Western Refining
GALLUP REFINERY

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January 22, 2008

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

Hope Monzeglio
Environmental Engineer
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, BLDG 1
Santa Fe NM 87505

Dear Mr. Chavez and Ms. Monzeglio:

Enclosed is the closure plan and financial assurance cost estimate report for the evaporation ponds at the Gallup Refinery. The report is being submitted as required by Condition 27 in the discharge permit (GW-32). The report was prepared for Western Refining by the environmental engineering firm Gannett Fleming West, Inc. in Albuquerque.

If you have any questions regarding the report please contact Mr. Ed Riege at (505) 722-0217.

Sincerely,

Jim Lieb
Environmental Engineer
Western Refining, Gallup Refinery

Cc: Ed Riege

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

NEW MEXICO ENVIRONMENT DEPARTMENT

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

April 11, 2008

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

RE: CLARIFICATION OF RCRA CORRECTIVE ACTION PROCESS
EVAPORATION POND CLOSURE PLAN
WESTERN REFINING COMPANY, GALLUP REFINERY
HWB-GRCC-MISC
EPA ID # NMD000333211

Dear Mr. Riege:

The New Mexico Environment Department (NMED) received the *Evaporation Pond Closure Plan* (Closure Plan) dated, December 2007 submitted on behalf of Western Refining Company, Gallup Refinery (Permittee). The Closure Plan was submitted as a requirement of the Oil Conservation Division (OCD) Discharge Permit (GW-032). This letter does not provide comments regarding the Closure Plan; however, NMED has taken this opportunity to provide the RCRA requirements that must be followed at the time the Evaporation Ponds (EPs) are removed from service. This process also applies to Solid Waste Management (SWMU) Unit No. 1 Aeration Basin.

The EPs are SWMU Unit No. 2 based on NMED's Post-Closure Care Permit. When the EPs are removed from service, they must go through the RCRA corrective action process outlined below. Definitions to the terminology below can be found in 20.4.2.7 NMAC.

a. Data collected during the investigations conducted in the early 1990's were not collected in accordance with standard sampling methods and procedures (e.g.; soil samples analyzed for VOC analysis were collected as composite samples);

b. The data collected is 10 to 15 years old and the EPs have been in continuous operation since this time;

c. The facility has had various releases of untreated wastewater to the aeration lagoons and EPs 1 and 2. Remedial actions to remove contaminated soil from the banks of EP 1 and 2 have been conducted twice since 2000. It is unknown whether contamination has migrated to the other ponds.

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

Sincerely,

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

cc: D. Cobrain NMED HWB
C. Frishkorn, NMED HWB
H. Monzeglio NMED HWB
W. Price, OCD
C. Chavez, OCD
J. Lieb, Western
File: Reading File and GRCC 2008 File
HWB-GRCC-MISC

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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

MIKE E. BRAZIE
NEW MEXICO
9376
REGISTERED PROFESSIONAL ENGINEER
12/11/07

TABLE OF CONTENTS

SITE LOCATION AND DESCRIPTION 1
SITE SOILS 1
SITE GEOLOGY 2
SURFACE AND GROUNDWATER HYDROLOGY 2
POST CLOSURE LAND USE 2
CLOSURE PLAN COMPONENTS 2
POTENTIAL FOR SITE REMEDIATION 2
WATER EVAPORATION 4
SITE GRADING 4
ROAD RECLAMATION 5
SITE DRAINAGE 5
REVEGETATION 5
REGULATORY COMPLIANCE 6
CLOSURE OPERATIONS AND SCHEDULE 6
CLOSURE COST ESTIMATE 7
MATERIAL ESTIMATES 7
COST ESTIMATE 8
REFERENCES 9

TABLES

No.	Table	Page
1	Recent Sampling Results	1-2
2	Volume Summaries	2-3
3	Cost Summaries	4-5

