GW - 33

GENERAL CORRESPONDENCE

YEAR(S):

1996/1991/1986

GOOD - File Copy

Discharge Plan
for the
SAN JUAN RIVER NATURAL SWEETENING PLANT

San Juan County, New Mexico

REV. 1 - DEC. 1996

Submitted
by
Western Gas Resources, Inc.

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DISCHARGE PLAN

FOR THE

SAN JUAN RIVER

NATURAL GAS SWEETENING PLANT

SAN JUAN COUNTY, NEW MEXICO

Submitted to the New Mexico Energy, Minerals & Natural Resources Department
Oil Conservation Division by

Western Gas Resources, Inc.

October 1996

EXECUTIVE SUMMARY

Western Gas Resources, Inc., (WGR), 12200 N. Pecos St., Denver, Colorado, 80234, submits this Discharge Plan renewal, Revision 1 dated December 6, 1996, for the San Juan River Plant located in San Juan County, New Mexico. The current discharge plan, NMOCD GW-33, expires on December 29, 1996. The previously approved plan expired on December 29, 1991, and was originally submitted by El Paso Natural Gas Company (EPNG), who was the previous plant operator. WGR assumed operation of the San Juan facility on August 1, 1989. Because of engineering changes implemented by WGR, an amendment to discharge plan GW-33 was submitted on January 30, 1990 and received the New Mexico Oil Conservation Division (NMOCD) approval on May 21, 1990.

Prior to WGR's earlier modification of plant processes at San Juan, noncontact wastewater production exceeded 8,000,000 gallons per year. Total production of wastewater, both contact and noncontact, is now approximately 600,000 gallons per year. The noncontact wastewater is made up of boiler blowdown and cooling tower blowdown, which are classified as non-exempt and exempt wastes, respectively, in accordance with RCRA Subtitle C regulations. The non-exempt boiler blowdown is considered non-hazardous due to the non-hazardous nature of the process which produces the wastewater. The contact wastewater consists of exempt wastewaters in accordance with 40CFR261.4(b)(5) for oil and gas exploration and production type wastes, except for the low volume laboratory wastewater. The laboratory wastewater is considered non-exempt from RCRA Subtitle C and was recently analyzed for the hazardous characteristics (ignitability, reactivity, corrosivity, and toxicity). The sample analyses indicated that the laboratory waste did not show any of the characteristics of hazardous waste. Therefore, the non-hazardous lab waste mixed with the contact and noncontact wastewater streams in the sumps is considered to be an exempt waste from RCRA Subtitle C in accordance with the mixture rule. WGR discharges all of the wastewater stream to a double lined evaporation pond. No effluent discharges direct to ground or surface waters, or to unlined ponds, are permitted. WGR does not use and has abandoned-in-place the secondary disposal unit that was referenced in the previous discharge plan. WGR is in the process of reducing the number of sumps being used to collect and transport the wastewater. The changes are discussed in Section 2.3.

The quantity and quality of plant waste streams are discussed in Section 2.0. The wastewater management plan for the plant is presented in Section 3.1. Alternatives for disposal of non-aqueous wastes are discussed in Section 3.3.

The modifications implemented by Western Gas Resources have had a positive environmental impact on the San Juan River Plant site. Annual wastewater discharges are expected to be approximately 7.5 percent of the 1989 levels. Plant procedures require rapid identification of, and response to, leaks and other accidental discharges.

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1.0 GENERAL INFORMATION

1.1 Western Gas Resources Representatives

Name of Discharger/Legally Responsible Party:

Edward A. Aabak
Vice President, Northern Region
Western Gas Resources, Inc.
12200 N. Pecos Street
Denver, CO 80234
(303) 452-5603

Local Representative:

Kent McEvers
San Juan River Plant Manager
P.O. Box 70
Kirtland, NM 87417
(505) 598-5601

Please direct questions and a copy of all correspondence to:

James E. Fleak, P.E.
Western Gas Resources, Inc.
12200 Pecos Street
Denver, CO 80234

1.2 Location of Discharges

The San Juan River Plant is located in Section 1, Township 29 North, Range 15 West, San Juan County, New Mexico, approximately eight miles west of Farmington and 1.7 miles north of Kirtland, New Mexico. Access to the plant is provided by Highway 550 and County Road 61.

The land to the north and west of the plant site is publicly owned. Approximately thirty private owners have tracts to the south and east of the plant.

1.3 San Juan River Plant Operations

Current activities at the San Juan River Plant include natural gas sweetening, gas compression, gas dehydration, sulfur recovery, and operation of plant utilities. These utilities include steam producing boilers and a cooling water system. The cooling water system is only operated during the warm weather months as a trim cooler, therefore, the wastewater generated by the cooling system blowdown is produced only during those months of warm weather operation. Currently, there are no capabilities to process liquids from natural gas located at this plant.

1.4 Affirmation

I hereby certify that I am familiar with the information contained in and submitted with this application and the most recent Revision 1 of the Discharge Plan, and that such information is true, accurate, and complete to the best of my knowledge and belief.

Edward Holck 12/06/96

Signature Date

Edward Holck VICE PRESIDENT, NORTHERN REGION

Print Name Title

2.0 PLANT PROCESSES

Engineering modifications implemented by WGR have reduced wastewater volumes at the San Juan Plant by more than 90 percent since the time the plant was acquired from EPNG.

2.1 Sources and Quantities of Effluent and Process Fluids

The source of the San Juan River Plant's water is the Public Service of New Mexico (PSNM) power plant located northwest of the WGR facility. Approximately 15,000 gallons of high-quality water are purchased daily from the PSNM power plant.

Contact water (process water that has contacted the hydrocarbon stream) is generated at a rate of approximately 150 gallons per day by the following sources:

- Dehydration unit and triethylene glycol (TEG) regeneration - Periodic regeneration of dehydration units and TEG creates a wastewater stream. This stream is considered to be an exempt waste in accordance with RCRA Subtitle C regulations listed in 40CFR 261.4(b)(5). The various exempt waste streams are listed in the May 1995 EPA document number EPA530-K-95-V003.

- Amine reflux and gas inlet - Contact wastewater is produced at the amine reflux and gas inlet vessels. These streams are also considered to be an exempt waste in accordance with RCRA Subtitle C regulations listed in 40CFR261.4(b)(5). The various exempt waste streams are listed in the May 1995 EPA document number EPA530-K-95-V003.

- Laboratory test waste - Contact wastewater is produced by laboratory tests performed at the plant. The tests are performed to determine the content of H_2S in the inlet gas stream. The laboratory waste stream produces low volumes and is considered to be a non-exempt waste in accordance with 40CFR261.4(b)(5). The non-exempt waste streams are listed in the May 1995 EPA document number EPA 530-K-95-V003. The typical laboratory waste was collected in a sterile 5 gallon pail and a grab sample was retrieved for analyses of hazardous waste characteristics (ignitability, corrosivity, reactivity, and toxicity). The sample results indicated that this waste is not characteristically hazardous. This waste is also not a listed waste per the RCRA regulations. This waste stream is commingled with the contact wastewater stream. In accordance with the mixture rule, the commingled wastewater stream is considered as an exempt type waste according to RCRA Subtitle C, since the non-exempt waste does not indicate hazardous characteristics prior to commingling and since the other contact wastewater streams are also considered exempt. The mixture rule is also discussed in the EPA document number EPA530-K-95-V003.

Noncontact wastewater is currently produced at an average rate of 1,440 gallons per day by combining the blowdown streams from the following plant functions:

- Boiler blowdown - Two boilers produce steam for the amine unit and other process requirements. Periodic blowdown is required to reduce total dissolved solids (TDS). This stream is routed through a sump and subsequently to the cooling tower. This stream is considered non-hazardous based on process knowledge and is not a RCRA listed waste. Periodic in-plant tests performed for PH and conductivity also demonstrate that this waste stream does not exhibit characteristics for corrosivity.

- Cooling tower blowdown - An evaporative cooling tower is being used as water cooling for the boiler and gas process units. Much of the water is recycled, but some blowdown is required to avoid exceeding operating limits for TDS, phosphates, and hardness. Variation in the blowdown rate will occur during the year due to the seasonal operation of the cooling tower system. Cooling tower blowdown in gas production is considered as an exempt waste in accordance with 40CFR261.4(b)(5) and is listed in the EPA document number EPA530-K-95-003.

- Sulfur recovery plant - Wastewater condensed from the sulfur recovery treatment plant is periodically generated in low volumes. This is considered to be exempt waste in accordance with 40CFR261.4(b)(5). This is referenced specifically as gas plant sweetening wastes for sulfur removal.

Waste hydro-test water is periodically generated during plant maintenance and construction operations. Disposal of this water is made to the double lined evaporation impoundment and is discussed in Section 3.1.

A site plot plan and a process flowsheet sketch are presented in Figures 1 and 2A, respectively (see attached "D" size drawings). A summary of the expected annual wastewater discharge volumes is presented below:

Contact water to lined impoundment	55,000 gallons
Noncontact water to lined impoundment	545,000 gallons
Noncontact water to evaporation plate (Abandoned)	0 gallons
Total expected wastewater discharge	600,000 gallons

2.2 Quality Characteristics

The noncontact wastewater stream is commingled with the contact wastewater stream in a large sump and then routed to the double lined impoundment. Wastewater characteristics will vary depending upon the ratio of contact to noncontact water being discharged to the impoundment at any given time. More non-contact wastewater is produced during the warm weather months, than during cooler months, due to the operation of the cooling tower system.

The following analytical results were obtained from grab samples taken at the lined pond on April 16, 1991 and November 6, 1996. WGR also obtained grab samples of the lab waste, contact, and non-contact wastewaters during November 1996. Results for BTEX and the major cations and anions are presented below for the impoundment's samples.

BTEX ANALYSIS					
CONSTITUENT	RESULTS April 16, 1991 µg/liter	RESULTS April 16, 1991 (mg/l)	RESULTS Dec. 1996 ppb	RESULTS Dec. 1996 ppm (mg/l)	WQ STDS (mg/l)
Benzene	56.0	0.056	254	0.254	0.01
Toluene	18.0	0.018	866	0.866	0.75
Ethyl Benzene	5.5	0.0055	31	0.031	0.75
Total Xylenes	8.2	0.0082	337.5	0.338	0.62

CATION/ANION ANALYSIS		
CONSTITUENT	CONCENTRATION IN MICROGRAMS/LITER (April 1991)	CONCENTRATION IN MICROGRAMS/LITER (Dec. 1996)
Calcium	840	pending
Magnesium	780	pending
Potassium	99	pending
Sodium	16,500	pending
Chloride	28,600	pending
Sulfate	619	pending
Cation/Anion Balance	94%	pending %
Anion/Cation Balance	107%	pending %

2.3 Transfer of Process Effluent

The mechanisms for wastewater transfer to disposal units are the "contact" and "noncontact" sumps at the north end of the plant yard (see Figure 1) which receive contact and noncontact water, respectively. These are metal sumps approximately ten feet deep, with areas 2 feet by 2 feet. To prevent movement of process effluent to the subsurface, both sumps are configured with monitoring wells for detection of leaks.

Used compressor engine oil and other fluid wastes associated with plant operations are not combined with process effluent. These fluids are collected in drums or tanks to prevent their migration into the environment. No waste fluids are stored in pressurized tanks.

WGR is in the process of removing underground sumps at monitoring locations #3, #4, #5, and #7. The wastewater is now combined at the large sump at monitoring location #6 and then directly pumped to the lined impoundment. If there are any hydrocarbons present in the wastewater, this will first be separated out by the hydrocarbon separation tank located at the lined impoundment. The hydrocarbon separation tank was relocated to the impoundment from monitoring location #3. Hydrocarbons that are collected in the separation tank will be visually monitored to determine when a contact hauler should be called to truck out the hydrocarbons. The hydrocarbons collected are trucked out for recycling.

The only monitoring points remaining after the sump removals will be #1, #2 and #6. The monitoring locations #1 and #2 are for leak detection at the leachate collection area of the impoundment.

Noncontact Water

All boiler blowdown is transferred to the cooling tower via the noncontact sump. The disposal method for the cooling tower blowdown includes the transfer through below-grade piping to the contact sump and subsequently to the double-lined impoundment. The disposal method is discussed in greater detail in Section 3.1. Boiler blowdown is sampled and analyzed at least once per month for pH and conductivity, and the analytical results are kept on file at the site.

This waste stream is considered non-hazardous based on knowledge of the boiler blowdown process and that the characteristics of the blowdown stream would not exhibit characteristics of ignitability, corrosivity, reactivity, or toxicity. The cooling tower blowdown is specifically an exempt type waste.

Contact Water

All contact wastewater generated at the plant is directed through buried piping to the contact water sump #6. This stream is commingled with the noncontact wastewater in the contact wastewater sump. The commingled waste stream is then discharged to the double-lined impoundment. The contact wastewater is considered exempt from RCRA Subtitle C in accordance with 40CFR261.4(b)(5), except for the small volumes of laboratory waste.

The volumes of lab wastes are generated by the daily H_2S Tutweiler tests performed at the plant. These wastes consist of small amounts of water, 1/4% iodine, H_2S extracted from the gas sample, sulfuric acid, and/or hydrochloric acid. No more than one quart per month of the iodine or acids each are used. These wastes are considered non-exempt according to RCRA Subtitle C regulations. The laboratory waste was sampled on November 19, 1996 and the results of the analyses indicated that the waste is not considered characteristically hazardous due to ignitability, corrosivity, reactivity, or toxicity. The lab waste also does not contain any of the listed RCRA wastes.

2.4 Spill/Leak Prevention and Housekeeping Procedures

The areas where significant spills would be most likely to occur are the areas near the two wastewater sumps and the lined impoundment.

2.4.1 Monitoring of Wastewater Disposal Systems

The wastewater handling and disposal system includes adequate provisions for detection of equipment and liner leaks. Both the contact and noncontact sumps are configured with monitoring wells and secondary containment. The secondary containment for each sump consists of a plastic liner surrounding the sump.

