GIANT REFINING CO.

Barbara

RED GREC 1996

September 10, 1996

Route 3, Box 7
Gallup, New Mexico
87301

505
[illegible]3833

Mr. Benito Garcia, Bureau Chief
New Mexico Environment Department
Hazardous and Radioactive Materials Bureau
2044 Galisteo
P.O. Box 26110
Santa Fe, New Mexico 87502

Dear Mr. Garcia:

SUBJECT: QUARTERLY PROGRESS REPORT - 2nd and 3rd Quarters, 1996.

Pursuant to Giant's **HSWA Permit Condition C.4., Page 11** and the May 31, 1990, **RFI Workplan Approval,** Giant Refining Company is submitting additional information for the second quarter (this is in addition to the April 16, 1996 Second Quarter Report) as well as information regarding the progress made during the third quarter of 1996.

As reported at the beginning of the second quarter of 1996, Mr. Bill Kingsley, Precision Engineering, has completed three additional soil borings at this site. The information gathered from the drilling and logging of those holes is being used by Mr. Kingsley to construct a geologic cross-section and modeling program for the Ciniza Refinery.

Giant informed Mr. James Harris, Jr., USEPA, in a letter dated April 16, 1996, that Giant had submitted a Corrective Action Plan (CAP) to the New Mexico Oil Conservation Division (NMOCD) for the recovery of "free product" from the area identified as Solid Waste Management Unit Six (SWMU-6). As a result of the CAP submittal, the New Mexico Environment Department, Hazardous and Radioactive Materials Bureau (HRMB) informed Giant that New Mexico is now an "Authorized State" for dealing with corrective action under the Hazardous and Solid Waste Act (HSWA) and that all future correspondence associated with corrective action activities should be directed to HRMB.

On June 20, 1996, the NMOCD, the HRMB, and the USEPA informed Giant that there were some areas of the CAP that needed to be addressed. On September 4,1996 Giant transmitted a letter in response to the June 20, 1996 letter. As explained in the September 4, 1996 letter, six (6) borings were to be drilled, samples taken every two (2) feet, and, if field screening indicated the presence hydrocarbons, samples were to be analyzed for BTEX. Once this program has been completed and analytical results received, Giant will provide a written update to the regulatory agencies on its findings around SWMU-6.

In addition to the activities associated with SWMU-6, Giant has conducted a drilling and sampling program on the Aeration Lagoons (SWMU-1) . Six (6) boreholes were drilled to a depth of 25 feet. Soil samples were taken from 4 feet, 9 feet, 11 feet, 14 feet and 20 feet, as required by EPA (see attached section identified as EPA-Requirements). All

samples were sent off to an independent laboratory for analysis. Results from this activity are found in the attachment identified as "SWMU-1 1996 SOIL BORING AND ANALYTICAL RESULTS".

In reviewing the sample analysis results from SWMU-1, it has been noted that sample numbers RFI0103A4 and RFI0104A4 indicated the possible presence of some volatile organic compounds. Questions about the validity of these two sample results have been raised; and, in an effort to resolve these questions, Giant will re-sample these two locations during the fourth quarter of 1996.

If there are any question regarding the above, please feel free to contact me at (505) 722-0217.

"I certify under penalty of law that this document and all attachments were prepared under my direction 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 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

David C. Pavlich

David C. Pavlich
HSE Manager
Giant Refining Company

Enc.

cc: Kim Bullerdick, Corporate Counsel,
Giant Industries Arizona, Inc. w/o enc.
Dick Platt, General Manager,
Giant Refining Company w/o enc.
Edward L. Horst, Environmental Manager,
Giant Refining Company
Steve Morris, Environmental Specialist
Giant Refining Company

RFI3Q96.DOC

REC'D GRCD 1996

GIANT
INDUSTRIES, INC.

April 29, 1996

Route 3, Box 7
Gallup, New Mexico
87301

Mr. Benito J. Garcia, Bureau Chief
New Mexico Environment Department
Hazardous & Radioactive Materials Bureau
P.O. Box 26110
Santa Fe, New Mexico 87502

RECEIVED
MAY 1 1996

Dear Mr. Garcia:

SUBJECT: CORRECTIVE ACTION PLAN SWMU-6 PRODUCT RECOVERY

Giant Refining Company (Giant) is in receipt of your April 24, 1996, letter informing Giant that New Mexico has obtained RCRA Corrective Action Authorization through its Hazardous and Radioactive Materials Bureau. Recently, on April 15, 1996, Giant transmitted the Environmental Protection Agency (EPA) Region 6 and the New Mexico Oil Conservation Division (OCD) a Corrective Action Plan (CAP) for recovering free product located below Solid Waste Management Unit 6 (SWMU-6). Giant requested that the USEPA and NMOCD review the CAP and if they had any questions to contact me or Mr. David Pavlich.

Enclosed, for your review, is a copy of the CAP submitted to the USEPA and NMOCD. I want to note that this document is intended to be a "living" document and may be modified as additional information is obtained.

If there are any questions in this matter, please contact me at (505) 722-0227 or Mr. David Pavlich at (505) 722-0217.

Sincerely,

Edward L. Horst, Environmental Manager
Giant Refining Company
Ciniza Refinery

cc: Mr. Ronald Kern, Manager, RCRA Technical Compliance Program, NMED/HRMB
Ms. Barbara Hoditscheck, Manager, RCRA Permits Program, NMED/HRMB
Mr. Patricio W. Sanchez, Petroleum Engineer, NMOCD **w/o enclosure**
Mr. David Neleigh, Chief, New Mexico Federal Facilities Section, EPA Region 6
Mr. Dick Platt, General Manager Giant Refining Company **w/o enclosures**
Mr. David Pavlich, HSE Manager Giant Refining Company **w/o enclosures**
Mr. Kim Bullerdick, Legal Counsel, Giant Industries Arizona

GIANT
INDUSTRIES, INC.

Route 3, Box 7
Gallup, New Mexico
87301

April 15, 1996

Mr. Patricio W. Sanchez
Petroleum Engineer
New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
2040 South Pacheco
Santa Fe, New Mexico 87505

Dear Mr. Sanchez:

SUBJECT: CORRECTIVE ACTION PLAN SWMU-6 PRODUCT RECOVERY.

Enclosed is Giant Refining Company's Corrective Action Plan for product recovery at the area known as the Tank Farm and identified as part of the Solid Waste Management Unit (SWMU) - 6. A copy of this document is being transmitted to Mr. James Harris, Region 6, U. S. Environmental Protection Agency (USEPA) for his review. Please review this document and if there are any questions please contact me at (505) 722-0227 or Mr. David Pavlich at (505) 722-0217.

Thank you for all the help you have given to me on this issue.

Sincerely

Edward L. Horst, Environmental Manager
Giant Refining Company
Ciniza Refinery

cc: Mr. James Harris, RCRA Facility Manager/Geologist
U. S. Environmental Protection Agency Region 6

w/o enclosure
Kim Bullerdick, Legal Counsel, Giant Industries Arizona
Dick Platt, General Manager Giant Refining Company
David Pavlich, HSE Manager
Steve Morris, Environmental Spec.

1.0 INTRODUCTION

Giant Refining Company (Giant) owns and operates the Ciniza Refinery Located 17 miles east of Gallup, New Mexico (Figure 1). In August, 1987, a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted at the refinery. As a result of this RFA, 14 potential solid waste management units (SWMUs) were identified. Between 1990 and 1992, Giant conducted a series of RCRA Facility Investigations (RFIs) to characterize all of the SWMUs. The RFI was performed in three phases. Phase I is the site-specific investigation schedule for SWMUs # 6, 8, 9, 10, and 12. Phase II covers the site-specific investigation schedule for SWMUs # 1, 2, and 13. While Phase III is concerned with the site specific investigation schedule for SWMUs # 3, 4, 5, 7, 11, and 12.

Phase I of the RFI, as it applies to SWMU-6, states that soil borings will be drilled near and under each tank that contained leaded gasoline. The borings will be drilled to a depth of 7.5 feet below the ground surface. Samples will be taken from each boring and analyzed. As a result, additional drilling,

sampling and analytical work was necessary to complete SWMU-6 site characterization.

As a result of these efforts, it has been determined that a corrective action plan (CAP) be submitted for the remediation and recovery of hydrocarbons found in monitoring wells B-2 and BG-4.

This report is the CAP for the remediation and recovery of hydrocarbons found in monitoring wells B-2 and BG-4.

2.0 SITE CONDITIONS

The Ciniza Refinery site is located on clays, silts, shales , and thin interbedded sand units of the Triassic Chinle Formation (Fm). The Chinle has a structural dip of approximately two degrees to the northwest. The uppermost aquifer unit that underlies the entire facility, including SWMU-6, is the Sonsela Sandstone. The top of the Sonsela Sandstone in this area occurs at a depth of approximately 55 feet. Ground water in the Sonsela is confined under artesian conditions by the relatively impermeable Chinle clays and shales above and below. A localized, lenticular, water-bearing sand body, locally called the Ciniza Sand, has also been identified underlying the northwestern part of the refinery area, but it is not present in the vicinity of SWMU-6.

Field observations and aquifer test data suggest that the shales and clays of the Chinle Formation do not contain free ground water and that low hydraulic conductivity inhibits horizontal and vertical migration of water, qualifying the Chinle as an aquitard.

2.1. SUBSURFACE GEOLOGY

The Ciniza Refinery site is located on predominantly clayey soil derived from weathering of the underlying Petrified Forest Member of the Triassic Chinle Formation (Figure 2). Clay, silt, and shale, along with thin interbedded sand units were encountered in borings drilled across the refinery site. The clay and shale of the Petrified Forest Member overlie the Sonsela Sandstone, which occurs at depths ranging from approximately 30 feet in the southeastern part of the refinery to over 100 feet to the northwest (Figure 2). The Sonsela Sandstone is composed of fine to coarse-grained quartz sand which is partially cemented with silica and carbonate. The Sonsela unit is approximately 10 to 30 feet thick and dips to the northeast and northwest beneath the Ciniza refinery location (Figure 2). The near surface fine-grained sequence is thickest towards the northwestern part of the refinery property and thins to the southeast. The clay and shale unit is predominantly reddish brown, highly weathered, and dry. It also contains relatively high background concentrations of naturally occurring metals.

2.2 HYDROGEOLOGY

The principle aquifer units in west central New Mexico are the Sonsela Sandstone and the San Andres Formations. Both are confined, artesian aquifers and both underlie the Ciniza Refinery site. The San Andres is present at a depth of approximately 800 feet. Wells completed in the San Andres produce in excess of a 1,000 gallons per minute (gpm) of good quality water, and the aquifer is the principle water supply source to the refinery. In comparison, the Sonsela Aquifer is present from 30 to over 100 feet below ground and produces 1 to 10 gallons per minute (gpm) of fair to poor quality water. Ground water, of poor quality, is also present under confined conditions in the "Ciniza Sand" beneath the northwestern part of the refinery. Clays and shales overlying both the Sonsela and Ciniza units are dry and act as aquitards (GCL, 1986).

2.2.1 Sonsela Sandstone Aquifer

The Sonsela Sandstone is the uppermost aquifer underlying the Ciniza Refinery and occurs at depths ranging from 30 to over 100 feet. The

Sonsela is confined above and below by clay and shale of the Chinle formation. Resulting artesian conditions in the Sonsela are manifest by artesian heads ranging from 30 to 100 feet in the refinery area (Figures 3 and 4). The resulting upward gradient between the Sonsela and the overlying Chinle aquitard results in localized saturation of Chinle shales and clay immediately above the Sonsela contact.

The potentiometric surface of ground water in the Sonsela dips to the northeast, roughly parallel with structural dips observed in the Sonsela Sandstone (Figure 5). The potentiometric surface has a gradient of approximately 0.010 ft/ft and is relatively uniform across the site (Figure 3).

Aquifer slug and pump test data in the western area of the refinery indicates that the hydraulic conductivity of the Sonsela Sandstone is 3.9×10^{-6} ft./sec. or 0.35 ft/day (Shomaker, 1984). Assuming an average porosity of 10 percent and a gradient of 0.010 ft./ft., the ground water velocity would be 13 feet per year.

2.2.2 Chinle Aquitard

The Sonsela Aquifer in confined above and below by low permeability clays and shales of the Chinle aquitard. Aquifer slug and pump tests indicate that the Chinle aquitard has a hydraulic conductivity of 8.3×10^{-9} ft./sec. or 7.1×10^{-4} ft./day (Shomaker, 1984). Assuming an average porosity of 40 percent and a gradient of 0.010 ft./ft., free ground water flow in the Chinle aquitard, if it exists, would be at a rate of 0.007 ft/yr. With the exception of shale and clay immediately overlying the Sonsela Aquifer, no ground water has been noted in Chinle shales and clays beneath the refinery site.

2.3 SUBSURFACE CONDITIONS IN SWMU-6 AREA

In March, 1995, eleven (11) borings and two (2) wells were drilled as part of the RCRA Facility Investigation (RFI). The identification, geologist log and respective locations for each boring drilled during the RFI are shown in Attachment "A". Clays, shales, and water bearing sands were encountered in all borings. It should be noted that a hydrocarbon order was

present in most borings; and both of the wells (BG-4 and B-2) did contain floating "free product".

3.0 SITE ASSESSMENT

SWMU 6 consists of seven hydrocarbon storage tanks (ranging in size from 1,000 to 24,000 barrels) that have contained leaded gasoline (that is, gasoline blended with the compound tetraethyl lead). After reviewing the first set of data results (samples collected from 0-0.5 feet, 3.5-4 feet, and 7-7.5 feet from drilling locations throughout SWMU-6), Giant decided that it would be necessary to collect samples at deeper intervals. It was agreed as part of the supplemental sampling requirements that ten (10) additional samples would be collected at depths from 11-11.5 feet. These samples would all be analyzed for BTEX with two (2) of the samples being analyzed for metals.