APPENDICES

APPENDIX A ..... VADSAT MODEL RESULTS
APPENDIX B ..... DETAILED COST ESTIMATE AND PRICING

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

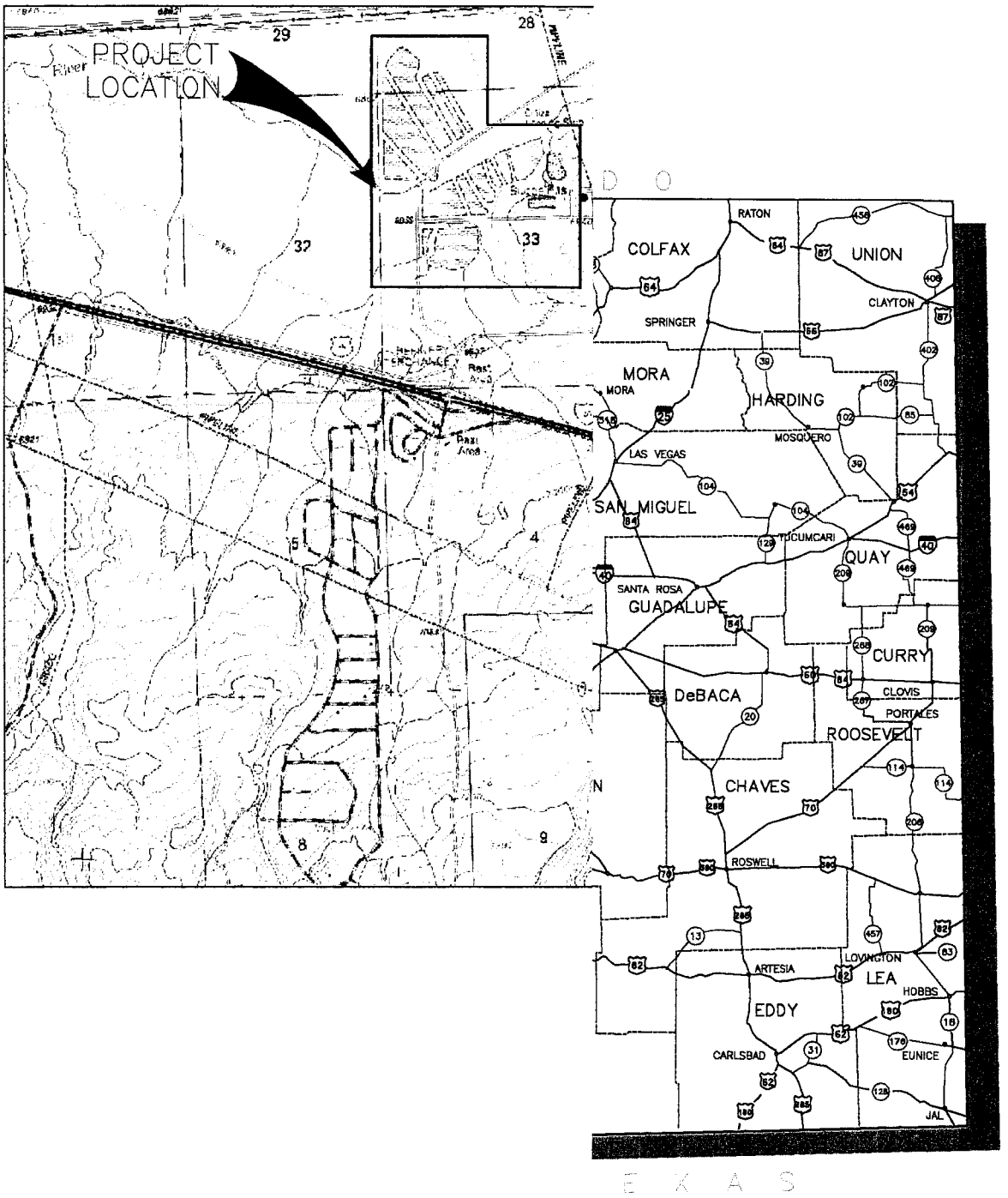
Giant Ciniza Refining Co., RFI Phase I Supplemental Report, August 21, 1991

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
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2			
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REVISIONS (OR CHANGE NOTICES)

