AP - 111

SMW-2 AREA INVESTIGATION & BOUNDARY WELL INSTALLATIONS WORKPLAN

2016

Chavez, Carl J, EMNRD

From: VanHorn, Kristen, NMENV
Sent: Monday, March 20, 2017 11:06 AM
To: Riege, Ed
Cc: Cobrain, Dave, NMENV; Chavez, Carl J, EMNRD; Hains, Allen (Allen.Hains@wnr.com); 'king.laurie@epa.gov'
Subject: Approval with Mods SMW2 and Boundary well installation WORK PLAN
Attachments: APPR_MODS_WP_SMW2WELLS_WRG16_006.pdf

Ed-
Attached is the Approval with Modifications for the SMW-2 and Boundary Well Installation.

Let me know if you have any questions,
Kristen

Kristen Van Horn
NMED Hazardous Waste Bureau
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BUTCH TONGATE
Cabinet Secretary
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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

March 17, 2017

Mr. Ed Riege
Remediation Manager
Western Refining, Southwest Inc., Gallup Refinery
92 Giant Crossing Road
Gallup, New Mexico 87301

RE: APPROVAL WITH MODIFICATONS
WORK PLAN SMW-2 AREA INVESTIGATION AND BOUNDARY WELL INSTALLATION
WESTERN REFINING SOUTHWEST INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-WRG-16-006

Dear Mr. Riege:

The New Mexico Environment Department (NMED) has received the *Work Plan SMW-2 Area Investigation and Boundary Well Installation* (Work Plan), dated October 2016 on behalf of Western Refining Southwest Inc., Gallup Refinery (Permittee). NMED hereby issues this Approval with Modifications. The Permittee must address the following comments. NMED understands that the Permittee is also in receipt of comments regarding the Work Plan from the Energy Minerals and Natural Resources Department Oil Conservation Division (OCD), dated February 21, 2017.

Comment 1
The Permittee discusses sampling and then abandoning shallow monitoring well (SMW)-2 during the investigation. In Section 2.1 (SMW-2 Area), the Permittee states, "[t]here is a concern that well SMW-2 may be allowing communication between the upper sands and the Chinle/alluvial aquifer that would naturally be isolated by intervening clay layers. Western proposes to plug and abandon well SMW-2. Similar concerns were previously observed in some

of the other SMW series wells (e.g., SMW-1 and SMW-5) that were plugged in 2004." Abandonment of the well is permitted; however, the RCRA Permit states, "[a]t least four thin sand lenses exist above the Chinle shale, between the ground surface and the top of the Sonsela sandstone; the first two lenses encountered are dry. SMW-1, 2, and 3 (up-gradient wells) are completed in the third lens. SMW-4 and SMW-5 (down-gradient wells) are completed in the fourth sand lens, which is saturated and perched immediately above the Chinle shale. Currently the unsaturated zone detection monitoring system consists of SMW-3, SMW-4, SMW-5, and SMW-6 and the detection monitoring system consists of MW-1, MW-2, MW-4, and MW-5." Monitoring wells SMW-1 and SMW-5 have been abandoned, SMW-3 was abandoned in 2004 and the Permittee has not been monitoring SMW-6. With the proposed abandonment of SMW-2, there are no wells monitoring the vadose zone upgradient of the LTU to detect contamination migrating from an upgradient source. Therefore, the Permittee must submit a work plan to install two additional monitoring wells upgradient of the LTU: one to monitor the Chinle/Alluvium Interface and one to monitor the Sonsela. A Permit modification will need to be submitted to address changes to the monitoring well network at the LTU. NMED can address the modification with the Permitte.

Comment 2
In Section 4.1 (SMW-2 Investigation) the Permittee states, "[t]wo new shallow monitoring wells are proposed up-gradient of SMW-2 (Figure 5). One well will be located on the southeast (up-gradient) corner of the NMOCD Central Landfarm and the second well will be located on the northwest (down-gradient) corner of the Central Landfarm." Ensure that the wells are screened in the upper sand interval captured by SMW-2 which is screened from 34.31 to 54.31 ft bgs. If sand layers within the clay are not encountered at the proposed locations, then alternate locations must be proposed. Also, based on the Permittee's *September and October 2016 Chloride Exceedance Excavation Report Central Oil Conservation Division Landfarm*, dated January 2017, there are elevated chloride concentrations in soils within Evaporation Pond 10 (EP-10)/OCD Landfarm, the elevated groundwater chloride levels in monitoring well SMW-2 may be a result of the elevated chloride levels in the EP-10/OCD Landfarm. If elevated chloride levels are detected in groundwater in the newly installed upgradient well, then the Permittee must propose to install an additional groundwater monitoring well further upgradient from SMW-2 and the southern boundary of EP-10/OCD Landfarm. The new wells must be included in the Facility-Wide Groundwater Monitoring Work Plan.

Comment 3
In Section 4.3 (Soil Sample Field Screening and Logging) the Permittee states, "[a]lthough the borings are being drilled at locations outside known areas of concern, Western may, at its' discretion retain soil samples for laboratory analysis." Whether or not the borings are located in areas of concern is not a measure of whether or not to collect soil samples for laboratory analysis. All investigation-related drilling activities must include both logging of the borings as well as collection of soil samples for laboratory analysis regardless of whether or not the area being investigated is an area of concern. The NMED and OCD may require drilling and sampling outside of identified "areas of concern" in order to collect data and gather information about the soils and groundwater that may be affected by activities conducted at the facility.

If you have questions regarding this Approval with Modifications, 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
A. Hains WRG
L. King EPA Region 6

File: Reading File and WRG 2017 File
HWB-WRG-16-006

Certified Mail # 7014 1820 0001 7489 0228

October 18, 2016

Mr. John E. Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, New Mexico 87505-6303

RE: WORK PLAN SMW-2 INVESTIGATION AND BOUNDARY WELL INSTALLATIONS
WESTERN REFINING SOUTHWEST, INC. GALLUP REFINERY
EPA ID # NMD000333211

Dear Mr. Kieling:

The enclosed Work Plan was prepared pursuant to your Disapproval Annual Groundwater Monitoring Report: Gallup Refinery - 2014. This Work Plan addresses Comments 16, 17 and 18 of your disapproval letter dated June 20, 2016.

If there are any questions regarding the enclosed Investigation Report, please contact Mr. Ed Riege at (505) 722-0217.

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,

Mr. Daniel J. Statile

VP Refining

Western Refining Southwest, Inc. – Gallup Refinery

Ed Riege

Remediation Manager

Western Refining Southwest, Inc. – Gallup Refinery

cc D. Cobrain NMED HWB without enclosure
~~N. Dhawan, NMED HWB without enclosure~~
K. Van Horn, NMED HWB without enclosure
C. Chavez, OCD
L. King, EPA without enclosure
A. Allen, Western El Paso

Work Plan
SMW-2 Area Investigation and Boundary Well Installations

Gallup Refinery
Western Refining Southwest, Inc.
Gallup, New Mexico

EPA ID# NMD000333211

OCTOBER 2016

Scott Crouch
Senior Geologist

DiSorbo
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Appendices

List of Acronyms

benzene, toluene, ethylbenzene, and xylene (BTEX)
Code of Federal Regulations (CFR)
Contract Laboratory Program (CLP)
data quality objective (DQO)
diesel range organics (DRO)
dilution attenuation factor (DAF)
Environmental Protection Agency (EPA)
investigation derived waste (IDW)
Maximum Contaminant Level (MCL)
mean sea level (msl)
monitoring well (MW)
motor oil range organics (MRO)
methyl tert butyl ether (MTBE)
New Mexico Administrative Code (NMAC)
New Mexico Environment Department (NMED)
New Mexico Oil Conservation Division (NMOCD)
photoionization detector (PID)
polynuclear aromatic hydrocarbon (PAH)
polyvinyl chloride (PVC)
quality assurance/quality control (QA/QC)
Resource Conservation and Recovery Act (RCRA)
separate-phase hydrocarbon (SPH)
semi-volatile organic compound (SVOC)
Solid Waste Management Unit (SWMU)
total petroleum hydrocarbon (TPH)
toxicity characteristic leaching procedure (TCLP)
volatile organic compound (VOC)

Executive Summary

The Gallup Refinery, which is located 17 miles east of Gallup, New Mexico, has been in operation since the 1950s. Pursuant to the terms and conditions of the facility Resource Conservation and Recovery Act (RCRA) Post-Closure Care Permit and 20.4.1.500 New Mexico Administrative Code, this Investigation Work Plan has been prepared for two areas near the on-site evaporation ponds. This includes the area near well SMW-2 and the far western portion of the Facility near well OW-1 and Evaporation Ponds No. 6 and 9. Both of these areas were identified by the New Mexico Environment Department (NMED) in comment letters regarding the 2013 and 2014 Annual Facility-Wide Ground Water Monitoring Reports as requiring additional groundwater monitoring wells.

Groundwater samples collected from monitoring well SMW-2 have detected concentrations of chloride and sulfate above screening levels. SMW-2 is potentially down-gradient of a nearby landfarm area and the on-site evaporation ponds. OW-1 is down-gradient of well OW-10, which has detected methyl tertiary butyl ethyl (MTBE) at concentrations above the screening level.

The purpose of this investigation is to determine the source of the elevated concentrations of chloride and sulfate detected at well SMW-2 and to provide additional groundwater monitoring wells down-gradient of Evaporation Ponds 6 and 9. To accomplish these objectives, two new permanent monitoring wells will be installed up-gradient of SMW-2. Two additional shallower monitoring wells will be installed near OW-1 to create three clustered wells similar to what was installed earlier at the boundary well locations (BW-1, BW-2 and BW-3) and another set of the clustered wells will be installed west of Pond 9.

Section 1
Introduction

The Gallup Refinery is located approximately 17 miles east of Gallup, New Mexico along the north side of Interstate Highway I-40 in McKinley County. The physical address is I-40, Exit #39 Jamestown, New Mexico 87347. The Gallup Refinery is located on 810 acres. Figure 1 presents the refinery location and the regional vicinity.

The Gallup Refinery generally processes crude oil from the Four Corners area transported to the facility by pipeline or tanker truck. Various process units are operated at the facility, including crude distillation, reforming, fluidized catalytic cracking, alkylation, sulfur recovery, merox treater, and hydrotreating. Current and past operations have produced gasoline, diesel fuels, jet fuels, kerosene, propane, butane, and residual fuel.

This investigation work plan addresses the area up-gradient of monitoring well SMW-2 and the area to the west of Evaporation Ponds 6 and 9. The purpose of this investigation is to determine the source of the elevated concentrations of chloride and sulfate detected in groundwater samples collected at SMW-2 and to provide additional groundwater monitoring locations down-gradient of the southwestern evaporation ponds (Ponds 6 and 9). The investigation activities will be conducted in accordance with Section IV.H.5 of the Post-Closure Care Permit.

Section 2
Background

This section presents background information for the area of the refinery property near monitoring wells SMW-2 and OW-1, including a review of historical waste management activities to identity the following:

- Type and characteristics of all waste and all contaminants handled in the subject areas;
- Known and possible sources of contamination;
- History of operations; and
- Prior investigations.

2.1 SMW-2 Area

Monitoring well SMW-2 is located immediately south of the closed Land Treatment Unit (LTU). This well is not included in the RCRA Permit as part of the detection or shallow monitoring well networks, but groundwater samples are routinely collected and analyzed per the Facility-Wide Ground Water Monitoring Plan. Well SMW-2 is located on the up-gradient end of the LTU. Analytical results for groundwater samples collected since 2010 are included in Table 1. Also included in Table 1 are the analytical results for groundwater samples collected in SMW-4, which is located on the north (down-gradient) end of the LTU. The results for SMW-2 provided in Table 1 for the last three years indicate the detection of chloride, sulfate, manganese, and uranium at concentrations above the applicable screening levels per the RCRA Permit. Uranium was also detected in groundwater samples collected from SMW-4 at concentrations above the screening level. MTBE has been detected in groundwater samples collected at SMW-2, but has remained below the screening level (NMED, 2015).

Well SMW-2 is located down-gradient of the Central Landfarm Area, which is permitted by the New Mexico Oil Conservation Division (NMOCD) and also potentially down-gradient of the evaporation ponds (Figure 2). It is noted that the area where the NMOCD Landfarm is currently located appears to overlie former Evaporation Pond #10 (Figure 3). According to information provided in the *Inventory of Solid Waste Management Units,* cell or Evaporation Pond #10 was used for wastewater from the boiler house and water softener regeneration wastes, but did not receive process wastewater discharges through the API Separator. The process of discharging directly to Evaporation Pond #10 was replaced with the addition of a neutralization tank in 1980 (Geoscience Consultants,

Ltd., 1985a). Evaporation Pond #10 was no longer in service in 1985 based on information provided in the 1985 *Discharge Plan Application* (Geoscience Consultants, Ltd., 1985b).

A review of the boring/well completion logs for SMW-2 and SMW-4, as well as other wells in the immediate area, indicates that well SMW-4 is screened in the transmissive media (e.g., sands) that directly overlie the Chinle bedrock. A copy of the boring logs for SMW-2 and SMW-4 are included in Appendix A. The screened interval in well SMW-2 appears to include not only any transmissive materials on top of the bedrock, but also some of the upper sands. There is a concern that well SMW-2 may be allowing communication between the upper sands and the Chinle/alluvial aquifer that would naturally be isolated by intervening clay layers. Western proposes to plug and abandon well SMW-2. Similar concerns were previously observed in some of the other SMW series wells (e.g., SMW-1 and SMW-5) that were plugged in 2004.

2.2 OW-1 Area

Monitoring well OW-1 was installed in November 1980 as part of the initial site investigations conducted pursuant to RCRA (Figure 4). The well was drilled to depth of 100 feet and is screened in the Sonsela Sandstone aquifer. Well OW-10, which is also screened in the Sonsela Sandstone aquifer, is located to the east and up-gradient of OW-1. In addition to the boring logs for OW-1 and OW-10, the logs for the closest set of clustered boundary wells (BW-1A, BW-1B, and BW-1C) are included in Appendix A. The only site operations known to have been conducted in the area are the evaporation ponds located to the east and hydraulically up-gradient of OW-1.

Analytical results for groundwater samples collected from OW-1 and OW-10 are included in Table 2. MTBE was detected in groundwater samples collected at OW-10 in 2012 and 2013 at concentrations above the screening level, but has since shown concentrations below the screening level. There have been a few detections of nitrate above screening levels in OW-1 and OW-10. Chloride has consistently been detected above the screening level in groundwater samples collected at OW-10. Total metals analyses of water samples collected at OW-1 have shown sporadic occurrences of arsenic, chromium, iron, lead, and manganese above screening levels. Total analyses of uranium have consistently exceeded screening levels in samples collected at both OW-1 and OW-10. Dissolved metals analyses of water samples collected at OW-1 have shown sporadic occurrences of iron, lead, and manganese above screening levels. Dissolved analyses of uranium have consistently exceeded screening levels in samples collected at both OW-1 and OW-10. Other organic constituents that have been detected at very low concentrations below screening levels in

water samples collected at OW-1 include benzene, toluene, and total xylenes. Organic constituents that have been detected at very low concentrations below screening levels in water samples collected at OW-10 include 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, ethylbenzene, toluene, and total xylenes.

Section 3
Site Conditions

3.1 Surface Conditions

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

Regional surface water features include the refinery evaporation ponds and a number of small ponds (one cattle water pond and two small unnamed spring fed ponds). The site is located in the Puerco River Valley, north of the Zuni Uplift with overland flows directed northward to the tributaries of the Puerco River. The Puerco River continues to the west to the confluence with the Little Colorado River. The South Fork of the Puerco River is intermittent and retains flow only during and immediately following precipitation events.

3.2 Subsurface Conditions

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

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

the Petrified Forest Formation with prevailing flow from the southeast to the northwest, although localized areas may have varying flow directions (Figure 2). Fluid level measurements for 2015 are included in Table 3.

Section 4
Scope of Services

The site investigation of groundwater will be conducted to determine the source of elevated chloride and sulfate concentrations detected in groundwater samples collected at SMW-2. Additional monitoring wells will be installed down-gradient of Evaporation Ponds 6 and 9. The investigation will commence upon approval of this investigation work plan by NMED.

4.1 SMW-2 Investigation

An investigation of groundwater conditions in the area near SMW-2 is proposed to determine the source of chloride and sulfate detected in groundwater samples collected at SMW-2. Two new shallow monitoring wells are proposed up-gradient of SMW-2 (Figure 5). One well will be located on the southeast (up-gradient) corner of the NMOCD Central Landfarm and the second well will be located on the northwest (down-gradient) corner of the Central Landfarm.

