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CLOSURE PLANS

Chavez, Carl J, EMNRD

From: Monzeglio, Hope, NMENV
Sent: Wednesday, February 24, 2010 9:14 AM
To: Allen, Ann
Cc: Bearzi, James, NMENV; Kieling, John, NMENV; Cobrain, Dave, NMENV; Chavez, Carl J, EMNRD; Dougherty.Joel@epamail.epa.gov; Edelstein.David@epamail.epa.gov; Hains, Allen; Riege, Ed; Schmaltz, Randy; Martinez, Cynthia, NMENV
Subject: Financial Assurance extension request
Attachments: FA mechanism ext apprvl 2-24-10.pdf

Ann

This will go out in the mail today.

Hope

Hope Monzeglio
Environmental Specialist
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, BLDG 1
Santa Fe NM 87505
Phone: (505) 476-6045; Main No.: (505)-476-6000
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hope.monzeglio@state.nm.us

Websites:
New Mexico Environment Department
Hazardous Waste Bureau

BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
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RON CURRY
Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

February 24, 2010

Ms. Ann Allen
Senior Vice President
Western Refining
123 W. Mills Avenue, Suite 200
El Paso, Texas 79901

RE: APPROVAL
EXTENSION REQUEST FOR THE
RESPONSE TO NOTICE OF DISAPPROVAL FOR
THE 2010 FINANCIAL ASSURANCE DEMONSTRATION
WESTERN REFINING COMPANY, SOUTHWEST, INC.
GALLUP AND BLOOMFIELD REFINERIES
EPA ID # NMD000333211
HWB-GRCC-MISC

Dear Ms. Allen:

The New Mexico Environment Department (NMED) received the Western Refining Company, Southwest Inc. (WRC) *Extension Request for Response to Notice of Disapproval Financial Assurance for Western Refining Southwest, Inc. Gallup* (Response) dated Feburary 18, 2010. The letter requests an extension to submit the response to NMED's *Notice of Disapproval Financial Assurance for the Gallup Refinery EPA ID# NMD000333211 and the Bloomfield Refinery NMD089416416* dated February 4, 2010.

Western's financial statements will not be finalized until March 4' 2010; the Permittee has shown good cause in this request. NMED hereby approves of the requested extension for submittal of the Response until March 15, 2010.

As part of the request WRC requested the regulatory basis for additional financial assurance for the closure of the Bloomfield Refinery surface impoundments. The surface impoundments (aeration lagoons) are interim status units. Even though investigation and cleanup of the surface impoundments below the liners will be conducted in conjunction with corrective action conducted in the process area (SWMU 13) under the July 27, 2007 Order, WRC is still required to provide financial assurance for the completion of closure of interim status units in accordance with 20.4.1.600 NMAC incorporating 40 CFR §265.142 and 143. The closure cost estimate must include the costs for all activities required to complete final closure. NMED's estimate is a general approximation based on complete removal of contaminated soils beneath the surface impoundments, disposal of those soils as nonhazardous waste at an approved landfill and all associated costs for testing, monitoring and reporting of the removal action. WRC may choose to provide its own estimate of the costs for closure of the surface impoundments rather than use the estimate provided in NMED's February 4, 2010 letter.

If you have questions regarding this letter please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

James P. Bearzi
Chief
Hazardous Waste Bureau

cc: J. Kieling, NMED HWB
D. Cobrain NMED HWB
H. Monzeglio, NMED HWB
C. Chavez, OCD
J. Dougherty, EPA Region 6
D. Edelstein, EPA Region 6
Alan Haines, Western Refining
File: Reading File and GRCC 2010 File

Western Refining
GALLUP

WNR
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NYSE

October 12, 2009

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VIA EMAIL AND CERTIFIED MAIL No. 7008 2810 0000 4726 2014

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

Joel Dougherty (6EN-HE)
Hazardous Waste Enforcement Branch
U.S. EPA Region 6, Suite 1200
1445 Ross Ave.
Dallas, TX 75202-2733

RE: **FINAL CLOSURE COST ESTIMATE, WESTERN REFINING COMPANY, SOUTHWEST INC., GALLUP REFINERY; EPA ID #NMD000333211**

Dear Chief,

Enclosed please find the Western Refining Gallup's ("Gallup") final closure cost estimate for Lagoons AL-1 and AL-2 pursuant to Section IV (Compliance Order) item 100.H of the Consent Agreement and Final Order ("CAFO") between Western, NMED and U.S. EPA Region 6.

I certify that the information contained in or accompanying this submission is true, accurate and complete. As to those identified portions of this submission for which I cannot personally verify the truth and accuracy, I certify as the company official having supervisory responsibility for the person(s) who, acting upon my direct instructions, made the verification, that this information is true, accurate, and complete.

Thank you for your review and approval of this cost estimate. Please feel free to contact Ed Riege at 505-722-0217 with any questions.

Sincerely,

Mark B. Turri
Refinery Manager

cc: Hope Monzeglio NMED HWB
Carl Chavez OCD
Ann Allen Western Refining
Ed Riege Western Refining

RPS JDC
404 Camp Craft Rd., Austin, Texas 78746
Tel: (512) 347 7588 Fax: (512) 347 8243
Internet: www.rpsgroup.com/energy

October 12, 2009

Ed Riege
Environmental Manager
Gallup Refinery - Western Refining Company
Rout 3, Box 7
Gallup, NM 87301

Re: Lagoons AL-1 and AL-2 Final Closure Cost Estimate
Gallup Refinery – Western Refining Company, Gallup, New Mexico
NMD000333211

Dear Mr. Riege:

Attached to this letter is a final closure cost estimate for Lagoons AL-1 and AL-2 at the Gallup Refinery. The estimate was prepared by RPS at the request of the Gallup Refinery and as required by provision IV.H of Complaint and Consent Agreement and Final Order Document RCRA-06-2009-0936. This provision requires a final closure cost estimate be prepared to establish the amount of financial assurance Western Refining must secure for closure of the lagoons. The estimate has been prepared assuming the closure would be done by a third party responsible for project administration, performing a pre-construction investigation of the soils surrounding the lagoons, and preparing a final closure report.

The cost estimate consists of three tables. Table 1A is the cost estimate for closure of the lagoons under Option 1, which assumes a portion of the sludge in the lagoon is excavated and temporarily placed in the adjacent temporarily out-of-service evaporation pond. The sludge placed in the evaporation pond and the remaining in-situ sludge are then bioremediated, which reduces the sludge volume by approximately 30%. Table 1B is the cost estimate for closure of the lagoons under Option 2, which assumes the sludge is stabilized in place, which increases the sludge volume by approximately 10%. Both Option 1 and 2 assume the top foot of the lagoons' clay liner has to be removed due to contamination. Both options also assume that the sludge and contaminated soils are disposed as special waste at Waste Management's San Juan landfill. Table 3 is the cost estimate for the pre-construction site investigation and clean soil confirmation sampling and testing (line item 1 in Tables 1A and 1B).

In addition to the scope of work described above, the cost estimates include removal of the existing benzene strippers adjacent to the lagoons. The total cost for Options 1 and 2 are $779,000 and $941,000, respectively. To assure adequate financial resources to close the lagoons under either option, financial assurance would have to be established for the higher amount.

We appreciate the opportunity to prepare the cost estimates for final closure of the lagoons. Please contact Scott Crouch or me at 512-347-7588 if we can be of further assistance.

Sincerely,

RPS

James Isensee

James Isensee, P.E.

JWI/gjg

Attachment

cc: Allen Hains – Western Refining
Rajev Gaurav – Western Refining
Scott Crouch - RPS

Final Closure Cost Estimate
Option 1 - Bioremediation and Disposal
Lagoons AL-1 & AL-2 Closure
October 12, 2009

Item	Description	Quantity	Units	Unit Cost	Cost
	Professional Services				
1	Investigation & clean soil confirmation sampling	1	LS	$87,000	$87,000
2	Final closure report	1	LS	$20,000	$20,000
3	Project administration (engineering, bidding, construction administration, etc.)	1	LS	$71,000	$71,000
	Demolition				
4	Dismantling and disposal of benzene strippers	1	LS	$5,000	$5,000
	Construction				
5	Mobilization	1	LS	$25,000	$25,000
6	Administrative costs (office facilities & staff, H&S plan, SWPPP, insurance, eqpmt decon, QA/QC, etc.)	1	LS	$28,000	$28,000
7	Dewater lagoons (3 ft water over 0.8 ac). Dispose at API Separator (200' distance)	800,000	Gal	$0.011	$9,000
8	Excavate and transfer portion of sludge from AP-1 to EP-1 for Bioremediation	3,600	CY	$4	$13,000
9	Bioremediate sludges in-situ and within EP-1	5,600	CY	$25	$140,000
10	Dispose bioremediated sludge offsite as Special Waste[1]	3,900	CY	$50	$195,000
11	Excavate top 1 ft of clay liner (AL-1 and AL-2)	850	CY	$7	$6,000
12	Dispose of excavated clay as Special Waste[2]	850	CY	$55	$47,000
13	Sludge characterization sampling - one per 100 CY	48	EA	$610	$29,000
14	Backfill lagoons	6,000	CY	$15	$90,000
15	Demobilization	1	LS	$14,000	$14,000
	TOTAL				**$779,000**

Notes
1. Assumes 30% reduction in sludge volume due to bioremediation and disposal at Waste Management landfill in San Juan (TPH > 1,000 ppm, metals < 20X rule)
2. Assumes disposal of liner soils at same location as bioremediated sludges
3. Assumes one sample per 100 CY analyzed for Haz Characteristics per 40 CFR 261 ($140), TCLP Skinner Metals ($190), TCLP BTEX ($130), TPH ($90) + 10% markup

Final Closure Cost Estimate
Option 2 - Stabilization and Disposal
Lagoons AL-1 & AL-2 Closure
October 12, 2009

Item	Description	Quantity	Units	Unit Cost	Cost
	Professional Services				
1	Investigation & clean soil confirmation sampling	1	LS	$87,000	$87,000
2	Final closure report	1	LS	$20,000	$20,000
3	Project administration (engineering, bidding, construction administration, etc.)	1	LS	$86,000	$86,000
	Demolition				
4	Dismantling and disposal of benzene strippers	1	LS	$5,000	$5,000
	Construction				
5	Mobilization	1	LS	$25,000	$25,000
6	Administrative costs (office facilities & staff, H&S plan, SWPPP, insurance, eqpmt decon, QA/QC, etc.)	1	LS	$28,000	$28,000
7	Dewater lagoons (3 ft water over 0.8 ac). Dispose at API Separator (200' distance)	800,000	Gal	$0.011	$9,000
8	Stabilize sludges in place	5,600	CY	$25	$140,000
9	Dispose stabilized sludges as Special Waste[1]	6,200	CY	$55	$341,000
10	Excavate top 1 ft of clay liner (AL-1 & AL-2)	850	CY	$7	$6,000
11	Dispose of excavated clay as Special Waste[2]	850	CY	$55	$47,000
12	Sludge characterization sampling - one per 100 CY	71	EA	$610	$43,000
13	Backfill lagoons	6,000	CY	$15	$90,000
14	Demobilization	1	LS	$14,000	$14,000
	TOTAL				**$941,000**

Notes

1 Assumes 10% increase in sludge volume due to stabilization and disposal at Waste Management landfill in San Juan (TPH > 1,000 ppm, metals < 20X rule)

2 Assumes disposal of liner soils at same location as bioremediated sludges

3 Assumes one sample per 100 CY analyzed for Haz Characteristics per 40 CFR 261 ($140), TCLP Skinner Metals ($190), TCLP BTEX ($130), TPH ($90) + 10% markup

TABLE 2
Investigation & Confirmation Sampling Cost Estimate
Lagoon AL-1 & AL-2 Closure
October 12, 2009

Dike & Surrounding Soils Characterization Samples			
Analysis	**# of Samples**	**Cost/Sample**	**Costs**
8260B	101	$90	$9,090
8270C	101	$220	$22,220
8015B (GRO, DRO, MRO)	101	$90	$9,090
Skinner List Metals & Fe, Mn	101	$185	$525
Sampling Labor	five 8-hour days	$75/hour	$3,000
Sampling Equipment	two days	$1500/day	$3,000
		Subtotal	**$46,925**
Benzene Stripper Area Characterization Samples			
Analysis	**# of Samples**	**Cost/Sample**	**Costs**
8260B	11	$90	$990
8270C	11	$220	$2,420
8015B (GRO, DRO, MRO)	11	$90	$990
Skinner List Metals & Fe, Mn	11	$185	$2,035
Sampling Labor	one 8-hour day	$75/hour	$600
Sampling Equipment	one day	$1500/day	$1,500
		Subtotal	**$8,535**
AL-1 & AL-2 Confirmation Samples			
Analysis	**# of Samples**	**Cost/Sample**	**Costs**
8260B	49	$90	$4,410
8270C	49	$220	$10,780
8015B (GRO, DRO, MRO)	49	$90	$4,410
Skinner List Metals & Fe, Mn	49	$185	$9,065
Sampling Labor	four 8-hour days	$75/hour	$2,400
		Subtotal	**$31,065**
		Total	**$86,525**

GRO - Gasoline Range Organics
DRO - Diesel Range Organics
MRO - Motor Oil Range Organics
AL - Aeration Lagoon

Western Refining
GALLUP REFINERY

WNR
LISTED
NYSE

February 26, 2008

Carl Chavez, Environmental Engineer
Oil Conservation Division
Environmental Bureau
1220 S. Saint Francis Street
Santa Fe, NM 87505

Dear Mr. Chavez:

Enclosed is the finalized Evaporation Pond Closure Plan including the financial cost estimate for closure dated December 2007. The report was prepared by Gannett Fleming West, Inc for Western - Gallup. If you have any questions regarding the finalized plan and estimate, please contact Ed Riege at (505) 722-0217.

Sincerely,

Jim Lieb

I-40 Exit 39, Jamestown, New Mexico 87347 • 505 722-3833 • www.wnr.com
Mail: Route 3 Box 7, Gallup, New Mexico 87301

EVAPORATION POND CLOSURE PLAN

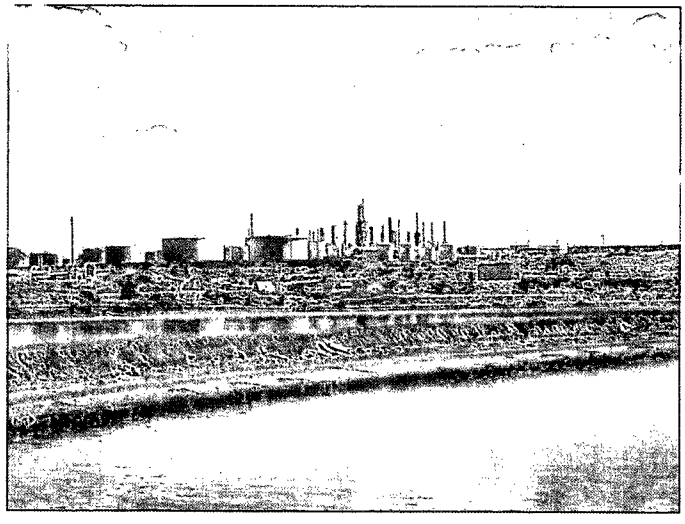
Giant Ciniza Refinery

December 2007

Prepared for

Western Refining

GIANT INDUSTRIES, INC.



Prepared By:

Gannett Fleming West, Inc.
2155 Louisiana Blvd NE, Suite 7000
Albuquerque, New Mexico 87110
Office (505) 265-8468
Fax (505) 881-2513

EVAPORATION POND CLOSURE PLAN

Giant Ciniza Refinery

December 2007

I, Mike Brazie, being a registered Professional Engineer in the state of New Mexico (NMPE #9376) certify that this closure plan was prepared by me or under my direct supervision.

Mike E. Brazie 12/11/07

Mike Brazie Date

TABLE OF CONTENTS

TABLES

APPENDICES

SITE LOCATION AND DESCRIPTION

This closure plan has been prepared for the evaporation ponds at the Giant Ciniza Refinery. The refinery is located on the north side of Interstate 40, approximately 17 miles east of Gallup, New Mexico. Within the refinery, the evaporation ponds are located on a flat plain to the west of the processing unit and tank farm, in the NW¼, Sec. 33, T. 15 N., R. 15 W, McKinley County, New Mexico. **Figure 1** is a location map for the refinery. The ponds are part of the refinery's wastewater treatment system, with effluent from the aeration basins directed to the ponds and allowed to evaporate. Process water from the refinery goes through the API separator for oil/water separation, then to the benzene strippers, and on to the aeration basins for treatment, and finally to the evaporation ponds for final disposition of the water.

There are 11 ponds of various sizes with a total surface area of approximately 120 acres. All are man-made earthen basins with bermed sidewalls. The initial ponds were constructed in the late 1950's, with additional ponds constructed at various times after that. The construction involved clearing and grubbing, followed by leveling of the pond bottoms and construction of the berms to form the ponds. The ponds have been in continuous operation since construction. Elevation of the ponds ranges from 6875.8 feet to 6889.2 feet (water elevation in the ponds), and the berms range from about 1 foot to 4 feet in height.

The refinery operates under a RCRA Hazardous Waste Facility Permit, No. NMD000333211-1. The evaporation ponds were identified as a Solid Waste Management Unit (SWMU No. 2) under this permit. The recommendation in the RCRA Facility Investigation (RFI) was for No Further Action (NFA) at this SWMU No. 2, so no site remediation has been required for these evaporation ponds. Therefore, no remediation of these ponds, except for Ponds 8 and 9 as discussed later in this report, is anticipated. Because of chloride deposition in Ponds 8 and 9, some remediation of those pond bottoms will be required at the time of closure.

SITE SOILS

The native soils in the area of the evaporation ponds are Rehobeth silty clay loam, which has formed in flood plains and on valley floors. It is naturally saline, with salinity up to about 8 mmhos/cm and organic matter content up to about 1 percent. Soil pH ranges from 8 to 9. According to the 2001 NFA Report, the soil at the site is bentonite clay and silt with a hydraulic conductivity of less than 10^{-7} cm/sec.

The evaporation ponds were investigated in the early 1990's. The investigation included collection and analysis of several soil and groundwater samples in the pond areas. No organic contaminants were detected in any of the groundwater samples, indicating no contaminants were migrating to the groundwater from the ponds. Soil samples collected from the perimeter and beneath the ponds (angle drill holes) detected no volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs), except trace amounts of toluene (5 µg/l maximum), in 8 of the 56 soil samples. Based on these results, EPA concurred with the NFA finding for these evaporation ponds.

SITE GEOLOGY

Bedrock at the site is the late Triassic Chinle Formation, which consists primarily of interbedded claystone and siltstone with minor amounts of sandstone and limestone. The Chinle Formation has a total thickness of about 1,600 feet in this area, and is generally not water-bearing, although water has been encountered in some of the minor inter-bedded sandstone lenses. Generally, the Chinle Formation acts as an aquitard.

SURFACE AND GROUNDWATER HYDROLOGY

The site is located within the Rio Puerco valley, north of the Zuni Uplift. Surface water flow off the site is generally northwest by overland flow to the tributaries of the Rio Puerco north of the site. The Rio Puerco is a principal tributary of the Rio Grande, which is east of the site.

Based on information on record at the Office of the State Engineer (OSE), groundwater in the area of the site ranges in depth up to 117 feet, with the average depth to groundwater of 45 feet, based on records for 13 wells within Section 33. Groundwater at the site is obtained from multiple depths between 580 and 1070 feet below ground surface.

The refinery has been sampling groundwater near the evaporation ponds on an annual basis, in compliance with the requirements of the RCRA permit. The latest results (November 2006), detected no VOCs or SVOCs in the groundwater beneath the evaporation ponds.

POST CLOSURE LAND USE

After closure of the ponds, it is anticipated the land will be returned to natural rangeland, as before construction of the refinery. The aircraft landing strip, an unpaved runway approximately 3000 feet long, will remain. This landing airstrip is designated as an emergency landing airstrip on Federal Aviation Administration (FAA) maps.

CLOSURE PLAN COMPONENTS

At closure, the water remaining in the ponds will be allowed to evaporate, the ponds will be regraded, and revegetated. This section describes these operations.

POTENTIAL FOR SITE REMEDIATION

Based on historic sampling results and a risk-based assessment performed using the API model VADSAT, the need to remediate the evaporation ponds to protect groundwater is not anticipated. Sampling is performed at 7 groundwater monitoring wells in the area of the ponds, soil sampling has been conducted around the ponds, and the water within the ponds has been sampled. The ponds were also identified as Solid Waste Management Unit (SWMU #2) in the RFI, which concluded no further action was required at the ponds.

Recent groundwater sampling results for benzene, toluene, ethylbenzene, and xylenes (BTEX) and chloride are summarized on **Table 1**. These results indicate no contaminants have migrated from the evaporation ponds. In addition, the VADSAT model indicated no salt migration below the ponds. Details of the modeling and the modeling results are in **Appendix A**. See **Figure 2** for the locations of the monitoring wells.

Table 1. 2007 Groundwater Sampling Results (BTEX in µg/l, chloride in mg/l)

WELL	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	CHLORIDE
BW-1C	ND	ND	ND	ND	36
BW-2A	ND	ND	ND	ND	39
BW-2B	ND	ND	ND	ND	31
BW-2C	ND	ND	ND	ND	42
BW-3B	ND	ND	ND	ND	33
BW-3C	ND	ND	ND	ND	38

Based on these groundwater monitoring results and the results of the VADSAT modeling, no over-excavation of most ponds is planned for closure. However, after the ponds have dried and before they are filled, soil samples will be collected to verify that no remediation of the pond bottoms is required at that time. The sampling results will be submitted to OCD to document that the ponds meet closure criteria before filling and grading the ponds.

