Gallup Ay 2011 ENTERED WWTS / STP-1 pond

VanHorn, Kristen, NMENV

From: Chavez, Carl J, EMNRD
Sent: Tuesday, August 16, 2011 11:14 AM
To: Chavez, Carl J, EMNRD; Hains, Allen
Cc: Riege, Ed; VanHorn, Kristen, NMENV; Cobrain, Dave, NMENV; VonGonten, Glenn, EMNRD
Subject: RE: engineering drawings STP-1

Allen and Ed:

One more OCD item of concern in Drawing Z 84-03-183 Note 2: The manufacturer's recommended procedures for pond liner shall conform to OCD Regulation 19.15.36.17 NMAC.
Thanks.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
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http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

From: Chavez, Carl J, EMNRD
Sent: Tuesday, August 16, 2011 10:01 AM
To: Hains, Allen
Cc: 'Riege, Ed'
Subject: FW: engineering drawings STP-1

Allen and Ed:

Good morning. The agencies have completed our preliminary review of the above subject submittal. Please find below and in NMED' questions below items for further discussion with Western.

OCD's review observations, requirements, and/or questions:

1. Some piping shows Schedule 40, but OCD Rule 36 requirement is minimum Schedule 80 piping requirement;
2. Three feet of freeboard must be maintain at all times;
3. Must submit engineering design for spray system for approval prior to installation and spray shall remain within confines of pond perimeter.
4. Oil trap or skimmer pit/tank to prevent oil from entering pond is required.
5. Where will liquids removed from leak detection system be treated, stored and/or disposed? Rule 36 requires some type of holding pit, tank, etc. to handle leakage through primary liner system.

Please respond to the NMED and OCD items in this communiqué. The agencies will arrange for a telephone conference call if necessary. Thank you.

Carl J. Chavez, CHMM
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From: VanHorn, Kristen, NMENV
Sent: Friday, August 12, 2011 4:48 PM
To: Chavez, Carl J, EMNRD
Cc: Cobrain, Dave, NMENV
Subject: engineering drawings STP-1

Carl,
I looked through the engineering drawings and here are our comments/questions.

1. Since native clay is "expansive" and not appropriate for compacted structural fill, where will fill be taken from to match the engineering requirements listed in notes?
2. What is the estimated amount of soil to be removed as part of the excavation? (Will we require them to do confirmation samples to make sure the soil is clean for reuse?)
3. Were any geotechnical borings done at the site? Where are the logs and the geotechnical results?
4. What is the outflow pipe (to EP-2) covered in to ensure no freezing? Is the pipe above ground or subgrade? Where will sample port(s) be for the outflow of the pipe as it enters EP-2?
5. Is there a schematic drawing of the piping as it enters STP-1 from the waste water treatment plant (MPPE) and the Pilot and refinery waste water (also it might help if it shows where sample port(s) will be located)? And a drawing of where the pipes leave STP-1 and go to EP-2?

If you need anything else, let me know.

Thanks,
Kristen

Kristen Van Horn
NMED Hazardous Waste Bureau
2905 Rodeo Park Drive East Building 1
Santa Fe, NM 87505
Phone: 505-476-6046

VanHorn, Kristen, NMENV

From: Riege, Ed [Ed.Riege@wnr.com]
Sent: Friday, August 19, 2011 9:48 AM
To: Chavez, Carl J, EMNRD; VanHorn, Kristen, NMENV
Cc: Keys, Frank; Hains, Allen; Riege, Ed
Subject: FW: STP-1 Response to Questions
Attachments: 20110818111843924.pdf

Importance: High

Carl,
Gallup has addressed the good questions from you and Kristen below in orange font. The attachments referred to below are attached in the PDF. Thanks for your quick review of the STP-1 design. Let me know if you have any additional questions.

Ed

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Gallup Refinery
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(505) 722-0217
ed.riege@wnr.com

From: Chavez, Carl J, EMNRD [mailto:CarlJ.Chavez@state.nm.us]
Sent: Tuesday, August 16, 2011 10:01 AM
To: Hains, Allen
Cc: Riege, Ed
Subject: FW: engineering drawings STP-1

Allen and Ed:

Good morning. The agencies have completed our preliminary review of the above subject submittal. Please find below and in NMED' questions below items for further discussion with Western.