Each well will be screened in the upper-most saturated interval(s) with a maximum screen length of 10 feet. Due to concerns over the construction of SMW-2 using a 20-foot well screen, which possibly allows cross-communication between separate zones (upper sands vs. Chinle/alluvial Interface), care will be taken to avoid screening across intervals that may not otherwise be in hydraulic communication.

A groundwater sample will be collected from SMW-2 prior to plugging this well due to the concerns over the well screen allowing communication between different zones. A groundwater sample will be collected from SMW-4. In addition, surface water samples will be collected from Evaporation Ponds No. 2 and No. 3. The water samples collected from SMW-2, SMW-4, the two new wells to be installed near the OCD Central Landfarm, and the evaporation ponds will be analyzed for major cations and anions to support a comparison between surface water and groundwater in the vicinity of SMW-2.

4.2 Installation of Boundary Wells

Additional boundary monitoring wells will be installed down-gradient of Evaporation Ponds 6 and 9. This includes two new wells near existing well OW-1 and three new clustered wells west of Pond 9 (Figure 6). The wells installed near OW-1 will be screened just above the Chinle bedrock in the

Chinle/Alluvial Interface zone and the other in the zone previously designated as the Upper Sands (Western, 2013). The three clustered wells to be drilled west of Pond 9 will be screened in the Upper Sand zone, the Chinle/Alluvial Interface, and the Sonsela Sandstone aquifer.

4.3 Soil Sample Field Screening and Logging

Samples obtained from the soil borings will be screened in the field on 2.0 foot intervals for evidence of contaminants. Field screening results will be recorded on the exploratory boring logs. Field screening results will be used to aid in the possible selection of soil samples for laboratory analysis. The primary screening methods include: (1) visual examination, (2) olfactory examination, and (3) headspace vapor screening for volatile organic compounds.

Visual screening includes examination of soil samples for evidence of staining caused by petroleum-related compounds or other substances that may cause staining of natural soils such as elemental sulfur or cyanide compounds. Headspace vapor screening targets volatile organic compounds and involves placing a soil sample in a plastic sample bag or a foil sealed container allowing space for ambient air. The container will be sealed and then shaken gently to expose the soil to the air trapped in the container. The sealed container will be allowed to rest for a minimum of 5 minutes while vapors equilibrate. Vapors present within the sample bag's headspace will then be measured by inserting the probe of the instrument in a small opening in the bag or through the foil. The maximum value and the ambient air temperature will be recorded on the field boring or test pit log for each sample.

The monitoring instruments will be calibrated each day to the manufacturer's standard for instrument operation. A photoionization detector (PID) equipped with a 10.6 or higher electron volt (eV) lamp or a combustible gas indicator may be used for VOC field screening. Field screening results may be site- and boring-specific and the results may vary with instrument type, the media screened, weather conditions, moisture content, soil type, and type of contaminant, therefore, all conditions capable of influencing the results of field screening will be recorded on the field logs.

Although the borings are being drilled at locations outside known areas of concern, Western may, at its' discretion retain soil samples for laboratory analysis. The physical characteristics of the samples (such as mineralogy, ASTM soil classification, moisture content, texture, color, presence of stains or odors, and/or field screening results), depth where each sample was obtained, method of sample collection, and other observations will be recorded in the field log by a qualified geologist or engineer. Detailed logs of each boring will be completed in the field by a qualified engineer or

geologist. Additional information, such as the presence of water-bearing zones and any unusual or noticeable conditions encountered during drilling, will be recorded on the logs.

Quality Assurance/Quality Control (QA/QC) samples will be collected to monitor the validity of the soil sample collection procedures as follows:

- Field duplicates will be collected at a rate of 10 percent; and
- Equipment blanks will be collected from all sampling apparatus at a frequency of one per day.

4.3.1 Drilling Activities

Soil borings will be drilled using hollow-stem augers. The drilling equipment will be properly decontaminated before drilling each boring. The NMED will be notified as early as practicable if conditions arise or are encountered that do not allow the advancement of borings to the specified depths or at planned sampling locations. Appropriate actions (e.g., installation of protective surface casing or relocation of borings to a less threatening location) will be taken to minimize any negative impacts from investigative borings. Slotted (0.01 inch) PVC well screen will be placed at the bottom of the borings and will extend for 10 feet. A 10/20 sand filter pack will be installed to two feet over the top of the well screen.

4.4 Groundwater Sample Collection

Groundwater samples will be collected from the seven new permanent monitoring wells, well SMW-4, and SMW-2 prior to plugging the well. Groundwater samples will be collected within 24 hours of the completion of well purging using disposal bailers. Alternatively, well sampling may also be conducted in accordance with the NMED's Position Paper *Use of Low-Flow and other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (October 30, 2001, as updated). 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 will be in accordance with the procedures presented below in Section 4.4.1.

Groundwater samples intended for metals analysis will be submitted to the laboratory as both total and dissolved metals samples. QA/QC samples will be collected to monitor the validity of the groundwater sample collection procedures as follows:

- Field duplicate water samples will be obtained at a frequency of ten percent, with a minimum, of one duplicate sample per sampling event;
- Equipment rinsate blanks will be obtained for chemical analysis at the rate of ten percent or a minimum of one rinsate blank per sampling day. Equipment rinsate blanks will be collected at a rate of one per sampling day if disposable sampling equipment is used. Rinsate samples will be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinsate sample will be placed in the appropriate sample container and submitted with the groundwater samples to the analytical laboratory for the appropriate analyses; and
- Trip blanks will accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks will consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample container. The trip blank will be prepared by the analytical laboratory prior to the sampling event and will be kept with the shipping containers and placed with other water samples obtained from the site each day. Trip blanks will be analyzed at a frequency of one for each shipping container of groundwater samples to be analyzed for VOCs.

4.4.1 Sample Handling

At a minimum, the following procedures will be used at all times when collecting samples during investigation, corrective action, and monitoring activities:

1. Neoprene, nitrile, or other protective gloves will be worn when collecting samples. New disposable gloves will be used to collect each sample;
2. All samples collected of each medium for chemical analysis will be transferred into clean sample containers supplied by the project analytical laboratory with the exception of soil, rock, and sediment samples obtained in Encore® samplers. 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; and
3. Sample labels and documentation will be completed for each sample following procedures discussed below. 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 below, will

be followed for all samples collected. All samples will be submitted to the laboratory soon enough to allow the laboratory to conduct the analyses within the method holding times.

Chain-of-custody and shipment procedures will include the following:

1. Chain-of-custody forms will be completed at the end of each sampling day, prior to the transfer of samples off site.
2. 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. Temperature blanks will be included with each shipping container.
3. Each cooler or other container will be delivered directly to the analytical laboratory.
4. Glass bottles will be separated in the shipping container by cushioning material to prevent breakage.
5. Plastic containers will be protected from possible puncture during shipping using cushioning material.
6. The chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
7. Chain-of-custody seals will be used to seal the sample-shipping container in conformance with EPA protocol.
8. Signed and dated chain-of-custody seals will be applied to each cooler prior to transport of samples from the site.
9. 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 and copies will be returned to the relinquishing party.
10. Copies of all chain-of-custody forms generated as part of sampling activities will be maintained on-site.

4.5 Collection and Management of Investigation Derived Waste

Drill cuttings, excess sample material and decontamination fluids, and all other investigation derived waste (IDW) associated with soil borings will be contained and characterized using methods based on

the boring location, boring depth, drilling method, and type of contaminants suspected or encountered. All purged groundwater and decontamination water will be characterized prior to disposal unless it is disposed in the refinery wastewater treatment system upstream of the API Separator. An IDW management plan is included as Appendix B.

Field equipment requiring calibration will be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. At a minimum, calibration checks will be conducted daily, or at other intervals approved by the Department, 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. In the interim, a properly calibrated replacement instrument will be used.

4.6 Documentation of Field Activities

Daily field activities, including observations and field procedures, will be recorded in a field log book. Copies of the completed forms will be maintained in a bound and sequentially numbered field file for reference during field activities. Indelible ink will be used to record all field activities. Photographic documentation of field activities will be performed, as appropriate. The daily record of field activities will include the following:

1. Site or unit designation;
2. Date;
3. Time of arrival and departure;
4. Field investigation team members including subcontractors and visitors;
5. Weather conditions;
6. Daily activities and times conducted;
7. Observations;
8. Record of samples collected with sample designations and locations specified;
9. Photographic log, as appropriate;
10. Field monitoring data, including health and safety monitoring;
11. Equipment used and calibration records, if appropriate;
12. List of additional data sheets and maps completed;
13. An inventory of the waste generated and the method of storage or disposal; and
14. Signature of personnel completing the field record.

4.7 Chemical Analyses

All samples collected for laboratory analysis will be submitted to an accredited laboratory. The laboratory will use the most recent standard EPA and industry-accepted analytical methods for target analytes as the testing methods for each medium sampled. Chemical analyses will be performed in accordance with the most recent EPA standard analytical methodologies and extraction methods.

Groundwater and soil samples will be analyzed by the following methods:

- SW-846 Method 8260 for volatile organic compounds;
- SW-846 Method 8270 for semi-volatile organic compounds; and
- SW-846 Method 8015B gasoline range (C5-C10), diesel range (>C10-C28), and motor oil range (>C28-C36) organics.

Groundwater and soil samples will also be analyzed for the following Skinner List metals and iron and manganese using the indicated analytical methods shown. The groundwater samples collected for metals analysis will be analyzed for total and dissolved concentrations. Groundwater samples will also be analyzed for chloride, fluoride, and sulfate.

Inorganic Analytical Methods

Analyte	Analytical Method
Antimony	SW-846 method 6010/6020
Arsenic	SW-846 method 6010/6020
Barium	SW-846 method 6010/6020
Beryllium	SW-846 method 6010/6020
Cadmium	SW-846 method 6010/6020
Chromium	SW-846 method 6010/6020
Cobalt	SW-846 method 6010/6020
Cyanide	SW-846 method 335.4/335.2 mod
Lead	SW-846 method 6010/6020
Mercury	SW-846 method 7470/7471
Nickel	SW-846 method 6010/6020
Selenium	SW-846 method 6010/6020
Silver	SW-846 method 6010/6020
Vanadium	SW-846 method 6010/6020

Zinc	SW-846 method 6010/6020
Iron	SW-846 method 6010/6020
Manganese	SW-846 method 6010/6020

Groundwater field measurements will be obtained for pH, specific conductance, dissolved oxygen concentrations, oxidation-reduction potential, and temperature.

The water samples collected from Evaporation Ponds No. 2 and No. 3, well SMW-2, well SMW-4, and the two new wells near the OCD Central Landfarm will be analyzed for the major cations (calcium, magnesium, sodium, and potassium) and anions (carbonate, bicarbonate, sulfate, and chloride).

4.8 Data Quality Objectives

The Data Quality Objectives (DQOs) were developed to ensure that newly collected data are of sufficient quality and quantity to address the project goals, including Quality Assurance/Quality Control (QA/QC) issues (EPA, 2006). The project goals are established to determine and evaluate the presence, nature, and extent of releases of contaminants at specified SWMUs. The type of data required to meet the project goals includes chemical analyses of soil and groundwater to determine if there has been a release of contaminants.

The quantity of data is location specific and is based on the historical operations at individual locations. Method detection limits should be 20% or less of the applicable background levels, cleanup standards and screening levels.

Additional DQOs include precision, accuracy, representativeness, completeness, and comparability. Precision is a measurement of the reproducibility of measurements under a given set of circumstances and is commonly stated in terms of standard deviation or coefficient of variation (EPA, 1987). Precision is also specific to sampling activities and analytical performance. Sampling precision will be evaluated through the analyses of duplicate field samples and laboratory replicates will be utilized to assess laboratory precision.

Accuracy is a measurement in the bias of a measurement system and may include many sources of potential error, including the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques (EPA, 1987). An evaluation of the accuracy will be performed by reviewing the results of field/trip blanks, matrix spikes, and laboratory QC samples.

Representativeness is an expression of the degree to which the data accurately and precisely represent the true environmental conditions. Sample locations and the number of samples have been selected to ensure the data is representative of actual environmental conditions. Based on SWMU specific conditions, this may include either biased (i.e., judgmental) locations/depths or unbiased (systematic grid samples) locations. In addition, sample collection techniques (e.g., field monitoring and decontamination of sampling equipment) will be utilized to help ensure representative results.

Completeness is defined as the percentage of measurements taken that are actually valid measurements, considering field QA and laboratory QC problems. EPA Contract Laboratory Program (CLP) data has been found to be 80-85% complete on a nationwide basis and this has been extrapolated to indicate that Level III, IV, and V analytical techniques will generate data that are approximately 80% complete (EPA, 1987). As an overall project goal, the completeness goal is 85%; however, some samples may be critical based on location or field screening results and thus a sample-by-sample evaluation will be performed to determine if the completeness goals have been obtained.

Comparability is a qualitative parameter, which expresses the confidence with which one data set can be compared to another. Industry standard sample collection techniques and routine EPA analytical methods will be utilized to help ensure data are comparable to historical and future data. Analytical results will be reported in appropriate units for comparison to historical data and cleanup levels.

Section 5
References

EPA, 1987, Data Quality Objectives for Remedial Response Activities; United States Environmental Protection Agency, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, OSWER Directive 9355.0-7B, 85p.

EPA, 2006, Guidance on Systematic Planning Using the Data Quality Objectives Process, United States Environmental Protection Agency, Office of Environmental Information; EPA/240/B-06/001, p. 111.

Geoscience Consultants, Ltd, 1985a, Inventory of Solid Waste Management Units, June 14, 1985, p. 22.

Geoscience Consultants, Ltd, 1985b, Discharge Plan Application for Giant Refining Company Ciniza Refinery, Gallup New Mexico, November 21, 1985, p, 59.

NMED, 2015, Risk Assessment Guidance for Site Investigation and Remediation, New Mexico Environment Department.

Stone, W.J., Lyford, F.P., Frenzel, P.F., Mizel, N.H., and Padgett, E.T., 1983, Hydrogeology and Water Resources of San Juan Basin, New Mexico; Hydrogeologic Report 6, New Mexico Bureau of Mines and Mineral Resources, p. 70.

Western, 2009, Facility-wide Groundwater Monitoring Plan: Gallup Refinery, p. 97.

Western, 2013, Annual Ground Water Monitoring Report: Gallup Refinery - 2013, p. 225.