In addition, the salt concentration in the pond samples was compared to the saturation concentration of NaCl in water. These calculations show that the measured salt concentrations in the pond water are well below saturation, and so no precipitation of NaCl is to be expected on that basis.

However, thin (up to ¼ inch) layers of crystalline salt were observed below the bottom of Pond 8, and the same was reported for Pond 9. No salt layers were reported in any of the other ponds. These observations were made by digging down about 2 ft with a hand shovel in Pond 8. At that location, 3 such salt layers were found interbedded with soil to a depth of approximately 2 feet below the pond bottom. Because these two ponds (8 and 9) are the final ponds in the series, they have the highest salt concentrations. If the upper ponds freeze, or the discharge from the upper ponds in the series is reduced, the water levels in Ponds 8 and 9 may decrease through evaporation to the point where the salt concentration reaches saturation and salt is precipitated out. Because of the higher salt concentrations in these two ponds, they have a lower freezing point than the other ponds, and would continue to evaporate after the other ponds have frozen over. This would result in a thin salt layer that would be buried by sediment carried into the pond when the inflow is resumed. It appears this is what has led to the salt layers in those two ponds.

Therefore, this closure plan has assumed that 2 feet of over-excavation will be required in Ponds 8 and 9. Under current OCD Rules (as of December 2007), chloride contaminated soil from petroleum sites can be disposed in a solid waste landfill that has a special waste

permit which allows such waste to be accepted. The nearest such facility is the Red Rocks Regional Landfill near Thoreau in McKinley County. This facility is currently permitted to accept chloride contaminated soil, and charges $46/ton for disposal. The closure estimate is based on excavating and hauling the chloride contaminated soil from Ponds 8 and 9 to this facility.

It should be noted, that the OCD is allowing disposal of chloride contaminated soils at landfills with special waste permits on an interim basis, and this rule may change if a special facility for handling petroleum wastes is constructed in this part of the state. Soil sampling will also be necessary at closure to confirm that two feet of over-excavation will be sufficient to meet closure standards.

WATER EVAPORATION

As part of the evaporation pond closure operations, treated wastewater will cease to be discharged to the evaporation ponds. The water remaining in the ponds will then be allowed to evaporate, with enhanced evaporation provided by the spray evaporators. Once the water has evaporated and the ponds are dry, the pond bottoms will be sampled to determine if excavation of the soil beneath the ponds must be treated or removed due to the presence of contaminants above New Mexico Environment Department (NMED) Soil Screening Levels (SSLs). Based on historic sampling and modeling discussed above, no site remediation is anticipated for closure of the ponds, except for salt removal from Ponds 8 and 9. However, should the closure samples indicate contaminants exceed the NMED SSLs, appropriate remedial measures will be implemented in the other ponds as well.

The recovered pond sites are not expected to function as an agricultural area. If remediation is required, it will mostly likely be to treat chlorides. Increased chloride levels may adversely impact vegetation growth. Such contamination may not be a significant issue except for the post-closure revegetation program. Where encountered, soils with chloride concentrations above plant tolerances will be excavated and disposed offsite, and clean fill from designated borrow areas within the facility perimeter will be placed to support plant growth consistent with the revegetation program. Several clean borrow areas are available on site, so there is no need for importing fill. Fill needed to attain final grade and support plants will be obtained from those designated fill sites, as needed.

SITE GRADING

Once the water in the ponds has evaporated, and Ponds 8 and 9 have been over-excavaed and backfilled, the ponds will be graded. A plan of the existing ponds is shown on **Figure 2** and the final grade on **Figure 3**. The grading has been designed to restore the area of the ponds approximately back to the natural contours prior to construction of the ponds. The material volumes are presented on page 6 of this closure plan. Final grade will be attained by grading the bermed soils into the pond areas, supplementing the material requirements by grading soils from the areas immediately adjacent to the ponds, if needed. Additional material for fill areas will be excavated from specific areas designated by the landowner. Because all of the property is owned by the refinery, there

will be no need to import soils for the closure grading. Based on the models generated from existing site topography and proposed grading, there is a deficit of approximately 104,000 cubic yards (CY) of material. This shortfall is the result of the over-excavation which will occur in Ponds 8 and 9. As stated previously, any borrow required to complete grading operations will be excavated from sites designated by the landowner. Topsoil material from cut areas will be stockpiled and used for final cover, and the grubbed materials will be disposed of on site or at a local landfill. Elevation at final grade will range from 6870 feet to 6890 feet, with a slope of approximately 0.7 percent to the west.

ROAD RECLAMATION

Most of the roads in the pond area are unpaved surfaces on the berms or between the ponds. These areas will be re-contoured along with the ponds. No paved roadways are present in the area of the ponds. However, the unpaved emergency runway will remain after closure of the ponds.

SITE DRAINAGE

No drainage structures will be required at closure. The final grade will provide a general slope of about 0.7 percent to the west, consistent with the natural contours and drainage patterns of the area. Post-closure site drainage will be by natural sheet flow to the western edge of the refinery property, and then will follow the existing drainage channels off-site. Because of the low grade and the re-vegetation at closure, no erosion protection other than site vegetation is necessary or planned.

REVEGETATION

Areas impacted by grading and other disturbances during closure operations will be re-vegetated. The re-vegetation is intended to reduce impacts to surface water by establishing a self-sustaining native plant community which will provide protection against soil erosion and enhance the natural aesthetics of the closed site. The need for soil amendments will be determined based on site-specific evaluations at the time of closure. Inorganic fertilizer will be added to increase nitrogen, phosphate, and potassium available to plants, as required by analytical results of the soils. Mulch will be applied after seeding to conserve soil moisture and protect against soil erosion until the plants have taken root. Planting will be performed between May and September.

Amended areas will be seeded with a mixture of native grasses and forbs that will not depend on external application of water or fertilizer. The plant species native to the area, as listed in the NRCS *Soil Survey of McKinley Area, New Mexico*, are shown on **Table 2**. Specific species, composition percentages, and seeding rates will be determined during a vegetation survey conducted as part of the closure operations.

Table 2. Native Plant Species

Alkalai Sacaton	Fourwing Saltbush	Blue Grama	Inland Saltgrass	Rabbitbrush
Western Wheatgrass	Black Greasewood	Bottlebrush Squirreltail	Mat Muhly	

REGULATORY COMPLIANCE

A stormwater discharge permit (NPDES) will be required for construction activities during site closure, and must be obtained prior to implementing the closure operations. Temporary erosion control measures, such as silt fence, will be placed around the construction zone during construction, but will be removed upon completion of the site closure. **Figure 3** shows the location of the silt fence for temporary erosion and sediment control. Dust will be controlled periodically during earthmoving operations by watering haul roads and other dust-generating areas, as necessary.

CLOSURE OPERATIONS AND SCHEDULE

Although a specific schedule of operations will be prepared by the construction contractor selected to perform the closure, a general schedule follows.

Week 1:

- Notify OCD that closure operations will commence
- Notify EPA that the evaporation ponds (SWMU No. 2) will be permanently closed
- Stop wastewater delivery to the evaporation ponds
- Prepare Storm Water Pollution Prevention Plan (SWPPP)

Weeks 1 – 4:

- Evaporate water from ponds
- Analyze bottom soil in each pond by SW-846
- Mobilize construction equipment
- Install sediment controls

Weeks 5 – 8:

- Excavate and dispose of salt contaminated soils
- Regrade ponds
- Perform vegetation survey and soil analysis for amendments and seed mix
- Final contour area

Week 9:

- Revegetate

CLOSURE COST ESTIMATE

The closure costs were estimated by calculating material volumes and using estimated unit bid prices. Material volumes for each pond were calculated based on pond size versus total cut, and are summarized on **Table 3**. Costs per pond were calculated based on pond area versus total cost and are summarized on **Table 4**.

Table 3. Pond Volumes

Pond Number	Pond Area (ac)	Pond Volume (CY)
2	7.5	16085
3	4.2	9007
4	2.4	5147
5	6.3	13511
6	14.2	30453
7	20.8	44608
8*	9.3	30008
9*	22.8	73560
10	1.7	3646
11	20.5	43964
12	12.7	27237
Total	122.4	297226

* Denotes salt contaminated pond

Table 4. Pond Costs

Pond Number	Pond Area (ac)	Pond Cost ($)
2	7.5	$189,818
3	4.2	$106,298
4	2.4	$60,742
5	6.3	$159,447
6	14.2	$359,389
7	20.8	$526,430
8	9.3	$235,375
9	22.8	$577,048
10	1.7	$43,025
11	20.5	$518,837
12	12.7	$321,426
Total	122.4	$3,097,835

A more detailed breakdown of the cost estimate is included in Appendix B.

MATERIAL ESTIMATES

Earthwork quantities were estimated from the existing contour map of the refinery, including the evaporation ponds, and the final grading plan developed as part of this closure plan. Because the existing contour map showed water surface elevations in the ponds and not the elevation of the bottom of the ponds, the bottom elevations were assumed from the elevations just outside each pond. Because the ponds were built up by constructing berms at grade, the assumed elevations should be adequate for the purposes of the closure cost estimate for this closure plan. The final contours were then designed integrally with the existing grades around the ponds, with the final contours of the closed ponds tied to those surrounding elevations and contours, with adequate slope to provide drainage by sheet flow into the natural drainage areas to the west of the ponds.

The cut and fill requirements were then determined by comparing the existing model to the proposed model generated by the proposed grading plan. This resulted in an excess of 2,326 CY of material, which is available from the berms surrounding the ponds. This excess represents the amount of material that will be available for the additional fill required after over-excavation of Ponds 8 and 9. The overall volumes are as follows:

Total Volume of Cut	158,352 CY
Total Volume of Fill	156,026 CY
Net	2,326 CY (Excess)

The amount of soil to be remediated was estimated by assuming 2 ft of soil will be excavated from the bottom of Ponds 8 and 9 throughout their areal extent. For purposes of estimating, it was also assumed that the salt layers would not be separated from the interbedded soil, and so the entire 2 ft thickness would be excavated and hauled to the Red Rocks Regional Landfill. This results in an estimated 104,000 CY of material excavated from Ponds 8 and 9, which will be replaced by an equivalent volume of clean material excavated from borrow sites designated by the landowner. These designated sites will be adjacent to the existing ponds. Silt fence requirements are shown on **Figure 3**. Silt fence will be placed along the lower gradient of the construction zone. A total of 5800 linear feet (LF) of silt fence will be required.

Revegetation acreage was determined from the grading plan, based on the area of disturbance. This includes the area scraped to meet the fill requirements. The acreage of each pond is summarized on Table 3. The total acreage to be revegetated is 182 AC.

The following items were considered incidental, and not separated out in the estimate:

1. Water for dust control, incidental to grading and shaping (Bid Item 5)
2. Silt fence management, incidental to SWPPP (Bid Item 2)
3. Soil analysis, incidental to revegetation (Bid Item 6)
4. Over-seeding, soil amendment, or blending, indental to revegetation (Bid Item 6)
5. Notifications, permits and clearances, incidental to mobilization (Bid Item 1)

COST ESTIMATE

Closure costs for the total site were estimated using the material volumes determined as described above, and applying average unit bid (AUBs) and an independent estimate of construction unit costs. The earthwork unit costs developed for this estimate are included in **Appendix B**. AUBs were estimated based on the latest bid prices for New Mexico Department of Transportation (NMDOT) construction projects, adjusted for McKinley County, project size, and construction season using Estimator® estimating software. An independent estimate of unit costs, developed as part of an earlier assignment on the project, were also used in adjusting the NMDOT AUBs, as shown in Appendix B. These estimates are presented in 2007 dollars and based on construction bid prices, supplier quotes, and commodity prices as of December 2007.

The earthwork costs are based on the earthwork material volumes required to close the entire pond site. These costs include the excavation and disposal of material excavated from Ponds 8 and 9. The re-vegetation costs are based on the acreages of the ponds and additional area of disturbance. The cost for silt fence is based on the placement shown on **Figure 3**. Mobilization and SWPPP costs were estimated as lump sum for the entire project, assuming the entire closure will be performed in a single mobilization. Engineering and construction services (E&C) were assumed to be 10% of construction costs, and include soil sampling and analysis for site remediation, and New Mexico Gross Receipts Tax (NMGRT) was applied at the current (December 2007) McKinley County rate of 6.625 percent.

Because no post-closure care or monitoring is anticipated, no costs for those items are included in the estimate. If contamination is found above SSLs at the time of closure, it is expected to be chlorides, based on historic monitoring results, which could impact plant growth. However, research has indicated that a soil cover of 5 feet above salt-contaminated soil in New Mexico can be sufficient to prevent wicking of salt to the plant root zone, and so if chlorides become a problem at closure, additional soil cover will most likely be the appropriate remediation approach for these ponds. Other options may include gypsum treatment or application of other salt-inhibiting materials.

Based on these assumptions and the cost estimating method described, the total estimated closure cost for the evaporation ponds is **$3,098,000**. See Appendix B for a complete breakdown of costs.

REFERENCES

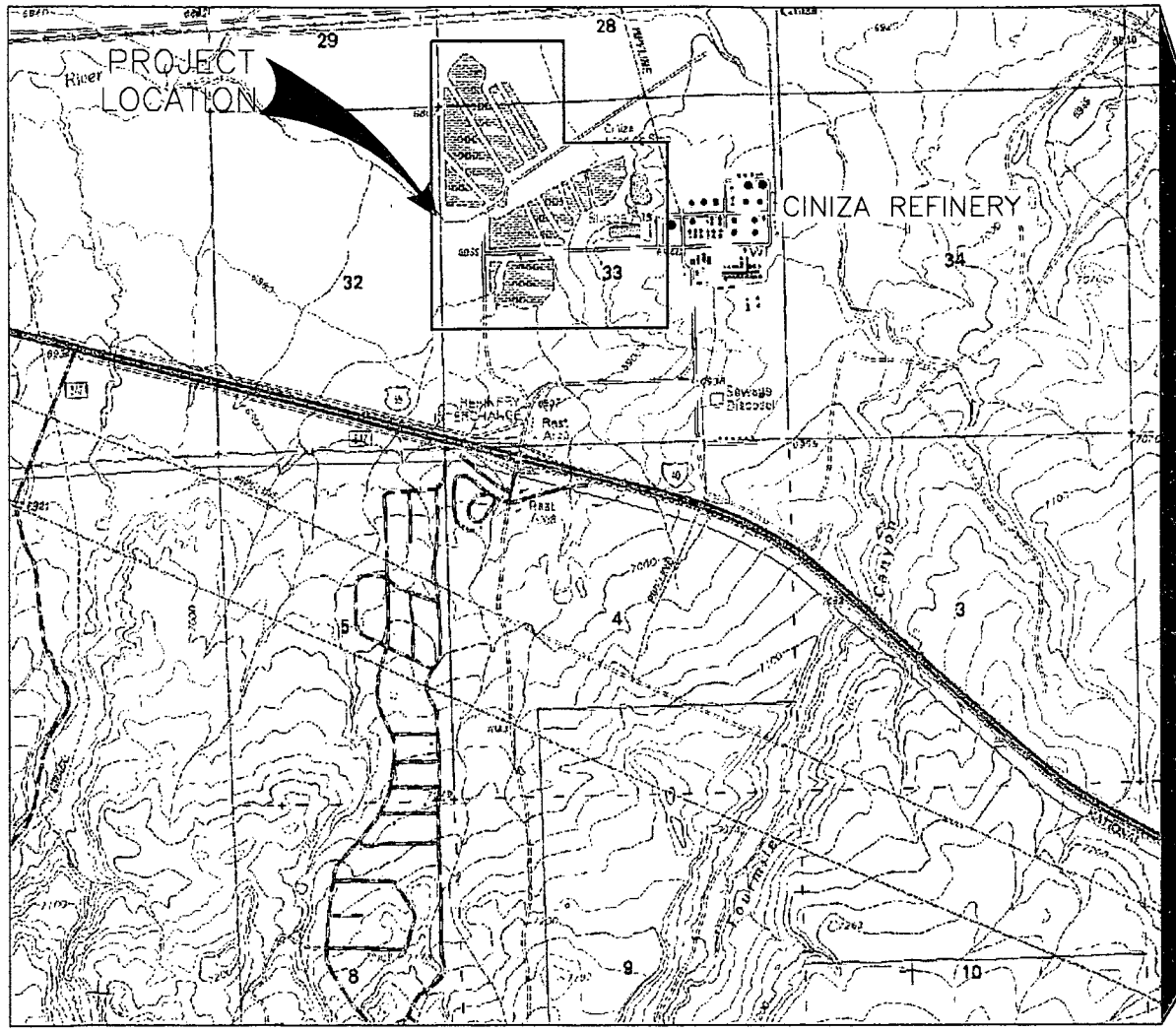
Giant Ciniza Refining Co., RFI Phase I Supplemental Report, August 21, 1991

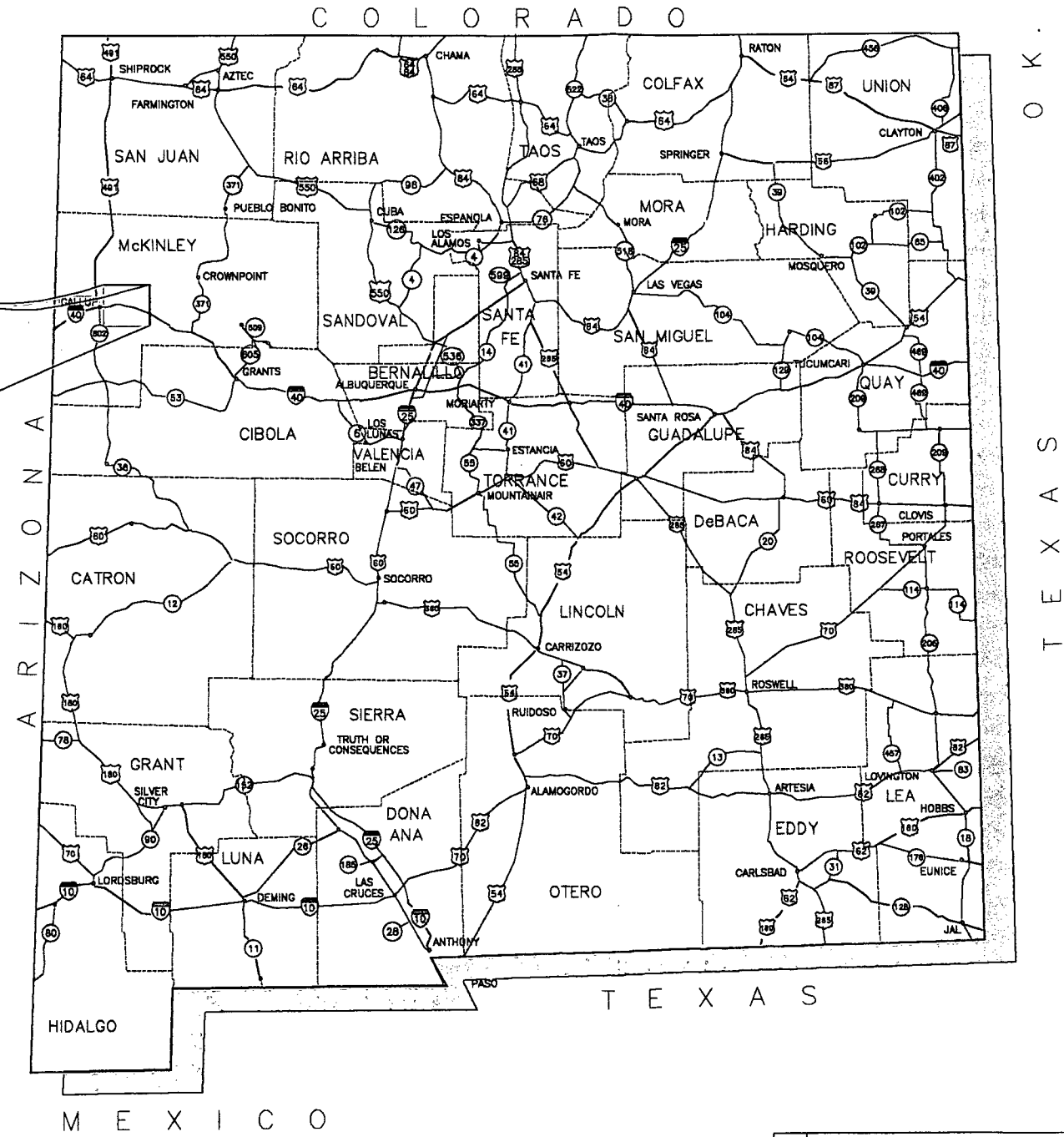
Giant Ciniza Refining Co., RFI Phase II Report, October 21, 1991

Giant Ciniza Refining Co., Post Closure Care Permit, Aug. 2000

Giant Ciniza Refining Co., OCD Draft Discharge Permit, July 9, 2007

Natural Resources Conservation Service, Soil Survey of McKinley Area, New Mexico, 2004