The lined impoundment is configured with a leak detection/leachate collection system. Refer to Figures 2B and 2C and Section 3.1 for construction details. The pond berms and exposed portions of the liner are inspected monthly. To verify the integrity of the pond liner, the leak detection system monitoring wells are also inspected monthly. Monitoring records are maintained at the plant office. In the event that fluids are present in a monitoring well, the San Juan River Plant supervisor will first pull a sample to visually determine if the sample could indicate a leak of pollutants. If the sample indicates a leak of pollutants from the pond, then the supervisor will notify the Corporate Environmental Staff located in Denver and notify the OCD in Santa Fe or Aztec as soon as possible, but no later than the next business day. A suspect fluid sample will be analyzed to determine the source of the fluids. Analytical results will be provided to the NMOCD as soon as they become available, and corrective action based on the results will be taken if necessary.

2.4.2 Protection from Spills and Leaks

Western Gas Resources intends to act responsibly to avoid spills or leaks that might harm the environment. Plant personnel are aware of the imperative nature of spill prevention. Housekeeping measures will require prompt identification of leaks, drips and spills.

The San Juan River Plant property is enclosed by a fence to minimize trespassing. Large spills of oil or gasoline will not occur because there is no processing or bulk storage of natural gas liquids at the plant. The bulk product tanks to the east of the plant yard are not in service at this time. WGR will revise this plan if the product tanks are to be put back into service.

WGR uses the concrete sump "B" beneath the tower as a storage area. The following substances will be stored in the "B" sump in quantities of 500 gallons or less: methanol, bio-degradable type solvent, gasoline and diesel fuel. The sump walls will be high enough to adequately contain the contents of a ruptured drum or tank. Drums are not likely to be disturbed since they will be located away from normal work areas. WGR intends to store cooling tower and boiler chemicals inside plant buildings on concrete floors. Accidental spills of these chemicals onto the building floors will be promptly cleaned up.

Below-grade effluent disposal systems will be monitored as discussed in Section 2.4.1. Above-ground tanks and drums will be visually inspected monthly by plant personnel for evidence of leaks or spillage. Plant personnel will ensure that run-off from maintenance activities is not contaminated. The amine sump and the "B" sump are scheduled for physical inspection at least once annually for evidence of leaks.

2.4.3 Spill Response Measures

WGR procedures require prompt attention to spills. Although no large volumes of hazardous substances are stored at the San Juan Plant, small spills may occasionally occur. The following substances are present at the plant site and could potentially be released to the environment:

- plant materials, such as engine oil, diesel fuel, gasoline, and methanol,
- treatment chemicals, including sulfuric acid, boiler and cooling tower chemicals, amine, spent caustic, and triethylene glycol,
- process effluent, including contact and noncontact wastewater, and
- production materials, including pigging sludge.

WGR will respond to a spill in the following manner:

(1) The San Juan River Plant supervisor will designate employees to respond to a spill. Plant employees will report the spill to the supervisor and will take appropriate cleanup action.

(2) If a spill involves more than five barrels of refined materials, ten barrels of production materials, or threatens the waters of the state, the San Juan River Plant supervisor will notify WGR environmental staff at the corporate office, who will contact the appropriate regulatory agencies and the spill will be mitigated as soon as possible.

(3) Spills not addressed in (2) above will be handled in accordance with this discharge plan.

Absorbent pads and booms are available at the plant site, although the site location makes a discharge to surface water highly unlikely. In the event of a discharge to land, shovels and sand are available for cleanup. Contaminated materials will be handled according to applicable environmental regulations. See Section 3.3 for discussion of solid waste disposal.

2.4.4 Schedule for Implementing Hydro-Static Leak Testing

WGR will commit to implementing a hydro-static leak test of the underground wastewater piping to demonstrate integrity of the piping system in accordance with the OCD Discharge Plan Guidelines stated in Section 8.B.3. on page 9. WGR will perform the leak test in sections starting in the spring of 1997 and will complete all sections of the underground wastewater piping by the end of the summer of 1997. Original drawings of the construction of the system will be used to develop the sections to be tested. A test method will be developed and presented to the NMOCD at least 30 days prior to the start of testing. WGR intends to use columns of water on closed-off sections of pipe to demonstrate pipe integrity.

3.0 EFFLUENT DISPOSAL

The San Juan Plant is self-contained. No effluent discharge to surface or ground water, or unlined ponds, is permitted. Plant practices are not expected to threaten ground water quality and should not result in ground water contaminant concentrations in excess of New Mexico Water Quality Control Commission (WQCC) standards.

3.1 On-site Facilities

The wastewater management plan for the San Juan Plant includes discharging the majority of the process effluent to a lined evaporation pond constructed with a leak detection/leachate collection system.

The lined impoundment, located at the south end of the plant property, is lined with high density polyethylene (HDPE), and has the following specifications:

Liner:	45-mil HDPE on sides, 30-mil HDPE on pond bottom
Dimensions:	250 feet x 150 feet x 4 feet, 4 inches
Volume:	773,000 gallons with 1-foot freeboard
Slope:	1.3 slope on sides, 1:125 slope on pond bottom
Leachate Collection:	Slotted 4-inch PVC drains within 1-foot sand layer
Leak Detection:	Monitoring wells connected to collection system
Secondary Containment:	6-inch clay liner beneath sand layer

This impoundment has been in use since 1987 (date of construction). There have been no liner leaks identified, and no liner repairs have been required. The liner material is compatible with the wastewater streams being discharged to the pond.

Figures 2B and 2C illustrate the pond design. The evaporation pond is configured with a leak detection/leachate collection system that is inspected monthly. The leachate collection system consists of slotted four-inch PVC Schedule 80 piping buried within a one-foot sand layer directly beneath the HDPE liner. Migration of contaminants into the subsurface is prevented by a six-inch layer of compacted clay located directly beneath the sand layer. The leak detection system consists of two monitoring wells which are directly connected to the leachate collection piping.

Annual discharge to the pond is expected to be 600,000 gallons. Of this total, 55,000 gallons is contact water. All of the noncontact cooling tower blowdown is discharged to the impoundment, since the evaporation plate is no longer in use. This noncontact water contributes the remaining 545,000 gallons of the pond's total discharge. The pond has a significantly greater capacity than is currently required for the annual wastewater discharge. A substantial portion of the pond bottom is dry throughout much of the year.

The commingled wastewater stream is sent to the oily water separator tank in the lined impoundment prior to being discharged to the pond. Oil recovery in small quantities is expected. Use of the separator enhances oil recovery and promotes evaporation in the lined pond by preventing an oil film from forming on the liquid surface. Removal of trace hydrocarbons will also help to alleviate the possibility of damage to bird life. A minimum freeboard of one foot is to be maintained. The current annual discharge volume amounts are well below the capacity of the impoundment.

Disposal of pipeline hydro-test water will occasionally be necessary. This is expected to occur no more than twice annually. The water will be discharged to the evaporation pond.

3.2 Off-site Disposal

Wastewater produced at the San Juan Plant is not routinely disposed of off-site. As a contingency measure, in the unlikely event that effluent volumes exceed the capacity of the pond, the water could be transported to a permitted Class II disposal well, since the wastewaters have been deemed exempt from RCRA Subtitle C. Approval of the well operator and the NMOCD will be obtained prior to disposal of the impoundment's wastewater at an off-site disposal well.

3.3 Solid Wastes

Solid wastes generated at the San Juan Plant include pigging sludge, used oil, used filter cartridges (amine, oil, glycol, and gas type), evaporation plate solids, and domestic waste. WGR proposes the disposal methods identified in the following table:

SOLID WASTE	ANNUAL VOLUME	PROPOSED DISPOSAL METHOD
Pigging Sludge - RCRA Exempt	100 barrels	Treat at Envirotech's land treatment facility or treat on site.
Filter Elements for Gas, Oil, Amine, and Glycol - RCRA Exempt	1,960 filters	Dry on concrete, bag, haul to Waste Management landfill
Domestic Trash - RCRA Exempt	2,500 pounds	Haul to Waste Management landfill
Activated Alumina or Charcoal Materials - RCRA Exempt		Dispose dry on site in not more than 2" lifts in accordance with OCD approval dated April 14, 1992 (GW-33 Discharge Plan Modification)
Slightly Contaminated, Nonhazardous Soil	20 barrels	Treat at Envirotech's land treatment facility, treat on site, or landfill

RCRA Exempt = Classified as exempt from RCRA Subtitle C in accordance with 40CFR261.4(b)(5).

WGR has obtained Waste Management approval for disposal of filter-elements. Annual renewals are required by Waste Management. WGR has obtained the necessary renewals for disposal.

3.4 Recycled Materials

Approximately 9,000 gallons of used lubricating oil are produced at the plant per year. The used oil will be stored in drums at sump "A" and then transported to a recycling facility or sent to the condensate tank for sale as useful product, if contracts allow.

4.0 SITE CHARACTERISTICS

The physical characteristics of the plant site have been studied in detail as part of a previously completed land application feasibility study completed in 1986 and 1987. Detailed information concerning site soil and ground water characteristics are presented in the Phase I and II reports, and should be consulted if more specific information is required than provided in the following summary.

4.1 Hydrologic Features

Surface water run-off from the plant site is expected to follow the local topographic contours. The topography slopes to the southwest across the majority of the site, although a south-southeasterly slope is apparent in the southeastern portion of the site and extends radially from Flare Hill in the northwestern portion of the site. The topographic gradient across most of the site is relatively flat (on the order of 0.01 feet/foot), with the exception of moderate to steep topographic gradients encountered on the flanks of Flare Hill. The infiltration rate of the majority of the surficial deposits is high (Sheppard soil = 8.9 in/hr). Therefore, large scale overland flow of surface runoff is not anticipated to occur under all but the most extreme storm or flood events.

Surface water bodies within a one-mile radius of the site include 1) the Stevens Arroyo (0.2 miles west), 2) the Farmers Mutual Ditch (0.5 miles south), and 3) small fresh water ponds located on the golf course south of the site. The Stevens Arroyo is an intermittent watercourse. The San Juan River is located greater than one mile south of the plant site.

Locations of local ground water wells are illustrated in Figure 3 of the previous Discharge Plan. Based on New Mexico State Engineer well records, all of these wells are completed within the shallow alluvial aquifer at approximately 75 feet below ground surface and are permitted for "domestic" water usage. Ground water is anticipated to discharge as a seep approximately 0.75 miles south of the site where the base of the alluvial aquifer is exposed (Figure 4 of the previous Discharge Plan).

Shallow ground water is contained within alluvial terrace gravel deposits beneath the site. The extent of the alluvial aquifer is shown in Figure 4 of the previous Discharge Plan. The alluvial sediments are underlain by greenish grey sediments of the Lower Shale Member of the Kirtland Shale. The Kirtland Shale is exposed in the extreme northern and western portions of the site, and approximately 0.5 miles south of the site. The thickness of the alluvial sediments varies from zero feet in the extreme northern and western portions of the site, to greater than 70 feet in the southern and eastern portions of the site. Depth to ground water varies across the site. It is estimated to be less than ten feet below the surface in the extreme northern and western portions of the site where the alluvial sediments are thin to nonexistent, and greater than 50 feet in the extreme southern and eastern portions of the site. Regional ground water flow is to the southwest beneath the majority of the site, with local south to southeasterly flow in the southeast portion of the site.

4.2 Surface and Groundwater Quality

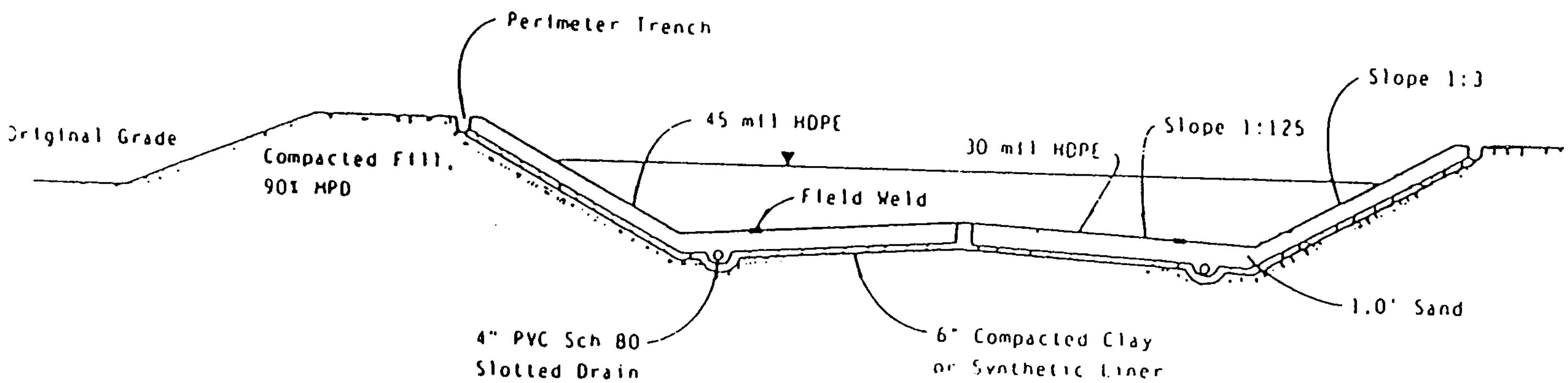
Groundwater samples from on-site monitoring wells and off-site local wells were analyzed for various water quality parameters as part of the Phase I and II feasibility study in 1987. Results of these analyses indicate that WQCC standards for TDS, sulfate, and manganese are exceeded in on-site wells. TDS, sulfate, and chloride content exceed WQCC standards in all off-site wells. The average TDS for on-site wells is 4,500 mg/l and is 2,775 mg/l for local wells.

Background ground water quality can be assessed from water quality data obtained from the Daley well (the only local well not located down gradient from the plant site). It is interesting to note that the TDS concentration in the Daley well (4,300 mg/l) is higher than that of the local wells located down gradient of the plant site and is near the average TDS concentration for on-site wells (4,500 mg/l). This fact, in conjunction with the high chloride concentrations in the Daley well, suggest that background water quality is comparable to that beneath the plant site.