Tables

Table 1
SMW-2 SMW-4
BTEX Analytical Results

			Parameters				
			Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Total Xylenes (mg/L)	MTBE (mg/L)
WQCC 20NMAC 6.2.3103			0.01	**0.75**	0.75	**0.62**	NE
40 CFR 141.62 MCL (NOV 2015)			**0.005**	1.0	**0.7**	10	NE
NMED Tap Water (JULY 2015)			0.00454	1.09	0.0149	0.193	**0.143**
EPA RSL for Tap Water (NOV 2015)			4.6E-04	1.1	0.0015	0.19	0.014
WELL ID	**DATE SAMPLED**	**METHOD**					
SMW-2	8/17/2015	8260B	<0.001	<0.001	<0.001	<0.0015	0.011
	9/11/2014	8260B	<0.001	<0.001	<0.001	<0.0015	0.012
	8/23/2012	8260B	<0.01	<0.01	<0.01	<0.015	0.012
	10/12/2011	8260B	<0.001	<0.001	<0.001	<0.0015	0.0079
	7/16/2010	8260B	<0.001	<0.001	<0.001	<0.0015	0.0088
SMW-4	8/14/2015	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	9/11/2014	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	9/9/2013	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	8/24/2012	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	10/10/2011	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	7/16/2010	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001

DEFINITIONS
NE = Not established
NA = Not analyzed
Bold and highlighted values represent values above the applicable standards

STANDARDS
WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.
a) Human Health Standards; b) Other Standards for Domestic Water
40 CFR 141.62 Detection Limits for Inorganic Contaminants
EPA Regional Screening Level (RSL) Summary Table
NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

Table 1
SMW-2 SMW-4
General Chemistry and DRO/GRO Analytical Results

			Parameters							
			Fluoride (mg/L)	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	DRO (mg/L)	GRO (mg/L)	MRO (mg/L)
WQCC 20NMAC 6.2.3103			**1.6**	**250.0**	NE	**10**	**600.0**	NE	NE	NE
40 CFR 141.62 MCL (NOV 2015)			4.0	NE	**1.0**	10	NE	NE	NE	NE
NMED Tap Water (JULY 2015)			1.2	NE	1.97	31.6	NE	NE	NE	NE
EPA RSL for Tap Water (NOV 2015)			0.8	NE	2	32	NE	NE	NE	NE
WELL ID	**DATE SAMPLED**	**METHOD**								
SMW-2	8/17/2015	300.0	<2.0	**3000**	<4.0	<4.0	**1600**	<1.0	0.78	<5.0
	9/11/2014	300.0	<2.0	**2500**	<2.0	<2.0	**1400**	<1.0	0.23	<5.0
	9/9/2013	300.0	<0.1	**2500**	<4.0	<4.0	**1500**	<1.0	0.15	<5.0
	8/23/2012	300.0	0.16	**2400**	<2.0	<2.0	**1600**	<1.0	0.28	<5.0
	10/12/2011	300.0	0.22	**2600**	<10	<10	**1600**	<1.0	0.36	<5.0
	7/16/2010	300.0	NA	NA	NA	NA	NA	<1.0	<0.05	
SMW-4	8/14/2015	300.0	1.0	55	<1.0	<1.0	160	<1.0	<0.05	<5.0
	9/11/2014	300.0	1.1	53	<1.0	<1.0	150	<1.0	<0.05	<5.0
	9/9/2013	300.0	0.93	59	<1.0	<1.0	170	<1.0	<0.05	<5.0
	8/24/2012	300.0	1.0	58	<1.0	<1.0	150	<1.0	<0.05	<5.0
	10/10/2011	300.0	1.1	58	**1.3**	1.3	170	<1.0	<0.05	<5.0
	7/16/2010	300.0	NA	NA	NA	NA	NA	<1.0	<0.05	
	3/1/2010 [1]	8015B	NA	NA	NA	NA	NA	<1.0	<0.05	

DEFINITIONS

NE = Not established

NA = Not analyzed

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STANDARDS

WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.

a) Human Health Standards; b) Other Standards for Domestic Water

40 CFR 141.62 Detection Limits for Inorganic Contaminants

EPA Regional Screening Level (RSL) Summary Table

NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

1) This was part of the 10 year RCRA Post Closure sampling event

Table 1
SMW-2 SMW-4
Total Metals Analytical Results

			Parameters											
			Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Selenium (mg/L)	Cyanide (mg/L)	Mercury (mg/L)	Uranium (mg/L)	Zinc (mg/L)
WQCC 20NMAC 6.2.3103			0.1	**1.0**	0.01	**0.05**	**1.0**	**1.0**	0.05	**0.2**	**0.05**	**0.2**	**0.002**	**0.03**	**10**
40 CFR 141.62 MCL (NOV 2015)			**0.01**	2.0	**0.005**	0.1	1.3	NE	**0.015**	NE	0.05	0.2	0.002	0.03	NE
NMED Tap Water (JULY 2015)			0.000513	3.28	0.00624	0.00559	0.79	13.8	NE	2.02	0.0987	0.00146	0.000626	0.0592	5.96
EPA RSL for Tap Water (NOV 2015)			5.2E-05	0.4	9.2E-03	NE	0.8	14	0.015	0.43	0.1	1.5E-02	6.3E-04	0.06	6
WELL ID	**DATE SAMPLED**	**METHOD**													
SMW-2	8/17/2015	200.7/200.8	<0.01	0.018	<0.002	0.0071	<0.006	0.26	<0.005	**0.33**	<0.01	0.045	<0.0002	**0.12**	<0.01
	9/11/2014	200.7/200.8	<0.01	0.013	<0.002	<0.006	<0.006	0.052	<0.001	**0.28**	0.019	0.0456	<0.0002	**0.11**	<0.01
	9/9/2013	200.7/200.8	<0.01	0.028	<0.002	0.029	<0.006	0.66	<0.01	**0.27**	<0.01	0.0406	<0.0002	**0.11**	0.011
	8/23/2012	200.7/200.8	0.005	0.038	<0.002	**0.17**	<0.006	**1.5**	<0.005	**0.25**	7.2E-03	NL	<0.0002	**0.11**	0.021
	10/12/2011	200.7/200.8	5.2E-03	0.031	<0.002	**0.11**	<0.006	0.68	<0.005	0.16	0.011	NL	<0.0002	**0.12**	<0.01
	7/16/2010	6010B	3.5E-03	0.022	<0.002	**0.093**	NL	NL	<0.005	NL	<0.001	5.25E-02	<0.0002	NL	<0.02
SMW-4	8/14/2015	200.7/200.8	3.0E-03	0.028	<0.002	7.8E-03	<0.006	0.32	5.3E-04	0.01	<0.001	<0.01	<0.0002	**0.036**	<0.01
	9/11/2014	200.7/200.8	3.4E-03	0.024	<0.002	<0.006	<0.006	0.35	<0.001	0.012	1.3E-03	<0.01	<0.0002	**0.037**	<0.01
	9/9/2013	200.7/200.8	2.5E-03	0.021	<0.002	0.025	<0.006	0.15	<0.001	0.005	<0.001	<0.01	<0.0002	**0.031**	0.012
	8/24/2012	200.7/200.8	3.3E-03	0.019	<0.002	<0.006	<0.006	0.13	<0.005	4.6E-03	<0.0025	NA	<0.0002	**0.033**	<0.01
	10/10/2011	200.7/200.8	2.9E-03	0.037	<0.002	**0.058**	<0.006	0.94	<0.005	0.029	<0.0025	NL	<0.0002	**0.037**	0.012
	7/16/2010	6010B	3.33E-03	0.027	<0.002	<0.006	NL	NL	<0.005	NL	<0.001	<0.01	<0.0002	NL	<0.02
	3/1/10 [1]	6010B	<0.005	0.035	<0.002	8.2E-03	NL	NL	<0.005	NL	<0.005	<0.01	<0.0002	NL	<0.02

DEFINITIONS

NE = Not established

NA = Not analyzed

Bold and highlighted values represent values above the applicable standards

STANDARDS

WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.

a) Human Health Standards; b) Other Standards for Domestic Water

40 CFR 141.62 Detection Limits for Inorganic Contaminants

EPA Regional Screening Level (RSL) Summary Table

NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

1) This was part of the 10 year RCRA Post Closure sampling event

Table 1
SMW-2 SMW-4
Dissolved Metals Analytical Results

			Parameters									
			Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Selenium (mg/L)	Uranium (mg/L)	Zinc (mg/L)
WQCC 20NMAC 6.2.3103			0.1	**1.0**	0.01	**0.05**	**1.0**	**1.0**	0.05	**0.2**	**0.05**	**0.03**	**10**
40 CFR 141.62 MCL (NOV 2015)			**0.01**	2.0	**0.005**	0.1	1.3	NE	**0.015**	NE	0.05	0.03	NE
NMED Tap Water (JULY 2015)			0.000513	3.28	0.000624	0.00559	0.79	13.8	NE	2.02	0.0987	0.0592	5.96
EPA RSL for Tap Water (NOV 2015)			5.2E-05	0.4	9.20E-03	NE	0.8	14	0.015	0.43	0.1	0.06	6
WELL ID	**DATE SAMPLED**	**METHOD**											
SMW-2	8/17/2015	200.7/200.8	<0.01	0.015	<0.002	<0.006	<0.006	0.022	<0.0025	**0.31**	<0.01	**0.12**	0.024
	9/11/2014	200.7/200.8	<0.01	0.015	<0.002	<0.006	<0.006	0.049	<0.02	**0.27**	0.021	**0.11**	<0.01
	9/9/2013	200.7/200.8	5.5E-03	0.016	<0.002	<0.006	<0.006	0.028	<0.01	0.17	0.011	**0.1**	0.014
	8/23/2012	200.7/200.8	<0.005	0.016	<0.002	<0.006	<0.006	0.042	<0.005	**0.22**	7.2E-03	**0.1**	0.029
	10/12/2011	200.7/200.8	6.4E-03	0.016	<0.002	<0.006	<0.006	<0.1	<0.005	**0.24**	0.015	**0.11**	0.11
	7/16/2010	6010B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SMW-4	8/14/2015	200.7/200.8	<0.01	0.02	<0.002	<0.006	<0.006	<0.02	<0.0025	<0.002	<0.01	**0.035**	<0.01
	9/11/2014	200.7/200.8	3.3E-03	0.021	<0.002	<0.006	<0.006	0.041	<0.01	3.3E-03	1.3E-03	**0.033**	<0.01
	9/9/2013	200.7/200.8	2.6E-03	0.021	<0.002	0.012	<0.006	<0.02	<0.001	<0.002	<0.001	**0.031**	<0.01
	8/24/2012	200.7/200.8	2.8E-03	0.016	<0.002	<0.006	<0.006	<0.02	<0.005	<0.002	<0.001	0.03	<0.01
	10/10/2011	200.7/200.8	0.003	0.02	<0.002	9.2E-03	<0.006	0.035	<0.005	4.1E-03	1.1E-03	**0.032**	0.13
	7/16/2010	6010B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/1/10 [1]	6010B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

DEFINITIONS

NE = Not established

NA = Not analyzed

Bold and highlighted values represent values above the applicable standards

STANDARDS

WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.

a) Human Health Standards; b) Other Standards for Domestic Water

40 CFR 141.62 Detection Limits for Inorganic Contaminants

EPA Regional Screening Level (RSL) Summary Table

NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

1) This was part of the 10 year RCRA Post Closure sampling event

Table 1
SMW-2 SMW-4
Volatile and Semi-Volatile Organic Compound Analytical Results

			Parameters					
			Acetone (mg/L)	bis(2-Ethylhexyl) phthalate (mg/L)	Diethylphthalate (mg/L)	Phenol (mg/L)	1,4-Dioxane (mg/L)	Benzenethiol (mg/L)
WQCC 20NMAC 6.2.3103			NE	NE	NE	**0.005**	NE	NE
40 CFR 141.62 MCL (NOV 2015)			NE	**0.006**	NE	NE	NE	NE
NMED TAP WATER (JULY 2015)			**14.1**	0.0556	**14.8**	5.76	**0.00776**	NE
EPA RSL for Tap Water (NOV 2015)			14	5.6E-03	15	5.8	4.6E-04	**0.017**
WELL ID	**DATE SAMPLED**	**METHOD**						
SMW-2	8/17/2015	8260B/8270C	<0.01	<0.01	<0.01	<0.01	NL	NL
	9/11/2014	8260B/8270C	<0.01	<0.011	<0.011	<0.11	NL	NL
	9/9/2013	8260B/8270C	<0.01	<0.01	<0.01	<0.01	NL	NL
	8/23/2012	8260B/8270C	<0.1	<0.01	<0.01	<0.01	NL	NL
	10/12/2011	8260B	<0.01	NA	NA	NA	NA	NA
	7/16/2010	8260B/8270C	<0.01	<0.0001	1.89E-03	<0.001	NL	<0.0005
SMW-4	8/14/2015	8260B/8270C	<0.01	<0.01	<0.01	<0.01	NL	NL
	9/11/2014	8260B/8270C	<0.01	<0.01	<0.01	<0.01	NL	NL
	9/9/2013	8260B/8270C	<0.01	<0.01	<0.01	<0.01	NL	NL
	8/24/2012	8260B/8270C	<0.01	<0.01	<0.01	<0.01	NL	NL
	10/10/2011	8260B	<0.01	NA	NA	NA	NA	NA
	7/16/2010	8260B/8270C	<0.01	<0.0001	<0.0001	<0.001	NL	<0.0005
	3/1/2010 [1]	8260B/8270C	<0.0025	<0.005	<0.01	<0.01	<0.005	<0.005

DEFINITIONS
NE = Not established
NA = Not analyzed
NL = Not listed on laboratory analysis.
Bold and highlighted values represent values above the applicable standards

STANDARDS
WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.
a) Human Health Standards; b) Other Standards for Domestic Water
40 CFR 141.62 Detection Limits for Inorganic Contaminants
EPA Regional Screening Level (RSL) Summary Table
NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES
1) This was part of the 10 year RCRA Post Closure Sampling requirement, Total Recoverable Metals Analysis

Table 2
OW-1 OW-10
BTEX Analytical Results

			Benzene (mg/L)	Toluene (mg/L)	Ethyl Benzene (mg/L)	Total Xylenes (mg/L)	MTBE (mg/L)
WQCC 20NMAC 6.2.3103			0.01	**0.75**	0.75	**0.62**	NE
40 CFR 141.62 MCL (NOV 2015)			**0.005**	1.0	**0.7**	10	NE
NMED Tap Water (JULY 2015)			0.00454	1.09	0.0149	0.193	**0.143**
EPA RSL for Tap Water (NOV 2015)			4.6E-04	1.1	0.0015	0.19	0.014
Well ID	**DATE SAMPLED**	**METHOD**					
OW-1	6/6/2016	8260B	0.00013J	<0.00012	<0.00011	<0.00037	0.001
	3/3/2016	8260B	<0.000096	<0.000089	<0.0001	<0.00032	0.00074J
	10/28/2015	8260B	0.0014	0.0024	<0.001	0.0022	0.0016
	8/12/2015	8260B	<0.002	<0.002	<0.002	<0.003	<0.002
	6/3/2015	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	3/9/2015	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	11/10/2014	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	9/11/2014	8260B	<0.002	<0.002	<0.002	<0.003	<0.002
	6/3/2014	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	3/7/2014	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	11/11/2013	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	9/4/2013	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	6/13/2013	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	3/19/2013	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	11/27/2012	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	8/22/2012	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	6/13/2012	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	3/22/2012	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	12/15/2011	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	10/27/2011	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	6/20/2011	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	3/1/2011	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	11/10/2010	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	9/21/2010	8260B	<0.001	<0.001	<0.001	<0.0015	<0.001
	3/15/2010	8021B	<0.001	<0.001	<0.001	<0.0015	<0.001
OW-10	6/6/2016	8260B	<0.000096	<0.00012	<0.00011	0.00037	0.033
	3/3/2016	8260B	<0.000096	<0.000089	<0.0001	<0.00032	0.039
	10/28/2015	8260B	<0.001	0.0023	0.0011	0.0042	0.051
	8/12/2015	8260B	<0.001	<0.001	<0.001	<0.0015	0.058
	6/3/2015	8260B	<0.001	<0.001	<0.001	<0.0015	0.055
	3/9/2015	8260B	<0.001	<0.001	<0.001	<0.0015	0.061
	11/10/2014	8260B	<0.001	<0.001	<0.001	<0.0015	0.098
	9/12/2014	8260B	<0.001	<0.001	<0.001	<0.0015	0.11
	6/3/2014	8260B	<0.001	<0.001	<0.001	<0.0015	0.092
	3/7/2014	8260B	<0.001	<0.001	<0.001	<0.0015	0.079
	11/11/2013	8260B	<0.001	<0.001	<0.001	<0.0015	0.062
	9/4/2013	8260B	<0.001	<0.001	<0.001	<0.0015	0.065

Table 2
OW-1 OW-10
BTEX Analytical Results

			Benzene (mg/L)	Toluene (mg/L)	Ethyl Benzene (mg/L)	Total Xylenes (mg/L)	MTBE (mg/L)
WQCC 20NMAC 6.2.3103			0.01	**0.75**	0.75	**0.62**	NE
40 CFR 141.62 MCL (NOV 2015)			**0.005**	1.0	**0.7**	10	NE
NMED Tap Water (JULY 2015)			0.00454	1.09	0.0149	0.193	**0.143**
EPA RSL for Tap Water (NOV 2015)			4.6E-04	1.1	0.0015	0.19	0.014
Well ID	**DATE SAMPLED**	**METHOD**					
	6/13/2013	8260B	<0.001	<0.001	<0.001	<0.0015	**0.22**
	3/19/2013	8260B	<0.001	<0.001	<0.001	<0.0015	**0.17**
	11/27/2012	8260B	<0.001	<0.001	<0.001	<0.0015	**0.23**
	8/22/2012	8260B	<0.001	<0.001	<0.001	<0.0015	0.044
	6/13/2012	8260B	<0.001	<0.001	<0.001	<0.0015	**0.13**
	3/22/2012	8260B	<0.001	<0.001	<0.001	<0.0015	0.031
	12/15/2011	8260B	<0.001	<0.001	<0.001	<0.0015	0.058
	10/26/2011	8260B	<0.001	<0.001	<0.001	<0.0015	0.038
	6/20/2011	8260B	<0.001	<0.001	<0.001	<0.0015	0.046
	2/28/2011	8260B	<0.001	<0.001	<0.001	<0.0015	0.036
	11/10/2010	8260B	<0.001	<0.001	<0.001	<0.0015	0.036
	9/21/2010	8260B	<0.001	<0.001	<0.001	<0.0015	0.037
	3/15/2010	8260B	<0.001	<0.001	<0.001	<0.0015	0.033