NO.	DESCRIPTION	DATE	BY
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

GIANT – WESTERN REFINING COMPANY

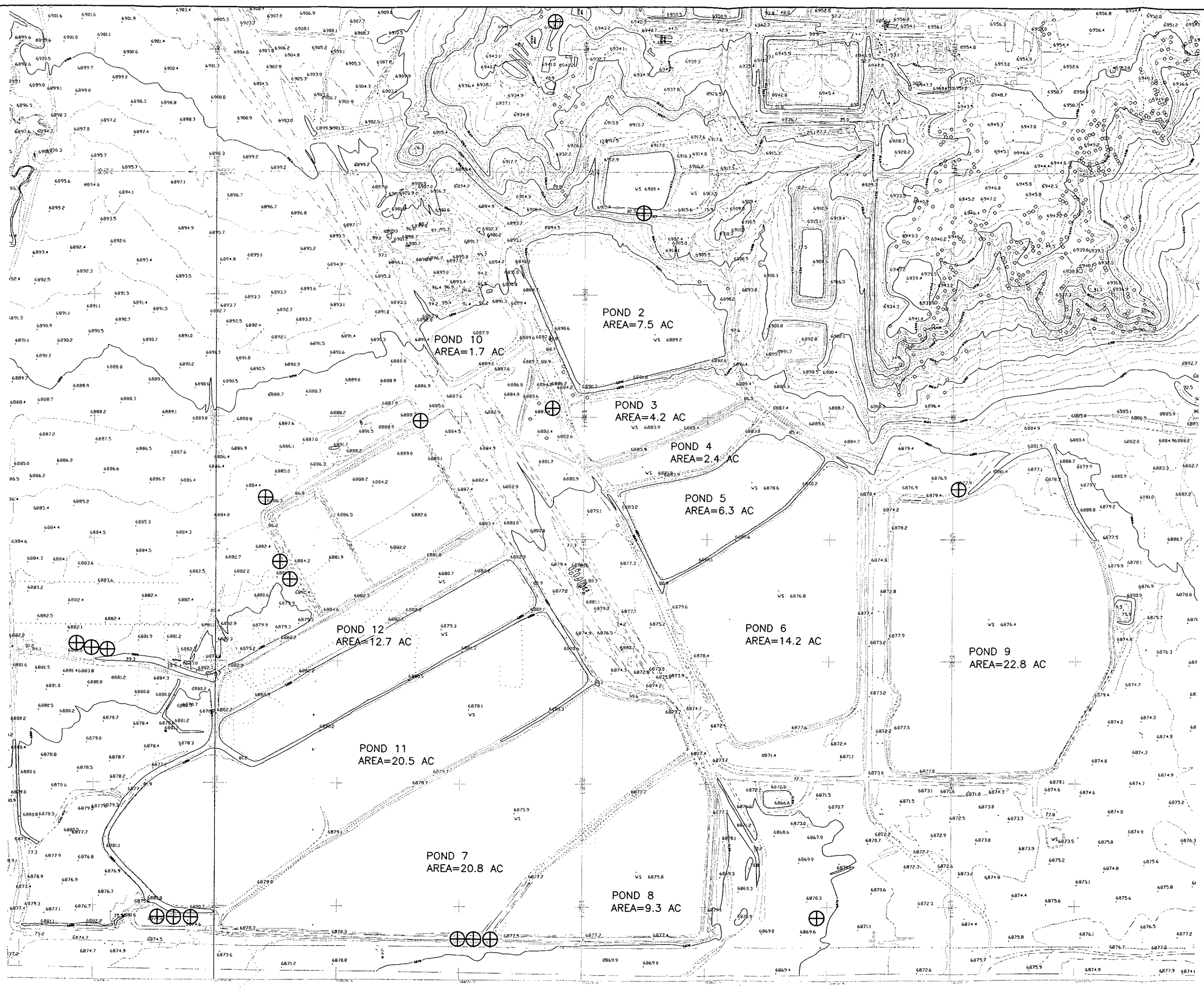
SITE GRADING

LOCATION MAP

ENGR. FILE :

Gannett Fleming West, Inc.

FIGURE 1



⊕ EXISTING WELL

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NO.	DESCRIPTION	DATE	BY
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

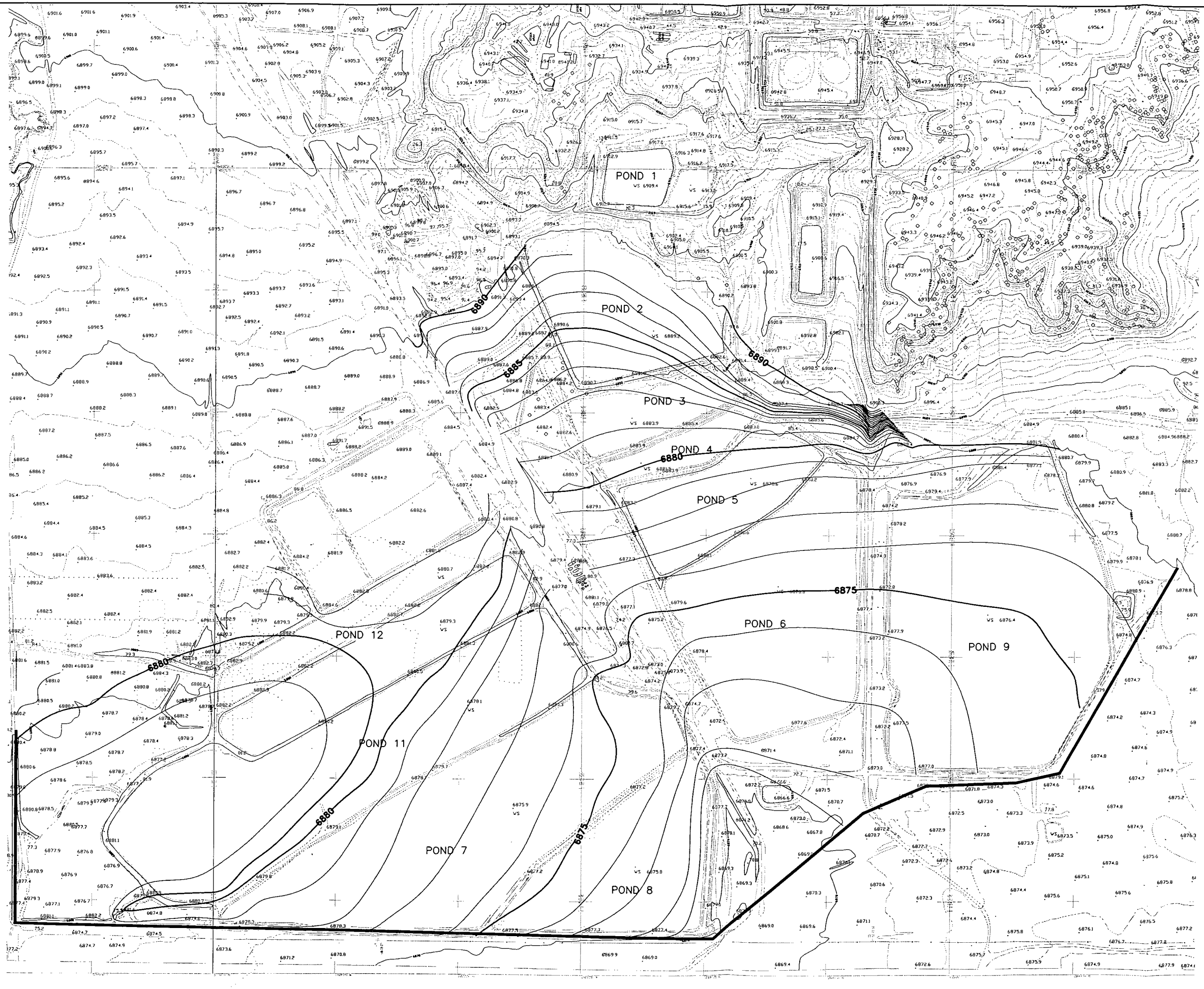
GIANT – WESTERN REFINING COMPANY
SITE GRADING
EXISTING CONDITIONS

ENGR. FILE :

Gannett Fleming West, Inc.

FIGURE 2

EXISTING
K:\PROJECTS\4871.3\CADD\PLANS\4871.3DP01.DWG
Last Saved: 11/30/2007 12:02 PM | Printed Date-By:12/10/07-Green, Christopher J



SILT FENCE

N

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SCALE: 1"=400'

NO.	DESCRIPTION	DATE	BY
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2			
1			

REVISIONS (OR CHANGE NOTICES)

GIANT – WESTERN REFINING COMPANY
SITE GRADING
PROPOSED POND AREA GRADING

PROPOSED
K:\PROJECTS\487.13\CADD\PLANS\487.13GP01.DWG
Last Saved 11/30/2007 12:02 PM | Printed Date=By:12/10/07-Green, Christopher J.

ENGR. FILE :

Gannett Fleming West, Inc.

FIGURE 3

Appendix A

SUMMARY OF VADSAT MODELING

API's VADSAT Model was used to estimate the potential for chloride migration from each of the ponds. Although the model is a groundwater protection risk assessment model, and therefore has limitations to estimating salt concentrations that will remain after the evaporation ponds are dried, it can be used to predict how far the salt might travel through the underlying soils. BTEX compounds were not modeled, since no BTEX was detected in any of the analytical results available for the site.

Each pond was modeled using the site-specific data for the pond (e.g., source area, depth, L/W ratio, etc.). This information was taken from the AutoCAD site drawings. VADSAT default parameters were used for hydrogeological properties, and adjusted where site-specific data was available. Soil data was obtained from the NRCS *Soil Survey of McKinley Area, New Mexico*. Groundwater data was obtained from the online WATERS data base, available on the OSE website. The maximum salt concentration within the evaporation ponds is 79,000 mg/l , based on analysis of water sampled from the ponds, and that value was used as the maximum aqueous salt concentration for the model for all ponds. Receptor coordinates were assigned depths of 1, 2, and 3, meters directly beneath the pond, and the modeling period was 15 years.

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 2

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 34480.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.20000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 3

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 15864.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.20000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 4

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 15742.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 5

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 21085.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 6

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 48200.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.40000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 7

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 91422.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 3.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 8

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 25658.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 9

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 89884.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.30000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 10

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 810.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 11

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 86484.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.80000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 12

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 42898.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 4.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
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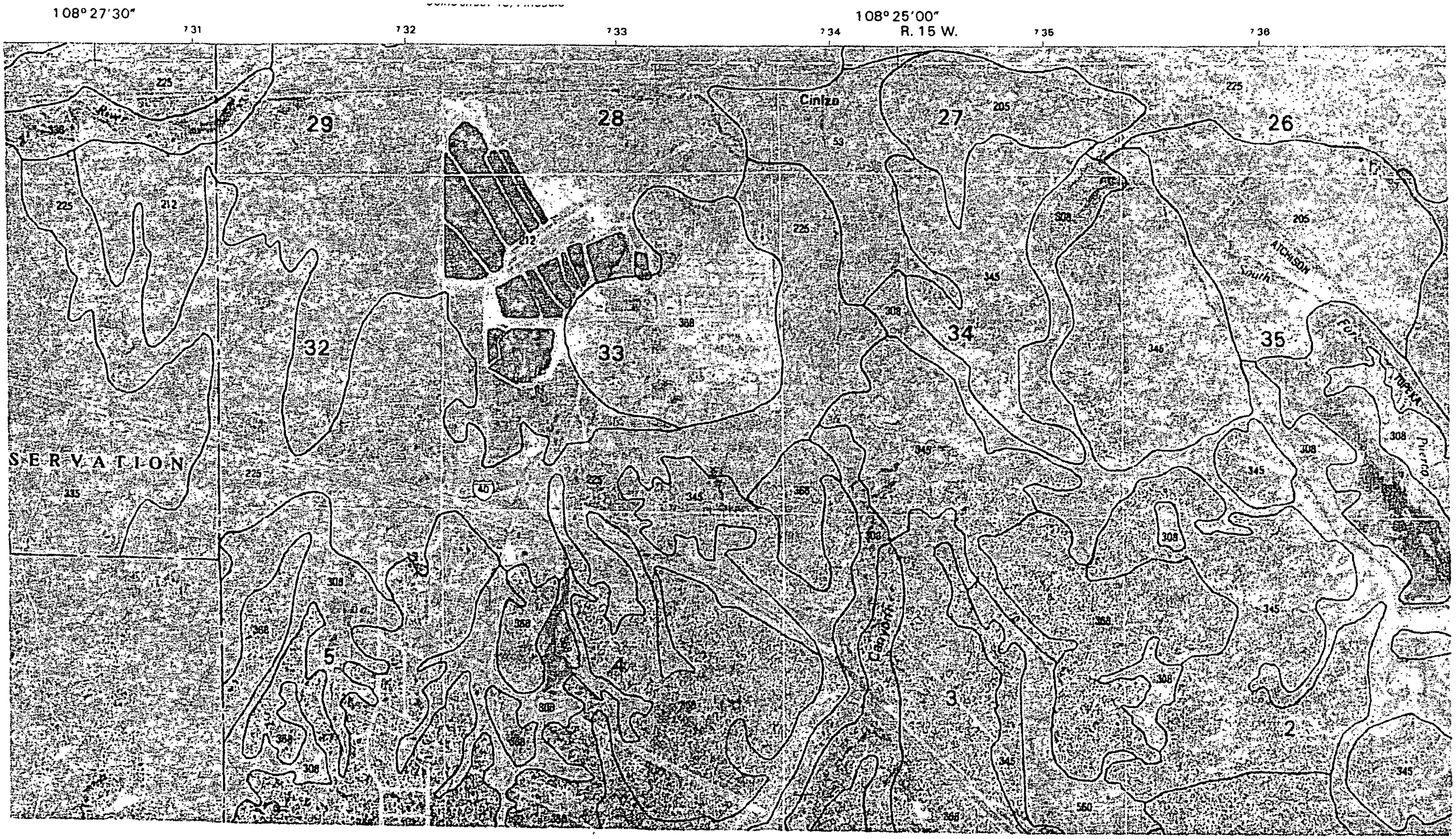
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

T. 15 N, R. 15 W


108° 27'30"
731
732
733
734
108° 25'00"
R. 15 W.
735
736
29
28
27
26
32
33
34
35
5
4
3
2
Cinizo
Canyon
Atchison
South
Puerco
SERVATION
225
212
205
308
345
368
335
560
40

Typical Profile:
A—0 to 5 inches; fine sandy loam
Bt—5 to 11 inches; sandy clay loam
Btk—11 to 47 inches; clay loam
Bk—47 to 65 inches; fine sandy loam

Skyvillage soils

Geomorphic position: Structural benches and summits on mesas, hills and ridges and dipslopes on cuestas
Parent material: Eolian material and slope alluvium derived from sandstone
Slope: 1 to 6 percent
Surface fragments: About 20 percent
Depth to restrictive feature: 5 to 20 inches to bedrock (lithic)
Drainage class: Well drained
Slowest permeability: About 0.60 in/hr (moderate)
Available water capacity: About 2.0 inches (very low)
Shrink-swell potential: About 4.0 LEP (moderate)
Flooding hazard: None
Seasonal water table minimum depth: Greater than 6 feet
Runoff class: Medium
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodicity maximum: About 0 SAR (slightly sodic)
Ecological site: Shallow Sandstone
Present native vegetation: Bigelow's sagebrush, blue grama, fourwing saltbush, galleta, Indian ricegrass, New Mexico feathergrass, little bluestem, shadscale saltbush, sideoats grama, winterfat, cliffrose, Mormon tea, oneseed juniper, twoneedle pinyon
Land capability (nonirrigated): 7s
Conservation Tree/Shrub Group: 10

Typical Profile:
A—0 to 2 inches; channery sandy loam
Bw1—2 to 5 inches; sandy loam
Bw2—5 to 9 inches; sandy clay loam
Bk—9 to 15 inches; sandy clay loam
2R—15 inches sandstone bedrock

Minor Components

Hagerwest and similar soils
Composition: About 10 percent
Slope: 1 to 6 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy

Rock outcrop
Composition: About 5 percent
Rock outcrop consists of barren or nearly barren areas of exposed sandstone and shale on ridges, ledges, and escarpments.

Hospah and similar soils
Composition: About 5 percent
Slope: 2 to 8 percent
Depth to restrictive feature: 5 to 20 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Shale Hills

212—Rehobeth silty clay loam, 0 to 1 percent slopes

Map Unit Setting

MLRA: 36
Elevation: 6,600 to 6,800 feet (2,012 to 2,073 meters)
Mean annual precipitation: 10 to 13 inches (254 to 330 millimeters)
Average annual air temperature: 46 to 49 degrees F (8 to 9 degrees C)
Frost-free period: 100 to 135 days

Map Unit Composition

Rehobeth and similar soils: 90 percent
Minor components: 10 percent
Urban land
In the City of Gallup, components of this map unit are covered by buildings, parking lots, roads, and sidewalks. The percentage of Urban land ranges from less than 10 percent on the city's periphery to 60 percent in densely developed residential sections. There are also many areas that have been cut and filled with a variety of earthen materials or man-made soils.

Component Descriptions

Rehobeth soils

Geomorphic position: Flood plains and stream terraces on valley floors
Parent material: Stream alluvium derived from gypsiferous shale
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Slowest permeability: About 0.06 in/hr (slow)
Available water capacity: About 8.5 inches (moderate)
Shrink-swell potential: About 7.5 LEP (high)

Flooding hazard: Occasional
Ponding hazard: Occasional
Seasonal water table minimum depth: Greater than 6 feet
Runoff class: Low
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 15 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodicity maximum: About 13 SAR (moderately sodic)
Ecological site: Salty Bottomland
Present native vegetation: alkali sacaton, western wheatgrass, fourwing saltbush, black greasewood, blue grama, bottlebrush squirreltail, inland saltgrass, mat muhly, rabbitbrush
Land capability (nonirrigated): 6c
Conservation Tree/Shrub Group: 10

Typical Profile:
A—0 to 2 inches; silty clay loam
Bw—2 to 5 inches; silty clay loam
Bss—5 to 12 inches; clay
Bssny1—12 to 18 inches; clay
Bssny2—18 to 32 inches; clay
Bssny3—32 to 80 inches; clay

Minor Components

Nuffel and similar soils
Composition: About 4 percent
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Ecological site: Bottomland

Aquima and similar soils
Composition: About 3 percent
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Ecological site: Loamy

Zia and similar soils
Composition: About 3 percent
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Somewhat excessively drained
Ecological site: Sandy

215—Viuda-Penistaja-Rock outcrop complex, 1 to 5 percent slopes

Map Unit Setting

MLRA: 36
Elevation: 6,700 to 7,000 feet (2,042 to 2,134 meters)
Mean annual precipitation: 10 to 13 inches (254 to 330 millimeters)
Average annual air temperature: 49 to 54 degrees F (9 to 12 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Viuda and similar soils: 35 percent
Penistaja and similar soils: 30 percent
Rock outcrop: 25 percent
Minor components: 10 percent

Component Descriptions

Viuda soils

Geomorphic position: Lava flows
Parent material: Eolian material and slope alluvium derived from sandstone and basalt
Slope: 1 to 5 percent
Surface fragments: About 40 percent
Depth to restrictive feature: 10 to 20 inches to bedrock (lithic)
Drainage class: Well drained
Slowest permeability: About 0.06 in/hr (slow)
Available water capacity: About 2.5 inches (very low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Seasonal water table minimum depth: Greater than 6 feet
Runoff class: High
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodicity maximum: About 2 SAR (slightly sodic)
Ecological site: Malpais
Present native vegetation: blue grama, galleta, alkali sacaton, hairy grama, sideoats grama, black grama, common wolfstail, fourwing saltbush, little bluestem, spike muhly
Land capability (nonirrigated): 7s