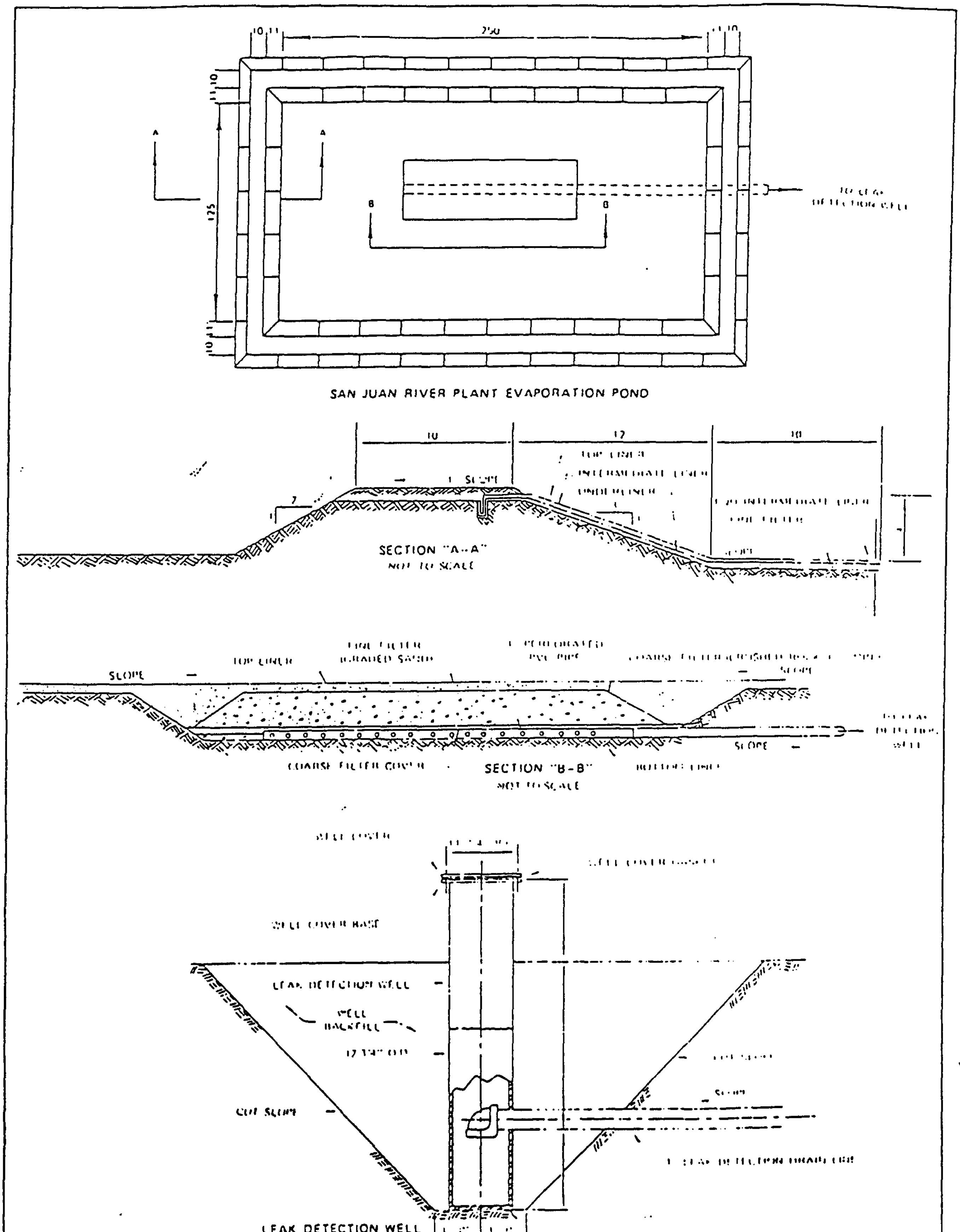
Surface water quality samples have been obtained from the Stevens Arroyo located west of the plant site. Background water quality from Stevens Arroyo reportedly exceeds 10,000 mg/l for TDS and, therefore, exceeds the WQCC limit for surface water.

5.0 CLOSURE PLAN COMMITMENT

WGR will commit to the preparation of a closure plan in accordance with the New Mexico Water Quality Control Commission regulation number 3107A.11. At this time, WGR has no plans to close the existing impoundment wastewater system or the facility.



DISCHARGE PLAN WESTERN GAS RESOURCES, INC. SAN JUAN RIVER PLANT San Juan County, New Mexico September, 1991	EVAPORATION POND DESIGN Figure 2B
Modified from El Paso Natural Gas Company Discharge Plan	Scale: None



DISCHARGE PLAN WESTERN GAS RESOURCES, INC. SAN JUAN RIVER PLANT San Juan County, New Mexico September, 1991	EVAPORATION POND DESIGN Figure 2C
Modified from	

P. O. Box 1980
Hobbs, NM 88241-1980
District II - (505) 748-1283
811 S. First
Artesia, NM 88210
District III - (505) 334-6178
1000 Rio Brazos Road
ec, NM 87410
trict IV - (505) 827-7131

Energy Minerals and Natural Resources Department
Oil Conservation Division
2040 South Pacheco Street
Santa Fe, New Mexico 87505
(505) 827-7131

Revised 12/1

Submit Origi
Plus 1 Cop
to Santa
1 Copy to appropri
District Offi

DISCHARGE PLAN APPLICATION FOR SERVICE COMPANIES, GAS PLANTS, REFINERIES, COMPRESSOR, AND CRUDE OIL PUMP STATIONS
(Refer to the OCD Guidelines for assistance in completing the application)

☐ New ☒ Renewal ☐ Modification

1. Type: Gas Sweetening Plant/Sulfur Recovery

2. Operator: Western Gas Resources, Inc.

Address: 12200 N. Pecos Street

Contact Person: James Fleak Phone: (303) 452-5603

3. Location: ______/4 ______/4 Section 1 Township 29 N Range 15W
Submit large scale topographic map showing exact location.

4. Attach the name, telephone number and address of the landowner of the facility site. Western Gas Resources same as above

5. Attach the description of the facility with a diagram indicating location of fences, pits, dikes and tanks on the facility. see discharge plan

6. Attach a description of all materials stored or used at the facility. see discharge plan

7. Attach a description of present sources of effluent and waste solids. Average quality and daily volume of waste water must be included. see discharge plan

8. Attach a description of current liquid and solid waste collection/treatment/disposal procedures. see discharge plan

9. Attach a description of proposed modifications to existing collection/treatment/disposal systems. see discharge plan

10. Attach a routine inspection and maintenance plan to ensure permit compliance. see discharge plan

11. Attach a contingency plan for reporting and clean-up of spills or releases. see discharge plan

12. Attach geological/hydrological information for the facility. Depth to and quality of ground water must be included. same as previous plan

13. Attach a facility closure plan, and other information as is necessary to demonstrate compliance with any other OCD rules, regulations and/or orders. Committment to prepare plan as necessary only. No plans to close at this time.

14. CERTIFICATION

I herby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: James E. Fleak, P.E. Title: Sr. Environmental Engineer

Signature: James E. Fleak Date: 10/31/96

Western Gas Resources, Inc.
12200 N. Pecos Street
Denver, Colorado 80234
Telephone:(303) 452-5603

31-OCT-96 7762 NEW MEXICO ENVIRONMENTAL DEPARTMENT CHECK# [redacted] 199

Invoice No.	Inv. Date	Description	Gross	Discount	Net Amt.
[illegible]0-OCT-96	30-OCT-96	FILING FEE	50.00		50.00

San Juan River Plant
Discharge Plan Renewal Fee for
Filing

Western Gas Resources, Inc.
12200 N. Pecos Street
Denver, Colorado 80234
Telephone: (303) 452-5603

NationsBank of Georgia, N.A.
Atlanta, Dekalb County, Georgia

Check No. [redacted]

DATE 31-OCT-96

PAY THE SUM OF
Fifty Dollars And 00 Cents

TO THE ORDER OF

AMOUNT *** 50.00

NEW MEXICO ENVIRONMENTAL DEPARTMENT 7762
WATER QUALITY MANAGEMENT FUND
2040 S PACHECO
SANTA FE, NM 87505

VOID IF NOT CASHED WITHIN NINETY DAYS

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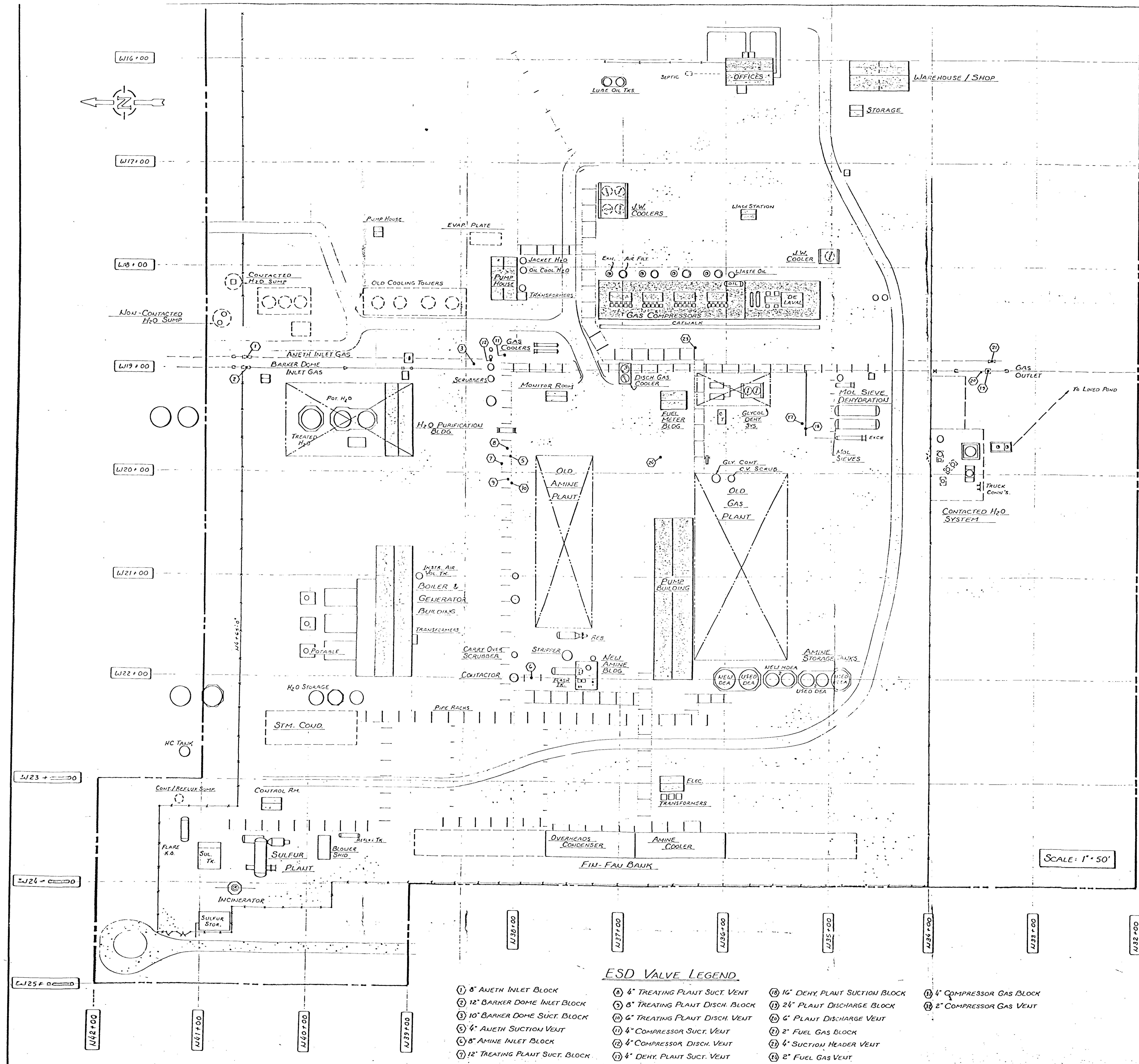