After Giant conducted the supplemental sampling events and reviewed the results of the sample analyses, it was determined that additional samples should be collected around TANK 569. Three additional borings were made with one sample collected from each boring. These samples were collected at different depth intervals as follows: 11-11.5 feet, 14-14.5 feet, and 16-16.5 feet.

Because BTEX levels were all below any of the proposed corrective actions levels, Giant proposed no corrective action be performed. EPA did not agree and stated:

"Giant shall complete additional soil borings as close as possible to the following sample points (numbers correspond to previous RFI sampling points competed in May, 1991): 21, 22, 23, 25 , 26, 27, 30 and 31. The sampling interval shall be at 16 feet with the exception of sample point 31 which shall be sampled at 20 feet. Samples will be analyzed for BTEX constituents. Sampling must extend vertically until no subsequent increase in contamination levels is likely to occur. A minimum of two (2) "clean" samples are required to verify delineation. The results of this sampling event shall be submitted to EPA by October 1, 1994."

EPA's required drilling, sampling and analytical work was performed and, as a result, it was discovered that there exists a plume of free product. Through laboratory "finger printing", the free product appears to be gasoline.

3.1 ORGANIC COMPOUNDS

Hydrocarbon contamination was detected in all but two borings, B1 and BG3. The hydrocarbon contamination was laboratory "finger printed" as gasoline. This is consistent with the type of materials historically stored in tanks located within the boundaries of SWMU-6.

4.0 REMEDIAL ACTION

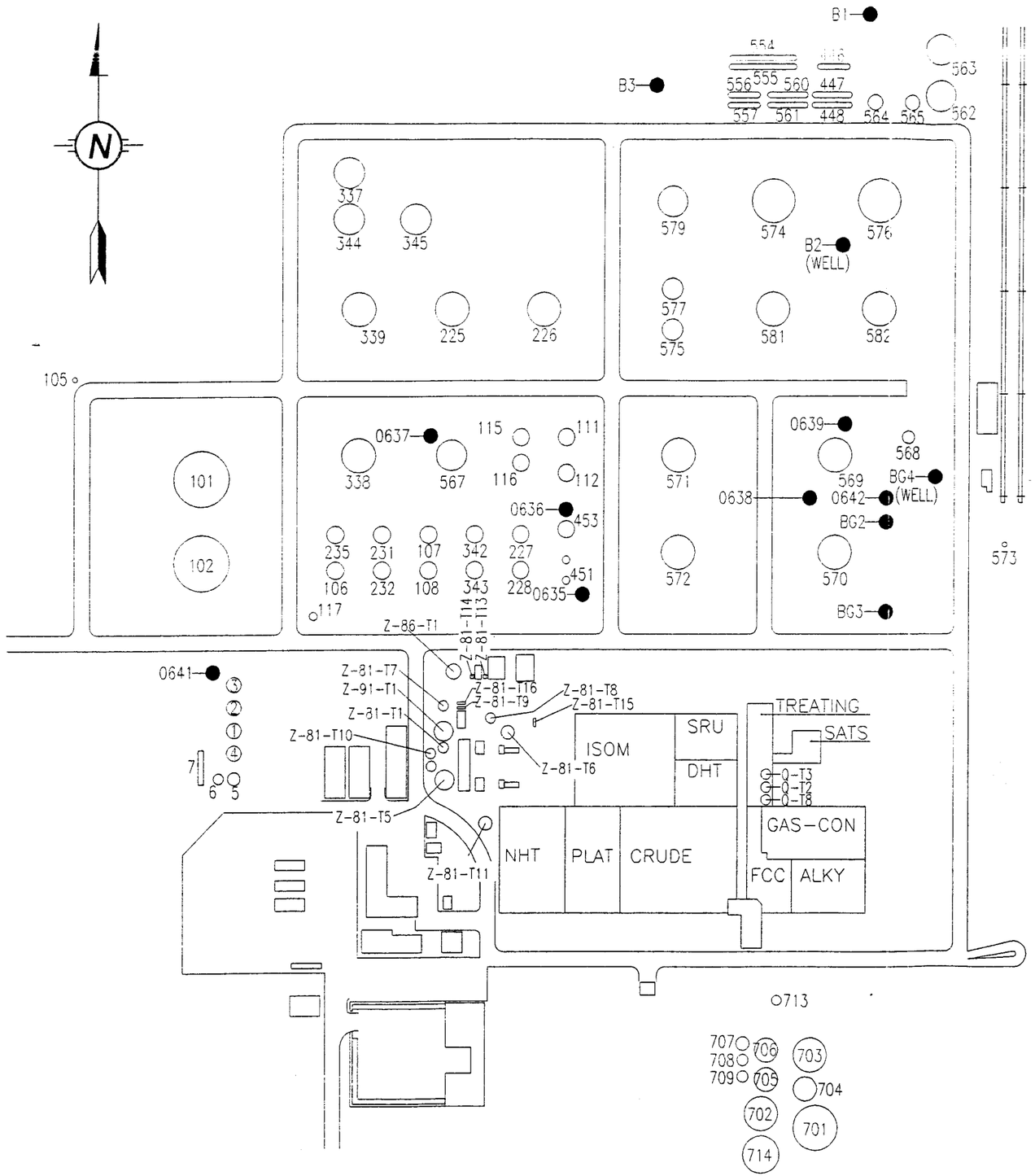
Giant Refining proposes to begin remediation through a pump and treat method. Initially, two (2) submergible pumps will be installed at wells B-2 and BG-4, see Appendix "A". Free product removed from these wells will be sent to the API Separator, via the sewer system, where the water will be removed and the product recovered and sent back through the refining process.

This operation will continue until all the recoverable free product has been removed. Monitoring of the success of this operation will be conducted

through water sampling at down gradient wells OW-14 and OW-13. One additional boring will be drilled down gradient of OW-14, and water samples will be gathered and analyzed for BTEX. Once the analytical results have been received and evaluated, Giant will be able to determine if additional drilling is necessary.

In the first year of operations, Giant will submit written quarterly progress reports to the regulatory authority(ies). After the first year, Giant will submit written progress reports on an annual basis.

As in many operations of this nature, unforeseen events may occur and adjustments to this plan will be necessary. In an effort to maintain continuous and uninterrupted operations, Giant proposes to make any necessary adjustments and contact the regulatory authority(ies), by telephone within 72 hours of implementing adjustments. A written follow-up report would then be submitted within 30 days.



ATTACHMENT "A"

GIANT REFINING CO.

CINIZA REFINERY — A DIVISION OF GIANT INDUSTRIES — GALLUP NEW MEXICO

BORING PLAN & DRILLING PLAN

MARK	DATE	DESCRIPTION	BY	APRVD

REVISIONS

SCALE: NONE | APRVD

DRN BY: CLM | 1=1 | REV 0

DATE: 04-10-96 | DWG NO. Z86-09-131

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: East Side of Tank 451

FILE #: 95-018
ELEVATION: 6956.0
TOTAL DEPTH: 35.0
LOGGED BY: WHK
DATE: 3-23-95
STATIC WATER: 15.0
BORING ID: 0635
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-0.2	xxxxxxxxx		C	Asphalt	
0.2-2.7	///---/// ///---/// ///---///	1.0	C C C	Clay, red brown, soft, silty, wet, (fill)	0.0
2.7-7.1	///--*/// ///--*/// ///--*/// ///--*/// ///--*/// ///--*/// ///--*/// ///--*/// ///--*/// ///--*///	3.0 5.0	C C C C C C C C C C	Clay, silty, slightly sandy, red brown, firm, wet, carbonate filaments (not fill)	0.2
7.1-8.0	///**--// ///**--//	7.0	C C	Clay, sandy, red brown, silty, wet, carbonate filaments, dark brown	0.0
8.0-9.8	********* ********* *********	8.0	C C C	Sand, fine, moist, moderately dense, light brown, no odor	
9.8-10.0	***000***		C	Sand, gravelly, moist, dense, light brown, some clay infilling	
10.0-10.6	///000///	10	C	Clay, gravelly, wet, hard, red brown, no odor	
10.6-11.3	///--**// ///--**//	11	C C	Clay, silty, sandy, soft, red brown, wet, no odor	2.0
11.3-11.7	///--**//		C	as above but with hydrocarbon odor and black	0.0
11.7-14.2	***---*** ***---*** ***---*** ***---*** ***---***	12 14	C C C C C	Sand, medium, silty, moist, dense, red brown, no odor	0.0
14.2-15.8	***000*** ***000***	15	C C	Sand, very gravelly to 2", subrounded, sandstone and lime rock, some clay infilling, no odor, dense, multicolored, light brown	150
15.8-17.8	000**//00 000**//00 000**//00 000**//00	16	C C C C	Gravel, sandy, clayey, dense, brown, no odor, water bearing	300
17.8-19.0	********* ********* *********	18	C C C	Sand, coarse, red brown, wet, strong hydrocarbon odor, dense	210
19.0-22.6	********* ********* ********* ********* ********* ********* ********* *********	19 22	C C C C C C C C	Sand, fine to medium, dense, red brown, water saturated, hydrocarbon odor	200
22.6-23.3	***//00** ***//00**	23	C C	Sand, clayey, water bearing, red brown, scattered gravel, odor	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: East Side of Tank 451

FILE #: 95-018
ELEVATION: 6956.0
TOTAL DEPTH: 35.0
LOGGED BY: WHK
DATE: 3-23-95
STATIC WATER: 15.0
BORING ID: 0635
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
23.3-25.0	***000***		C	Sand, coarse, gravelly, loose, water bearing, black to dark grey	180
	000	24	C		
	000		C		200
	000	25	C		
	000		C		
	000		C		
	000		C		
	000		C		
	000		C		
	000	28	C		
28.4-30.0	---------		C	CHINLE FORMATION	0.0
	---------		C	Shale, green, sandy, hard, moist, no odor	
	---------		C		
30.0-33.4	---------	30	C	Shale, red brown, green interbedded, sandy partings, slightly blocky	
	---------		C	somewhat sandy, laminar bedding, moist	
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------	33	C		
33.4-34.2	000**0000		C	Conglomerate, hard, weakly cemented, few pebbles and very coarse sand, moist	
	000**0000	34	C	to wet, multicolored	0.5
34.2-35.0	---------		C	Shale, red brown, hard, moist	
	---------	35	C		
TD				end 4:45p	
				pull auger, depth of water 15.0 @ 5:30p	
				backfill with bentonite slurry from bottom of boring	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: N. Manway, Tank 453

FILE #: 95-018
ELEVATION: 6951.5
TOTAL DEPTH: 35.0
LOGGED BY: WHK
DATE: 3-27-95
STATIC WATER:
BORING ID: 0636
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-2.6	///o/////		C	Clay, slightly gravelly to 1.5", stiff, red brown, wet, some odor @ 2.1'	
	///o/////		C		
	///o/////		C		
	///o/////	2.0	C		280
2.6-3.1	///***///		C	Clay, sandy, firm, wet, red brown	
	///***///	3.0	C		300
3.1-3.9	*********		C	Sand, fine, red brown, loose, moist, odor	
3.9-4.1	///***///	4.0	C	Clay, sandy, red brown, moist to wet	280
4.1-5.5	***000***		C	Sand, medium to coarse, gravelly to cobbly, some grey staining, odor, overall	
	000	5.0	C	red brown, moist	180
5.5-7.0	***---***		C	Sand, fine, red brown, silty, moist, loose	
	---		C		
	---		C		180
7.0-8.0	///---///	7.0	C	Clay, silty, wet, soft, brown, slightly black staining, odor	
	///---///		C		150
8.0-8.8	///---///	8.0	C	Clay, silty, brown, wet, firm	110
8.8-9.1	***000***		C	Sand, gravelly, red brown, odor, loose, moist	120
9.1-10.7	///oo////	9.0	C	Clay, slightly gravelly, firm, brown, odor, wet	
	///oo////		C		
	///oo////	10	C		320
10.7-15.0	**ooooo**		C	Sand, very gravelly, dense, grey to brown, rounded to subrounded, some rock to	
	ooooo	11	C	2.5", odor	
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo	15	C	(sandstone rock @ 15.0'-pulled sampler, drilled 8", replaced sampler and continued)	
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		
	ooooo		C		180
19.0-19.5	**ooooo**	19	C	As above but black, water bearing, odor	70
19.5-22.9	////-////		C	Clay, slightly silty, some laminations, soft, wet, sticky, weak odor, red brown	
	////-////		C		
	////-////		C		
	////-////		C		
	////-////		C		
	////-////	22	C		
	////-////		C		200
22.9-23.6	ooo///ooo	23	C	Gravel, clayey, water bearing, brown, dense, slight odor	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: N. Manway, Tank 453

FILE #: 95-018
ELEVATION: 6951.5
TOTAL DEPTH: 35.0
LOGGED BY: WHK
DATE: 3-27-95
STATIC WATER:
BORING ID: 0636
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
23.6-24.8	---***---		C	CHINLE FORMATION	
	---***---	24	C	Shale, sandy, wet, grey green, slight odor, hard	30
24.8-25.0	---------		C	Shale, red brown, hard, moist, no odor, some green laminations	2.0
25.0-29.3	---***---	25	C	Shale, sandy, fissle, green grey, no odor, moist, hard	2.0
	---***---		C		
	---***---		C		
	---***---		C		
	---***---		C		
	---***---		C		
	---***---	28	C		
	---***---		C		
	---***---	29	C		
29.3-30.0	---------		C	Shale, fine blocky, green grey, no odor, damp, hard	1.0
30.0-35.0	---------	30	C	Shale, blocky, red brown, moist, hard, slightly fissle	1.0
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------	35	C		
TD				pull auger 11:00a	
				backfill with montmorillonite clay and hydrate (13 50# bags)	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: N. Manway, Tank 567