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
205:												
Penistaja	0-3	10-20	1.40-1.50	2.00-6.00	0.11-0.13	0.0-2.9	1.0-2.0	.24	.24	5	3	86
	3-19	20-30	1.45-1.55	0.60-2.00	0.14-0.16	0.0-2.9	0.5-1.0	.32	.32			
	19-65	15-30	1.45-1.55	0.60-6.00	0.11-0.16	0.0-2.9	0.5-1.0	.32	.32			
Tintero	0-4	5-15	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	4-16	10-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28			
	16-48	10-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28			
	48-65	2-10	1.45-1.55	6.00-20.00	0.09-0.10	0.0-2.9	0.5-1.0	.20	.20			
208:												
Marianolake	0-2	10-20	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	2-8	18-30	1.35-1.45	0.60-2.00	0.16-0.18	3.0-5.9	0.0-0.5	.37	.37			
	8-14	27-35	1.35-1.45	0.20-0.60	0.19-0.21	3.0-5.9	0.0-0.5	.32	.32			
	14-24	15-25	1.45-1.55	2.00-6.00	0.13-0.15	3.0-5.9	0.0-0.5	.28	.28			
	24-39	15-25	1.45-1.55	2.00-6.00	0.13-0.15	3.0-5.9	0.0-0.5	.28	.28			
	39-70	5-15	1.55-1.65	6.00-20.00	0.09-0.10	0.0-2.9	0.0-0.5	.20	.20			
210:												
Marianolake	0-5	10-20	1.35-1.45	2.00-6.00	0.13-0.15	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	5-11	20-35	1.50-1.60	0.60-2.00	0.14-0.16	3.0-5.9	0.5-1.0	.32	.32			
	11-47	27-35	1.55-1.65	0.20-0.60	0.19-0.21	3.0-5.9	0.5-1.0	.32	.32			
	47-65	10-20	1.60-1.70	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.32	.32			
Skyvillage	0-2	5-15	1.35-1.45	2.00-6.00	0.07-0.09	0.0-2.9	0.5-1.0	.15	.24	1	4	86
	2-5	10-15	1.45-1.55	2.00-6.00	0.11-0.13	0.0-2.9	0.2-0.6	.24	.24			
	5-9	20-25	1.45-1.55	0.60-2.00	0.14-0.16	3.0-5.9	0.2-0.6	.32	.32			
	9-15	20-25	1.45-1.55	0.60-2.00	0.14-0.16	3.0-5.9	0.2-0.6	.32	.32			
	15-20	---	---	0.20-2.00	---	---	---	---	---			
212:												
Rehobeth	0-2	30-40	1.25-1.35	0.20-0.60	0.18-0.20	6.0-8.9	0.5-1.0	.37	.37	5	4L	86
	2-5	30-40	1.25-1.35	0.20-0.60	0.18-0.20	6.0-8.9	0.5-1.0	.37	.37			
	5-12	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.5-1.0	.20	.20			
	12-18	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.5-1.0	.20	.20			
	18-32	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.2-0.5	.20	.20			
	32-80	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.2-0.5	.20	.20			
215:												
Viuda	0-3	10-20	1.30-1.40	2.00-6.00	0.07-0.09	0.0-2.9	0.5-0.9	.10	.37	1	6	48
	3-15	35-50	1.40-1.45	0.06-0.20	0.14-0.17	6.0-8.9	0.0-0.0	.20	.20			
	15-17	20-35	1.45-1.50	0.60-2.00	0.15-0.17	3.0-5.9	0.0-0.0	.15	.32			
	17-20	---	---	0.00-0.20	---	---	---	---	---			
Penistaja	0-2	10-20	1.40-1.50	2.00-6.00	0.11-0.13	0.0-2.9	1.0-2.0	.24	.24	5	3	86
	2-22	20-30	1.45-1.55	0.60-2.00	0.14-0.16	3.0-5.9	0.5-1.0	.32	.32			
	22-65	15-30	1.45-1.55	0.60-6.00	0.11-0.16	3.0-5.9	0.5-1.0	.32	.32			
Rock outcrop	0	---	---	0.00-0.20	---	---	---	---	---	-	---	---
220:												
Hagerwest	0-2	10-20	1.20-1.25	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	2	3	86
	2-13	20-35	1.35-1.45	0.60-2.00	0.14-0.16	3.0-5.9	0.2-0.8	.32	.32			
	13-19	20-35	1.35-1.45	0.60-6.00	0.14-0.16	3.0-5.9	0.2-0.8	.32	.32			
	19-35	10-20	1.50-1.60	2.00-6.00	0.11-0.13	0.0-2.9	0.2-0.8	.24	.24			
	35-40	---	---	0.00-0.20	---	---	---	---	---			

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
205:							
Penistaja	0-3	5.0-15	6.6-7.8	0-1	0	0.0-2.0	0
	3-19	10-20	6.6-8.4	0-1	0	0.0-2.0	0
	19-65	5.0-20	7.4-8.4	5-10	0	0.0-2.0	0
Tintaro	0-4	5.0-10	6.6-7.3	0-5	0	0	0
	4-16	5.0-15	7.4-7.8	1-5	0	0	0
	16-48	5.0-15	7.4-7.8	5-10	0	0.0-2.0	0
	48-65	1.0-1.0	7.4-7.8	5-10	0	0.0-2.0	0
208:							
Marianolake	0-2	5.0-15	7.4-8.4	0-5	0-1	0.0-2.0	0
	2-8	5.0-15	7.4-8.4	0-5	0-1	0.0-2.0	0-1
	8-14	15-25	7.4-8.4	0-5	0-1	0.0-2.0	0-1
	14-24	5.0-15	7.9-8.4	0-5	0-1	0.0-2.0	0-1
	24-39	5.0-15	7.9-8.4	0-5	0-1	0.0-2.0	0-1
	39-70	0.0-5.0	7.9-8.4	0-5	0-1	0.0-2.0	0-1
210:							
Marianolake	0-5	5.0-15	7.4-8.4	0-5	0	0.0-2.0	0
	5-11	10-25	7.4-8.4	5-10	0	0.0-2.0	0
	11-47	10-25	7.4-8.4	5-10	0	0.0-2.0	0
	47-65	5.0-15	7.4-8.4	5-10	0	0.0-2.0	0
Skyvillage	0-2	5.0-10	7.4-8.4	0-5	0	0.0-2.0	0
	2-5	5.0-10	7.4-8.4	5-10	0	0.0-2.0	0
	5-9	10-20	7.4-8.4	5-10	0	0.0-2.0	0
	9-15	10-20	7.4-8.4	5-10	0	0.0-2.0	0
	15-20	---	---	---	---	---	---
212:							
Rehobeth	0-2	20-30	7.9-9.0	1-5	1-10	0.0-2.0	1-5
	2-5	20-30	7.9-9.0	1-5	1-10	0.0-2.0	1-5
	5-12	20-40	7.9-9.0	1-5	1-10	0.0-2.0	1-5
	12-18	20-40	7.9-9.0	1-5	5-10	0.0-2.0	5-13
	18-32	20-40	7.9-9.0	1-5	5-10	0.0-2.0	5-14
	32-80	20-40	7.9-9.0	1-5	1-5	2.0-8.0	5-14
215:							
Viuda	0-3	2.0-7.0	6.6-7.3	0	0	0.0-2.0	0-2
	3-15	2.0-20	7.9-8.4	0	0	0.0-2.0	0-2
	15-17	2.0-10	7.9-8.4	1-15	0	0.0-2.0	0-2
	17-20	---	---	---	---	---	---
Penistaja	0-2	5.0-15	6.6-7.8	0-1	0	0.0-2.0	0
	2-22	10-20	6.6-8.4	0-1	0	0.0-2.0	0
	22-65	5.0-20	7.4-8.4	1-10	0	0.0-2.0	0
Rock outcrop	0	---	---	---	---	---	---
220:							
Hagerwest	0-2	5.0-15	6.6-7.8	0	0	0.0-2.0	0
	2-13	10-20	6.6-7.8	0	0	0.0-2.0	0
	13-19	10-20	7.4-8.4	1-10	0	0.0-2.0	0
	19-35	5.0-15	7.4-8.4	1-10	0	0.0-2.0	0
	35-40	---	---	---	---	---	---

New Mexico Office of the State Engineer
POD Reports and Downloads

Township: 15N Range: 15W Sections: 33

NAD27 X: Y: Zone: Search Radius:

County: Basin: Number: Suffix:

Owner Name: (First) (Last) Non-Domestic Domestic All

POD / Surface Data Report | Avg Depth to Water Report | Water Column Report

Clear Form | iWATERS Menu | Help

AVERAGE DEPTH OF WATER REPORT 11/29/2007

							(Depth Water in Feet)		
Bsn	**Tws**	**Rng**	**Sec**	**Zone**	**X**	**Y**	**Wells**	**Min**	**Max**	**Avg**
G	15N	15W	33				13		117	45

Record Count: 13

New Mexico Office of the State Engineer
Point of Diversion Summary

Back

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are biggest to smallest)

POD Number	Tws	Rng	Sec	q	q	q	Zone	X	Y
G 00003 S	15N	15W	33	1	3	1			

Driller Licence:
Driller Name: BARRON DRILLING
Drill Start Date: 09/24/1956
Log File Date: 02/06/1957
Pump Type:
Casing Size: 16
Depth Well: 1075.

Source: Artesian
Drill Finish Date: 09/24/1956
PCW Received Date:
Pipe Discharge Size:
Estimated Yield: 370
Depth Water:

Water Bearing Stratifications:	Top	Bottom	Description
	580	620	Sandstone/Gravel/Conglomer
	645	670	Sandstone/Gravel/Conglomer
	725	740	Sandstone/Gravel/Conglomer
	790	1070	Sandstone/Gravel/Conglomer
Casing Perforations:	**Top**	**Bottom**	
	580	625	
	645	670	
	725	740	
	790	950	
	960	070	

New Mexico Office of the State Engineer
Point of Diversion Summary

Back

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are biggest to smallest)

POD Number	Tws	Rng	Sec	q	q	q	Zone	X	Y
G 00003	15N	15W	33	3	1	1			

Driller Licence:
Driller Name: BARRON DRLG. CO.
Drill Start Date: 08/27/1956
Log File Date: 12/26/1956
Pump Type:
Casing Size: 16
Depth Well: 1235.

Source: Artesian
Drill Finish Date: 09/22/1956
PCW Received Date:
Pipe Discharge Size:
Estimated Yield: 125
Depth Water:

Water Bearing Stratifications:	Top	Bottom	Description
	100	150	Sandstone/Gravel/Conglomer
	520	600	Sandstone/Gravel/Conglomer
	640	700	Sandstone/Gravel/Conglomer
	800	1020	Sandstone/Gravel/Conglomer
Casing Perforations:	**Top**	**Bottom**	
	520	600	
	625	700	
	710	750	
	800	020	

HALL
ENVIRONMENTAL
ANALYSIS
LABORATORY

COVER LETTER

December 30, 2005

Steve Morris
Giant Refining Co
Rt. 3 Box 7
Gallup, NM 87301
TEL: (505) 722-0258
FAX (505) 722-0210

RE: Annual Pond Samp for Gen Chem Pond #8- Order No.: 0512188

Dear Steve Morris:

Hall Environmental Analysis Laboratory received 1 sample on 12/15/2005 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109
505.345.3975 ■ Fax 505.345.4107
www.hallenvironmental.com

Hall Environmental Analysis Laboratory

Date: *30-Dec-05*

CLIENT: Giant Refining Co
Client Sample ID: Pond #8
Lab Order: 0512188
Collection Date: 12/13/2005 10:30:00 AM
Project: Annual Pond Samp for Gen Chem Pond #8-200
Lab ID: 0512188-01
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: MAP
Fluoride	ND	50		mg/L	500	12/28/2005
Chloride	79000	500		mg/L	5000	12/28/2005
Phosphorus, Orthophosphate (As P)	ND	250	H	mg/L	500	12/28/2005
Sulfate	4800	250		mg/L	500	12/28/2005
Nitrate (As N)+Nitrite (As N)	ND	50		mg/L	500	12/28/2005
EPA 120.1: SPECIFIC CONDUCTANCE						Analyst: TES
Specific Conductance	280000	0.20		µmhos/cm	20	12/23/2005
EPA 6010: TOTAL RECOVERABLE METALS						Analyst: NMO
Calcium	200	10		mg/L	10	12/27/2005 3:23:15 PM
Magnesium	4000	200		mg/L	200	12/27/2005 3:27:36 PM
Potassium	7300	200		mg/L	200	12/27/2005 3:27:36 PM
Sodium	47000	500		mg/L	500	12/28/2005 7:53:33 AM
EPA METHOD 150.1: PH						Analyst: TES
pH	5.42	0.010		pH units	1	12/16/2005

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

Appendix B

APPENDIX B

PRELIMINARY ENGINEER'S OPINION OF PROBABLE COSTS
Project Name:
WESTERN REFINING COMPANY,
CINIZA REFINERY POND CLOSURE

					ENGINEERS ESTIMATE GANNETT FLEMING WEST, INC.	
BID ITEM #	ITEM ID NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	621000	MOBILIZATON	LS	1.00	$15,000.00	$15,000.00
2	603000	NPDES PERMITTING AND SWPPP IMPLEMENTATION, COMPLETE	LS	1.00	$15,000.00	$15,000.00
3	801000	CONSTRUCTION STAKING, COMPLETE	LS	1.00	$5,500.00	$5,500.00
4	201000	CLEAR AND GRUB, COMPLETE	LS	1.00	$10,000.00	$10,000.00
5	209000	MISC. GRADING, AND SHAPING, COMPLETE	SY	262500	$5.00	$1,312,500.00
6	203000	SUBEXCAVATION, INCLUDING HAUL, DISPOSAL, COMPLETE	CY	104000	$5.60	$582,400.00
7	000001	TIPPING FEE, LANDFILL, COMPLETE	CY	104000	$0.62	$64,480.00
8	632000	CLASS A SEEDING, COMPLETE	AC	182	$1,500.00	$273,000.00
9	603200	SILT FENCE, COMPLETE	LF	5800	$5.60	$32,480.00
10	000002	ENGINEERING AND CONSTRUCTION SERVICES	LS	1	$231,036.00	$231,036.00
		Subtotal of Base Bid Items				$2,526,396.00
		Contingency of 15%				$378,959.40
		New Mexico Gross Receipts Tax (NMGRT) at 6.625%				$192,479.80
		TOTAL				**$3,097,835.20**

Equipment	Monthly Rate	Daily Equivalent	per cy
Scraper (17 yd)	$12,500.00	$416.67	$0.08
Grader (16H)	$16,000.00	$533.33	$0.10
Dump Truck (40	$15,200.00	$506.67	$0.09
Dump Truck (40	$15,200.00	$506.67	$0.09
Water Truck	$13,700.00	$456.67	$0.08
Compactor	$4,000.00	$133.33	$0.02
Loader	$11,800.00	$393.33	$0.07
Fuel Truck	$5,500.00	$183.33	$0.03
	Subtotal		$0.57

Personnel	Hourly Wage	Daily Equivalent	per cy
Operator	$15.93	$127.44	$0.02
Operator	$15.93	$127.44	$0.02
Operator	$15.93	$127.44	$0.02
Operator	$15.93	$127.44	$0.02
Laborer	$10.47	$83.76	$0.02
Laborer	$10.47	$83.76	$0.02
Supervisor	$24.59	$196.72	$0.04
Helper	$10.04	$80.32	$0.01
Helper	$10.04	$80.32	$0.01
	Subtotal		$0.19

Materials	Unit Cost	Daily Equivalent	per cy
Water (gal)	$0.81	$16,200.00	$2.95
Fuel (gal)	$2.85	$2,850.00	$0.52
	Subtotal		$3.46

Additional Costs

G&A on labor	1.70	$0.32
Parts and maint	12.00%	$0.07
Profit	8.00%	$0.37
	Subtotal	$0.76

Total Unit Cost per cu yd of earthwork **$4.98**

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD
Sent: Monday, February 25, 2008 3:18 PM
To: Ed Riege
Cc: Monzeglio, Hope, NMENV; Price, Wayne, EMNRD
Subject: FW: Western Refining Southwest, Gallup Refinery (GW-32) Discharge Permit Closure Plan & Financial Assurance

Mr. Riege:

Good afternoon. You brought to my attention this afternoon that there was a finalized version of the above Closure Plan dated December 2007 with the final estimated closure amount; however, the OCD apparently only received the November 2007 Draft Plan described in the message below. You explained that the December 2007 Final Closure Plan had a revised closure cost of over $3,000,000.00 (three million).

After discussing the situation with my Supervisor, Mr. Wayne Price, we agree that Western Refining Southwest, Gallup Refinery must comply with our February 25, 2008 e-mail communiqué below. The Final Closure Plan dated December 2007 shall be submitted to the OCD and NMED to update our files.

Please contact me if you have questions. Thank you.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3491
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
(Pollution Prevention Guidance is under "Publications")

From: Chavez, Carl J, EMNRD
Sent: Monday, February 25, 2008 9:29 AM
To: 'Jim Lieb'
Cc: Ed Riege; 'Ann Allen'; Allen Hains; Price, Wayne, EMNRD
Subject: Western Refining Southwest, Gallup Refinery (GW-32) Discharge Permit Closure Plan & Financial Assurance

Mr. Lieb, et. al:

Per Section 27 (**Closure Plan and Financial Assurance)** of the Discharge Permit: Pursuant to 20.6.2.3107 NMAC an owner/operator shall notify the OCD when any operations of the facility are to be discontinued for a period in excess of six months. Prior to closure, or as a condition of this permit, or request from the OCD, the operator will submit an approved closure plan, or modify an existing plan, and/or provide adequate financial assurance. Please submit a closure plan and financial assurance cost estimate for the unlined wastewater and/or evaporation/temporary ponds by December 31, 2007. The plan shall address how any remaining water contaminants will be monitored and abated to ensure the protection of public health and safety, fresh water, and the environment in the foreseeable future.

The New Mexico Oil Conservation Division (OCD) has reviewed the Gannett Fleming letters to the Gallup Refinery dated September 14, 2007 and October 23, 2007. More recently, the OCD was provided a copy of Gannett Fleming West, Inc.'s "Evaporation Pond Closure Plan" dated November 2007 (Draft Plan) at our meeting in Santa Fe, New Mexico on Monday, February 11, 2008. The Draft Plan was submitted to address the above. The Draft Plan estimates the pond closure estimate amount at $1,325,165. Consequently, the OCD is requesting an Irrevocable

Letter of Credit (LOC) in the amount of $1,000,000.00 (one million). Please provide the Irrevocable LOC along with a finalized Closure Plan to the address below within 90 days of receipt this message.

OCD links containing information on the LOC may be viewed from the links provided below.

How to Become an Operator in New Mexico (see "Irrevocable Letter of Credit" within text)
http://www.emnrd.state.nm.us/ocd/documents/HOWTOBECOMEAWELLOPERATORINNEWMEXICO20060125.pdf

LOC Form
http://www.emnrd.state.nm.us/ocd/documents/FormLOCSample_000.pdf

Please contact me to address or facilitate responses from OCD Bond Staff and/or Attorneys to any questions you may have on the Irrevocable LOC. Thank you.

Please be advised that NMOCD approval of this closure plan does not relieve Western Refining Southwest, Gallup Refinery of responsibility should their operations pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD approval does not relieve Western Refining Southwest, Gallup Refinery of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3491
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
(Pollution Prevention Guidance is under "Publications")

Chavez, Carl J, EMNRD

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Sent: Monday, February 25, 2008 9:29 AM

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LOC Form
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(Pollution Prevention Guidance is under "Publications")

Meeting at Oil Conservation Division
RE: Western Refining – Gallup Refinery
February 11, 2008
10:00 AM – 12:00 PM

AGENDA

Expected Attendees:

Western Refining: Jim Lieb, Ed Riege, Mark Turri, Don Riley, Ann Allen, Ed Cote (HRC, Inc.)
OCD: Carl Chavez, Wayne Price
NMED, HWB: Hope Monzeglio, Cheryl Frischkorn, Dave Cobrain

Opening remarks

Jim Lieb – Introductions: General Manager, Mark Turri

Topics/Presentations

Ed Cote - PowerPoint Presentation:

- New Wastewater Treatment Plant Design Development.
- Activated Sludge Treatment Pilot Test Plant.
- Highlighted technology - Membrane Bioreactor
- New Treatment System will be designed with enough redundancy/safeguards to make lining EP1 unnecessary.
- Pilot Travel Center Sanitary Waste Water Management.

Jim Lieb – PowerPoint Presentation:

- Status of Repairs to New API Separator (Siemens SS Liner)
- Engineering Plan to Replace Old API Separator
- Alternative Plan and Schedule for Storage Tanks

Other - depending on time (Ponds Closure Plan)

OCD Discharge Permit (GW-032)
Minor Permit Modification
September 21, 2007
Schedule
Giant Refining - Gallup Refinery
This is the deadline table agreed to with Carl Chavez

Section No.	Requirement	Conditions Deadline	Proposed Deadline	Reason for the Change
Cover Letter	Signed Discharge Permit Approval Conditions GW-032 and $8,400.00 Fee	9/27/2007	Same	
2	OCD Discharge Permit Renewal	4/1/2011	Same	
9	Above Ground Tanks Impermeable Secondary Containment Requirement - Retrofit all tanks by 8/1/11 or propose alternate schedule by 10/17/07.	10/17/2007	2/15/2008	Alternative Plan and Schedule development requires: 1. Data Collection and evaluation, Email / letter rqst. ext. of time 2. Engineering, and 3. Design.
11. A.	Underground Sumps - Retrofit with secondary containment and leak detection.	8/1/2011	Same	
16.A.	Old API Separator - Storm Water Engineering Plan to decomission and Replace	12/31/2007	Same	Plan should coincide with Section 17.
16.B.	Repair new API Separator	12/31/2007	Same	
16.C.	Activated Sludge Wastewater Treatment Study and Design (including installation of Flow meters and Phenol, BOD, COD into AL1,AL2 & EP1 Analyses)	12/31/2007	6/6/2008	The study is an extensive undertaking requiring: 1. Modification of equipment such as tanks, piping, valves and controls. 2. Data collection and evaluation, and 3. Engineering, and 4. Design. This study should coincide with the Section 16.D schedule
16.C.2.	Grab samples for VOC, BOD, COD, Chlorides, DRO,GRO, MTBE, pH & Phenol. Monitoring monthly at EP1 for 12 months or by 12/31/08	12/31/2008	Same	
16.D.	Aeration Lagoons Replacement Engineering Design/Construction Plan and Schedule	6/6/2008	Same	
16.E.	Evaporation Ponds - Engineering Design/Construction Plan to single-line the evaporation pond EP-1 or alternative plan.	6/6/2008	Same	

OCD Discharge Permit (GW-032)
Minor Permit Modification
September 21, 2007
Schedule
Giant Refining - Gallup Refinery
This is the deadline table agreed to with Carl Chavez

Section No.	Requirement	Conditions Deadline	Proposed Deadline	Reason for the Change
16.F.	Temporary Landfarms - Closure Plan	12/31/2007	*3/17/2008*	Closure Plan development will require: 1. Development of Sampling Program and Sampling, 2. Analyses and Data Evaluation, and 3. Preparation of Plan.
20. A.	Annual Ground Water Report	Annually due by 9/1	Same	
21. A.	If decide not to landfarm, submit a closure plan within 3 months of permit issuance	NA	NA	
24. A.	Pilot by-pass be disconnected and plugged. Installation of Dual Primary Separation Device with secondary containment and leak detection	12/31/2007	*7/16/2008*	Pilot bypass will be locked closed and would only be opended in event of an emergency until the 48 hours storage can be installed. Installation requires: 1. Data Collection and evaluation, 2. Engineering, and 3. Design, and 4. Delivery and/or Construction/Installation.
24. B.	Emergency tank holding system for Pilot waste water (48 hours accumulation)	12/31/2007	*7/16/2008*	
24. D.	Maintain a sampling and metering station on incoming Pilot waste water line	Permit Issuance Date	Same	
24. E.	Biohazard O&M Plan for WW treatment facility	6/30/2008	Same	
27	Closure Plan and Financial Assurance cost estimate for unlined waste water and/or evaporation ponds	12/31/2007	Same	

EVAPORATION POND CLOSURE PLAN

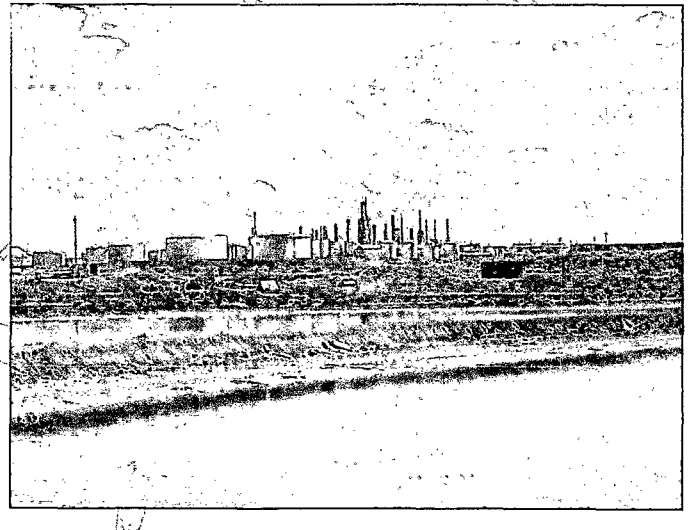
Giant Ciniza Refinery

November, 2007

Prepared for

Western Refining

GIANT INDUSTRIES, INC.