GIANT – WESTERN REFINING COMPANY
SITE GRADING

LOCATION MAP

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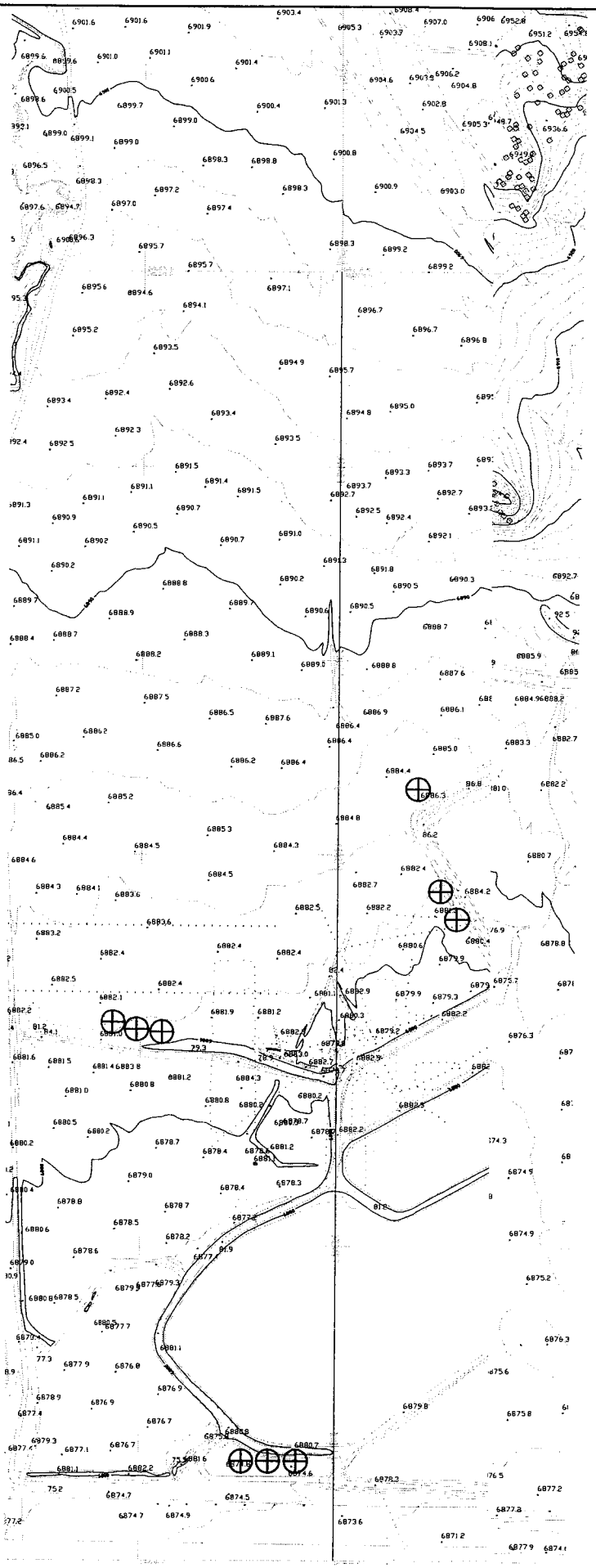
FIGURE 1



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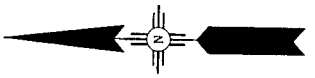

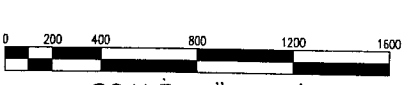

SCALE: 1"=400'

NO.	DESCRIPTION	DATE	BY
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REVISIONS (OR CHANGE NOTICES)

GIANT – WESTERN REFINING COMPANY

SITE GRADING

EXISTING CONDITIONS

LAYOUT: EXISTING
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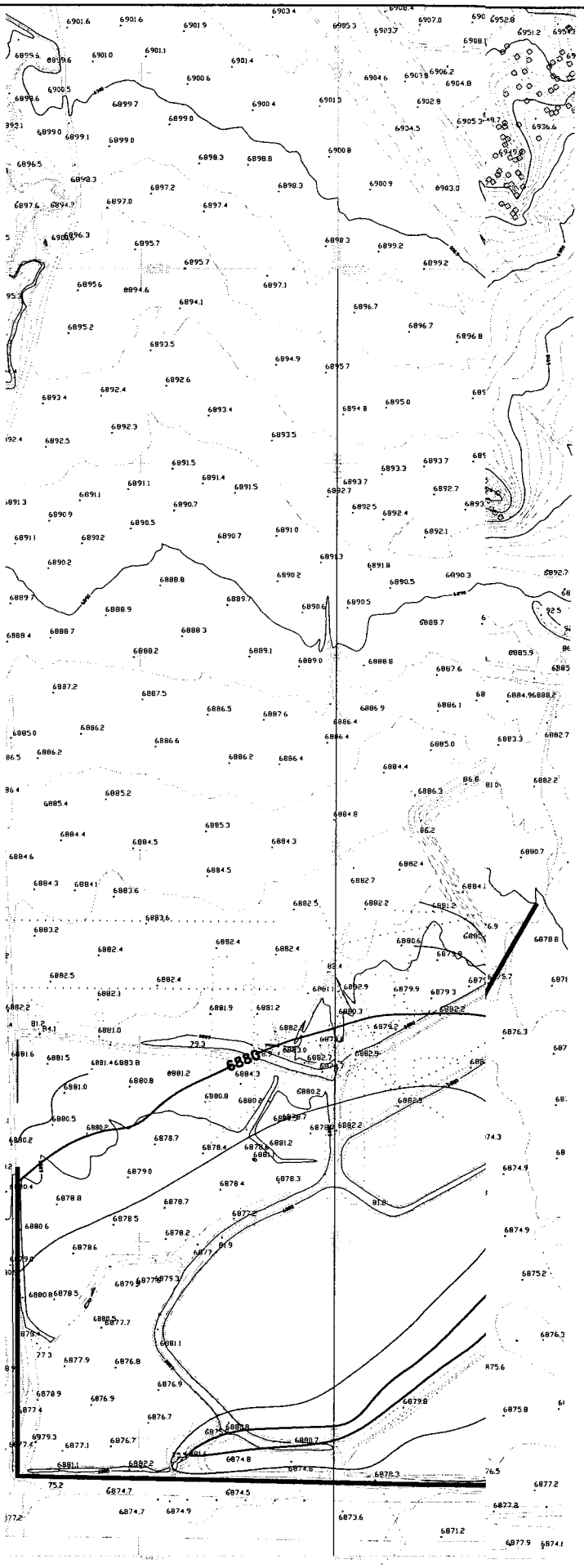
FIGURE 2