DEFINITIONS

NE = Not established

NA = Not analyzed

Bold and highlighted values represent values above the applicable standards

STANDARDS

WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.

a) Human Health Standards; b) Other Standards for Domestic Water

40 CFR 141.62 Detection Limits for Inorganic Contaminants

EPA Regional Screening Level (RSL) Summary Table

NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

Table 2
OW-1 OW-10
General Chemistry Analytical Results

			Fluoride (mg/L)	Chloride (mg/L)	Bromide (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	Sulfate (mg/L)	pH	DRO (mg/L)	GRO (mg/L)	MRO (mg/L)
WQCC 20NMAC 6.2.3103			**1.6**	**250.0**	NE	NE	**10**	NE	**600.0**	**6 to 9**	NE	NE	NE
40 CFR 141.62 MCL (NOV 2015)			4.0	NE	NE	**1.0**	10	NE	NE	NE	NE	NE	NE
NMED Tap Water (JULY 2015)			1.18	NE	NE	1.97	31.6	NE	NE	N	NE	NE	NE
EPA RSL for Tap Water (NOV 2015)			0.8	NE	NE	2	32	NE	NE	NE	NE	NE	NE
Well ID	**DATE SAMPLED**	**METHOD**											
OW-1	10/8/2015	300.0/8015B	0.25	71	0.26	<.0	<1.0	<0.5	160	NA	<1.0	<0.05	<5.0
	8/12/2015	300.0/8015D	0.29	68	0.25	<1.0	<1.0	<0.5	160	NA	<1.0	<0.1	<5.0
	6/3/2015	300.0/8015D	<0.5	77	<0.5	<1.0	<1.0	<2.5	190	NA	<1.0	<0.05	<5.0
	3/9/2015	300.0/8015D	0.23	67	0.28	<1.0	<1.0	<0.5	170	NA	<1.0	<0.05	<5.0
	11/10/2014	300.0/8015B	0.3	72	0.27	<0.1	0.3	<0.5	170	NA	<1.0	<0.05	<5.0
	9/11/2014	300.0/8015B	<0.5	60	<0.5	<1.0	<1.0	<2.5	150	NA	<1.0	<0.05	<5.0
	6/3/2014	300.0/8015B	0.26	66	0.27	<1.0	<1.0	<0.5	160	NA	<1.0	<0.05	<5.0
	3/7/2014	300.0/8015B	0.3	65	0.27	<1.0	<1.0	<0.5	170	NA	<1.0	<0.05	<5.0
	11/11/2013	300.0/8015B	0.28	65	0.26	**4.7**	4.7	<0.5	170	NA	<1.0	<0.05	NA
	9/4/2013	300.0/8015B	0.3	66	0.22	**29**	**29**	<0.5	180	NA	<1.0	<0.05	<5.0
	6/13/2013	300.0/8015B	<1.0	61	<1.0	<1.0	<1.0	<5.0	180	NA	<1.0	<0.05	<5.0
	3/19/2013	300.0/8015B	<0.5	70	<0.5	<1.0	<1.0	<2.5	200	NA	<1.0	<0.05	<5.0
	11/27/2012	300.0/8015B	<0.5	72	0.75	<1.0	<1.0	<2.5	180	NA	<1.0	<0.05	<5.0
	8/22/2012	300.0/8015B	0.24	62	0.26	<1.0	<1.0	<0.5	170	NA	<1.0	<0.05	<5.0
	6/13/2012	300.0/8015B	0.34	61	0.26	<1.0	<1.0	NL	180	8.76	<1.0	<0.05	<5.0
	3/22/2012	300.0/8015B	0.34	62	0.27	<0.1	0.33	<0.5	170	NA	<1.0	<0.05	<5.0
	12/15/2011	300.0/8015B	0.31	63	0.25	<1.0	<1.0	<0.5	180	NA	<1.0	<0.05	NL
	10/27/2011	300.0/8015B	0.3	65	0.21	<1.0	<1.0	<0.5	180	NA	NL	<0.05	<5.0
	6/20/2011	300.0/8015B	0.33	64	0.3	<0.1	0.5	<0.5	180	8.87	<1.0	<0.05	<1.0
	3/1/2011	300.0/8015B	0.29	68	0.27	**1.1**	1.1	<0.5	180	NA	<1.0	<0.05	
	11/10/2010	300.0/8015B	0.31	64	NL	<1.0	<1.0	<0.5	180	NA	<1.0	<0.05	
	9/10/2010	300.0/8015B	0.32	60	NL	<1.0	<1.0	<0.5	190	NA	<1.0	<0.05	
	3/15/2010	300.0/8015B	0.33	58	0.24	**4.1**	4.1	<0.5	190	NA	<1.0	<0.05	
	6/6/2016			**960**					200				
	3/3/2016			**1100**					200				
OW-10	10/28/2015	300.0/8015B	<0.1	**1500**	0.13	<1.0	<1.0	<0.5	220	NA	<1.0	<0.05	<5.0
	8/12/2015	300.0/8015D	<0.1	**1900**	2.7	<1.0	<1.0	<0.5	240	NA	<1.0	0.064	<5.0
	6/3/2015	300.0/8015D	<0.5	**1500**	1.6	<1.0	<1.0	<2.5	240	NA	<1.0	0.067	<5.0
	3/9/2015	300.0/8015D	0.22	**840**	1.1	<1.0	<1.0	<0.5	200	NA	<1.0	<0.05	<5.0
	11/10/2014	300.0/8015B	0.2	**1600**	0.69	<2.0	0.22	<0.5	200	NA	<1.0	0.087	<5.0
	9/12/2014	300.0/8015B	0.12	**1500**	1.4	<1.0	<1.0	<0.5	200	NA	<1.0	0.064	<5.0
	6/3/2014	300.0/8015B	<0.1	**1500**	1.2	<4.0	<4.0	<0.5	200	NA	<1.0	0.069	<5.0
	3/7/2014	300.0/8015B	0.2	**1200**	0.43	<1.0	<1.0	<0.5	190	NA	<1.0	<0.05	<5.0
	11/11/2013	300.0/8015B	0.17	**850**	0.73	**1.3**	1.3	<0.5	150	NA	<1.0	0.055	NA
	9/4/2013	300.0/8015B	0.19	**1200**	0.98	**11**	**11**	<0.5	180	NA	<1.0	0.051	<5.0
	6/13/2013	300.0/8015B	<1.0	**2400**	1.9	<1.0	<1.0	<5.0	250	NA	<1.0	0.15	<5.0
	3/19/2013	300.0/8015B	<0.5	**1700**	<0.5	<1.0	<1.0	<2.5	230	NA	<1.0	0.11	<5.0

Table 2
OW-1 OW-10
General Chemistry Analytical Results

			Fluoride (mg/L)	Chloride (mg/L)	Bromide (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphorus (mg/L)	Sulfate (mg/L)	pH	DRO (mg/L)	GRO (mg/L)	MRO (mg/L)
WQCC 20NMAC 6.2.3103			**1.6**	**250.0**	NE	NE	**10**	NE	**600.0**	**6 to 9**	NE	NE	NE
40 CFR 141.62 MCL (NOV 2015)			4.0	NE	NE	**1.0**	10	NE	NE	NE	NE	NE	NE
NMED Tap Water (JULY 2015)			1.18	NE	NE	1.97	31.6	NE	NE	N	NE	NE	NE
EPA RSL for Tap Water (NOV 2015)			0.8	NE	NE	2	32	NE	NE	NE	NE	NE	NE
Well ID	**DATE SAMPLED**	**METHOD**											
	11/27/2012	300.0/8015B	<0.5	**2100**	11	<4.0	<4.0	<2.5	240	NA	<1.0	0.13	<5.0
	8/22/2012	300.0/8015B	0.34	**280**	0.59	<1.0	<1.0	<0.5	130	NA	<1.0	<0.05	<5.0
	6/13/2012	300.0/8015B	0.31	**980**	<2.0	<1.0	<1.0	<10	160	7.65	<1.0	0.14	<5.0
	3/22/2012	300.0/8015B	0.41	**260**	0.64	<0.1	0.59	<0.5	140	NA	<1.0	0.062	<5.0
	12/15/2011	300.0/8015B	0.31	**420**	0.54	<1.0	<1.0	<0.5	150	NA	<1.0	0.084	<5.0
	10/26/2011	300.0/8015B	0.34	**500**	0.82	<2.0	0.38	<0.5	140	NA	NL	<0.05	NL
	6/20/2011	300.0/8015B	<0.50	**300**	0.75	<2.0	0.52	<0.5	140	8.42	<1.0	0.053	<5.0
	2/28/2011	300.0/8015B	0.34	**490**	0.76	**1.1**	1.1	<0.5	140	NA	<1.0	0.062	<5.0
	11/10/2010	300.0/8015B	0.38	**450**	NL	<1.0	<1.0	<0.5	150	NA	<0.001	<0.05	
	9/21/2010	300.0/8015B	0.35	**790**	NL	<1.0	<1.0	<0.5	160	NA	<0.001	<0.05	
	3/15/2010	300.0/8015B	0.4	**390**	0.7	**2.2**	2.2	<0.5	150	NA	<0.001	0.064	

DEFINITIONS

NE = Not established
NA = Not analyzed
Bold and highlighted values represent values above the applicable standards

STANDARDS

WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.
a) Human Health Standards; b) Other Standards for Domestic Water
40 CFR 141.62 Detection Limits for Inorganic Contaminants
EPA Regional Screening Level (RSL) Summary Table
NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

Table 2
OW-1 OW-10
Total Metals Analytical Results

			Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Mercury (mg/L)	Zinc (mg/L)
WQCC 20NMAC 6.2.3103			0.1	**1.0**	0.01	**0.05**	**1.0**	0.05	**0.2**	**0.05**	**0.05**	**0.03**	**0.002**	**10**
40 CFR 141.62 MCL (NOV 2015)			**0.01**	2.0	**0.005**	0.1	NE	**0.015**	NE	0.05	NE	0.03	0.002	NE
NMED Tap Water (JULY 2015)			0.000513	3.28	0.00624	0.00559	13.8	NE	2.02	0.0987	0.0812	0.0592	0.000626	5.96
EPA RSL for Tap Water (NOV 2015)			5.2E-05	0.38	9.2E-03	NE	14	0.015	0.43	0.1	0.094	0.06	6.3E-04	6
Well ID	**DATE SAMPLED**	**METHOD**												
OW-1	10/28/2015	200.7/200.8	3.8E-03	0.18	<0.002	0.056	11	0.015	0.42	<0.005	<0.005	**0.042**	<0.0002	0.06
	8/12/2015	200.7/200.8	0.036	2.1	<0.01	0.51	140	0.25	6.7E+00	<0.01	<0.005	**0.098**	<0.0002	0.65
	6/3/2015	200.7/200.8	<0.01	0.047	<0.002	<0.006	1.0	<0.005	0.05	<0.01	<0.005	**0.042**	<0.0002	<0.01
	3/9/2015	200.7/200.8	<0.005	0.04	<0.002	<0.006	0.54	<0.001	0.024	<0.005	<0.005	**0.042**	<0.0002	<0.01
	11/10/2014	200.7/200.8	<0.001	0.036	<0.002	<0.006	0.27	<0.001	6.7E-03	2.9E-03	<0.005	**0.043**	<0.0002	<0.01
	9/11/2014	200.7/200.8	**0.013**	0.56	<0.002	**0.12**	0.025	**0.078**	**1.7**	<0.01	<0.005	**0.066**	<0.0002	0.19
	6/3/2014	200.7/200.8	<0.005	0.034	<0.002	<0.006	**1.7**	0.003	0.073	<0.005	<0.005	**0.042**	<0.0002	0.031
	3/7/2014	200.7/200.8	<0.001	0.041	<0.002	<0.006	0.28	<0.001	0.02	3.4E-03	<0.005	**0.042**	<0.0002	0.01
	11/11/2013	200.7/200.8	1.2E-03	0.048	<0.002	<0.006	**1.2**	1.9E-03	0.053	3.6E-03	<0.005	**0.039**	<0.0002	<0.01
	9/4/2013	200.7/200.8	1.1E-03	0.037	<0.002	<0.006	0.37	<0.001	0.02	3.5E-03	<0.005	**0.043**	<0.0002	<0.01
	6/13/2013	200.7/200.8	6.1E-03	0.26	<0.002	0.028	0.19	NL	**0.82**	4.2E-03	<0.005	**0.052**	<0.0002	0.07
	3/19/2013	200.7/200.8	<0.0025	0.035	<0.002	<0.006	0.088	<0.005	7.4E-03	3.2E-03	<0.005	**0.044**	<0.0002	<0.01
	11/27/2012	200.7/200.8	<0.0025	0.035	<0.002	<0.006	<0.006	<0.005	0.013	2.6E-03	<0.005	**0.045**	<0.0002	<0.01
	8/22/2012	200.7/200.8	<0.0025	0.039	<0.002	<0.006	0.008	<0.005	0.027	4.1E-03	<0.005	**0.04**	<0.0002	<0.01
	6/13/2012	200.7/200.8	<0.0025	0.035	<0.002	<0.006	<0.006	<0.005	0.012	4.2E-03	<0.005	**0.039**	<0.0002	<0.01
	3/22/2012	200.7/200.8	<0.0025	0.045	<0.002	<0.006	<0.006	<0.005	0.058	3.5E-03	<0.005	**0.041**	<0.0002	0.01
	12/15/2011	200.7/200.8	<0.0025	0.066	<0.002	7.2E-03	**2.7**	<0.005	0.13	3.7E-03	<0.005	**0.046**	<0.0002	0.25
	10/27/2011	200.7/200.8	<0.0025	0.036	<0.002	<0.006	0.042	<0.005	0.013	3.5E-03	<0.005	**0.04**	<0.0002	<0.01
	6/20/2011	200.7/200.8	<0.0025	0.039	<0.002	<0.006	0.053	<0.005	0.016	5.6E-03	<0.005	**0.047**	<0.0002	<0.01
	3/1/2011	200.7/200.8	<0.0025	0.038	<0.002	<0.006	0.058	<0.005	0.013	<0.05	<0.005	**0.053**	NL	<0.01
	11/10/2010	6010B	<0.02	<0.02	<0.002	<0.006	<0.05	<0.005	6.6E-03	<0.05	<0.005	**0.039**	<0.0002	<0.02
	9/21/2010	6010B	<0.02	0.038	<0.002	<0.006	0.081	<0.005	0.023	<0.05	<0.005	**0.038**	<0.0002	<0.02
	3/15/2010	6010B	<0.02	0.031	<0.002	<0.006	0.16	<0.005	0.012	<0.05	<0.005	**3.94E-02**	<0.0002	<0.02
OW-10	10/28/2015	200.7/200.8	<0.005	0.095	<0.002	<0.006	<0.02	<0.0025	0.22	0.013	<0.005	**0.061**	<0.0002	<0.01
	8/12/2015	200.7/200.8	<0.005	0.11	<0.002	<0.006	0.038	<0.0005	0.33	0.011	<0.005	**0.064**	<0.0002	0.011
	6/3/2015	200.7/200.8	<0.01	0.095	<0.002	<0.006	<0.02	<0.005	0.15	<0.02	<0.005	**0.063**	<0.0002	<0.01
	3/9/2015	200.7/200.8	<0.005	0.067	<0.002	<0.006	<0.02	<0.001	0.087	0.012	<0.005	**0.061**	<0.0002	<0.01
	11/10/2014	200.7/200.8	<0.005	0.082	<0.002	<0.006	<0.02	<0.001	0.18	<0.02	<0.005	**0.066**	<0.0002	<0.01
	9/12/2014	200.7/200.8	<0.01	0.086	<0.002	<0.006	<0.02	<0.001	0.18	0.017	<0.005	**0.065**	<0.0002	<0.01
	6/3/2014	200.7/200.8	<0.005	0.094	<0.002	<0.006	<0.02	<0.001	0.14	0.015	<0.005	**0.064**	<0.0002	<0.01
	3/7/2014	200.7/200.8	<0.005	0.071	<0.002	<0.006	<0.02	<0.001	0.086	0.012	<0.005	**0.06**	<0.0002	<0.01
	11/11/2013	200.7/200.8	1.8E-03	0.058	<0.002	<0.006	<0.02	<0.001	0.07	0.011	<0.005	**0.057**	<0.0002	<0.01
	9/4/2013	200.7/200.8	<0.005	0.084	<0.002	<0.006	<0.02	<0.001	0.12	0.011	<0.025	**0.061**	<0.0002	<0.01
	6/13/2013	200.7/200.8	<0.005	0.12	<0.002	<0.006	<0.02	NL	0.14	0.017	0.015	**0.076**	<0.0002	<0.01
	3/19/2013	200.7/200.8	<0.0025	0.11	<0.002	<0.006	<0.02	<0.005	0.16	9.8E-03	<0.005	**0.077**	<0.0002	<0.01
	11/27/2012	200.7/200.8	<0.0025	0.11	<0.002	<0.006	<0.006	<0.005	0.13	0.013	<0.005	**0.087**	<0.0002	<0.01
	8/22/2012	200.7/200.8	<0.0025	0.037	<0.002	<0.006	<0.006	<0.005	3.4E-03	8.4E-03	<0.005	**0.049**	<0.0002	<0.01
	6/13/2012	200.7/200.8	<0.0025	0.079	<0.002	<0.006	<0.006	<0.005	0.054	0.013	<0.005	**0.062**	<0.0002	<0.01
	3/22/2012	200.7/200.8	<0.0025	0.033	<0.002	<0.006	<0.006	<0.005	<0.002	7.6E-03	<0.005	**0.051**	<0.0002	<0.01
	12/15/2011	200.7/200.8	<0.0025	0.037	<0.002	<0.006	<0.02	<0.005	0.022	8.9E-03	<0.005	**0.058**	<0.0002	<0.01
	10/26/2011	200.7/200.8	<0.0025	0.045	<0.002	<0.006	<0.02	<0.005	0.043	7.1E-03	<0.005	**0.051**	<0.0002	<0.01
	6/20/2011	200.7/200.8	<0.0025	0.038	<0.002	<0.006	<0.02	<0.005	8.6E-03	0.013	<0.005	**0.057**	<0.0002	<0.01