Prepared By:

Gannett Fleming West, Inc.
2155 Louisiana Blvd NE, Suite 7000
Albuquerque, New Mexico 87110
Office (505) 265-8468
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EVAPORATION POND CLOSURE PLAN

Giant Ciniza Refinery

November, 2007

I, Mike Brazie, being a registered Professional Engineer in the state of New Mexico (NMPE #9376) certify that this closure plan was prepared by me or under my direct supervision.

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Mike Brazie Date

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SITE LOCATION AND DESCRIPTION

This closure plan has been prepared for the evaporation ponds at the Giant Ciniza Refinery. The refinery is located on the north side of Interstate 40, approximately 17 miles east of Gallup, New Mexico. Within the refinery, the evaporation ponds are located on a flat plain to the west of the process unit and tank farm, in the NW¼, Sec. 33, T. 15 N., R. 15 W, McKinley County, New Mexico. **Figure 1** is a location map for the refinery. The ponds are part of the refinery's wastewater treatment system, with effluent from the aeration basins directed to the ponds and allowed to evaporate. Process water from the refinery goes through the API separator for primary treatment, and then to the aeration basins for secondary treatment, and finally to the evaporation ponds for final disposition of the water.

There are 11 ponds of various sizes with a total surface area of approximately 120 acres. All are man-made earthen basins with bermed sidewalls. The initial ponds were constructed in the late 1950's, with additional ponds constructed at various times after that. The construction involved clearing and grubbing, followed by leveling of the pond bottoms and construction of the berms to form the ponds. The ponds have been in continuous operation since construction. Elevation of the ponds ranges from 6875.8 feet to 6889.2 feet (water elevation in the ponds), and the berms range from about 1 foot to 4 feet in height.

The refinery operates under a RCRA Hazardous Waste Facility Permit, No. NMD000333211-1. The evaporation ponds were identified as a Solid Waste Management Unit (SWMU No. 2) under this permit. The recommendation in the RCRA Facility Investigation (RFI) was for No Further Action (NFA) at this SWMU No. 2, so no site remediation has been required for these evaporation ponds.

SITE SOILS

The native soils in the area of the evaporation ponds are Rehobeth silty clay loam, which has formed in flood plains and on valley floors. It is naturally saline, with salinity up to about 8 mmhos/cm and organic matter content up to about 1 percent. Soil pH ranges from 8 to 9. According to the 2001 NFA Report, the soil at the site is bentonite clay and silt with a hydraulic conductivity of less than 10^{-7} cm/sec.

The evaporation ponds were investigated in the early 1990's. The investigation included collection and analysis of several soil and groundwater samples in the pond areas. No organic contaminants were detected in any of the groundwater samples, indicating no contaminants were migrating to the groundwater from the ponds. Soil samples collected from the perimeter and beneath the ponds (angle drill holes) detected no volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs), except trace amounts of toluene (5 μg/l maximum), in 8 of the 56 soil samples. Based on these results, EPA concurred with the NFA finding for these evaporation ponds.

SITE GEOLOGY

Bedrock at the site is the late Triassic Chinle Formation, which consists primarily of interbedded claystone and siltstone with minor amounts of sandstone and limestone. The Chinle Formation has a total thickness of about 1,600 feet in this area, and is generally not water-bearing, although water has been encountered in some of the minor inter-bedded sandstone lenses. Generally, the Chinle Formation acts as an aquitard.

SURFACE AND GROUNDWATER HYDROLOGY

The site is located within the Rio Puerco valley, north of the Zuni Uplift. Surface water flow off the site is generally northwest by overland flow to the tributaries of the Rio Puerco north of the site. The Rio Puerco is a principal tributary of the Rio Grande, which is east of the site.

Based on information on record at the Office of the State Engineer (OSE), groundwater in the area of the site ranges in depth up to 117 feet, with the average depth to groundwater of 45 feet, based on records for 13 wells within Section 33. Groundwater at the site is obtained from multiple depths between 580 and 1070 feet below ground surface.

The refinery has been sampling groundwater near the evaporation ponds on an annual basis, in compliance with the requirements of the RCRA permit. The latest results (November 2006), detected no VOCs or SVOCs in the groundwater beneath the evaporation ponds.

POST CLOSURE LAND USE

After closure of the ponds, it is anticipated the land will be returned to natural rangeland, as before construction of the refinery. The aircraft landing strip, an unpaved runway approximately 3000 feet long will remain. This landing airstrip is designated as an emergency landing airstrip on Federal Aviation Administration (FAA) maps.

CLOSURE PLAN COMPONENTS

At closure, the water remaining in the ponds will be allowed to evaporate, the ponds will be regraded, and revegetated. This section describes these operations.

POTENTIAL FOR SITE REMEDIATION

Based on historic sampling results and a risk-based assessment performed using the API model VADSAT, the need for remediation of the evaporation ponds is not anticipated. Sampling is performed at 7 groundwater monitoring wells in the area of the ponds, soil sampling has been conducted around the ponds, and the water within the ponds has been sampled. The ponds were also identified as Solid Waste Management Unit (SWMU #2) in the RFI, which concluded no further action was required at the ponds.

Recent sampling results for benzene, toluene, ethylbenzene, and xylenes (BTEX) and chloride are summarized on **Table 1**. These results indicate no contaminants have

migrated from the evaporation ponds. In addition, the VADSAT model indicated no salt migration below the ponds. Details of the modeling and the modeling results are in **Appendix A**. See Figure 2 for the locations of the monitoring wells.

Table 1. 2007 Groundwater Sampling Results (BTEX in μg/l, chloride in mg/l)

WELL	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	CHLORIDE
BW-1C	ND	ND	ND	ND	36
BW-2A	ND	ND	ND	ND	39
BW-2B	ND	ND	ND	ND	31
BW-2C	ND	ND	ND	ND	42
BW-3B	ND	ND	ND	ND	33
BW-3C	ND	ND	ND	ND	38

Based on these groundwater monitoring results and the results of the VADSAT modeling, no over-excavation of the ponds is planned for closure. However, after the ponds have dried and before they are filled, soil samples will be collected to verify that no remediation of the pond bottoms is required at that time. The sampling results will be submitted to OCD to document that the ponds meet closure criteria before filling and grading the ponds.

WATER EVAPORATION

As part of the evaporation pond closure plan, treated wastewater will cease to be discharged to the evaporation ponds. The water remaining in the ponds will then be allowed to evaporate, with enhanced evaporation provided by the spray evaporators. Once the water has evaporated and the ponds are dry, the pond bottoms will be sampled to determine if excavation of the soil beneath the ponds must be treated or removed due to the presence of contaminants above New Mexico Environment Department (NMED) Soil Screening Levels (SSLs). Based on historic sampling and modeling discussed above, no site remediation is anticipated for closure of the ponds. However, should the closure samples indicate contaminants exceed the NMED SSLs, appropriate remedial measures will be implemented at that time.

The recovered pond sites are not expected to function as an agricultural area. If remediation is required, it will mostly likely be to treat chlorides. Increased chloride levels may adversely impact vegetation growth. Such contamination may not be a significant issue except for the post-closure revegetation program. Note that an excess of fill material will be available, and this clean soil soil may be added or blended into the pond areas where chloride levels do not support plant roots. The treated soil at these locations should support plant growth and a root system.

SITE GRADING

Once the water in the ponds has evaporated, the ponds will be graded. A plan of the existing ponds is shown on **Figure 2** and the final grade on **Figure 3**. The grading has been designed to restore the area of the ponds approximately back to the natural contours prior to construction of the ponds. The material volumes are presented on page 6 of this

closure plan. Final grade will be attained by grading the bermed soils into the pond areas, supplementing the material requirements by grading soils from the areas immediately adjacent to the ponds, if needed. Because all of the property is owned by the refinery, there will be no need to import soils for the closure grading. Based on the models generated from existing site topography and proposed grading, there is an excess of approximately 2326 cubic yards (CY) of material within the berms themselves. This excess material will be used to fill any areas that have been regraded after the survey of the pond area. Excess topsoil material from cut areas will be stockpiled and used for final cover, and the grubbed materials will be disposed of on site or at a local landfill. Elevation at final grade will range from 6870 feet to 6890 feet, with a slope of approximately 0.7 percent to the west.

ROAD RECLAMATION

Most of the roads in the pond area are unpaved surfaces on the berms or between the ponds. These areas will be re-contoured along with the ponds. No paved roadways are present in the area of the ponds. However, the unpaved emergency runway will remain after closure of the ponds.

SITE DRAINAGE

No drainage structures will be required at closure. The final grade will provide a general slope of about 0.7 percent to the west, consistent with the natural contours and drainage patterns of the area. Post-closure site drainage will be by natural sheet flow to the west edge of the refinery property, and then will follow the existing drainage to the west of the property. Because of the low grade and the revegetation at closure, no erosion protection other than site vegetation is necessary or planned.

REVEGETATION

Areas impacted by grading and other disturbances during closure operations will be revegetated. The revegetation is intended to reduce impacts to surface water by establishing a self-sustaining native plant community which will provide protection against soil erosion and enhance the natural aesthetics of the closed site. The need for soil amendments will be determined based on site-specific evaluations at the time of closure. Inorganic fertilizer will be added to increase nitrogen, phosphate, and potassium available to plants, as required by analytical results of the soils. Mulch will be applied after seeding to conserve soil moisture and protect against soil erosion until the plants have taken root. Planting will be performed between May and September.

Amended areas will be seeded with a mixture of native grasses and forbs that will not depend on external application of water or fertilizer. The plant species native to the area, as listed in the NRCS *Soil Survey of MicKinley Area, New Mexico*, are shown on **Table 2**. Specific species, composition percentages, and seeding rates will be determined during a vegetation survey conducted as part of the closure operations.

Table 2. Native Plant Species

Alkalai Sacaton	Fourwing Saltbush	Blue Grama	Inland Saltgrass	Rabbitbrush
Western Wheatgrass	Black Greasewood	Bottlebrush Squirreltail	Mat Muhly	

REGULATORY COMPLIANCE

A stormwater discharge permit (NPDES) will be required for construction activities during site closure, and must be obtained prior to implementing the closure operations. Temporary erosion control measures, such as silt fence, will be placed around the construction zone during construction, but will be removed upon completion of the site closure. **Figure 3** shows the location of the silt fence for temporary erosion and sediment control. Dust will be controlled periodically during earthmoving operations by watering haul roads and other dust-generating areas, as necessary.

CLOSURE OPERATIONS AND SCHEDULE

Although a specific schedule of operations will be prepared by the construction contractor selected to perform the closure, a general schedule follows.

Week 1:

- Notify OCD that closure operations will commence
- Notify EPA that the evaporation ponds (SWMU No. 2) will be permanently closed
- Stop wastewater delivery to the evaporation ponds
- Prepare Storm Water Pollution Prevention Plan (SWPPP)

Weeks 1 – 4:

- Evaporate water from ponds
- Analyze bottom soil by SW-846
- Mobilize construction equipment
- Install sediment controls

Weeks 5 – 7:

- Regrade ponds
- Perform vegetation survey and soil analysis for amendments and seed mix
- Final contour area

Week 8:

- Revegetate

CLOSURE COST ESTIMATE

The closure costs were estimated by calculating material volumes and using estimated unit bid prices. Material volumes for each pond were calculated based on pond size versus total cut, and are summarized on **Table 3**. Costs per pond were calculated based on pond area versus total cost and are summarized on **Table 4**.

Table 3. Pond Volumes

Pond Number	Pond Area (ac)	Pond Volume (CY)
2	7.5	9712
3	4.2	5439
4	2.4	3108
5	6.3	8158
6	14.2	18388
7	20.8	26935
8	9.3	12043
9	22.8	29525
10	1.7	2201
11	20.5	26546
12	12.7	16446
Total	122.4	158500

Table 4. Pond Costs

Pond Number	Pond Area (ac)	Pond Cost ($)
2	7.5	$81,199
3	4.2	$45,471
4	2.4	$25,984
5	6.3	$68,207
6	14.2	$153,737
7	20.8	$225,191
8	9.3	$100,687
9	22.8	$246,845
10	1.7	$18,405
11	20.5	$221,944
12	12.7	$137,497
Total	122.4	$1,325,165

A more detailed breakdown of the cost estimate is included in Appendix B.

MATERIAL ESTIMATES

Earthwork quantities were estimated from the existing contour map of the refinery, including the evaporation ponds, and the final grading plan developed as part of this closure plan. Because the existing contour map showed water surface elevations in the ponds and not the elevation of the bottom of the ponds, the bottom elevations were assumed from the elevations just outside each pond. Because the ponds were built up by constructing berms at grade, the assumed elevations should be adequate for the purposes of the closure cost estimate for this closure plan. The final contours were then designed integrally with the existing grades around the ponds, with the final contours of the closed ponds tied to those surrounding elevations and contours, with adequate slope to provide drainage by sheet flow into the natural drainage areas to the west of the ponds.

The cut and fill requirements were then determined by comparing the existing model to the proposed model generated by the proposed grading plan. This resulted in an excess of 2,326 CY of material, which is available from the berms surrounding the ponds. This excess represents the amount of material that will be available for additional fill or soil blending. The overall volumes are as follows:

Total Volume of Cut	158,352 CY
Total Volume of Fill	156,026 CY
Net	2,326 CY (Excess)

Silt fence requirements are shown on **Figure 3**. Silt fence will be placed along the lower gradient of the construction zone. A total of 5800 linear feet (LF) of silt fence will be required.

Revegetation acreage was determined from the grading plan, based on the area of disturbance. This includes the area scraped to meet the fill requirements. The acreage of each pond is summarized on Table 3. The total acreage to be revegetated is 182 AC.

The following items were considered incidental, and not separated out in the estimate:

1. Water for dust control, incidental to grading and shaping (Bid Item 5)
2. Silt fence management, incidental to SWPPP (Bid Item 2)
3. Soil analysis, incidental to revegetation (Bid Item 6)
4. Over-seeding, soil amendment, or blending, indental to revegetation (Bid Item 6)
5. Notifications, permits and clearances, incidental to mobilization (Bid Item 1)

COST ESTIMATE

Closure costs for the total site were estimated using the material volumes determined as described above, and applying average unit bid (AUBs) and an independent estimate of construction unit costs. The earthwork unit costs developed for this estimate are included in **Appendix B**. AUBs were estimated based on the latest bid prices for New Mexico Department of Transportation (NMDOT) construction projects, adjusted for McKinley County, project size, and construction season using Estimator® estimating software. An independent estimate of unit costs, developed as part of an earlier assignment on the project, were also used in adjusting the NMDOT AUBs, as shown in Appendix B. These estimates are presented in 2007 dollars and based on construction bid prices and commodity prices as of November 2007.

The earthwork costs are based on the earthwork material volumes required to close the entire pond site. The revegetation costs are based on the acreages of the ponds and additional area of disturbance. The cost for silt fence is based on the placement shown on **Figure 3**. Mobilization and SWPPP costs were estimated as lump sum for the entire project, assuming the entire closure will be performed in a single mobilization. Engineering and construction services (E&C) were assumed to be 10% of construction costs, and New Mexico Gross Receipts Tax (NMGRT) was applied at the current (November 2007) McKinley County rate of 6.625 percent.

Because no post-closure care or monitoring is anticipated, no costs for those items are included in the estimate. Based on VADSAT modeling and historic site monitoring results, no over-excavation of soil was estimated. If contamination is found above SSLs at the time of closure, it is expected to be chlorides, which could impact plant growth. However, research has indicated that a soil cover of 5 feet above salt-contaminated soil in New Mexico can be sufficient to prevent wicking of salt to the plant root zone, and so if chlorides become a problem at closure, additional soil cover will most likely be the

appropriate remediation approach for these ponds. Other options may include gypsum treatment or application of other salt-inhibiting materials.

Based on these assumptions and the cost estimating method described, the total estimated closure cost for the evaporation ponds is **$1,325,165**. See Appendix B for a complete breakdown of costs.

REFERENCES

Giant Ciniza Refining Co., RFI Phase I Supplemental Report, August 21, 1991

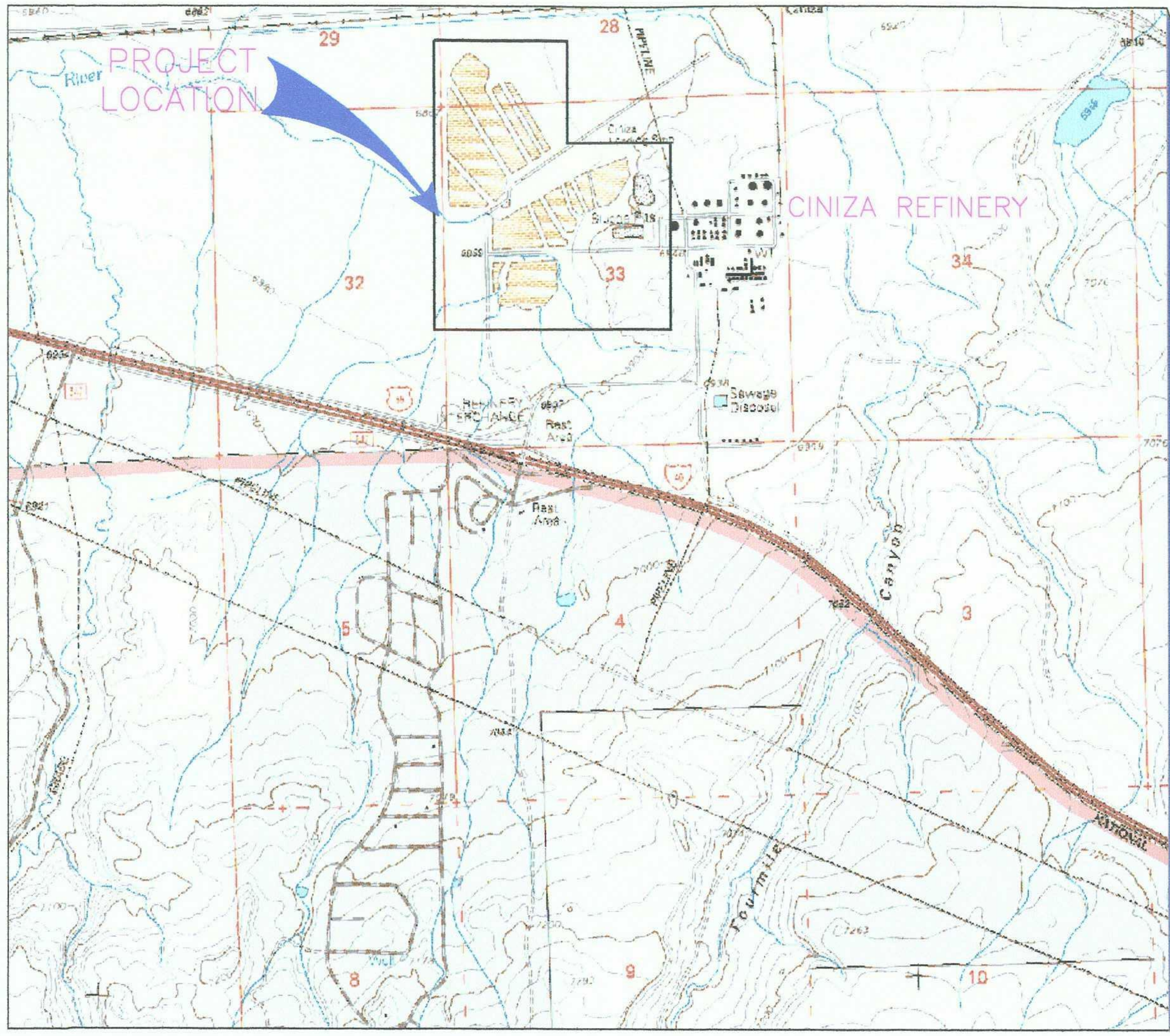
Giant Ciniza Refining Co., RFI Phase II Report, October 21, 1991

