Notes:

1. Geological Survey Monument ET 6 GT 1962 was the basis for this survey. The combined factor equals 0.99960744.

2. NGS Bench Mark Z 426 - 1983 having a normal ortho. Height of 2100.35015 meters (elev. 6890.91 feet) was used for this survey.

3. A Bench Mark was established for this project at SMW-3, Top of concrete pad at the south edge of the well casing. The elevation being 6882.64 feet.

4. Subtracting 0.37 feet from the elevations shown for this project should equal the elevations in this area shown on our 1989 map which was based on datum furnished by Giant Refinery.

WILLIAM P. MATAYA
4329
NEW MEXICO
REGISTERED PROFESSIONAL SURVEYOR

William P. Mataya

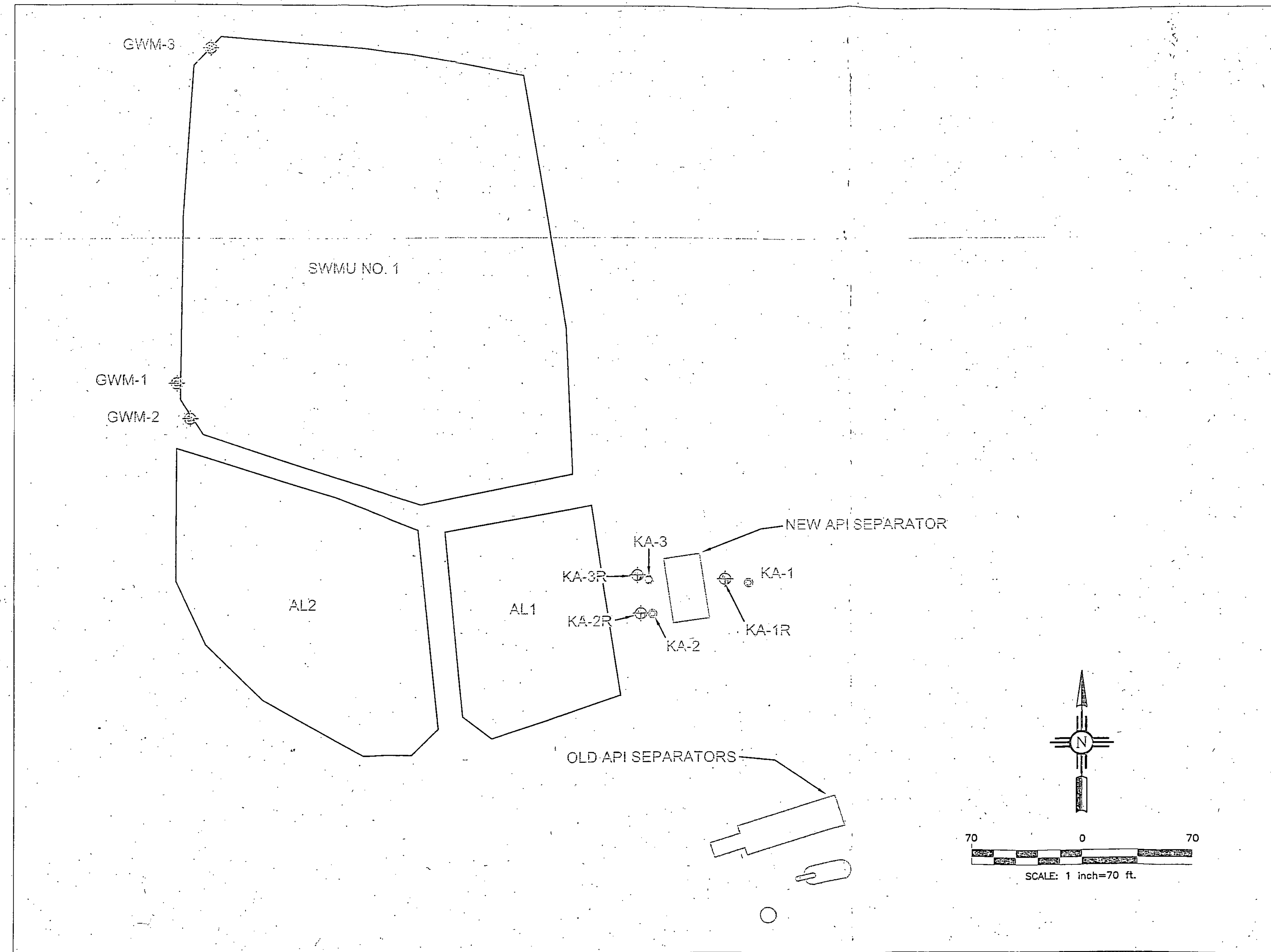
SURVEY DATA

Well ID	Northing	Easting	Top of Casing Elevation
KA-1R	1634587.51	2545700.49	6918.43
KA-2R	1634565.05	2545647.32	6917.27
KA-3	1634583.87	2545645.49	6917.17
KA-3R	1634589.80	2545645.10	6917.31

NOTES:
1. COORDINATES ARE NEW MEXICO STATE PLANE GRID, WEST ZONE, NAD 83.
2. ELEVATIONS SHOWN NAVD 88.
3. COORDINATES AND ELEVATIONS WERE DETERMINED FROM BRASS CAP, NMSHD 2765-11 (USED FOR CINIZA CONTROL SURVEY).
4. SURVEYING BY LYNN ENGINEERING & SURVEYING, INC., DATES 06/21/07 AND 03/20/08.
5. SOURCE: LOCATIONS OF SWM UNITS, AERATION LAGOONS, AND OLD API SEPERATORS TAKEN FROM A DRAWING PROVIDED BY GIANT REFINING CO. ENTITLED "REFINERY MONITOR WELL LOCATIONS," DRAWING NO. Z-02-155, DATED 10/20/1997.

LEGEND

- KA-3 = Monitoring Well Location
- KA-1R = New Monitoring Well Location
- KA-1 = Monitoring Well Location (Abandoned)
- GWM-1 = Existing Monitoring Well Location
- SWMU = Solid Waste Management Unit
- AL = Aeration Lagoon



KLEINFELDER	SITE PLAN Ciniza Refinery Jamestown, New Mexico		FIGURE
Originator: B. Lucero	Drawn By: PDan	Date: April 2008	1
Approved By: E. Shannon	Project No.: 84679	Drawing No.:84679_01_0_4-08	
	Scale: 1" = 70'	Drawing Category: A	

Western Refining
GALLUP

WN
NYS

RECEIVED OCD
2012 APR 23 A 11: 21

Certified Return Receipt: #7010 1670 0001 3141 0156

April 19, 2012

Mr. John Kieling, Chief
NMED - Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, NM 87505-6303

RE: Second Notice of Disapproval
Requirement to Resurvey Ground Water Monitoring Wells and Recovery Wells
Western Refining Company, Southwest, Inc., Gallup Refinery
EPA ID #NMD000333211
HWB-WRG-11-003

Dear Mr. Kieling:

Western Refining Southwest, Gallup Refinery has prepared the following responses to the comments listed regarding the above referenced matter.

Comment 1

No response required.

Comment 2

DePauli Engineering & Surveying has re-submitted their survey report to address issues concerning survey point locations on each well. Copy of survey report is attached as "Attachment 1".

Comment 3

See response to Comment 2.

Comment 4

a) Under column labeled "Previous Ground Level Elevation (feet)" entries for OW-50, OW-52 and MW-2 have been corrected to reflect data from the Well Data Summary Table – 2009 Annual Ground Water Monitoring Report.

b) Under column labeled "Previous Well Casing Rim Elevation (feet)" entries for BW-2A, OW-50 and OW-52 have been corrected to reflect data from the Well Data Summary Table – 2009 Annual Ground Water Monitoring Report.

c) Discrepancies regarding 2011 Survey Total Well Depth and Screened Interval Depth to Bottom concerning wells BW-3B, OW-1, OW-12, OW-52, SMW-2, SMW-4, NAPIS-1, NAPIS-2 and KA-3. Screened intervals have been verified to the drilling logs and total well depth was verified by Gallup Refinery field technician. The fluctuation in ground water movement from the day to day and seasonal precipitation may have caused sediment to settle at the bottom of these wells. These wells were developed between 1980 and 2009.

d) In the "Notes" section, item number 5 has been added to read as follows: "Previous measurements and elevations are from the Well Data Summary Table from the 2009 Annual Ground Water Monitoring Report."

e) In the "Notes" section, Note 3 has been revised to state "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."

f) Revised table to include page numbers and title on all pages and submitted as "Attachment 2".

Comment 5

Revised Note ** from the 2011 Well Elevation Summary Table for Artesian Wells, "176 feet of 24" surface casing steel". Actual well casing for PW-4 is 12 inches. The 176 feet of 24 inch surface casing is the cemented support for the development of the well. In the notes section, item number 3 has been added to read as follows: "The actual total well depth is 1020 feet with an additional 56 feet x 7-7/8 inch diameter open exploratory hole which was accounted for as total depth of 1076 feet". Under column heading "Total Well Depth (feet)" has also been revised to read 1020 feet referenced as Note 3. The 1076 feet included the open exploratory hole of 56 feet x 7-7/8" diameter hole. (Copy of drill log attached as "Attachment 3".

Gallup Refinery also had Peregrine GeoConnect evaluate all the active wells to verify stratigraphic zones in which the wells were developed. A copy of the evaluation by Peregrine is included as "Attachment 4" and a new column was added to the 2011

Corrected Well Elevation Summary Table highlighted in yellow. All future ground water elevation maps submitted will reflect corrected elevation data resulting from the survey conducted by DePauli Engineering, evaluation of stratigraphic zone study conducted by Peregrine GeoConnect and the field verifications by Gallup Refinery environmental technician.

If you have any questions regarding Western's responses, please do not hesitate to contact Cheryl Johnson of my staff at (505) 722-0231.

Sincerely,

Ed Riege
Environmental Manager

cc: K. Van Horn, NMED HWB w/attach
C. Chavez, OCD w/attach
C. Johnson, Western-Gallup

ATTACHMENT 1

DePauli Engineering
& Surveying, LLC.
Civil Engineers and Land Surveyors

Phone: 505-863-5440 • Fax: 505-863-1919 • des@cnetco.com
102 W. Hill Avenue • Gallup, NM 87301
PO Box 876 • Gallup, NM 87305

April 12, 2012

Mr. Ed Riege, Environmental Manager
Western Refining-Gallup Refinery
Route 3 Box 7
Gallup, NM 87301

Re: Survey Gallup Refinery Monitoring Wells-Amendment

Dear Mr. Riege:

This Letter is in response to your request to amend our survey to include a report describing the work performed and to provide a table that includes all the survey points.

DePauli Engineering & Surveying, LLC completed the survey of the monitoring wells at Western Refining-Gallup Refinery on June 7, 2011. A total of 36 wells were surveyed. As requested, the wells were surveyed for the following parameter: ground level elevation, ground level elevation inside steel sleeve, center steel lid elevation, well casing rim elevation and corresponding measuring point description associated with each elevation. Survey conducted enlisted NM Surveyor in Training and a Technician from DePauli Engineering Surveying and one Gallup Refinery representative to assist with the location of the wells.

The instruments used to complete the survey consisted of a Leica 1200 GPS (Global Positing System) Base and Rover GPS. The method used to survey the wells was Real-time Kinematic GPS Surveying (RTK). RTK Surveying requires that two or more receivers be operated simultaneously. The aspect of the procedure is a radio used to transmit a signal with corrections and observations to the roving receiver. The base (reference) station is a known position that produces the correction and the signal received by the Rover thence giving the Rover observation corrected valves.

The horizontal and vertical positions of the top of the PVC casing (unless otherwise noted) and the vertical positions for the lid, ground elevation inside the steel casing, and the surrounding ground elevation is shown on the attached sheet labeled "Western Refining Monitoring Well 2011." The horizontal position is NAD 83 datum and the vertical positions are NGVD 1929. The description was revised to indicate location of survey point. (Revised 11/30/11). Elevation were taken using the concrete pad surrounding each well and locations noted on the report. Ground elevation was taken using the concrete pad surrounding each well and locations shown on the report. In GWM-3 and BW-1B monitoring wells, the ground elevation was from the lowest point on the concrete pad surrounding the well and note referenced on the report. If there are no existing marks on the well casing the locations (descriptions) for each well is described in the report from where the measurement was determined. In OW-1 monitoring well, the top segment of the PVC casing was not connected to the coupling inside the casing. The elevation referenced in this well was taken from the top segment of the coupling inside the casing and noted on the report.

DePauli Engineering & Surveying LLC has also prepared a table which incorporates all the measurements taken from the survey, entitled "Table 1-2011 Western Refining Monitoring Well Survey." Gallup Refinery field Representative verified the casing diameter using a tape measure and also the total well depth was verified by Western Refining which is noted in Table 1.

The requested survey was complete on June 7, 2011 and in accordance with sections 500.1 through 500.12 of the Regulations and Rules of the Board of Registration for Professional Engineers and Surveyors Minimum Standards for Surveying in New Mexico; which horizontal positions were measured to the nearest 0.1-ft and vertical elevations were measured to an accuracy of 0.01-ft.

If you have any questions concerning this survey please do not hesitate to contact our office.

Sincerely,

Marc DePauli

Marc DePauli, PE/PS

Western Refining Monitoring Well 2011

Well #	Northing	Easting		Elevation	Description
napis-1	1,634,587.37	2,545,700.47		6913.86	North edge PVC casing
				6914.23	Center steel lid
				6913.56	South side ground elev. inside steel sleeve
				6913.62	North East & South West corner of concrete pad
napis-3	1,634,589.71	2,545,645.25		6912.76	North edge PVC casing
				6913.12	Center steel lid
				6912.53	South side ground elev. inside steel sleeve
				6913.38	North East & South West corner of concrete pad
ka-3	1,634,583.87	2,545,645.66		6912.52	North edge PVC casing
				6912.87	Center steel lid
				6912.20	South side ground elev. inside steel sleeve
				6913.29	North West & South East corner of concrete pad
napis-2	1,634,564.93	2,545,647.46		6912.65	North edge PVC casing
				6913.26	Center steel lid
				6912.54	South side ground elev. inside steel sleeve
				6913.41	North West & South East corner of concrete pad
gwm-2	1,634,680.33	2,545,348.57		6913.09	North edge PVC casing
				6913.39	Center steel lid
				6908.05	West side ground elev. inside steel sleeve
				6910.32	South West & South East corner of concrete pad
gwm-1	1,634,686.36	2,545,346.90		6912.61	North edge PVC casing
				6912.93	Center steel lid
				6908.36	West side ground elev. inside steel sleeve
				6910.22	South West & North East corner of concrete pad
gwm-3	1,634,932.99	2,545,364.09		6910.25	North edge PVC casing
				6910.51	Center steel lid
				6905.48	West side ground elev. inside steel sleeve
			**	6907.35	Ground elev.
ow-12	1,635,128.64	2,546,062.41		6940.69	North edge PVC casing
				6941.59	Center steel lid
				6939.04	West side ground elev. inside steel sleeve
				6939.57	South West & North East corner of concrete pad

** Elevation is to the lowest concrete pad elevation surounding the well

Well #	Northing	Easting	Elevation	Description
rw-5	1,634,761.32	2,546,311.24	6943.57	West edge PVC casing **
			6943.78	Center steel lid
			6940.82	West side ground elev. inside steel sleeve
			6941.53	South West & North East corner of concrete pad
				**Exsiting mark on west edge of PVC casing used
rw-6	1,634,688.45	2,546,381.03	6944.01	North edge PVC casing
			6944.26	Center steel lid
			6941.49	West side ground elev. inside steel sleeve
			6941.96	North West & South East corner of concrete pad
rw-2	1,634,624.56	2,547,167.32	6928.53	North edge PVC casing
			6929.29	Center steel lid
			6925.02	West side ground elev. inside steel sleeve
			6926.40	North West & South East corner of concrete pad
rw-1	1,634,179.63	2,547,362.39	6946.06	North edge PVC casing
			6946.42	Center steel lid
			6941.25	West side ground elev. inside steel sleeve
			6942.86	Surrounding South ground elev.
ow-10	1,633,507.94	2,544,187.82	6874.91	North edge PVC casing
			6875.39	Center steel lid
			6872.59	West side ground elev. inside steel sleeve
			6873.67	South West & North East corner of concrete pad
ow-1	1,634,052.94	2,542,464.15	6866.62	North edge PVC Casing**
			6868.83	Center steel lid
			6866.44	West side ground elev. inside steel sleeve
			6866.32	North West & South East corner of concrete pad
	** Top segment of pvc casing not connected to coupling, coupling is were elevation is referenced.			
mw-4	1,635,127.10	2,544,509.90	6881.63	North edge PVC casing
			6882.38	Center steel lid
			6879.34	West side ground elev. inside steel sleeve
			6879.89	South West & North East corner of concrete pad
smw-2	1,635,652.32	2,544,450.91	6883.97	North edge Aluminum casing
			6884.54	Center steel lid
			6879.07	West side ground elev. inside steel sleeve
			6881.63	South West & North East corner of concrete pad

Well #	Northing	Easting	Elevation	Description
mw-5	1,636,272.55	2,544,141.37	6882.83	North edge Aluminum casing
			6883.40	Center steel lid
			6881.77	South side ground elev. inside steel sleeve
			6880.20	North West & South West corner of concrete pad
mw-2	1,636,243.70	2,543,943.74	6880.30	North edge PVC Casing
			6880.57	Center steel lid
			6878.41	North side ground elev. inside steel sleeve
			6878.39	North West & South East corner of concrete pad
smw-4	1,636,213.12	2,543,883.04	6879.52	North edge PVC casing
			6880.63	Center steel lid
			6875.72	West side ground elev. inside steel sleeve
			6877.63	South West & North East corner of concrete pad
mw-1	1,636,171.89	2,543,811.84	6878.12	North edge PVC casing
			6878.85	Center steel lid
			6876.79	West side ground elev. inside steel sleeve
			6876.63	South West & North East corner of concrete pad
bw-3b	1,637,028.25	2,543,362.30	6878.59	North edge PVC casing
			6878.92	Center steel lid
			6875.41	West side ground elev. inside steel sleeve
			6876.16	North West & South East corner of concrete pad
bw-3a	1,637,035.46	2,543,363.75	6878.09	North edge PVC casing
			6878.39	Center steel lid
			6875.08	West side ground elev. inside steel sleeve
			6875.94	North West & South East corner of concrete pad
bw-3c	1,637,038.21	2,543,356.75	6877.95	North edge PVC casing
			6878.22	Center steel lid
			6875.27	West side ground elev. inside steel sleeve
			6875.72	North West & South East corner of concrete pad
bw-2c	1,636,859.87	2,542,467.18	6875.30	North edge PVC casing
			6875.78	Center steel lid
			6872.02	West side ground elev. inside steel sleeve
			6872.90	South West & South East corner of concrete pad

Well #	Northing	Easting		Elevation	Description
bw-2a	1,636,848.27	2,542,473.25		6874.69	North edge PVC casing
				6875.20	Center steel lid
				6870.45	West side ground elev. inside steel sleeve
				6871.88	South West & South East corner of concrete pad
bw-2b	1,636,836.81	2,542,481.15		6874.50	North edge PVC casing
				6874.85	Center steel lid
				6870.06	West side ground elev. inside steel sleeve
				6871.66	South West & South East corner of concrete pad
bw-1a	1,635,367.32	2,542,393.40		6876.68	North edge PVC casing
				6877.09	Center steel lid
				6872.30	West side ground elev. inside steel sleeve
				6874.10	North West & South East corner of concrete pad
bw-1c	1,635,366.60	2,542,398.24		6876.78	North edge PVC casing
				6877.11	Center steel lid
				6872.28	West side ground elev. inside steel sleeve
				6873.95	South West & North East corner of concrete pad
bw-1b	1,635,368.46	2,542,404.18		6876.94	North edge PVC casing
				6877.28	Center steel lid
				6876.26	West side ground elev. inside steel sleeve
			**	6874.13	Ground elev.

** Elevation is to the lowest concrete pad elevation surounding the well

Well #	Northing	Easting	Elevation	Description
ow-50	1,636,295.73	2,547,393.72	6914.21	North edge PVC casing
			6914.47	Center steel lid
			6911.46	West side ground elev. inside steel sleeve
			6912.63	South West & North East corner of concrete pad
ow-52	1,636,497.52	2,546,917.71	6907.68	North edge PVC casing
			6908.28	Center steel lid
			6905.31	West side ground elev. inside steel sleeve
			6906.53	North West & South East corner of concrete pad
ow-29	1,635,940.11	2,547,227.40	6917.00	North edge PVC casing
			6917.25	Center steel lid
			6912.09	West side ground elev. inside steel sleeve
			6913.89	South West & North East corner of concrete pad

Well #	Northing	Easting	Elevation	Description
ow-30	1,635,431.14	2,547,552.67	6924.69	North edge PVC casing
			6924.96	Center steel lid
			6919.84	West side ground elev. inside steel sleeve
			6921.81	North West & South East corner of concrete pad
ow-14	1,635,059.64	2,547,178.60	6926.65	North edge PVC casing
			6927.71	Center steel lid
			6924.40	West side ground elev. inside steel sleeve
			6924.55	South West & North East corner of concrete pad
ow-13	1,635,445.53	2,546,668.91	6920.07	North edge PVC casing
			6920.23	Center steel lid
			6915.33	West side ground elev. inside steel sleeve
			6918.95	South West & North East corner of concrete pad
ow-11	1,632,247.50	2,546,078.73	6923.51	North edge PVC casing
			6923.97	Center steel lid
			6921.80	West side ground elev. inside steel sleeve
			6922.05	South West & North East corner of concrete pad

Notes:

1) Date of Survey: June 7, 2011
2) Instrument: Leica 1200 GPS - Base & Rover
3) The method used to survey the wells was GPS-RTK

The horizontal and vertical positions of the top of the PVC casing (unless otherwise noted) and the vertical positions for the lid, ground elevation inside the steel casing, and the surrounding ground elevation is shown above. The horizontal position are NAD 83 datum and the vertical positions are NGVD 1929. The description were revised to indicate location of survey point. (revised 11/30/2011)

Marc DePauli PS13606

11/30/2011

Date

2011 Survey - Western Refining Monitoring Well

Well ID Number	Survey Measurement date	Casing Diameter [1] (Inch)	Northing (feet)	Easting (feet)	Center Steel Lid (feet)	Ground level Elevation inside Steel Sleeve (feet)	Measuring Point Description for Ground Level Elevation inside steel sleeve	Survey Ground Level Elevation (feet)	Measuring Point Description for Ground Level Elevation	Survey Well Casing Rim Elevation (feet)	Measuring Point Description for Well Casing Rim Elevation	Survey Total Well Depth (feet)[2]
BW-1A	6/7/2011	2.00	1,635,367.32	2,542,393.40	6877.09	6872.30	West side ground elevation	6,874.10	NW & SE Corner of concrete pad	6,876.68	North edge PVC casing	37.62
BW-1B	6/7/2011	2.00	1,635,368.46	2,542,404.18	6877.28	6876.26	West side ground elevation	6,874.13	SW Corner of concrete pad	6,876.94	North edge PVC casing	67.45
BW-1C	6/7/2011	2.00	1,635,366.60	2,542,398.24	6877.11	6872.28	West side ground elevation	6,873.95	SW & NE Corner of concrete pad	6,876.78	North edge PVC casing	136.39
BW-2A	6/7/2011	2.00	1,636,848.27	2,542,473.25	6875.20	6870.45	West side ground elevation	6,871.88	SW & SE Corner of concrete pad	6,874.69	North edge PVC casing	67.57
BW-2B	6/7/2011	2.00	1,636,836.81	2,542,481.15	6874.85	6880.06	West side ground elevation	6,871.66	SW & SE Corner of concrete pad	6,874.50	North edge PVC casing	92.26
BW-2C	6/7/2011	2.00	1,636,859.87	2,542,467.18	6875.78	6872.02	West side ground elevation	6,872.90	SW & SE Corner of concrete pad	6,875.30	North edge PVC casing	152.84
BW-3A	6/7/2011	2.00	1,637,035.46	2,543,363.75	6878.39	6875.08	West side ground elevation	6,875.94	NW & SE Corner of concrete pad	6,878.09	North edge PVC casing	52.35
BW-3B	6/7/2011	2.00	1,637,028.25	2,543,362.30	6878.92	6875.41	West side ground elevation	6,876.16	NW & SE Corner of concrete pad	6,878.59	North edge PVC casing	69.40
BW-3C	6/7/2011	2.00	1,673,038.21	2,543,356.75	6878.22	6875.27	West side ground elevation	6,875.72	NW & SE Corner of concrete pad	6,877.95	North edge PVC casing	154.55
OW-1	6/7/2011	4.00	1,634,052.94	2,542,464.15	6868.83	6866.44	West side ground elevation	6,866.32	NW & SE Corner of concrete pad	6,866.62	North edge PVC casing**	94.55
OW-10	6/7/2011	4.00	1,633,507.94	2,544,187.82	6875.39	6872.59	West side ground elevation	6,873.67	SW & NE Corner of concrete pad	6,874.91	North edge PVC casing	60.33
OW-11	6/7/2011	4.00	1,632,247.50	2,546,078.73	6923.97	6921.80	West side ground elevation	6,922.05	SW & NE Corner of concrete pad	6,923.51	North edge PVC casing	65.79
OW-12	6/7/2011	4.00	1,635,128.64	2,546,062.41	6941.59	6939.04	West side ground elevation	6,939.57	SW & NE Corner of concrete pad	6,940.69	North edge PVC casing	128.85
OW-13	6/7/2011	4.00	1,635,445.53	2,546,668.91	6920.23	6915.33	West side ground elevation	6,918.95	SW & NE Corner of concrete pad	6,920.07	North edge PVC casing	99.15
OW-14	6/7/2011	4.00	1,635,059.64	2,547,178.60	6927.71	6924.40	West side ground elevation	6,924.55	SW & NE Corner of concrete pad	6,926.65	North edge PVC casing	46.52