SILT FENCE

0 200 400 800 1200 1600

SCALE: 1"=400'

NO.	DESCRIPTION	DATE	BY
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REVISIONS (OR CHANGE NOTICES)

GIANT – WESTERN REFINING COMPANY

SITE GRADING

PROPOSED POND AREA GRADING

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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.

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

MIKE E. BRAZIE
NEW MEXICO
9376
REGISTERED PROFESSIONAL ENGINEER
12/11/07

TABLE OF CONTENTS

SITE LOCATION AND DESCRIPTION 1
SITE SOILS 1
SITE GEOLOGY 2
SURFACE AND GROUNDWATER HYDROLOGY 2
POST CLOSURE LAND USE 2
CLOSURE PLAN COMPONENTS 2
POTENTIAL FOR SITE REMEDIATION 2
WATER EVAPORATION 4
SITE GRADING 4
ROAD RECLAMATION 5
SITE DRAINAGE 5
REVEGETATION 5
REGULATORY COMPLIANCE 6
CLOSURE OPERATIONS AND SCHEDULE 6
CLOSURE COST ESTIMATE 7
MATERIAL ESTIMATES 7
COST ESTIMATE 8
REFERENCES 9

TABLES

No.	Table	Page
1	Recent Sampling Results	1-2
2	Volume Summaries	2-3
3	Cost Summaries	4-5

APPENDICES

APPENDIX A ..... VADSAT MODEL RESULTS
APPENDIX B ..... DETAILED COST ESTIMATE AND PRICING

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

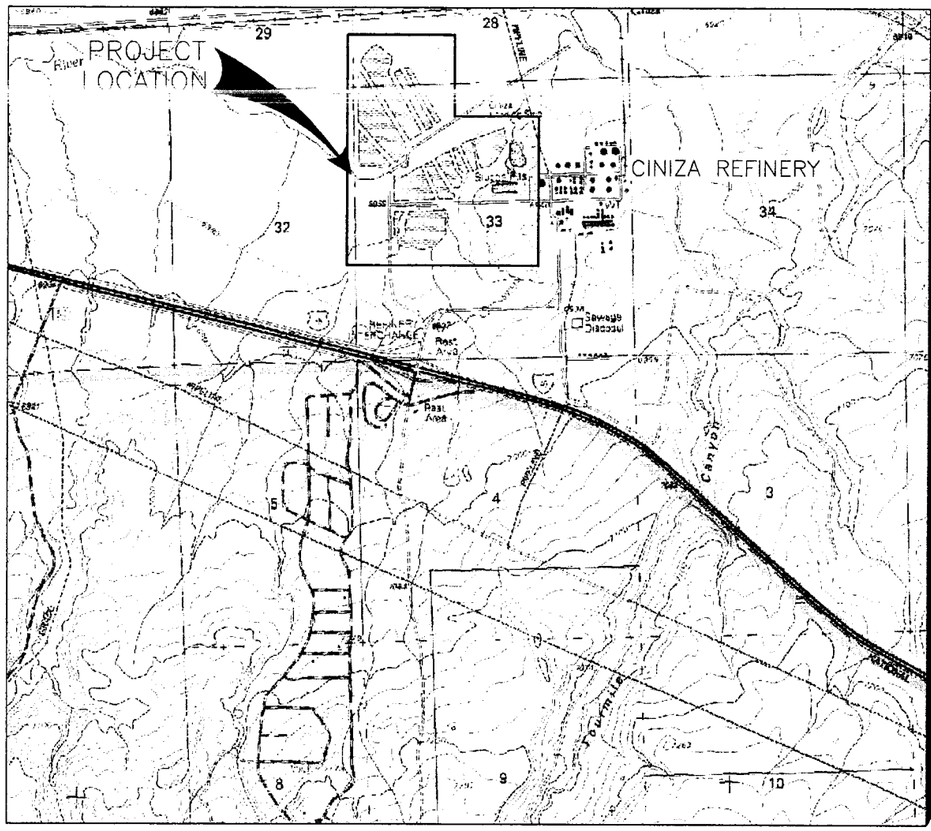
Giant Ciniza Refining Co., RFI Phase I Supplemental Report, August 21, 1991