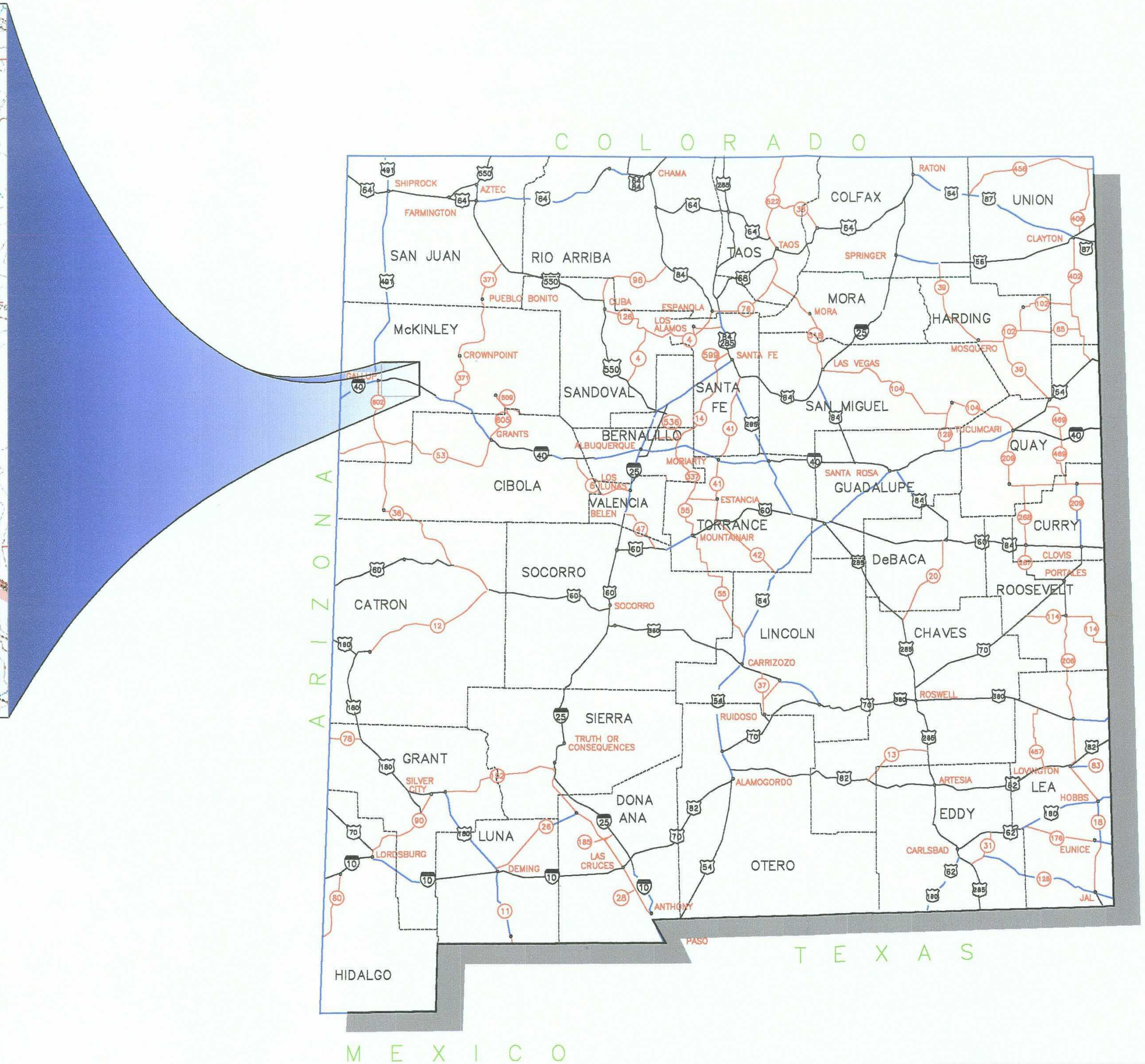
Giant Ciniza Refining Co., Post Closure Care Permit, Aug. 2000

Giant Ciniza Refining Co., OCD Draft Discharge Permit, July 9, 2007

Natural Resources Conservation Service, Soil Survey of McKinley Area, New Mexico, 2004

FIGURES





NO.	DESCRIPTION	DATE	BY
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

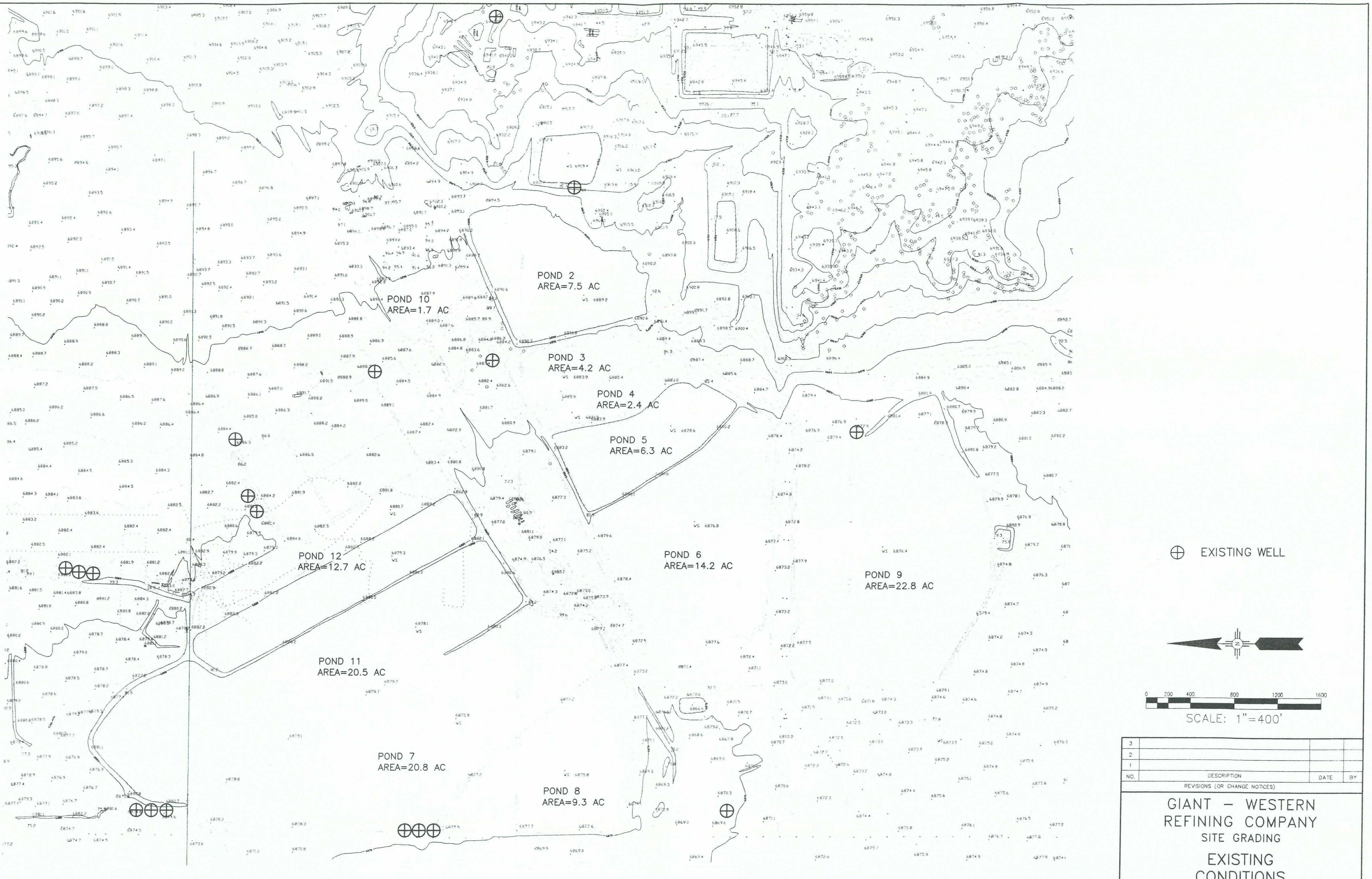
GIANT – WESTERN REFINING COMPANY
SITE GRADING

LOCATION MAP

FIGURE 1

Gannett Fleming West, Inc.

NGR. FILE :



NO.	DESCRIPTION	DATE	BY
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

GIANT - WESTERN REFINING COMPANY

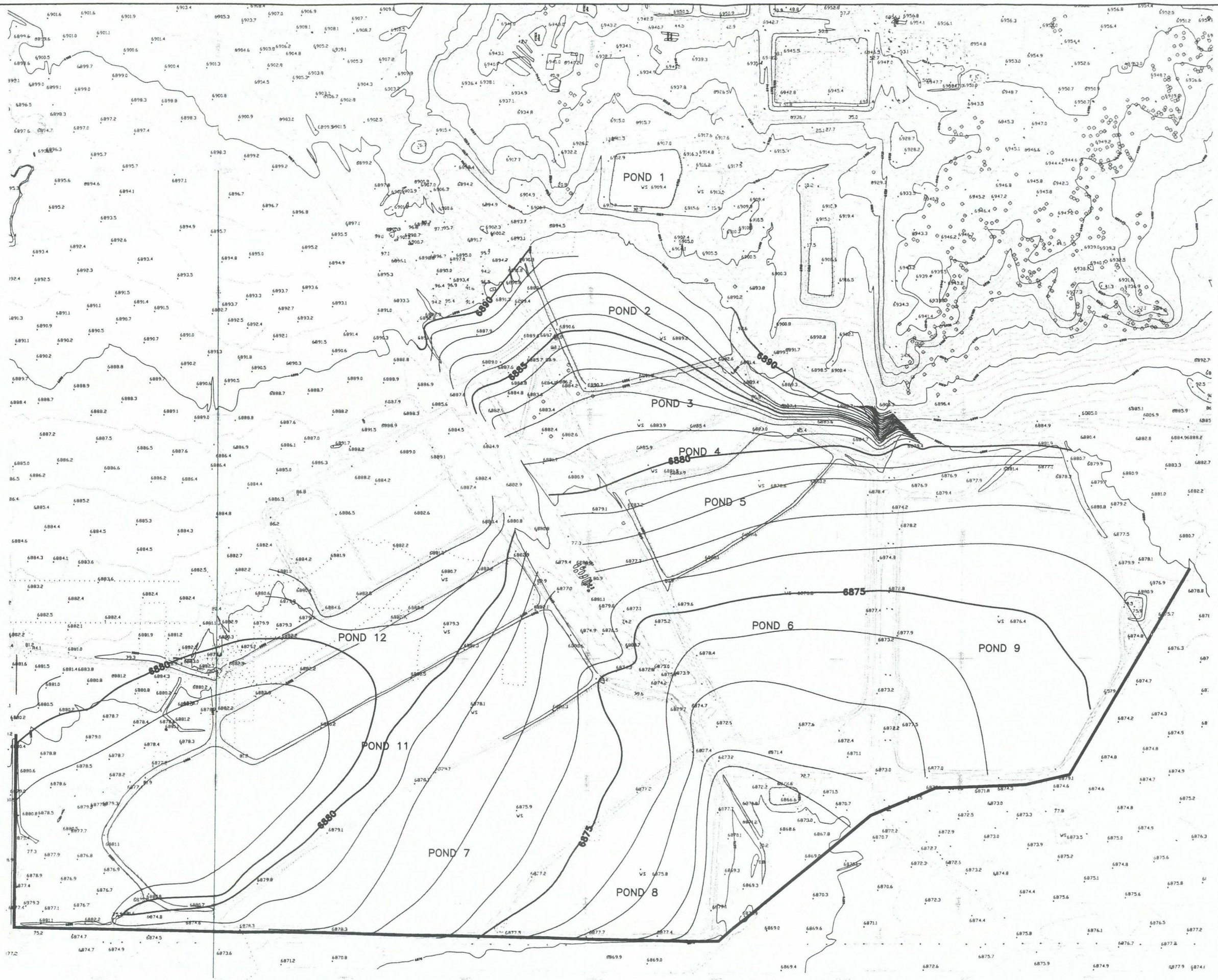
SITE GRADING

EXISTING CONDITIONS

ENGR. FILE :

Gannett Fleming West, Inc.

FIGURE 2



NO.	DESCRIPTION	DATE	BY
3			
2			
1			

REVISIONS (OR CHANGE NOTICES)

GIANT – WESTERN REFINING COMPANY

SITE GRADING

PROPOSED POND AREA GRADING

ENGR. FILE :

Gannett Fleming West, Inc.

FIGURE 3

SUMMARY OF VADSAT MODELING

API's VADSAT Model was used to estimate the potential for chloride migration from each of the ponds. Although the model is a groundwater protection risk assessment model, and therefore has limitations to estimating salt concentrations that will remain after the evaporation ponds are dried, it can be used to predict how far the salt might travel through the underlying soils. BTEX compounds were not modeled, since no BTEX was detected in any of the analytical results available for the site.

Each pond was modeled using the site-specific data for the pond (e.g., source area, depth, L/W ratio, etc.). This information was taken from the AutoCAD site drawings. VADSAT default parameters were used for hydrogeological properties, and adjusted where site-specific data was available. Soil data was obtained from the NRCS *Soil Survey of McKinley Area, New Mexico*. Groundwater data was obtained from the online WATERS data base, available on the OSE website. The maximum salt concentration within the evaporation ponds is 79,000 mg/l , based on analysis of water sampled from the ponds, and that value was used as the maximum aqueous salt concentration for the model for all ponds. Receptor coordinates were assigned depths of 1, 2, and 3, meters directly beneath the pond, and the modeling period was 15 years.

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 2

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 34480.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.20000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 3

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 15864.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.20000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 4

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 15742.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 5

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 21085.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 6

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 48200.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.40000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 7

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 91422.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 3.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 8

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 25658.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 9

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 89884.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 1.30000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

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+                                                                         +
+                        VADSAT Version 3.0                               +
+                                                                         +
+    A Monte Carlo Model for Assessing the Effects of Soil               +
+             Contamination on Groundwater Quality                        +
+                                                                         +
+                                                                         +
+                        Developed by:                                    +
+             Environmental Systems and Technologies Inc.                 +
+                   Blacksburg, Virginia                                  +
+               Tel: 703-552-0685, Fax: 703-951-5307                      +
+                                                                         +
+                                                                         +
+                           For                                           +
+                The American Petroleum Institute                         +
+                           1995                                          +
+                                                                         +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
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PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 10

SOURCE AND CHEMICAL DATA ****

FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) =	0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. =	0.00000
DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) =	0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE =	0.00000
AREAM, MEAN WASTE ZONE AREA (m^2) =	810.00000
STDA, STD.DEV. OF WASTE ZONE AREA =	0.00000
RLWM, MEAN L/W RATIO (-) =	1.00000
STDRLW, STD.DEV. OF L/W RATIO =	0.00000
CVRTHM, MEAN VALUE OF COVER THICKNESS (m) =	0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS =	0.00000
MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)=	18271.45312
STD OF MASS FRACTION OF SALT IN WASTE =	0.00000
CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) =	79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT =	0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **

GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) =	0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF =	0.00000
UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) =	0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. =	0.00000
FKSW, MEAN SAT. CONDUCTIVITY (m/day) =	0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY =	0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 11

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 86484.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 2.80000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

VADSAT Version 3.0

A Monte Carlo Model for Assessing the Effects of Soil Contamination on Groundwater Quality

Developed by:
Environmental Systems and Technologies Inc.
Blacksburg, Virginia
Tel: 703-552-0685, Fax: 703-951-5307

For
The American Petroleum Institute
1995

PROJECT TITLE:Giant Ciniza Refinery Evaporation Pond 12

SOURCE AND CHEMICAL DATA ****
FKSWM, MEAN WASTE ZONE SAT. CONDUC. (m/day) = 0.00008
SDFKSW, STD.DEV. OF WASTE ZONE SAT. CONDUC. = 0.00000

DEPTHM, MEAN THICKNESS OF WASTE ZONE (m) = 0.50000
DEPSTD, STD.DEV. OF THICKNESS OF WASTE ZONE = 0.00000

AREAM, MEAN WASTE ZONE AREA (m^2) = 42898.00000
STDA, STD.DEV. OF WASTE ZONE AREA = 0.00000

RLWM, MEAN L/W RATIO (-) = 4.00000
STDRLW, STD.DEV. OF L/W RATIO = 0.00000

CVRTHM, MEAN VALUE OF COVER THICKNESS (m) = 0.00000
CVRTHS, STD.DEV. OF COVER THICKNESS = 0.00000

MEAN MASS FRACTION OF SALT IN WASTE (mg/kg)= 18271.45312
STD OF MASS FRACTION OF SALT IN WASTE = 0.00000

CZEROM, MEAN AQU. PHASE CONC OF SALT (g/m^3) = 79000.00000
CZEROS, STD.DEV. OF AQU. PHASE CONC. OF SALT = 0.00000

CHEMICAL SPECIES Sodium Chloride

HYDROGEOLOGICAL PROPERTIES

** UNSATURATED ZONE INPUT PARAMETERS **
GAMMAM, MEAN UNSAT ZONE DECAY COEF (1/day) = 0.00000
STDGAM, STD.DEV. OF UNSAT ZONE DECAY COEF = 0.00000

UNFOCM, MEAN UNSAT ZONE ORGANIC CARBON FRACTION (-) = 0.00000
UNFOCS, STD.DEV. OF UNSAT ZONE ORGANIC CARBON FRAC. = 0.00000

FKSW, MEAN SAT. CONDUCTIVITY (m/day) = 0.00020
STDFKS, STD.DEV. OF SAT. CONDUCTIVITY = 0.000

DISTM, MEAN DEPTH TO GROUNDWATER (m) = 17.40000
STDDST, STD.DEV. OF DEPTH TO GROUNDWATER = 0.00000

UNPORM, MEAN VADOSE ZONE POROSITY (-) = 0.38000
SUNPOR, STD.DEV. OF VADOSE ZONE POROSITY = 0.00000

PARNM, MEAN VALUE OF VG PARAMETER N (-) = 1.09000
SDPARN, STD.DEV. OF VG PARAMETER N = 0.00000

RESWCM, MEAN RESIDUAL WATER CONTENT (-) = 0.06800
RESWCS, STD.DEV. OF RESIDUAL WATER CONTENT = 0.00000

ALFINM = 0, UNSAT DISPERSIVITY CALCULATED INTERNALLY
** SATURATED ZONE INPUT PARAMETERS **

LAMBW, MEAN SAT. ZONE DECAY COEFF. (1/day) = 0.00000
SLAMB, STD.DEV. OF SAT. ZONE DECAY COEFF. = 0.00000

PORM, MEAN SAT. ZONE POROSITY (-) = 0.20000
STDPOR, STD.DEV. OF SAT. ZONE POROSITY = 0.00000

FOCM, MEAN SAT. ZONE ORG. CARBON FRAC. (-) = 0.00000
STDFOC, STD.DEV. SAT. ZONE ORG. CARBON FRAC.= 0.00000

ALRLTM, MEAN DISPERS, RATIO LONG/TRANSV. (-) = 1.00000
SALRLT, STD.DEV. OF DISP. RATIO LONG/TRANSV. = 0.00000

ALRTVM, MEAN DISPERS. RATIO TRANSV/VERT. (-) = 1.00000
SALRTV, STD.DEV. OF DISP. RATIO TRANSV/VERT. = 0.00000

CONDS, SAT. HYDRAULIC COND. (m/day) = 0.00001
SCONDS, STD.DEV. OF SAT HYDRAULIC COND. = 0.00000

GRADS, HYDRAULIC GRADIENT (m/m) = 0.02300
SGRADS, STD.DEV. OF HYDRAULIC GRADIENT = 0.00000

HMEAN, MEAN AQUIFER THICKNESS (m) = 20.00000
STDH, STD.DEV. OF AQUIFER THICKNESS = 0.00000

QINM, MEAN INFILTRATION RATE (m/day) = 0.01000
QINSTD, STD.DEV. OF INFILTRATION RATE = 0.00000

LOCATION OF RECEPTORS:

	X (M)	Y (M)	Z (M)
RECEPTOR(1)	0.0	0.0	1.0
RECEPTOR(2)	0.0	0.0	2.0
RECEPTOR(3)	0.0	0.0	3.0

BREAKTHROUGH CURVES

CONCENTRATIONS (MG/L) AT:

TIME (DAYS)	WATER TABLE BELOW THE SOURCE	RECEPTORS (in order)		
360.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
720.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1080.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1440.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1800.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4320.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4680.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5040.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5400.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