FILE #: 95-018
ELEVATION: 6945.6
TOTAL DEPTH: 40.0
LOGGED BY: WHK
DATE: 3-22-95
STATIC WATER:
BORING ID: 0637
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-4.6	///***///		C	Clay, sandy, coarse, gravelly, wet, soft, brown, no odor	0.0
	///***///	1.0	C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///	4.0	C		
4.6-6.9	*********		C	Sand, red brown, coarse, loose, wet, rounded pebbles	0.0
	*********	5.0	C		
	*********		C		
	*********		C		
	*********		C		
6.9-8.7	///---**/	7.0	C	Clay, silty, very fine sandy, brown, soft, wet, hydrocarbon odor (old)	4.0
	///---**/		C	odor only below 7.5'	
	///---**/		C		
8.7-9.3	///***///		C	Clay, sandy, brown, soft, wet, odor	2.0
	///***///	9.0	C		
9.3-12.0	*********		C	Sand, fine, light grey, loose, moist, odor (old)	5.0
	*********		C		
	*********		C		
	*********		C		
	*********		C		
12.0-13.3	**0000***	12	C	Sand, very gravelly, moist, brown, some cobbles, dense, odor	13.0
	0000*		C		
	0000*	13	C		
13.3-16.7	*********		C	Sand, coarse, red brown, dense, moist, odor, some pebbles	10.0
	*********		C		
	*********		C		
	*********		C		
	*********		C		
	*********	16	C		
16.7-17.2	///***///		C	Clay, sandy, very wet, soft, brown-grey, odor, saturated (not water bearing)	500
	///***///	17	C		
17.2-19.1	****00***		C	Sand, fine to coarse, some pebbles, odor, saturated water bearing	250
	****00***		C		
	****00***		C		
19.1-20.5	---------	19	C	CHINLE FORMATION	
	---------		C	Shale, green to red brown, laminar bedding, blocky structure, hard, moist	80
	---------	20	C		
20.5-25.0	---------		C	Shale, green, fissle to blocky, moist to wet, hard	3.0
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: N. Manway, Tank 567

FILE #: 95-018
ELEVATION: 6945.6
TOTAL DEPTH: 40.0
LOGGED BY: WEK
DATE: 3-24-95
STATIC WATER:
BORING ID: 0637
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	---------		C	continued from page 1	
	---------	24	C		
	---------		C		
25.0-30.0	---------	25	C	Shale, green, some slightly grey banding, fissured, fissle, moist to wet, hard	2.0
	---------		C		
	---------		C	stop drilling 4:00p--wait for analysis	
	---------		C	additional sample required @ 5:20p	
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------	30	C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
34.1-37.5	----***--	34	C	Shale, sandy, green, hard, moist, blocky, slightly laminar	0.0
	----***--		C		
	----***--		C		
	----***--		C		
	----***--		C		
	----***--		C		
	----***--	37	C		
37.5-40.0	****++***		C	Sandstone, green/yellow specs as limonite, jointed, weak carbonate cementation	0.0
	****++***		C	some carbonate infilling in joints, moist, hard	
	****++***		C		
	****++***		C		
	****++***		C		
	****++***	40	C		
TD				drilling stopped @ 5:50p	
				backfilled with bentonite @ 6:35p	

LOGGED BY: WEK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: Adjacent to South Manway, Tank 569

FILE #: 95-018
ELEVATION: 6947.1
TOTAL DEPTH: 45.0
LOGGED BY: WHK
DATE: 3-22-95
STATIC WATER: None
BORING ID: 0638
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-3.4	///---///		C	time in 10:00a--PID calibrated 0.54 hexane	
	///---///		C	Clay, silty, some gravel in upper 6", wet, soft	0 @ 1.8'
	///---///		C		0.3 @ 2.3'
	///---///	2.0	C		540 @ 2.8'
	///---///		C		
	///---///	3.0	C		
3.4-4.0	///***///		C	Clay, sandy, some odor, red brown, wet, soft	1000 @ 4.2'
4.0-5.6	***///***	4.0	C	Sand, clayey, some odor, red brown, wet to moist, loose	
	///		C		
	///	5.0	C		
5.6-11.3	///--**//		C	Clay, silty, sandy, blocky, red brown, firm, wet	>1438 @ 6.5'
	///--**//	6.0	C		
	///--**//		C		
	///--**//		C		
	///--**//		C		
	///--**//		C		
	///--**//		C		
	///--**//	9.0	C		>1438 @ 9.5'
	///--**//		C		
	///--**//	10	C		
	///--**//		C		
	///--**//	11	C		
11.3-11.9	/////////		C	Clay, firm, red brown, wet	
11.9-12.1	*********	12	C	Sand, wet, loose, red brown, weak hydrocarbon odor	
12.1-12.4	/////////		C	Clay, firm, red brown, wet, odor	300 @ 13.3'
12.4-13.3	///---///	13	C	Clay, silty, slightly sandy, soft, red brown, odor, wet	
13.3-13.9	///**--//		C	Clay, sandy, silty, soft, red brown, odor	
13.9-14.8	///++////	14	C	Clay, firm, some carbonate streaks, brown, wet	
14.8-15.0	***--****		C	Sand, loose, silty, red brown	
15.0-15.9	///***///	15	C	Clay, sandy, red brown, soft, wet, odor	
	///***///		C		
15.9-17.7	***---***	16	C	Sand, silty, moist, light brown, loose, strong hydrocarbon odor	
	---		C		>1438 @ 17.5'
	---	17	C		
17.7-18.8	///---///		C	Clay, silty, wet, light brown, soft, sand lens 1"	
	///---///	18	C		
18.8-21.3	***///***		C	Sand, clayey, moist, hydrocarbon odor, dense, brown, jar sample @ 20.0'	
	///	19	C		
	///		C		650 @ 20'
	///	20	C		
	///		C		
	///	21	C		
21.3-23.7	///***///		C	Clay, sandy, wet, hydrocarbon odor, soft, brown to red brown	
	///***///		C		
	///***///		C		
	///***///	23	C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: TANK 569
LOCATION: Adjacent to South Manway, Tank 569

FILE #: 95-018
ELEVATION: 6947.1
TOTAL DEPTH: 45.0
LOGGED BY: WHK
DATE: 3-22-95
STATIC WATER: None
BORING ID: 0638
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
23.7-24.8	***//****		C	Sand, slightly clayey in laminations, wet to moist, loose to moderately dense	
	//*	24	C	slight odor (sweet)	
24.8-25.0	*********		C	Sand, (sandstone rock @ 24.8'), moderately dense, light brown, moist	60 @ 25'
25.0-28.3	*********	25	C	Sand, slightly gravelly below 27.5', moderately dense, moist, slightly sweet	
	*********		C	hydrocarbon odor	
	*********		C		
	*********		C		
	*********		C		
	****00***		C		
	****00***	28	C		580 @ 28.0'
28.3-30.0	00000/000		C	Gravel, some minor clay, sandstone gravel and cobble material, moist, dense	
	00000/000		C	mottled red brown, strong odor	
	00000/000		C		
30.0-30.5	00000/000	30	C	as above but saturated with fresh gasoline odor	960 @ 30.0'
30.5-32.7	///***///		C	Clay, sandy, firm, brown, wet, hydrocarbon odor	1200 @ 30.3'
	///***///	31	C		
	///***///		C		
	///***///	32	C		
32.7-36.1	///---*//		C	Clay, silty, some sandy zones as infilling in joints or cracks, wet, firm to	
	///---*//	33	C	very firm, few pebbles; 33.3'-33.6', breaks into blocky fragments @ silt seams	
	///---*//		C	at random angles, weak hydrocarbon odor	
	///---*//		C		
	///---*//		C		
	///---*//	35	C		32 @ 35.0'
	///---*//		C		
36.1-37.5	***000***	36	C	Sand, very gravelly, gravel to 1.5", subrounded, sandstone pieces as fragments	
	000		C	black staining to 37.0', moist	
	000	37	C		
37.5-40.0	/////////		C	Top of CHINLE FORMATION	
	/////////	38	C	Clay, mottled green blotches, shaley, (weathered in-situ?), moist to wet, hard	
	/////////		C		
	/////////		C		
	/////////		C		
40.3	---++----	40	C	Grades to	70 @ 40.0'
	---++----		C	Shale, carbonate nodules, hard, red brown, moist to wet	
	---++----		C		
	---++----		C		
	---++----	42	C	more carbonate @ 42.3'-42.6'	
	---++----		C		
	---++----	43	C		
43.5-44.5	---***---		C	Shale, sandy, laminated, moist, green grey, hard, fissle	
	---***---	44	C		
44.5-45.0	---------		C	Shale, fissle, dry to moist, brown, hard, light green grey last 1.5"	15 @ 45.0'
	---------	45	C		
TD				boring abandoned and backfilled with highyield montmorillonite clay (bentonite)	
				at 1:35p	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6948.2
TOTAL DEPTH: 60.0
LOGGED BY: WHK
DATE: 3-20-95
STATIC WATER: 44.3
BORING ID: 0639
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-2.0	//oo*oo//		C	Clay, gravelly, sandy, wet, soft, red brown	
	//oo*oo//		C		
	//oo*oo//		C		
2.0-3.8	//--o--//	2.0	C	Clay, silty, soft carbonate nodules give blotchy appearance	
	//--o--//		C		
	//--o--//		C		
3.8-4.3	///***///		C	Clay, sandy, hydrocarbon odor, moist to wet, soft, red brown	>1438
	///***///	4.0	C		
4.3-4.8	//-**--//		C	Clay, silty, sandy, hydrocarbon odor, wet, red brown, 1" roots	570 @ 4'
4.8-5.8	***---***	5.0	C	Sand, fine, silty, red brown, loose, moist, roots	480 @ 4.8'
	---		C		
5.8-7.0	///---///	6.0	C	Clay, silty, red brown, firm, root matter (1") and filaments, wet	
	///---///		C		
7.0-10.7	///**--//	7.0	C	Clay, sandy to silty, hydrocarbon odor, wet, soft, red brown	
	///**--//		C		204 @ 7.5'
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//	10	C		330 @ 10'
10.7-12.6	///--////		C	Clay, slightly silty, wet, red brown, firm, slight odor, 1" root at 12.6'	142 @ 11'
	///--////	11	C		
	///--////		C		
	///--////	12	C		
12.6-15.5	///****//		C	Clay, sandy to very sandy, very slightly bedded, red brown, strong odor	1220 @ 13'
	///****//		C		
	///****//		C		>1438 @ 14'
	///****//		C		
	///****//		C		
	///****//	15	C		
15.5-21.9	***///***		C	Sand, clayey, slightly laminated, brown to red brown, firm to moderately	>1438 @ 17.8
	///		C	dense, moist, strong odor	>1438 @ 20'
	///		C		
	///		C		
	///		C		
	///		C		
	///		C		
	///		C		
	///		C		
	///	20	C		
	///		C		
	///		C		
	///		C		
21.9-22.8	*********	22	C	Sand, fine, loose, brown, moist-odor	>1438
	*********		C		
2.8-25.0	***000***		C	Sand, gravelly, light brown, sandstone gravel, dense, slightly laminar structure	>1438 @ 23'

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6948.2
TOTAL DEPTH: 60.0
LOGGED BY: WHK
DATE: 3-20-95
STATIC WATER: 44.3
BORING ID: 0639
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	00*		C	continued from page 1	
	00*	24	C		
	00*		C		
25.0-27.4	**00000**	25	C	Sandstone cobble material, sandy, sandstone is white with psolomoline staining	>1438 @ 26.2
	00000		C	dense, strong hydrocarbon odor, free moisture condenses on sampler since 16'	
	00000		C		
	00000		C		
	00000	27	C		
27.4-28.0	*********		C	Sandstone, hard, no sample taken-refusal to push, (large rock)	
28.0-30.0	***000***	28	C	Sand, gravelly, cobbly, sandstone cobbles are white and hard, conglomeratic @	>1438 @ 28.5
	000		C	29.7'	
	000		C	driller note -- 32' drills very soft, 30'-35' pull sampler, PID readings from bore	
	000		C	vapor range from 600-700 PID	>1438 @ 30'
30.0-30.8	*0*0*0*0*	30	C	Conglomerate, fine to 1/4", hard	
	*0*0*0*0*		C		
30.8-32.8	///***///	31	C	Clay, sandy, red brown, soft, hydrocarbon odor, wet (not water bearing)	
	///***///		C		
	///***///	32	C		
32.8-33.3	***///***		C	Sand, clayey, red brown, soft, wet, hydrocarbon odor	1080 @ 32.8
	///	33	C		
33.3-33.9	///---///		C	Clay, silty, red brown, soft, wet	
33.9-35.0	///+/////	34	C	sharp contact with above	
	///+/////		C	Clay, red, filaments of carbonate, hard, wet, no odor, sandstone cobble in clay	
	///+/////	35	C	matrix (geology note--not formation--eroded and redeposited from above)	
35.1-38.3	***000***		C	Sand, gravelly, hydrocarbon odor, dense, sandstone and silicaceous rock, gravel	800 @ 36.8
	000	36	C	rounded to subrounded--80% is 1", weakly water bearing	
	000		C		
	000	37	C	pull sampler 35'-40'--PID reading 800-1100 water on top head of sampler when	
	000		C	withdrawn from hole	
	000	38	C		
38.3-40.0	---------		C	CHINLE FORMATION	730 @ 38.3
	---------		C	Shale, clayey, weathered in-situ, hard, blocky, green band 2" @ 39.5, red brown,	340 @ 38.8
	---------		C	moist	
40.0-42.4	---------	40	C	Shale, wet (saturated), does not appear water bearing, soft red brown, fine blocky	1200 @ 40.5
	---------		C		
	---------		C		
	---------		C		
	---------	42	C		
42.4-45.0	---------		C	Shale, hard, red brown, some green grey mottling, fine blocky, moist	500 @ 44.5
	---------		C		
	---------		C	drilling stopped @ 3:30p, sample downhole fluid @ 4:00p, shows hydrocarbon layer	
	---------	44	C	PID reading - 800, headspace reading of fluid - 1200	
	---------		C		
45.0-50.0	---------	45	C	Shale, fissle, red brown, redder when dry, green grey reduction zones of 10"	1200 @ 45.5
	---------		C	in intervals of 3', green grey from 46.8'-48.0', dry	
	---------		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6948.2
TOTAL DEPTH: 60.0
LOGGED BY: WHK
DATE: 3-20-95
STATIC WATER: 44.3
BORING ID: 0639
PAGE: 3