OCD's review observations, requirements, and/or questions:

1. Some piping shows Schedule 40, but OCD Rule 36 requirement is minimum Schedule 80 piping requirement; Western has requested to Mustang Engineering our engineering contractor to change all piping within the leak detection system from Sch 40 to Sch 80, in accordance with NMAC 19.15.36.17.B(9).
2. Three feet of freeboard must be maintain at all times; Western has requested to Mustang our engineering contractor to change freeboard to three feet in plans to comply with NMAC 19.15.36.17.B(11).
3. Must submit engineering design for spray system for approval prior to installation and spray shall remain within confines of pond perimeter. The aeration pump spray system engineering design from Mustang is attached as Attachment 1.
4. Oil trap or skimmer pit/tank to prevent oil from entering pond is required. This requirement is being met with the installation of the new DGF and MPPE system. The API Separator provides first stage oil-water separation. The DGF will provide the second stage oil water separation. Emulsified oil and gas is electrically released from the wastewater by the addition of coagulant and flocculent. If a problem is detected in the effluent of the DGF through the continuous turbidity monitor, flow will be automatically diverted to the DGF feed tank thereby

protecting the MPPE system. If the MPPE effluent is found out of spec flow will also be diverted to the DGF tank.

5. Where will liquids removed from leak detection system be treated, stored and/or disposed? Rule 36 requires some type of holding pit, tank, etc. to handle leakage through primary liner system. Please see the Attachment 2 which is from Appendix 1 of Mustang's design.

Please respond to the NMED and OCD items in this communiqué. The agencies will arrange for a telephone conference call if necessary. Thank you.

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From: VanHorn, Kristen, NMENV
Sent: Friday, August 12, 2011 4:48 PM
To: Chavez, Carl J, EMNRD
Cc: Cobrain, Dave, NMENV
Subject: engineering drawings STP-1

Carl,
I looked through the engineering drawings and here are our comments/questions.

1. Since native clay is "expansive" and not appropriate for compacted structural fill, where will fill be taken from to match the engineering requirements listed in notes? No native soil will be used as structural fill which will be purchased from a local construction materials supplier.
2. What is the estimated amount of soil to be removed as part of the excavation? (Will we require them to do confirmation samples to make sure the soil is clean for reuse?) The estimated amount of soil is 21,000 cubic yards. Confirmation sampling similar to the sampling done for the fill used at the RRR Lagoon Fan out area will be completed.
3. Were any geotechnical borings done at the site? Yes Where are the logs and the geotechnical results? Our geotechnical investigation included two boreholes at STP-1, see Attachment 3.
4. What is the outflow pipe (to EP-2) covered in to ensure no freezing? The outflow piping from STP-1 to EP-2 will be buried deeper than the frost line of four feet. Is the pipe above ground or subgrade? Subgrade Where will sample port(s) be for the outflow of the pipe as it enters EP-2? Sample can be taken in V notch weir to be located at exit of STP-1.
5. Is there a schematic drawing of the piping as it enters STP-1 from the waste water treatment plant (MPPE) and the Pilot and refinery waste water (also it might help if it shows where sample port(s) will be located)? And a drawing of where the pipes leave STP-1 and go to EP-2? Mustang is currently working to provide Gallup with a current pipe rack layout. Gallup will provide it to you once received.

If you need anything else, let me know.

Thanks,
Kristen

ATTACHMENT 1

STP-1 Design Basis

- The treatment objective of STP-1 is to provide sufficient organic removal to prevent an organic loading to the Evaporation Ponds that cause the ponds to become anoxic.

- The STP-1 is to have a large hydraulic retention time (HRT) sufficient to metabolize the dissolved organic in the treated refinery effluent and the Pilot Travel Center sanitary wastewater. The refinery wastewater is pretreated by the removal of O&G using an API Separator and DGF Unit, while most of the dissolved organics are removed in the MPPE Unit. The Pilot sanitary wastewater is pretreated through the removal of settleable solids in the new pump station prior to the sanitary stream being pumped to STP-1.