VERT DISPERSIVITY ADJUSTED 48 TIMES DUE TO MASS BALANCE CHECK

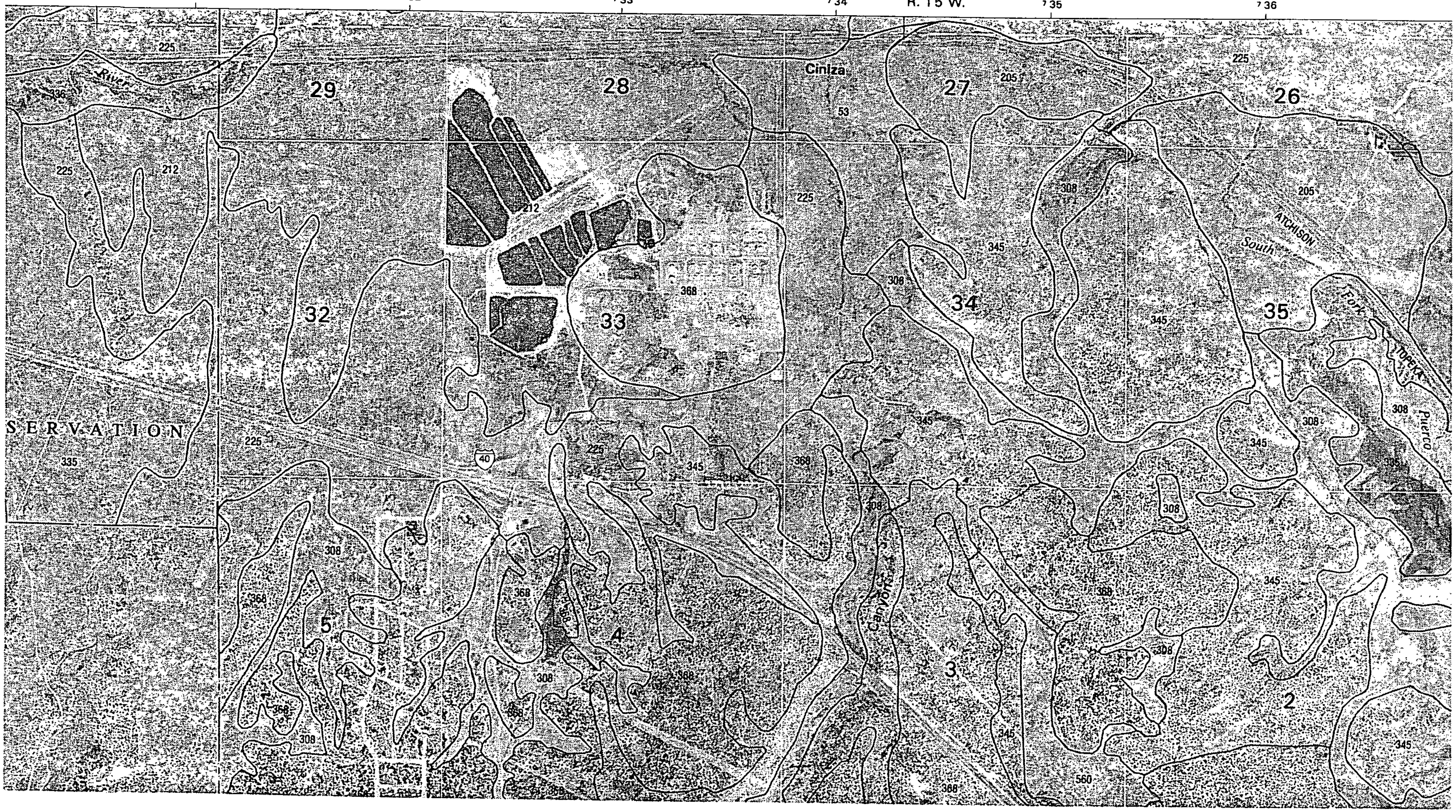
MASS OF CONTAMINANT REMAINING IN THE WASTE ZONE

TIME (DAYS)	MASS/AREA (G/M^2)	MASS FRAC. IN WASTE
0.0000000	15009.9980469	0.0182715
360.0000000	10459.5966797	0.0127323
720.0000000	8184.3964844	0.0099627
1080.0000000	5909.1958008	0.0071932
1440.0000000	3633.9951172	0.0044236
1800.0000000	1358.7945557	0.0016540
2160.0000000	0.0000000	0.0000000
2520.0000000	0.0000000	0.0000000
2880.0000000	0.0000000	0.0000000
3240.0000000	0.0000000	0.0000000
3600.0000000	0.0000000	0.0000000
3960.0000000	0.0000000	0.0000000
4320.0000000	0.0000000	0.0000000
4680.0000000	0.0000000	0.0000000
5040.0000000	0.0000000	0.0000000

T. 15 N, R. 15 W

108° 27'30"

108° 25'00"
R. 15 W.



Typical Profile:
A—0 to 5 inches; fine sandy loam
Bt—5 to 11 inches; sandy clay loam
Btk—11 to 47 inches; clay loam
Bk—47 to 65 inches; fine sandy loam

Skyvillage soils

Geomorphic position: Structural benches and summits on mesas, hills and ridges and dipslopes on cuestas
Parent material: Eolian material and slope alluvium derived from sandstone
Slope: 1 to 6 percent
Surface fragments: About 20 percent
Depth to restrictive feature: 5 to 20 inches to bedrock (lithic)
Drainage class: Well drained
Slowest permeability: About 0.60 in/hr (moderate)
Available water capacity: About 2.0 inches (very low)
Shrink-swell potential: About 4.0 LEP (moderate)
Flooding hazard: None
Seasonal water table minimum depth: Greater than 6 feet
Runoff class: Medium
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodicity maximum: About 0 SAR (slightly sodic)
Ecological site: Shallow Sandstone
Present native vegetation: Bigelow's sagebrush, blue grama, fourwing saltbush, galleta, Indian ricegrass, New Mexico feathergrass, little bluestem, shadscale saltbush, sideoats grama, winterfat, cliffrose, Mormon tea, oneseed juniper, twoneedle pinyon
Land capability (nonirrigated): 7s
Conservation Tree/Shrub Group: 10

Typical Profile:
A—0 to 2 inches; channery sandy loam
Bw1—2 to 5 inches; sandy loam
Bw2—5 to 9 inches; sandy clay loam
Bk—9 to 15 inches; sandy clay loam
2R—15 inches sandstone bedrock

Minor Components

Hagerwest and similar soils
Composition: About 10 percent
Slope: 1 to 6 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy

Rock outcrop
Composition: About 5 percent
Rock outcrop consists of barren or nearly barren areas of exposed sandstone and shale on ridges, ledges, and escarpments.

Hospah and similar soils
Composition: About 5 percent
Slope: 2 to 8 percent
Depth to restrictive feature: 5 to 20 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Shale Hills

212—Rehobeth silty clay loam, 0 to 1 percent slopes

Map Unit Setting

MLRA: 36
Elevation: 6,600 to 6,800 feet (2,012 to 2,073 meters)
Mean annual precipitation: 10 to 13 inches (254 to 330 millimeters)
Average annual air temperature: 46 to 49 degrees F (8 to 9 degrees C)
Frost-free period: 100 to 135 days

Map Unit Composition

Rehobeth and similar soils: 90 percent
Minor components: 10 percent
Urban land
In the City of Gallup, components of this map unit are covered by buildings, parking lots, roads, and sidewalks. The percentage of Urban land ranges from less than 10 percent on the city's periphery to 60 percent in densely developed residential sections. There are also many areas that have been cut and filled with a variety of earthen materials or man-made soils.

Component Descriptions

Rehobeth soils

Geomorphic position: Flood plains and stream terraces on valley floors
Parent material: Stream alluvium derived from gypsiferous shale
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Slowest permeability: About 0.06 in/hr (slow)
Available water capacity: About 8.5 inches (moderate)
Shrink-swell potential: About 7.5 LEP (high)

Flooding hazard: Occasional
Ponding hazard: Occasional
Seasonal water table minimum depth: Greater than 6 feet
Runoff class: Low
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 15 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodicity maximum: About 13 SAR (moderately sodic)
Ecological site: Salty Bottomland
Present native vegetation: alkali sacaton, western wheatgrass, fourwing saltbush, black greasewood, blue grama, bottlebrush squirreltail, inland saltgrass, mat muhly, rabbitbrush
Land capability (nonirrigated): 6c
Conservation Tree/Shrub Group: 10

Typical Profile:
A—0 to 2 inches; silty clay loam
Bw—2 to 5 inches; silty clay loam
Bss—5 to 12 inches; clay
Bssny1—12 to 18 inches; clay
Bssny2—18 to 32 inches; clay
Bssny3—32 to 80 inches; clay

Minor Components

Nuffel and similar soils
Composition: About 4 percent
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Ecological site: Bottomland

Aquima and similar soils
Composition: About 3 percent
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Ecological site: Loamy

Zia and similar soils
Composition: About 3 percent
Slope: 0 to 1 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Somewhat excessively drained
Ecological site: Sandy

215—Viuda-Penistaja-Rock outcrop complex, 1 to 5 percent slopes

Map Unit Setting

MLRA: 36
Elevation: 6,700 to 7,000 feet (2,042 to 2,134 meters)
Mean annual precipitation: 10 to 13 inches (254 to 330 millimeters)
Average annual air temperature: 49 to 54 degrees F (9 to 12 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Viuda and similar soils: 35 percent
Penistaja and similar soils: 30 percent
Rock outcrop: 25 percent
Minor components: 10 percent

Component Descriptions

Viuda soils

Geomorphic position: Lava flows
Parent material: Eolian material and slope alluvium derived from sandstone and basalt
Slope: 1 to 5 percent
Surface fragments: About 40 percent
Depth to restrictive feature: 10 to 20 inches to bedrock (lithic)
Drainage class: Well drained
Slowest permeability: About 0.06 in/hr (slow)
Available water capacity: About 2.5 inches (very low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Seasonal water table minimum depth: Greater than 6 feet
Runoff class: High
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodicity maximum: About 2 SAR (slightly sodic)
Ecological site: Malpais
Present native vegetation: blue grama, galleta, alkali sacaton, hairy grama, sideoats grama, black grama, common wolfstail, fourwing saltbush, little bluestem, spike muhly
Land capability (nonirrigated): 7s

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
205:												
Penistaja	0-3	10-20	1.40-1.50	2.00-6.00	0.11-0.13	0.0-2.9	1.0-2.0	.24	.24	5	3	86
	3-19	20-30	1.45-1.55	0.60-2.00	0.14-0.16	0.0-2.9	0.5-1.0	.32	.32			
	19-65	15-30	1.45-1.55	0.60-6.00	0.11-0.16	0.0-2.9	0.5-1.0	.32	.32			
Tintero	0-4	5-15	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	4-16	10-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28			
	16-48	10-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28			
	48-65	2-10	1.45-1.55	6.00-20.00	0.09-0.10	0.0-2.9	0.5-1.0	.20	.20			
208:												
Marianolake	0-2	10-20	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	2-8	18-30	1.35-1.45	0.60-2.00	0.16-0.18	3.0-5.9	0.0-0.5	.37	.37			
	8-14	27-35	1.35-1.45	0.20-0.60	0.19-0.21	3.0-5.9	0.0-0.5	.32	.32			
	14-24	15-25	1.45-1.55	2.00-6.00	0.13-0.15	3.0-5.9	0.0-0.5	.28	.28			
	24-39	15-25	1.45-1.55	2.00-6.00	0.13-0.15	3.0-5.9	0.0-0.5	.28	.28			
	39-70	5-15	1.55-1.65	6.00-20.00	0.09-0.10	0.0-2.9	0.0-0.5	.20	.20			
210:												
Marianolake	0-5	10-20	1.35-1.45	2.00-6.00	0.13-0.15	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	5-11	20-35	1.50-1.60	0.60-2.00	0.14-0.16	3.0-5.9	0.5-1.0	.32	.32			
	11-47	27-35	1.55-1.65	0.20-0.60	0.19-0.21	3.0-5.9	0.5-1.0	.32	.32			
	47-65	10-20	1.60-1.70	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.32	.32			
Skyvillage	0-2	5-15	1.35-1.45	2.00-6.00	0.07-0.09	0.0-2.9	0.5-1.0	.15	.24	1	4	86
	2-5	10-15	1.45-1.55	2.00-6.00	0.11-0.13	0.0-2.9	0.2-0.6	.24	.24			
	5-9	20-25	1.45-1.55	0.60-2.00	0.14-0.16	3.0-5.9	0.2-0.6	.32	.32			
	9-15	20-25	1.45-1.55	0.60-2.00	0.14-0.16	3.0-5.9	0.2-0.6	.32	.32			
	15-20	---	---	0.20-2.00	---	---	---	---	---			
212:												
Rehobeth	0-2	30-40	1.25-1.35	0.20-0.60	0.18-0.20	6.0-8.9	0.5-1.0	.37	.37	5	4L	86
	2-5	30-40	1.25-1.35	0.20-0.60	0.18-0.20	6.0-8.9	0.5-1.0	.37	.37			
	5-12	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.5-1.0	.20	.20			
	12-18	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.5-1.0	.20	.20			
	18-32	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.2-0.5	.20	.20			
	32-80	40-55	1.40-1.50	0.06-0.20	0.13-0.15	6.0-8.9	0.2-0.5	.20	.20			
215:												
Viuda	0-3	10-20	1.30-1.40	2.00-6.00	0.07-0.09	0.0-2.9	0.5-0.9	.10	.37	1	6	48
	3-15	35-50	1.40-1.45	0.06-0.20	0.14-0.17	6.0-8.9	0.0-0.0	.20	.20			
	15-17	20-35	1.45-1.50	0.60-2.00	0.15-0.17	3.0-5.9	0.0-0.0	.15	.32			
	17-20	---	---	0.00-0.20	---	---	---	---	---			
Penistaja	0-2	10-20	1.40-1.50	2.00-6.00	0.11-0.13	0.0-2.9	1.0-2.0	.24	.24	5	3	86
	2-22	20-30	1.45-1.55	0.60-2.00	0.14-0.16	3.0-5.9	0.5-1.0	.32	.32			
	22-65	15-30	1.45-1.55	0.60-6.00	0.11-0.16	3.0-5.9	0.5-1.0	.32	.32			
Rock outcrop	0	---	---	0.00-0.20	---	---	---	---	---	-	---	---
220:												
Hagerwest	0-2	10-20	1.20-1.25	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	2	3	86
	2-13	20-35	1.35-1.45	0.60-2.00	0.14-0.16	3.0-5.9	0.2-0.8	.32	.32			
	13-19	20-35	1.35-1.45	0.60-6.00	0.14-0.16	3.0-5.9	0.2-0.8	.32	.32			
	19-35	10-20	1.50-1.60	2.00-6.00	0.11-0.13	0.0-2.9	0.2-0.8	.24	.24			
	35-40	---	---	0.00-0.20	---	---	---	---	---			

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
205:							
Penistaja	0-3	5.0-15	6.6-7.8	0-1	0	0.0-2.0	0
	3-19	10-20	6.6-8.4	0-1	0	0.0-2.0	0
	19-65	5.0-20	7.4-8.4	5-10	0	0.0-2.0	0
Tintero	0-4	5.0-10	6.6-7.3	0-5	0	0	0
	4-16	5.0-15	7.4-7.8	1-5	0	0	0
	16-48	5.0-15	7.4-7.8	5-10	0	0.0-2.0	0
	48-65	1.0-1.0	7.4-7.8	5-10	0	0.0-2.0	0
208:							
Marianolake	0-2	5.0-15	7.4-8.4	0-5	0-1	0.0-2.0	0
	2-8	5.0-15	7.4-8.4	0-5	0-1	0.0-2.0	0-1
	8-14	15-25	7.4-8.4	0-5	0-1	0.0-2.0	0-1
	14-24	5.0-15	7.9-8.4	0-5	0-1	0.0-2.0	0-1
	24-39	5.0-15	7.9-8.4	0-5	0-1	0.0-2.0	0-1
	39-70	0.0-5.0	7.9-8.4	0-5	0-1	0.0-2.0	0-1
210:							
Marianolake	0-5	5.0-15	7.4-8.4	0-5	0	0.0-2.0	0
	5-11	10-25	7.4-8.4	5-10	0	0.0-2.0	0
	11-47	10-25	7.4-8.4	5-10	0	0.0-2.0	0
	47-65	5.0-15	7.4-8.4	5-10	0	0.0-2.0	0
Skyvillage	0-2	5.0-10	7.4-8.4	0-5	0	0.0-2.0	0
	2-5	5.0-10	7.4-8.4	5-10	0	0.0-2.0	0
	5-9	10-20	7.4-8.4	5-10	0	0.0-2.0	0
	9-15	10-20	7.4-8.4	5-10	0	0.0-2.0	0
	15-20	---	---	---	---	---	---
212:							
Rehobeth	0-2	20-30	7.9-9.0	1-5	1-10	0.0-2.0	1-5
	2-5	20-30	7.9-9.0	1-5	1-10	0.0-2.0	1-5
	5-12	20-40	7.9-9.0	1-5	1-10	0.0-2.0	1-5
	12-18	20-40	7.9-9.0	1-5	5-10	0.0-2.0	5-13
	18-32	20-40	7.9-9.0	1-5	5-10	0.0-2.0	5-14
	32-80	20-40	7.9-9.0	1-5	1-5	2.0-8.0	5-14
215:							
Viuda	0-3	2.0-7.0	6.6-7.3	0	0	0.0-2.0	0-2
	3-15	2.0-20	7.9-8.4	0	0	0.0-2.0	0-2
	15-17	2.0-10	7.9-8.4	1-15	0	0.0-2.0	0-2
	17-20	---	---	---	---	---	---
Penistaja	0-2	5.0-15	6.6-7.8	0-1	0	0.0-2.0	0
	2-22	10-20	6.6-8.4	0-1	0	0.0-2.0	0
	22-65	5.0-20	7.4-8.4	1-10	0	0.0-2.0	0
Rock outcrop	0	---	---	---	---	---	---
220:							
Hagerwest	0-2	5.0-15	6.6-7.8	0	0	0.0-2.0	0
	2-13	10-20	6.6-7.8	0	0	0.0-2.0	0
	13-19	10-20	7.4-8.4	1-10	0	0.0-2.0	0
	19-35	5.0-15	7.4-8.4	1-10	0	0.0-2.0	0
	35-40	---	---	---	---	---	---

New Mexico Office of the State Engineer
POD Reports and Downloads

Township: 15N Range: 15W Sections: 33

NAD27 X: Y: Zone: Search Radius:

County: Basin: Number: Suffix:

Owner Name: (First) (Last) ○ Non-Domestic ○ Domestic
◉ All

POD / Surface Data Report | Avg Depth to Water Report | Water Column Report

Clear Form | iWATERS Menu | Help

AVERAGE DEPTH OF WATER REPORT 11/29/2007

(Depth Water in Feet)

Bsn	Tws	Rng	Sec	Zone	X	Y	Wells	Min	Max	Avg
G	15N	15W	33				13		117	45

Record Count: 13

New Mexico Office of the State Engineer
Point of Diversion Summary

Back

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are biggest to smallest)

POD Number	Tws	Rng	Sec	q	q	q	Zone	X	Y
G 00003 S	15N	15W	33	1	3	1			

Driller Licence:
Driller Name: BARRON DRILLING
Source: Artesian
Drill Start Date: 09/24/1956
Drill Finish Date: 09/24/1956
Log File Date: 02/06/1957
PCW Received Date:
Pump Type:
Pipe Discharge Size:
Casing Size: 16
Estimated Yield: 370
Depth Well: 1075.
Depth Water:

Water Bearing Stratifications:	Top	Bottom	Description
	580	620	Sandstone/Gravel/Conglomer
	645	670	Sandstone/Gravel/Conglomer
	725	740	Sandstone/Gravel/Conglomer
	790	1070	Sandstone/Gravel/Conglomer
Casing Perforations:	**Top**	**Bottom**	
	580	625	
	645	670	
	725	740	
	790	950	
	960	070	

New Mexico Office of the State Engineer
Point of Diversion Summary

Back

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are biggest to smallest)

POD Number	Tws	Rng	Sec	q	q	q	Zone	X	Y
G 00003	15N	15W	33	3	1	1			

Driller Licence:
Driller Name: BARRON DRLG. CO.
Source: Artesian
Drill Start Date: 08/27/1956
Drill Finish Date: 09/22/1956
Log File Date: 12/26/1956
PCW Received Date:
Pump Type:
Pipe Discharge Size:
Casing Size: 16
Estimated Yield: 125
Depth Well: 1235.
Depth Water:

Water Bearing Stratifications:	Top	Bottom	Description
	100	150	Sandstone/Gravel/Conglomer
	520	600	Sandstone/Gravel/Conglomer
	640	700	Sandstone/Gravel/Conglomer
	800	1020	Sandstone/Gravel/Conglomer
Casing Perforations:	**Top**	**Bottom**	
	520	600	
	625	700	
	710	750	
	800	020	

HALL
ENVIRONMENTAL
ANALYSIS
LABORATORY

COVER LETTER

December 30, 2005

Steve Morris
Giant Refining Co
Rt. 3 Box 7
Gallup, NM 87301
TEL: (505) 722-0258
FAX (505) 722-0210

RE: Annual Pond Samp for Gen Chem Pond #8- Order No.: 0512188

Dear Steve Morris:

Hall Environmental Analysis Laboratory received 1 sample on 12/15/2005 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Business Manager
Nancy McDuffie, Laboratory Manager