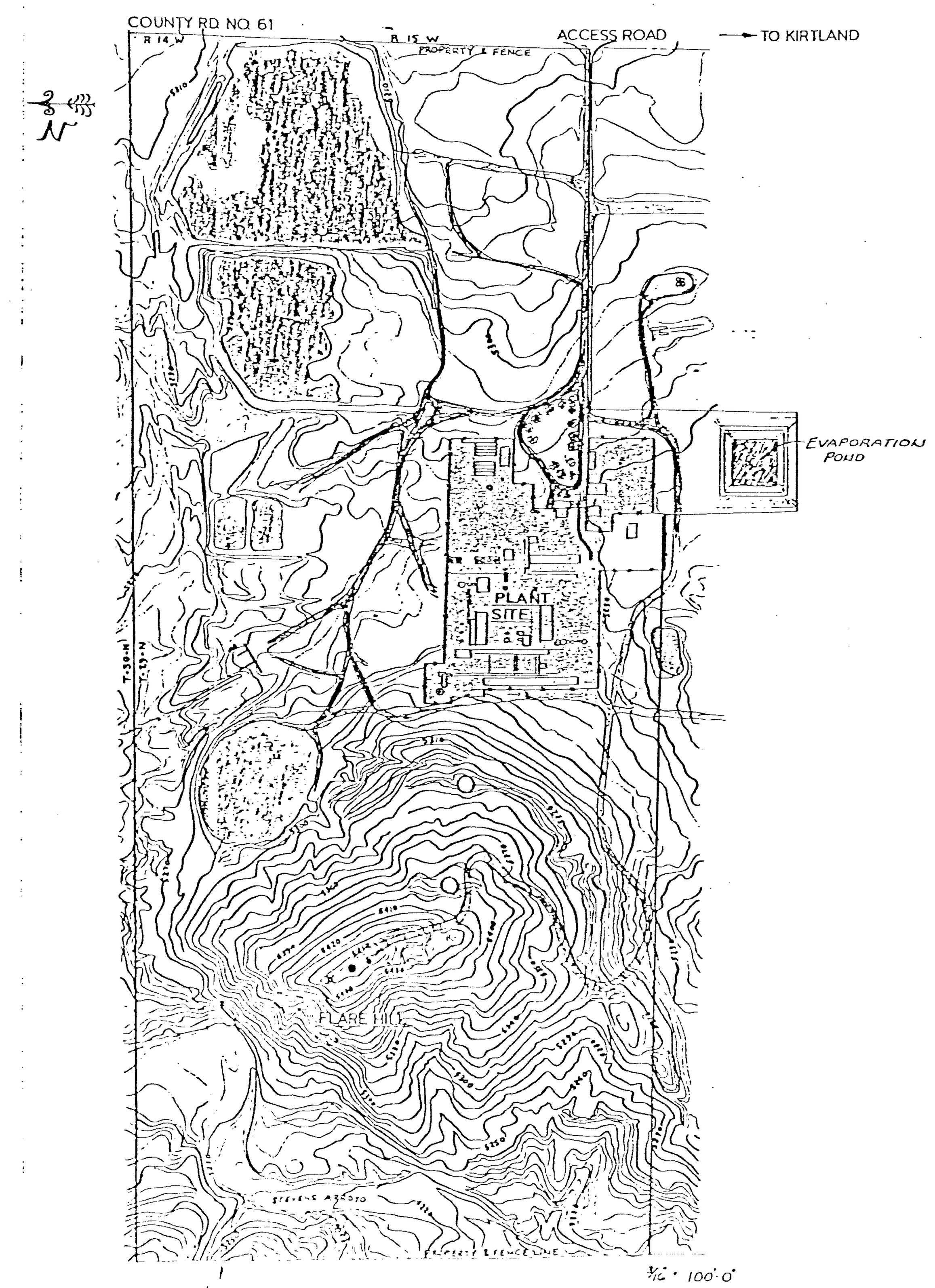

SITE LOCATION MAP

DISCHAR
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SAN JUAN R
San Juan Count
Septemb

PLOT PLAN

SITE
F

Drawn by:
Checked by
Scale: None

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Environmental Bureau
Oil Conservation Division

Western Gas Resources, In

SAN JUAN RIVER PLANT

KIRTLAND, NEW MEXICO.

DRAWN BY: D. ORDES OIL & GAS SYSTEMS DESIGN CO. 4/12/91 REV. 0

DISCHARGE PLAN
WESTERN GAS RESOURCES, INC.
SAN JUAN RIVER PLANT
San Juan County, New Mexico

September, 1991

PROCESS FLOWSHEET

Figure 2A

Drawn by: DO
Checked by: GB/KM
Scale: None

Process Flowsheet

Western Gas Resources, Inc.

SAN JUAN RIVER PLANT

Kirtland, New Mexico 8-26-91

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SEP 19 1991

OIL CONSERVATION DIV.
SANTA FE

DISCHARGE PLAN

FOR THE

SAN JUAN RIVER

NATURAL GAS PROCESSING PLANT

SAN JUAN COUNTY, NEW MEXICO

Submitted to the New Mexico Oil Conservation Division by

Western Gas Resources, Inc.

September, 1991

Prepared by:

ERM-Rocky Mountain, Inc.

EXECUTIVE SUMMARY

Western Gas Resources, Inc. (WGR), 12200 N. Pecos St., Suite 230, Denver, Colorado, 80234, submits this discharge plan for the San Juan River Plant in San Juan County, New Mexico. The current discharge plan, NMOCD GW-33, expires on December 29, 1991. That plan was originally submitted by El Paso Natural Gas Company (EPNG), the previous operator of the plant. WGR assumed operation of the San Juan facility on August 1, 1989. EPNG and WGR have signed a definitive sales agreement for the plant that awaits final approval by the Federal Energy Regulatory Commission. Because of engineering changes implemented by WGR, an amendment to discharge plan GW-33 was submitted on January 30, 1990 and received NMOCD approval on May 21, 1990.

Prior to WGR's modification of plant processes at San Juan, noncontact wastewater production exceeded 8,000,000 gallons per year. Total production of wastewater, both contact and noncontact, is now anticipated to be approximately 600,000 gallons per year. WGR proposes to discharge most of this wastewater stream to a lined evaporation pond. The secondary disposal unit is an evaporation plate configured with fans.

The quantity and quality of plant waste streams are discussed in Section 2.0. The wastewater management plan for the plant is presented in Section 3.1. Alternatives for disposal of non-aqueous wastes are undergoing evaluation by WGR engineers. Those wastes are discussed in Section 3.3.

The modifications implemented by Western Gas Resources have had a positive environmental impact on the San Juan River plant site. Annual wastewater discharges are expected to be approximately 7.5 per cent of the 1989 levels. No effluent discharges to ground or surface water, or to unlined ponds, are proposed. Plant procedures will require rapid identification of, and response to, leaks and other accidental discharges.

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1.0 GENERAL INFORMATION

1.1 Western Gas Resources Representatives

Name of Discharger/Legally Responsible Party:

Gary Davis
Vice President of Engineering/Environmental
Western Gas Resources, Inc.
12200 N. Pecos Street, Suite 230
Denver, Colorado 80234
(303) 452-5603

Local Representative:

Kent McEvers
San Juan River Plant Manager
P.O. Box 70
Kirtland, NM 87417
(505) 598-5601

Please direct questions and a copy of all correspondence to:

Shauna Doven
Western Gas Resources, Inc.
12200 Pecos Street, Suite 230
Denver, Colorado 80234

1.2 Location of Discharges

The San Juan River Plant is located in Section 1, Township 29 North, Range 15 West, San Juan County, New Mexico, approximately eight miles west of Farmington and 1.7 miles north of Kirtland, New Mexico. Highway 550 and County Road 61 provide access to the plant.

The land to the north and west of the plant site is publicly owned. Approximately thirty private owners have tracts to the south and east of the plant.

1.3 San Juan River Plant Operations

Current activities at the San Juan River Plant include natural gas sweetening, compression, dehydration, sulfur recovery, and operation of peripheral utilities. These utilities include boilers and cooling water systems.

1.4 Affirmation

I hereby certify that I am familiar with the information contained in and submitted with this application, and that such information is true, accurate, and complete to the best of my knowledge and belief.

Gary W Davis
Signature

9/21/91
Date

Gary W. Davis
Western Representative

VP- Engineering
Title

2.0 PLANT PROCESSES

Engineering modifications implemented by WGR have reduced wastewater volumes at the San Juan Plant by more than 90 per cent.

2.1 Sources and Quantities of Effluent and Process Fluids

The source of the San Juan River Plant's water is the Public Service of New Mexico power plant located northwest of the WGR facility. Approximately 15,000 gallons of high-quality water are purchased daily.

Contact water (process water that has contacted the hydrocarbon stream) is generated at a rate of 150 gallons per day by the following sources:

- Dehydration unit and triethylene glycol (TEG) regeneration - Periodic regeneration of dehydration units and TEG creates a wastewater stream.

- Amine reflux - Contact wastewater is produced by amine reflux.

Noncontact wastewater is currently produced at an average rate of 1,440 gallons per day by combining the blowdown streams from the following plant functions:

- Boiler blowdown - Two boilers produce steam for the amine unit and other process requirements. Periodic blowdown is required to reduce total dissolved solids (TDS). This stream is routed through a sump and subsequently to the cooling tower.

- Cooling tower blowdown - An evaporative cooling tower has been used for general cooling in utilities and process units. Much of the water is recycled, but some blowdown is required to avoid exceeding operating limits for TDS, phosphates, and hardness. Some seasonal variation in the blowdown rate will occur.

- Sulfur recovery plant - Waste water from the treatment plant is periodically generated.

A new cooling tower and compressor discharge aerial cooler have been installed at the plant and will soon be operational. The old "A" cooling tower is scheduled to be removed from service during September, 1991. Noncontact wastewater flow rates are expected to remain below 1,500 gallons per day after these equipment changes are completed.

Waste hydro-test water is periodically generated during plant maintenance and construction operations. Disposal of this water is discussed in Section 3.1.

A site plot plan and a process flowsheet sketch are presented in Figures 1 and 2A, respectively. A summary of expected annual wastewater discharge volumes is presented below:

Contact water to lined impoundment	55,000 gallons
Noncontact water to lined impoundment	300,000 gallons
Noncontact water to evaporation plate	245,000 gallons
Total expected wastewater discharge	600,000 gallons

2.2 Quality Characteristics

During warm months, the majority of the noncontact wastewater stream is discharged to an evaporation plate. The remainder of the noncontact stream is commingled with the contact water stream and routed to a lined impoundment. During winter months, all wastewater is discharged to the impoundment. Wastewater characteristics will vary depending upon the ratio of contact to noncontact water being discharged to the impoundment at a particular time.

At the time of the NMOCD site inspection on July 15, 1991, no fluids were being discharged to the lined pond, and the pond was dry. Because a representative effluent sample was unavailable, the NMOCD recommended that no sampling be conducted at that time. The most recent analytical results are for a grab sample taken from the lined pond on April 16, 1991. Results for BTEX and the major cations and anions are presented below. Complete analytical results are included in the Appendix.

BTEX ANALYSIS	
CONSTITUENT	CONCENTRATION IN MICROGRAMS/LITER
Benzene	56.0
Toluene	18.0
Ethyl Benzene	5.5
Total Xylenes	8.2

CATION/ANION ANALYSIS	
CONSTITUENT	CONCENTRATION IN MILLIGRAMS/LITER
Calcium	840
Magnesium	780
Potassium	99
Sodium	16,500
Chloride	28,600
Sulfate	619
Cation/Anion Balance	94%
Anion/Cation Balance	107%

2.3 Transfer of Process Effluent

No plant wastewater is stored at the San Juan River Plant. The mechanisms for wastewater transfer to disposal units are the "contact" and "noncontact" sumps at the north end of the plant yard (see Figure 1) which receive contact and noncontact water, respectively. These are metal sumps approximately ten feet deep, with areas 2 feet by 2 feet. To prevent movement of process effluent to the subsurface, both sumps are configured with monitoring wells for detection of leaks.

Used compressor engine oil and other fluid wastes associated with plant operations are not combined with process effluent. These fluids are collected in drums or tanks to prevent their migration into the environment. No waste fluids are stored in pressurized tanks.

Noncontact Water

All boiler blowdown is transferred to the cooling tower via the noncontact sump. There are two disposal methods for cooling tower blowdown. It is transferred (1) through above-grade piping directly to the evaporation plate, or (2) through below-grade piping to the contact sump and subsequently to the lined impoundment. Both of these disposal techniques are discussed in greater detail in Section 3.1.

Contact Water

All contact wastewater generated at the plant is directed through buried piping to the contact water sump. This stream is commingled with that portion of the noncontact wastewater that is not directed to the evaporation plate. The commingled waste stream is then discharged to the lined impoundment.

2.4 Spill/Leak Prevention and Housekeeping Procedures

The areas where significant spills would be most likely to occur are the areas near the two wastewater sumps and the lined impoundment.

2.4.1 Monitoring of Wastewater Disposal Systems

The wastewater handling and disposal system includes adequate provisions for detection of equipment and liner leaks. Both the contact and noncontact sumps are configured with monitoring wells and secondary containment. The secondary containment for each sump consists of a plastic liner surrounding the sump.

The lined impoundment is configured with a leak detection/leachate collection system. Refer to Figures 2B and 2C and Section 3.1 for construction details. The pond berms and exposed portions of the liner are inspected monthly. To verify the integrity of the pond liner, the monitoring wells which are part of the leak detection system are also inspected monthly. Monitoring records are maintained at the plant office. In the event that fluids are present in a monitoring well, the San Juan River Plant supervisor will notify the NMOCD immediately. A fluid sample will be taken and analyzed to determine the source of the fluids. Analytical results will be provided to the NMOCD as soon as they become available, and corrective action will be taken if necessary.

During periods of operation, the evaporation plate is inspected weekly to ensure its integrity. Disposal of solids accumulated on the plate is discussed in Section 3.3.

2.4.2 Protection from Spills and Leaks

Western Gas Resources intends to act responsibly to avoid spills or leaks that might harm the environment. Plant personnel are aware of the imperative nature of spill prevention. Housekeeping measures will require prompt identification of leaks, drips and spills.

The San Juan River Plant property is enclosed by a fence to minimize trespassing. Large spills of oil or gasoline will not occur because there is no processing or bulk storage of natural gas liquids at the plant. The bulk product tanks to the east of the plant yard are not in service.

The "B" cooling tower has been out of service for two years; the tower will be removed from the plant yard in the near future. WGR proposes to use the concrete sump beneath the tower as a storage area. This conversion is expected to be completed by May 1, 1992. The following substances will be stored in the "B" sump in quantities of 500 gallons or less: methanol, solvent, gasoline, diesel fuel, field glycol, and pipeline corrosion inhibitor. This will be an effective storage practice because it will eliminate storage of those substances on the ground. The sump walls will be high enough to adequately contain the contents of a ruptured drum or tank. Drums are not likely to be disturbed since they will be located away from work areas. WGR intends to store cooling tower and boiler chemicals inside plant buildings on concrete floors.

Below-grade effluent disposal systems will be monitored as discussed in Section 2.4.1. Above-ground tanks and drums will be visually inspected monthly by plant personnel for evidence of leaks or spillage. Plant personnel will ensure that run-off from maintenance activities is not contaminated. The amine sump and the future "B" sump are scheduled for physical inspection at least once annually for evidence of leaks.

2.4.3 Spill Response Measures

WGR procedures require prompt attention to spills. Although no large volumes of hazardous substances are stored at the San Juan plant, small spills may occasionally occur. The following substances are present at the plant site and could potentially be released to the environment:

- plant materials, including engine oil, diesel fuel, gasoline, and methanol,
- treatment chemicals, including sulfuric acid, boiler and cooling tower chemicals, amine, spent caustic, and triethylene glycol,
- process effluent, including contact and noncontact wastewater, and
- production materials, including pigging sludge.