- The sludge age is to be "infinite". There is no planned sludge wasting. Therefore a dynamic balance will be maintained between the biomass under aeration and the influent organic load. The influent organic load is to be entirely metabolized to CO2 and water. The downstream portion of STP-1 is quiescent to allow any suspended solids to settle prior to passing under an underflow baffle and over a V-notch weir, and then by gravity to the Evaporation Ponds. The solids that settle to the bottom of the quiescent portion of STP-1 will be removed on an infrequent basis using e.g. a pontoon mounted suction pump to pull settled solids off the bottom.

- STP-1 is divided longitudinally by a concrete wall which allows one side of the pond to be dewatered for inspection and maintenance if necessary, while maintaining the other side in operation. The liners are attached to the concrete wall and the concrete effluent structure using a water tight seal.

There are currently five Aqua-Jet surface aerators, each at 15 HP, that provide aeration and mixing of the two Aerated Lagoons. These aerators will be relocated to the new STP-1 along with five additional Aqua Aerobic surface aerators, for a total of 10 Aqua-Jet aerators.

Aeration

Provide sufficient D.O. transfer to satisfy the biochemical oxygen demand assuming the MPPE remove 80% of the dissolved organics from the refinery wastewater. The refinery dissolved BOD5 = 811 mg/l prior to the MPPE. Because there is no sludge wasting in this system, base oxygen demand on BODult, where BODult = 2 x BOD5. Average refinery flow rate = 275 gpm.

The Pilot sanitary wastewater BOD5 = 250 mg/l; Pilot average flow rate = 50 gpm (values from Brown & Caldwell report of 23 Mar 2009).

BOD5 refinery = 536 lb/d
BOD5 Pilot = 150 lb/d
BOD5 total = 686 lb/d

BODult total = 1372 lb/d = 57 lb/hr

Typically, surface aerators transfer about 2 lb 02/HP-hr

Horsepower required = 51 HP

Horsepower required with 1.5 safety factor = 76.5

Number of Aqua Jet surface aerators required for this case = 5

Now size the aerated portion of STP-1 assuming a food to microorganism ratio:

F/M = 0.236 BODult [lb/d] / (MLSS x Vol)

Assume the MLSS is 1000 mg/l in the aerated portion of STP-1.

Vol = 0.7 MG; this is volume of the aerated portion of STP-1 (based on F/M and 1000 mg/l MLSS).

Now calculate number of aerators required for mixing based on 1.15 HP/1000 ft3.

HP mixing = 700,000 gal/ (7.48 gal/ft3) x 1.15 HP/1000 ft3 = 107.6 HP

Aqua Jet aerators required for mixing = 7
Therefore, the mixing requirement governs the number of aerators required, and supplies sufficient DO to satisfy case where refinery wastewater bypasses MPPE. **Consider installing 10 aerators, five on each side.** During normal operation two of the aerators are turned off.

ATTACHMENT 2

APPENDIX 1 - ACTION LEAKAGE RATE

This appendix presents a calculation of the Action Leakage Rates (ALR) for the STP-1 treatment pond at the WNR Gallup refinery. As per the U.S. EPA (1992) the ALR is defined as *"the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot"*.

STP-1 is divided longitudinally with a full water depth partition and laterally by a half depth partition. Each quarter of STP-1 is served by a dedicated Leak Collection and Recovery System (LCRS) sump. A mobile pump will be used to pump collected water from the LCRS sump back into the STP-1 aerated pond. The ALR is calculated for each LCRS sump. According to Title 40 CFR Section 264.223, of a leakage rate exceeding this value is measured, action must be taken.

Objective

The objective is to determine the Action Leakage Rate (ALR) for the STP-1 aerated treatment pond.

Given:

- The STP-1 treatment pond configuration is as shown in Figure 6 of the Preliminary Engineering Report.
- A typical liner system consists of a prepared subgrade, upon which a secondary liner is placed, then a geonet permeable liner, then an impervious primary liner.
- The LCSR top dimensions are 16 feet by 12 feet for all four sumps.

Material Properties:

The material properties considered in the analysis for the drainage geonet on STP-1 are shown below:

Geonet Properties			
Manufacturer		**Transmissivity [gpm/ft (m^2/s)] [1]**	**Thickness [mil]**
GSE	HyperNet	9.66 (2 x 10^{-3})	200
[1] See Attachment 1 to this Appendix.			