Well ID Number	Survey Measurement date	Casing Diameter [1] (Inch)	Northing (feet)	Easting (feet)	Center Steel Lid (feet)	Ground level Elevation inside Steel Sleeve (feet)	Measuring Point Description for Ground Level Elevation inside steel sleeve	Survey Ground Level Elevation (feet)	Measuring Point Description for Ground Level Elevation	Survey Well Casing Rim Elevation (feet)	Measuring Point Description for Well Casing Rim Elevation	Survey Total Well Depth (feet)[2]
OW-29	6/7/2011	4.00	1,635,940.11	2,547,227.40	6917.25	6912.09	West side ground elevation	6,913.89	SW & NE Corner of concrete pad	6,917.00	North edge PVC casing	51.08
OW-30	6/7/2011	4.00	1,635,431.14	2,547,552.67	6924.96	6919.84	West side ground elevation	6,921.81	NW & SE Corner of concrete pad	6,924.69	North edge PVC casing	49.90
OW-50	6/7/2011	2.00	1,636,295.73	2,547,393.72	6914.47	6911.46	West side ground elevation	6,912.63	SW & NE Corner of concrete pad	6,914.21	North edge PVC casing	64.00
OW-52	6/7/2011	2.00	1,636,497.52	2,546,917.71	6908.28	6905.31	West side ground elevation	6,906.53	NW & SE Corner of concrete pad	6,907.68	North edge PVC casing	77.74
MW-1	6/7/2011	5.00	1,636,171.89	2,543,811.84	6878.85	6876.79	West side ground elevation	6,876.63	SW & NE Corner of concrete pad	6,878.12	North edge PVC casing	130.83
MW-2	6/7/2011	5.00	1,636,243.70	2,543,943.74	6880.57	6878.41	North side ground elevation	6,878.39	NW & SE Corner of concrete pad	6,880.30	North edge PVC casing	137.48
MW-4	6/7/2011	5.00	1,635,127.10	2,544,509.90	6882.38	6879.34	West side ground elevation	6,879.89	SW & NE Corner of concrete pad	6,881.63	North edge PVC casing	121.72
MW-5	6/7/2011	4.00	1,636,272.55	2,544,141.37	6883.40	6881.77	South side ground elevation	6,880.20	NW & SW Corner of concrete pad	6,880.30	North edge Aluminum casing	130.83
RW-1	6/7/2011	4.00	1,634,179.63	2,547,362.39	6946.42	6941.25	West side ground elevation	6,942.86	Surrounding South Ground elev.	6,946.06	North edge PVC casing	43.04
RW-2	6/7/2011	4.00	1,634,624.56	2,547,167.32	6929.29	6925.02	West side ground elevation	6,926.40	NW & SE Corner of concrete pad	6,928.53	North edge PVC casing	39.80
RW-5	6/7/2011	4.00	1,634,761.32	2,546,311.24	6943.78	6940.82	West side ground elevation	6,941.53	SW & NE Corner of concrete pad	6,882.82	West Edge PVC Casing (Existing Mark)	39.59
RW-6	6/7/2011	4.00	1,634,688.45	2,546,381.03	6944.26	6941.49	West side ground elevation	6,941.96	NW & SE Corner of concrete pad	6,944.01	North edge PVC casing	40.90
SMW-2	6/7/2011	2.00	1,635,652.32	2,544,450.91	6884.54	6879.07	West side ground elevation	6,881.63	SW & NE Corner of concrete pad	6,883.97	North edge Aluminum casing	52.80
SMW-4	6/7/2011	2.00	1,636,213.12	2,543,883.04	6880.63	6875.72	West side ground elevation	6,877.63	SW & NE Corner of concrete pad	6,879.52	North edge PVC casing	69.68
GWM-1	6/7/2011	2.00	1,634,686.36	2,545,346.90	6912.93	6908.36	West side ground elevation	6,910.22	SW & NE Corner of concrete pad	6,912.61	North edge PVC casing	26.20
GWM-2	6/7/2011	2.00	1,634,680.33	2,545,348.57	6913.39	6908.05	West side ground elevation	6,910.32	SW & SE Corner of concrete pad	6,913.09	North edge PVC casing	18.81
GWM-3	6/7/2011	2.00	1,634,932.99	2,545,364.09	6910.51	6905.48	West side ground elevation	6,907.35	SE Corner of Concrete pad	6,910.25	North edge PVC casing	17.80

Well ID Number	Survey Measurement date	Casing Diameter [1] (Inch)	Northing (feet)	Easting (feet)	Center Steel Lid (feet)	Ground level Elevation inside Steel Sleeve (feet)	Measuring Point Description for Ground Level Elevation inside steel sleeve	Survey Ground Level Elevation (feet)	Measuring Point Description for Ground Level Elevation	Survey Well Casing Rim Elevation (feet)	Measuring Point Description for Well Casing Rim Elevation	Survey Total Well Depth (feet)[2]
NAPIS-1	6/7/2011	2.00	1,634,587.37	2,545,700.47	6914.23	6913.56	South side ground elevation	6,913.62	NE & SW Corner of Concrete pad	6,913.86	North edge PVC casing	13.53
NAPIS-2	6/7/2011	2.00	1,634,564.93	2,545,647.46	6913.26	6912.54	South side ground elevation	6,913.41	NW & SE Corner of concrete pad	6,912.65	North edge PVC casing	13.61
NAPIS-3	6/7/2011	2.00	1,634,589.71	2,545,645.25	6913.12	6912.53	South side ground elevation	6,913.38	SW & NE Corner of concrete pad	6,912.76	North edge PVC casing	30.42
KA-3	6/7/2011	2.00	1,634,583.87	2,545,645.66	6912.87	6912.20	South side ground elevation	6,913.29	NW & SE Corner of concrete pad	6,912.52	North edge PVC casing	23.20

NOTES:

** Top segment of pvc casing not connected to coupling. Coupling is where elevation is referenced.

1) Field verified using a tape measure by Gallup Refinery field technician.

2) Total well depth measured using a bottom sensing meter, Testwell Water level meter with bottom sensing indicator. Field verified by Gallup Refinery field technician.

ATTACHMENT 2

2011 CORRECTED WELL ELEVATION SUMMARY TABLE

Revision 2 - April 19, 2012

Date of Installation	Well ID Number	2011 Survey Measurement date[1]	Previous Casing Diameter (Inch)	2011 Verified Casing Diameter[2] (Inch)	Previous Ground Level Elevation (feet)	2011 Survey Ground Level Elevation[1] (feet)	Previous Well Casing Rim Elevation (feet)	2011 Survey Well Casing Rim Elevation[1] (feet)	2011 Measuring Point Description[1]	2011 Ground Elevation Inside Steel Sleeve[1] (feet)	Previous Stick-up length (feet)	2011 Survey Stick-up length[1] (feet)	Previous Well Casing Bottom Elevation (feet)	2011 Survey Well Casing Bottom Elevation[3] (feet)	Previous Total Well Depth (feet)	2011 Survey Total Well Depth[4] (feet)	Screened Interval Depth Top to Bottom[6] (feet)	Previous Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[7]
11/10/2003	BW-1A	6/7/2011	2.00	2.00	6,876.73	6,874.10	6,876.73	6,876.68	North edge PVC casing	6,872.30	4.37	4.38	6,836.73	6,839.06	40.00	37.62	30 - 35	Chinle/Alluvium	Upper Sand
10/28/2003	BW-1B	6/7/2011	2.00	2.00	6,876.91	6874.13*	6,876.91	6,876.94	North edge PVC casing	6,876.26	2.38	0.68	6,811.71	6,809.49	67.55	67.45	54.6 - 64.6	Chinle/Alluvium	Chinle/Alluvium Interface
11/10/2003	BW-1C	6/7/2011	2.00	2.00	6,876.75	6,873.95	6,876.75	6,876.78	North edge PVC casing	6,872.28	4.51	4.50	6,719.75	6,740.39	157.00	136.39	125 -135	sonsela Sandstone	Sonsela
11/10/2003	BW-2A	6/7/2011	2.00	2.00	6,874.72	6,871.88	6,874.72	6,874.69	North edge PVC casing	6,870.45	4.26	4.24	6,809.22	6,807.12	65.50	67.57	55 - 65	Upper sand wells	Upper Sand
10/28/2003	BW-2B	6/7/2011	2.00	2.00	6,874.58	6,871.66	6,874.58	6,874.50	North edge PVC casing	6,870.06	4.49	4.44	6,784.08	6,782.24	90.50	92.26	80 - 90	Chinle/Alluvium	Chinle/Alluvium Interface
10/28/2003	BW-2C	6/7/2011	2.00	2.00	6,875.40	6,872.90	6,875.40	6,875.30	North edge PVC casing	6,872.02	2.97	3.28	6,724.40	6,722.46	151.00	152.84	139.5 - 149.5	Sonsela sandstone	Sonsela
6/15/2004	BW-3A	6/7/2011	2.00	2.00	6,878.22	6,875.94	6,878.22	6,878.39	North edge PVC casing	6,875.08	2.99	3.31	6,828.22	6,826.04	52.60	52.35	39.5 - 49.5	Upper sand wells	Upper Sand
10/15/2003	BW-3B	6/7/2011	2.00	2.00	6,878.79	6,876.16	6,878.79	6,878.59	North edge PVC casing	6,875.41	3.14	3.18	6,803.79	6,809.19	75.00	69.40	63 - 73	Chinle/alluvium	Chinle/Alluvium Interface
7/20/2004	BW-3C	6/7/2011	2.00	2.00	6,878.08	6,875.72	6,878.08	6,877.95	North edge PVC casing	6,875.27	2.68	2.68	6,723.08	6,723.40	155.00	154.55	144.5 - 154.5	Sonsela sandstone	Sonsela
1/5/1981	OW-1	6/7/2011	4.00	4.00	6,868.00	6,866.32	6,868.45	6,866.62	North edge PVC casing**	6,866.44	1.91	0.18	6,773.96	6,772.07	94.04	94.55	89.3 - 99.3	Sonsela sandstone	Sonsela
11/25/1980	OW-10	6/7/2011	4.00	4.00	6,872.00	6,873.67	6,875.12	6,874.91	North edge PVC casing	6,872.59	1.59	2.32	6,804.00	6,814.58	68.00	60.33	40 - 60	Sonsela sandstone	Sonsela
9/25/1981	OW-11	6/7/2011	4.00	4.00	6,923.89	6,922.05	6,923.51	6,923.51	North edge PVC casing	6,921.80	2.08	1.71	6,857.27	6,857.72	66.62	65.79	43 - 65	Chinle/alluvium	Sonsela
12/15/1980	OW-12	6/7/2011	4.00	4.00	6,940.43	6,939.57	6,940.43	6,940.69	North edge PVC casing	6,939.04	1.87	1.65	6,795.43	6,811.84	145.00	128.85	117.8 - 137.8	Sonsela sandstone	Sonsela
12/10/1980	OW-13	6/7/2011	4.00	4.00	6,920.12	6,918.95	6,920.12	6,920.07	North edge PVC casing	6,915.33	4.79	4.74	6,820.12	6,820.92	100.00	99.15	78.2 - 98.2	Sonsela sandstone	Sonsela
12/17/1980	OW-14	6/7/2011	4.00	4.00	6,926.64	6,924.55	6,926.64	6,926.65	North edge PVC casing	6,924.40	2.25	2.25	6,881.64	6,880.13	45.00	46.52	35 - 45	Chinle/alluvium	Chinle/Alluvium Interface
8/23/1996	OW-29	6/7/2011	4.00	4.00	6,913.50	6,913.89	6,913.50	6,917.00	North edge PVC casing	6,912.09	3.87	4.91	6,864.50	6,865.92	49.00	51.08	37.5 - 47.5	Chinle/alluvium	Chinle/Alluvium Interface
8/28/1996	OW-30	6/7/2011	4.00	4.00	6,921.60	6,921.81	6,921.60	6,924.69	North edge PVC casing	6,919.84	4.85	4.85	6,873.20	6,874.79	48.40	49.90	37.9 - 47.9	Chinle/alluvium	Chinle/Alluvium Interface
10/5/2009	OW-50	6/7/2011	2.00	2.00	6,914.37	6,912.63	6,914.37	6,914.21	North edge PVC casing	6,911.46	2.70	2.75	6,847.63	6,850.21	63.00	64.00	48 - 63	Chinle/alluvium	Chinle/Alluvium Interface
10/5/2009	OW-52	6/7/2011	2.00	2.00	6,906.26	6,906.53	6,907.68	6,907.68	North edge PVC casing	6,905.31	2.20	2.37	6,828.53	6,829.94	79.00	77.74	64 - 79	Chinle/alluvium	Chinle/Alluvium Interface
10/14/1981	MW-1	6/7/2011	5.00	5.00	6,878.52	6,876.63	6,878.15	6,878.12	North edge PVC casing	6,876.79	1.25	1.33	6,746.50	6,747.29	132.02	130.83	117.72 - 127.72	Sonsela sandstone	Sonsela
10/15/1981	MW-2	6/7/2011	5.00	5.00	6,878.40	6,878.39	6,880.84	6,880.30	North edge PVC casing	6,878.41	1.82	1.89	6,741.90	6,742.82	140.24	137.48	112 - 122	Sonsela sandstone	Sonsela
10/16/1981	MW-4	6/7/2011	5.00	5.00	6,882.54	6,879.89	6,882.20	6,881.63	North edge PVC casing	6,879.34	2.31	2.29	6,760.40	6,759.91	122.14	121.72	101 - 121	Sonsela sandstone	Sonsela
7/21/1986	MW-5	6/7/2011	4.00	4.00	6,883.32	6,880.20	6,882.93	6,882.83	North edge aluminum casing	6,881.77	2.02	1.06	6,750.30	6,752.00	133.02	130.83	115 - 125	Sonsela sandstone	Sonsela
3/28/1995	RW-1	6/7/2011	4.00	4.00	6,943.50	6,942.86	6,943.50	6,946.06	North edge PVC casing	6,941.25	4.41	4.81	6,900.50	6,903.02	43.00	43.04	25 - 40	Chinle/alluvium	Chinle/Alluvium Interface
3/29/1995	RW-2	6/7/2011	4.00	4.00	6,927.20	6,926.40	6,927.20	6,928.53	North edge PVC casing	6,925.02	3.58	3.51	6,889.20	6,888.73	38.00	39.80	26.1 - 36.1	Chinle/alluvium	Chinle/Alluvium Interface
8/27/1997	RW-5	6/7/2011	4.00	4.00	6,942.50	6,941.53	6,942.50	6,943.57	West Edge PVC Casing (Existing Mark)	6,940.82	2.92	2.75	6,902.50	6,903.98	40.00	39.59	29.5 - 39.5	Chinle/alluvium	Chinle/Alluvium Interface
8/27/1997	RW-6	6/7/2011	4.00	4.00	6,972.60	6,941.96	6,972.60	6,944.01	North edge PVC casing	6,941.49	2.58	2.52	6,933.80	6,903.11	38.80	40.90	28.5 - 38.5	Chinle/alluvium	Chinle/Alluvium Interface
9/26/1985	SMW-2	6/7/2011	2.00	2.00	6,884.44	6,881.63	6,884.11	6,883.97	North edge aluminum casing	6,879.07	4.54	4.90	6,827.10	6,831.17	57.34	52.80	34.31 - 54.31	Upper sand wells	Chinle/Alluvium Interface and Upper Sand
9/25/1985	SMW-4	6/7/2011	2.00	2.00	6,882.54	6,877.63	6,882.73	6,879.52	North edge aluminum casing	6,875.72	3.83	3.80	6,760.40	6,809.84	72.20	69.68	51.7 - 71.7	Upper sand wells	Chinle/Alluvium Interface
7/8/2004	GWM-1	6/7/2011	2.00	2.00	6,912.65	6,910.22	6,912.65	6,912.61	North edge PVC casing	6,908.36	3.87	4.25	6,888.95	6,886.41	23.70	26.20	17.5 - 23.5	Chinle/alluvium	Chinle/Alluvium Interface
9/25/2005	GWM-2	6/7/2011	2.00	2.00	6,913.17	6,910.32	6,913.17	6,913.09	North edge PVC casing	6,908.05	4.75	5.04	6,896.97	6,894.28	18.97	18.81	3.2 - 16.2	Chinle/alluvium	Chinle/Alluvium Interface
9/25/2005	GWM-3	6/7/2011	2.00	2.00	6,912.65	6,907.35	6,912.65	6,910.25	North edge PVC casing	6,905.48	4.85	4.77	6,896.15	6,892.45	17.94	17.80	3 - 15	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-1	6/7/2011	2.00	2.00	6,918.43	6,913.62	6,918.43	6,913.86	North edge PVC casing	6,913.56	0.29	0.30	6,904.40	6,900.33	14.00	13.53	3.7 - 13.7	Chinle/alluvium	Chinle/Alluvium Interface

2011 CORRECTED WELL ELEVATION SUMMARY TABLE

Revision 2 - April 19, 2012

Date of Installation	Well ID Number	2011 Survey Measurement date[1]	Previous Casing Diameter (Inch)	2011 Verified Casing Diameter[2] (Inch)	Previous Ground Level Elevation (feet)	2011 Survey Ground Level Elevation[1] (feet)	Previous Well Casing Rim Elevation (feet)	2011 Survey Well Casing Rim Elevation[1] (feet)	2011 Measuring Point Description[1]	2011 Ground Elevation Inside Steel Sleeve[1] (feet)	Previous Stick-up length (feet)	2011 Survey Stick-up length[1] (feet)	Previous Well Casing Bottom Elevation (feet)	2011 Survey Well Casing Bottom Elevation[3] (feet)	Previous Total Well Depth (feet)	2011 Survey Total Well Depth[4] (feet)	Screened Interval Depth Top to Bottom[6] (feet)	Previous Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[7]
3/14/2008	NAPIS-2	6/7/2011	2.00	2.00	6,917.27	6,913.40	6,917.27	6,912.65	North edge PVC casing	6,912.54	0.10	0.11	6,902.80	6,899.04	14.50	13.61	4.2 - 14.2	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-3	6/7/2011	2.00	2.00	6,917.31	6,913.38	6,917.31	6,912.76	North edge PVC casing	6,912.53	0.29	0.23	6,886.60	6,882.34	30.70	30.42	25.4 - 30.4	Chinle/alluvium	Chinle/Alluvium Interface
6/11/2007	KA-3	6/7/2011	2.00	2.00	6,917.17	6,913.29	6,917.17	6,912.52	North edge PVC casing	6,912.20	0.17	0.32	6,892.40	6,889.32	25.00	23.20	15 - 25	Chinle/alluvium	Chinle/Alluvium Interface

NOTES:

* Ground elevation is to the lowest concrete pad elevation surrounding the well

** Top segment of pvc casing not connected to coupling. Coupling is where elevation is referenced.

1) Surveyed by DePauli Engineering & Surveying, LLC on June 7, 2011 at request of NMED due to discrepancies on well casing and ground level elevations.
2) Field verified using a tape measure by Gallup Refinery field technician.
3) 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.
4) Total well depth was determined using a bottom sensing meter, Testwell Water level meter with bottom sensing indicator.
5) Previous measurements and elevations are from the Well Data Summary Table from the 2009 Annual Ground Water Monitoring Report.
6) 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.
7) Stratigraphic interpretation conducted by Peregrine Geoconnect to re-evaluate the named zones they produce water from. Tables were updated to reflect correct stratigraphic zone. (See attached report from Peregrine Geoconnect in Attachment 3)

2011 WELL ELEVATION SUMMARY TABLE FOR ARTESIAN WATER WELLS
Revision #2 - March 21, 2012

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.

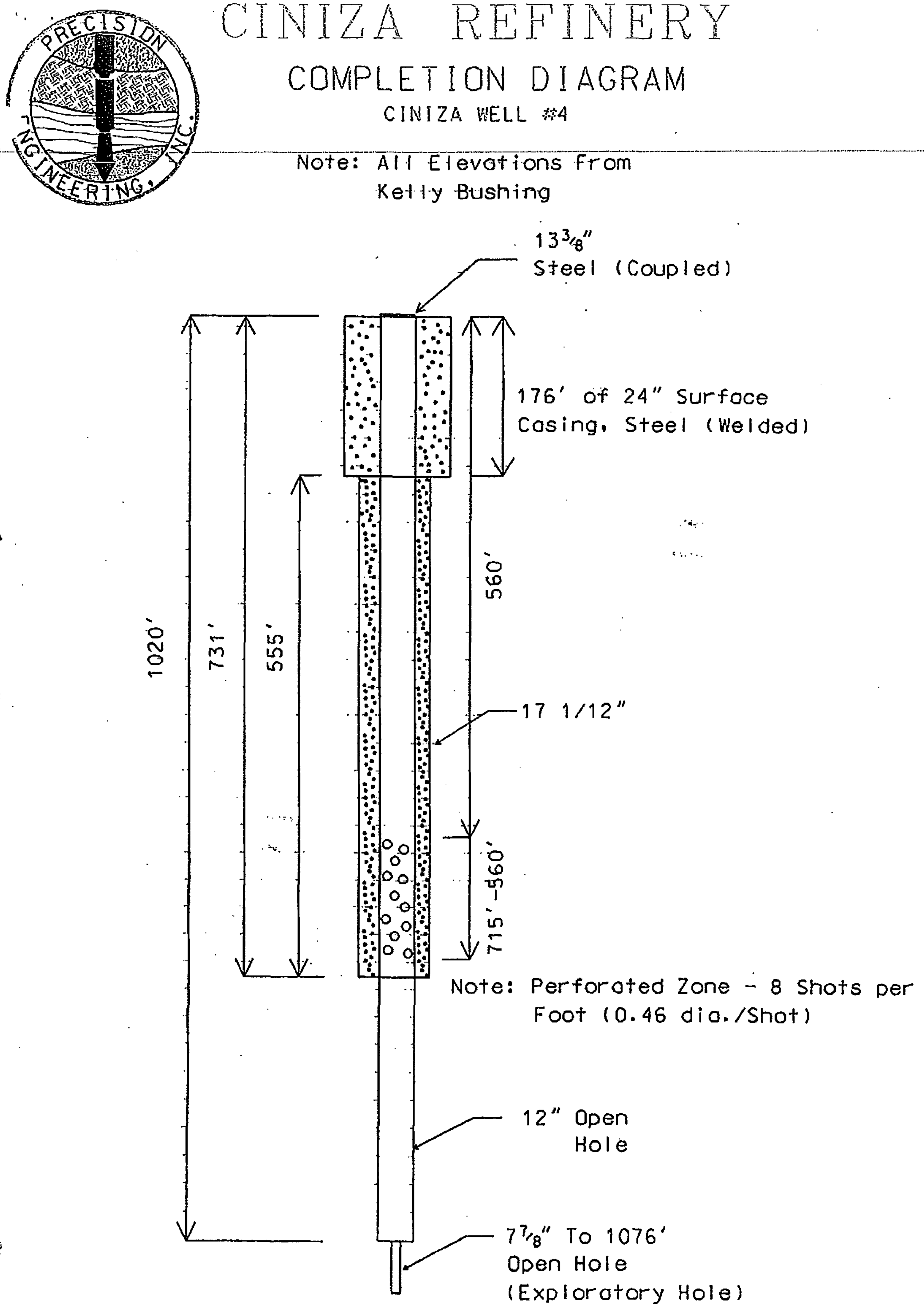
ATTACHMENT 3

CINIZA REFINERY

COMPLETION DIAGRAM

CINIZA WELL #4

Note: All Elevations From Kelly Bushing



ATTACHMENT 4

Peregrine GeoConnect

P.O. BOX 422 • LAS CRUCES, NM 88004
PH: 575-523-7674
FAX: 575-523-7248 • e-mail: kingsleywh@aol.com

March 21, 2012

Ms. Cheryl Johnson
Environmental Specialist
Western Refining – Gallup Refinery
Route 3 Box 7
Gallup, New Mexico 87301

Re: Stratigraphic Interpretation, Western Refining, Inc., Ciniza Refinery
File No. 12-001

Cheryl,

Peregrine GeoConnect, Inc. has performed an evaluation of the wells you requested. The wells were studied to determine the named zones they produce water from. The wells all produce water from various relatively shallow aquifers that represent different depositional sequences that are below the property.