WGR will respond to a spill in the following manner:

(1) The San Juan River Plant supervisor will designate employees to respond to a spill. Plant employees will report the spill to the supervisor and will take appropriate cleanup action.

(2) If a spill involves more than five barrels of refined materials, ten barrels of production materials, or threatens the waters of the state, the San Juan River Plant supervisor will notify WGR environmental staff at the corporate office, who will contact the appropriate regulatory agencies.

(3) Spills not addressed in (2) above will be handled in accordance with this discharge plan.

Absorbent pads and booms are available at the plant site, although the site location makes a discharge to surface water highly unlikely. In the event of a discharge to land, shovels and sand are available for cleanup. Contaminated materials will be handled according to applicable environmental regulations. See Section 3.3 for discussion of solid waste disposal.

3.0 EFFLUENT DISPOSAL

The San Juan Plant is self-contained. No effluent discharge to surface or ground water, or unlined ponds, is proposed. Plant practices are not expected to threaten ground water quality and should not result in ground water contaminant concentrations in excess of New Mexico Water Quality Control Commission (WQCC) standards.

3.1 On-site Facilities

The wastewater management plan for the San Juan plant includes:

- discharging the majority of the process effluent to a lined evaporation pond constructed with a leak detection/leachate collection system, and

- discharging a portion of the plant noncontact water to an evaporator plate during warm, dry months.

The impoundment, located at the south end of the plant property, is lined with high density polyethylene (HDPE), and has the following specifications:

Liner:	45-mil HDPE on sides, 30-mil HDPE on pond bottom
Dimensions:	250 feet x 150 feet x 4 feet, 4 inches
Volume:	773,000 gallons with 1-foot freeboard
Slope:	1:3 slope on sides, 1:125 slope on pond bottom
Leachate Collection:	Slotted 4-inch PVC drains within 1-foot sand layer
Leak Detection:	Monitoring wells connected to collection system
Secondary Containment:	6-inch clay liner beneath sand layer

This pond has been in use since 1987; no liner leaks have been identified and no liner repairs have been required. The liner material material is compatible with the wastewater stream being discharged to the pond.

Figures 2B and 2C illustrate the pond design. The evaporation pond is configured with a leak detection/leachate collection system that is inspected monthly. The leachate collection system consists of slotted four-inch PVC Schedule 80 piping buried within a one-foot sand layer directly beneath the HDPE liner. Migration of contaminants into the subsurface is prevented by a six-inch layer of compacted clay located directly beneath the sand layer. The leak detection system consists of two monitoring wells which are directly connected to the leachate collection piping.

Annual discharge to the pond is expected to be 355,000 gallons. Of this total, 55,000 gallons is contact water. Approximately 55% of the cooling tower blowdown is discharged to the impoundment. This noncontact water contributes the remaining 300,000 gallons of the pond discharges. The pond has significantly greater capacity than is currently required. A substantial portion of the pond bottom is dry throughout most of the year.

The commingled wastewater stream passes through two oily water separators prior to being discharged to the pond; oil recovery in very small quantities is expected. Use of the separator enhances oil recovery and promotes evaporation by preventing an oil film from forming on the liquid surface. Removal of trace hydrocarbons also will alleviate the possibility of damage to bird life. A minimum freeboard of one foot is maintained.

The evaporation plate, located just east of the cooling towers, functions as a supplementary disposal unit during warm months for noncontact water discharged as blowdown from the "A" cooling tower. WGR has operated the plate successfully for the past two summers. The evaporation plate has the following specifications:

Material:	Carbon steel, seal-welded to prevent leakage
Perimeter:	10' x 25'
Height:	18" above ground level

Noncontact wastewater is sprayed through nozzles over the plate. Surrounding the plate is a four-foot splash guard welded at a 45-degree angle to minimize the spray of wastewater outside of the system. In the event that the inlet rate is too high, overflow is directed to an open-top containment vessel configured with a float mechanism that is, in effect, controlled by the evaporation rate. The float provides a means of controlling the cooling tower blowdown wastewater rate to the plate. Five fans assist evaporation by blowing across the plate. Use of these fans significantly increases the evaporation rate.

The plate receives approximately 45% of the plant's noncontact water discharge. Expected annual discharge volumes are 245,000 gallons, but discharges will occur during only the six warm months of the year. Following is the calculation used to determine the evaporation rate.

245,000 gal/yr x 1 cubic ft/7.48 gal = 32,754 cubic ft/yr evaporated

Surface area of plate = 250 square ft

32,754 cubic ft/250 sq ft = 131 feet per year evaporation (with fans)

Although a routine discharge to the evaporation plate of only 0.95 gallons per minute is anticipated, WGR's contingency plan includes discharging greater amounts to the plate if increased wastewater volumes make this necessary. Because the lined pond is currently underutilized, a need for additional discharge to the evaporation plate is not expected.

Disposal of pipeline hydro-test water will occasionally be necessary. This is expected to occur no more than twice annually. The water will be discharged to the evaporation pond or the land adjacent to the plant yard. If land application is selected as the disposal method, WGR will first ensure that the water is free of pollutants.

3.2 Off-site Disposal

Wastewater produced at the San Juan plant is not routinely disposed off site. As a contingency measure, in the unlikely event that effluent volumes exceed the capacity of the evaporation plate and pond, the water will be transported to a permitted Class II disposal well. Approval of the NMOCD will be obtained prior to such disposal.

3.3 Solid Wastes

Solid wastes generated at the San Juan plant include pigging sludge, used oil, filter cartridges, evaporation plate solids, and domestic waste. WGR proposes the disposal methods identified in the following table:

SOLID WASTE	ANNUAL VOLUME	PROPOSED DISPOSAL METHOD
Pigging Sludge	100 barrels	Treat at Envirotech's land treatment facility or treat on site
Filter Elements for Oil, Amine, and Glycol	1,960	Dry on concrete, bag, haul to Waste Management landfill
Domestic Trash	2,500 pounds	Haul to Waste Management landfill
Evaporation Plate Solids	100 pounds	Bury on site after laboratory analysis
Slightly Contaminated, Nonhazardous Soil	20 barrels	Treat at Envirotech's land treatment facility, treat on site, or landfill

WGR is in the process of obtaining Waste Management approval for disposal of filter elements.

3.4 Recycled Materials

Approximately 9,000 gallons of used lubricating oil are produced at the plant per year. The used oil will be stored in drums and transported to a recycling facility.

4.0 SITE CHARACTERISTICS

The physical characteristics of the plant site have been studied in detail as part of a previously completed land application feasibility study completed in 1986 and 1987. Detailed information concerning site soil and ground water characteristics are presented in the Phase I and II reports, and should be consulted if more specific information is required than provided in the following summary.

4.1 Hydrologic Features

Surface water run-off from the plant site is expected to follow the local topographic contours. The topography slopes to the southwest across the majority of the site, although a south-southeasterly slope is apparent in the southeastern portion of the site and extends radially from Flare Hill in the northwestern portion of the site. The topographic gradient across most of the site is relatively flat (on the order of 0.01 feet/foot), with the exception of moderate to steep topographic gradients encountered on the flanks of Flare Hill. The infiltration rate of the majority of the surficial deposits is high (Sheppard soil = 8.9 in/hr). Therefore, large scale overland flow of surface runoff is not anticipated to occur under all but the most extreme storm or flood events.

Surface water bodies within a one-mile radius of the site include 1) the Stevens Arroyo (0.2 miles west), 2) the Farmers Mutual Ditch (0.5 miles south), and 3) small fresh water ponds located on the golf course south of the site. The Stevens Arroyo is an intermittent watercourse. The San Juan River is located greater than one mile south of the plant site.

Locations of local ground water wells are illustrated in Figure 3. Based on New Mexico State Engineer well records, all of these wells are completed within the shallow alluvial aquifer at approximately 75 feet below ground surface and are permitted for "domestic" water usage. Ground water is anticipated to discharge as a seep approximately 0.75 miles south of the site where the base of the alluvial aquifer is exposed (Figure 4).

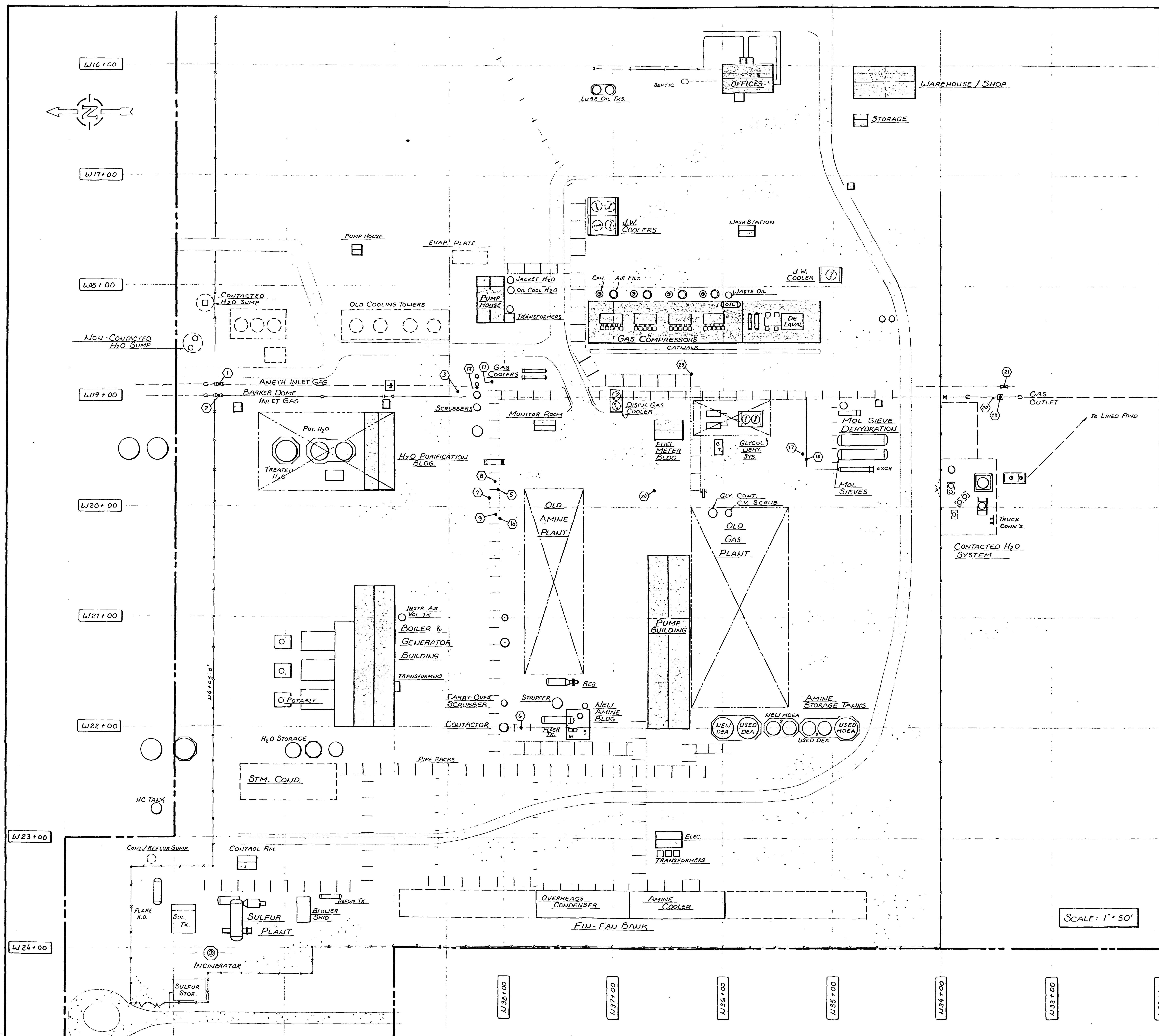
Shallow ground water is contained within alluvial terrace gravel deposits beneath the site. The extent of the alluvial aquifer is shown in Figure 4. The alluvial sediments are underlain by greenish grey sediments of the Lower Shale Member of the Kirtland Shale. The Kirtland Shale is exposed in the extreme northern and western portions of the site, and approximately 0.5 miles south of the site. The thickness of the alluvial sediments varies from zero feet in the extreme northern and western portions of the site, to greater than 70 feet in the southern and eastern portions of the site. Depth to ground water varies across the site. It is estimated to be less than ten feet below the surface in the extreme northern and western portions of the site where the alluvial sediments are thin or nonexistent, and greater than 50 feet in the extreme southern and eastern portions of the site. Regional ground water flow is to the southwest beneath the majority of the site, with local south to southeasterly flow in the southeast portion of the site.

4.2 Surface and Ground Water Quality

Ground water samples from on-site monitoring wells and off-site local wells were analyzed for various water quality parameters as part of the Phase I and II feasibility study in 1987. Results of these analyses indicate that WQCC standards for TDS, sulfate, and manganese are exceeded in on-site wells. TDS, sulfate, and chloride content exceed WQCC standards in all off-site wells. The average TDS for on-site wells is 4,500 mg/l and is 2,775 mg/l for local wells.

Background ground water quality can be assessed from water quality data obtained from the Daley well (the only local well not located downgradient from the plant site). It is interesting to note that the TDS concentration in the Daley well (4,300 mg/l) is higher than that of the local wells located downgradient of the plant site and is near the average TDS concentration for on-site wells (4,500 mg/l). This fact, in conjunction with the high chloride concentrations in the Daley well, suggest that background water quality is comparable to that beneath the plant site.

Surface water quality samples have been obtained from the Stevens Arroyo located west of the plant site. Background water quality from Stevens Arroyo reportedly exceeds 10,000 mg/l and, therefore, exceeds the WQCC protectable limit for surface water.