Method:

The ALR calculation is based on the U.S. EPA guidelines published in U.S. EPA (1992).

Assumptions:

- Darcy's law applies;
- The gradient of the floor of the STP-1 is approximately 2 percent. The gradient of the side slopes of STP-1 is approximately 33.3 percent.

Flow Through Liner Defect Calculations and Sump Capacity Calculations

The flow through a defect in the geomembrane is given by the following equation (Giroud et al. 1997, *Rate of Liquid Migration Through Defects In A Geomembrane Placed On A Semi-Permeable Medium*).

$d := 0.005$ ft; defect diameter

$h_{prim} := 10$ ft; total liquid head over primary membrane

$g := 32.2$ ft/sec^2 gravity

Where the maximum flow rate through the primary liner geomembrane is:

$$Q := \frac{2}{3} \cdot d^2 \cdot \sqrt{g \cdot h_{prim}}$$

$Q = 2.991 \cdot 10^{-4}$ ft^3/sec

The permeability of the geonet can be defined by:

$t_{LCL} := 0.017$ ft; thickness of the geonet

$\theta := 0.0215$ ft^2/sec; geonet transmissivity

$k := \frac{\theta}{t_{LCL}}$ geonet hydraulic conductivity

$k = 1.265$ ft/sec

The maximum steady-state rate of leachate migration through a defect in the primary liner that a leakage collection layer can accommodate without being filled with leachate:

$$Q_{full} := k \cdot t_{LCL}^2$$

$Q_{full} = 3.655 \cdot 10^{-4}$ ft^3/sec

The liquid head build-up on the secondary geomembrane liner can be calculated by using the following equation:

$$to := \sqrt{\frac{Q}{k}}$$

$to = 0.015$ ft

Since the flow rate through a defect in the geomembrane (Q) is lower than the maximum flow rate that the leakage collection layer can accommodate (Qfull), and the estimated liquid head build-up (to) is less than the thickness of the geonet (tLCL), the calculated flow in the geomembrane is valid.

Sump Capacity:

Flow in the LCRS layer through the geonet is 2.99 x 10^{-4} ft^3/sec = 193 gpd per defect.

Assume 1 defect per acre of pond area.

The area of the liquid surface = 108' x 268' = 0.664 acres

Total Flow: Q_T = 193 gpd/acre x 0.664 acre = 128 gpd

t = 48 hr
n = 0.3 (porosity)
FS = 1.5 (factor of safety)