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
				continued from page 2	
		47			
					317 @ 49.5
		50			
				hole allowed to remain open 1 hr--it is believed product flows down hole and contaminates soil between sample intervals. -- suspect zone 35'-38'	
				ream hole to 13" with little difficulty to 50' set 10" PVC casing--slip coupled and screw set, hole remained open to 48', set casing easily to 50', plug inside of casing with 50# - 1/2" bentonite pellets, hydrate pellets set 1" tremmie tube with some difficulty as hole was beginning to swell closed	
				grout outside annulus with 8-94# bags cement, 50# high yield bentonite, approx 100 gallons of fresh water	
TD (day 1)				finish clean up 10:00p	
Begin day 2				begin drilling through casing 03-21-95 @ 12:10p 2" of product measured on water placed inside casing 03-20-95, light phase amber product. Product then water pumped from interior of casing.	
				5' of plug in bottom of casing, upper 3' bentonite pellets lost bottom "soup"--appears to be free of product however drilled 4' with continuous sampler, encountered refusal @ 54' with continuous sampler, pulled sampler and drilled to 55'	
50.0-55.0			50	Shale, fissle, hard, red brown, dry to moist, no odor, some siltstone lenses, very difficult to auger drill with continuous sampler, dry @ 55'	0.0
55.0-57.2	*********		55	Sandstone, dry, hard, red brown	
57.2-58.0	=========		57	Shale and Siltstone, red brown, hard, dry	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6948.2
TOTAL DEPTH: 60.0
LOGGED BY: WHK
DATE: 3-21-95
STATIC WATER: 44.3
BORING ID: 0639
PAGE: 4

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
58.0-58.6	*********	58		Sandstone, hard, white to light grey, water bearing	
58.6-59.5	**------**			Sandstone and Shale, interbedded, water bearing	
	------	59			
59.5-60.0	*********			Sandstone, white to light green grey, water bearing, very hard, sample may be	12
	*********	60		slightly contaminated with clay fines from drilling	
TD				stop drilling 5:10P	
				sample method--2" split spoon sampler driven	
				water level @ 5:20p---44.24', water appears to be filling casing rapidly	
				decision made to grout immediately. Drilling believed to penetrate water bearing	
				sandstone member of the Chinle (Sonsela).	
				Stabilized water elevation not determined.	
				grout to surface, clean up, finish--7:30p	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: Marketing Tank 3

FILE #: 95-018
ELEVATION: 6944.0
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 3-24-95
STATIC WATER: 15.2
BORING ID: 0641
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-0.9	***---***		C	start 9:15a PID calibrated with span gas 61	
	---	1.0	C	Sand, silty, red brown, moist, loose	
0.9-3.1	///--+///		C	Clay, silty, stiff, wet, red brown, odor, some carbonate filaments and scattered	15
	///--+///		C	carbonate nodules	
	///--+///		C		
3.1-4.0	***000***	3.0	C	Sand, gravelly, red brown, loose, some gravel to 1.5", moist, hydrocarbon odor	280
	000		C		
4.0-5.0	///00*///	4.0	C	Clay, gravelly, some sand, red brown, wet, stiff, weak hydrocarbon odor	300
	///00*///		C		
5.0-8.5	///++////	5.0	C	Clay, red brown, stiff, wet, some carbonate filaments and occasional carbonate	150
	///++////		C	nodules, slightly blocky (fine), odor	
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///++////	8.0	C		
8.5-8.7	***///***		C	Sand, clayey, loose, red brown, moist, odor	50
8.7-11.0	///--++//	9.0	C	Clay, silty, red brown, stiff, carbonate filaments and nodules, blocky (fine)	220
	///--++//		C	slightly fissured, hydrocarbon odor	
	///--++//	10	C		
	///--++//		C		
11.0-13.9	***---/**	11	C	Sand, silt, clay interbeds to 1" each, red brown, wet, odor, soft/loose	300
	***---/**		C		
	***---/**		C		
	***---/**		C		
	***---/**		C		
	***---/**		C		
13.9-14.7	***//****	14	C	Sand, fine, slightly clayey, red brown/purple, saturated, odor, loose	300
14.7-15.2	///**////		C	Clay, sandy in streaks, soft, purple/red brown, wet, odor	200
15.2-17.4	***///***	15	C	Sand, clayey, water bearing, soft, hydrocarbon odor, laminar banding	150
	///		C	brown to red brown	
	///		C		
	///		C		
	///	17	C		
17.4-18.4	***---***		C	Sand, fine, silty, water bearing, loose, red brown	210
	---	18	C		
18.4-20.0	***--//**		C	Sand, silt, clay interbedded, soft/loose, odor, wet, (not water bearing), red brown	1.0
	***--//**		C		
	***--//**		C		
20.0-21.3	*********	20	C	Sand, fine/medium, laminar, water bearing, loose, red brown	0.0
	*********		C		
	*********	21	C		
21.3-25.0	///--**//		C	Clay, silt, sand, interbedded, mainly clay, sand/silt in <1" bands, and are	2.0
	///--**//		C	individually laminar banded, brown to red brown overall, not water bearing	
	///--**//		C	no odor	
	///--**//		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: RFI
LOCATION: Marketing Tank 3

FILE #: 95-018
ELEVATION: 6944.0
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 3-24-95
STATIC WATER: 15.2
BORING ID: 0641
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	///--**//		C	continued from page 1	
	///--**//	24	C		
	///--**//		C		
25.0-28.1	///---///	25	C	Clay, silty, wet (not water bearing), brown, stiff to firm, no odor	0.0
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
28.1-28.5	///***///	28	C	Clay, sandy, wet, brown, no odor, stiff	0.0
28.5-30.0	///***///		C	Clay, sandy, sand seam 1", water bearing, brown, stiff	0.0
	///***///		C		
	///***///		C		
	///***///	30	C		
TD				stop drilling for sample analysis @ 10:15a	
				leave auger in hole	
				lab analysis OK--abandon hole with bentonite @ 2:45p	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6947.9
TOTAL DEPTH: 39.0
LOGGED BY: WHK
DATE: 3-22-95
STATIC WATER: 28.3
BORING ID: 0642
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.3	//--**///		C	Clay, silty, sandy, brown, wet, soft	500 @ 0.3'
	//--**///	1.0	C		
1.3-2.5	////++///		C	Clay, some carbonate nodules, wet, firm, brown with white nodules	
	////++///	2.0	C		
2.5-4.0	//**--///		C	Clay, sandy, silty, soft, brown, wet	
	//**--///		C		
	//**--///		C		
4.0-4.6	***//--**	4.0	C	Sand, clayey, silty, loose, brown, wet	44 @ 4.4'
4.6-5.4	////-////		C	Clay, slightly silty, wet, soft, brown	
	////-////	5.0	C		
5.4-8.2	///**--//		C	Clay, sandy, silty, wet, soft, brown, fine sands and silts in interbeds 1/2"-1"	
	///**--//		C		
	///**--//		C		4 @ 6.3'
	///**--//		C		
	///**--//		C		
8.2-8.9	/////////	8.0	C	Clay, firm, brown, wet	
	/////////		C		
8.9-10.0	///**--//	9.0	C	Clay, fine sandy, silty, very little sand, soft, wet, in interbeds 1/2"-1"	
	///**--//		C		33 @ 9.7'
10.0-11.3	/////////	10	C	Clay, wet, soft, brown	
	/////////		C		
	/////////	11	C		
11.3-12.0	///--*///		C	Clay, silty, very little sand, soft, wet, brown	
12.0-12.9	****//***	12	C	Sand, fine, slightly clayey, wet, loose, dark grey, black	
	****//***		C		6 @ 12.6'
12.9-14.0	///---///	13	C	Clay, silty, firm, wet, brown	
	///---///		C		
14.0-15.2	****/****	14	C	Sand, fine, some minor clay, moist, moderately dense	
	****/****		C		2 @ 14.7'
	****/****	15	C		
15.2-16.7	***///***		C	Sand, clayey, wet, loose, brown	
	///	16	C		
16.7-17.9	///**--//		C	Clay, sandy, silty, 1/2"-1" bedding, wet, soft	
	///**--//	17	C		
	///**--//		C		
17.9-21.2	**///--**	18	C	Sand, very clayey, silty, bedding and laminations as above, wet, loose/soft	
	///--		C	no odor, brown	
	///--		C		
	///--		C		
	///--	20	C		
	///--		C		
21.2-22.2	///***///	21	C	Clay, sandy, fine, soft, wet, brown	
	///***///		C		
22.2-23.8	*********	22	C	Sand, fine, dense, moist, light brown to white	
	*********		C		
	*********	23	C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6947.9
TOTAL DEPTH: 39.0
LOGGED BY: WHK
DATE: 3-22-95
STATIC WATER: 28.3
BORING ID: 0642
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
23.8-26.1	**000****	24	C	Sand, very gravelly, dense, light brown, moist, subrounded to rounded gravel	27 @ 25.0'
	000**		C	no odor	
	000**	25	C		
	000**		C		
26.1-26.3	*********	26	C	Sandstone cobble	
26.3-27.8	***000***		C	Sand, fine gravelly, moist, dense, light brown to white	
	000		C		
27.8-28.1	*********		C	Sandstone cobble	7.6 @ 27.8'
28.1-31.1	***00****	28	C	Sand, medium to coarse, some gravel, dense, moist, strong odor, multicolored	
	00*		C		
	00*		C		
	00*		C		
	00*	30	C		
	00*		C		
31.1-32.9	***00****	31	C	Sand as above--saturated with hydrocarbon product and water	>1438 @ 31.5
	00*		C		
	00*		C		
32.9-36.0	***000***		C	Sand, very gravelly, very dense, strong, hydrocarbon odor, does not appear	
	000	33	C	saturated, angular sandstone pieces, some subrounded, wet	
	000		C		
	000		C		
	000		C		
	000	35	C		9.9 @ 35.0'
	000		C		
36.0-37.1	0000**000	36	C	Gravel, cobbly, sandstone blocks, water bearing, hard, brown	
	0000**000		C		
37.1-39.0	---------	37	C	Top of CHINLE FORMATION	
	---------		C	Shale, red brown, hard, shows some green grey banding, (green grey @ 38.4-38.9)	
	---------		C	green grey appears more sandy in general, fine blocky, damp to dry.	
	---------		C		0.0 @ 39.0'
39.0	---------	39	C		
TD				pull auger, temporary hole covered pending decision on whether to continue drilling	
				or abandon hole	
				clean up and decon 5:45p	
				50# TR30 1/2 pellets added @ 5:30p	
				grout boring from the bottom of bore elevation to the surface with 8% bentonite	
				(montmorillonite clay) and cement grout 03-23-95 AM. Water level 28.3' 03-23-95 AM	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6955.4
TOTAL DEPTH: 45.0
LOGGED BY: WHK
DATE: 3-27-95
STATIC WATER: 27.9
BORING ID: BG3
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-0.9	///---///		C	Clay, silty, wet, red brown, soft	0.0
0.9-3.0	***//00**	1.0	C	Sand, clayey, gravelly, wet, red brown, loose, no odor	0.0
	***//00**		C		
	***//00**		C		
	***//00**		C		
3.0-5.0	///---///	3.0	C	Clay, silty, wet, brown, firm, slightly laminar bedding	0.0
	///---///		C		
	///---///		C		
	///---///		C		
5.0-5.3	***---***	5.0	C	Sand, silty, wet, brown, no odor	0.0
5.3-5.9	///---///		C	Clay, silty, wet, brown, stiff, some carbonate nodules	0.0
5.9-8.8	***00****	6.0	C	Sand, medium, some fine gravel, moist, brown, loose, no odor, some gravel to 1.5"	0.0
	00*		C		
	00*		C		
	00*		C		
	00*		C		
8.8-11.2	///**////		C	Clay, very fine sandy, wet, brown, firm, no odor	0.0
	///**////	9.0	C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////	11	C		
11.2-13.0	///--**//		C	Clay, silty, sandy, wet, brown, soft, some laminar bedding, no odor	0.0
	///--**//		C		
	///--**//		C		
13.0-14.1	/////////	13	C	Clay, wet, brown, stiff	0.0
	/////////		C		
	/////////	14	C		
14.1-14.7	*********		C	Sand, fine, moist, brown, loose	0.0
14.7-15.0	///***///	15	C	Clay, sandy, wet, brown, soft, laminar	0.0
15.0-16.1	/////////		C	Clay, wet, brown, stiff	1.0
	/////////	16	C		
16.1-18.2	///***///		C	Clay, sandy, wet, brown, soft, laminar banding, no odor	2.0
	///***///		C		
	///***///		C		
	///***///	18	C		
18.2-19.0	////--///		C	Clay, slightly silty, wet, brown, stiff, no odor	1.0
19.0-20.4	///***///	19	C	Clay, sandy, wet, brown, soft, laminar banding, no odor	0.0
	///***///		C		
	///***///	20	C		
20.4-21.5	****--***		C	Sand, fine, slightly silty, moist, brown, loose	
	****--***	21	C		
21.5-24.2	***000***		C	Sand, gravelly, rounded to subrounded sandstone and silica rock, moist, light brown	
	000		C	loose to very dense	
	000		C		
	000		C		