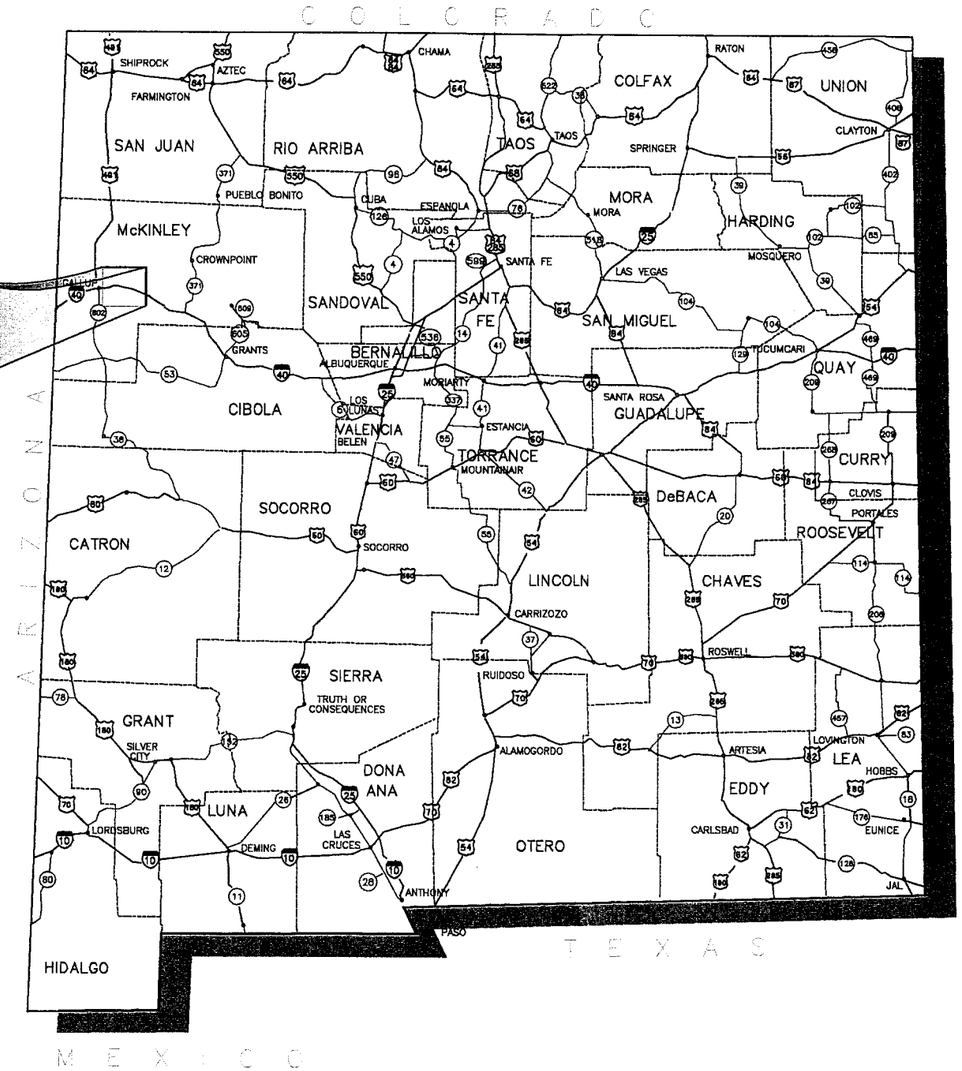
Giant Ciniza Refining Co., RFI Phase II Report, October 21, 1991