As you are aware there are three basic zones that are monitored on the site. The uppermost zone has been locally named the Alluvial Sands Zone. This zone represents relatively young soils that are derived from the older formations to the south and east. These soils are primarily of fluvial (stream or river) deposition. The material was eroded from the Chinle Group formations forming the highlands to the south and east of the site and carried into the low valley where they were deposited as a result of intermittent fluviation. Earlier work at the site defined the sandy materials as a single large sand body and was locally named the Ciniza Sand. No formal naming process was given to the sands, however, reports from the 1980's and early 1990's refer these sands as the Ciniza Sand. Later, improved sampling technology allowed for more detailed stratigraphic evaluation of the materials and it was determined that rather than a large sand body the sands represented multiple channel deposits from intermittent stream development; likely generated as a result of storm water and seasonal runoff from the highlands to the south. The source of the material has been speculated to be from the Sonsela Sandstone in the Four Mile Canyon and/or Six Mile Canyon areas, although there has been no reason to study the area in detail as the information does not significantly impact the understanding of the conditions at the site. What differentiates these sands from others in the area is that they are sinuous, lenticular, and occasionally isolated bodies located within clays deposited in the valley area as a result of erosion of the sandstones, siltstones, and claystones of the Chinle Group. The sands are often buff to orange or very light red. The Alluvial Sands exhibit morphology and stratigraphy of recent erosional valley fill and should not be classified as part of the Chinle Group. Also the sands show no cementation that would be typical of the sands within the Chinle Group. One other distinguishing attribute the Alluvial Sands have is that they do not tend to follow the regional dip of the Chinle Group bedrock. The Chinle Group bedding at the site tends to dip downward northwesterly across the site at an angle of approximately ten (10) degrees. The Alluvial Sands tend to fan out across the valley in a relatively horizontal zone typically encountered at a depth of about thirty (30) feet and terminating on the order of forty five (45) to fifty (50) feet below the ground surface. These characteristics were used to identify the zones screened in the Alluvial Sand.

The second zone monitored at the site is locally called the Chinle Interface Zone. This second zone is the interface between the upper erosional soil fill material carried into the valley as a result of alluviation from the highlands to the south and the contact of the relatively unweathered Chinle Group sandstones, siltstones, and mudstones. The zone is distinguished by the presence of a gravelly or relatively clean sandy zone that lies directly on top of the relatively unweathered erosional surface of the Petrified Forest Formation within the Chinle Group. The sands and gravels form a very distinguishable marker bed on the relatively undisturbed shaley materials of the Petrified Forest Formation. The marker sands and gravels form the aquifer which lies on top of the relatively impervious shales and immediately below relatively impervious clays of the valley fill. As a result, the water confined in the sands and gravels is somewhat artesian in most wells screened in this zone. Typically the zone ranges in thickness from approximately eight (8) inches to about two (2) feet. It is not unusual to see the zone thin and become somewhat finer to the north. This zone follows the regional dip of the Chinle Group across the site (ten (10) degrees) and because of the amount of data available the depth of the top of the zone can be estimated using data from other site wells and borings from earlier investigations. Although easily identified, because of the similar densities of the alluvial clay soils above and the upper shaley materials of the Petrified Forest formation below, as well as the limited thickness of the zone, continuous sampling techniques are normally required to identify the exact zone contacts. Earlier work lumped this zone with the Upper Sands and although there is some evidence there could be communication between the zones, it is currently believed they are geomorphically distinct.

The third water producing zone that is monitored on the site is the Sonsela Sandstone. The Sonsela is a named member of the Petrified Forest Formation within the Chinle Group of Triassic Age. The Sonsela tends to also follow the local dip of approximately ten (10) degrees to the north-northwest. The member can be seen on the surface in the extreme southeast area of the property and south of Interstate 40 in both Four Mile and Six Mile Canyons. The sandstone at the site is white to very light brown or grey, may be massive to very thin bedded with low angle cross bedding. The sandstone is generally medium to coarse grained and comprised of quartz, feldspar and, in the lower portion, abundant mica. At this site the zone is ten (10) to twenty (20) feet in thickness and has a relatively thin shale bed separating the upper and lower portions of the unit. The sandstone unit is located within the Petrified Forest Formation of the Chinle Group and separates the Petrified Forest formation into the upper and lower members. When dry, the sandstone glistens in sunlight and is easily distinguished from finer and much thinner sandstone beds higher in the Upper Petrified Forest section. Because of the confining materials at the site above and below the sandstone, the water in the aquifer is artesian. Water in this aquifer is typically more artesian than the water in the Interface Zone and can aid in defining the production unit. The Sonsela Sandstone member is densely cemented and easily identified within the Petrified Forest Formation.

Using the information provided above, historic knowledge of the area, correlations from 220 borings and wells drilled at the site, as well as reports from earlier studies of the geologic conditions regionally and at the site, the following list of wells and the stratigraphic units they are monitoring (screened across) for water has been generated.

Well Identification	Stratigraphic Unit Screen Is Placed In
BW-1A	Upper Sand
BW-1B	Chinle-Alluvium Interface
BW-1C	Sonsela
BW-2A	Upper Sand
BW-2B	Chinle-Alluvium Interface
BW-2C	Sonsela
BW-3A	Upper Sand
BW-3B	Chinle-Alluvium Interface
BW-3C	Sonsela

Well Identification	Stratigraphic Unit Screen Is Placed In
OW-1	Sonsela
OW-10	Sonsela
OW-11	Sonsela
OW-12	Sonsela
OW-13	Sonsela
OW-14	Chinle-Alluvium Interface
OW-29	Chinle-Alluvium Interface
OW-30	Chinle-Alluvium Interface
OW-50	Chinle-Alluvium Interface
OW-52	Chinle-Alluvium Interface
MW-1	Sonsela
MW-2	Sonsela
MW-4	Sonsela
MW-5	Sonsela
RW-1	Chinle-Alluvium Interface
RW-2	Chinle-Alluvium Interface
RW-5	Chinle-Alluvium Interface
RW-6	Chinle-Alluvium Interface
SMW-2	**Chinle-Alluvium Interface** and **Upper Sand**
SMW-4	Chinle-Alluvium Interface
GWM-1	Chinle-Alluvium Interface
GWM-2	Chinle-Alluvium Interface
GWM-3	Chinle-Alluvium Interface
NAPIS-1	Chinle-Alluvium Interface
NAPIS-2	Chinle-Alluvium Interface
NAPIS-3	Chinle-Alluvium Interface
KA-3	Chinle-Alluvium Interface

If you have specific questions concerning any of the wells or how they were interpreted please contact our office. We will discuss the matter to your satisfaction.

Sincerely,
Peregrine GeoConnect, Inc.

William H. Kingsley, PE

Facility-wide Ground Water Monitoring Work Plan ~~– Revision 1~~

Gallup Refinery - 2011~~0~~ Updates

Submitted: March 29, 2012 ~~November 7, 2011~~

Submitted by: Western Refining Company
Route 3 Box 7
Gallup, New Mexico 87301

Facility-Wide Ground Water Monitoring Work Plan – ~~Revision 1~~
Gallup Refinery – 201~~0~~1 Updates

Western Refining
Gallup, New Mexico

March 29, 2012 ~~**November 7, 2011**~~

Prepared by:

Cheryl Johnson
Environmental Specialist

Reviewed by:

Ed Riege, M.P.H.
Environmental Manager

Executive Summary

This Site-Wide Ground Water Monitoring Work Plan (Plan) has been prepared and revised in response to requirements stated in a letter from the New Mexico Environment Department's Hazardous Waste Bureau dated February 9, 2009 (see Appendix A.)

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 owned by Western Refining ("Gallup Refinery" or "Facility"). The monitoring work plan is also designed to make the Facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which free products have been principally removed, but continue to be recovered in small quantities, and the northeast set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the waste water treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced/production water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

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.

We have 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 at select locations of the Gallup Refinery. The persons responsible for the implementation and oversight of this plan are:

Refinery Manager

- Mark B. Turri

Environmental Manager

- Ed Riege

Environmental Specialist

- Cheryl Johnson
- Alvin Dorsey

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LIST OF ACRONYMS

BMP	Best Management Practices
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
EPA	Environmental Protection Agency
GPM	Gallons per minute
HWB	Hazardous Waste Bureau
MTBE	Methyl Tert Butyl Ether
NAPIS	New American Petroleum Institute Separator
NMED	New Mexico Environment Department
OCD	Oil Conservation Division
PPE	Personal protective equipment
VOC	Volatile Organic Compounds
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
SWPP	Storm Water Pollution Prevention program
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 Western Refining ("Gallup Refinery" or "Facility"). The Plan follows the requirements of the February 9, 2009 letter issued by the New Mexico Environment Department's Hazardous Waste Bureau (NMED/HWB) (a copy of this letter is provided in Appendix A).

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 also designed to make the facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which small quantities of free products have been continually removed, and the northeast set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the waste water treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced/production water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

Gallup Refinery will periodically review facility-wide monitoring data, and assess the monitoring program presented in this Plan. Annual revisions to the Plan, as necessary, will then 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 Western Refining Southwest Inc. Gallup Refinery located at Exit 39 on Interstate I-40. This refinery is known as the Gallup Refinery and 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:

Western Refining (Parent Corporation)
123 W. Mills Avenue
El Paso, TX 79901

Operator: Western Refining Southwest Inc (postal address)
Route 3, Box 7
Gallup, New Mexico 87301
Western Refining Southwest Inc (physical address)
I-40, Exit 39
Jamestown, New Mexico 87347

SIC code 2911 (petroleum refining) applies to the Gallup Refinery.

The following regulatory identification and permit governs the Gallup Refinery:

U.S. EPA ID Number NMD000333211
OCD Discharge Permit No. GW-032

The facility status is corrective action/compliance. Annual -and quarterly 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 substantially located within the lower one quarter of Section 28 and throughout Section 33 of Township 15 North, Range 15 West of the New Mexico Prime Meridian. A small component of the property lies within the northeastern one quarter of Section 4 of Township 14 North, Range 15 West. Figure 2 is a topographic map showing the general layout of the refinery in comparison to the local topography.

2.0 Background Information

2.1 Historical and current site uses

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 Pilot (formerly Giant) 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 at a density of less than six cattle or 30 sheep per section.

The refinery primarily receives crude oil via two 6 inch diameter pipelines; two pipelines from the Four Corners Area enter the refinery property from the north. . In addition, the refinery also receives natural gasoline feed stocks via a 4-inch diameter pipeline that comes in from the west along the Interstate 40 corridor from the 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 NAIC is 32411. There are no organic chemicals, plastics, or synthetic fibers manufactured that contribute to our process flow of waste water. We do 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.

- The crude distillation unit separates crude oil into various fractions; including gas, naphtha, light oil, heavy oil, and residuum.
- The fluidized catalytic cracking unit (FCCU) dissociates_ long-chain hydrocarbon molecules into smaller molecules, and essentially converts heavier oils into naphtha and lighter oils.
- The alkylation unit combines specific types of hydrocarbon molecules into a high octane gasoline blending component.
- The reforming unit breaks up and reforms low octane naphtha molecules to form high octane naphtha.
- The 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.
- The isomerization unit converts low octane hydrocarbon molecules into high octane molecules.
- The treater units remove impurities from various intermediate and blending feed stocks -to produce finished products that comply with sales specifications.
- The ammonium thiosulfate unit accepts high H2S and ammonia containing gas streams from the Amine and the Sour Water Stripper units, and converts these into a useful fertilizer product, ammonium thiosulfate.
- The 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. This unit only operates when the ammonium thiosulfate unit is inoperable or cannot handle incoming loads.

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 aforementioned processing units, various other equipment and systems support the operation of the refinery and are briefly described as follows.

Storage tanks are used throughout the refinery to hold and store crude oil, natural gasoline, intermediate feed stocks, finished products, chemicals, and water. These tanks are all located above ground and 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 may receive crude oil, other feed stocks, additives, and chemicals.

Gasoline and diesel is delivered to the Pilot Travel Center via tanker truck. An underground diesel pipeline exits between the refinery and the Pilot Travel Center. As the result of an off-refinery release, the pipeline was purged of product, filled with nitrogen and temporarily placed out of service. Western is working with OCD and PSTB to place this line back into service.

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 leading to the New API Separator (NAPIS).

The process wastewater system is a network of curbing, paving, catch basins, and underground piping that collects waste water effluent from various processing areas within the refinery and then conveys this wastewater to Tank 35 (T-35) and then to the NAPIS.

T-35 is an equalization tank which handles large process and storm water flows allowing the flow to the NAPIS to be controlled during process and storm water events. The equalization tank is also used to store the waste water for a couple of days if problems are encountered with the downstream equipment, i.e., NAPIS and the benzene strippers and in the future the new DAF and MPPE units. The NAPIS is a two compartment oil water separator. 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 oil is passed to a collection chamber where it is pumped back into the refinery process. The clarified water is piped to three benzene strippers where benzene is removed. The stripped water flows into the first aeration lagoon. Sludge sinks to the bottom of the NAPIS which is periodically vacuumed out by a vacuum truck and disposed as hazardous waste at an approved landfill or recycled and reused in refineries that have this allowable exemption under RCRA.

At the benzene strippers, ambient air is blown upwards through the falling cascade of clarified waste water as it passes through distillation column packing. Countercurrent desorption of benzene from the water occurs due to the high volume of air passing over the relatively large surface area provided by the packing. The desorbed benzene is absorbed into the air stream and vented to the atmosphere. Effluent from the stripper columns gravity flows through piping into the first aeration lagoon.

At the aeration basins, the treated waste water is mixed with air in order to oxidize any remaining organic constituents and increase the dissolved oxygen concentration available in the water for growth of bacteria and other microbial organisms. The microbes degrade hydrocarbons into carbon dioxide and water. Three 15-hp mechanical aerators provide aeration in the first aeration lagoon with two 15-hp aerators providing aeration in the second lagoon. Effluent from the second aeration lagoon flows onward into the first of several evaporation ponds of various sizes.

At the evaporation ponds, waste water is converted into vapor via solar and mechanical wind-effect evaporation. No waste water is discharged from the refinery to surface waters of the state because all of the waste water evaporates. .

The storm water system is a network of valves, gates, berms, embankments, culverts, trenches, ditches, natural arroyos, and retention ponds that collect, convey, control, treat, 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 T-35, T-27 and T-28 when needed before it reaches the NAPIS, benzene strippers and waste water treatment system for retention in evaporation ponds. Storm water discharge from the refinery is very infrequent due to the arid desert-like nature of the surrounding geographical area.

The Gallup Refinery currently operates under the Multi-Sector Permit 2008 (MSGP-2008). Gallup Refinery submitted a new NOI for coverage under the new MSGP. The refinery maintains a Storm Water Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) for effective storm water pollution prevention. 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.

2.2 Potential Rreceptors

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 themselves through contact with contaminated ground water. However, drinking water wells remain the primary route of possible exposure.

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[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.

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. These wells are designated PW-2, PW-3 and PW-4. Figure 3 shows the locations of these wells. These wells are operated by the facility to provide the refinery's process water, drinking water to nearby refinery-owned houses, to the refinery itself, and to the Pilot Travel Center. These wells are monitored and no contaminants have been detected in the deep aquifer that these wells are screened within.

Other than the on-site wells, there are 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 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 having left the facility in shallow ground water.

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. Dry wastes could stem from wind-blown metallic powders used as catalysts, and regular municipal solid wastes stored in covered containers destined for municipal landfills.

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 attenuate. There is a possibility also that certain long-lived chemicals would not biodegrade, or, if they did, it would be at a very slow pace.

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 also within berms to contain spills. The NAPIS has double walls and a leak detection system. This situation did not exist in the past. So, past spills and leaks could be a source of ground water contamination.

Similarly, surface impoundments can serve as a source of possible ground water contamination. In the past, liquids from the railroad rack lagoon in the northeast end of the Facility discharged into a field and drain onto the ground and evaporate – this led to subsurface soil contamination and has recently 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 Sold Waste Management Units (SWMU) identified at the Gallup Refinery, and one closed Land Treatment Area.

<u>RCRA Regulated Units</u>

- Land Treatment Unit

<u>SWMUs</u>

- 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 Landfarm
- 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

Existing ground water monitoring wells effectively surround all these SWMUs.

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 rapidly picked up for recovery, some of the liquids present in a spill enter the subsurface. With precipitation, there is a possibility that some of the contaminants could leach out and reach ground water.

Separate Phase Hydrocarbons (SPH) floating on shallow ground water has been found at the northeast end of the facility. A system of recovery wells has been created and SPH has been pumped out for several years. Recovery through hand-bailing continues on a quarterly basis with the volumes recovered, dropping substantially every year. Trace levels of Benzene have also been found in wells in this area possibly linked to this spilled material.

Recovery Wells

- RW-1
- RW-2
- RW-5
- RW-6

A small tank that held Methyl Tert Butyl Ether (MTBE) has leaked and created a plume of MTBE in the shallow ground water at the northeast end of the refinery. This tank is no longer in service and has been removed. MTBE has not been used at the refinery since April 2006.

A series of monitoring wells at various depths are in place to monitor contaminant plumes from this northeast area that has SPH and MTBE releases. These monitoring wells are designated as follows.

Monitoring Wells

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

A unit at the southwest end of the Facility that is used to recover oil and recycle this 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 New American Petroleum Institute Separator (NAPIS) which was put into service in October 2004. The NAPIS has one up-gradient well – NAPIS-1 and three down-gradient shallow monitoring wells, NAPIS-2, NAPIS-3 and KA-3.

There has always been the possibility that the waste water treatment system of the Facility based at the aeration lagoons (AL-1 and AL-2) and evaporation pond 1 (EP-1) may have leaked contaminants into shallow ground water. The first aeration lagoon, known as AL-1, has received waste water with benzene at levels greater than 0.5 ppm – either through ineffective treatment farther upstream in the process, or through overflows – making these liquids a hazardous waste; however the aeration process and biological action within this lagoon has brought the benzene levels to well below 0.5 ppm and of the order of 0.1 ppm and less. Equalization tanks (Tank 35, Tank 27 and Tank 28) were put in service in 2011 for collection of excess waste water effluent from various processing areas within the refinery. The equalization tanks are used to divert excess waste water overflow to the NAPIS caused by unit shutdowns or rain storms. The waste water flow can then be controlled to the NAPIS.

Monitoring well GWM-1 was installed in July 2004 down gradient of the aeration basins in order to detect potential leakage from the aeration basins, however analyses of ground water samples collected at GWM-1 have indicated only very low concentrations of constituents such as BTEX and methyl tertiary butyl ether (MTBE) that would indicate a potential for historical releases in the area. GWM-1 has shown benzene levels ranging from 0.012 ppm in 2006 to 0.006~~69~~96 ppm in 20~~10~~11. Ethyl benzene was detected in July 2008 at 0.0039 ppm to 0.003~~35~~42 ppm in ~~November of 2010~~ December of 2021. MTBE was also detected in 2006 at 0.16 ppm with a slight decrease in ~~November of 2010~~ December of 2011 at ~~0.062~~ 0.054 ppm. The location of this well was determined in the field after mutual consultation by representatives of the refinery, OCD and the drilling contractor.

Two new shallow ground water monitoring wells were installed in the early fall of 2005 near GWM-1 which is located at the southwest corner of EP-1. GWM-2 was placed at the NW corner of EP-2 and GWM-3 was placed at the NW corner of EP-1. GWM-1, 2 and 3 were placed to determine whether any leakage from the lagoons and or evaporation pond is occurring. GWM-2 and GWM-3 are considered dry wells since its installation in 2005. Water was detected in the first quarter of 2008 in GWM-2.—Notification was given to NMED and OCD respectively. In 2010 during the second quarter inspections, GWM-2 and GWM-3 were found to have a water level of 1.5 feet in GWM-2 and 0.88 feet in GWM-3. Weekly inspections were done to monitor recharge rate. Quarterly inspections in 2011 have indicated the continued presence of water in both GWM-2 and GWM-3 wells. GWM-2 and GWM-3 have shown non-detectable (<0.001 ppm) levels of BTEX constituents ~~such as BTEX~~ and MTBE has been detected in GWM-2 at levels ranging from 0.011 ppm in September 2010 to 0.0027 ppm in December 2011, which are below the EPA RSL standard of 0.012 ppm. GWM-3 has also indicated the presence of MTBE at levels ranging from 0.009 ppm in September 2010 to non-detectable levels of <0.0025 ppm in September and December 2011. –GWM-2 and GWM-3 have also shown high levels of fluoride, chloride and sulfate which are above the WQCC and EPA MCL standards. GWM-3 has also detection levels of DRO ranging from 3.7 ppm in September 2010 to 1.3 ppm in December 2011. –The continued presence of water in GWM-2 and GWM-3 may be attributed to the fluctuation of ground water levels due to the increase in moisture this year. Figure 3 shows the location of all of the active monitoring wells on the Facility.

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 lands and is used for cattle and sheep grazing at low densities[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.

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 7 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 ricegrass, blue grama, bottlebrush squirreltail,

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

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, needleandthread, oneseed juniper, sand dropseed, spineless horsebrush, rabbitbrush, and twoneedle 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 Mentmore-Gish 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, 2-72 inches 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 formation, Petrified Forest group) and siltstone start to appear. Figure 4 shows a generalized relationship of soils in and around the Gallup Refinery.

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 Formation, which consists

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[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

of low permeability clay stones and siltstones that comprise the shale of this formation. As such, the Chinle Formation effectively serves as an aquiclude. Inter-bedded within the Chinle Formation is the Sonsela Sandstone bed, which represents the uppermost potential aquifer in the region.

The Sonsela Sandstone bed lies within and parallels the dip of the Chinle Formation. As such, its high point is located southeast of the refinery and it slopes downward to the northwest as it passes under the refinery. Due to the confinement of the Chinle Formation aquiclude, 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 Chinle 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 Chinle Formation is highly variable due to the presence of complex and irregular stratigraphy; including sand stringers, cobble beds, and dense clay layers. As such, hydraulic conductivity may range from less than 10^{-2} centimeters per second in the gravelly sands immediately overlying the Chinle Formation up 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 Chinle Formation. The prevailing flow direction is from the southeast and toward the northwest. In the past, a subsurface ridge has been identified that was thought to deflect some flow in a northeasterly direction in the vicinity of the refinery tank farm. This is not clear from the present data.

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 B provides more detailed information on actual sampling procedures 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.

Appendix C-1 provides 2011 details of the annual and quarterly DTW (depth to water) and DTB (depth to bottom) measurements taken during 2011. The table also includes ~~wells to be sampled including their~~ date of establishment, ground elevation, top of casing elevation, well casing stick-up length, well depth, ground water elevation and corrected water table elevation with respect to wells that have separate phase hydrocarbon levels. ~~well casing diameter, screened interval, screen length, and stratigraphic units.~~

Appendix C-2 provides Revision 2 – 2011 Corrected Well Elevation Summary Table. This table provides a corrected version of the 2009 Well Elevation Summary Table which had some discrepancies regarding well elevations, well depth and stick up lengths. The information supplied in Revision 2 is a compilation of data provided by DePauli Engineering who was contracted to re-survey all of our active wells to verify ground level elevations, well casing elevations, stickup lengths. Gallup field technician also field verified casing diameters, depth to bottom of wells using a Testwell Water Level bottom sensing indicator as well as went over original drill logs to verify screened intervals. Screened interval depth to bottom level may be equal to or lower than the total depth of the well. Settlement may have occurred in some of these wells over time.