LOGGED BY: WHK

E AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6955.4
TOTAL DEPTH: 45.0
LOGGED BY: WHK
DATE: 3-27-95
STATIC WATER: 27.9
BORING ID: BG3
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	000		C	continued from page 1	
	000	24	C		
24.2-25.0	*********		C	Sand, fine, damp, brown, dense	
25.0-27.4	*********	25	C	Sand, fine to medium, moist, brown, loose to moderately dense	0.0
	*********		C		
	*********		C		
	*********		C		
	*********	27	C		
27.4-29.7	///**////		C	Clay, very fine sandy, wet, brown, stiff, laminar	0.0
	///**////		C		
	///**////		C		
	///**////	29	C		
29.7-30.0	***---***		C	Sand, fine, silty, wet, brown, stiff	0.0
30.0-31.4	*********	30	C	Sand, fine, water bearing, brown, loose	0.0
	*********		C		
	*********	31	C		
31.4-32.9	///**////		C	Clay, very fine sandy, saturated but not water bearing, brown, soft	0.0
	///**////		C	laminar banding	
	///**////		C		
32.9-38.0	/////////	33	C	Clay, wet, brown, very stiff, no odor, some carbonate filaments	1.0
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
38.0-38.6	**--//***	38	C	Sand, silty, clayey, weakly water bearing, brown, loose	
38.6-41.4	***000***		C	Sand, gravelly, weakly water bearing, brown, 4" sandstone rock @ 39.8', brown	1.0
	000		C	dense	
	000		C		
	000	40	C		
	000		C		
	000	41	C		
41.4-45.0	---------		C	CHINLE FORMATION	
	---------		C	Shale, blocky, moist, red brown, hard, green grey banding	
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------		C		
	---------	45	C		
TD				begin pulling auger at 3:30p, water @ 27.9' @ 11:30a 3-28-95	
				grout with 8% bentonite/cement--hole collapsed to 28'	

LOGGED BY: WHK

.E AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6954.6
TOTAL DEPTH: 45.0
LOGGED BY: WHK
DATE: 3-23-95
STATIC WATER: 35.7
BORING ID: BG2
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-2.1	///---*//		C	**Clay**, silty, slightly sandy, stiff, wet, red brown	
	///---*//	1.0	C		
	///---*//		C		
2.1-6.0	///---**/	2.0	C	**Clay**, silty, very slightly more sandy than above (fill?), black, piece of sandstone	
	///---**/		C	at 4.7'	1100 @ 2.6'
	///---**/		C		
	///---**/		C		
	///---**/	4.0	C		
	///---**/		C		18 @ 4.7'
	///---**/	5.0	C		
	///---**/		C		
6.0-11.6	///**--//	6.0	C	**Clay**, sandy, silty, stiff, wet, red brown, some black mottling to 7', natural	28 @ 6.0'
	///**--//		C	banding and laminations of sand and silt, blocky, scattered carbonate nodules	
	///**--//		C	very weak odor 11.6'	
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		21 @ 9.0'
	///**--//		C		
	///**--//	10	C		
	///**--//		C		
	///**--//	11	C		
11.6-12.9	///---///		C	**Clay**, silty, wet, stiff, blocky, dark brown	
	///---///	12	C		
12.9-13.8	***//--**		C	**Sand**, clayey, silty, wet to moist, laminar banding, slight odor, dark brown	0.0 @ 12.6'
	***//--**	13	C		
13.8-15.0	/////////		C	**Clay**, brown, stiff, wet, slight odor	
	/////////	14	C		
	/////////		C		
15.0-16.7	///--**//	15	C	**Clay**, silty, sandy, wet, soft, brown, very thin bedded <1/4", very slight odor	0.0 @ 15.0'
	///--**//		C		
	///--**//		C		
16.7-18.2	/////////		C	**Clay**, brown, wet, stiff, blocky	5 @ 16.9'
	/////////	17	C		
	/////////		C		
	/////////	18	C		
18.2-19.4	///---*//		C	**Clay**, very silty, slightly sandy, soft, wet, slight odor	
	///---*//	19	C		
19.4-20.2	/////////		C	**Clay**, brown, wet, stiff, slightly blocky	2 @ 19.8'
	/////////	20	C		
20.2-21.6	///---///		C	**Clay**, silty, wet, soft, brown	1.4 @ 21.0'
	///---///	21	C		
21.6-24.5	**///---*		C	**Sand**, very clayey, very silty, loose, wet, brown, fine laminar banded, few	
	**///---*		C	cleaner zones, weak odor	
	**///---*		C		
	**///---*		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6954.6
TOTAL DEPTH: 45.0
LOGGED BY: WHK
DATE: 3-23-95
STATIC WATER: 35.7
BORING ID: BG2
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	**///---*		C	continued from page 1	
	**///---*	24	C		25 @ 24.0'
24.5-26.1	////**///		C	Clay, slightly sandy, stiff, brown, wet, weak odor	
	////**///	25	C		
	////**///		C		
26.1-27.4	*********	26	C	Sand, fine, loose, moist, brown	
	*********		C		1 @ 26.8'
	*********	27	C		
27.4-30.0	///***///		C	Clay, very sandy, wet, soft, brown, laminar banded, weak odor	8 @ 28.0'
	///***///	28	C		
	///***///		C		
	///***///		C		
	///***///		C		
30.0-30.9	///**////	30	C	Clay, sandy, soft, wet, brown, slight odor	0.0
30.9-32.5	****//***		C	Sand, slightly clayey, loose, moist, brown, slight odor	
	****//***	31	C		
	****//***		C		
	****//***	32	C		7.0
32.5-34.1	***000***		C	Sand, gravelly, dense, slight odor, moist, grey brown	
	000		C		
	000		C		
34.1-35.6	**0000***	34	C	Sand, gravelly, cobbly, moist, dense, slight odor, multicolored, cobbles	
	0000*		C	sandstone (white), subrounded to rounded silica gravel	12.0
	0000*	35	C		
35.6-37.2	****00***		C	Sand, coarse, fine gravelly, grey to multicolored, saturated with fluid	>1438 @ 37.0
	****00***	36	C	gasoline odor strong	
	****00***		C		
	****00***	37	C		>1438
37.2-38.5	000000000		C	Gravel, cobbly, sandstone blocks, very dense, white to multicolored	
	000000000	38	C	wet (not saturated)	
38.5-40.0	****00***		C	Sand, fine, slightly gravelly, water bearing, grey, strong hydrocarbon odor	
	****00***		C	very loose	
	****00***		C		
40.0-41.3	****00***	40	C		
	****00***		C		
	****00***	41	C		2000
41.3-42.4	000***000		C	Gravel, fine, sandy, dense, water bearing, strong odor, grey.	
	000***000	42	C		2000
42.4-43.2	000***000		C	as above but brown	
	000***000	43	C		
43.2-45.0	---------		C	CHINLE FORMATION	30
	---------		C	Shale, weathered in-situ, some green mottling, fine blocky, moist	
	---------		C	very slight odor	
	---------	45	C		
TD				Water level after 2 hours 35.7'. Grouted hole closed from bottom to surface.	
				1/8" of amber colored product observed on water surface prior to grouting.	

LOGGED BY: WHK

'ZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6943.7
TOTAL DEPTH: 48.5
LOGGED BY: WHK
DATE: 3-28-95
STATIC WATER: 28.0
BORING ID: BG4
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-0.3	*********		C	**Sand**, fine, dry, brown, loose	
0.3-0.4	xxxxxxxxx	1.0	C	**Asphalt Cement Concrete**	11.0
0.4-5.0	///***///		C	**Clay**, sandy, wet, brown, firm, (fill), odor below 3.9', water saturated @ 4.8'	>1438
	///***///		C	bottom of fill is at 4.8'	
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
5.0-11.8	///--+///	5.0	C	**Clay**, silty, blocky, wet, brown, firm, scattered carbonate filaments, some	0.0
	///--+///		C	nodules, native, no odor, redder >10'	
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///		C		
	///--+///	11	C		
	///--+///		C		
11.8-13.0	///***///	12	C	**Clay**, sandy, very fine, wet, red brown to brown, soft	0.0
	///***///		C		
13.0-14.1	////+++//	13	C	**Clay**, stiff, fissured, wet, brown, some carbonate nodules	0.0
	////+++//		C		
14.1-14.6	*********	14	C	**Sand**, fine, clean, damp, white, loose	0.0
14.6-15.0	///**0*//		C	**Clay**, sandy, slightly gravelly, wet, brown, very stiff to hard	0.0
15.0-16.9	///**////	15	C	**Clay**, very fine sandy, laminar bedded, wet, brown, soft	0.0
	///**////		C		
	///**////		C		
	///**////		C		
16.9-18.1	///*/////	17	C	**Clay**, very fine sandy, slightly less than above, slightly blocky, wet, brown, firm	0.0
	///*/////		C		
	///*/////	18	C		
18.1-19.8	****//***		C	**Sand**, some clay, sandy in bands, moist to wet, brown, moderately dense to soft	0.0
	****//***		C	interbedded with finer soil	
19.8-21.3	000***000		C	**Gravel**, sandy, moist, light grey to white, dense, subrounded	0.0
	000***000	20	C		
	000***000		C		
	000***000	21	C		
21.3-21.8	///***///		C	**Clay**, sandy, wet, brown, soft	
21.8-25.5	000**/000	22	C	**Gravel**, slightly sandy, some clay as binder, moist, grey to brown, dense	20 @ 22.5'
	000**/000		C	odor @ 24.4'	
	000**/000		C		

LOGGED BY: WHK

TZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6943.7
TOTAL DEPTH: 48.5
LOGGED BY: WHK
DATE: 3-28-95
STATIC WATER: 28.0
BORING ID: BG4
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	000**/000		C	continued from page 1	
	000**/000	24	C		
	000**/000		C		160 @ 24.4'
	000**/000	25	C		
25.5-29.4	*********		C	**Sand**, fine, clean of silt and clay, moist, brown, loose	45.0
	*********	26	C		
	*********		C		
	*********		C		
	*********		C		
	*********		C		
	*********		C		
	*********	29	C		
29.4-30.5	*********		C	**Sand** as above but **very weakly water bearing @ 29.4'**, grey to black, strong odor	1100
	*********	30	C		
30.5-31.2	///***///		C	**Clay**, sandy, wet, brown, soft, odor	770
	///***///	31	C		
31.2-34.0	///+++///		C	**Clay**, blocky, wet, very stiff, numerous carbonate filaments, brown, slightly	770
	///+++///		C	fissured, odor	
	///+++///		C		
	///+++///		C		
	///+++///		C		
34.0-35.0	***---***	34	C	**Sand**, silty, very fine, does not appear water bearing, but sample covered with	700
	---		C	water from above, very dark brown to black, soft, strong odor	
35.0-37.3	***///***	35	C	**Sand**, very fine, clayey, **saturated, water bearing zones--2" thick**, gradational to	1000
	///		C	clay below, brown, strong odor	
	///		C		
	///		C		
	///	37	C		
37.3-39.2	///+++///		C	**Clay**, wet, brown, stiff, carbonate filaments, soft to firm, not blocky or fissured	320
	///+++///		C		
	///+++///		C		
	///+++///	39	C		
39.2-40.9	000**/000		C	**Gravel**, sandy, slightly clayey, **water bearing**, brown, dense, rounded to subrounded	800
	000**/000		C	odor	
	000**/000		C		
40.9-45.0	----*----	41	C	**CHINLE FORMATION**	
	----*----		C	**Shale**, slightly sandy, fissle, fissured, slightly blocky, moist, red brown, hard	2.0
	----*----		C	some grey green banding, no odor	
	----*----		C		
	----*----		C		
	----*----		C		
	----*----		C		
	----*----		C		
45.0-48.5	----**---	45	C	**Shale**, sandy, fissle, moist to damp, hard, water from above runs into fissle	
	----**---		C	partings (dry on interior of sample) difficult to obtain uncontaminated sample	
	----**---		C	dark red brown, suspect samples taken may be contaminated by water from above	

LOGGED BY: WHK

IZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6943.7
TOTAL DEPTH: 48.5
LOGGED BY: WHK
DATE: 3-28-95
STATIC WATER: 28'-7"
BORING ID: BG4
PAGE: 3