4901 Hawkins NE ▪ Suite D ▪ Albuquerque, NM 87109
505.345.3975 ▪ Fax 505.345.4107
www.hallenvironmental.com

Hall Environmental Analysis Laboratory

Date: *30-Dec-05*

CLIENT: Giant Refining Co
Client Sample ID: Pond #8

Lab Order: 0512188
Collection Date: 12/13/2005 10:30:00 AM

Project: Annual Pond Samp for Gen Chem Pond #8-200

Lab ID: 0512188-01
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: MAP
Fluoride	ND	50		mg/L	500	12/28/2005
Chloride	79000	500		mg/L	5000	12/28/2005
Phosphorus, Orthophosphate (As P)	ND	250	H	mg/L	500	12/28/2005
Sulfate	4800	250		mg/L	500	12/28/2005
Nitrate (As N)+Nitrite (As N)	ND	50		mg/L	500	12/28/2005
EPA 120.1: SPECIFIC CONDUCTANCE						Analyst: TES
Specific Conductance	280000	0.20		µmhos/cm	20	12/23/2005
EPA 6010: TOTAL RECOVERABLE METALS						Analyst: NMO
Calcium	200	10		mg/L	10	12/27/2005 3:23:15 PM
Magnesium	4000	200		mg/L	200	12/27/2005 3:27:36 PM
Potassium	7300	200		mg/L	200	12/27/2005 3:27:36 PM
Sodium	47000	500		mg/L	500	12/28/2005 7:53:33 AM
EPA METHOD 150.1: PH						Analyst: TES
pH	5.42	0.010		pH units	1	12/16/2005

Qualifiers:
- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

APPENDIX B

APPENDIX B

PRELIMINARY ENGINEER'S OPINION OF PROBABLE COSTS
Project Name:
WESTERN REFINING COMPANY,
CINIZA REFINERY POND CLOSURE

					ENGINEERS ESTIMATE GANNETT FLEMING WEST, INC.	
BID ITEM #	**ITEM ID NO.**	**ITEM DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**UNIT PRICE**	**AMOUNT**
1	621000	MOBILIZATON	LS	1.00	$15,000.00	$15,000.00
2	603000	NPDES PERMITTING AND SWPPP IMPLEMENTATION, COMPLETE	LS	1.00	$15,000.00	$15,000.00
3	801000	CONSTRUCTION STAKING, COMPLETE	LS	1.00	$5,500.00	$5,500.00
4	201000	CLEAR AND GRUB, COMPLETE	LS	1.00	$10,000.00	$10,000.00
5	209000	MISC. GRADING, AND SHAPING, COMPLETE	SY	158500	$5.00	$792,500.00
6	632000	CLASS A SEEDING, COMPLETE	AC	182	$1,500.00	$273,000.00
7	603200	SILT FENCE, COMPLETE	LF	5800	$5.60	$32,480.00
8		ENGINEERING AND CONSTRUCTION SERVICES	LS	1	$114,348.00	$114,348.00
		Subtotal of Base Bid Items				$1,242,828.00
		New Mexico Gross Receipts Tax (NMGRT) at 6.625%				$82,337.36
		TOTAL				**$1,325,165.36**

Equipment	Monthly Rate	Daily Equivalent	per cy
Scraper (17 yd)	$12,500.00	$416.67	$0.08
Grader (16H)	$16,000.00	$533.33	$0.10
Dump Truck (4C	$15,200.00	$506.67	$0.09
Dump Truck (4C	$15,200.00	$506.67	$0.09
Water Truck	$13,700.00	$456.67	$0.08
Compactor	$4,000.00	$133.33	$0.02
Loader	$11,800.00	$393.33	$0.07
Fuel Truck	$5,500.00	$183.33	$0.03
	Subtotal		$0.57

Personnel	Hourly Wage	Daily Equivalent	per cy
Operator	$15.93	$127.44	$0.02
Operator	$15.93	$127.44	$0.02
Operator	$15.93	$127.44	$0.02
Operator	$15.93	$127.44	$0.02
Laborer	$10.47	$83.76	$0.02
Laborer	$10.47	$83.76	$0.02
Supervisor	$24.59	$196.72	$0.04
Helper	$10.04	$80.32	$0.01
Helper	$10.04	$80.32	$0.01
	Subtotal		$0.19

Materials	Unit Cost	Daily Equivalent	per cy
Water (gal)	$0.81	$16,200.00	$2.95
Fuel (gal)	$2.85	$2,850.00	$0.52
	Subtotal		$3.46

Additional Costs

G&A on labor	1.70		$0.32
Parts and maint	12.00%		$0.07
Profit	8.00%		$0.37
	Subtotal		$0.76

Total Unit Cost per cu yd of earthwork **$4.98**

Gannett Fleming

GANNETT FLEMING WEST, INC.
2155 Louisiana Blvd. NE
Suite 7000
Albuquerque, New Mexico 87110

Office (505) 265-8468
Facsimile (505) 881-2513

October 23, 2007

Mr. Ed Riege
Environmental Superintendent
Giant Refining Company
Rt. 3 Box 7
Gallup, NM 87301

RE: Proposal to Prepare Closure Plan for Evaporation Ponds

Dear Mr. Riege:

At the request of Mr. Allen Hains, Western Refining Company, Gannett Fleming West, Inc. (GFW) is providing this proposal and cost estimate to prepare a closure plan for the unlined wastewater and evaporation/temporary ponds at the Ciniza Refinery near Gallup, New Mexico. The purpose of the closure plan will be to comply with Condition 27 of the facility's discharge permit, and the closure and post-closure requirements of 19.15.36.17 NMAC and 19.15.36.18 NMAC, as applicable to the evaporation ponds. In addition, the OCD Guidelines require that the closure plan include all of the information described in WQCC Section 3107.A.11, and follow the OCD Guidelines for Remediation of Leaks, Spills and Releases. Furthermore, the evaporation ponds have been identified as SWMU #2 in the facility's RCRA permit. Therefore, the closure of these ponds must comply with the closure and post-closure requirements of the RCRA permit, as well. To comply with the terms and conditions of the facility's discharge permit, the Closure Plan and Financial Assurance demonstration must be submitted by December 31, 2007. Therefore, GFW will submit a draft closure plan for review and comment by November 30, 2007.

GFW will develop a closure plan for the evaporation ponds based on the applicable regulations and guidelines, as discussed above. Because of time constraints, GFW will be unable to perform any field investigations, and so the closure plan will be developed from existing information provided by the refinery and supplemented from available public document sources.

GFW will begin this work by reviewing the available site information. This will include the Discharge Permit and permit application, RCRA Permit and related documents, facility survey and site drawings, and historic monitoring results for the ponds. Background geological and hydrological information will be gathered from site documents and published technical reports for the area of the refinery.

Based on discussions with refinery personnel, GFW envisions a closure program that will involve removal of the impounded water by evaporation, grading the existing berms into the

ponds, and supplementing the earth quantities, as necessary, by scraping adjacent site soils. The entire pond area will then be graded to provide for natural drainage after closure, and the site will be revegetated in accordance with the applicable regulations and guidelines. However, this assumes that the ponds will not require remediation.

GFW will review the available monitoring reports for the ponds and the current OCD guidelines for soil remediation. GFW will then use the VADSAT model to estimate remediation depths based on BTEX and chloride concentrations. Although no longer supported by API, the VADSAT model was used by the OCD Chloride Working Group, and it has been accepted as a Risk-Based closure model by OCD. If the model results indicate remediation is required, GFW will estimate the soil volume that must be removed from the pond bottoms. Alternatively, since chlorides are an issue from a soil sterility analysis standpoint, GFW will consider chloride concentrations in the revegetation root zone and alternatives to excavation, such as gypsum application, to reduce site remediation costs. GFW will then develop a grading plan using the existing site survey as a basis. The material quantities for the closure will be taken off the drawings, which will be prepared in AutoCad. A closure plan document will then be prepared, to include the following:

Site description and process summary
Geologic and hydrologic conditions
Summary of monitoring results
Results of VADSAT model
Description of closure measures
Site plan showing existing conditions
Final grading plan
Description of post-closure maintenance and monitoring
Summary of quantities and cost estimate for closure

The accuracy of the drawings will be limited to that of the site survey provided. GFW will rely on the accuracy and adequacy of the materials provided by Western/Giant for purposes of preparing the closure plan. GFW cannot guarantee that the closure plan will be approved by OCD, but it will address the issues covered by the applicable rules and guidelines.

GFW will provide three hard copies of the draft closure plan for review and comment by November 30, 2007. Once comments have been received, GFW will prepare the final closure plan for submission to the OCD. Five hard copies and one electronic copy (CD) will be provided of the final documents. The files will be editable format, so Western/Giant can revise and update the plan in the future.

GFW proposes to invoice this project on a lump sum basis. Our lump sum estimate for the work described in this letter is $23,245.28 plus NMGRT ($24,843.39 total with tax included). This estimate is based on the following assumptions:

1. The final grading plan and material quantities will be developed from the site survey provided by the refinery.
2. The refinery will provide pond monitoring results sufficient for GFW to estimate excavation depths and backfill for the closure estimate.
3. The closure estimate can be made from average unit bid prices, supplier quotations, published material prices, and GFW's recent experience with similar bid items.
4. The closure plan will be prepared by, or under the supervision of, a Professional Engineer registered in New Mexico.
5. The closure plan will be developed on the basis of current regulations and site conditions. Western/Giant should be aware that the OCD is proposing amendments to their regulations, which may impact closure of the evaporation ponds in the future.

We are prepared to begin work on this project upon receipt of your notice to proceed. We anticipate submitting the draft plan on or before November 30, 2007. Assuming review comments are received by November 5, 2007, GFW anticipates submitting the final plan on or before December 17, 2007.

GFW appreciates the opportunity to bid on this work, and looks forward to working with you on this time-critical project. Should you have any questions concerning this project, please call Mike Brazie at (505) 265-8468 x109.

Sincerely,
GANNETT FLEMING WEST, INC.

Mike E. Brazie

Mike E. Brazie, P.E.
Senior Project Manager

cc: Allen Hains, Western Refining Company

Gannett Fleming

GANNETT FLEMING WEST, INC.
2155 Louisiana Boulevard, NE
Suite 7000
Albuquerque, New Mexico 87110

Office 505.265.8468
Facsimile 505.881.2513

September 14, 2007

Mr. Ed Riege
Environmental Superintendent
Giant Refining Company
Rt. 3 Box 7
Gallup, New Mexico 87301

RE: Financial Assurance Cost estimate for Pond Closure

Dear Mr. Riege:

Executive Summary

Gannett Fleming West, Inc. (GFW) has prepared an engineer's opinion of probable costs for closure of the unlined wastewater and evaporation/temporary ponds for the Ciniza Refinery located in McKinley County, New Mexico. This estimate was prepared for financial assurance compliance with Condition 27 of the facility's draft discharge permit. It should be noted that a closure plan has not yet been prepared for this facility, and is pending the final discharge permit conditions placed on the facility by the New Mexico Oil Conservation Division (OCD). If conditions change from those assumed for this estimate, the closure costs should be re-evaluated.

GFW performed this work by reviewing the available site information including the Draft Discharge Permit (July 9, 2007), Discharge Plan Renewal Application (Permit No. GW-032), SWMU Summary Reports, refinery site map, OCD Guidelines for Remediation, and historic monitoring results for the ponds. GFW personnel also visited the refinery to visually inspect the ponds.

Based on these findings and the assumptions discussed in this letter, GFW has estimated pond closure costs to be $21,080,000. GFW's cost estimate includes volume of soil to backfill the ponds, grading requirements to attain drainage contours, revegetation, and expected equipment and labor efforts. Post-closure costs are not included, based on the assumption that the ponds are within the applicable closure standards and can be closed without remediation of contaminants.

GFW estimated earthwork quantities based on pond dimensions and other factors provided by the refinery such as onsite borrow being available. Construction labor rates

are based on latest (2007) New Mexico Department of Labor Construction Wages Rates, for the central part of the state. Average 2006-2007 unit bid rates for New Mexico Department of Transportation were also used to develop unit costs. Equipment rates and fuel rates were developed using supplier quotations and local commodity prices. The developed costs are provided in the attached spreadsheet with estimated quantities, unit prices, and total costs. Supporting cost information relied upon to develop this estimate is also attached to this letter. New Mexico Gross Receipts Tax (NMGRT) at the current McKinley County rate and a 10% contingency are also included.

No provision has been made for state procurement costs. If the State of New Mexico performs the closure of these ponds, GFW assumes it will be performed as part of a closure of the entire facility, whereas the scope of this estimate is for the ponds alone. Some economies of scale might be realized if the ponds are closed as part of a complete facility closure, but allowance for that has not been included in this estimate.

Discussion of Methodology

Because no closure plan has yet been developed for these ponds, and construction drawings were not available, GFW estimated earthwork quantities using the best information available. A plan drawing of the ponds was provided in AutoCAD format by the refinery. The surface area of each pond was measured in AutoCAD.

Portions of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) report were provided to GFW for use on this project. That document reported the water depth of the ponds to be between two and four feet deep, it is assumed this will be allowed to evaporate prior to pond closure. Based on the reported water depth, and height of the berms observed during our site visit, GFW assumed the depth of all ponds to be four feet. This assumption will need to be verified by an engineer for final closure cost estimates.

The RFI also reported that no contamination has been detected from the ponds. The facility operations also told GFW that there is no contamination from the ponds, except for minor chlorides in a few areas. The RFI and the operators indicated that no standards of the OCD or Water Quality Control Commission (WQCC) standards had been exceeded. Therefore, GFW assumed the ponds could attain clean closure without the need for excavating the pond bottoms or performing remedial action in the ponds. Natural site soils are reported in the RFI to be low permeability (10-7 cm/sec) clays.

No information was available on the piping between the ponds or the valve boxes. GFW has assumed those will be removed as part of the pond closure. To estimate those quantities, GFW determined the distance between the ponds at the locations where the operators indicated pipes exist, or where they were observed during the site visit. The operators told GFW they were cast iron pipes at shallow (6 to 12 inches) depth. One valve box was noticed during the site visit and 11 others are shown on a pond flow diagram provided. Therefore, this provides the basis for the removal estimate.

Assumptions

For estimating the closure costs, GFW has assumed the closure will involve the following activities:

1. The berms will be graded into the ponds, which will be restored to near surrounding topography.
2. The cast iron pipe and 12 concrete valve boxes are buried at no more than 12 inches deep, and will be excavated and removed.
3. The ponds will be filled four feet to match the surrounding grade.
4. The filled ponds will be capped with site soils and shaped to provide 1.5% slopes to the sides for drainage.
5. The ponds will be closed in groups, as shown on the facility plan.
6. Drainage channels will be constructed and rip rap placed around the closed ponds to allow drainage to the northwest, following the natural drainage pattern of the area.
7. The closed ponds will be seeded with New Mexico Department of Transportation (NMDOT) Class A Seed Mix, and no irrigation will be required after site closure.

Additional cost assumptions are as follows:

1. The fill material is available on site as excavated or banked earth, and can be easily scraped and/or excavated to fill the ponds. No haul distance or offsite material cost was included in the cost estimate.
2. Fuel costs are based on commercial diesel prices in the area at the time of the site visit.
3. Water costs are based New Mexico rate summaries for western New Mexico. Actual rates will vary, depending on the source. GFW assumed water would be available at the refinery, so no haul costs are included in the estimate.
4. The earthwork unit cost calculated for this project was compared to recent NMDOT bid rates, as shown in Bid Express, and the rates appear to be consistent for the earthwork.
5. GFW assumed 4,000 cubic yards per day could be excavated and placed with the equipment and personnel shown.

Closure Estimate

Based on the methodology and assumptions presented herein, GFW estimates the closure cost for these ponds at $24,030,000 at current (2007) prices. Because the refinery does not have plans to close these ponds in the near future, the actual closure costs may differ significantly from this estimate, as commodity and labor costs fluctuate. Therefore, if conditions change from those assumed by GFW, the closure costs should be re-evaluated.

Assuming closure in 2012 (five years into the future), and the current rate of inflation based on the latest Consumer Price Index (2.7%), the future value of the closure cost would be $23,937,800.

This cost opinion has been prepared for the sole purpose of the Giant Ciniza Refinery complying with the financial assurance requirements of the OCD.

Gannett Fleming West appreciates being of service to you. Please do not hesitate to contact us with any questions.

Sincerely,

GANNETT FLEMING WEST, INC.

Mike E. Brazie, P.E.
Senior Project Manager

CC: Allen Hains, Western Refining Company

Enclosures (1)

GFW Project No. 048713
Ciniza Refinery McKinley County, New Mexico
Financial Assurance Cost Estimate
Evaporation Pond Closure Costs, 2007 Basis

Equipment	**Monthly Rate**	**Daily Equivalent**	**per cy***
Scraper (17 yd)	$12,500.00	$416.67	$0.10
Grader (16H)	$16,000.00	$533.33	$0.13
Dump Truck (40T)	$15,200.00	$506.67	$0.13
Dump Truck (40T)	$15,200.00	$506.67	$0.13
Water Truck	$13,700.00	$456.67	$0.11
Compactor	$4,000.00	$133.33	$0.03
Loader	$11,800.00	$393.33	$0.10
Fuel Truck	$5,500.00	$183.33	$0.05
	Subtotal		$0.78
Personnel	**Hourly Wage**	**Daily Equivalent**	**per cy**
Operator	$15.93	$127.44	$0.03
Operator	$15.93	$127.44	$0.03
Operator	$15.93	$127.44	$0.03
Operator	$15.93	$127.44	$0.03
Laborer	$10.47	$83.76	$0.02
Laborer	$10.47	$83.76	$0.02
Supervisor	$24.59	$196.72	$0.05
Helper	$10.04	$80.32	$0.02
Helper	$10.04	$80.32	$0.02
	Subtotal		$0.26
Materials	**Unit Cost**	**Daily Equivalent**	**per cy**
Water (gal)	$0.81	$16,200.00	$4.05
Fuel (gal)	$2.85	$2,850.00	$0.71
	Subtotal		$4.76
Additional Costs			
G&A on labor	1.70		$0.44
Parts and maintenance	12.00%		$0.09
Profit	8.00%		$0.51
	Subtotal		$1.04
Total Unit Cost per cu yd of earthwork			**$6.84**

*CY/day= 4000

GFW Project No. 048713
Ciniza Refinery McKinley County, New Mexico
Financial Assurance Cost Estimate
Evaporation Pond Closure Costs, 2007 Basis

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT COST (3)	ESTIMATED QUANTITIES	ESTIMATED COST
1	MOBILIZATION-DEMOBILIZATION (ABQ TO CINIZA)	L.S.	$ 175,000	1	$ 175,000
2	EARTHWORK	CU. YD	$ 6.84	2,668,112	$ 18,249,886
3	DRAINAGE GRADING	CU. YD	$ 6.84	3,592	$ 24,569
4	RIPRAP CLASS B	CU. YD	$ 125	4,041	$ 505,125
5	CLASS A SEEDING	ACRE	$ 1,400	120	$ 168,000
6	CONSTRUCTION QC/QA	L.S.	$ 32,000	1	$ 32,000
7	REMOVALS	L.S.	$ 7,500	1	$ 7,500
					$ -
				Subtotal	**$ 19,162,080**
				10% Contingency	**$ 1,916,208**
				McKinley Co. GRT (6.625)	**$ 1,269,488**
				Total	**$ 21,078,288**

* Assumptions:
1. On-site borrow available, no-haul cost
2. Level of NMED, OCD, EPA, RCRA regulated substances are below levels requiring corrective action.
3. Prices based on 2006-2007 Bid Express, supplier quotations, NM dept Labor Wage Rates

GFW Project No. 048713
Ciniza Refinery McKinley County, New Mexico
Financial Assurance Cost Estimate
Evaporation Pond Closure Costs, 2007 Basis

Areas based on CADD drawing (Z-02-146.dwg) provided by Western Refinery

	Area		Basin Fill Volume	
Pond/Lagoon	**Acres**	**ft2**	**ft3**	**cy**
Aeration Lagoon 1	0.3	12,838	51,352	1,902
Aeration Lagoon 1	0.5	22,952	91,808	3,400
Evaporation Pond 1	1.5	63,862	255,448	9,461
Evaporation Pond 2	8.5	371,534	1,486,136	55,042
Evaporation Pond 3	3.9	170,970	683,880	25,329
Evaporation Pond 4	3.9	169,432	677,728	25,101
Evaporation Pond 5	5.2	227,124	908,496	33,648
Evaporation Pond 6a	6.8	297,899	1,191,596	44,133
Evaporation Pond 6b	5.1	220,653	882,612	32,689
Evaporation Pond 7	22.6	983,948	3,935,792	145,770
Evaporation Pond 8	6.3	276,253	1,105,012	40,926
Evaporation Pond 9a	5.2	225,466	901,864	33,402
Evaporation Pond 9b	4.8	210,041	840,164	31,117
Evaporation Pond 9c	6.1	264,712	1,058,848	39,217
Evaporation Pond 9d	6.1	266,848	1,067,392	39,533
Evaporation Pond 10	0.2	8,716	34,864	1,291
Evaporation Pond 11	21.4	930,734	3,722,936	137,887
Evaporation Pond 12a	5.7	246,521	986,084	36,522
Evaporation Pond 12b	5.1	219,980	879,920	32,590
Drainage Ditch	0.6	24,750	99,000	3,667
Total Area	**119.7**	**5,215,233**	**20,860,932**	**772,627**

Basin fill volume assume 4 deep