Appendix C-2.1 provides Revision 2 – 2011 Corrected Well Elevation Summary Table for Artesian Wells. Information provided in this section was gathered from well boring logs. These wells are encased and therefore measurement for depth to bottom was not field verified.

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 A - Table 1 Ground Water Monitoring Schedule, will be gauged to record the depth to SPH (if present), the depth to water, and the total depth 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. All measurements will be made relative to the same datum for all wells.

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, and dissolved oxygen (%). 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 disposable bailers and/or appropriately decontaminated 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 procedures are described in more detail in Appendix B. Decontamination procedures for reusable water sampling equipment are described in Appendix B.

All purged ground water and decontamination water from monitoring wells will be disposed of in the refinery waste water treatment system upstream of the API Separator. The procedures for disposing materials are described in Appendix B.

Ground water samples intended for metals analysis will be submitted to the laboratory as total metals samples. Ground water samples obtained for dissolved metals analysis will be filtered using 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 Western in sealed coolers. Chemical preservation is also provided by the laboratory through pre-preserved bottleware. 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, and nitrates. 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 Appendix B of this Plan, 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 method holding times. Details of the general sample handling procedures are provided in Appendix B.

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 chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Signed and dated chain-of-custody 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 for the constituents listed in Appendix D, Table 1. In addition, for various locations the list of metals is modified to either be the Skinner list of the NM Water Quality Control Commission list or RCRA 8 metals list. Appendix D, Table 1 provides a summary of target analytes for each EPA analytical method.

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 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 and 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 and trip blanks may be obtained for quality assurance during sampling activities. The samples will be handled as described in Section 4.4.3.

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 de-ionized water placed in an appropriate sample container. Trip blanks will be analyzed at a frequency of one for each shipping event involving twenty or more samples. Generally, a trip blank will only be placed in one of the containers, if more than one container is used to ship the set of samples.

4.4.3 Laboratory QA/QC Samples

Analytical procedures will be evaluated by analyzing reagent or method blanks, surrogates, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (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 (µg/L)); 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 chain-of-custody 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;
- 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,
- 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), and

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. Field duplicates will not be collected on a routine basis, as there is sufficient data to establish outliers or suspect results through a trends analysis. Field duplicate samples may be collected for confirmation if a sample establishes the presence of a contaminant in an unexpected location, such as a deep aquifer, or at unexpected levels.

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
- 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 two investigation areas (East Side and West Side). The sampling frequency, analyses and target analytes will vary for each investigation area and well/outfall/evaporation pond location. 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 East Side

5.1.1 Sampling Locations

The location of the East Side monitoring and recovery wells are shown in Figure 3. The following wells will be sampled (as described in Appendix D, Table 1) within the East Side area:

Recovery wells

- RW-1
- RW-2
- RW-5
- RW-6

Monitoring wells

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

5.2 West Side

5.2.1 Sampling Locations

The locations of wells on the West Side are shown in Figure 3.

The following wells, outfalls, and ponds will be sampled (as described in Appendix D, Table 1) within the West Side area:

(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.)

Monitoring wells

- NAPIS 1

- NAPIS 2
- NAPIS 3
- KA-3
- GWM-1
- GWM-2
- GWM-3
- SMW-2
- SMW-4
- MW-1
- MW-2
- MW-4
- MW-5
- OW-1
- OW-10
- OW-11
- OW-12
- BW-1A
- BW-1B
- BW-1C
- BW-2A
- BW-2B
- BW-2C
- BW-3A
- BW-3B
- BW-3C
- PW-2
- PW-3
- PW-4

<u>Outfalls</u>

- Influent to AL-1
- Influent to AL-2
- Influent to EP-2
- AL2 to EP-1
- Pilot Effluent (Travel Center)
- NAPIS Effluent
- Boiler Water Inlet to EP-2

<u>Ponds</u>

- EP-1
- EP-2
- EP-3

- EP-4
- EP-5
- EP-6
- EP-7
- EP-8
- EP-9
- EP-11
- EP-12A
- EP-12B
- Any temporary pond containing liquid

Containment

- NAPIS secondary containment (Leak Detection Units -LDU)
    - East LDU
    - West LDU
    - Oil Sump LDU

5.3 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 Western Refining 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.

5.3.1 Request for Modifications to Sampling Plan

Gallup Refinery requests a change to the monitoring frequency for the following wells; OW-50, OW-52 and OW-1. OW-50 and OW-52 were installed in October 2009 to monitor the possible migration of MTBE from up-gradient wells OW-14, OW-29 and OW-30. Since its installation, quarterly sampling analytical lab data has indicated non-detect for BTEX constituents as well as MTBE and VOCs for 2010 and 2011. Based on the analytical data Gallup requests to change the monitoring/sampling frequency to an annual basis.

OW-1 inspection was changed in the Facility Wide Monitoring Work Plan approved August 25, 2010 to quarterly sampling. In the past this well was only required to be visually checked and water level measurement recorded on a quarterly basis. Based on the 2010 and 2011 quarterly sampling results, lab analysis data indicates non-detectable levels for BTEX plus MTBE constituents as well as VOCs for 2010 and 2011. Gallup proposes to change the sampling frequency to an annual basis and continue to monitor this well on a quarterly basis for water level measurement.

Based on these proposals, Gallup has made changes to Appendix D to reflect requested changes. Hall Environmental Lab Data is also included for OW-50, OW-52, and OW-1 in Appendix E as supporting documents.

Appendix A: Letter from NMED/HWB February 9

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

2905 Rodeo Park Drive East, Building 1
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RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

February 9, 2009

Mr. Ed Riege
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
Route 3, Box 7
Gallup, New Mexico 87301

RE: FACILITY WIDE GROUNDWATER MONITORING WORK PLAN
WESTERN REFINING COMPANY, SOUTHWEST, INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-GRCC-09-001

Dear Mr. Riege:

The New Mexico Environment Department (NMED) requires Western Refining Company, Southwest Inc., Gallup Refinery (Permittee) to submit a Facility Wide Groundwater Monitoring Plan (Monitoring Plan). The purpose of this Monitoring Plan is to characterize the nature and extent of groundwater contamination at, and migrating from the facility and provide one plan that contains all groundwater monitoring activities that will satisfy both NMED and the New Mexico Energy Minerals and Natural Resource Department Oil Conservation Division (OCD) requirements. The Monitoring Plan must be revised on an annual basis to accommodate monitoring changes at the facility and to alleviate the need to update NMED and OCD permits. .

Currently, the groundwater monitoring requirements are established in the OCD Discharge Plan dated August 23, 2007, specifically items 16 (the Sampling Schedule Resulting from historical New API Separator Spills), 19, 20 (A & B), and 25.

The Permittee must use Attachment 1 of this letter as a general guide for preparing the Monitoring Plan. The Monitoring Plan must include, but is not limited to the following:

a. A general description of the hydrogeologic system beneath the facility.

b. A section or table to include, but not limited to, a description of all existing monitoring wells, recovery wells, and any other required sampling locations specifying their exact location, date the wells were installed including ground elevation, top of casing elevation, well casing stick up length, well depth, well casing diameter, screened interval, screen length, and stratigraphic unit(s) intersected by the well screen.

c. The initial submittal must include a section or appendix that includes all well construction diagrams.

d. A facility map showing all monitoring well locations. This map must be revised as necessary to reflect any well additions and well abandonments that occur during the year.

e. The current groundwater monitoring/sampling requirements found in the OCD Discharge Plan (items 16 (the Sampling Schedule Resulting from historical New API Separator Spills), 19, 20 (A & B), and 25).

f. The sampling requirements must include the proposed frequency of sampling, sampling methodology, field water quality parameters to be measured, and chemical analytical methods.

g. A description of all sampling methods and procedures that will be applied during each monitoring event.

h. Identification of all field instruments proposed for use as well as calibration procedures.

The Permittee must continue to submit their Annual Groundwater Monitoring Report to NMED and the OCD by September 1 of each subsequent year to include the specified items found in the OCD Discharge Permit and describe all groundwater monitoring activities. The annual updates to this Monitoring Plan must be submitted by April 1 of each year beginning in 2010, so that any changes will be implemented prior to the groundwater monitoring summaries provided in the Annual Groundwater Monitoring Report.

Once this Monitoring Plan is approved, this plan will include and replace the requirements of the OCD Discharge Plan. The information gathered per the Monitoring Plan will then be included in the Annual Groundwater Monitoring Report. The Annual Groundwater Monitoring Report is considered a Periodic Monitoring Report for the purpose of compliance with NMED requirements and the OCD Discharge Plan items 20 (A and B) and 25. Attachment 2 provides general guidance for the preparation of Periodic Monitoring Reports.

The Permittee must submit the Monitoring Plan to NMED and the OCD on or before May 11, 2009. If you have questions regarding this letter please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

John E. Kieling
Program Manager
Permits Management Program
Hazardous Waste Bureau

cc: D. Cobrain NMED HWB
H. Monzeglio, NMED HWB
W. Price, OCD
B. Jones, OCD
G. Rajen, Gallup
File: Reading File and GRCC 2009 File
HWB-GRCC-09-001

ATTACHMENT 1
GENERAL GUIDE FOR COMPOSING THE MONITORING PLAN

- An Executive Summary (Abstract) must be included to provide a brief summary of the purpose and scope of the Monitoring Plan. This section must include the facility name and portions of the facility including any areas of concern (AOCs), Solid Waste Management Units (SWMUs) or other locations that the Monitoring Plan will be addressing.

- A Table of Contents must be included that lists all text sections, subsections, tables, figures, and appendices or attachments included in the Monitoring Plan.

- An Introduction must be included in the Monitoring Plan to include general information on the current facility and a brief description of the purpose of the proposed groundwater monitoring and the types of activities that will be conducted.

- A Background section must be added that briefly describes relevant general background information, including historical site uses, potential receptors, the type and characteristics of the waste or contaminants and any known and possible source(s), and a summary of the history of contaminant releases which could be contributing to groundwater contamination.

- The Permittee must include a Site Conditions section to provide a detailed description of current site topography and locations of natural features and manmade structures. This section must include a description of drainages, vegetation types, erosional features, and current site uses, in addition to, descriptions of features located in surrounding sites (i.e. SWMUs, AOCs) that may have an impact on the subject site regarding recharge sediment transport, surface water runoff, or contaminant fate and transport. A description of subsurface conditions must also be included that provides a discussion of the conditions observed during previous subsurface investigations, including but not limited to soil types and associations, stratigraphy, and the presence and flow direction of groundwater.

- A Scope of Activities section must include a list of all anticipated activities to be performed during the facility-wide groundwater monitoring sampling events.

- A section must be included that provides a description of all anticipated locations to be sampled and methods for conducting the activities during the facility wide groundwater monitoring events. This section must include, but is not limited to, descriptions of: sampling methods, sample handling procedures, procedures for collecting field water quality measurements, any field equipment and calibration procedures, water level measurement, purging activities, and decontamination procedures. This section must also address Investigation Derived Waste (IDW).

- The Permittee must include a Schedule section that proposes a schedule for the groundwater monitoring.

- Tables, Figures, and Appendices must be included.

Appendix B: Gallup Field Sampling Collection and Handling Standard Procedures

Field Data Collection: Elevation and Purging

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

All water/product levels are measured to an accuracy of the nearest 0.01 foot using an electrical conductivity based meter, the Heron Instruments 100 ft. DipperT electric water depth tape complying with US GGG-T-106E, EEC Class II. 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 the DipperT electric water depth tape. If product is present, a ground water sample is typically 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 (%). The well will be retested for pH, temperature, specific conductivity and dissolved oxygen (%) 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, SMW-4, OW13, OW14, OW29 and OW30 are each equipped with a dedicated electrical pump. The remaining wells are purged using a portable Grundfos pump. Recovery wells and NAPIS-1, NAPIS-2, NAPIS-3 and KA-3 are hand-bailed as well as GWM1 and GWM2 and GWM3 are hand-bailed if the presence of water is detected.

Purged well water from wells is collected in fifty five gallon drums and disposed of upstream of the NAPIS. The water is treated in the refinery's waste water treatment system.

Sampling Equipment at Gallup

The following sampling equipment is maintained at Gallup 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 syringe 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.

Calibration and maintenance procedures will be performed according to the manufacturer's specifications.

Order of Collection

Samples will be collected in the order listed below:

Parameter	Bottle Type
VOC, SVOC	40 ml VOA vials, (H2SO4)
TOC	1 liter glass jar, H2SO4
Extractable Organics	1 liter glass jar with Teflon™ cap
Metals* Total and Dissolved	500 ml, 125 ml plastic, HNO3
Phenols, Cyanide	1 liter glass jar
Chloride, Sulfate, Nitrates	1 liter plastic, no preservative

* Prefiltration bottle for dissolved metals which is subsequently filtered and transferred to a pint plastic bottle with HNO3.

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 paper 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 HNO3 preservative.

For samples destined for *total metals* analysis, do not filter the sample, and preserve with HNO3 to pH <2 in the field.

Gallup 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 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 QC requirements before departing—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/ bailer is 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 disposed 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 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. 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.

LIST OF FIGURES

LIST OF ACRONYMS

BMP	Best Management Practices
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
EPA	Environmental Protection Agency
GPM	Gallons per minute
HWB	Hazardous Waste Bureau
MTBE	Methyl Tert Butyl Ether
NAPIS	New American Petroleum Institute Separator
NMED	New Mexico Environment Department
OCD	Oil Conservation Division
PPE	Personal protective equipment
VOC	Volatile Organic Compounds
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
SWPP	Storm Water Pollution Prevention program
WWTP	Waste water treatment plant

Western Refining
GALLUP

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March 29, 2012

Mr. John E. Kieling, Acting Chief
NMED - Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, NM 87505-6303

Re: 2011 Annual update to Site-Wide Ground Water Monitoring Work Plan
Western Refining Company Southwest Inc., Gallup Refinery
EPA ID #NMD000333211 HWB-WRG-11-001

Dear Mr. Kieling:

Enclosed are the 2011 annual updates to the Site-Wide Ground Water Monitoring Work Plan. A redline version is also attached indicating changes made as well as sent electronically. The following changes were made in the work plan.

- Cover Page and Page 2 – Submittal dates.
- Page 4 – updated Table of Contents
- Page 14 – addition of equalization tanks 35, 27 and 28.
- Page 14-15 – GWM analytical updates
- Page 17, Additions to Section 4.1
- Page 27, Addition of Section 5.3.1 – Request for Modifications to Sampling Plan.
- Addition of Appendix C-1 – Well Data 2011Annual Quarterly DTW/DTB Measurements
- Addition of Appendix C-2 – 2011 Corrected Well Elevation Summary Table – Revision 2
- Addition of Appendix C-2.1 – 2011 Corrected Well Elevation Summary Table – Artesian Wells – Revision 2.
- Revised Appendix D to reflect requested changes in Section 5.3.1.
- Addition of Appendix E – Hall Laboratory Data to support request made in Section 5.3.1.
- Addition of Appendix F – Stratigraphic Survey by Peregrine GeoConnect

If you have any questions regarding Western's responses, please do not hesitate to contact Cheryl Johnson of my staff at (505) 722-0231.

Sincerely,

Ed Riege
Environmental Manager

cc: K. Van Horn, NMED HWB
C. Chavez, OCD
C. Johnson, Gallup

Facility-wide Ground Water Monitoring Work Plan

Gallup Refinery - 2011 Updates

Submitted: March 29, 2012

Submitted by: Western Refining Company
Route 3 Box 7
Gallup, New Mexico 87301

Facility-Wide Ground Water Monitoring Work Plan
Gallup Refinery – 2011 Updates

Western Refining
Gallup, New Mexico

March 29, 2012

Prepared by:

Cheryl Johnson
Environmental Specialist

Reviewed by:

Ed Riege, M.P.H.
Environmental Manager

Executive Summary

This Site-Wide Ground Water Monitoring Work Plan (Plan) has been prepared and revised in response to requirements stated in a letter from the New Mexico Environment Department's Hazardous Waste Bureau dated February 9, 2009 (see Appendix A.)

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 owned by Western Refining ("Gallup Refinery" or "Facility"). The monitoring work plan is also designed to make the Facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which free products have been principally removed, but continue to be recovered in small quantities, and the northeast set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the waste water treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced/production water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

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.

We have 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 at select locations of the Gallup Refinery. The persons responsible for the implementation and oversight of this plan are:

Refinery Manager

- Mark B. Turri

Environmental Manager

- Ed Riege

Environmental Specialist

- Cheryl Johnson
- Alvin Dorsey

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Section Title **Page**

LIST OF FIGURES

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NMED	New Mexico Environment Department
OCD	Oil Conservation Division
PPE	Personal protective equipment
VOC	Volatile Organic Compounds
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
SWPP	Storm Water Pollution Prevention program
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 Western Refining ("Gallup Refinery" or "Facility"). The Plan follows the requirements of the February 9, 2009 letter issued by the New Mexico Environment Department's Hazardous Waste Bureau (NMED/HWB) (a copy of this letter is provided in Appendix A).

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 also designed to make the facility quickly aware of any levels of contaminants that exceed compliance standards.

This Plan divides the Facility into two areas for periodic monitoring: the East Side and the West Side. The East Side includes the Refinery Complex, recovery wells from which small quantities of free products have been continually removed, and the northeast set of observation wells and monitoring wells. The West Side includes a cluster of wells in and around the waste water treatment system, boundary wells, shallow monitoring wells in and around land treatment areas, and produced/production water wells. This plan also includes sampling requirements for aeration lagoons, influents, and evaporation ponds located in the West Side. Designated wells and sample points in these two areas will be monitored on an annual, semi-annual, quarterly, monthly, and weekly basis following the procedures presented in this Plan.

Gallup Refinery will periodically review facility-wide monitoring data, and assess the monitoring program presented in this Plan. Annual revisions to the Plan, as necessary, will then 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 Western Refining Southwest Inc. Gallup Refinery located at Exit 39 on Interstate I-40. This refinery is known as the Gallup Refinery and 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:

Western Refining (Parent Corporation)
123 W. Mills Avenue
El Paso, TX 79901

Operator: Western Refining Southwest Inc (postal address)
Route 3, Box 7
Gallup, New Mexico 87301
Western Refining Southwest Inc (physical address)
I-40, Exit 39
Jamestown, New Mexico 87347

SIC code 2911 (petroleum refining) applies to the Gallup Refinery.

The following regulatory identification and permit governs the Gallup Refinery:

U.S. EPA ID Number NMD000333211
OCD Discharge Permit No. GW-032

The facility status is corrective action/compliance. Annual and quarterly 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 substantially located within the lower one quarter of Section 28 and throughout Section 33 of Township 15 North, Range 15 West of the New Mexico Prime Meridian. A small component of the property lies within the northeastern one quarter of Section 4 of Township 14 North, Range 15 West. Figure 2 is a topographic map showing the general layout of the refinery in comparison to the local topography.

2.0 Background Information

2.1 Historical and current site uses

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 Pilot (formerly Giant) 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 at a density of less than six cattle or 30 sheep per section.

The refinery primarily receives crude oil via two 6 inch diameter pipelines; two pipelines from the Four Corners Area enter the refinery property from the north. . In addition, the refinery also receives natural gasoline feed stocks via a 4-inch diameter pipeline that comes in from the west along the Interstate 40 corridor from the 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 NAIC is 32411. There are no organic chemicals, plastics, or synthetic fibers manufactured that contribute to our process flow of waste water. We do 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.

- The crude distillation unit separates crude oil into various fractions; including gas, naphtha, light oil, heavy oil, and residuum.
- The fluidized catalytic cracking unit (FCCU) dissociates_ long-chain hydrocarbon molecules into smaller molecules, and essentially converts heavier oils into naphtha and lighter oils.
- The alkylation unit combines specific types of hydrocarbon molecules into a high octane gasoline blending component.
- The reforming unit breaks up and reforms low octane naphtha molecules to form high octane naphtha.
- The 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.
- The isomerization unit converts low octane hydrocarbon molecules into high octane molecules.
- The treater units remove impurities from various intermediate and blending feed stocks to produce finished products that comply with sales specifications.
- The ammonium thiosulfate unit accepts high H2S and ammonia containing gas streams from the Amine and the Sour Water Stripper units, and converts these into a useful fertilizer product, ammonium thiosulfate.
- The 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. This unit only operates when the ammonium thiosulfate unit is inoperable or cannot handle incoming loads.

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 aforementioned processing units, various other equipment and systems support the operation of the refinery and are briefly described as follows.

Storage tanks are used throughout the refinery to hold and store crude oil, natural gasoline, intermediate feed stocks, finished products, chemicals, and water. These tanks are all located above ground and 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 may receive crude oil, other feed stocks, additives, and chemicals.

Gasoline and diesel is delivered to the Pilot Travel Center via tanker truck. An underground diesel pipeline exits between the refinery and the Pilot Travel Center. As the result of an off-refinery release, the pipeline was purged of product, filled with nitrogen and temporarily placed out of service. Western is working with OCD and PSTB to place this line back into service.

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 leading to the New API Separator (NAPIS).

The process wastewater system is a network of curbing, paving, catch basins, and underground piping that collects waste water effluent from various processing areas within the refinery and then conveys this wastewater to Tank 35 (T-35) and then to the NAPIS.

T-35 is an equalization tank which handles large process and storm water flows allowing the flow to the NAPIS to be controlled during process and storm water events. The equalization tank is also used to store the waste water for a couple of days if problems are encountered with the downstream equipment, i.e., NAPIS and the benzene strippers and in the future the new DAF and MPPE units. The NAPIS is a two compartment oil water separator. 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 oil is passed to a collection chamber where it is pumped back into the refinery process. The clarified water is piped to three benzene strippers where benzene is removed. The stripped water flows into the first aeration lagoon. Sludge sinks to the bottom of the NAPIS which is periodically vacuumed out by a vacuum truck and disposed as hazardous waste at an approved landfill or recycled and reused in refineries that have this allowable exemption under RCRA.

At the benzene strippers, ambient air is blown upwards through the falling cascade of clarified waste water as it passes through distillation column packing. Countercurrent desorption of benzene from the water occurs due to the high volume of air passing over the relatively large surface area provided by the packing. The desorbed benzene is absorbed into the air stream and vented to the atmosphere. Effluent from the stripper columns gravity flows through piping into the first aeration lagoon.

At the aeration basins, the treated waste water is mixed with air in order to oxidize any remaining organic constituents and increase the dissolved oxygen concentration available in the water for growth of bacteria and other microbial organisms. The microbes degrade hydrocarbons into carbon dioxide and water. Three 15-hp mechanical aerators provide aeration in the first aeration lagoon with two 15-hp aerators providing aeration in the second lagoon. Effluent from the second aeration lagoon flows onward into the first of several evaporation ponds of various sizes.

At the evaporation ponds, waste water is converted into vapor via solar and mechanical wind-effect evaporation. No waste water is discharged from the refinery to surface waters of the state because all of the waste water evaporates. .

The storm water system is a network of valves, gates, berms, embankments, culverts, trenches, ditches, natural arroyos, and retention ponds that collect, convey, control, treat, 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 T-35, T-27 and T-28 when needed before it reaches the NAPIS, benzene strippers and waste water treatment system for retention in evaporation ponds. Storm water discharge from the refinery is very infrequent due to the arid desert-like nature of the surrounding geographical area.

The Gallup Refinery currently operates under the Multi-Sector Permit 2008 (MSGP-2008). Gallup Refinery submitted a new NOI for coverage under the new MSGP. The refinery maintains a Storm Water Pollution Prevention Plan (SWPPP) that includes Best Management Practices (BMPs) for effective storm water pollution prevention. 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.

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 themselves through contact with contaminated ground water. However, drinking water wells remain the primary route of possible exposure.

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[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.