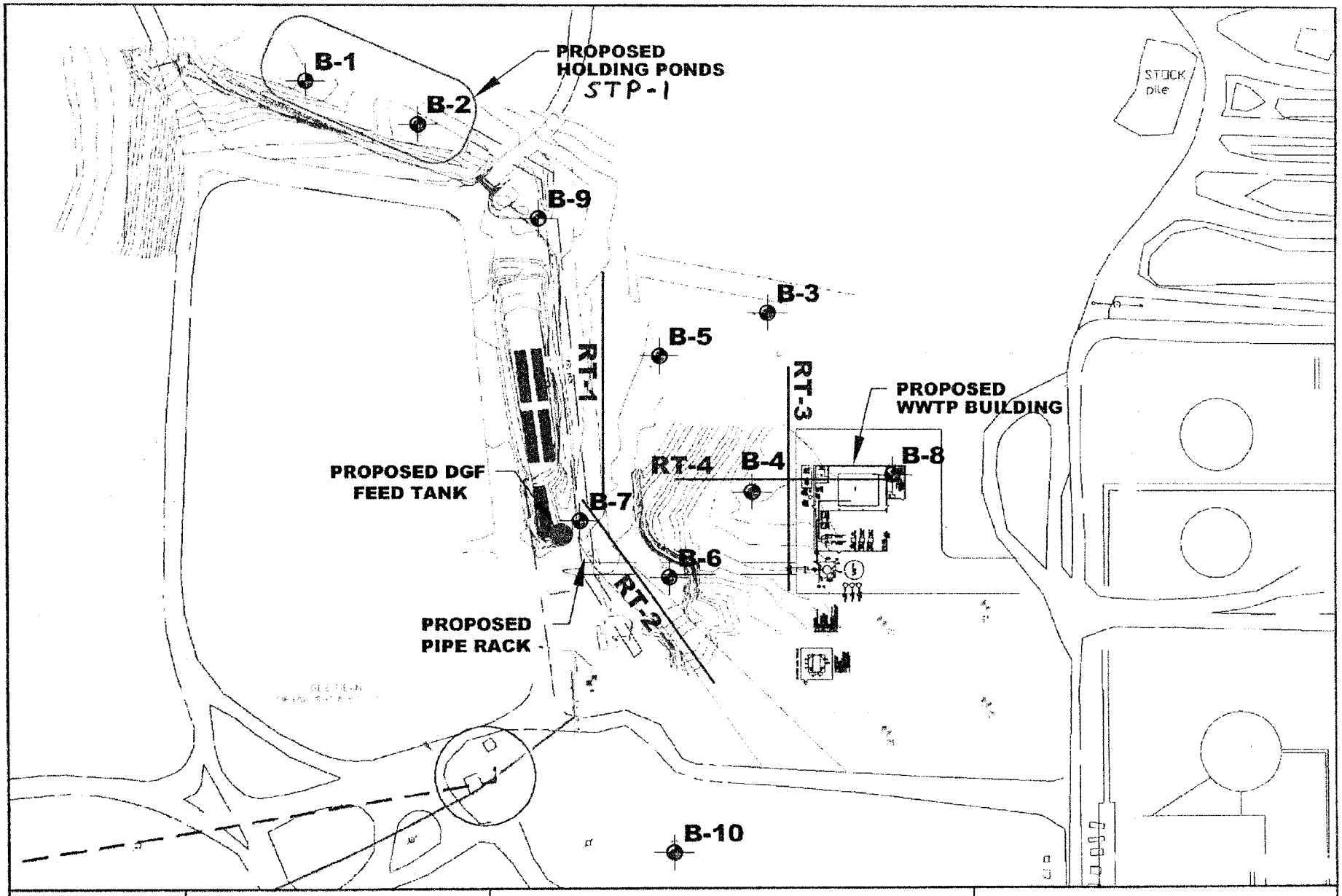
Noting that each sump is devoted to collecting leakage from one quadrant of the STP-1 pond:

$$\text{Required volume} = Q_T/4 \times t \times FS = 9\ ft^3$$

$$\text{Vol sump} = \text{Depth}/3 \times [A1 + A2 + (A1 \times A2)^{1/2}] = 151\ ft^3$$

Therefore, there is sufficient capacity in the LCRS sump to contain the projected leak rate over 48 hours.

ATTACHMENT 3



Approximate Not to Scale	SITE PLAN Boring Locations (approximate) GEOMAT Project No. 112-1286 Date Borings Drilled: 04-11-11 to 04-13-11	PROJECT Waste Water Treatment Plant Gallup Refinery Gallup, New Mexico

GEOMAT INC

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Borehole B-1

Project Name:	Gallup Refinery Proposed WWTP	Date Drilled:	4/11/2011
Project Number:	112-1286	Latitude:	Not Determined
Client:	Western Refining Southwest, Inc.	Longitude:	Not Determined
Site Location:	Gallup, New Mexico	Elevation:	Not Determined
Rig Type:	CME - 75	Boring Location:	See Site Plan
Drilling Method:	7" O.D. Hollow Stem Auger	Groundwater Depth:	None Encountered
Sampling Method:	Ring and Split spoon samples	Logged By:	DB
Hammer Weight:	140 lbs	Remarks:	None
Hammer Fall:	30 inches		

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
									1	SANDY LEAN CLAY, red-brown, very stiff, dry to damp
									2	
				11-11-11	SS 18				3	
									4	
									5	
				10-12-11	SS 18				6	trace gravel
									7	
			9.8	24-50/4"	MC 10		CL		8	
									9	hard, damp
				7-17-23	SS 18				10	
									11	
									12	
									13	
									14	
									15	
				28-36-50/5"	SS 17				16	
									17	SHALE, red-brown, highly weathered, soft to moderately soft, fissile, friable
									18	
									19	
				33-50/5"	MC 11				20	
									21	
									22	
									23	
									24	
				13-23-31	SS 18		RK		25	
									26	
									27	
									28	
									29	
				25-28-50/6"	SS 18				30	
									31	
									32	
									33	
									34	
									35	