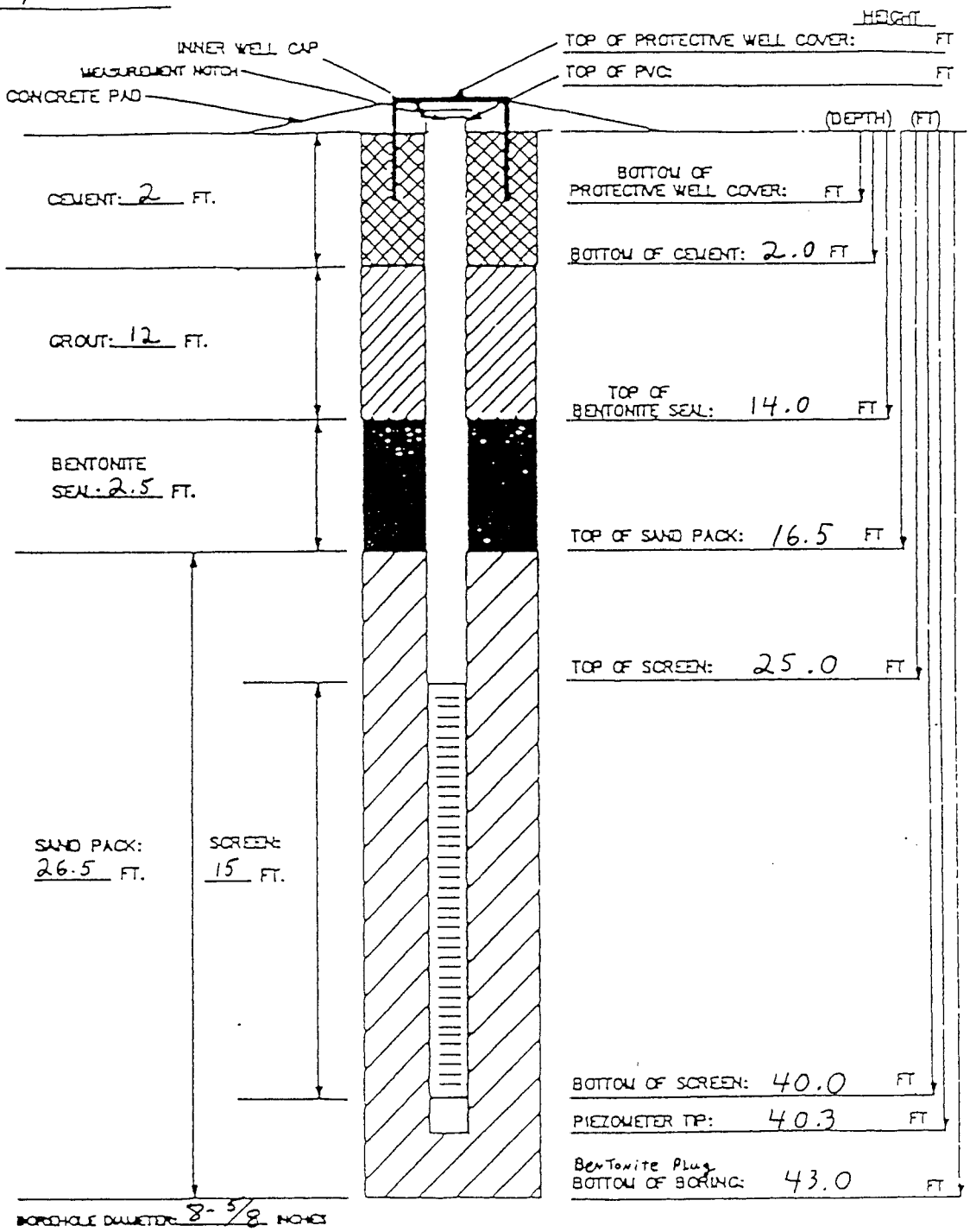
DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	----**---		C	continued from page 2	
	----**---	47	C		23 @ 47.0'
	----**---		C		
	----**---	48	C		
	----**---		C		12 @ 48.5'
TD				stop drilling 11:05a	
				water @ 18.8' @ 11:30a -- 8" of hydrocarbon on water @ 2:00p water level @ 28'-7"	
				completed 4" well, screened from 25' to 40'	
				(see attached completion diagram)	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

INSTALLATION DATE: 032895

INSTALLATION DIAGRAM
MONITORING WELL NO.
B6-4



MATERIALS USED:

SAND TYPE AND QUANTITY: 20-40
BENTONITE PELLETS (5-GALLON BUCKETS): 1
BAGS OF GROUT: 1
AMOUNT OF CEMENT: 8-94# Bags+75#Gel
AMOUNT OF WATER USED: 8 gal
OTHER:

Bottom Cap Used? YES
Screen Lengths: 15'
Riser Used: 30'
Top Cap Used?
Well Size: 4" Dia.

J-Plug Used? YES
Flush Mount Vault
Above Ground Vault YES
Bollards, No.& Size:

TASK: Tank 569 GEOLOGIST/ENGINEER: WHK

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6918.6
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 28.0
BORING ID: B1
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.2	***///***		C	**Sand**, clayey, damp, brown, soft/loose, some fine gravel	0.0
	///	1.0	C		
1.2-5.0	///**--//		C	**Clay**, sandy, silty, moist to wet, brown, stiff, some root fibers in upper 3'	0.0
	///**--//		C	no odor	
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		
5.0-8.8	///---///	5.0	C	**Clay**, silty, moist, brown, hard, scattered root fibers	0.0
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
8.8-9.1	000///000		C	Gravel, fine, clayey, damp, brown, dense, silica gravel to 1/2", no odor	0.0
9.1-10.0	///***///	9.0	C	**Clay**, sandy, damp, brown, hard, some root matter, no odor	0.0
	///***///		C		
10.0-12.4	/////////	10	C	**Clay**, blocky, moist to wet, brown, hard, root matter, gradational above and below	0.0
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	12	C		
12.4-16.4	///--**//		C	**Clay**, silty, sandy, sandier @ 14' but gradational, moist to wet, brown, stiff to	0.0
	///--**//		C	hard, does not appear weathered in-situ, slightly fissured, pieces (2-3 mm) of	
	///--**//		C	clay in sandy matrix, root matter	
	///--**//		C		
	///--**//		C		
	///--**//	15	C		
	///--**//		C		
	///--**//	16	C		
16.4-16.7	*********		C	Sand, fine, moist, red brown, loose	0.0
16.7-17.4	///***///	17	C	Clay, sandy, wet, brown, very stiff	
17.4-22.9	///++////		C	**Clay**, slightly fissured but not as much as above, some 4" slightly sandy zones	0.0
	///++////		C	some carbonate nodules, wet, dark brown, hard	
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
22.9-30.0	///**++//		C	**Clay**, slightly sandy, some carbonate filaments, occasional individual coarse sand	0.0
	///**++//		C	grains of silica rock, wet, dark brown, soft, no odor, free water on tip of sample	
	///**++//	23	C	but not in samples	

LOGGED BY: WHK

.E AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6918.6
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 28.0
BORING ID: B1
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	///**++//		C	continued from page 1	
	///**++//	24	C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
30.0-32.5	***/O****	30	C	Sand, slightly clayey, occasional pebbles, weakly water bearing, brown, very	0.0
	/O*		C	soft/loose	
	/O*		C		
	/O*		C		
	/O*	32	C		
32.5-39.5	///---+//		C	Clay, silty, some carbonate filaments and staining, more carbonate filaments below	0.0
	///---+//		C	32', wet, saturated but not water bearing, light brown, soft to firm	
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//	39	C		
39.5-41.1	///000///		C	Clay, gravelly, wet, saturated but not water bearing, light brown, soft	0.0
	///000///		C		
	///000///		C		
	///000///	41	C		
41.1-47.1	***OO****		C	Sand, coarse, fine to medium gravelly, water bearing, brown, dense, subrounded	0.0
	OO*		C	to rounded silica rock, some sandstone pieces	
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6918.6
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 28.0
BORING ID: B1
PAGE: 3

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	000		C	continued from page 2	
	000	47	C		
47.1-50.0	---------		C	CHINLE FORMATION	
	---------		C	Shale, some green mottling, fissle, moist, hard, slightly blocky, no odor	0.0
	---------		C		
	---------		C		
	---------		C		
	---------	50	C		
TD				end 11:00a -- depth to water @ 12:15p 28.0'	
				grout hole with bentonite/cement/8% grout to surface	
				time end 1:15p -- water depth affected by hole collapse	

LOGGED BY: WHK

ZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan
Tank 576

FILE #: 95-018
ELEVATION: 6927.3
TOTAL DEPTH: 38.0
LOGGED BY: WHK
DATE: 3-29-95
STATIC WATER: 24'-3"
BORING ID: B2
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-5.0	///-*////		C	start at 10:00a	
	///-*////		C	**Clay**, slightly silty, little sand, wet, brown, soft to firm, no odor	0.0
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////	5.0	C		
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////		C		
	///-*////	8.0	C		
8.4-10.6	///***///		C	**Clay**, fine sandy, gradational fine above and to below, wet, brown, firm, no odor	0.0
	///***///		C		
	///***///		C		
	///***///	10	C		
10.6-12.0	***---***		C	**Sand**, silty, fine, moist, light red brown, loose, no odor	0.0
	---		C		
	---		C		
12.0-12.5	***000***	12	C	**Sand**, very gravelly, to 2", moist, light red brown, dense, slightly rounded rock	0.0
12.5-13.1	***---***		C	**Sand**, silty, moist, light red brown, loose, no odor	0.0
13.1-15.0	///**--//	13	C	**Clay**, sandy, silty, moist, red brown, firm to stiff, some root filaments	0.0
	///**--//		C		
	///**--//		C		
	///**--//		C		
15.0-16.8	***///***	15	C	**Sand**, clayey, fine, moist, red brown, moderately dense, no odor	0.0
	///		C		
	///		C		
	///		C		
16.8-19.1	//*++-///	17	C	**Clay**, silty grading to very fine sandy, moist to wet, red brown, stiff, no odor	0.0
	//*++-///		C	carbonate filaments common	
	//*++-///		C		
	//*++-///		C		
	//*++-///	19	C		
19.1-20.0	//--oo++/		C	**Clay**, silty, large gravel present (2"), wet, dark brown, hard, no odor	0.0
	//--oo++/	20	C	numerous carbonate filaments	
20.0-23.6	//--++///		C	**Clay**, silty, brown, stiff, slightly blocky, no odor, carbonate filaments	0.0
	//--++///		C		
	//--++///		C		
	//--++///		C		540 @ 22.6'
	//--++///		C		
	//--++///		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6927.3
TOTAL DEPTH: 38.0
LOGGED BY: WHX
DATE: 3-29-95
STATIC WATER: 24'-3"
BORING ID: B2
PAGE: 2

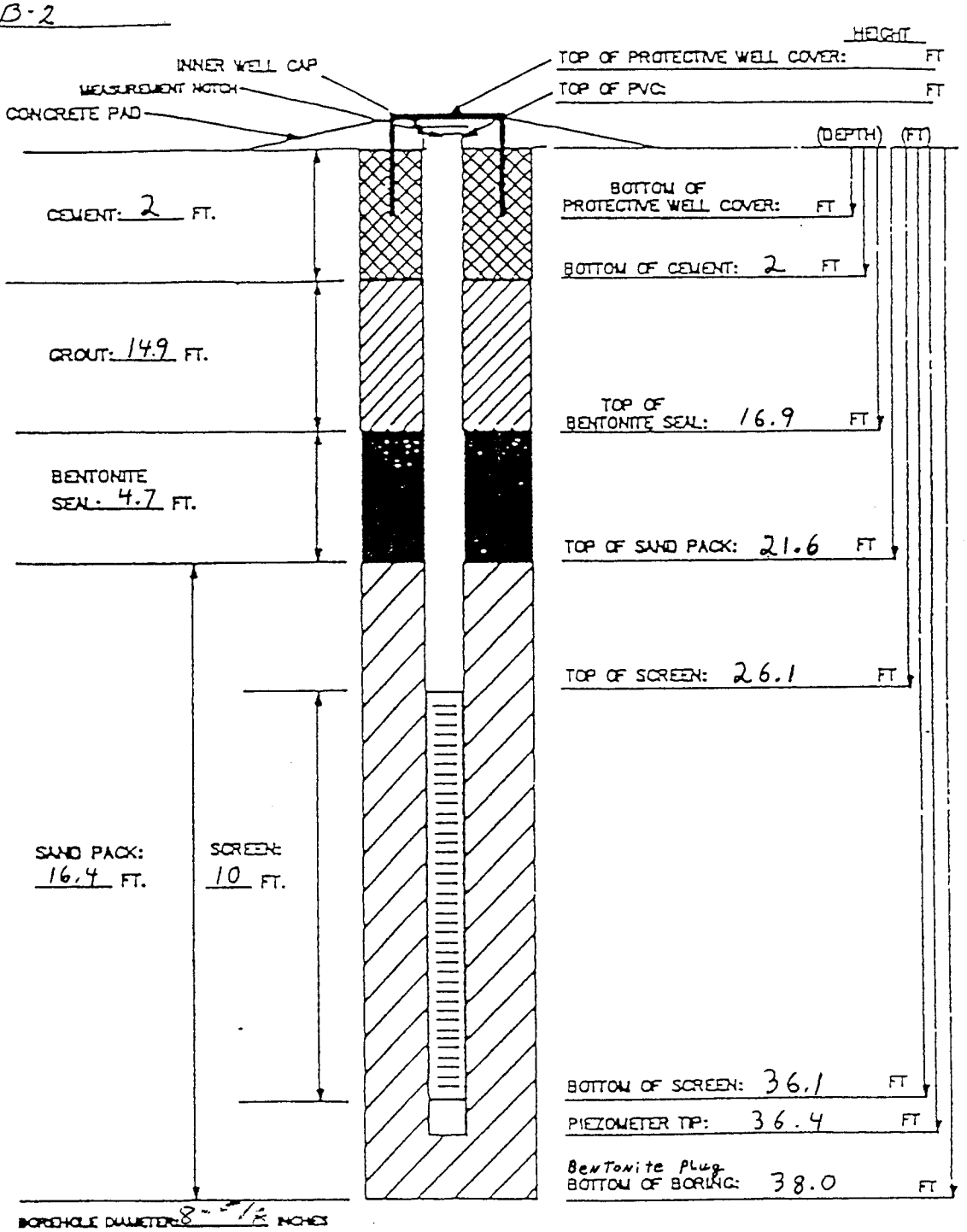
DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
23.6-24.2	***00****		C	**Sand**, coarse, some fine gravel, saturated but does not appear water bearing, brown	1000
	00*	24	C	dense, hydrocarbon odor	
24.2-25.5	/////////		C	**Clay**, wet, not water bearing, brown, stiff, hydrocarbon odor	1060
	/////////	25	C		
25.5-27.1	***///***		C	**Sand**, clayey, **water bearing**, brown, odor	610
	///		C		
	///		C		
27.1-28.5	/////////	27	C	**Clay**, some sand @ 28'-28.5', wet, brown, soft, slightly blocky, hydrocarbon odor	
	/////////		C	saturated but not water bearing	
	/////////	28	C		
28.5-30.9	///***///		C	**Clay**, sandy, some laminations, wet, brown, stiff	60
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
30.9-32.9	000**0000	31	C	**Gravel**, some sand, silica rock, **water bearing**, brown, dense, rounded to subrounded	1030
	000**0000		C		
	000**0000		C		
	000**0000		C		
32.9-35.0	---------	33	C	**CHINLE FORMATION**	
	---------		C	**Shale**, weathered, wet to moist, some green mottling, red brown overall, stiff	20
	---------		C	weak odor	
	---------		C		
35.0-38.0	----*----	35	C	**Shale**, as above, slightly more sand, blocky, dark red brown, wet to moist	57
	----*----		C	suspect contamination by water flowing from gravel above--gravel produces more	
	----*----		C	water at this location than previous drilling	
	----*----		C		
	----*----		C		
	----*----		C		
	----*----	38	C		
TD				stop drilling 11:25a	
				completed 4" well - see attached well completion diagram	
				24'-3" to water	
				2" product on water	