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)

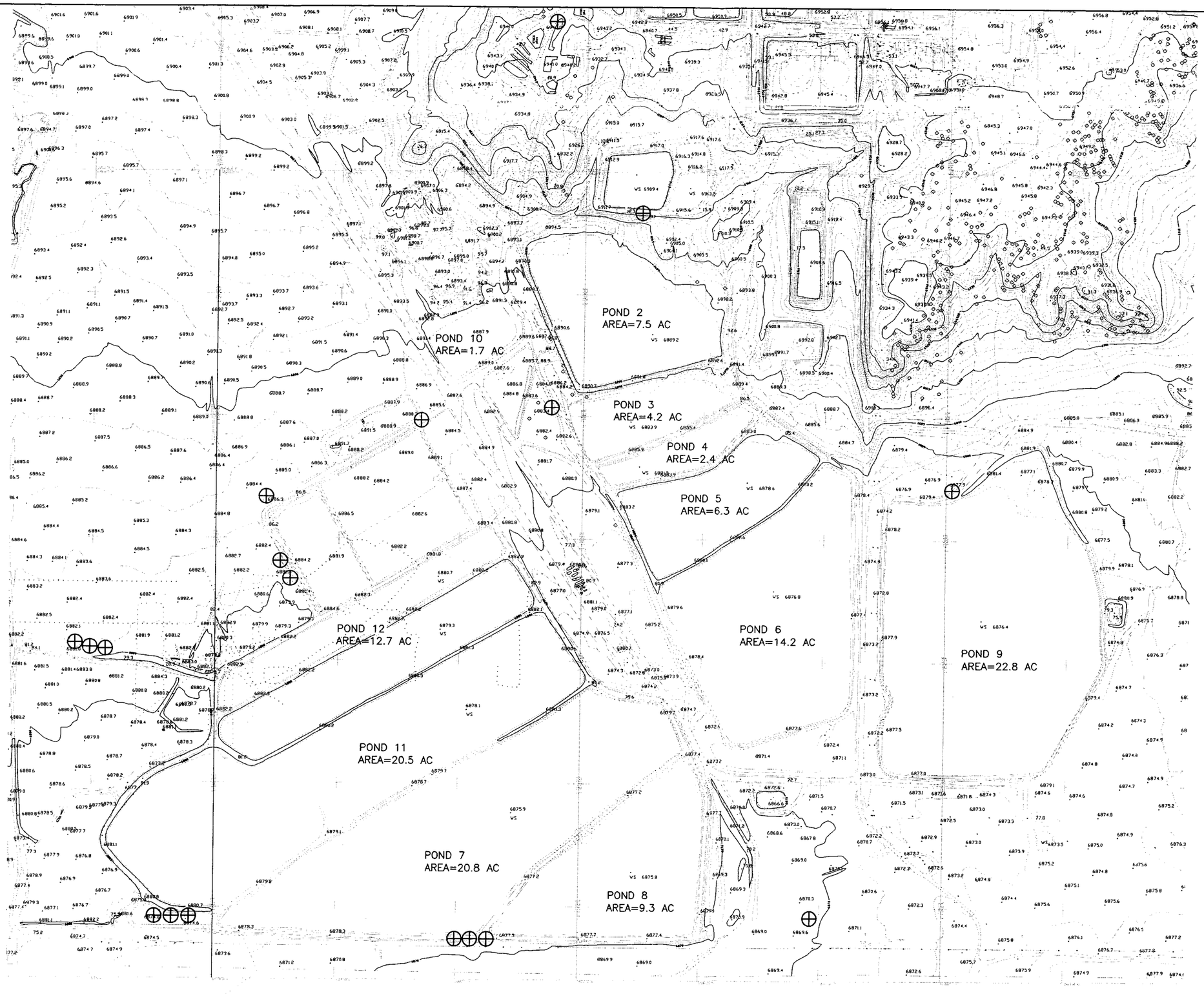
GIANT – WESTERN REFINING COMPANY
SITE GRADING

LOCATION MAP

ENGR. FILE :

Gannett Fleming West, Inc.