N42+00 N41+00 N40+00 N39+00

ESD VALVE LEGEND

1. 8" ANETH INLET BLOCK
2. 12" BARKER DOME INLET BLOCK
3. 10" BARKER DOME SUCT. BLOCK
4. 4" ANETH SUCTION VENT
5. 8" AMINE INLET BLOCK
6. 12" TREATING PLANT SUCT. BLOCK
7. 4" TREATING PLANT SUCT. VENT
8. 8" TREATING PLANT DISCH. BLOCK
9. 6" TREATING PLANT DISCH. VENT
10. 4" COMPRESSOR SUCT. VENT
11. 4" COMPRESSOR DISCH. VENT
12. 4" DEHY. PLANT SUCT. VENT
13. 16" DEHY. PLANT SUCTION BLOCK
14. 24" PLANT DISCHARGE BLOCK
15. 6" PLANT DISCHARGE VENT
16. 2" FUEL GAS BLOCK
17. 4" SUCTION HEADER VENT
18. 2" FUEL GAS VENT
19. 4" COMPRESSOR GAS BLOCK
20. 2" COMPRESSOR GAS VENT

SITE LOCATION MAP

DISCHARGE PLAN
WESTERN GAS RESOURCES, INC.
SAN JUAN RIVER PLANT
San Juan County, New Mexico
September, 1991

PLOT PLAN

SITE LAYOUT
Figure 1

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SANTA FE

Drawn by: DO
Checked by: GB/KM
Scale: None

Western Gas Resources, Inc.

SAN JUAN RIVER PLANT

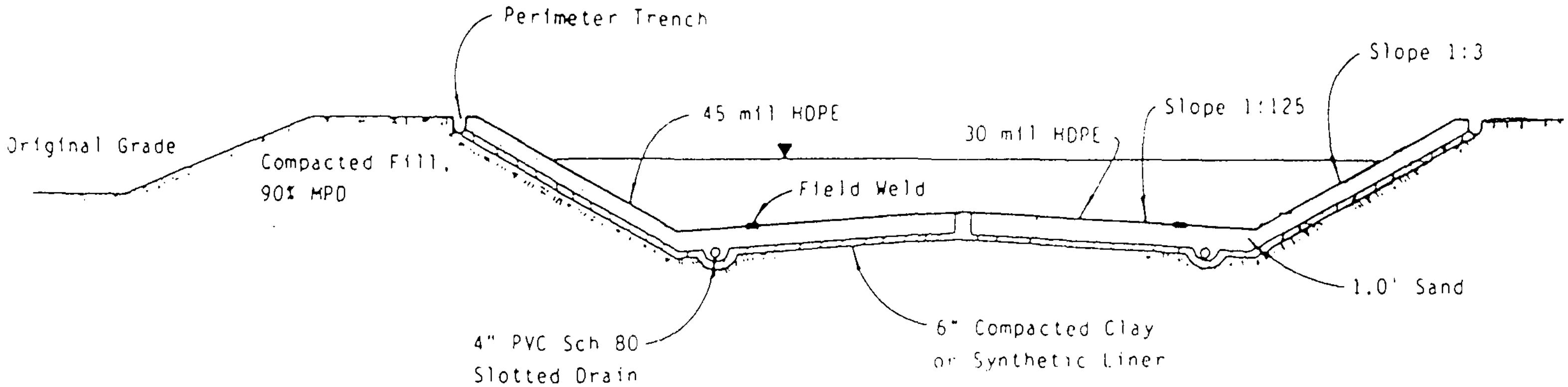
KIRTLAND, NEW MEXICO.

DRAWN BY: D. ORDES OIL & GAS SYSTEMS DESIGN CO. 4/12/91 REV. 1 8/29/91

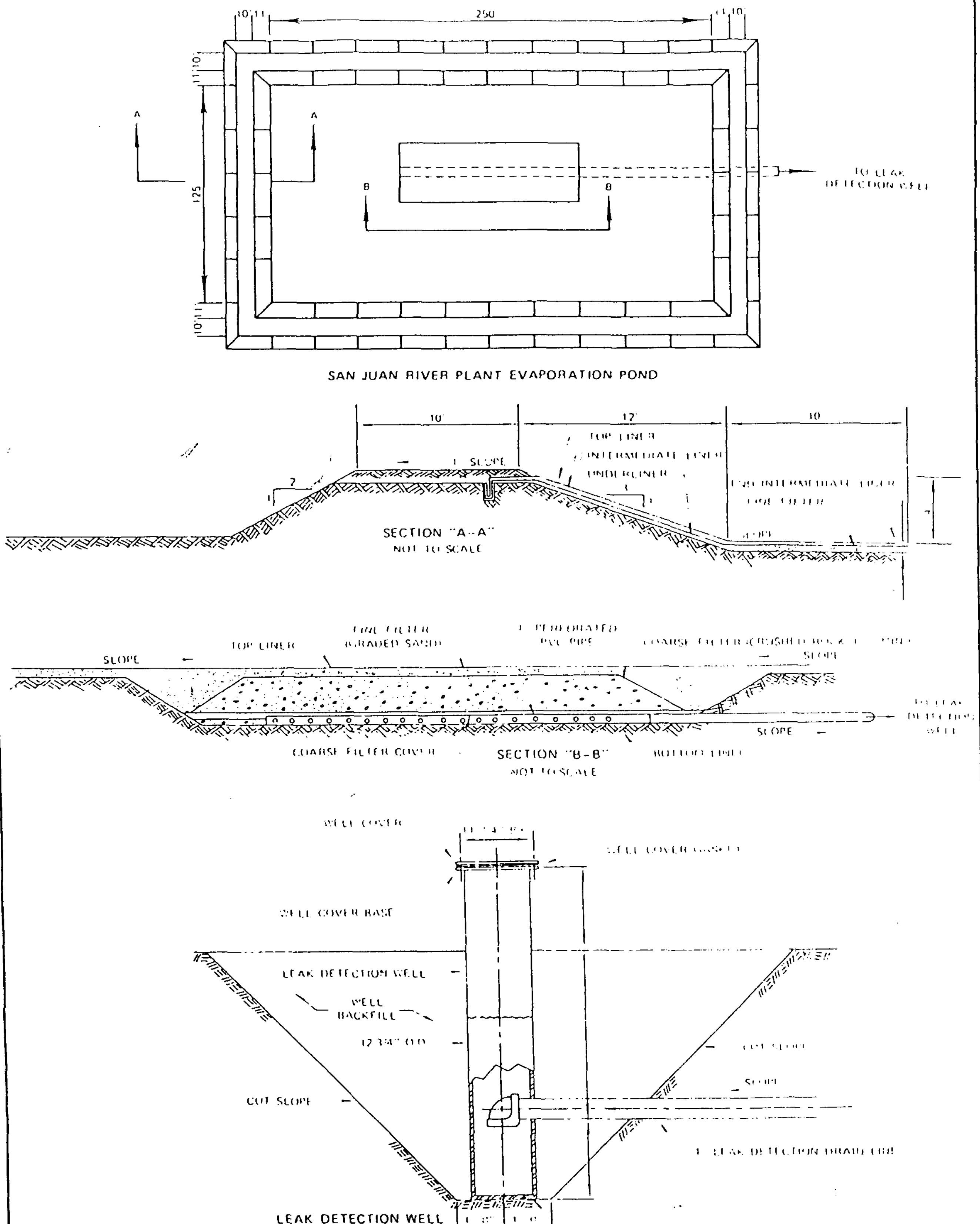

GAS COMPRESSORS
COOLERS
AIR FILTERS
VENTS
EXHAUST SILENCERS
L.P. HC TKS.
VENT
HC's
TRUCK CONN.
OIL COOLING H2O SYS.
O.C. PUMPS
J.W. COOLING H2O SYS.
J.W. PUMPS
FILTER
SURGE
OIL COOLER
1000 HP C.B. GMV-10TF A
1000 HP C.B. GMV-10TF B
1000 HP C.B. GMV-10TF C
1000 HP C.B. GMV-10TF D
COOLER
DELAVAL 2000 HP
OIL COOLER
VENTS
EXHAUST
EVAPORATION POND
PIG RECEIVER AREA
ANETH PIG RECEIVER
BARKER-DOME PIG RECEIVER
ANETH
GAS INLETS
BARKER DOME
350 PSI 40°-60°F
SLUG-CATCHER (COMMON)
.15% H2S (1500 ppm)
3% H2S (30,000 ppm)
BYPASS
RECYCLE
DISCH. GAS COOLER
GAS COOLERS
FUEL GAS
F.G. TO BOILERS
V.O. SYS.
VENT
ENG. F.G.
FUT. FUEL
SWEET GAS AFTER COOLER
SWEET GAS EXCH'S.
GAS DEHY (GLYCOL) SYSTEM
H2O SEPARATOR
GLYCOL CONTACTOR
CARRY-OVER SCRUBBER
M.S. BYPASS
SALES
SALES GAS OUT
MOL SIEVE REGEN GAS SCRUBBER
MOL SIEVE REGEN GAS COOLER
CONTACTED H2O
GAS DEHYDRATION SYSTEM (MOL SIEVE)
MOL SIEVES
REGEN. GAS HEATER
H2S VAPORS TO ATMOS
TANK
BROM BOX
TO VENT SYSTEM
SOUR H2O FROM DEHYS & REGEN. SCRUB.
CONTACTED H2O FLASH TANK
UNDERGROUND SOUR H2O TANKS
TRUCK CONNECTIONS
GRADE
CONTACTED H2O SYSTEM
PLANT FLARES
SULFUR PLANT
35 TPD
SULFUR CONVERTER
ACID GAS EXCH.
INCINERATOR
SULFUR CONDENSER
SAMPLERS
SULFUR CONDENSERS 1 & 2
SULFUR REACTOR COOLER
F.C. BYPASS
SULFUR REACTOR
AIR BLOWERS
TO FLARE K.O.
ACID GAS SCRUB.
REFLUX ACCUM.
SRU S.D.
FLARE K.O. DRUM
SULFUR STORAGE TANK
TRUCK LOADING
GAS SCRUBBER AREA
GAS SCRUBBER
CONTACTOR
CARRY-OVER SCRUBBER
AMINE CONTACTOR AREA
STRIPPER
CARTRIDGE FILTER
RICH/LEAN AMINE EXCH.
BAG FILT.
REBOILER
FLASH TANK
REFLUX PUMPS
AMINE REGEN. AREA
AMINE CHARGE PUMPS
AMINE INJECTION PUMPS
ANTIFOAM
H2O MAKE-UP
AMINE FILTERS
AMINE SURGE TANK
FUTURE H2O
GLYCOL FLASH TK.
LEAN/RICH GLYCOL EXCHANGER
RICH GLYCOL FILTER
LEAN GLY. FILTER
GLYCOL REGENERATOR
AMINE/GLYCOL EXCHANGER
GLYCOL INJ. PUMPS
GLYCOL SURGE TK.
GLYCOL REGENERATION
VENTS
NEW DEA
USED DEA
NEW MDEA (LEFT OVER)
USED MDEA
STORAGE TANKS
INCINERATOR (ABAN.)
VENT STACKS
FLARE STACK
FLARE MOUNTAIN
H2O TANK (ON HILLSIDE)
(UNUSED)
OVERHEADS CONDENSER
AMINE COOLER
FIN-FAN COOLER BANK
NOTE: EQUIPMENT LOCATED ON SITE NOT BELONGING TO WGR IS NOT SHOWN.
LEGEND:
EMISSIONS SOURCES - SEE WRITE-UP
ESD SYSTEM - SEE PLOT PLAN
DISCHARGE PLAN
WESTERN GAS RESOURCES, INC.
SAN JUAN RIVER PLANT
San Juan County, New Mexico
September, 1991
PROCESS FLOWSHEET
Figure 2A
Drawn by: DO
Checked by: GB/KM
Scale: None
Process Flowsheet
Western Gas Resources, Inc.
SAN JUAN RIVER PLANT
Kirtland, New Mexico
8-26-91
RECEIVED
SEP 19 1991
OIL CONSERVATION DIV.
SANTA FE
OIL & GAS SYSTEMS DESIGN CO.
CASPER, WY
8-26-91
REV. 1 8/29/91

Figure 1: Site Layout
Western Gas Resources, Inc.
San Juan River Plant
San Juan County, New Mexico