Table 2
OW-1 OW-10
Total Metals Analytical Results

			Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Mercury (mg/L)	Zinc (mg/L)
WQCC 20NMAC 6.2.3103			0.1	**1.0**	0.01	**0.05**	**1.0**	0.05	**0.2**	**0.05**	**0.05**	**0.03**	**0.002**	**10**
40 CFR 141.62 MCL (NOV 2015)			**0.01**	2.0	**0.005**	0.1	NE	**0.015**	NE	0.05	NE	0.03	0.002	NE
NMED Tap Water (JULY 2015)			0.000513	3.28	0.00624	0.00559	13.8	NE	2.02	0.0987	0.0812	0.0592	0.000626	5.96
EPA RSL for Tap Water (NOV 2015)			5.2E-05	0.38	9.2E-03	NE	14	0.015	0.43	0.1	0.094	0.06	6.3E-04	6
Well ID	**DATE SAMPLED**	**METHOD**												
	2/28/2011	200.7/200.8	<0.0025	0.045	<0.002	<0.006	<0.02	<0.005	0.03	<0.05	<0.005	**0.054**	NL	<0.01
	11/10/2010	6010B	<0.02	0.062	<0.002	<0.006	<0.02	<0.005	0.04	<0.05	<0.005	**0.052**	<0.0002	<0.02
	9/21/2010	6010B	<0.02	0.071	<0.002	<0.006	<0.02	<0.005	0.068	<0.05	<0.005	**0.057**	<0.0002	<0.02
	3/15/2010	6010B	<0.02	0.046	<0.002	<0.006	<0.02	<0.005	0.013	<0.05	<0.005	**5.25E-02**	<0.0002	<0.02

DEFINITIONS

NE = Not established

NA = Not analyzed

Bold and highlighted values represent values above the applicable standards

STANDARDS

WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.

a) Human Health Standards; b) Other Standards for Domestic Water

40 CFR 141.62 Detection Limits for Inorganic Contaminants

EPA Regional Screening Level (RSL) Summary Table

NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

Table 2
OW-1 OW-10
Dissolved Metals Analytical Results

			Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
WQCC 20NMAC 6.2.3103			0.1	**1.0**	0.01	**0.05**	**1.0**	**1.0**	0.05	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**
40 CFR 141.62 MCL (NOV 2015)			**0.01**	2.0	**0.005**	0.1	1.3	NE	**0.015**	NE	0.05	NE	0.03	NE
NMED Tap Water (JULY 2015)			0.000513	3.28	0.00624	0.00559	0.79	13.8	NE	2.02	0.0987	0.0812	0.0592	5.96
EPA RSL for Tap Water (NOV 2015)			5.2E-05	0.38	9.2E-03	NE	0.8	14	0.015	0.43	0.1	0.094	0.06	6
Well ID	**DATE SAMPLED**	**METHOD**												
OW-1	10/28/2015	200.7/200.8	<0.005	0.083	<0.002	0.021	<0.006	1.1	0.0081	0.11	5.0E-03	<0.005	**0.043**	0.02
	8/12/2015	200.7/200.8	<0.005	0.1	<0.002	0.042	<0.006	**11**	7.2E-03	0.13	<0.005	<0.005	**0.042**	0.028
	6/3/2015	200.7/200.8	<0.01	0.033	<0.002	<0.006	<0.006	<0.02	<0.01	0.006	<0.01	<0.005	**0.041**	0.034
	3/9/2015	200.7/200.8	<0.001	0.034	<0.002	<0.006	<0.006	<0.02	<0.001	5.5E-03	4.7E-03	<0.005	**0.039**	<0.01
	11/10/2014	200.7/200.8	1.3E-03	0.033	<0.002	<0.006	<0.006	0.048	<0.02	<0.002	3.7E-03	<0.005	**0.038**	0.031
	9/11/2014	200.7/200.8	2.5E-03	0.12	<0.002	8.2E-03	<0.006	**7.1**	**0.017**	**0.23**	4.4E-03	<0.005	**0.048**	0.078
	6/3/2014	200.7/200.8	1.6E-03	0.039	<0.002	<0.006	<0.006	0.64	<0.005	0.025	6.6E-03	<0.005	**0.044**	0.013
	3/7/2014	200.7/200.8	<0.001	0.035	<0.002	<0.006	<0.006	<0.02	<0.001	6.3E-03	3.9E-03	<0.005	**0.043**	0.012
	11/11/2013	200.7/200.8	1.2E-03	0.038	<0.002	<0.006	<0.006	<0.02	<0.001	7.5E-03	4.6E-03	<0.005	**0.041**	0.029
	9/4/2013	200.7/200.8	<0.005	0.033	<0.002	<0.006	<0.006	0.037	<0.005	6.2E-03	<0.005	<0.005	**0.045**	<0.01
	6/13/2013	200.7/200.8	1.4E-03	0.035	<0.002	<0.006	<0.006	0.35	<0.001	0.013	4.9E-03	<0.005	**0.043**	0.25
	3/19/2013	200.7/200.8	1.3E-03	0.03	<0.002	<0.006	<0.006	<0.02	<0.005	<0.002	3.6E-03	<0.005	**0.044**	0.037
	11/27/2012	200.7/200.8	1.2E-03	0.033	<0.01	<0.03	<0.03	<0.1	<0.025	<0.01	0.004	<0.025	**0.043**	<0.05
	8/22/2012	200.7/200.8	<0.001	0.029	<0.002	<0.006	<0.006	<0.02	<0.005	8.6E-03	3.6E-03	<0.005	**0.041**	0.011
	6/13/2012	200.7/200.8	<0.001	0.036	<0.002	<0.006	<0.006	<0.02	<0.005	6.7E-03	3.7E-03	<0.005	**0.043**	0.015
	3/22/2012	200.7/200.8	<0.001	0.034	<0.002	<0.006	<0.006	<0.02	<0.005	0.005	3.7E-03	<0.005	**0.039**	0.027
	12/15/2011	200.7/200.8	<0.001	0.018	<0.002	<0.006	<0.006	0.19	<0.005	0.013	3.1E-03	<0.005	**0.043**	0.018
	10/27/2011	200.7/200.8	<0.001	0.035	<0.002	<0.006	<0.006	<0.02	<0.005	5.9E-03	3.6E-03	<0.005	**0.04**	<0.01
	6/20/2011	200.7/200.8	1.4E-03	0.034	<0.002	<0.006	<0.006	<0.02	<0.005	4.5E-03	6.2E-03	<0.005	**0.043**	0.048
	3/1/2011	200.7/200.8	<0.001	0.037	<0.002	<0.006	<0.006	<0.02	<0.005	4.1E-03	<0.05	<0.005	**0.032**	<0.01
	11/10/2010	6010B	<0.02	0.037	<0.002	<0.006	<0.006	<0.02	<0.005	4.6E-03	<0.05	<0.005	**0.04**	<0.05
	9/21/2010	6010B	<0.02	0.029	<0.002	<0.006	<0.006	<0.02	<0.005	4.1E-03	<0.05	<0.005	**0.038**	<0.05
	3/15/2010	6010B	<0.02	0.028	<0.002	<0.006	<0.006	<0.02	<0.005	<0.002	<0.05	<0.005	**0.0379**	<0.05
OW-10	10/28/2015	200.7/200.8	<0.005	0.099	<0.002	<0.006	<0.006	<0.02	<0.0025	0.22	0.019	<0.005	**0.061**	<0.01
	8/12/2015	200.7/200.8	<0.005	0.066	<0.002	<0.006	<0.006	<0.02	<0.0025	0.1	0.013	<0.005	**0.056**	<0.01
	6/3/2015	200.7/200.8	<0.01	0.074	<0.002	<0.006	<0.006	<0.02	<0.01	7.5E-02	0.014	<0.005	**0.059**	0.01
	3/9/2015	200.7/200.8	<0.005	0.076	<0.002	<0.006	<0.006	<0.02	<0.001	0.11	<0.05	<0.005	**0.057**	<0.01
	11/10/2014	200.7/200.8	<0.01	0.039	<0.002	<0.006	<0.006	<0.02	<0.01	9.9E-03	0.013	<0.005	**0.057**	0.038
	9/12/2014	200.7/200.8	<0.005	0.099	<0.002	<0.006	<0.006	<0.02	<0.01	0.2	0.017	<0.005	**0.064**	<0.01
	6/3/2014	200.7/200.8	<0.005	0.094	<0.002	<0.006	<0.006	<0.02	<0.005	0.13	0.017	<0.005	**0.062**	<0.01
	3/7/2014	200.7/200.8	<0.005	0.071	<0.002	<0.006	<0.006	<0.02	<0.001	0.098	9.5E-03	<0.005	**0.057**	<0.01
	11/11/2013	200.7/200.8	2.1E-03	0.063	<0.002	<0.006	<0.006	<0.02	<0.001	0.066	0.013	<0.005	**0.054**	<0.01
	9/4/2013	200.7/200.8	<0.005	0.082	<0.002	<0.006	<0.006	<0.02	<0.005	0.12	0.011	<0.025	**0.066**	<0.01
	6/13/2013	200.7/200.8	2.5E-03	0.12	<0.002	<0.006	<0.006	<0.02	<0.001	0.14	0.019	0.012	**0.076**	0.018
	3/19/2013	200.7/200.8	<0.005	0.1	<0.002	<0.006	<0.006	<0.02	<0.005	0.15	0.015	<0.005	**0.073**	<0.01
	11/27/2012	200.7/200.8	1.7E-03	0.11	<0.01	<0.03	<0.03	<0.1	<0.025	0.13	0.015	<0.025	**0.078**	0.05
	8/22/2012	200.7/200.8	0.001	0.034	<0.002	<0.006	<0.006	<0.02	<0.005	<0.002	7.6E-03	<0.005	**0.05**	<0.01
	6/13/2012	200.7/200.8	<0.002	0.08	<0.002	<0.006	<0.006	<0.02	<0.005	0.053	0.014	<0.005	**0.067**	0.026
	3/22/2012	200.7/200.8	<0.001	0.033	<0.002	<0.006	<0.006	<0.02	<0.005	2.3E-03	7.6E-03	<0.005	**0.048**	0.024
	12/15/2011	200.7/200.8	<0.001	0.038	<0.002	<0.006	<0.006	<0.02	<0.005	0.023	8.9E-03	<0.005	**0.056**	<0.01
	10/26/2011	200.7/200.8	0.001	0.043	<0.002	<0.006	<0.006	<0.02	<0.005	0.04	7.9E-03	<0.005	**0.05**	<0.01
	6/20/2011	200.7/200.8	0.002	0.034	<0.002	<0.006	<0.006	<0.02	<0.005	5.5E-03	0.015	<0.005	**0.052**	0.16

Table 2
OW-1 OW-10
Dissolved Metals Analytical Results

			Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Selenium (mg/L)	Silver (mg/L)	Uranium (mg/L)	Zinc (mg/L)
WQCC 20NMAC 6.2.3103			0.1	**1.0**	0.01	**0.05**	**1.0**	**1.0**	0.05	**0.2**	**0.05**	**0.05**	**0.03**	**10.0**
40 CFR 141.62 MCL (NOV 2015)			**0.01**	2.0	**0.005**	0.1	1.3	NE	**0.015**	NE	0.05	NE	0.03	NE
NMED Tap Water (JULY 2015)			0.000513	3.28	0.00624	0.00559	0.79	13.8	NE	2.02	0.0987	0.0812	0.0592	5.96
EPA RSL for Tap Water (NOV 2015)			5.2E-05	0.38	9.2E-03	NE	0.8	14	0.015	0.43	0.1	0.094	0.06	6
Well ID	**DATE SAMPLED**	**METHOD**												
	2/28/2011	200.7/200.8	<0.001	0.044	<0.002	<0.006	<0.006	<0.02	<0.005	0.029	<0.05	<0.005	**0.055**	<0.01
	11/10/2010	6010B	<0.02	0.047	<0.002	<0.006	<0.006	<0.02	<0.005	0.03	<0.05	<0.005	**0.052**	<0.05
	9/21/2010	6010B	<0.02	0.064	<0.002	<0.006	<0.006	<0.02	<0.005	0.055	<0.05	<0.005	**0.051**	0.088
	3/15/2010	6010B	<0.02	0.044	<0.002	<0.006	<0.006	<0.02	<0.005	0.012	<0.05	<0.005	**4.97E-02**	<0.05

DEFINITIONS

NE = Not established

NA = Not analyzed

Bold and highlighted values represent values above the applicable standards

STANDARDS

WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.

a) Human Health Standards; b) Other Standards for Domestic Water

40 CFR 141.62 Detection Limits for Inorganic Contaminants

EPA Regional Screening Level (RSL) Summary Table

NMED Risk Assessment Guidance for Investigations and Remediations Table A-1 (July 2015)

NOTES

Table 2
OW-1 OW-10
Volatile Organic Compound Analytical Results

			1,1-Dichloroethane (mg/L)	1,2-Dichloroethane (EDC) (mg/L)	1,1-Dichloroethene (mg/L)
WQCC 20NMAC 6.2.3103			**0.025**	0.01	**0.005**
40 CFR 141.62 MCL (NOV 2015)			NE	**0.005**	0.007
NMED TAP WATER (JULY 2015)			0.0275	0.00171	0.284
EPA RSL for Tap Water (NOV 2015)			0.0028	0.017	0.28
Well ID	**DATE SAMPLED**	**METHOD**			
	6/6/2016		0.0011	0.00051J	0.0009J
	3/3/2016		0.00096J	0.00055J	0.00091J
OW-10	10/28/2015	8260B	<0.001	<0.001	<0.001
	8/12/2015	8260B	1.1E-03	<0.001	<0.001
	6/3/2015	8260B	<0.001	<0.001	<0.001
	3/9/2015	8260B	<0.001	<0.001	<0.001
	11/10/2014	8260B	1.3E-03	<0.001	1.7E-03
	9/12/2014	8260B	1.6E-03	1.1E-03	1.8E-03
	6/3/2014	8260B	1.2E-03	<0.001	1.2E-03
	3/7/2014	8260B	<0.001	<0.001	<0.001
	11/11/2013	8260B	<0.001	<0.001	<0.001
	9/4/2013	8260B	<0.001	<0.001	<0.001
	6/13/2013	8260B	1.6E-03	0.001	1.9E-03
	3/19/2013	8260B	1.5E-03	1.3E-03	1.9E-03
	11/27/2012	8260B	1.6E-03	1.1E-03	2.1E-03