LOGGED BY: WHX

SIZE AND TYPE OF BORING: 4'-1/4" HSA

INSTALLATION DATE: 032995

INSTALLATION DIAGRAM
MONITORING WELL NO.
B-2



MATERIALS USED:

SAND TYPE AND QUANTITY: 20-40
BENTONITE PELLETS (5-GALLON BUCKETS): 2
BAGS OF GROUT:
AMOUNT OF CEMENT: 8 - 94# Bags + 75# Gel
AMOUNT OF WATER USED: 8 Gal
OTHER:

Bottom Cap Used? YES
Screen Lengths: 10'
Riser Used: 30'
Top Cap Used?
Well Size: 4" Dia.

J-Plug Used? YES
Flush Mount Vault
Above Ground Vault YES
Bollards, No. & Size:

TASK: Tank 569 GEOLOGIST/ENGINEER: WHK

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6917.6
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 22.3
BORING ID: B3
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.3	///**OO//		C	**Clay**, sandy, gravelly, wet, brown, soft, no odor	0.0
	///**OO//	1.0	C		
1.3-2.7	///**////		C	**Clay**, fine sandy, wet, brown to red brown, soft, no odor	0.0
	///**////	2.0	C		
2.7-5.0	/////////		C	**Clay**, wet, very soft, some root matter	0.0
	/////////	3.0	C		
	/////////		C		
	/////////		C		
	/////////		C		
5.0-8.4	/////////	5.0	C	**Clay**, wet, dark brown, stiff, no odor, some root matter	0.0
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	8.0	C		
8.4-10.3	///+++///		C	**Clay**, carbonate filaments common, some carbonate nodules scattered, wet, stiff	0.0
	///+++///	9.0	C	red brown, no odor	
	///+++///		C		
	///+++///	10	C		
10.3-10.6	///OOO///		C	**Clay**, gravelly, wet, red brown, stiff, no odor	0.0
10.6-12.9	///**+--/	11	C	**Clay**, fine sandy, silty, wet, light red brown, firm, no odor, scattered fine	0.0
	///**+--/		C	gravel, some root matter, some carbonate filaments, slightly blocky	
	///**+--/		C		
12.9-14.1	///*+++//		C	**Clay**, slightly sandy, carbonate filaments abundant, wet, brown, firm, carbonate	0.0
	///*+++//	13	C	filaments stain sample, white CCI2, no odor, root matter abundant	
	///*+++//		C		
14.1-14.4	*********	14	C	**Sand**, fine, moist, light brown, loose, no odor	0.0
14.4-15.3	//***+--/		C	**Clay** as at 12.9'-14.1' but slightly more fine sand, no odor	0.0
	//***+--/	15	C		
15.3-16.7	***/*****		C	**Sand**, fine, slightly clayey, moist to wet, brown, loose, no odor	0.0
	/**	16	C		
16.7-18.3	///**////		C	**Clay**, fine sandy in laminations, wet, dull brown, soft, root matter common, no odor	0.0
	///**////	17	C		
	///**////		C		
	///**////	18	C		
18.3-18.9	/////////		C	**Clay**, blocky, slabby, wet, dull brown, firm, no odor	0.0
18.9-20.0	///***///	19	C	**Clay**, very sandy, wet, brown, soft	0.0
	///***///		C		
20.0-24.4	***OOO***	20	C	**Sand**, very gravelly, rounded to subrounded silica rock, some sandstone white, some	5 (upper 6")
	OOO		C	odor in upper 5", stained black to dark grey, water bearing, dense, multicolored	
	OOO		C	red brown matrix	
	OOO		C		
	OOO		C		
	OOO		C		
	OOO		C		

LOGGED BY: WHK

ZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

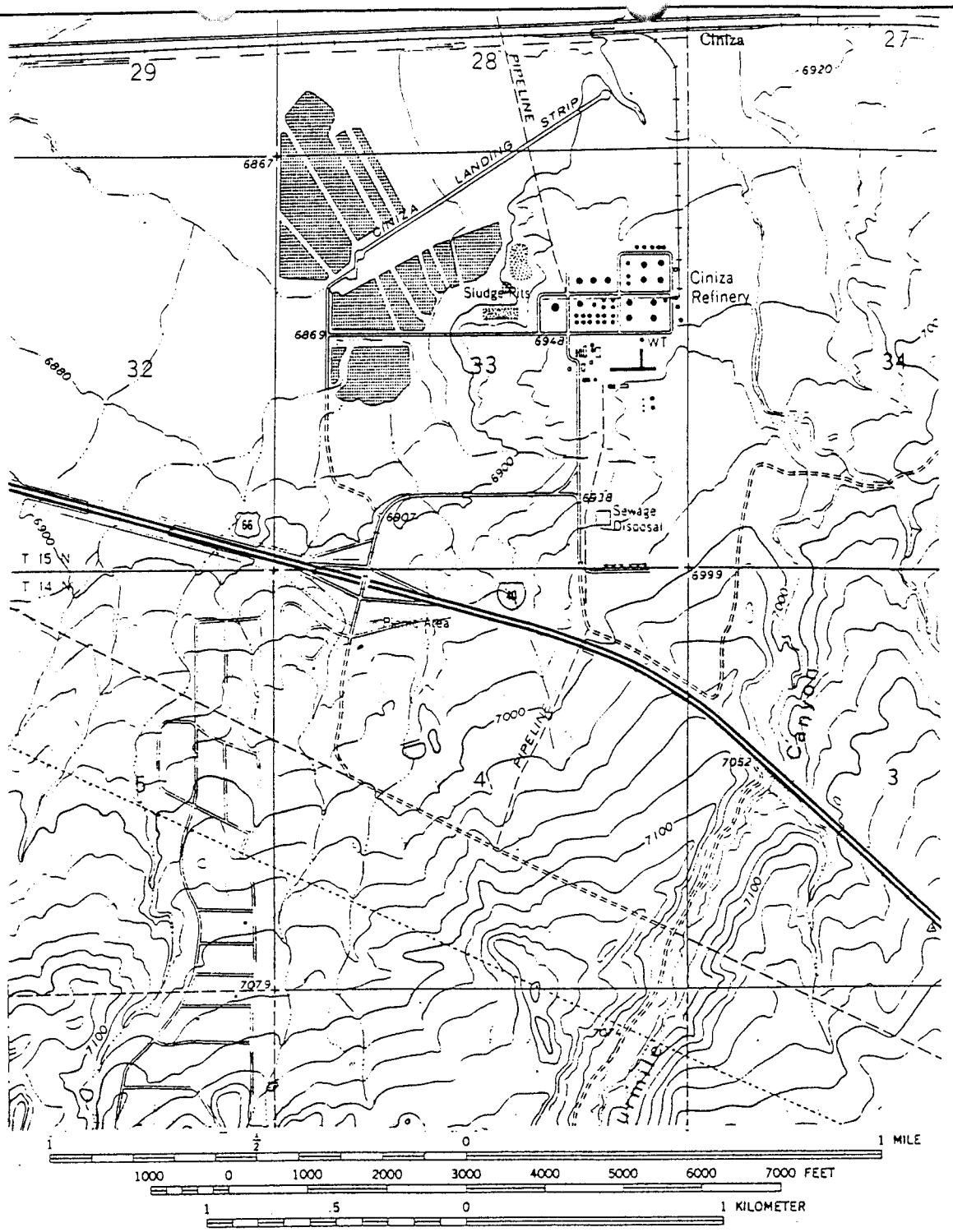
PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6917.6
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 22.3
BORING ID: B3
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	000		C		
	000	24	C		
24.4-25.0	---***---		C	**CHINLE FORMATION**	
	---***---	25	C	Shale, very sandy, weathered, grey, green, no odor, hard	0.0
25.0-30.0	---**----		C	Shale, sandy, fissle, some green grey streaks, moist, hard	0.0
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----	30	C		
TD				stop drilling @ 4:05p	
				water @ 4:20p -- 22.3'	
				grout to surface with bentonite/cement	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA



CINIZA QUADRANGLE
NEW MEXICO-MC KINLEY CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