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. These wells are designated PW-2, PW-3 and PW-4. Figure 3 shows the locations of these wells. These wells are operated by the facility to provide the refinery's process water, drinking water to nearby refinery-owned houses, to the refinery itself, and to the Pilot Travel Center. These wells are monitored and no contaminants have been detected in the deep aquifer that these wells are screened within.

Other than the on-site wells, there are 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 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 having left the facility in shallow ground water.

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. Dry wastes could stem from wind-blown metallic powders used as catalysts, and regular municipal solid wastes stored in covered containers destined for municipal landfills.

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 attenuate. There is a possibility also that certain long-lived chemicals would not biodegrade, or, if they did, it would be at a very slow pace.

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 also within berms to contain spills. The NAPIS has double walls and a leak detection system. This situation did not exist in the past. So, past spills and leaks could be a source of ground water contamination.

Similarly, surface impoundments can serve as a source of possible ground water contamination. In the past, liquids from the railroad rack lagoon in the northeast end of the Facility discharged into a field and drain onto the ground and evaporate – this led to subsurface soil contamination and has recently 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 Sold Waste Management Units (SWMU) identified at the Gallup Refinery, and one closed Land Treatment Area.

<u>RCRA Regulated Units</u>

- Land Treatment Unit

<u>SWMUs</u>

- 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 Landfarm
- 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

Existing ground water monitoring wells effectively surround all these SWMUs.

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 rapidly picked up for recovery, some of the liquids present in a spill enter the subsurface. With precipitation, there is a possibility that some of the contaminants could leach out and reach ground water.

Separate Phase Hydrocarbons (SPH) floating on shallow ground water has been found at the northeast end of the facility. A system of recovery wells has been created and SPH has been pumped out for several years. Recovery through hand-bailing continues on a quarterly basis with the volumes recovered, dropping substantially every year. Trace levels of Benzene have also been found in wells in this area possibly linked to this spilled material.

<u>Recovery Wells</u>

- RW-1
- RW-2
- RW-5
- RW-6

A small tank that held Methyl Tert Butyl Ether (MTBE) has leaked and created a plume of MTBE in the shallow ground water at the northeast end of the refinery. This tank is no longer in service and has been removed. MTBE has not been used at the refinery since April 2006.

A series of monitoring wells at various depths are in place to monitor contaminant plumes from this northeast area that has SPH and MTBE releases. These monitoring wells are designated as follows.

<u>Monitoring Wells</u>

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

A unit at the southwest end of the Facility that is used to recover oil and recycle this 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 New American Petroleum Institute Separator (NAPIS) which was put into service in October 2004. The NAPIS has one up-gradient well – NAPIS-1 and three down-gradient shallow monitoring wells, NAPIS-2, NAPIS-3 and KA-3.

There has always been the possibility that the waste water treatment system of the Facility based at the aeration lagoons (AL-1 and AL-2) and evaporation pond 1 (EP-1) may have leaked contaminants into shallow ground water. The first aeration lagoon, known as AL-1, has received waste water with benzene at levels greater than 0.5 ppm – either through ineffective treatment farther upstream in the process, or through overflows – making these liquids a hazardous waste; however the aeration process and biological action within this lagoon has brought the benzene levels to well below 0.5 ppm and of the order of 0.1 ppm and less. Equalization tanks (Tank 35, Tank 27 and Tank 28) were put in service in 2011 for collection of excess waste water effluent from various processing areas within the refinery. The equalization tanks are used to divert excess waste water overflow to the NAPIS caused by unit shutdowns or rain storms. The waste water flow can then be controlled to the NAPIS.

Monitoring well GWM-1 was installed in July 2004 down gradient of the aeration basins in order to detect potential leakage from the aeration basins, however analyses of ground water samples collected at GWM-1 have indicated only very low concentrations of constituents such as BTEX and methyl tertiary butyl ether (MTBE) that would indicate a potential for historical releases in the area. GWM-1 has shown benzene levels ranging from 0.012 ppm in 2006 to 0.0096 ppm in 2011. Ethyl benzene was detected in July 2008 at 0.0039 ppm to 0.0042 ppm in December of 2021. MTBE was also detected in 2006 at 0.16 ppm with a slight decrease in December of 2011 at 0.054 ppm. The location of this well was determined in the field after mutual consultation by representatives of the refinery, OCD and the drilling contractor.

Two new shallow ground water monitoring wells were installed in the early fall of 2005 near GWM-1 which is located at the southwest corner of EP-1. GWM-2 was placed at the NW corner of EP-2 and GWM-3 was placed at the NW corner of EP-1. GWM-1, 2 and 3 were placed to determine whether any leakage from the lagoons and or evaporation pond is occurring. GWM-2 and GWM-3 are considered dry wells since its installation in 2005. Water was detected in the first quarter of 2008 in GWM-2Notification was given to NMED and OCD respectively. In 2010 during the second quarter inspections, GWM-2 and GWM-3 were found to have a water level of 1.5 feet in GWM-2 and 0.88 feet in GWM-3. Weekly inspections were done to monitor recharge rate. Quarterly inspections in 2011 have indicated the continued presence of water in both GWM-2 and GWM-3 wells. GWM-2 and GWM-3 have shown non-detectable (<0.001 ppm) levels of BTEX constituents and MTBE has been detected in GWM-2 at levels ranging from 0.011 ppm in September 2010 to 0.0027 ppm in December 2011, which are below the EPA RSL standard of 0.012 ppm. GWM-3 has also indicated the presence of MTBE at levels ranging from 0.009 ppm in September 2010 to non-detectable levels of <0.0025 ppm in

September and December 2011. GWM-2 and GWM-3 have also shown high levels of fluoride, chloride and sulfate which are above the WQCC and EPA MCL standards. GWM-3 has also detection levels of DRO ranging from 3.7 ppm in September 2010 to 1.3 ppm in December 2011. The continued presence of water in GWM-2 and GWM-3 may be attributed to the fluctuation of ground water levels due to the increase in moisture this year. Figure 3 shows the location of all of the active monitoring wells on the Facility.

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 lands and is used for cattle and sheep grazing at low densities[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.

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 7 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 ricegrass, 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

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

ricegrass, big sagebrush, galleta, bottlebrush squirreltail, fourwing saltbrush, needleandthread, oneseed juniper, sand dropseed, spineless horsebrush, rabbitbrush, and twoneedle 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 Mentmore-Gish 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, 2-72 inches 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 formation, Petrified Forest group) and siltstone start to appear. Figure 4 shows a generalized relationship of soils in and around the Gallup Refinery.

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 Formation, which consists of low permeability clay stones and siltstones that comprise the shale of this formation. As such, the Chinle Formation effectively serves as an aquiclude. Inter-bedded within the

[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

Chinle Formation is the Sonsela Sandstone bed, which represents the uppermost potential aquifer in the region.

The Sonsela Sandstone bed lies within and parallels the dip of the Chinle Formation. As such, its high point is located southeast of the refinery and it slopes downward to the northwest as it passes under the refinery. Due to the confinement of the Chinle Formation aquiclude, 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 Chinle 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 Chinle Formation is highly variable due to the presence of complex and irregular stratigraphy; including sand stringers, cobble beds, and dense clay layers. As such, hydraulic conductivity may range from less than 10^{-2} centimeters per second in the gravelly sands immediately overlying the Chinle Formation up 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 Chinle Formation. The prevailing flow direction is from the southeast and toward the northwest. In the past, a subsurface ridge has been identified that was thought to deflect some flow in a northeasterly direction in the vicinity of the refinery tank farm. This is not clear from the present data.

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 B provides more detailed information on actual sampling procedures 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.

Appendix C-1 provides 2011 details of the annual and quarterly DTW (depth to water) and DTB (depth to bottom) measurements taken during 2011. The table also includes date of establishment, ground elevation, top of casing elevation, well casing stick-up length, well depth, ground water elevation and corrected water table elevation with respect to wells that have separate phase hydrocarbon levels.

Appendix C-2 provides Revision 2 – 2011 Corrected Well Elevation Summary Table. This table provides a corrected version of the 2009 Well Elevation Summary Table which had some discrepancies regarding well elevations, well depth and stick up lengths. The information supplied in Revision 2 is a compilation of data provided by DePauli Engineering who was contracted to re-survey all of our active wells to verify ground level elevations, well casing elevations, stickup lengths. Gallup field technician also field verified casing diameters, depth to bottom of wells using a Testwell Water Level bottom sensing indicator as well as went over original drill logs to verify screened intervals. Screened interval depth to bottom level may be equal to or lower than the total depth of the well. Settlement may have occurred in some of these wells over time.

Appendix C-2.1 provides Revision 2 – 2011 Corrected Well Elevation Summary Table for Artesian Wells. Information provided in this section was gathered from well boring logs. These wells are encased and therefore measurement for depth to bottom was not field verified.

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 A - Table 1 Ground Water Monitoring Schedule, will be gauged to record the depth to SPH (if present), the depth to water, and the total depth 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. All measurements will be made relative to the same datum for all wells.

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, and dissolved oxygen (%). 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 disposable bailers and/or appropriately decontaminated 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 procedures are described in more detail in Appendix B. Decontamination procedures for reusable water sampling equipment are described in Appendix B.

All purged ground water and decontamination water from monitoring wells will be disposed of in the refinery waste water treatment system upstream of the API Separator. The procedures for disposing materials are described in Appendix B.

Ground water samples intended for metals analysis will be submitted to the laboratory as total metals samples. Ground water samples obtained for dissolved metals analysis will be filtered using 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 Western in sealed coolers. Chemical preservation is also provided by the laboratory through pre-preserved bottleware. 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, and nitrates. 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 Appendix B of this Plan, 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 method holding times. Details of the general sample handling procedures are provided in Appendix B.

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 chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Signed and dated chain-of-custody 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 for the constituents listed in Appendix D, Table 1. In addition, for various locations the list of metals is modified to either be the Skinner list of the NM Water Quality Control Commission list or RCRA 8 metals list. Appendix D, Table 1 provides a summary of target analytes for each EPA analytical method.

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 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 and 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 and trip blanks may be obtained for quality assurance during sampling activities. The samples will be handled as described in Section 4.4.3.

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 de-ionized water placed in an appropriate sample container. Trip blanks will be analyzed at a frequency of one for each shipping event involving twenty or more samples. Generally, a trip blank will only be placed in one of the containers, if more than one container is used to ship the set of samples.

4.4.3 Laboratory QA/QC Samples

Analytical procedures will be evaluated by analyzing reagent or method blanks, surrogates, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (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 (µg/L)); 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 chain-of-custody 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;
- 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,
- 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), and

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. Field duplicates will not be collected on a routine basis, as there is sufficient data to establish outliers or suspect results through a trends analysis. Field duplicate samples may be collected for confirmation if a sample establishes the presence of a contaminant in an unexpected location, such as a deep aquifer, or at unexpected levels.

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
- 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 two investigation areas (East Side and West Side). The sampling frequency, analyses and target analytes will vary for each investigation area and well/outfall/evaporation pond location. 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 East Side

5.1.1 Sampling Locations

The location of the East Side monitoring and recovery wells are shown in Figure 3. The following wells will be sampled (as described in Appendix D, Table 1) within the East Side area:

Recovery wells

- RW-1
- RW-2
- RW-5
- RW-6

Monitoring wells

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

5.2 West Side

5.2.1 Sampling Locations

The locations of wells on the West Side are shown in Figure 3.

The following wells, outfalls, and ponds will be sampled (as described in Appendix D, Table 1) within the West Side area:

(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.)

Monitoring wells

- NAPIS 1

- NAPIS 2
- NAPIS 3
- KA-3
- GWM-1
- GWM-2
- GWM-3
- SMW-2
- SMW-4
- MW-1
- MW-2
- MW-4
- MW-5
- OW-1
- OW-10
- OW-11
- OW-12
- BW-1A
- BW-1B
- BW-1C
- BW-2A
- BW-2B
- BW-2C
- BW-3A
- BW-3B
- BW-3C
- PW-2
- PW-3
- PW-4

<u>Outfalls</u>

- Influent to AL-1
- Influent to AL-2
- Influent to EP-2
- AL2 to EP-1
- Pilot Effluent (Travel Center)
- NAPIS Effluent
- Boiler Water Inlet to EP-2

<u>Ponds</u>

- EP-1
- EP-2
- EP-3

- EP-4
- EP-5
- EP-6
- EP-7
- EP-8
- EP-9
- EP-11
- EP-12A
- EP-12B
- Any temporary pond containing liquid

Containment

- NAPIS secondary containment (Leak Detection Units -LDU)
    - East LDU
    - West LDU
    - Oil Sump LDU

5.3 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 Western Refining 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.

5.3.1 Request for Modifications to Sampling Plan

Gallup Refinery requests a change to the monitoring frequency for the following wells; OW-50, OW-52 and OW-1. OW-50 and OW-52 were installed in October 2009 to monitor the possible migration of MTBE from up-gradient wells OW-14, OW-29 and OW-30. Since its installation, quarterly sampling analytical lab data has indicated non-detect for BTEX constituents as well as MTBE and VOCs for 2010 and 2011. Based on the analytical data Gallup requests to change the monitoring/sampling frequency to an annual basis.

OW-1 inspection was changed in the Facility Wide Monitoring Work Plan approved August 25, 2010 to quarterly sampling. In the past this well was only required to be visually checked and water level measurement recorded on a quarterly basis. Based on the 2010 and 2011 quarterly sampling results, lab analysis data indicates non-detectable levels for BTEX plus MTBE constituents as well as VOCs for 2010 and 2011. Gallup proposes to change the sampling frequency to an annual basis and continue to monitor this well on a quarterly basis for water level measurement.

Based on these proposals, Gallup has made changes to Appendix D to reflect requested changes. Hall Environmental Lab Data is also included for OW-50, OW-52, and OW-1 in Appendix E as supporting documents.

Appendix A: Letter from NMED/HWB February 9

NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
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BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

February 9, 2009

Mr. Ed Riege
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
Route 3, Box 7
Gallup, New Mexico 87301

RE: FACILITY WIDE GROUNDWATER MONITORING WORK PLAN
WESTERN REFINING COMPANY, SOUTHWEST, INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-GRCC-09-001

Dear Mr. Riege:

The New Mexico Environment Department (NMED) requires Western Refining Company, Southwest Inc., Gallup Refinery (Permittee) to submit a Facility Wide Groundwater Monitoring Plan (Monitoring Plan). The purpose of this Monitoring Plan is to characterize the nature and extent of groundwater contamination at, and migrating from the facility and provide one plan that contains all groundwater monitoring activities that will satisfy both NMED and the New Mexico Energy Minerals and Natural Resource Department Oil Conservation Division (OCD) requirements. The Monitoring Plan must be revised on an annual basis to accommodate monitoring changes at the facility and to alleviate the need to update NMED and OCD permits. .

Currently, the groundwater monitoring requirements are established in the OCD Discharge Plan dated August 23, 2007, specifically items 16 (the Sampling Schedule Resulting from historical New API Separator Spills), 19, 20 (A & B), and 25.

The Permittee must use Attachment 1 of this letter as a general guide for preparing the Monitoring Plan. The Monitoring Plan must include, but is not limited to the following:

a. A general description of the hydrogeologic system beneath the facility.

b. A section or table to include, but not limited to, a description of all existing monitoring wells, recovery wells, and any other required sampling locations specifying their exact location, date the wells were installed including ground elevation, top of casing elevation, well casing stick up length, well depth, well casing diameter, screened interval, screen length, and stratigraphic unit(s) intersected by the well screen.

c. The initial submittal must include a section or appendix that includes all well construction diagrams.

d. A facility map showing all monitoring well locations. This map must be revised as necessary to reflect any well additions and well abandonments that occur during the year.

e. The current groundwater monitoring/sampling requirements found in the OCD Discharge Plan (items 16 (the *Sampling Schedule Resulting from historical New API Separator Spills*), 19, 20 (A & B), and 25).

f. The sampling requirements must include the proposed frequency of sampling, sampling methodology, field water quality parameters to be measured, and chemical analytical methods.

g. A description of all sampling methods and procedures that will be applied during each monitoring event.

h. Identification of all field instruments proposed for use as well as calibration procedures.

The Permittee must continue to submit their Annual Groundwater Monitoring Report to NMED and the OCD by September 1 of each subsequent year to include the specified items found in the OCD Discharge Permit and describe all groundwater monitoring activities. The annual updates to this Monitoring Plan must be submitted by April 1 of each year beginning in 2010, so that any changes will be implemented prior to the groundwater monitoring summaries provided in the Annual Groundwater Monitoring Report.

Once this Monitoring Plan is approved, this plan will include and replace the requirements of the OCD Discharge Plan. The information gathered per the Monitoring Plan will then be included in the Annual Groundwater Monitoring Report. The Annual Groundwater Monitoring Report is considered a Periodic Monitoring Report for the purpose of compliance with NMED requirements and the OCD Discharge Plan items 20 (A and B) and 25. Attachment 2 provides general guidance for the preparation of Periodic Monitoring Reports.

The Permittee must submit the Monitoring Plan to NMED and the OCD on or before May 11, 2009. If you have questions regarding this letter please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

John E. Kieling
Program Manager
Permits Management Program
Hazardous Waste Bureau

cc: D. Cobrain NMED HWB
H. Monzeglio, NMED HWB
W. Price, OCD
B. Jones, OCD
G. Rajen, Gallup
File: Reading File and GRCC 2009 File
HWB-GRCC-09-001

ATTACHMENT 1
GENERAL GUIDE FOR COMPOSING THE MONITORING PLAN

- An Executive Summary (Abstract) must be included to provide a brief summary of the purpose and scope of the Monitoring Plan. This section must include the facility name and portions of the facility including any areas of concern (AOCs), Solid Waste Management Units (SWMUs) or other locations that the Monitoring Plan will be addressing.

- A Table of Contents must be included that lists all text sections, subsections, tables, figures, and appendices or attachments included in the Monitoring Plan.

- An Introduction must be included in the Monitoring Plan to include general information on the current facility and a brief description of the purpose of the proposed groundwater monitoring and the types of activities that will be conducted.

- A Background section must be added that briefly describes relevant general background information, including historical site uses, potential receptors, the type and characteristics of the waste or contaminants and any known and possible source(s), and a summary of the history of contaminant releases which could be contributing to groundwater contamination.

- The Permittee must include a Site Conditions section to provide a detailed description of current site topography and locations of natural features and manmade structures. This section must include a description of drainages, vegetation types, erosional features, and current site uses, in addition to, descriptions of features located in surrounding sites (i.e. SWMUs, AOCs) that may have an impact on the subject site regarding recharge sediment transport, surface water runoff, or contaminant fate and transport. A description of subsurface conditions must also be included that provides a discussion of the conditions observed during previous subsurface investigations, including but not limited to soil types and associations, stratigraphy, and the presence and flow direction of groundwater.

- A Scope of Activities section must include a list of all anticipated activities to be performed during the facility-wide groundwater monitoring sampling events.

- A section must be included that provides a description of all anticipated locations to be sampled and methods for conducting the activities during the facility wide groundwater monitoring events. This section must include, but is not limited to, descriptions of: sampling methods, sample handling procedures, procedures for collecting field water quality measurements, any field equipment and calibration procedures, water level measurement, purging activities, and decontamination procedures. This section must also address Investigation Derived Waste (IDW).

- The Permittee must include a Schedule section that proposes a schedule for the groundwater monitoring.

- Tables, Figures, and Appendices must be included.

Appendix B: Gallup Field Sampling Collection and Handling Standard Procedures

Field Data Collection: Elevation and Purging

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

All water/product levels are measured to an accuracy of the nearest 0.01 foot using an electrical conductivity based meter, the Heron Instruments 100 ft. DipperT electric water depth tape complying with US GGG-T-106E, EEC Class II. 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 the DipperT electric water depth tape. If product is present, a ground water sample is typically 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 (%). The well will be retested for pH, temperature, specific conductivity and dissolved oxygen (%) 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, SMW-4, OW13, OW14, OW29 and OW30 are each equipped with a dedicated electrical pump. The remaining wells are purged using a portable Grundfos pump. Recovery wells and NAPIS-1, NAPIS-2, NAPIS-3 and KA-3 are hand-bailed as well as GWM1 and GWM2 and GWM3 are hand-bailed if the presence of water is detected.

Purged well water from wells is collected in fifty five gallon drums and disposed of upstream of the NAPIS. The water is treated in the refinery's waste water treatment system.

Sampling Equipment at Gallup

The following sampling equipment is maintained at Gallup 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 syringe 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.

Calibration and maintenance procedures will be performed according to the manufacturer's specifications.

Order of Collection

Samples will be collected in the order listed below:

Parameter	Bottle Type
VOC, SVOC	40 ml VOA vials, (H_2SO_4)
TOC	1 liter glass jar, H_2SO_4
Extractable Organics	1 liter glass jar with Teflon™ cap
Metals* Total and Dissolved	500 ml, 125 ml plastic, HNO_3
Phenols, Cyanide	1 liter glass jar
Chloride, Sulfate, Nitrates	1 liter plastic, no preservative

* Prefiltration bottle for dissolved metals which is subsequently filtered and transferred to a pint plastic bottle with HNO_3.

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 paper 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 HNO3 to pH <2 in the field.

Gallup 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 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 QC requirements before departing—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/ bailer is 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 disposed 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 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. 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.