DEFINITIONS
NE = Not established
NA = Not analyzed
Bold and highlighted values represent values above the applicable standards

STANDARDS
WQCC 20 NMAC 6.2.3103 - Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.
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Table 3
Fluid Level Measurements

Date of Installation	Well ID Number	Inspection or Sample Date	Casing Diameter (Inch)	2014 Survey Ground Level Elevations (ft)	2014 Survey Well Casing Rim Elevations (ft)	2014 Survey Ground Elevation Inside Steel Sleeve (ft)	Stick-up length (ft)	2014 Survey Well Casing Bottom Elevations (ft)	Total Well Depth (ft)	Depth to SPH (ft)	SPH [2] Column Thickness (ft)	Depth to Water (ft)	Ground water Elevation [3] (ft)	Corrected Water Table [4] Elevation (factor 0.8) (ft)	Screened Interval Depth Top to Bottom (ft)	2012 Stratigraphic unit in which screen exists
11/10/2003	BW-1A [5]	8/10/2015	2.00	6,883.17	6,885.12	6,884.93	1.95	6,847.50	46.06	N/A	N/A	DRY	DRY	N/A	30 - 35	Upper Sand
10/28/2003	BW-1B [5]	8/10/2015	2.00	6,883.17	6,885.78	6,885.72	2.61	6,818.33	76.29	N/A	N/A	DRY	DRY	N/A	54.6 - 64.6	Chinle/Alluvium Interface
11/10/2003	BW-1C [5]	8/10/2015	2.00	6,883.17	6,885.68	6,885.64	2.51	6,749.29	145.29	N/A	N/A	12.33	6,873.35	N/A	125 -135	Sonsela
11/10/2003	BW-2A	8/10/2015	2.00	6,871.88	6,874.69	6,870.45	2.81	6,807.12	67.57	N/A	N/A	32.00	6,842.69	N/A	55 - 65	Upper Sand
10/28/2003	BW-2B	8/10/2015	2.00	6,871.66	6,874.50	6,870.06	2.84	6,782.24	92.26	N/A	N/A	28.00	6,846.50	N/A	80 - 90	Chinle/Alluvium Interface
10/28/2003	BW-2C	8/10/2015	2.00	6,872.90	6,875.30	6,872.02	2.40	6,722.46	152.84	N/A	N/A	20.56	6,854.74	N/A	139.5 - 149.5	Sonsela
6/15/2004	BW-3A	8/10/2015	2.00	6,875.94	6,878.39	6,875.08	2.45	6,826.04	52.35	N/A	N/A	DRY	DRY	N/A	39.5 - 49.5	Upper Sand
10/15/2003	BW-3B	8/10/2015	2.00	6,876.16	6,878.59	6,875.41	2.43	6,809.19	69.40	N/A	N/A	33.00	6,845.59	N/A	63 - 73	Chinle/Alluvium Interface
7/20/2004	BW-3C	8/10/2015	2.00	6,875.72	6,877.95	6,875.27	2.23	6,723.40	154.55	N/A	N/A	7.75	6,870.20	N/A	144.5 - 154.5	Sonsela
10/14/1981	MW-1	8/10/2015	5.00	6,876.63	6,878.12	6,876.79	1.49	6,747.29	130.83	N/A	N/A	6.90	6,871.22	N/A	117.72 - 127.72	Sonsela
10/15/1981	MW-2	8/10/2015	5.00	6,878.39	6,880.30	6,878.41	1.91	6,742.82	137.48	N/A	N/A	9.13	6,871.17	N/A	112 - 122	Sonsela
10/16/1981	MW-4	8/10/2015	5.00	6,879.89	6,881.63	6,879.34	1.74	6,759.91	121.72	N/A	N/A	7.30	6,874.33	N/A	101 - 121	Sonsela
7/21/1986	MW-5	8/10/2015	4.00	6,880.20	6,882.83	6,881.77	2.63	6,752.00	130.83	N/A	N/A	11.20	6,871.63	N/A	115 - 125	Sonsela
9/26/1985	SMW-2	8/10/2015	2.00	6,881.63	6,883.97	6,879.07	2.34	6,831.17	52.80	N/A	N/A	24.88	6,859.09	N/A	34.31 - 54.31	Chinle/Alluvium and Upper Sand
9/25/1985	SMW-4	8/10/2015	2.00	6,877.63	6,879.52	6,875.72	1.89	6,809.84	69.68	N/A	N/A	29.32	6,850.20	N/A	51.7 - 71.7	Chinle/Alluvium Interface
1/5/1981	OW-1	3/9/2015	4.00	6,866.32	6,866.62	6,866.44	0.30	6,772.07	94.55	N/A	N/A	0.00	6,866.62	N/A	89.3 - 99.3	Sonsela
		6/3/2015	4.00	6,866.32	6,866.62	6,866.44	0.30	6,772.07	94.55	N/A	N/A	0.00	6,866.62	N/A	89.3 - 99.3	Sonsela
		8/12/2015	4.00	6,866.32	6,866.62	6,866.44	0.30	6,772.07	94.55	N/A	N/A	0.00	6,866.62	N/A	89.3 - 99.3	Sonsela
		10/28/2015	4.00	6,866.32	6,866.62	6,866.44	0.30	6,772.07	94.55	N/A	N/A	0.00	6,866.62	N/A	89.3 - 99.3	Sonsela
11/25/1980	OW-10	3/9/2015	4.00	6,873.67	6,874.91	6,872.59	1.24	6,814.58	60.33	N/A	N/A	0.96	6,873.95	N/A	40 - 60	Sonslea
		6/3/2015	4.00	6,873.67	6,874.91	6,872.59	1.24	6,814.58	60.33	N/A	N/A	1.00	6,873.91	N/A	40 - 60	Sonsela
		8/12/2015	4.00	6,873.67	6,874.91	6,872.59	1.24	6,814.58	60.33	N/A	N/A	0.38	6,874.53	N/A	40 - 60	Sonsela
		10/28/2015	4.00	6,873.67	6,874.91	6,872.59	1.24	6,814.58	60.33	N/A	N/A	1.47	6,873.44	N/A	40 - 60	Sonsela

DEFINITIONS:

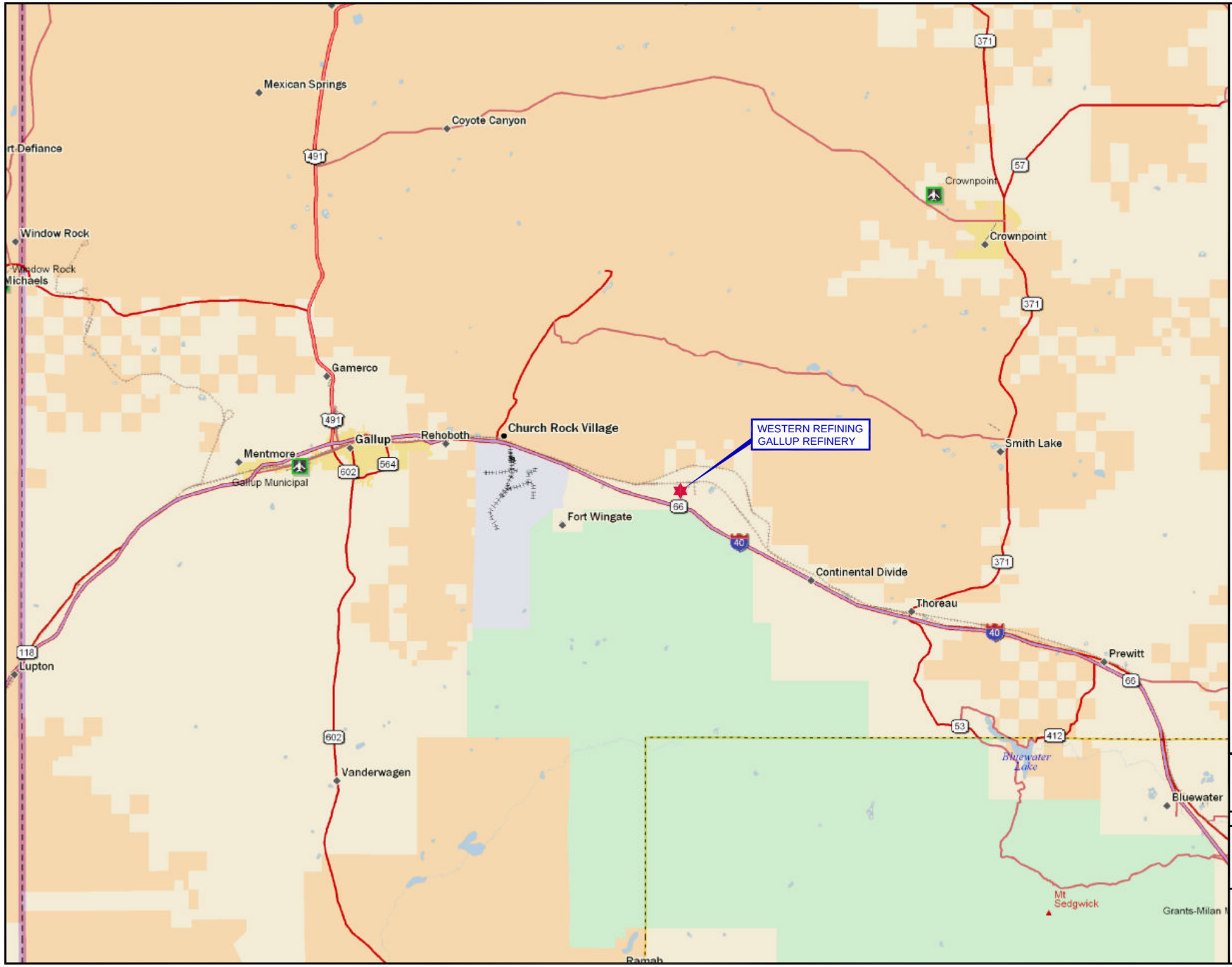
DTB - Depth to Bottom
DTW - Depth to Water
SPH = Separate Phase Hydrocarbons
N/A = Not Applicable
Negative number in Stick Up Length column indicates well is flushmount and located at or below ground level.
Depth to Water Column - if 0.00 is indicated - means water is at top of casing (full). Dry indicates no water was detected.

NOTES:

1. *Elevation data from NMED's "Approval with Modifications, Requirement to Resurvey Ground water Monitoring Wells and Recovery Wells", dated 9/26/12.*
2. *Ground water elevation - Depth to SPH = SPH Column Thickness.*
3. *2014 Survey Well Casing Rim elevation - depth to water measurement.*
4. *Corrected Water Table Elevation applies only if SPH thickness column measurement exists. (0.8 X SPH thickness + Ground Water Elevation)*
5. *BW-1A, B, C: Height and width of berm was increased where these wells are located for repairs. Berm work at all evaporation ponds from April through August, 2015 for berm repairs (erosion). Casings were extended and all three wells were resurveyed by HEI (Hammon Enterprises Inc) upon completion.*

Figures

Map Source: DeLorme Street Atlas USA 2007 Plus.



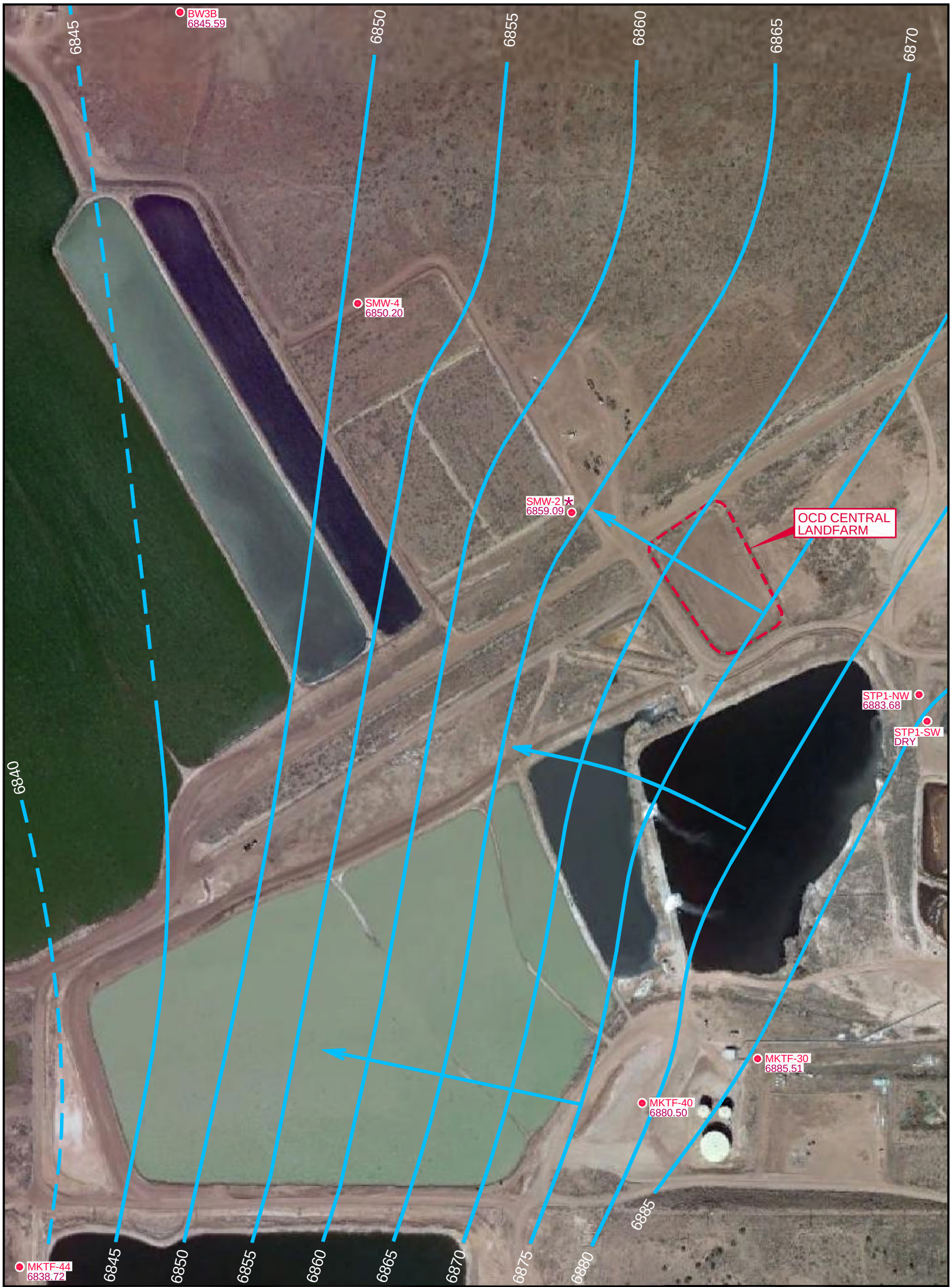
0 5
SCALE IN MILES

Western Refining
GALLUP REFINERY

PROJ. NO.: Western Refining | DATE:07/13/14 | FILE:WestRef-B198

FIGURE 1
SITE LOCATION MAP
GALLUP REFINERY

DiSorbo
Environmental Consulting Firm
8501 N. MoPac Expy.
Suite 300
Austin, Texas 78759



Aerial Map Source: Google Map, 03/18/2016.