FIGURE 1



⊕ EXISTING WELL

N

0 200 400 800 1200 1600

SCALE: 1"=400'

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
X:\PROJECTS\6713\CADD\PLANS\B13GPD.DWG
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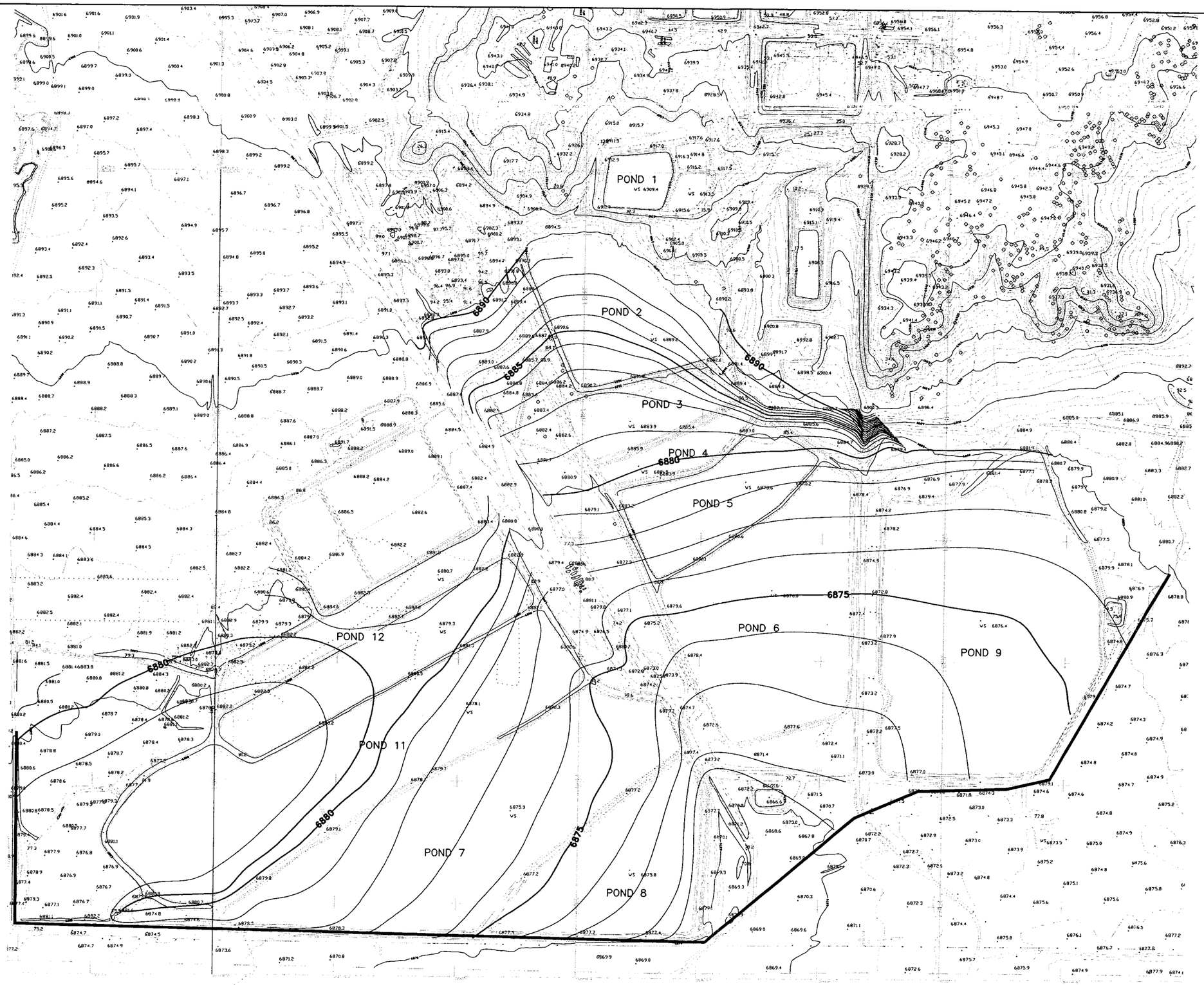

SILT FENCE

0 200 400 800 1200 1600

SCALE: 1"=400'

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

DGNPROSEC
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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.