WELL DATA 2011 ANNUAL/QUARTERLY SAMPLING
2011 DTB/DTW MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	A Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	A Depth to SPH (ft)	B SPH Thickness (ft)	C Depth to Water (ft)	D = A-C Ground water Elevation (ft)	= 0.8 B + D Corrected Water Table Elevation	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[1]	Purge Volume = 3 Well Vol (gal)
11/10/2003	BW-1A	10/28/2011	2.00	6,874.10	6,876.68	6,872.30	4.38	6,839.06	37.62	N/A	N/A	0.00	DRY	N/A	30 - 35	Chinle/Alluvium	Upper Sand	N/A
10/28/2003	BW-1B	10/28/2011	2.00	6,874.13	6,876.94	6,876.26	0.68	6,809.49	67.45	N/A	N/A	0.00	DRY	N/A	54.6 - 64.6	Chinle/Alluvium	Chinle/Alluvium Interface	N/A
11/10/2003	BW-1C	10/28/2011	2.00	6,873.95	6,876.78	6,872.28	4.50	6,740.39	136.39	N/A	N/A	6.11	6,867.84	N/A	125 -135	Sonsela Sandstone	Sonsela	63.66
11/10/2003	BW-2A	10/28/2011	2.00	6,871.88	6,874.69	6,870.45	4.24	6,807.12	67.57	N/A	N/A	32.16	6,839.72	N/A	55 - 65	Chinle/Alluvium	Upper Sand	17.32
10/28/2003	BW-2B	10/28/2011	2.00	6,871.66	6,874.50	6,870.06	4.44	6,782.24	92.26	N/A	N/A	27.56	6,844.10	N/A	80 - 90	Sonsela Sandstone	Chinle/Alluvium Interface	31.64
10/28/2003	BW-2C	10/28/2011	2.00	6,872.90	6,875.30	6,872.02	3.28	6,722.46	152.84	N/A	N/A	20.18	6,852.72	N/A	139.5 - 149.5	Sonsela Sandstone	Sonsela	64.87
6/15/2004	BW-3A	10/28/2011	2.00	6,875.94	6,878.39	6,875.08	3.31	6,826.04	52.35	N/A	N/A	0.00	DRY	N/A	39.5 - 49.5	Chinle/Alluvium	Upper Sand	N/A
10/15/2003	BW-3B	10/28/2011	2.00	6,876.16	6,878.59	6,875.41	3.18	6,809.19	69.40	N/A	N/A	32.10	6,844.06	N/A	63 - 73	Chinle/Alluvium	Chinle/Alluvium Interface	18.24
7/20/2004	BW-3C	10/28/2011	2.00	6,875.72	6,877.95	6,875.27	2.68	6,723.40	154.55	N/A	N/A	7.62	6,868.10	N/A	144.5 - 154.5	Sonsela Sandstone	Sonsela	71.8
9/25/1981	OW-11	10/26/2011	4.00	6,922.05	6,923.51	6,921.80	1.71	6,857.72	65.79	N/A	N/A	20.83	6,901.22	N/A	43 - 65	Chinle/Alluvium	Sonsela	99.81
12/15/1980	OW-12	10/26/2011	4.00	6,939.57	6,940.69	6,939.04	1.65	6,811.84	128.85	N/A	N/A	48.00	6,891.57	N/A	117.8 - 137.8	Sonsela Sandstone	Sonsela	179.49
10/14/1981	MW-1	10/6/2011	5.00	6,876.63	6,878.12	6,876.79	1.33	6,747.29	130.83	N/A	N/A	6.79	6,869.84	N/A	117.72 - 127.72	Chinle/Alluvium	Sonsela	379.56
10/15/1981	MW-2	10/10/2011	5.00	6,878.39	6,880.30	6,878.41	1.89	6,742.82	137.48	N/A	N/A	8.80	6,869.59	N/A	112 - 122	Chinle/Alluvium	Sonsela	393.76
10/16/1981	MW-4	10/12/2011	5.00	6,879.89	6,881.63	6,879.34	2.29	6,759.91	121.72	N/A	N/A	7.72	6,872.17	N/A	101 - 121	Sonsela Sandstone	Sonsela	348.84
7/21/1986	MW-5	10/10/2011	4.00	6,880.20	6,882.83	6,881.77	1.06	6,752.00	130.83	N/A	N/A	14.52	6,865.68	N/A	115 - 125	Sonsela Sandstone	Sonsela	258.21
9/26/1985	SMW-2	10/12/2011	2.00	6,881.63	6,883.97	6,879.07	4.90	6,831.17	52.80	N/A	N/A	25.58	6,856.05	N/A	34.31 - 54.31	Chinle/Alluvium	Chinle/Alluvium and Upper Sand	13.31
9/25/1985	SMW-4	10/10/2011	2.00	6,877.63	6,879.52	6,875.72	3.80	6,809.84	69.68	N/A	N/A	29.33	6,848.30	N/A	51.7 - 71.7	Chinle Alluvium	Chinle/Alluvium Interface	19.73
1/5/1981	OW-1	12/15/2011	4.00	6,866.32	6,866.62	6,866.44	0.18	6,772.07	94.55	N/A	N/A	3.48	6,862.84	N/A	89.3 - 99.3	Sonsela Sandstone	Sonsela	178
		10/13/2011	4.00	6,866.32	6,866.62	6,866.44	0.18	6,772.07	94.55	N/A	N/A	0.00	6,866.32	N/A	89.3 - 99.3	Sonsela Sandstone	Sonsela	209.52
		10/26/2011	4.00	6,866.32	6,866.62	6,866.44	0.18	6,772.07	94.55	N/A	N/A	0.17	6,866.15	N/A	89.3 - 99.3	Sonsela Sandstone	Sonsela	209.52
		6/20/2011	4.00	6,866.32	6,866.62	6,866.44	0.18	6,772.07	94.55	N/A	N/A	1.90	6,864.42	N/A	89.3 - 99.3	Sonsela Sandstone	Sonsela	204.55
		2/28/2011	4.00	6,866.32	6,866.62	6,866.44	0.18	6,772.07	94.55	N/A	N/A	1.84	6,864.48	N/A	89.3 - 99.3	Sonsela Sandstone	Sonsela	204.68

WELL DATA 2011 ANNUAL/QUARTERLY SAMPLING
2011 DTB/DTW MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	A Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	A Depth to SPH (ft)	B SPH Thickness (ft)	C Depth to Water (ft)	D = A-C Ground water Elevation (ft)	= 0.8 B + D Corrected Water Table Elevation	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[1]	Purge Volume = 3 Well Vol (gal)
11/25/1980	OW-10	12/15/2011	4.00	6,873.67	6,874.91	6,872.59	2.32	6,814.58	60.33	N/A	N/A	0.78	6,872.89	N/A	40 - 60	Chinle/Alluvium	Sonslea	116
		10/13/2011	4.00	6,873.67	6,874.91	6,872.59	2.32	6,814.58	60.33	N/A	N/A	0.19	6,873.48	N/A	40 - 60	Chinle/Alluvium	Sonsela	133.51
		10/26/2011	4.00	6,873.67	6,874.91	6,872.59	2.32	6,814.58	60.33	N/A	N/A	0.42	6,873.25	N/A	40 - 60	Chinle/Alluvium	Sonsela	133
		6/20/2011	4.00	6,873.67	6,874.91	6,872.59	2.32	6,814.58	60.33	N/A	N/A	1.40	6,872.27	N/A	40 - 60	Chinle/Alluvium	Sonsela	147.85
		2/28/2011	4.00	6,873.67	6,874.91	6,872.59	2.32	6,814.58	60.33	N/A	N/A	0.35	6,873.32	N/A	40 - 60	Chinle/Alluvium	Sonsela	150.18
12/10/1980	OW-13	12/13/2011	4.00	6,918.95	6,920.07	6,915.33	4.74	6,820.92	99.15	N/A	N/A	23.00	6,895.95	N/A	78.2 - 98.2	Sonsela Sandstone	Sonsela	150
		10/25/2011	4.00	6,918.95	6,920.07	6,915.33	4.74	6,820.92	99.15	N/A	N/A	23.14	6,895.81	N/A	78.2 - 98.2	Sonsela Sandstone	Sonsela	168.74
		6/20/2011	4.00	6,918.95	6,920.07	6,915.33	4.74	6,820.92	99.15	N/A	N/A	23.19	6,895.76	N/A	78.2 - 98.2	Sonsela Sandstone	Sonsela	170.52
		2/24/2011	4.00	6,918.95	6,920.07	6,915.33	4.74	6,820.92	99.15	N/A	N/A	23.32	6,895.63	N/A	78.2 - 98.2	Sonsela Sandstone	Sonsela	170.23
12/17/1980	OW-14	12/13/2011	4.00	6,924.55	6,926.65	6,924.40	2.25	6,880.13	46.52	N/A	N/A	25.19	6,899.36	N/A	35 - 45	Chinle/Alluvium	Chinle/Alluvium Interface	42
		10/24/2011	4.00	6,924.55	6,926.65	6,924.40	2.25	6,880.13	46.52	N/A	N/A	25.38	6,899.17	N/A	35 - 45	Chinle/Alluvium	Chinle/Alluvium Interface	46.93
		6/20/2011	4.00	6,924.55	6,926.65	6,924.40	2.25	6,880.13	46.52	N/A	N/A	25.45	6,899.10	N/A	35 - 45	Chinle/Alluvium	Chinle/Alluvium Interface	43.4
		2/24/2011	4.00	6,924.55	6,926.65	6,924.40	2.25	6,880.13	46.52	N/A	N/A	25.69	6,898.86	N/A	35 - 45	Chinle/Alluvium	Chinle/Alluvium Interface	42.87
8/23/1996	OW-29	12/13/2011	4.00	6,913.89	6,917.00	6,912.09	4.91	6,865.92	51.08	N/A	N/A	20.00	6,893.89	N/A	37.5 - 47.5	Chinle/Alluvium	Chinle/Alluvium Interface	61
		10/24/2011	4.00	6,913.89	6,917.00	6,912.09	4.91	6,865.92	51.08	N/A	N/A	20.06	6,893.83	N/A	37.5 - 47.5	Chinle/Alluvium	Chinle/Alluvium Interface	68.4
		6/20/2011	4.00	6,913.89	6,917.00	6,912.09	4.91	6,865.92	51.08	N/A	N/A	20.44	6,893.45	N/A	37.5 - 47.5	Chinle/Alluvium	Chinle/Alluvium Interface	63.4
		2/24/2011	4.00	6,913.89	6,917.00	6,912.09	4.91	6,865.92	51.08	N/A	N/A	20.49	6,893.40	N/A	37.5 - 47.5	Chinle/Alluvium	Chinle/Alluvium Interface	69.95
8/28/1996	OW-30	12/15/2011	4.00	6,921.81	6,924.69	6,919.84	4.85	6,874.79	49.90	N/A	N/A	24.64	6,897.17	N/A	37.9 - 47.9	Chinle/Alluvium	Chinle/Alluvium Interface	50
		10/24/2011	4.00	6,921.81	6,924.69	6,919.84	4.85	6,874.79	49.90	N/A	N/A	24.70	6,897.11	N/A	37.9 - 47.9	Chinle/Alluvium	Chinle/Alluvium Interface	55.94
		6/20/2011	4.00	6,921.81	6,924.69	6,919.84	4.85	6,874.79	49.90	N/A	N/A	24.80	6,897.01	N/A	37.9 - 47.9	Chinle/Alluvium	Chinle/Alluvium Interface	52.39
		2/24/2011	4.00	6,921.81	6,924.69	6,919.84	4.85	6,874.79	49.90	N/A	N/A	24.91	6,896.90	N/A	37.9 - 47.9	Chinle/Alluvium	Chinle/Alluvium Interface	52.15
10/5/2009	OW-50[3]	12/15/2011	2.00	6,912.63	6,914.21	6,911.46	2.75	6,850.21	64.00	N/A	N/A	17.30	6,895.33	N/A	48 - 63	Chinle/Alluvium	Chinle/Alluvium Interface	23

WELL DATA 2011 ANNUAL/QUARTERLY SAMPLING
2011 DTB/DTW MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	A Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	A Depth to SPH (ft)	B SPH Thickness (ft)	C Depth to Water (ft)	D = A-C Ground water Elevation (ft)	= 0.8 B + D Corrected Water Table Elevation	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[1]	Purge Volume = 3 Well Vol (gal)
		10/25/2011	2.00	6,912.63	6,914.21	6,911.46	2.75	6,850.21	64.00	N/A	N/A	17.51	6,895.12	N/A	48 - 63	Chinle/Alluvium	Chinle/Alluvium Interface	22.73
		6/20/2011	2.00	6,912.63	6,914.21	6,911.46	2.75	6,850.21	64.00	N/A	N/A	17.61	6,895.02	N/A	48 - 63	Chinle/Alluvium	Chinle/Alluvium Interface	22.2
		3/1/2011	2.00	6,912.63	6,914.21	6,911.46	2.75	6,850.21	64.00	N/A	N/A	17.61	6,895.02	N/A	48 - 63	Chinle/Alluvium	Chinle/Alluvium Interface	22.2
10/5/2009	OW-52[3]	12/13/2011	2.00	6,906.53	6,907.68	6,905.31	2.37	6,829.94	77.74	N/A	N/A	15.90	6,890.63	N/A	64 - 79	Chinle/Alluvium	Chinle/Alluvium Interface	30
		10/25/2011	2.00	6,906.53	6,907.68	6,905.31	2.37	6,829.94	77.74	N/A	N/A	16.14	6,890.39	N/A	64 - 79	Chinle/Alluvium	Chinle/Alluvium Interface	30.12
		6/20/2011	2.00	6,906.53	6,907.68	6,905.31	2.37	6,829.94	77.74	N/A	N/A	16.09	6,890.44	N/A	64 - 79	Chinle/Alluvium	Chinle/Alluvium Interface	30.76
		3/1/2011	2.00	6,906.53	6,907.68	6,905.31	2.37	6,829.94	77.74	N/A	N/A	16.18	6,890.35	N/A	64 - 79	Chinle/Alluvium	Chinle/Alluvium Interface	30.72
7/8/2004	GWM-1	12/14/2011	2.00	6,910.22	6,912.61	6,908.36	4.25	6,886.41	26.20	N/A	N/A	16.08	6,894.14	N/A	17.5 - 23.5	Chinle/Alluvium	Chinle/Alluvium Interface	4.9
		9/26/2011	2.00	6,910.22	6,912.61	6,908.36	4.25	6,886.41	26.20	N/A	N/A	16.42	6,893.80	N/A	17.5 - 23.5	Chinle/Alluvium	Chinle/Alluvium Interface	4.78
		6/15/2011	2.00	6,910.22	6,912.61	6,908.36	4.25	6,886.41	26.20	N/A	N/A	15.82	6,894.40	N/A	17.5 - 23.5	Chinle/Alluvium	Chinle/Alluvium Interface	3.84
		2/16/2011	2.00	6,910.22	6,912.61	6,908.36	4.25	6,886.41	26.20	N/A	N/A	15.99	6,894.23	N/A	17.5 - 23.5	Chinle/Alluvium	Chinle/Alluvium Interface	3.16
9/25/2005	GWM-2	12/14/2011	2.00	6,910.32	6,913.09	6,908.05	5.04	6,894.28	18.81	N/A	N/A	15.40	6,894.92	N/A	3.2 - 16.2	Chinle/Alluvium	Chinle/Alluvium Interface	1.6
		9/26/2011	2.00	6,910.32	6,913.09	6,908.05	5.04	6,894.28	18.81	N/A	N/A	15.89	6,894.43	N/A	3.2 - 16.2	Chinle/Alluvium	Chinle/Alluvium Interface	1.51
		6/15/2011	2.00	6,910.32	6,913.09	6,908.05	5.04	6,894.28	18.81	N/A	N/A	15.02	6,895.30	N/A	3.2 - 16.2	Chinle/Alluvium	Chinle/Alluvium Interface	1.93
		2/16/2011	2.00	6,910.32	6,913.09	6,908.05	5.04	6,894.28	18.81	N/A	N/A	15.08	6,895.24	N/A	3.2 - 16.2	Chinle/Alluvium	Chinle/Alluvium Interface	0.7
9/25/2005	GWM-3	12/14/2011	2.00	6,907.35	6,910.25	6,905.48	4.77	6,892.45	17.80	N/A	N/A	14.35	6,893.00	N/A	3 - 15	Chinle/Alluvium	Chinle/Alluvium Interface	1.7
		9/26/2011	2.00	6,907.35	6,910.25	6,905.48	4.77	6,892.45	17.80	N/A	N/A	15.64	6,891.71	N/A	3 - 15	Chinle/Alluvium	Chinle/Alluvium Interface	3.94
		6/15/2011	2.00	6,907.35	6,910.25	6,905.48	4.77	6,892.45	17.80	N/A	N/A	14.20	6,893.15	N/A	3 - 15	Chinle/Alluvium	Chinle/Alluvium Interface	1.82
		2/16/2011	2.00	6,907.35	6,910.25	6,905.48	4.77	6,892.45	17.80	N/A	N/A	12.84	6,894.51	N/A	3 - 15	Chinle/Alluvium	Chinle/Alluvium Interface	0.46
3/14/2008	NAPIS-1	12/14/2011	2.00	6,913.62	6,913.86	6,913.56	0.30	6,900.33	13.53	N/A	N/A	7.45	6,906.17	N/A	3.7 - 13.7	Chinle/Alluvium	Chinle/Alluvium Interface	3
		9/27/2011	2.00	6,913.62	6,913.86	6,913.56	0.30	6,900.33	13.53	N/A	N/A	7.30	6,906.32	N/A	3.7 - 13.7	Chinle/Alluvium	Chinle/Alluvium Interface	3.05
		6/15/2011	2.00	6,913.62	6,913.86	6,913.56	0.30	6,900.33	13.53	N/A	N/A	7.96	6,905.66	N/A	3.7 - 13.7	Chinle/Alluvium	Chinle/Alluvium Interface	2.95

WELL DATA 2011 ANNUAL/QUARTERLY SAMPLING
2011 DTB/DTW MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	A Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	A Depth to SPH (ft)	B SPH Thickness (ft)	C Depth to Water (ft)	D = A-C Ground water Elevation (ft)	= 0.8 B + D Corrected Water Table Elevation	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[1]	Purge Volume = 3 Well Vol (gal)
		3/2/2011	2.00	6,913.62	6,913.86	6,913.56	0.30	6,900.33	13.53	N/A	N/A	7.47	6,906.15	N/A	3.7 - 13.7	Chinle/Alluvium	Chinle/Alluvium Interface	3.19
3/14/2008	NAPIS-2	12/14/2011	2.00	6,913.40	6,912.65	6,912.54	0.11	6,899.04	13.61	N/A	N/A	8.20	6,905.20	N/A	4.2 - 14.2	Chinle/Alluvium	Chinle/Alluvium Interface	2.6
		9/27/2011	2.00	6,913.40	6,912.65	6,912.54	0.11	6,899.04	13.61	N/A	N/A	8.18	6,905.22	N/A	4.2 - 14.2	Chinle/Alluvium	Chinle/Alluvium Interface	2.66
		6/15/2011	2.00	6,913.40	6,912.65	6,912.54	0.11	6,899.04	13.61	N/A	N/A	8.67	6,904.73	N/A	4.2 - 14.2	Chinle/Alluvium	Chinle/Alluvium Interface	2.85
		3/2/2011	2.00	6,913.40	6,912.65	6,912.54	0.11	6,899.04	13.61	N/A	N/A	9.14	6,904.26	N/A	4.2 - 14.2	Chinle/Alluvium	Chinle/Alluvium Interface	2.62
3/14/2008	NAPIS-3	12/14/2011	2.00	6,913.38	6,912.76	6,912.53	0.23	6,882.34	30.42	N/A	N/A	8.30	6,905.08	N/A	25.4 - 30-4	Chinle/Alluvium	Chinle/Alluvium Interface	11
		9/27/2011	2.00	6,913.38	6,912.76	6,912.53	0.23	6,882.34	30.42	N/A	N/A	7.74	6,905.64	N/A	25.4 - 30-4	Chinle/Alluvium	Chinle/Alluvium Interface	11.09
		6/15/2011	2.00	6,913.38	6,912.76	6,912.53	0.23	6,882.34	30.42	N/A	N/A	7.89	6,905.49	N/A	25.4 - 30-4	Chinle/Alluvium	Chinle/Alluvium Interface	11.15
		3/2/2011	2.00	6,913.38	6,912.76	6,912.53	0.23	6,882.34	30.42	N/A	N/A	8.11	6,905.27	N/A	25.4 - 30-4	Chinle/Alluvium	Chinle/Alluvium Interface	11.05
6/11/2007	KA-3	12/14/2011	2.00	6,913.29	6,912.52	6,912.20	0.32	6,889.32	23.20	N/A	N/A	8.08	6,905.21	N/A	15 - 25	Chinle/Alluvium	Chinle/Alluvium Interface	7.25
		9/27/2011	2.00	6,913.29	6,912.52	6,912.20	0.32	6,889.32	23.20	N/A	N/A	8.11	6,905.18	N/A	15 - 25	Chinle/Alluvium	Chinle/Alluvium Interface	7.38
		6/15/2011	2.00	6,913.29	6,912.52	6,912.20	0.32	6,889.32	23.20	N/A	N/A	8.44	6,904.85	N/A	15 - 25	Chinle/Alluvium	Chinle/Alluvium Interface	8.1
		3/2/2011	2.00	6,913.29	6,912.52	6,912.20	0.32	6,889.32	23.20	N/A	N/A	8.51	6,904.78	N/A	15 - 25	Chinle/Alluvium	Chinle/Alluvium Interface	8.06
3/28/1995	RW-1	11/28/2011	4.00	6,942.86	6,946.06	6,941.25	4.81	6,903.02	43.04	30.77	0.08	30.85	6,912.01	6912.074	25 - 40	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		10/3/2011	4.00	6,942.86	6,946.06	6,941.25	4.81	6,903.02	43.04	30.81	0.09	30.90	6,911.96	6912.032	25 - 40	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		6/27/2011	4.00	6,942.86	6,946.06	6,941.25	4.81	6,903.02	43.04	30.52	0.11	30.63	6,912.23	6912.318	25 - 40	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		3/9/2011	4.00	6,942.86	6,946.06	6,941.25	4.81	6,903.02	43.04	30.04	0.11	30.15	6,912.71	6912.798	25 - 40	Chinle/Alluvium	Chinle/Alluvium Interface	NA
3/29/1995	RW-2	11/28/2011	4.00	6,926.40	6,928.53	6,925.02	3.51	6,888.73	39.80	0.00	0.00	31.65	6,894.75	6894.75	26.1 - 36.1	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		10/3/2011	4.00	6,926.40	6,928.53	6,925.02	3.51	6,888.73	39.80	0.00	0.00	25.36	6,901.04	6901.04	26.1 - 36.1	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		6/27/2011	4.00	6,926.40	6,928.53	6,925.02	3.51	6,888.73	39.80	0.00	0.00	26.71	6,899.69	6899.69	26.1 - 36.1	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		3/9/2011	4.00	6,926.40	6,928.53	6,925.02	3.51	6,888.73	39.80	0.00	0.00	25.68	6,900.72	6900.72	26.1 - 36.1	Chinle/Alluvium	Chinle/Alluvium Interface	NA
8/27/1997	RW-5	11/28/2011	4.00	6,941.53	6,943.57	6,940.82	2.75	6,903.98	39:59	0.00	29.85	29.85	6,911.68	6935.56	29.5 - 39.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA

WELL DATA 2011 ANNUAL/QUARTERLY SAMPLING
2011 DTB/DTW MEASUREMENTS

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	A Ground Level Elevations (ft)	Well Casing Rim Elevations (ft)	Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	A Depth to SPH (ft)	B SPH Thickness (ft)	C Depth to Water (ft)	D = A-C Ground water Elevation (ft)	= 0.8 B + D Corrected Water Table Elevation	Screened Interval Depth Top to Bottom (ft)	Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[1]	Purge Volume = 3 Well Vol (gal)
		10/3/2011	4.00	6,941.53	6,943.57	6,940.82	2.75	6,903.98	39.59	0.00	0.00	29.89	6,911.64	6911.64	29.5 - 39.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		6/27/2011	4.00	6,941.53	6,943.57	6,940.82	2.75	6,903.98	39.59	0.00	30.11	30.11	6,911.42	6935.508	29.5 - 39.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		3/9/2011	4.00	6,941.53	6,943.57	6,940.82	2.75	6,903.98	39.59	0.00	0.00	30.05	6,911.48	6911.48	29.5 - 39.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA
8/27/1997	RW-6	11/28/2011	4.00	6,941.96	6,944.01	6,941.49	2.52	6,903.11	40.90	29.90	0.03	29.93	6,912.03	6912.054	28.5 - 38.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		10/4/2011	4.00	6,941.96	6,944.01	6,941.49	2.52	6,903.11	40.90	29.91	0.03	29.94	6,912.02	6912.044	28.5 - 38.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		6/27/2011	4.00	6,941.96	6,944.01	6,941.49	2.52	6,903.11	40.90	30.11	0.04	30.15	6,911.81	6911.842	28.5 - 38.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA
		3/9/2011	4.00	6,941.96	6,944.01	6,941.49	2.52	6,903.11	40.90	30.24	0.02	30.26	6,911.70	6911.716	28.5 - 38.5	Chinle/Alluvium	Chinle/Alluvium Interface	NA

NOTES:
DTB - Depth to Bottom
DTW - Depth to Water
SPH = Separate Phase Hydrocarbons
Corrected water table elevations are only provided if SPH was detected.
Total well depth re-measured on 9-19-11.
[1] Stratigraphic interpretation conducted by Peregrine GeoConnect to re-evaluate the named zones they produce water from. Tables were updated to reflect correct units. (See attached report from Peregrine GeoConnect in Appendix F.)