LEGEND

MKTF-40 — MONITORING WELL LOCATION

6860 — POTENTIOMETRIC CONTOUR (FT) (5 FT INTERVAL)

GROUNDWATER FLOW DIRECTION

6880.50 — WATER LEVEL ELEVATION MEASURED AUGUST 2015 (ABOVE MSL)

* — DATA NOT USED IN CONTOURS

0 250
SCALE IN FEET

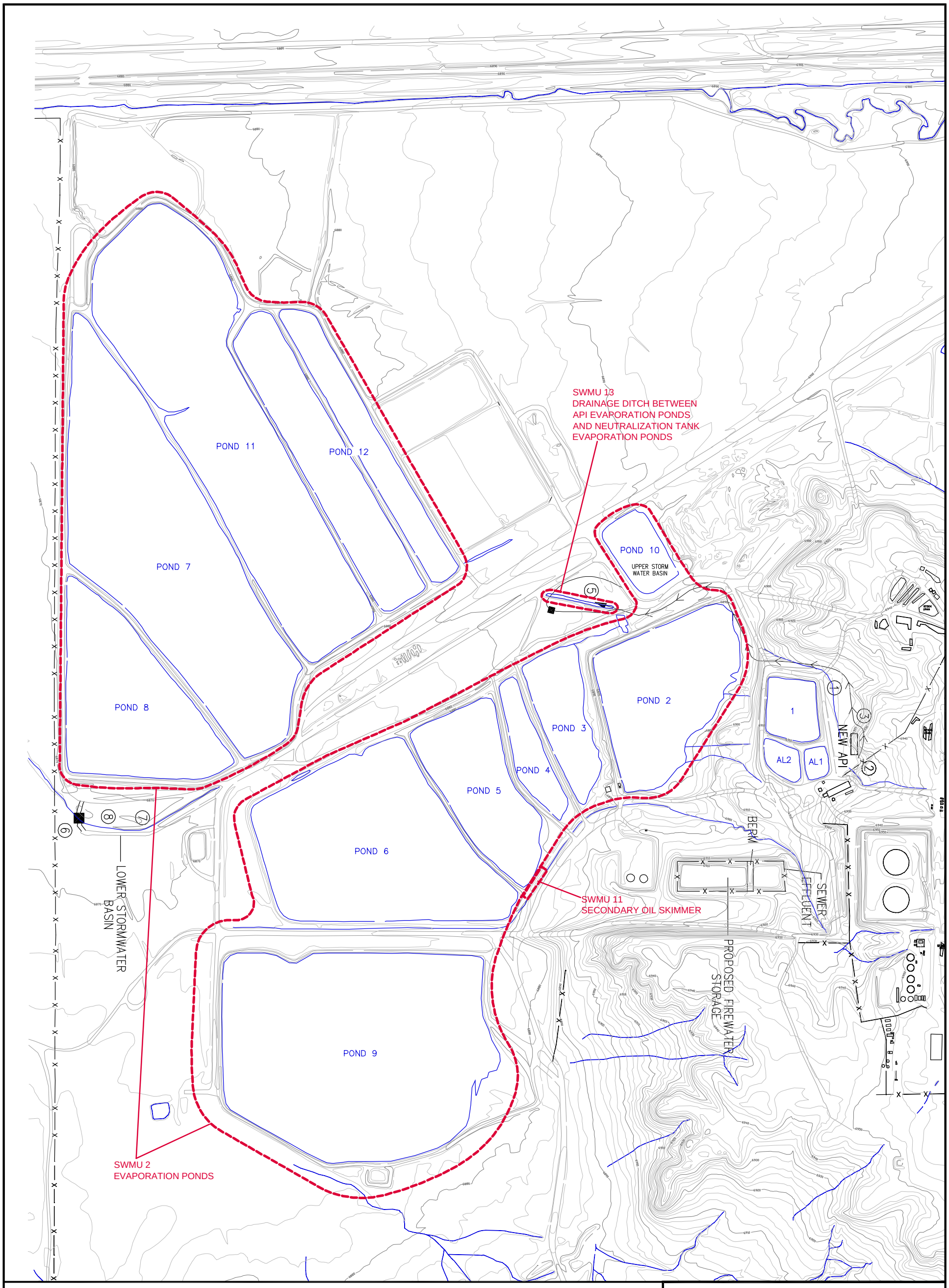
NEW MEXICO
SITE LOCATION

Western Refining
GALLUP REFINERY

PROJ. NO.:Western Refining | DATE:10/03/16 | FILE:WestRef-dB113

FIGURE 2
CHINLE / ALLUVIUM INTERFACE
POTENTIOMETRIC MAP
AUGUST 2015

DiSorbo
Environmental Consulting Firm
8501 N. MoPac Expy.
Suite 300
Austin, Texas 78759



N

0 400

SCALE IN FEET

LEGEND

SWMU LOCATIONS

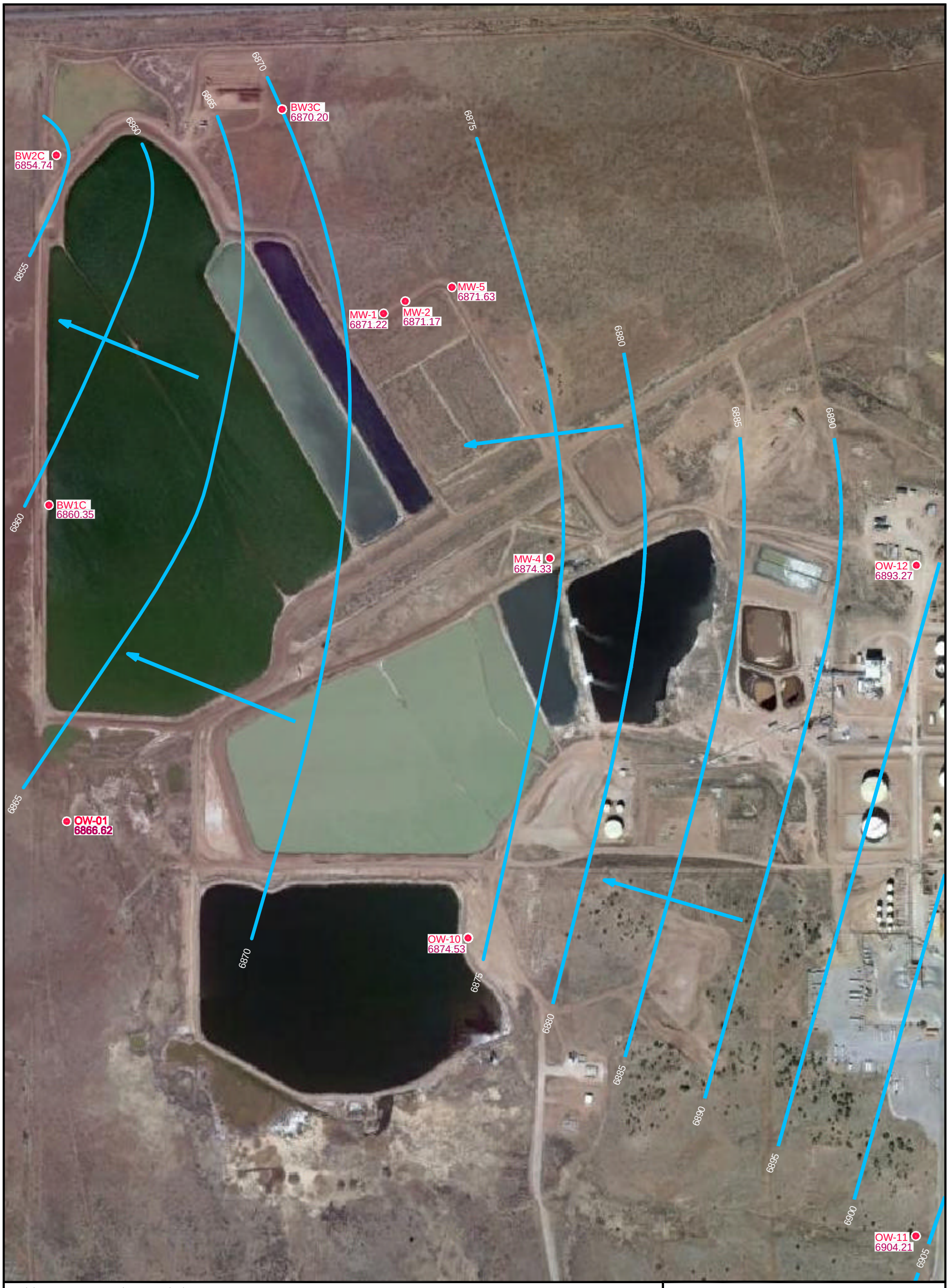
Western Refining
GALLUP REFINERY

PROJ. NO.: Western Refining | DATE: 02/17/14 | FILE: WestRef-B181

FIGURE 3
SWMU / AOC LOCATIONS

DiSorbo
Environmental Consulting Firm

8501 N. Mopac Expy
Suite 300
Austin, Texas 78759



Aerial Map Source: Google Map, 03/18/2016.

LEGEND

OW-10	MONITORING WELL LOCATION
6880	POTENTIOMETRIC CONTOUR (FT) (5 FT INTERVAL)
	GROUNDWATER FLOW DIRECTION
6874.53	WATER LEVEL ELEVATION MEASURED AUGUST 2015 (ABOVE MSL)

N

0 400
SCALE IN FEET

NEW MEXICO
SITE LOCATION

Western Refining
GALLUP REFINERY

PROJ. NO.:Western Refining | DATE:10/03/16 | FILE:WestRef-dB114

FIGURE 4
SONSELA SANDSTONE
POTENTIOMETRIC MAP
AUGUST 2015

DiSorbo
Environmental Consulting Firm
8501 N. MoPac Expy.
Suite 300
Austin, Texas 78759

Aerial Map Source: Google Map, 03/18/2016.

N

0 300

SCALE IN FEET

LEGEND

PROPOSED MONITORING WELL LOCATION

MKTF-43 MONITORING WELL LOCATION (CHINLE / ALLUVIAL) AND IDENTIFICATION NUMBER

OW-01 MONITORING WELL LOCATION (SONSELA) AND IDENTIFICATION NUMBER

NEW MEXICO

SITE LOCATION

Western Refining

GALLUP REFINERY

PROJ. NO.:Western Refining | DATE: 10/4/16 | FILE:WestRef-dA76

FIGURE 5
SMW-2 AREA
PROPOSED
MONITORING WELL LOCATIONS

DiSorbo
Environmental Consulting Firm

8501 N. MoPac Expy.
Suite 300
Austin, Texas 78759

Aerial Map Source: Google Map, 03/18/2016.

LEGEND

- PROPOSED MONITORING WELL LOCATION
- THREE PROPOSED CLUSTERED MONITORING WELLS
- MKTF-43 — MONITORING WELL LOCATION (CHINLE / ALLUVIAL) AND IDENTIFICATION NUMBER
- OW-01 — MONITORING WELL LOCATION (SONSELA) AND IDENTIFICATION NUMBER
- PW-2 — RAW WATER PRODUCTION WELL LOCATION AND IDENTIFICATION NUMBER

N

0 300

SCALE IN FEET

NEW MEXICO

SITE LOCATION

Western Refining
GALLUP REFINERY

PROJ. NO.:Western Refining | DATE: 10/4/16 | FILE:WestRef-dA77

FIGURE 6
OW-1 AREA ADDITIONAL MONITORING WELL LOCATIONS

DiSorbo
Environmental Consulting Firm
8501 N. MoPac Expy.
Suite 300
Austin, Texas 78759

Appendix A

Boring Logs

Sheet: 1 OF 2
Bore Point: 12' West of BW1

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW1A

Log of Test Borings

Elevation: Existing
Date: 11/10/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-4.0	Continuous	//////////	2.5	**Clay**, firm, red-brown, moist				
	4.0-5.0		//////////	5.0	**Clay**, silty, firm-stiff, red-brown, wet				
	5.0-10.0		//////////	7.5 10.0	**Clay**, firm-stiff, red-brown, wet ("Fat Clay")				
	10.0-20.0		//////////	15.0 20.0	**Clay**, stiff, red-brown, wet ("Fat Clay")				
	20.0-24.5		//////////		**Clay**, hard, damp-moist, some slickensides, (shrink swell), brittle, slightly silty @ 21.0-21.3				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1A.xls]Sheet1

Sheet: OF 2
Bore Point: 12' West of BW1

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW1A

Log of Test Borings

Elevation: Existing
Date: 11/10/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	22.0					
			//////////						
			//////////						
			//////////						
			//////////						
	24.5-24.7		********		**Sand**, very fine, silty, dry, loose, light red-brown				
	24.7-26.5		/*/*/*/*/*/	25.0	**Clay**, very sandy, silty hard, damp, red-brown				
			/*/*/*/*/*/		crumbly				
			/*/*/*/*/*/						
	26.5-28.5		**_**_**_		**Sand**, very fine, silty, dry, slightly clayey,				
			__**_		occasional < 1cm clay beds, loose-moderate				
			__**_		dense, very light brown				
			__**_						
	28.5-30.5		//*//*//*//		**Clay**, slightly sandy, silty, firm-stiff, very light				
			//*//*//*//		red-brown, damp, occasional laminar salt bed,				
			//*//*//*//		dry, very crumbly in hand				
			//*//*//*//	30.0					
	30.5-31.3		//*//*//*//		**Clay**, sandy, gradational with above dry, stiff-hard,				
	31.3-32.3		//*//*//*//		very light brown				
	32.3-32.9		********		**Sand**, very fine, loose, silty, slightly clayey,				
	32.9-33.2		//*//*//*//		moderate dense, very light brown, dry				
	33.2-35.0		//*//*//*//		**Clay**, slightly sandy, firm, dry, very light brown				
			********		crumbles easily				
			********		**Sand**, very silty, dry, very light brown, moderate,				
			//*//*//*//		dense				
			//*//*//*//		**Clay**, slightly sandy, silty, hard, dry, crumbly, very				
			//*//*//*//	35.0	light red-brown, graditional contacts				
	35.0-40.0		//////////		**Clay**, red-brown, "Fat", damp, crumbly in hand				
			//////////		carves smooth vitrius surface with knife, hard,				
			//////////		2 lamini of very fine sand in 5' run				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	40.0					
					T.D. 40.0				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1A.xls]Sheet2

Sheet: 1 OF 3
Bore Point: Dike 7-8 intersection

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW1B

Log of Test Borings

Elevation: Existing
Date: 10/28/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-4.0	Continuous	//////////		**Clay**, firm, red-brown, moist				
			//////////						
			//////////						
			//////////						
			//////////	2.5					
			//////////						
			//////////						
	4.0-5.0		//////////		**Clay**, silty, firm-stiff, red-brown, wet				
			//////////						
			//////////	5.0					
	5.0-10.0		//////////		**Clay**, firm-stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////	7.5					
			//////////						
			//////////						
			//////////						
			//////////	10.0					
	10.0-20.0		//////////		**Clay**, stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	15.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	20.0					
	20.0-24.5		//////////		**Clay**, hard, damp-moist, some slickensides,				
			//////////		(shrink swell), brittle, slightly silty @ 21.0-21.3				
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

Sheet: 2 OF 3
Bore Point: Dike 7-8 intersection

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW1B

Log of Test Borings

Elevation: Existing
Date: 10/28/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	22.0					
			//////////						
			//////////						
			//////////						
			//////////						
	24.5-24.7		********		**Sand**, very fine, silty, dry, loose, light red-brown				
	24.7-26.5		/*/*/*/*/*/	25.0	**Clay**, very sandy, silty hard, damp, red-brown crumbly				
			/*/*/*/*/*/						
			/*/*/*/*/*/						
	26.5-28.5		**_**_**_		**Sand**, very fine, silty, dry, slightly clayey, occasional < 1cm clay beds, loose-moderate dense, very light brown				
			__**_						
			__**_						
			__**_						
	28.5-30.5		//*//*//*//		**Clay**, slightly sandy, silty, firm-stiff, very light red-brown, damp, occasional laminar salt bed, dry, very crumbly in hand				
			//*//*//*//						
			//*//*//*//						
			//*//*//*//	30.0					
	30.5-31.3		//*//*//*//		**Clay**, sandy, gradational with above dry, stiff-hard, very light brown				
	31.3-32.3		//*//*//*//						
	32.3-32.9		********		**Sand**, very fine, loose, silty, slightly clayey, moderate dense, very light brown, dry				
	32.9-33.2		//*//*//*//						
	33.2-35.0		//*//*//*//		**Clay**, slightly sandy, firm, dry, very light brown crumbles easily				
			********						
			********		**Sand**, very silty, dry, very light brown, moderate, dense				
			//*//*//*//						
			//*//*//*//		**Clay**, slightly sandy, silty, hard, dry, crumbly, very light red-brown, graditional contacts				
			//*//*//*//	35.0					
	35.0-40.0		//////////		**Clay**, red-brown, "Fat", damp, crumbly in hand carves smooth vitrius surface with knife, hard, 2 lamini of very fine sand in 5' run				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	40.0					
	40.0-45.0		//////////		**Same as above**, 1 sand laminae				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1B.xls]Sheet2