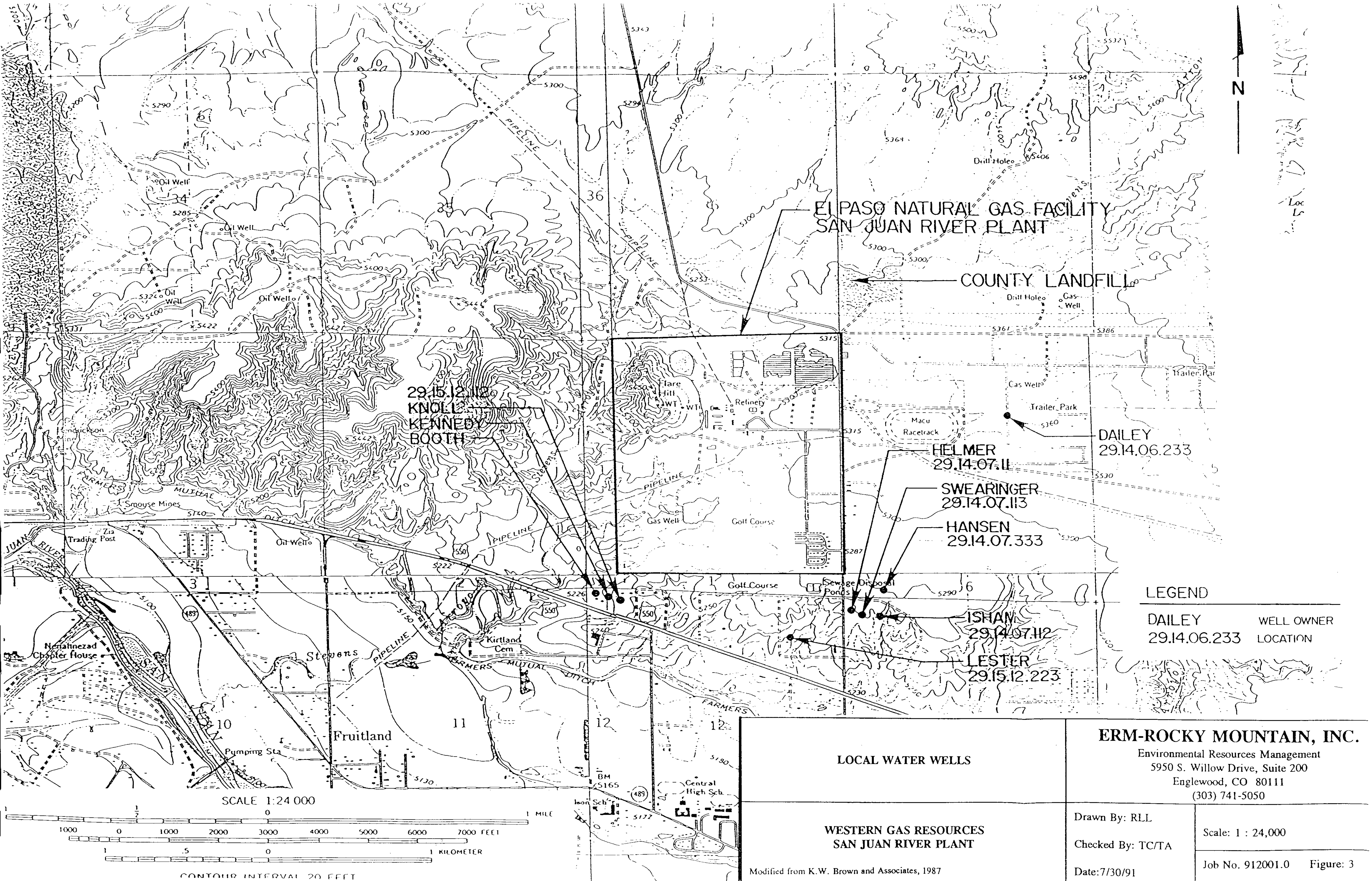
Figure 2A: Process Flowsheet
Western Gas Resources, Inc.
San Juan River Plant
San Juan County, New Mexico



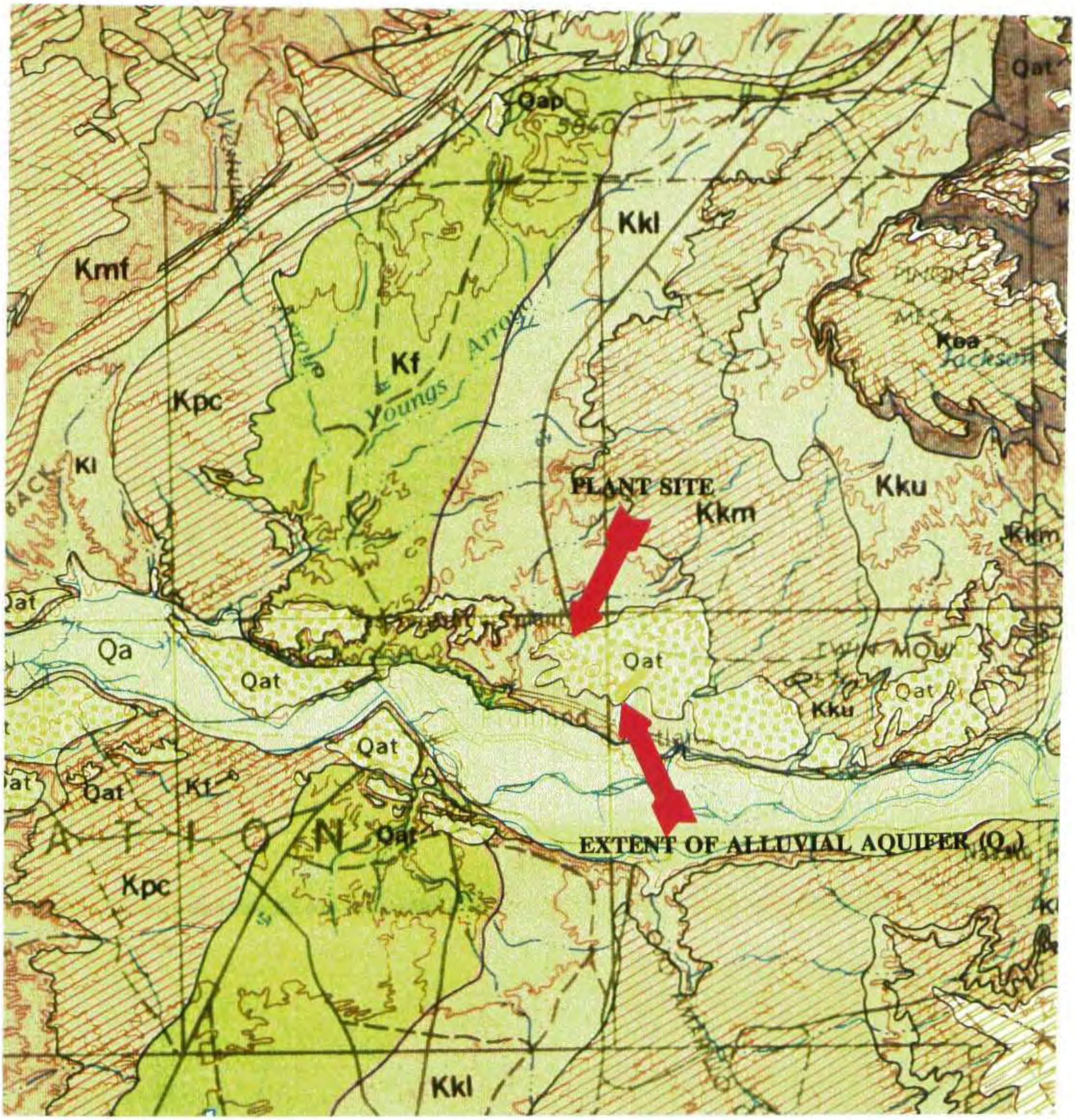
DISCHARGE PLAN WESTERN GAS RESOURCES, INC. SAN JUAN RIVER PLANT San Juan County, New Mexico September, 1991	EVAPORATION POND DESIGN Figure 2B
Modified from El Paso Natural Gas Company Discharge Plan	Scale: None



DISCHARGE PLAN WESTERN GAS RESOURCES, INC. SAN JUAN RIVER PLANT San Juan County, New Mexico September, 1991	EVAPORATION POND DESIGN Figure 2C
Modified from El Paso Natural Gas Company Discharge Plan	Scale: None



LOCAL WATER WELLS	**ERM-ROCKY MOUNTAIN, INC.** Environmental Resources Management 5950 S. Willow Drive, Suite 200 Englewood, CO 80111 (303) 741-5050
WESTERN GAS RESOURCES SAN JUAN RIVER PLANT Modified from K.W. Brown and Associates, 1987	Drawn By: RLL Checked By: TC/TA Date:7/30/91 Scale: 1 : 24,000 Job No. 912001.0 Figure: 3



MAPPED EXTENT OF ALLUVIAL AQUIFER	**ERM-ROCKY MOUNTAIN, INC.** Environmental Resources Management 5950 S. Willow Drive, Suite 200 Englewood, CO 80111 (303) 741-5050	
WESTERN GAS RESOURCES **SAN JUAN RIVER PLANT** Modified from U.S.G.S. Misselaneous Field Investigations Map I-345, Sheet 1.	Drawn By: RLL Checked By: TA/TC Date:7/30/91	Scale: 1 : 128,000(Approx.) Job No. 912001.0 Figure: 4

REFERENCES

Phase I and II Feasibility Study, San Juan River Plant, Final Reports, prepared by K.W. Brown and Associates, Inc., August and November 1987.

Geology, Structure and Uranium Deposits of the Shiprock Quadrangle New Mexico and Arizona, U.S.G.S. Miscellaneous Geological Investigations Map I-345, Sheet 1, Scale 1:250,000.

Letter from David Boyer, State Energy and Minerals Department, to the El Paso Natural Gas Company, June, 27, 1986, page 2.

APPENDIX A

ANALYTICAL RESULTS

EVERGREEN ANALYTICAL, INC.
4036 Youngfield St. Wheat Ridge, CO 80033
(303) 425-6021

INORGANIC ANALYSIS DATA SHEET

Date Sampled	:	04/16/91	Client Project	:	SJRP SAMPLING
Date Received	:	04/18/91	Lab Project #	:	91-1132
Date Prepared	:	05/03/91	Method	:	600/4-79-20
Date Analyzed	:	04/23-05/03/91	Basis	:	Dissolved

Lab Sample Number	Client Sample Number	Element	Matrix	Conc.	Units	Method Det. Limits
X34148	SJRP-W01	Calcium	WATER	200*	mg/L	0.1
		Magnesium	WATER	170	mg/L	0.001
		Potassium	WATER	110	mg/L	0.003
		Sodium	WATER	5,400*	mg/L	0.003
X34149	SJRP-P01	Calcium	WATER	840*	mg/L	0.1
		Magnesium	WATER	780	mg/L	0.001
		Potassium	WATER	99	mg/L	0.003
		Sodium	WATER	16,500*	mg/L	0.003

* These elements were originally run between 4/18-23/91, and rerun on 5/3/91. The results from 5/3/91 are reported above. Compare these results to any you may have previously received. The results reported are final results.

WKH
Approved

MJM
Quality Assurance Officer

EVERGREEN ANALYTICAL, INC.
4036 Youngfield St. Wheat Ridge, CO 80033
(303) 425-6021

MISCELLANEOUS ANALYSES

Date Received	: 4/18/91		Client Project No.	: SJRP Sampling
Date Sampled	: 4/16/91		Lab Project No.	: 91-1132
Date Prepared	: 5/3/91		Methods	: See Below
Date Analyzed	: 5/3/91			

Evergreen Sample #	X34147	X34148	X34149	X34150	X34151
Client Sample #	SJRP-001	SJRP-W01	SJRP-P01	SJRP-S01	SJRP-C01
Matrix	Sludge	Waste Water	Waste Water	Solid	Solid
Anions[1]					
Chloride (mg/L)	NR	5270*	28,600 (2.9%)*	NR	NR
Sulfate (mg/L)	NR	335*	619*	NR	NR
Ion Balance[2] Cation/Anion	NR	169%	94%	NR	NR
Anion/Cation	NR	59%	107%	NR	NR

NR = Not Requested

* These analyses were originally run on 4/19/91, and rerun on 5/3/91. The results from 5/3/91 are reported above. Compare these results to any you may have previously received. The results reported above are the final results.

(1) EPA Method 300.0

(2) The original ion balances for sample # X34148 were 150% (Cation/Anion) and 67% (Anion/Cation). The ion balances for the rerun results footnoted herein and on the Cation report form are shown above.

Approved

Quality Assurance Officer

1132t1.5

EVERGREEN ANALYTICAL, INC.
4036 Youngfield St. Wheat Ridge, CO 80033
(303)425-6021

Purgeable Aromatic Report

Client Sample #	: SJRP-P01		
Lab Sample #	: X34149	Client Project #	: SJRP Sampling
Date Sampled	: 04/16/91	Lab Project #	: 91-1132
Date Received	: 04/18/91	Dilution Factor	: 1.000
Date Extracted/Prepared	: 04/25/91	Method	: 602
Date Analyzed	: 04/25/91	Matrix	: Water
Percent Loss on Drying	: NA	Lab File No.	: PID8269
Methanol extract?	: No	Method Blank No.	: MB04/25/91

Compound Name	Cas Number	Concentration ug/L		MDL* ug/L
Benzene	71-43-2	56		0.4
Toluene	108-88-3	18	B	0.4
Ethyl Benzene	100-41-4	5.5		0.4
Total Xylenes	1330-20-7	8.2		0.4**
Chlorobenzene	108-90-7		U(1)	0.4
1,2-Dichlorobenzene	95-50-1		U(1)	0.6
1,3-Dichlorobenzene	541-73-1		U(1)	0.6
1,4-Dichlorobenzene	106-46-7		U(1)	0.8

** This is Evergreen's estimated MDL value for a single xylene peak.
(1) The absence of Chloro,and Dichlorobenzenes is confirmed by run Hall7269.
Surrogate Recoveries;
cis-1,2-Dichloroethtene
125%

QUALIFIERS:
U = Compound analyzed for, but not detected.
B = Compound found in blank and sample. Compare blank and sample data.
* = The Method Detection Limit. See 40 CFR Ch.1, Pt.136, App. A, Meth. 602, Table 1 and pa. 12.1.
NA = Not applicable or not available.

Approved: D. Blaschke

Quality Assurance Officer

forms\purge602.pln

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DISCHARGE PLAN FOR EL PASO NATURAL GAS COMPANY'S SAN JUAN RIVER PLANT SAN JUAN COUNTY, NEW MEXICO

El Paso
Natural Gas Company

APRIL, 1986

DISCHARGE PLAN APPLICATION
FOR EL PASO NATURAL GAS COMPANY'S
SAN JUAN RIVER PLANT

April, 1986

Submitted to:

NEW MEXICO OIL CONSERVATION DIVISION
P.O. Box 2088
Santa Fe, New Mexico 87501

AFFIRMATION:

"I hereby certify that I am familiar with the information contained in and submitted with this application and that such information is true, accurate and complete to the best of my knowledge and belief."

Signature	Date April 25, 1986
John M. Craig	Vice President
John M. Craig	Vice President

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C	SOIL CHARACTERISTICS NEAR SAN JUAN RIVER PLANT
D	CHEMICAL ANALYSES OF WASTEWATER AND GROUND WATER

1.0 EXECUTIVE SUMMARY

El Paso Natural Gas Company, P.O. Box 4990, Farmington, New Mexico, 87499 proposes to discharge approximately 24,000,000 gallons per year of wastewater to evaporation ponds. The wastewater is generated at the San Juan River Plant which is located in Section 1, T. 29 N., R. 15 W., San Juan County, near Kirtland, New Mexico. More than 90% of the wastewater is blowdown from the plant's cooling towers, boilers and water treatment facility (non-contact wastewater). Non-contact wastewater has a TDS of approximately 2,700 mg/l and contains no toxic hydrocarbon contaminants. Wastewater which comes into contact with hydrocarbons during natural gas processing will be separated from non-contact wastewater and evaporated in lined impoundments equipped with leak detection devices. Ground water which may be affected by this discharge is at a depth of 6 to 25 feet and has an average total dissolved solids content of approximately 17,500 mg/l.