QUADRANGLE LOCATION

SEC DONOHUE
Environment & Infrastructure

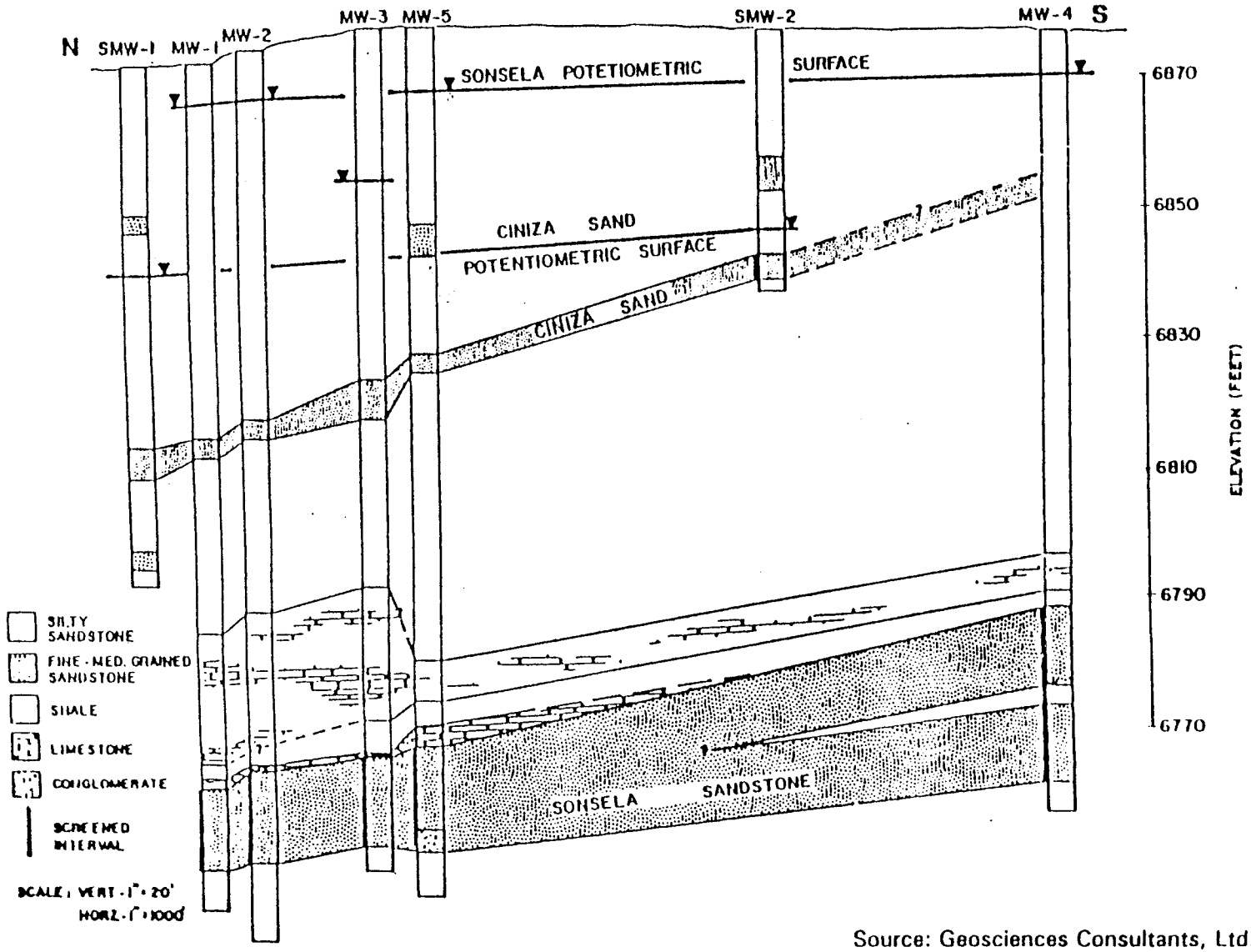
FIGURE 1
LOCATION MAP

CINIZA REFINERY

GIANT REFINERING COMPANY
GALLUP, NEW MEXICO

REVISION NO. 0 | FILE NAME J4679\F04-001.DWG | DATE 12/21/92 | DRAWN BY EMH | APPROVED BY | CHECKED BY

CHECKED BY	APPROVED BY	DRAWN BY EMH	DATE 12/22/92	FILE NAME J4679\F06-001.DWG	REVISION NO. 0



Source: Geosciences Consultants, Ltd. 1986

SEC DONOHUE
Environment & Infrastructure

FIGURE 2
GEOLOGIC CROSS SECTION

CINIZA REFINERY

GIANT REFINING COMPANY
GALLUP, NEW MEXICO

REFERENCE DRAWINGS

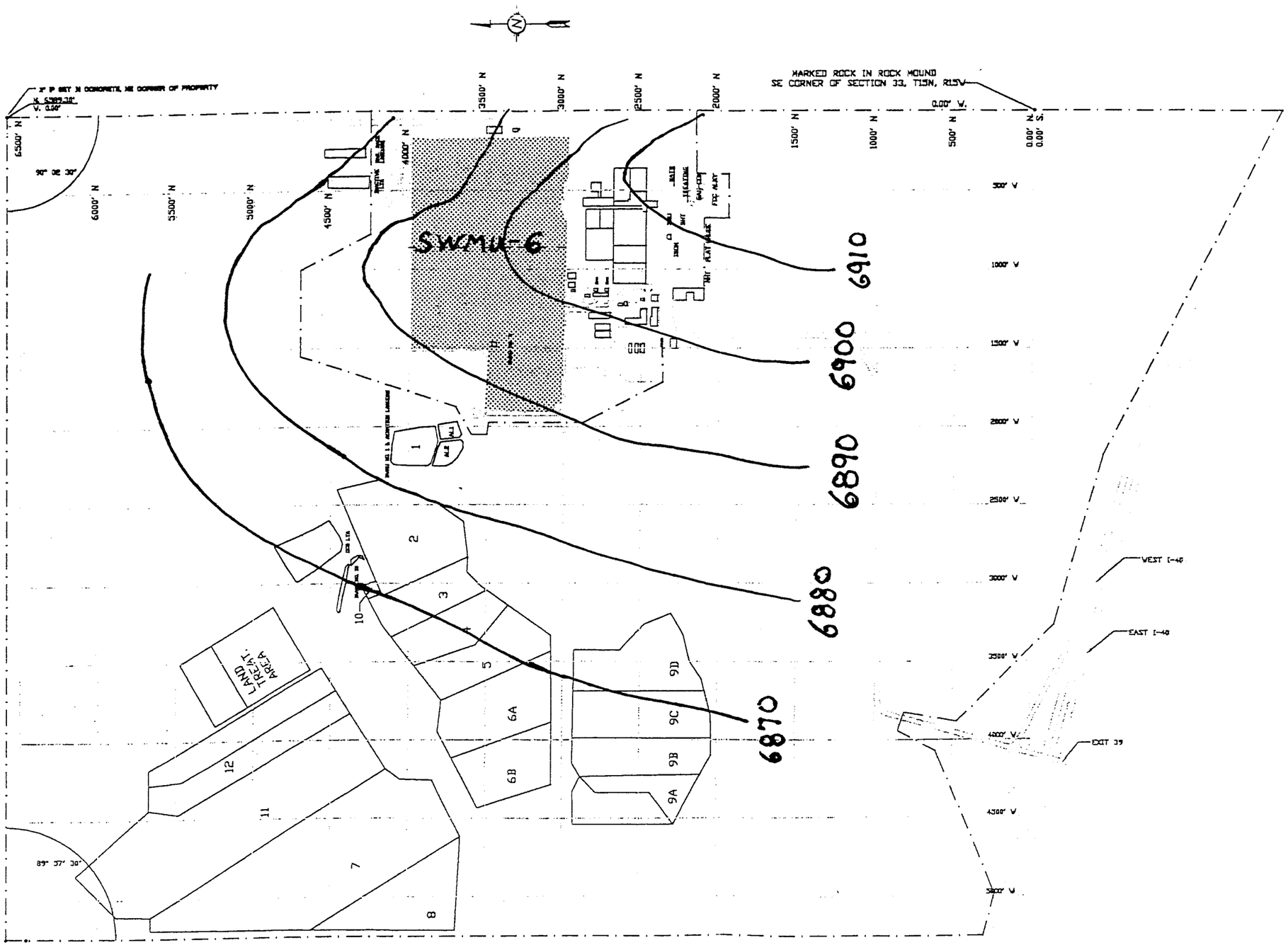


FIGURE 3

CINIZA REFINERY | GIANT REFINING,CO. A DIVISION OF GIANT INDUSTRIES | GALLUP NEW MEXICO

MASTER PLOT PLAN

MARK	DATE	DESCRIPTION	BY	APRV'D

SCALE	1"=300'	APRV'D	
DATE	9-1-94	APRV'D	
DRN.	SPS	IPS 300MS	REV. 1
CHK'D.	DWG NO.	Z-02-146	

POTENTIOMETRIC SURFACE (SONSELA AQUIFER)

REFERENCE DRAWINGS

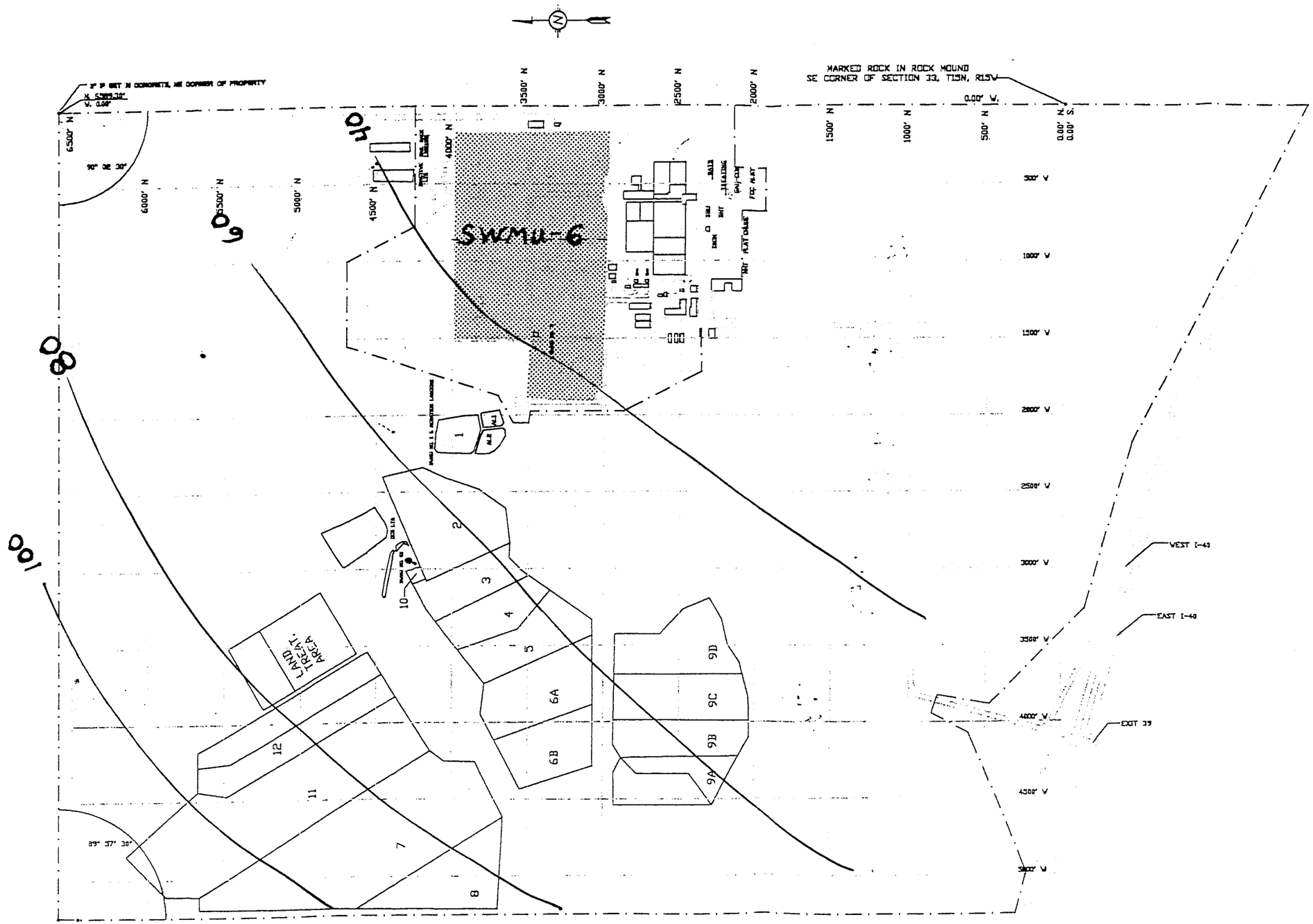


FIGURE 4

CINIZA REFINERY — GIANT REFINING, CO. — GALLUP NEW MEXICO
A DIVISION OF GIANT INDUSTRIES

MASTER PLOT PLAN

SCALE	1"=300'	APRV'D	
DATE	9-1-94	APRV'D	
DRN.	SPS	TPS 300MS	REV.
CHK'D.	DWG NO.	Z-02-146	1

MARK	DATE	DESCRIPTION	BY	APRV'D

ARTESIAN HEAD OF THE SONSELA AQUIFER

REFERENCE DRAWINGS

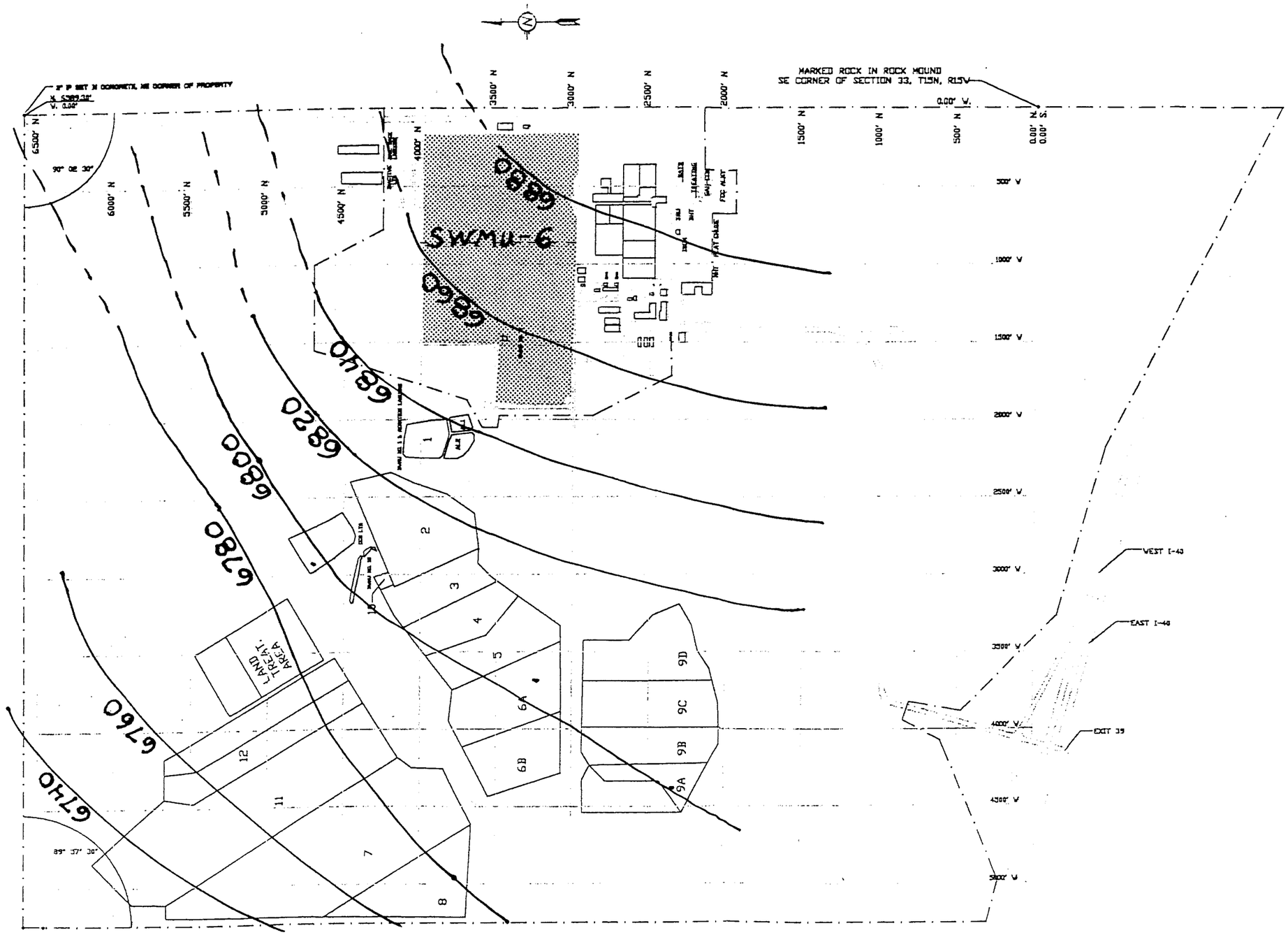


FIGURE 5

CINIZA REFINERY — GIANT — GALLUP NEW MEXICO

REFINING,CO.
A DIVISION OF GIANT INDUSTRIES

MASTER PLOT PLAN

SCALE	1"=300'	APRV'D.	
DATE	9-1-94	APRV'D.	
DRN.	SPS	IPS 300MS	REV.
CHK'D.	DWG NO.	Z-02-146	1

MARK	DATE	DESCRIPTION	BY	APRV'D

STRUCTURE CONTOUR MAP TOP OF SONSELA SANDSTONE