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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                                     +
+                                                                       +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
```

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   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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 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    WATER TABLE     RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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
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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 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

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     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   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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 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   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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                                    +
+                                                                     +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
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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    WATER TABLE     RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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                                      +
+                                                                     +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
```

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    WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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    WATER TABLE     RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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                                       +
+                                                                     +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
```

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   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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                                    +
+                                                                     +
+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
```

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   WATER TABLE    RECEPTORS (in order)
(DAYS) BELOW THE SOURCE

 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
```

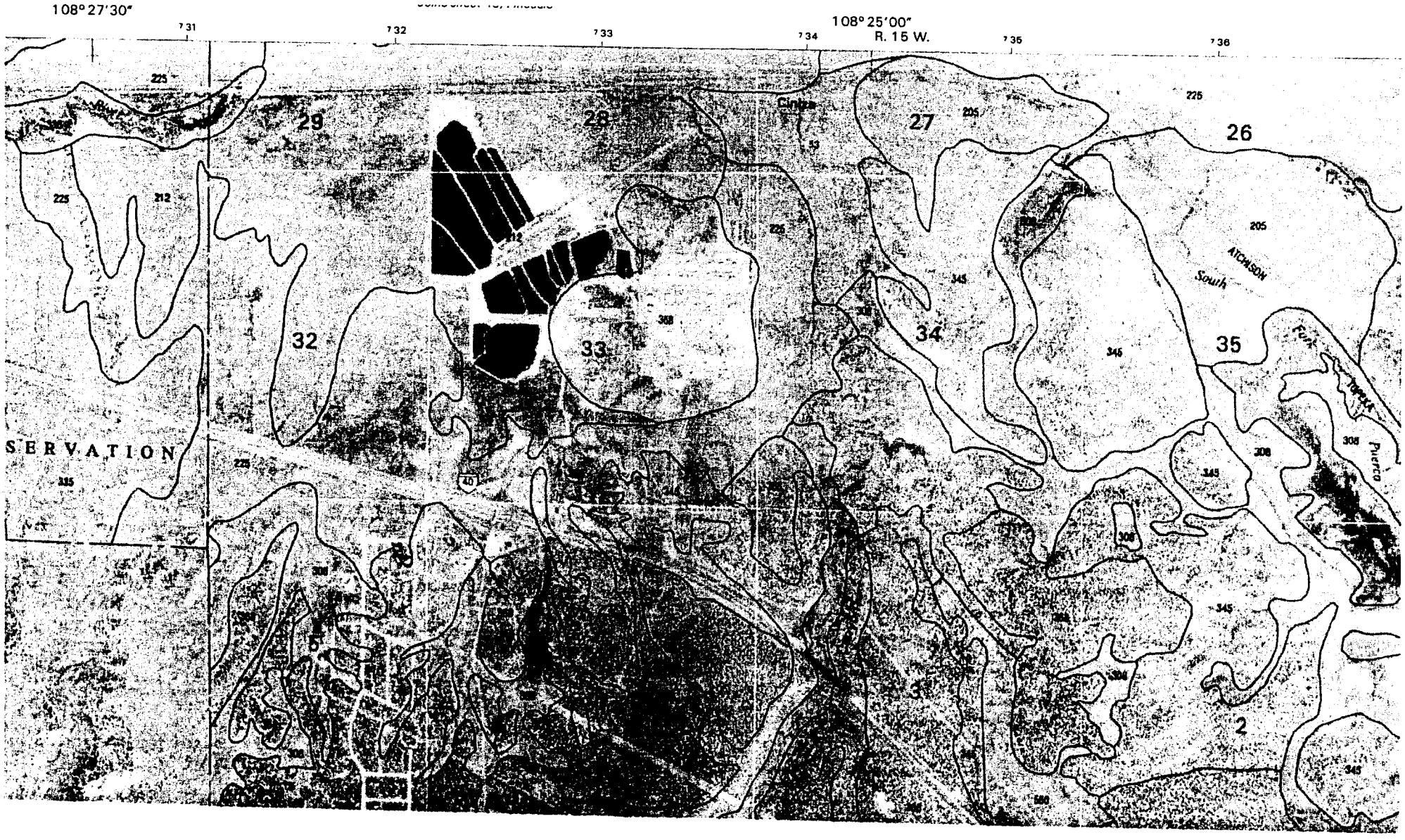
2160.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2520.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2880.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3240.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3600.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3960.0000	0.0000E+00	0.0000E+00	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.
31
32
33
34
35
36
29
28
27
26
32
33
34
35
5
3
2
SERVATION
ATCHISON
South
Fork
Puerco
Chinle
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	Permea-bility (Ksat)	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	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:							
Hagarwest	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

Bsn	Tws	Rng	Sec	Zone	X	Y	Wells	(Depth Water in Feet) 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
Lab Order: 0512188
Project: Annual Pond Samp for Gen Chem Pond #8-200
Lab ID: 0512188-01

Client Sample ID: Pond #8
Collection Date: 12/13/2005 10:30:00 AM
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

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**