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon HQ = 2.5" Rock Core

GEOMAT INC.
915 Malta Avenue
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Borehole B-1

Project Name: Gallup Refinery Proposed WWTP
Project Number: 112-1286
Client: Western Refining Southwest, Inc.
Site Location: Gallup, New Mexico
Rig Type: CME - 75
Drilling Method: 7" O.D. Hollow Stem Auger
Sampling Method: Ring and Split spoon samples
Hammer Weight: 140 lbs
Hammer Fall: 30 inches

Date Drilled: 4/11/2011
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: None Encountered
Logged By: DB
Remarks: None

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
				22-28-29	SS 18				36	SHALE, red-brown, highly weathered, soft to moderately soft, fissile, friable
									37	
									38	
									39	
									40	
				39-50/6"	SS 12				41	moderately weathered
									42	moderately hard
							RK		43	
									44	
									45	
				50/6"	SS 6				46	blue-green mottling
									47	
									48	
									49	
									50	
				50/5"	SS 5				51	Total Depth 50.4 feet
									52	
									53	
									54	
									55	
									56	
									57	
									58	
									59	
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									61	
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									66	
									67	
									68	
									69	
									70	

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Borehole B-2

Project Name:	Gallup Refinery Proposed WWTP	Date Drilled:	4/11/2011
Project Number:	112-1286	Latitude:	Not Determined
Client:	Western Refining Southwest, Inc.	Longitude:	Not Determined
Site Location:	Gallup, New Mexico	Elevation:	Not Determined
Rig Type:	CME - 75	Boring Location:	See Site Plan
Drilling Method:	7" O.D. Hollow Stem Auger	Groundwater Depth:	None Encountered
Sampling Method:	Ring and Split spoon samples	Logged By:	DB
Hammer Weight:	140 lbs	Remarks:	None
Hammer Fall:	30 inches		

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
									1	LEAN CLAY with sand, red-brown, very stiff, dry to damp
									2	
				12-9-8	SS 18				3	
									4	
	76			24-28	MC 12				5	
									6	
									7	
	74			11-13-11	SS 18				8	
									9	
									10	
				21-44	MC 12		CL		11	damp, hard
									12	
									13	
									14	
									15	
				12-14-23	SS 18				16	
									17	
									18	
									19	
									20	
				12-16-27	SS 18				21	
									22	SHALE, red-brown with blue-green mottling, highly weathered, soft to moderately soft, fissile, friable
									23	
									24	
				25-35-43	SS 18				25	
									26	
									27	
							RK		28	
									29	
									30	
				39-50/3"	SS 9				31	moderately weathered moderately hard
									32	
									33	
									34	
									35	

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon HQ = 2.5" Rock Core

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Borehole B-2

Project Name:	Gallup Refinery Proposed WWTP	Date Drilled:	4/11/2011
Project Number:	112-1286	Latitude:	Not Determined
Client:	Western Refining Southwest, Inc.	Longitude:	Not Determined
Site Location:	Gallup, New Mexico	Elevation:	Not Determined
Rig Type:	CME - 75	Boring Location:	See Site Plan
Drilling Method:	7" O.D. Hollow Stem Auger	Groundwater Depth:	None Encountered
Sampling Method:	Ring and Split spoon samples	Logged By:	DB
Hammer Weight:	140 lbs	Remarks:	None
Hammer Fall:	30 inches		

Laboratory Results: Dry Density (pcf)	% Passing #200 Sieve	Plasticity Index	Moisture Content (%)	Blows per 6"	Sample Type & Length (in)	Recovery	USCS	Soil Symbol	Depth (ft)	Soil Description
				35-50/5"	SS 11	X	RK		36	SHALE, red-brown with blue-green mottling, highly weathered, soft to moderately soft, fissile, friable
									37	
									38	
									39	
									40	
				29-50/5"	SS 11	X			41	
									42	Total Depth 40.9 feet
									43	
									44	
									45	
									46	
									47	
									48	
									49	
									50	
									51	
									52	
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									67	
									68	
									69	
									70	

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon HQ = 2.5" Rock Core