2011 CORRECTED WELL ELEVATION SUMMARY TABLE
Revision 2 - March 26, 2012

Date of Installation	Well ID Number	2011 Survey Measurement date[1]	Previous Casing Diameter (Inch)	2011 Verified Casing Diameter[2] (Inch)	Previous Ground Level Elevation (feet)	2011 Survey Ground Level Elevation[1] (feet)	Previous Well Casing Rim Elevation (feet)	2011 Survey Well Casing Rim Elevation[1] (feet)	2011 Measuring Point Description[1]	2011 Ground Elevation Inside Steel Sleeve[1] (feet)	Previous Stick-up length (feet)	2011 Survey Stick-up length[1] (feet)	Previous Well Casing Bottom Elevation (feet)	2011 Survey Well Casing Bottom Elevation[5] (feet)	Previous Total Well Depth (feet)	2011 Survey Total Well Depth[4] (feet)	Screened Interval Depth Top to Bottom[6] (ft)	Previus Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[7]
11/10/2003	BW-1A	6/7/2011	2.00	2.00	6,876.73	6,874.10	6,876.73	6,876.68	North edge PVC casing	6,872.30	4.37	4.38	6,836.73	6,839.06	40.00	37.62	30 - 35	Chinle/Alluvium	Upper Sand
10/28/2003	BW-1B	6/7/2011	2.00	2.00	6,876.91	6874.13*	6,876.91	6,876.94	North edge PVC casing	6,876.26	2.38	0.68	6,811.71	6,809.49	67.55	67.45	54.6 - 64.6	Chinle/Alluvium	Chinle/Alluvium Interface
11/10/2003	BW-1C	6/7/2011	2.00	2.00	6,876.75	6,873.95	6,876.75	6,876.78	North edge PVC casing	6,872.28	4.51	4.50	6,719.75	6,740.39	157.00	136.39	125 -135	sonsela Sandstone	Sonsela
11/10/2003	BW-2A	6/7/2011	2.00	2.00	6,874.72	6,871.88	6,874.72	6,874.69	North edge PVC casing	6,870.45	4.26	4.24	6,809.22	6,807.12	65.50	67.57	55 - 65	Upper sand wells	Upper Sand
10/28/2003	BW-2B	6/7/2011	2.00	2.00	6,874.58	6,871.66	6,874.58	6,874.50	North edge PVC casing	6,870.06	4.49	4.44	6,784.08	6,782.24	90.50	92.26	80 - 90	Chinle/Alluvium	Chinle/Alluvium Interface
10/28/2003	BW-2C	6/7/2011	2.00	2.00	6,875.40	6,872.90	6,875.40	6,875.30	North edge PVC casing	6,872.02	2.97	3.28	6,724.40	6,722.46	151.00	152.84	139.5 - 149.5	Sonsela sandstone	Sonsela
6/15/2004	BW-3A	6/7/2011	2.00	2.00	6,878.22	6,875.94	6,878.22	6,878.39	North edge PVC casing	6,875.08	2.99	3.31	6,828.22	6,826.04	52.60	52.35	39.5 - 49.5	Upper sand wells	Upper Sand
10/15/2003	BW-3B	6/7/2011	2.00	2.00	6,878.79	6,876.16	6,878.79	6,878.59	North edge PVC casing	6,875.41	3.14	3.18	6,803.79	6,809.19	75.00	69.40	63 - 73	Chinle/alluvium	Chinle/Alluvium Interface
7/20/2004	BW-3C	6/7/2011	2.00	2.00	6,878.08	6,875.72	6,878.08	6,877.95	North edge PVC casing	6,875.27	2.68	2.68	6,723.08	6,723.40	155.00	154.55	144.5 - 154.5	Sonsela sandstone	Sonsela
1/5/1981	OW-1	6/7/2011	4.00	4.00	6,868.00	6,866.32	6,868.45	6,866.62	North edge PVC casing**	6,866.44	1.91	0.18	6,773.96	6,772.07	94.04	94.55	89.3 - 99.3	Sonsela sandstone	Sonsela
11/25/1980	OW-10	6/7/2011	4.00	4.00	6,872.00	6,873.67	6,875.12	6,874.91	North edge PVC casing	6,872.59	1.59	2.32	6,804.00	6,814.58	68.00	60.33	40 - 60	Sonsela sandstone	Sonsela
9/25/1981	OW-11	6/7/2011	4.00	4.00	6,923.89	6,922.05	6,923.51	6,923.51	North edge PVC casing	6,921.80	2.08	1.71	6,857.27	6,857.72	66.62	65.79	43 - 65	Chinle/alluvium	Sonsela
12/15/1980	OW-12	6/7/2011	4.00	4.00	6,940.43	6,939.57	6,940.43	6,940.69	North edge PVC casing	6,939.04	1.87	1.65	6,795.43	6,811.84	145.00	128.85	117.8 - 137.8	Sonsela sandstone	Sonsela
12/10/1980	OW-13	6/7/2011	4.00	4.00	6,920.12	6,918.95	6,920.12	6,920.07	North edge PVC casing	6,915.33	4.79	4.74	6,820.12	6,820.92	100.00	99.15	78.2 - 98.2	Sonsela sandstone	Sonsela
12/17/1980	OW-14	6/7/2011	4.00	4.00	6,926.64	6,924.55	6,926.64	6,926.65	North edge PVC casing	6,924.40	2.25	2.25	6,881.64	6,880.13	45.00	46.52	35 - 45	Chinle/alluvium	Chinle/Alluvium Interface
8/23/1996	OW-29	6/7/2011	4.00	4.00	6,913.50	6,913.89	6,913.50	6,917.00	North edge PVC casing	6,912.09	3.87	4.91	6,864.50	6,865.92	49.00	51.08	37.5 - 47.5	Chinle/alluvium	Chinle/Alluvium Interface
8/28/1996	OW-30	6/7/2011	4.00	4.00	6,921.60	6,921.81	6,921.60	6,924.69	North edge PVC casing	6,919.84	4.85	4.85	6,873.20	6,874.79	48.40	49.90	37.9 - 47.9	Chinle/alluvium	Chinle/Alluvium Interface
10/5/2009	OW-50	6/7/2011	2.00	2.00	6,914.39	6,912.63	6,914.37	6,914.21	North edge PVC casing	6,911.46	2.70	2.75	6,847.63	6,850.21	63.00	64.00	48 - 63	Chinle/alluvium	Chinle/Alluvium Interface
10/5/2009	OW-52	6/7/2011	2.00	2.00	6,906.26	6,906.53	6,907.68	6,907.68	North edge PVC casing	6,905.31	2.20	2.37	6,828.53	6,829.94	79.00	77.74	64 - 79	Chinle/alluvium	Chinle/Alluvium Interface
10/14/1981	MW-1	6/7/2011	5.00	5.00	6,878.52	6,876.63	6,878.15	6,878.12	North edge PVC casing	6,876.79	1.25	1.33	6,746.50	6,747.29	132.02	130.83	117.72 - 127.72	Sonsela sandstone	Sonsela
10/15/1981	MW-2	6/7/2011	5.00	5.00	6,878.40	6,878.39	6,880.84	6,880.30	North edge PVC casing	6,878.41	1.82	1.89	6,741.90	6,742.82	140.24	137.48	112 - 122	Sonsela sandstone	Sonsela
10/16/1981	MW-4	6/7/2011	5.00	5.00	6,882.54	6,879.89	6,882.20	6,881.63	North edge PVC casing	6,879.34	2.31	2.29	6,760.40	6,759.91	122.14	121.72	101 - 121	Sonsela sandstone	Sonsela
7/21/1986	MW-5	6/7/2011	4.00	4.00	6,883.32	6,880.20	6,882.93	6,882.83	North edge aluminum casing	6,881.77	2.02	1.06	6,750.30	6,752.00	133.02	130.83	115 - 125	Sonsela sandstone	Sonsela
3/28/1995	RW-1	6/7/2011	4.00	4.00	6,943.50	6,942.86	6,943.50	6,946.06	North edge PVC casing	6,941.25	4.41	4.81	6,900.50	6,903.02	43.00	43.04	25 - 40	Chinle/alluvium	Chinle/Alluvium Interface
3/29/1995	RW-2	6/7/2011	4.00	4.00	6,927.20	6,926.40	6,927.20	6,928.53	North edge PVC casing	6,925.02	3.58	3.51	6,889.20	6,888.73	38.00	39.80	26.1 - 36.1	Chinle/alluvium	Chinle/Alluvium Interface
8/27/1997	RW-5	6/7/2011	4.00	4.00	6,942.50	6,941.53	6,942.50	6,943.57	West Edge PVC Casing (Existing Mark)	6,940.82	2.92	2.75	6,902.50	6,903.98	40.00	39.59	29.5 - 39.5	Chinle/alluvium	Chinle/Alluvium Interface
8/27/1997	RW-6	6/7/2011	4.00	4.00	6,972.60	6,941.96	6,972.60	6,944.01	North edge PVC casing	6,941.49	2.58	2.52	6,933.80	6,903.11	38.80	40.90	28.5 - 38.5	Chinle/alluvium	Chinle/Alluvium Interface
9/26/1985	SMW-2	6/7/2011	2.00	2.00	6,884.44	6,881.63	6,884.11	6,883.97	North edge aluminum casing	6,879.07	4.54	4.90	6,827.10	6,831.17	57.34	52.80	34.31 - 54.31	Upper sand wells	Chinle/Alluvium Interface and Upper Sand
9/25/1985	SMW-4	6/7/2011	2.00	2.00	6,882.54	6,877.63	6,882.73	6,879.52	North edge aluminum casing	6,875.72	3.83	3.80	6,760.40	6,809.84	72.20	69.68	51.7 - 71.7	Upper sand wells	Chinle/Alluvium Interface
7/8/2004	GWM-1	6/7/2011	2.00	2.00	6,912.65	6,910.22	6,912.65	6,912.61	North edge PVC casing	6,908.36	3.87	4.25	6,888.95	6,886.41	23.70	26.20	17.5 - 23.5	Chinle/alluvium	Chinle/Alluvium Interface
9/25/2005	GWM-2	6/7/2011	2.00	2.00	6,913.17	6,910.32	6,913.17	6,913.09	North edge PVC casing	6,908.05	4.75	5.04	6,896.97	6,894.28	18.97	18.81	3.2 - 16.2	Chinle/alluvium	Chinle/Alluvium Interface

2011 CORRECTED WELL ELEVATION SUMMARY TABLE
Revision 2 - March 26, 2012

Date of Installation	Well ID Number	2011 Survey Measurement date[1]	Previous Casing Diameter (Inch)	2011 Verified Casing Diameter[2] (Inch)	Previous Ground Level Elevation (feet)	2011 Survey Ground Level Elevation[1] (feet)	Previous Well Casing Rim Elevation (feet)	2011 Survey Well Casing Rim Elevation[1] (feet)	2011 Measuring Point Description[1]	2011 Ground Elevation Inside Steel Sleeve[1] (feet)	Previous Stick-up length (feet)	2011 Survey Stick-up length[2] (feet)	Previous Well Casing Bottom Elevation (feet)	2011 Survey Well Casing Bottom Elevation[3] (feet)	Previous Total Well Depth (feet)	2011 Survey Total Well Depth[4] (feet)	Screened Interval Depth Top to Bottom[6] (ft)	Previus Stratigraphic unit in which screen exists	2012 Re-Evaluated Stratigraphic unit in which screen exists[7]
9/25/2005	GWM-3	6/7/2011	2.00	2.00	6,912.65	6,907.35	6,912.65	6,910.25	North edge PVC casing	6,905.48	4.85	4.77	6,896.15	6,892.45	17.94	17.80	3 - 15	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-1	6/7/2011	2.00	2.00	6,918.43	6,913.62	6,918.43	6,913.86	North edge PVC casing	6,913.56	0.29	0.30	6,904.40	6,900.33	14.00	13.53	3.7 - 13.7	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-2	6/7/2011	2.00	2.00	6,917.27	6,913.40	6,917.27	6,912.65	North edge PVC casing	6,912.54	0.10	0.11	6,902.80	6,899.04	14.50	13.61	4.0 - 14.0	Chinle/alluvium	Chinle/Alluvium Interface
3/14/2008	NAPIS-3	6/7/2011	2.00	2.00	6,917.31	6,913.38	6,917.31	6,912.76	North edge PVC casing	6,912.53	0.29	0.23	6,886.60	6,882.34	30.70	30.42	25.0 - 30.0	Chinle/alluvium	Chinle/Alluvium Interface
6/11/2007	KA-3	6/7/2011	2.00	2.00	6,917.17	6,913.29	6,917.17	6,912.52	North edge PVC casing	6,912.20	0.17	0.32	6,892.40	6,889.32	25.00	23.20	15 - 25	Chinle/alluvium	Chinle/Alluvium Interface

NOTES:
* Ground elevation is to the lowest concrete pad elevation surrounding the well
** Top segment of pvc casing not connected to coupling. Coupling is where elevation is referenced.

[1] Surveyed by DePauli Engineering & Surveying, LLC on June 7, 2011 at request of NMED due to discrepancies on well casing and ground level elevations.
[2] Field verified using a tape measure by Gallup Refinery field technician.
[3] 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.
[4] Total well depth was determined using a bottom sensing meter, Testwell Water level meter with bottom sensing indicator.
[5] Previous measurements and elevations are from the Well Data Summary Table from the 2009 Annual Ground Water Monitoring Report
[6] 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.
[7] Stratigraphic interpretation conducted by Peregrine Geoconnect to re-evaluate the named zones they produce water from. Tables were updated to reflect correct units. (See attached report from Peregrine Geoconnect in Appendix F)

Appendix D

Table 1: Gallup Refinery - Revised Ground Water Monitoring Schedule

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
Pilot Effluent	Quarterly (Q)			VOC/ DRO extended/GRO/BOB/COD/WQCC Metals
NAPIS Effluent	Q			Gen Chem/VOC/SVOC(phenol)/DRO extended//GRO/WQCC Metals
AL2 to EP-1	Q			Major cations/major anions/VOC/SVOC (phenol)/DRO extended/GRO/WQCC Metals
Influent to AL-1	Q			VOC/BOD/COD/chlorides/DRO extended/GRO/pH/phenol
Influent to AL-2	Q			VOC/BOD/COD/chlorides/DRO extended/GRO/pH/phenol
Influent to Evaporation Pond 1	Q			Major cations/ major anions/pH/BOD/COD/chlorides/VOC/SVOC (phenol)/DRO extended/GRO/WQCC metals
NAPI 2ndary Containment	Q			BTEX/DRO extended/GRO/WQCC Metals or check for fluids
RW-1	Q	X		Measure DTW,DTP
RW-2	Q	X		Measure DTW,DTP
RW-5	Q	X		Measure DTW,DTP
RW-6	Q	X		Measure DTW,DTP
OW-1 (c)	**Q**	X		Visual check for artesian flow conditions.
OW-10	Q	X	pH , E.C., D.O., ORP, Temp, TDS	Water level measurement of the Sonsela Aquifer water table. Major cations/anions, VOC, DRO extended, WQCC Metals.
OW-13	Q	X	pH , E.C., D.O., ORP, Temp, TDS	VOC
OW-14	Q	X	pH , E.C., D.O., ORP, Temp, TDS	VOC
OW-29	Q	X	pH , E.C., D.O., ORP, Temp, TDS	VOC
OW-30	Q	X	pH , E.C., D.O., ORP, Temp, TDS	VOC
GWM-2	Q	X		Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for BTEX+MTBE/GRO/DRO extended/major cations/anions.
GWM-3	Q	X		Check for Water - if water is detected report to OCD & NMED within 24 hours. Sample for BTEX+MTBE/GRO/DRO extended/major cations/anions.
GWM-1	Q	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/major anions/VOC/DRO extended/GRO/WQCC Metals
NAPIS-1(**a**)	Q	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO/WQCC Metals
NAPIS-2 (**a**)	Q	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO/WQCC Metals
NAPIS-3(**a**)	Q	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO/WQCC Metals
KA- 3 (a)	Q	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/major anions/ BTEX + MTBE/SVOCs/DRO/GRO/WQCC Metals
Boiler Water & Cooling Tower Blow down inlet to EP-2	Semi Annual (SA)		pH , E.C., D.O., ORP, Temp, TDS	Major Cations/Anions
Evaporation Pond 1 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	General Chemistry/VOC/SVOC/WQCC 20.6.2.3103 constituents/BOD/COD/E-Coli Bacteria/RCRA 8 Metals
Evaporation Pond 2 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 3 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1

Appendix D

Table 1: Gallup Refinery - Revised Ground Water Monitoring Schedule - Continued

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
Evaporation Pond 4 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 5 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 6 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 7 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 8 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 9A (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 11 (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 12A (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Evaporation Pond 12B (b)	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
Any temporary Pond containing fluid	SA		pH , E.C., D.O., ORP, Temp, TDS	Same as Evaporation Pond 1
BW-1A	Annual (A)	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-2A	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-3A	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-2A	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-2B	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-2C	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-3A	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-3B	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
BW-3C	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
Pond 2 Inlet	A			VOC/DRO extended/GRO/BOD/COD/TDS
MW-1	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/DRO extended/GRO/WQCC Metals
MW-2	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/DRO extended/GRO/WQCC Metals
MW-4	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/DRO extended/GRO/WQCC Metals
MW-5	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/DRO extended/GRO/WQCC Metals
OW-11	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions, VOC/SVOC/WQCC Metals
OW-12	A	X	pH , E.C., D.O., ORP, Temp, TDS	VOC
OW-50 (c)	**A**	X	pH , E.C., D.O., ORP, Temp, TDS	VOC/SVOC/WQCC Metals(Total and Dissolved), GRO/DRO/Gen Chem
OW-52 (c)	**A**	X	pH , E.C., D.O., ORP, Temp, TDS	VOC/SVOC/WQCC Metals(Total and Dissolved), GRO/DRO/Gen Chem
OW-1 (c)	**A**	X	pH , E.C., D.O., ORP, Temp, TDS	VOC/DRO extended/Major cations/anions/WQCC Metals
SMW-2	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions/VOC/DRO extended/GRO/WQCC Metals
SMW-4	A	X	pH , E.C., D.O., ORP, Temp, TDS	Major cations/anions/VOC/DRO extended/GRO/WQCC Metals

Appendix D

Table 1: Gallup Refinery - Revised Ground Water Monitoring Schedule - Continued

Sampling Location ID	Sampling Frequency	Collect GW Elevation, DTW, DTP	Water Quality Parameters	Analytical Suite
PW-3	Annual beginning in 2009	X	pH , E.C., D.O., ORP, Temp, TDS	VOC/SVOC/WQCC Metals/Cyanide/Nitrates
PW-2	Every 3 years. Starting in 2008	X	pH , E.C., D.O., ORP, Temp, TDS	VOC/SVOC/WQCC Metals/Cyanide/Nitrates
PW-4	Every 3 years. Starting in 2007	X	pH , E.C., D.O., ORP, Temp, TDS	VOC/SVOC/WQCC Metals/Cyanide/Nitrates
Effluent from OLD API (storm Water Separator Effluent)	Monthly flow rate measure-ments to new API separator			Collect monthly flow rate readings from the Old API to the New API Separator. If Effluent is re-routed to any other location than the New API Separator, NMED/OCD must be contacted to determine whether additional sampling and analysis is required.

The Analyte list for EPA Method 8260 must include MTBE

(a.) NAPIS 1, NAPIS 2, NAPIS 3: Detection of product during quarterly monitoring must comply with Section II.F.2 (twenty-four hour reporting) of NMED Post-Closure Care Permit

(b.) 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.

(c.) Proposed changes as requested by Gallup Refinery.

WQCC metals include the RCRA 8 metals, must be analyzed as totals and dissolved

Evaporation Pond samples must be collected at the inlet where waste water flows into the evaporation ponds.

NOTES:

Pilot Effluent - Effluent from the Pilot Gas Station to the Aeration Lagoon

Pond 2 Inlet - Sample collected at the inlet to Evaporation Pond 2 from Evaporation Pond 1

NAPIS Effluent - Effluent leaving the New API Separator

AL-2 to EP-1 - Sample collection at the inlet from Aeration Lagoon 2 to Evaporation Pond 1 (Influent location into EP-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; E.C. - Electrical or Specific Conductivity

TDS - Total Dissolved Solids; VOCs - Volatile Organic Compounds-EPA Method 8260, must include MTBE

SVOCs - 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 Tertiary-Butyl Ether (MTBE) - EPA Method 8021+MTBE

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

Appendix F

Peregrine GeoConnect

P.O. BOX 422 • LAS CRUCES, NM 88004
PH: 575-523-7674
FAX: 575-523-7248 • e-mail: kingsleywh@aol.com

March 21, 2012

Ms. Cheryl Johnson
Environmental Specialist
Western Refining – Gallup Refinery
Route 3 Box 7
Gallup, New Mexico 87301

Re: Stratigraphic Interpretation, Western Refining, Inc., Ciniza Refinery
File No. 12-001

Cheryl,

Peregrine GeoConnect, Inc. has performed an evaluation of the wells you requested. The wells were studied to determine the named zones they produce water from. The wells all produce water from various relatively shallow aquifers that represent different depositional sequences that are below the property.

As you are aware there are three basic zones that are monitored on the site. The uppermost zone has been locally named the Alluvial Sands Zone. This zone represents relatively young soils that are derived from the older formations to the south and east. These soils are primarily of fluvial (stream or river) deposition. The material was eroded from the Chinle Group formations forming the highlands to the south and east of the site and carried into the low valley where they were deposited as a result of intermittent fluviation. Earlier work at the site defined the sandy materials as a single large sand body and was locally named the Ciniza Sand. No formal naming process was given to the sands, however, reports from the 1980's and early 1990's refer these sands as the Ciniza Sand. Later, improved sampling technology allowed for more detailed stratigraphic evaluation of the materials and it was determined that rather than a large sand body the sands represented multiple channel deposits from intermittent stream development; likely generated as a result of storm water and seasonal runoff from the highlands to the south. The source of the material has been speculated to be from the Sonsela Sandstone in the Four Mile Canyon and/or Six Mile Canyon areas, although there has been no reason to study the area in detail as the information does not significantly impact the understanding of the conditions at the site. What differentiates these sands from others in the area is that they are sinuous, lenticular, and occasionally isolated bodies located within clays deposited in the valley area as a result of erosion of the sandstones, siltstones, and claystones of the Chinle Group. The sands are often buff to orange or very light red. The Alluvial Sands exhibit morphology and stratigraphy of recent erosional valley fill and should not be classified as part of the Chinle Group. Also the sands show no cementation that would be typical of the sands within the Chinle Group. One other distinguishing attribute the Alluvial Sands have is that they do not tend to follow the regional dip of the Chinle Group bedrock. The Chinle Group bedding at the site tends to dip downward northwesterly across the site at an angle of approximately ten (10) degrees. The Alluvial Sands tend to fan out across the valley in a relatively horizontal zone typically encountered at a depth of about thirty (30) feet and terminating on the order of forty five (45) to fifty (50) feet below the ground surface. These characteristics were used to identify the zones screened in the Alluvial Sand.

The second zone monitored at the site is locally called the Chinle Interface Zone. This second zone is the interface between the upper erosional soil fill material carried into the valley as a result of alluviation from the highlands to the south and the contact of the relatively unweathered Chinle Group sandstones, siltstones, and mudstones. The zone is distinguished by the presence of a gravelly or relatively clean sandy zone that lies directly on top of the relatively unweathered erosional surface of the Petrified Forest Formation within the Chinle Group. The sands and gravels form a very distinguishable marker bed on the relatively undisturbed shaley materials of the Petrified Forest Formation. The marker sands and gravels form the aquifer which lies on top of the relatively impervious shales and immediately below relatively impervious clays of the valley fill. As a result, the water confined in the sands and gravels is somewhat artesian in most wells screened in this zone. Typically the zone ranges in thickness from approximately eight (8) inches to about two (2) feet. It is not unusual to see the zone thin and become somewhat finer to the north. This zone follows the regional dip of the Chinle Group across the site (ten (10) degrees) and because of the amount of data available the depth of the top of the zone can be estimated using data from other site wells and borings from earlier investigations. Although easily identified, because of the similar densities of the alluvial clay soils above and the upper shaley materials of the Petrified Forest formation below, as well as the limited thickness of the zone, continuous sampling techniques are normally required to identify the exact zone contacts. Earlier work lumped this zone with the Upper Sands and although there is some evidence there could be communication between the zones, it is currently believed they are geomorphically distinct.

The third water producing zone that is monitored on the site is the Sonsela Sandstone. The Sonsela is a named member of the Petrified Forest Formation within the Chinle Group of Triassic Age. The Sonsela tends to also follow the local dip of approximately ten (10) degrees to the north-northwest. The member can be seen on the surface in the extreme southeast area of the property and south of Interstate 40 in both Four Mile and Six Mile Canyons. The sandstone at the site is white to very light brown or grey, may be massive to very thin bedded with low angle cross bedding. The sandstone is generally medium to coarse grained and comprised of quartz, feldspar and, in the lower portion, abundant mica. At this site the zone is ten (10) to twenty (20) feet in thickness and has a relatively thin shale bed separating the upper and lower portions of the unit. The sandstone unit is located within the Petrified Forest Formation of the Chinle Group and separates the Petrified Forest formation into the upper and lower members. When dry, the sandstone glistens in sunlight and is easily distinguished from finer and much thinner sandstone beds higher in the Upper Petrified Forest section. Because of the confining materials at the site above and below the sandstone, the water in the aquifer is artesian. Water in this aquifer is typically more artesian than the water in the Interface Zone and can aid in defining the production unit. The Sonsela Sandstone member is densely cemented and easily identified within the Petrified Forest Formation.

Using the information provided above, historic knowledge of the area, correlations from 220 borings and wells drilled at the site, as well as reports from earlier studies of the geologic conditions regionally and at the site, the following list of wells and the stratigraphic units they are monitoring (screened across) for water has been generated.