Sheet: 3 OF 3
Bore Point: Dike 7-8 intersection

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW1B

Log of Test Borings

Elevation: Existing
Date: 10/28/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	44.0					
			//////////						
			//////////	45.0					
	45.0-50.0		//////////		**Same as above**				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	50.0					
	50.0-52.0		**/**/**/		**Sand**, clayey, moderate dense, dark red-purple, damp				
			//**/						
			//**/						
	52.0-55.0		//////////		**Clay**, dark red-purple, hard, moist-wet, crumbles in hand sample				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	55.0					
	55.0-58.2		/*/*/*/*/*/		**Clay**, very sandy, red-purple, hard, brittle, moist-wet, gradition of sand is greater with depth				
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
	58.2-59.8		**/**/**/		**Sand**, slightly clayey, mottled red-grey, dry, dense				
			//**/		dense-very dense, pebbles of limestone, chert				
	59.8-60.0				and sandstone				
				60.0	**Petrified Forest Formation of the Painted**				
	60.0-65.0				**Desert Member**. **Clay**,(claystone), red, carbonate				
					nodules, (white), hard, crumbly, damp-moist				
					Same as above, some grey mottling, fissile				
					at 60.0'				
	T.D.			65.0	Set well in boring, see well diagram				
					.010" Slotted PVC Screen: set in 64.6'-54.6' interval				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1B.xls]Sheet3

Sheet: 1 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-4.0	Continuous	//////////		**Clay**, firm, red-brown, moist				
			//////////						
			//////////						
			//////////						
			//////////	2.5					
			//////////						
			//////////						
	4.0-5.0		//////////		**Clay**, silty, firm-stiff, red-brown, wet				
			//////////						
			//////////	5.0					
	5.0-10.0		//////////		**Clay**, firm-stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////	7.5					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	10.0					
	10.0-20.0		//////////		**Clay**, stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	15.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	20.0					
	20.0-24.5		//////////		**Clay**, hard, damp-moist, some slickensides,				
			//////////		(shrink swell), brittle, slightly silty @ 21.0-21.3				
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1C.xls]Sheet1

Sheet: 1 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			////////// ////////// ////////// ////////// //////////	22.0					
	24.5-24.7		********		**Sand**, very fine, silty, dry, loose, light red-brown				
	24.7-26.5		/*/*/*/*/*/ /*/*/*/*/*/ /*/*/*/*/*/	25.0	**Clay**, very sandy, silty hard, damp, red-brown crumbly				
	26.5-28.5		**_**_**_ **_**_**_ **_**_**_ **_**_**_		**Sand**, very fine, silty, dry, slightly clayey, occasional < 1cm clay beds, loose-moderate dense, very light brown				
	28.5-30.5		//*//*//*// //*//*//*// //*//*//*// //*//*//*//	30.0	**Clay**, slightly sandy, silty, firm-stiff, very light red-brown, damp, occasional laminar salt bed, dry, very crumbly in hand				
	30.5-31.3		//*//*//*//		**Clay**, sandy, gradational with above dry, stiff-hard, very light brown				
	31.3-32.3		//*//*//*//						
	32.3-32.9		********		**Sand**, very fine, loose, silty, slightly clayey, moderate dense, very light brown, dry				
	32.9-33.2		//*//*//*//		**Clay**, slightly sandy, firm, dry, very light brown crumbles easily				
	33.2-35.0		//*//*//*//		**Sand**, very silty, dry, very light brown, moderate, dense				
			******** ******** //*//*//*//		**Clay**, slightly sandy, silty, hard, dry, crumbly, very light red-brown, graditional contacts				
			//*//*//*//	35.0					
	35.0-40.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	40.0	**Clay**, red-brown, "Fat", damp, crumbly in hand carves smooth vitrius surface with knife, hard, 2 lamini of very fine sand in 5' run				
	40.0-45.0		////////// ////////// ////////// ////////// ////////// //////////		**Same as above**, 1 sand laminae				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1C.xls]Sheet2

Sheet: 1 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	44.0					
			//////////						
			//////////	45.0					
	45.0-50.0		//////////		**Same as above**				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	50.0					
	50.0-52.0		**/**/**/		**Sand**, clayey, moderate dense, dark red-purple,				
			//**/		damp				
			//**/						
	52.0-55.0		//////////		**Clay**, dark red-purple, hard, moist-wet, crumbles				
			//////////		in hand sample				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	55.0					
	55.0-58.2		/*/*/*/*/*/		**Clay**, very sandy, red-purple, hard, brittle, moist-				
			/*/*/*/*/*/		wet, gradition of sand is greater with depth				
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
	58.2-59.8		**/**/**/		**Sand**, slightly clayey, mottled red-grey, dry, dense				
			//**/		dense-very dense, pebbles of limestone, chert				
	59.8-60.0				and sandstone				
				60.0	**Petrified Forest Formation of the Painted**				
	60.0-65.0				**Desert Member**. **Clay**,(claystone), red, carbonate				
					nodules, (white), hard, crumbly, damp-moist				
					Same as above, some grey mottling, fissile				
					at 60.0'				
	T.D.			65.0	Set well in boring, see well diagram				
					.010" Slotted PVC Screen: set in 64.6'-54.6' interval				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1C.xls]Sheet3

Sheet: 4 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-65.0	Continuous		65.0	See Stratigraphic Log From BW 1				
	65.0-119.0				**Mudstone/Siltstone** interbedded, blocky, damp-dry, dense **Chinle Group, Petrified Forest Formation, Painted Desert Member**				
				75.0					
				85.0					
				95.0					
				105.0					
				115.0					
	119.0-131.0				**Petrified Forest Formation,** **Sandstone**, white, hard, some pebbles of quartzite, and mafic rock, interbedded claystone and silt-stone				
				125.0					
	131.0-134.5				**Sandstone**, very hard, clean, quartz, water bearing				
	134.5-145.0			135.0	**Mudstone**, grey, moist, firm				
				145.0					
	145.0-152.0				**Siltstone/Mudstone**, grey, sandy				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1C.xls]Sheet4

Sheet: 5 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/03

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
				151.0					
	152.0-154.0				**Sandstone**, white-light grey, hard, silty				
				155.0					
	T.D.			157.0	Set well in boring, see well diagram				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\AAFWFILE\projects\2003\03-118Ciniza\[BW1C.xls]Sheet5

BORING OW-1

SURFACE ELEVATION: 6868 FEET

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)
0									
10									
20									
30									
40									
50									
60									
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

PENETRATION RATE MINUTES/FOOT	SYMBOLS	DESCRIPTION
6.0	CL	TRIASSIC PERIOD CHINLE FORMATION RED TO REDDISH BROWN CLAY WITH TRACE TO SOME SILT, CALCAREOUS, HIGHLY WEATHERED
5.0		
4.0		
4.2		
3.8	SHALE	27 FEET: SHALE, REDDISH BROWN, SILTY, CALCAREOUS, SOFT, FRESH
4.1		GRADES HARD FROM 33 FEET
5.6		GRADES WITH OCCASIONAL THIN LIMESTONE INTERBEDS FROM 40 TO 50 FEET
5.0		
4.2		GRADES WITH THIN SANDSTONE INTERBEDS FROM 45 TO 50 FEET
4.6		
5.4		
4.2		GRADES SOFT FROM 65 FEET
3.6		
4.0		GRADES WITH THIN SANDSTONE AND LIMESTONE INTERBEDS FROM 75 FEET, HARD
5.4		
8.0		
5.2	SS	86 FEET: SANDSTONE, VARIEGATED BROWN TO LIGHT GRAY, FINE GRAINED, SILTY, SOFT, WITH ROUNDED TO SUBROUNDED, CLEAR TO FROSTED QUARTZ GRAINS, MICACEOUS, FRESH
4.2		
3.6		SHALE 98 FEET: SHALE, REDDISH BROWN, SILTY, SOFT, FRESH

BORING COMPLETED AT 99.3 FEET ON 11/10/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 89.3 TO 99.3 FEET.
GRAVEL PLACED FROM 88.0 TO 99.3 FEET AND SEALED WITH CEMENT AND BENTONITE TO SURFACE.
GROUND WATER LEVEL MEASURED AT 6.4 FEET BELOW GROUND ON 1/5/81.

KEY TO BORINGS
ROCK SYMBOLS

SHALE SANDSTONE MUDSTONE

NOTES:
1. PENETRATION RATE IN MINUTES PER FOOT WAS DETERMINED BY THE TIME REQUIRED TO DRILL EACH INTERVAL SHOWN WITH A CABLE TOOL RIG.
2. ESTIMATES OF SOIL CONSISTENCY AND ROCK STRENGTH ARE BASED ON PENETRATION RATE USING THE FOLLOWING CRITERIA:
   < 4.2 MIN./FT.-SOFT
   > 4.2 MIN./FT.-HARD
3. ELEVATION GIVEN IN FEET ABOVE MEAN SEA LEVEL.
4. SOIL CLASSIFICATION IS BASED ON UNIFIED SOIL CLASSIFICATION SYSTEM (PLATE A2-1).
5. ALL DEPTHS REFER TO DEPTH BELOW GROUND.
6. SEE PLATE 1 FOR LOCATION OF WELLS.

LOG OF BORINGS

DAMES & MOORE

BORING OW-10

SURFACE ELEVATION: 6872 FEET

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)
0									
10									
20									
30									
40									
50									
60									
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

LABORATORY TEST DATA

PENETRATION RATE MINUTES/FOOT

PENETRATION RATE (MINUTES/FOOT)	SYMBOLS	DESCRIPTION
1.0	CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED
1.4	ML	GRADES WITH TRACE TO SOME MEDIUM TO FINE-GRAINED SAND-SIZED PARTICLES OF CHERT, PETRIFIED WOOD, AND LIMESTONE FROM 5 FEET
1.4	CL	10 FEET: REDDISH BROWN SILTY FINE-GRAINED SAND, WITH SOME CLAY, SOFT, HIGHLY WEATHERED 13 FEET: REDDISH BROWN SILTY CLAY WITH SOME SAND, SOFT, HIGHLY WEATHERED SAND GRADES OUT FROM 16 FEET GRADES WITH SAND FROM 24 FEET GRADES WITH OCCASIONAL THIN INTERBEDS OF SANDSTONE FROM 28 FEET
2.0		
2.0		
2.8	SS	34 FEET: SANDSTONE, COLOR VARIES FROM DARK AND REDDISH BROWN TO WHITE TO LIGHT GRAY, SILTY, FINE-GRAINED, NONCALCAREOUS, SOFT, FRESH GRADES BROWN FROM 45 FEET
3.0		
6.7		
2.9		
4.6		
5.0	SHALE	63 FEET: SHALE, GRAY TO PURPLISH GRAY, SILTY, WITH OCCASIONAL THIN INTERBEDS OF TAN TO BROWN, FINE-GRAINED, CALCAREOUS SANDSTONE, HARD, FRESH

BORING COMPLETED AT 68.0 FEET ON 11/25/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 40.0 TO 60.0 FEET.
GRAVEL PLACED FROM 36.0 TO 68.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 1.7 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

DAMES & MOORE

Geoscience Consultants, Ltd

WELL LOGGING FORM

Page ____ of ____

Client GIANT REFINING COMPANY Well Number SMW-2

__ ¼ __ ¼ __ ¼ __ ¼ S __ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9/26/95 Completion Date

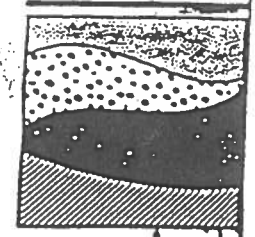
Logs Run Lith from Cores Logged By J.C. Hunter

Elevation 6882.83 Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

th	Litho	Recov	RUN	From	To	Sample#/Ft	Lith/Remarks
							SE corner of LTA Times should be 15xx, not 14xx etc
						850925	
70 0			ϕ	0	5	1415/4.0 (35% Cly)	0-1.5 SOIL
5			2	5	10	1420/10.0 (Cly 50)	
10			3	10	15	1426/15' (Cly)	1.5 - 4.0 CLAY
15			4	15	20	1432/20' (20)	
20			5	20	25	1438/25' (Cly)	4.0 - 19.0 SANDY CLAY
25			6	25	30	1445/22.5 (50) 1446/30.0 (Cly 50)	
30			7	30	35	1452/32.5 (Cly) 1453 35.0 (50)	19.0 - 24 SAND; gr rd (5R4/2); med gr, poor sort, qty + Uic ca frag
35			8	35	40	1458/37.5 1459/40.0	24 - 25 CLAY
40							25 - 28 SAND, as above
							28 - 33 CLAYEY SAND & CLAY
						5'	33 - 38 SAND (WET) med rd brn (10R4/2) med gr, mod sort, qty, rnd
							38-40 CLAY
							9/27/95 H_2O level 29'7" 9:40
							N 120° to SMW-2
							pH 7.1 #850926 1445

Consultants, Ltd



Client GIANT REFINING COMPANY Well Number SMW-4

__ ¼ __ ¼ __ ¼ __ ¼ S __ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9/25/85 Completion Date 9/25/85

Logs Run Lith from Cores Logged By J.C. Hunter

Elevation 6878.84 Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth	Litho	Recov	RUN	From	To	Sample#/Ft	Lith/Remarks
							Between MW1- & MW-2 Depths from top of auger, ~ 1.5' AGL (typical)
0							
TTR 0830 5			1	0	5	0850925: a 0840/40	0-1.5' (1.5) SOIL; gry rd (10R 4/2); silty cly w/ minor sd; roots & org matter
10			2	5	10	0847 cl 110.8	
15			3	10	15	0952 cl 115'	1.5-9.0 (7.5') CLAY; gry rd (5R4/2) - dk rd brn (10R3/4); dense, plastic, 1-5% si
20			4	15	20	0859 cl 120'	
25			5	20	25	0906 sd 125'	9.0-16.0 (6.0') SANDY CLAY; gry rd (10R4/ - dk gy rd (5R3/4); cly w/ 15-20% f
30			6	25	30	0913/27.5 cl 0914/30.0 snd	
35			7	30	35	0917/32.5 cl 0920/35.0 cl	cly (boils @ 38') gr-cr gr sd, local f grvl, poor sor
40			8	35	40	0927/37.5 cl 0928/40.0 cl	
45			9	40	45	0936/42.5 cl 0937/45.0 cl	(mud cutting @ 45')
50			10	45	50	0940/42.5 sd/cly 0941/50.0 cly	15.0-23.0 (7.0) CLAY; gry rd (5R4/2), loc. sandy, 5-10% sd
TD 1000 55			11	50	55	0954/52.5 sd/cly 0955/55.0 cly	
More to do			12	55	60	0959/20/1245/57.5' cly 1216/60.0 sd	23.0-24.0 (1) SAND; pale rd brn (10R5/4) - rd brn (10R4/6); f g, mod srt, loose qtz ± K-spar
Continued 9/30/85 @ 1100			13	60	65	1241/62.5 1242/65.0	24.0-33.0 (9.0) SILTY CLAY; mod rd (5R5/4) cly w/ 10-20% slt, loc f g sand
			14	65	70	1258/67.5 1259/70.0	33.0-59 (26) CLAY; mod rd brn (10R4) loc silty-sandy
							57.5-59.5
							59-61 (2') Sltst (calc ↑) mod rd brn (10R4/6); f g, mod srt
							61-65 Silty Sandstone (dry) pale red (10R6/2)
							loc 1" calc cmt

Appendix B

Investigation Derived Waste Management Plan

Investigation Derived Waste (IDW) Management Plan

All IDW will be properly characterized and disposed of in accordance with all federal, State, and local rules and regulations for storage, labeling, handling, transport, and disposal of waste. The IDW may be characterized for disposal based on the known or suspected contaminants potentially present in the waste.

A dedicated decontamination area will be setup prior to any sample collection activities. The decontamination pad will be constructed so as to capture and contain all decontamination fluids (e.g., wash water and rinse water) and foreign materials washed off the sampling equipment. The fluids will be pumped directly into suitable storage containers (e.g., labeled 55-gallon drums), which will be located at satellite accumulation areas until the fluids are disposed in the refinery wastewater treatment system upstream of the API separator. The solids captured in the decontamination pad will be shoveled into 55-gallon drums and stored at the designated satellite accumulation area pending proper waste characterization for off-site disposal.

Drill cuttings generated during installation of soil borings will be placed directly into 55-gallon drums and staged in the satellite accumulation area pending results of the waste characterization sampling. The portion of soil cores, which are not retained for analytical testing, will be placed into the same 55-gallon drums used to store the associated drill cuttings.

The solids (e.g., drill cuttings and used soil cores) will be characterized by testing to determine if there are any hazardous characteristics in accordance with 40 Code of Federal Regulations (CFR) Part 261. This includes tests for ignitability, corrosivity, reactivity, and toxicity. If the materials are not characteristically hazardous, then further testing will be performed pursuant to the requirements of the facility to which the materials will be transported. Depending upon the results of analyses for individual investigation soil samples, additional analyses may include VOCs, TPH and polynuclear aromatic hydrocarbons (PAHs).