Well Identification	Stratigraphic Unit Screen Is Placed In
BW-1A	Upper Sand
BW-1B	Chinle-Alluvium Interface
BW-1C	Sonsela
BW-2A	Upper Sand
BW-2B	Chinle-Alluvium Interface
BW-2C	Sonsela
BW-3A	Upper Sand
BW-3B	Chinle-Alluvium Interface
BW-3C	Sonsela

Well Identification	Stratigraphic Unit Screen Is Placed In
OW-1	Sonsela
OW-10	Sonsela
OW-11	Sonsela
OW-12	Sonsela
OW-13	Sonsela
OW-14	Chinle-Alluvium Interface
OW-29	Chinle-Alluvium Interface
OW-30	Chinle-Alluvium Interface
OW-50	Chinle-Alluvium Interface
OW-52	Chinle-Alluvium Interface
MW-1	Sonsela
MW-2	Sonsela
MW-4	Sonsela
MW-5	Sonsela
RW-1	Chinle-Alluvium Interface
RW-2	Chinle-Alluvium Interface
RW-5	Chinle-Alluvium Interface
RW-6	Chinle-Alluvium Interface
SMW-2	**Chinle-Alluvium Interface** and **Upper Sand**
SMW-4	Chinle-Alluvium Interface
GWM-1	Chinle-Alluvium Interface
GWM-2	Chinle-Alluvium Interface
GWM-3	Chinle-Alluvium Interface
NAPIS-1	Chinle-Alluvium Interface
NAPIS-2	Chinle-Alluvium Interface
NAPIS-3	Chinle-Alluvium Interface
KA-3	Chinle-Alluvium Interface

If you have specific questions concerning any of the wells or how they were interpreted please contact our office. We will discuss the matter to your satisfaction.

Sincerely,
Peregrine GeoConnect, Inc.

William H. Kingsley, PE

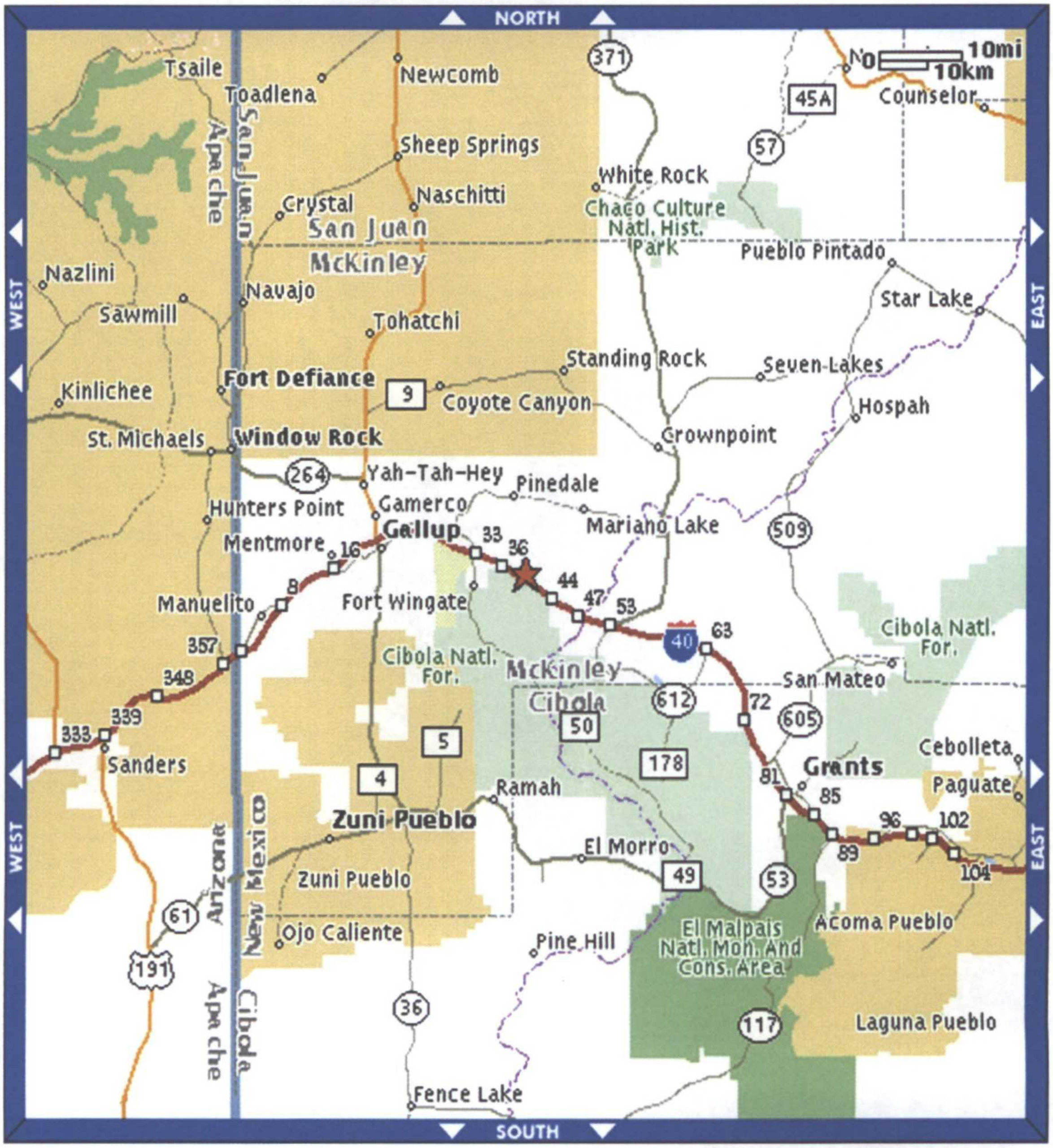


Figure 1: Regional map showing the location of the Gallup Refinery (red star along Interstate-40, 20 miles east of the City of Gallup).

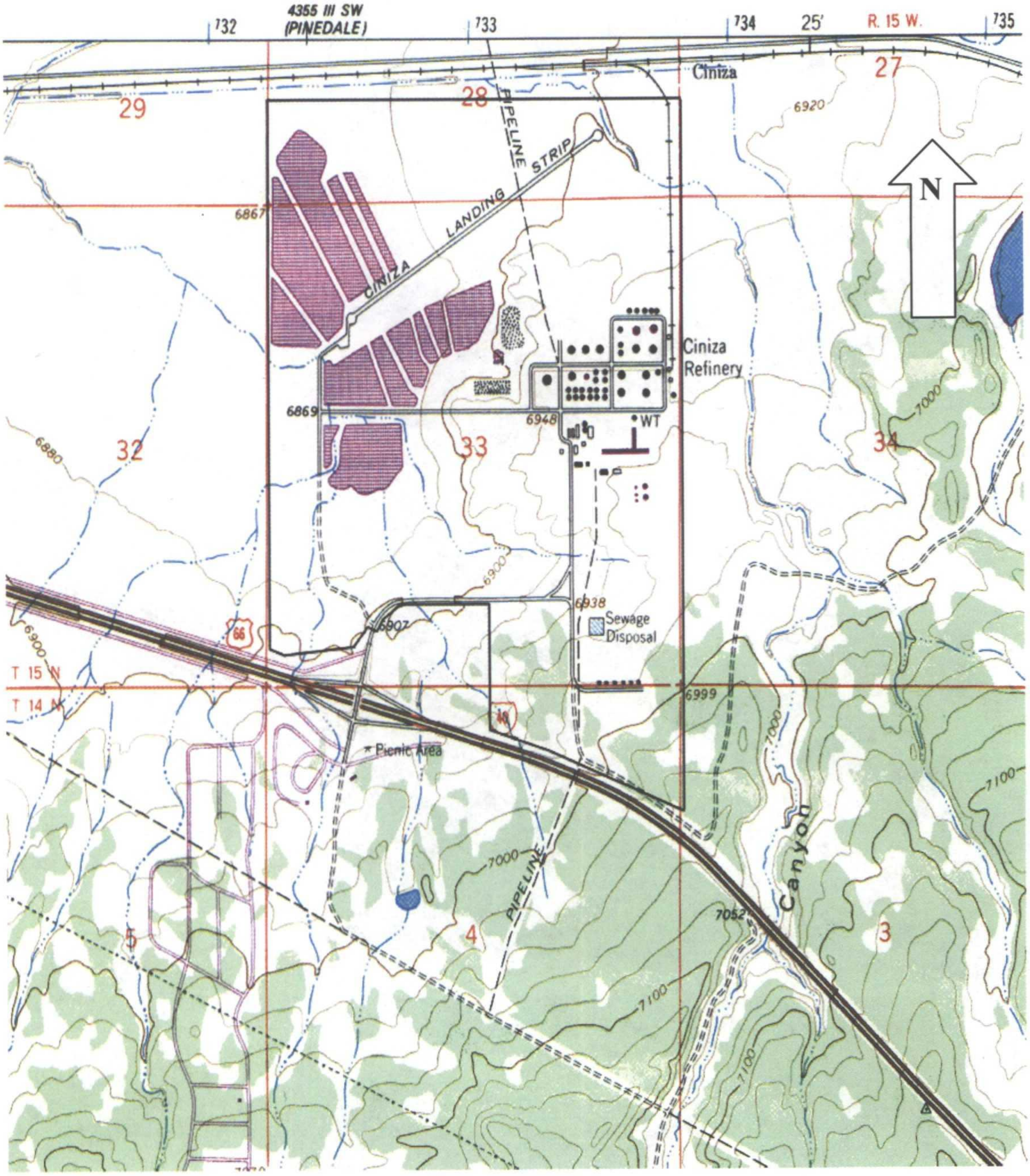
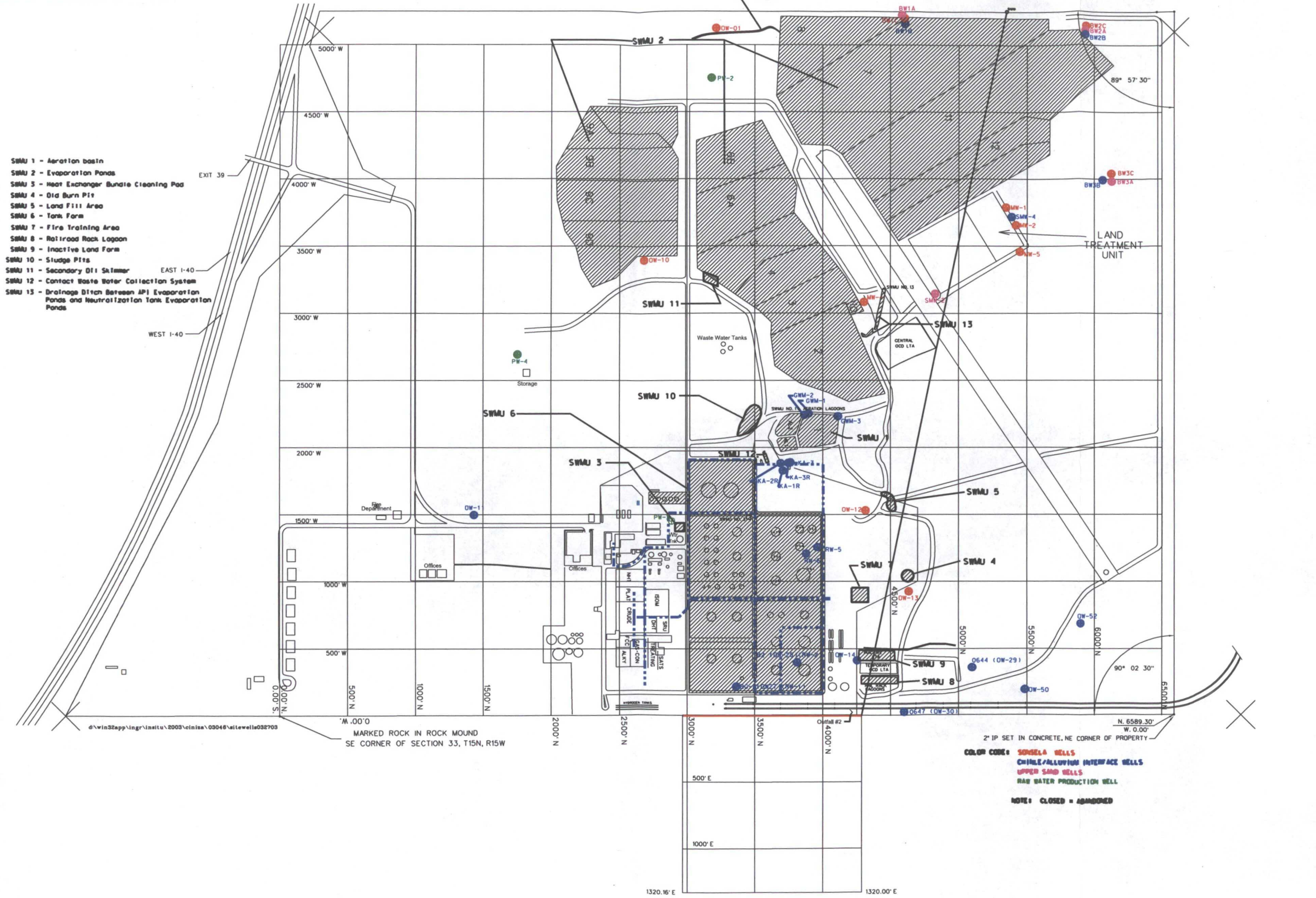


Figure 2: Topographic Map of the Gallup Refinery Site - USGS Topographical Map - Gallup Quadrangle (Revised 1980)

Figure 3: Location of Wells



Peregrine GeoConnect, Inc.

1"=500'

FACILITIES AND WELLS

WESTERN REFINING - GALLUP REFINERY

Western Refining - Gallup Refinery
Interstate 40, Exit 39
Jamestown, New Mexico 87347
Date: April 25, 2011
File: 11-002

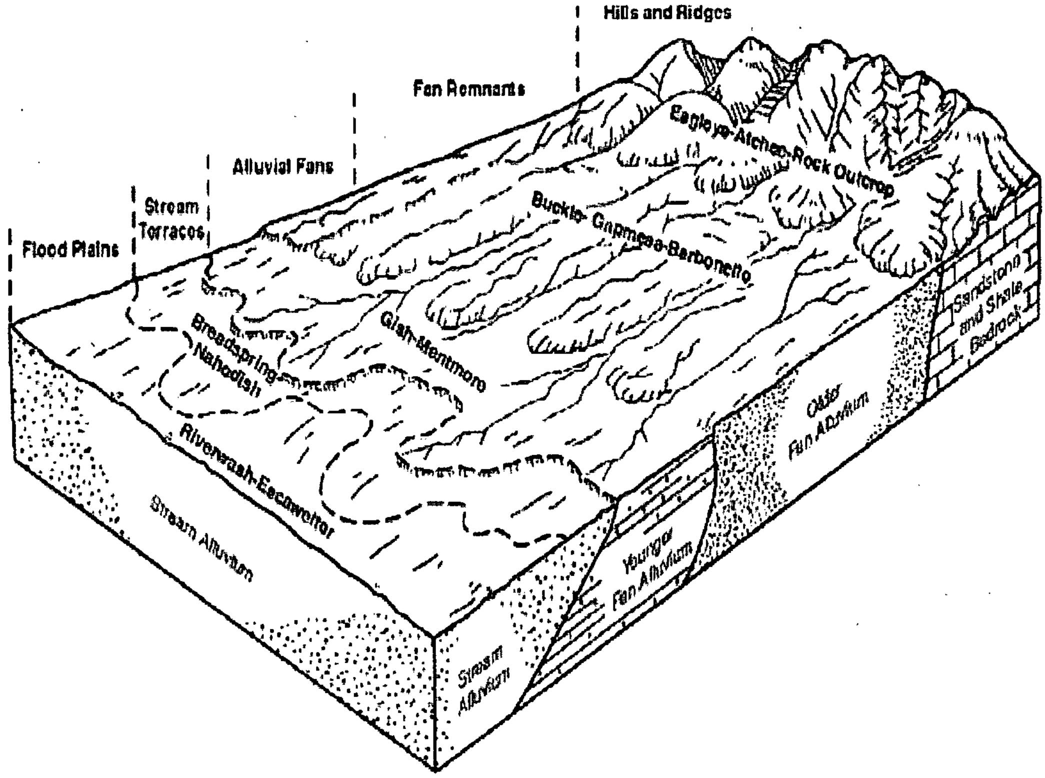
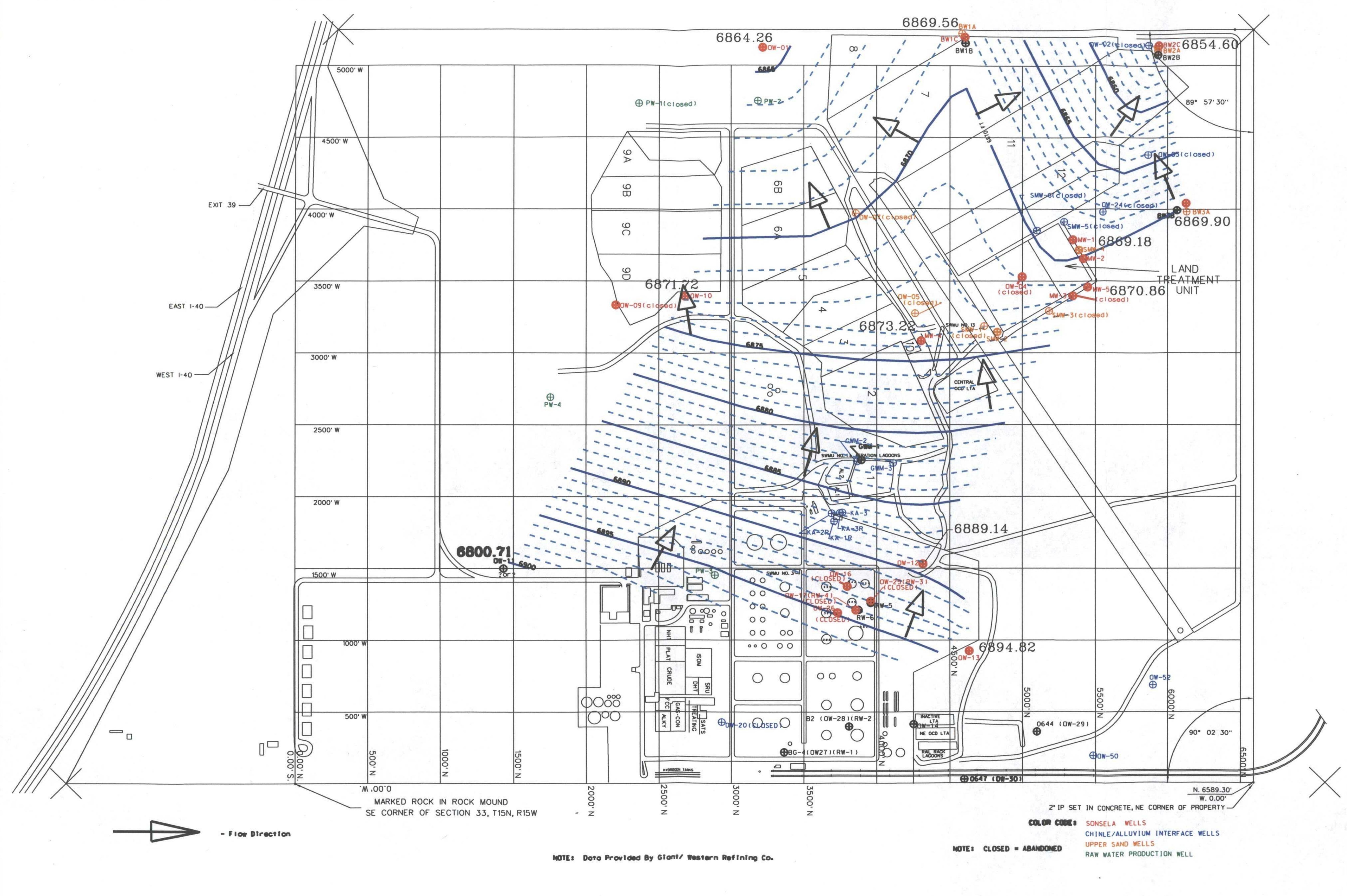


Figure 4: Generalized relationship of soils in the Gallup Refinery area: from NRCS/USDA Soil Survey of McKinley County.

Figure 5: Map of groundwater flow - Sonsela



Peregrine GeoConnect, Inc.	1" = 500' File 11-002	**Sonsela Water** **Piezometric Surface (July-Sept 2010)**

Western Refining - Gallup Refinery
Interstate 40, Exit 39
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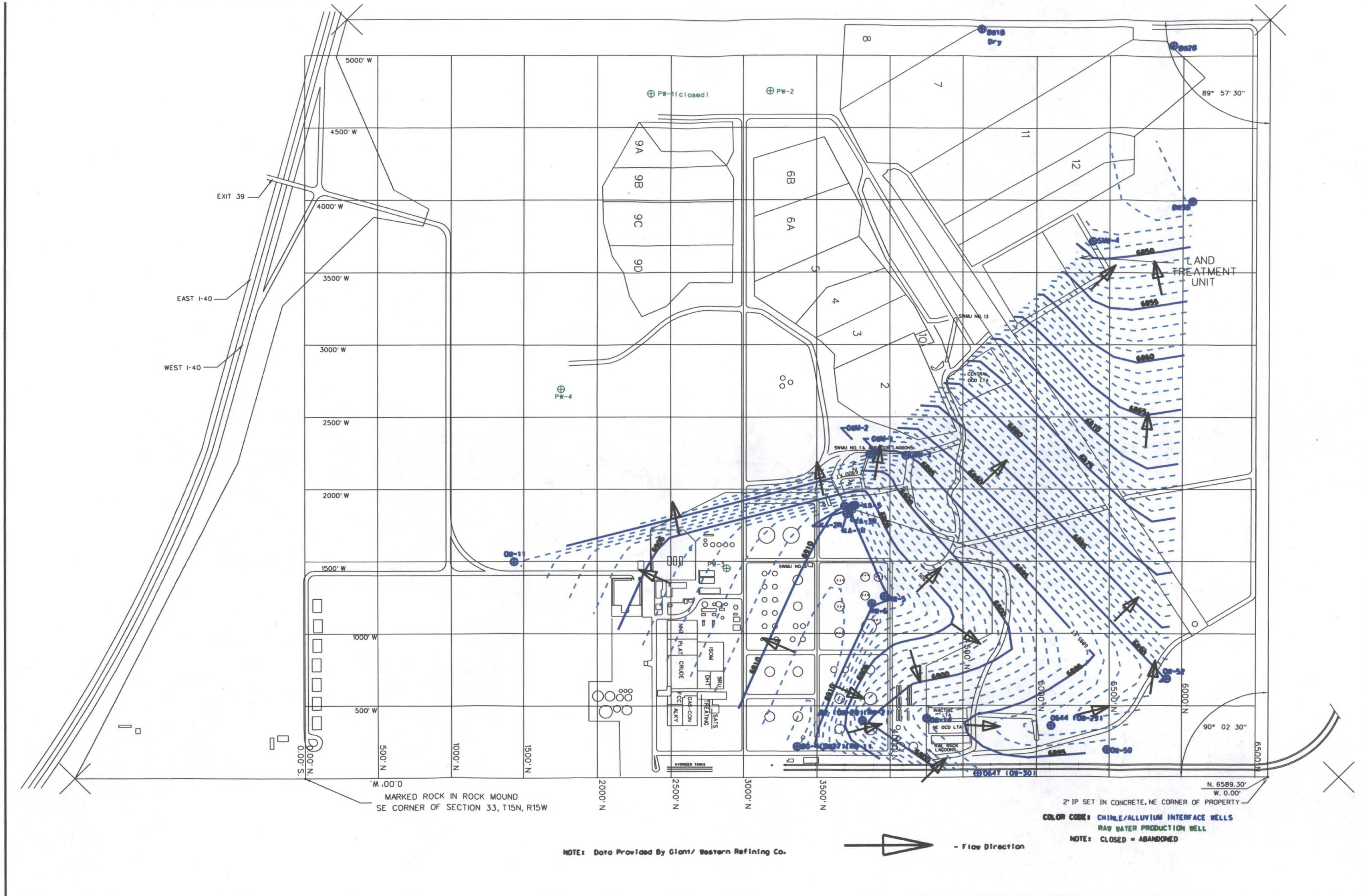
Figure 5b: Map of groundwater flow - Chinle



Peregrine GeoConnect, Inc.

1" = 500'

File 11-002

Chinle Gp./Alluvium Interface Water

Piezometric Surface (September 2010)

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