Presently the San Juan River Plant discharges commingled contact/non-contact wastewater into three unlined evaporation ponds. Prior to discharge to the ponds contact wastewater flows into unlined "flare pits" at the plant. Because contact wastewater is believed to contain hydrocarbons, EPNG proposes to close the unlined flare pits and discharge all contact wastewater into lined, total evaporation lagoons. Leak detection and leachate collection systems will monitor the integrity of these impoundments and insure that releases to ground water will not occur.

An extensive on-site sampling and analysis program was conducted to chemically characterize major wastestreams for all appropriate WQCC parameters and 10 piezometers were installed to obtain site hydrogeologic data. Site data showed that natural ground water quality was not suitable for domestic, industrial or irrigation uses. Data suggest that seepage of non-contact wastewater into the ground water zone may actually improve natural water quality.

EPNG has proposed major modifications to its existing wastewater management system to provide for environmental protection. These include:

1. Primary segregation of contact and non-contact waste streams with a lined pond for total evaporation of contact wastewater,

2. A two-celled set of evaporation/holding ponds with compacted-earth dikes and membrane liners of HDPE on the side slopes and the bottoms for contact wastewater,

3. A leak-detection/leachate collection (LD/LC) system to detect and locate potential leaks in the contact-wastewater ponds, and to control accumulation of leachate which might cause structural damage for all impoundments, and

4. Discharge of non-contact wastewater to the existing, unlined evaporation ponds after assessing the need for, and implementing modifications to, the dikes and collection area.

EPNG is wholly committed to carrying out sound disposal practices and to this end submits this plan outlining the proposed procedures. Likewise, EPNG is committed to cooperating fully with NMOCD in honoring requests for additional information or providing clarification of existing information related to the Discharge Plan.

2.0 GENERAL INFORMATION

2.1 NAME OF DISCHARGER/LEGALLY RESPONSIBLE PARTY

All correspondence regarding this discharge plan should be sent to EPNG San Juan Division headquarters at the address below:

John M. Craig
Vice President
San Juan Division
El Paso Natural Gas Company
P.O. Box 4990
Farmington, NM 87499
(505) 325-2841

2.2 LOCAL REPRESENTATIVE OR CONTACT

A copy of all correspondence and all questions should be directed to the San Juan Division Compliance Engineer:

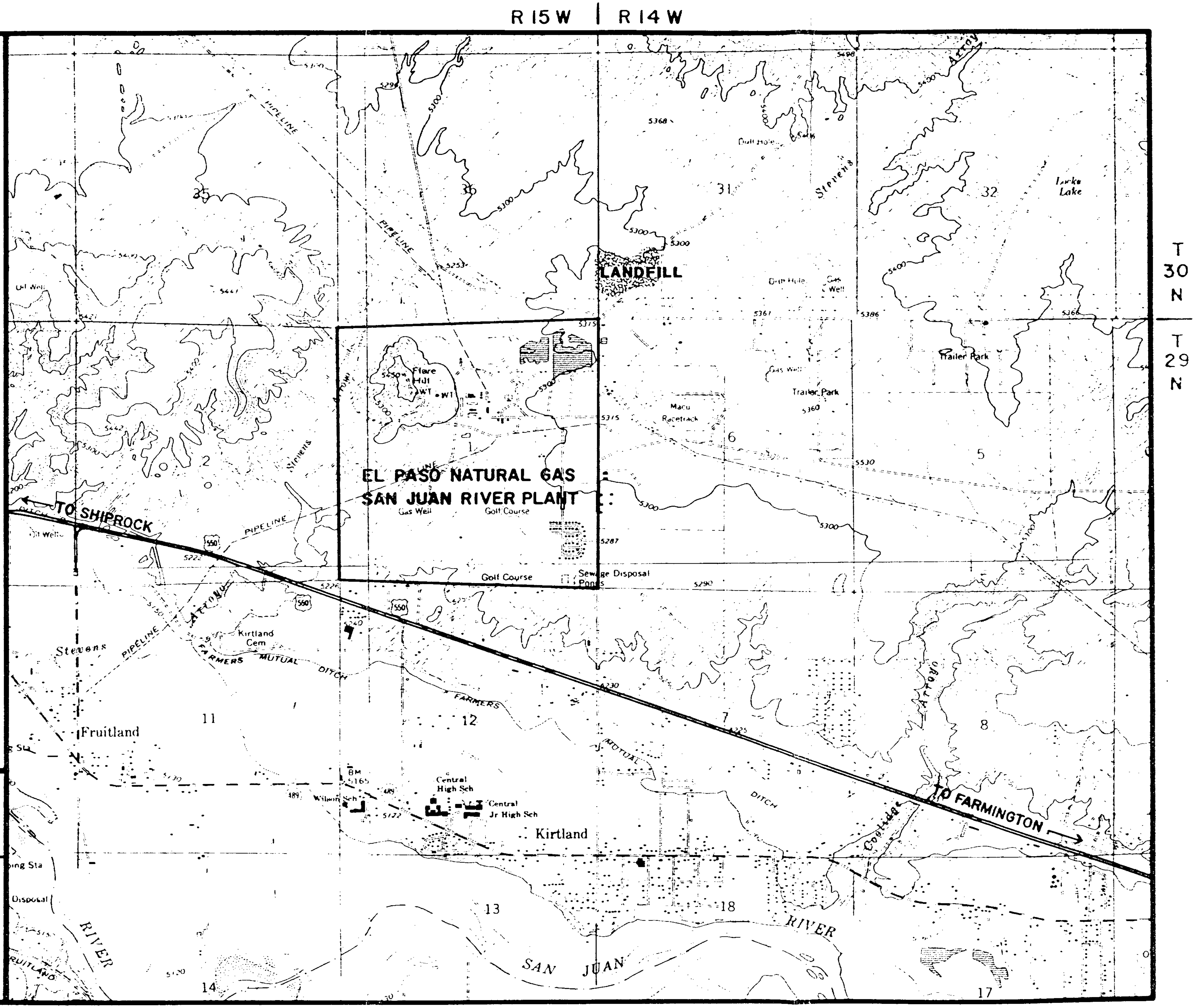
Kenneth E. Beasley
El Paso Natural Gas Company
San Juan Division
P.O. Box 4990
Farmington, NM 87499
(505) 325-2841

EPNG requests that copies of correspondence also be sent to:

Environmental Affairs
El Paso Natural Gas Company
P.O. Box 1492
El Paso, TX 79978
ATTN: H. Van
(915) 541-2832

2.3 LOCATION OF DISCHARGE

The San Juan River Plant is located in Section 1, T. 29 N., 15 W., San Juan County, New Mexico, approximately 8 miles west of Farmington, New Mexico and 1.7 miles north of Kirtland, New Mexico (Figure 2-1). Highway 550 and County Road 61 provide access to the plant. An aerial photographic base map of the facility is included as Plate 1 (all plates are found in map pockets).



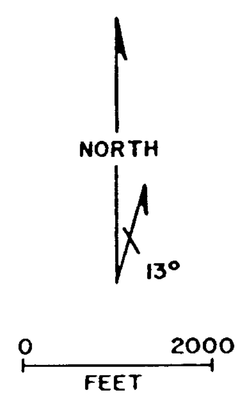


FIGURE 2-1
LOCATION MAP OF EPNG
SAN JUAN RIVER PLANT

CLIENT: EL PASO NATURAL GAS CO.
DATE: 11-10-85
DRAWN BY: SELKE
CHECKED BY:
REVISED:
SCALE: 1"=2000'

2.4 LOCAL LAND USE

The San Juan River Plant is bounded on the north and west by state and public lands. This includes state lands in Section 36, T. 30 N., R. 15 W. and Section 2, T. 29 N., R. 15 W., and public lands in Section 31, T. 30 N., R. 14 W. and Section 35, T. 30 N., R. 15 W.

Approximately 30 tracts of privately-owned land have been identified in the lands bordering the eastern and southern perimeter of the San Juan Plant. These tracts are located in Section 6, T. 29 N., R. 14 W., Section 7, T. 29 N., R. 14 W., Section 11, T. 29 N., R. 15 W. and Section 12, T. 29 N., R. 15 W.

2.5 TYPE OF NATURAL GAS OPERATION

The El Paso Natural Gas Company San Juan River Plant is engaged in the compression and processing of natural gas and recovered natural gas liquid products. The supply sources for the gas processed at the facility, each having certain unique properties, define the type of processing required.

Low-pressure sour gas from the Barker Dome field is compressed to approximately 800 psig. This stream is then combined with sour natural gas from EPNG's Aneth Plant and the mixture is passed through an amine treating unit for removal of carbon dioxide and hydrogen sulfide. Most (>96%) of the hydrogen sulfide resulting from this process is then sent to a sulfur recovery unit that produces elemental liquid sulfur as a commercial by-product.

Low-pressure gas from the San Juan fields is also compressed and then routed to the gasoline plant where propane, butanes, pentanes and heavier hydrocarbons (C_3-C_5+) are extracted for sale as natural gas liquids. The remaining natural gas is then combined with the residue natural gas from the amine treating unit. The resulting mixture is dehydrated to remove water and then enters the company's pipelines for transmission to market.

2.6 REGULATORY INDEX

Table 2-1 presents the regulatory index. This table provides a cross reference between WQCC Regulations and this discharge plan.

TABLE 2-1
REGULATORY INDEX

WQCC Regulation Required in Discharge Plan	Section in Discharge Plan
1-201	1.0, 2.0
1-202	To Be Submitted Prior to Construction and after NMOCD Approval of Discharge Plan
1-203	3.3.4
3-106 C.1	3.2
3-106 C.2	2.3, Figure 5.9, 5.3.2
3-106 C.3	1.0, 5.3
3-106 C.4	5.4
3-106 C.5	4.3, To be Included in Plans and Specifications
3-106 C.6	5.1
3-106 C.7	7.0
3-107	6.0
3-108.B	1.0

3.0 EFFLUENT SOURCES, CHARACTERISTICS AND DISPOSAL

3.1 PROCESS DESCRIPTION

The San Juan River Plant receives raw natural gas from the Aneth, Barker Dome and San Juan fields. Although these inlet streams vary in chemistry, all are processed to some extent to:

- Remove contaminants such as H_2O and acid gases (H_2S and CO_2)
- Extract hydrocarbon by-products (C_3 to C_5+ liquids)
- Add odorant into the natural gas
- Compress the gas for introduction into transmission pipelines

Data for 1985 indicates a total average gas inlet flow of 51.8 MMCF/day. Of this total, 44.9 MMCF/day were mainline sales and 3.9 MMCF/day were consumed on-site as boiler, compressor and space-heating fuel. Flares, liquids and sulfur removal and miscellaneous losses account for the remaining 3.0 MMCF/day. Gasoline-plant production averages about 22,200 gallons/day, and the sulfur-recovery plant produces about 15.4 tons/day. Plate 2 (block flow-diagram) summarizes processes and material flows. Plates 3, 4 and 5 identify the location of process and waste-management units.

In the following subsections, unit processes are classified according to wastewater production. Processes which produce no wastewater are considered "dry" (D). A process which produces wastewater due to contact with hydrocarbons is a "contact" process (C), and those processes which do not contact hydrocarbons are "non-contact" (NC) wastestreams.

Dry processes include:

PROCESS	SUBSECTION
Compressors (D)	3.1.1
Acid-Gas Treatment (D)	3.1.2

Contact processes are:

PROCESS	SUBSECTION
Scrubber/Separators (C)	3.1.3
Dry-Bed Dehydration (C)	3.1.4
Gasoline-Plant Operations (C)	3.1.5
Sulfur Plant Sump (C)	3.1.6

Non-Contact wastewater is generated by:

PROCESS	SUBSECTION
Sulfur Plant Boilers (NC)	3.1.7
Water Treatment (NC)	3.1.8
Boilers (NC)	3.1.9
Cooling Towers (NC)	3.1.10
Domestic Sewage (NC)	3.1.11
Storm Water (NC)	3.1.12

3.1.1 Compressors (D)

Gas is compressed by reciprocating or centrifugal compressors. No wastewater is produced by these units.

3.1.2 Acid-Gas Treatment (D)

Field gas contains varying amounts of CO_2, H_2S, COS and CS_2, all of which may form acids in the presence of water. These contaminants are corrosive to pipelines and equipment and must therefore be removed to meet pipeline quality standards and safety requirements.

Inlet gas to the treating plant is contacted with two sweetening agents, methyl diethanolamine (MDEA) and diethanolamine (DEA) which absorb the impurities mentioned above. The sulfur gases and CO_2 are then removed from the MDEA and DEA in stripping stills. Both MDEA and DEA are regenerated and recycled; no "spent catalyst" is discharged. Sulfur-rich gases from the MDEA stripping stills flow to the sulfur-recovery unit and CO_2-rich gas from the DEA still flows to the incinerator. If the sulfur recovery unit is inoperative, MDEA stripping still gases may be flared.

3.1.3 Scrubbers/Separators (C)

All inlet gas is passed through one or more scrubber/separator units to remove water produced with the gas. This wastewater may contain some free and dissolved hydrocarbons. Aneth and Barker Dome gas is treated by scrubber/separators which discharge approximately 54 gallons per day (gpd) of wastewater to the north flare pit where any hydrocarbons are burned off. Gas from the San Juan Gathering System is treated in a scrubber/separator which discharges approximately 5 gpd to the south flare pit. All wastewater from the south flare pit is ultimately discharged to the evaporation ponds.

3.1.4 Dry-Bed Dehydration (C)

In order to meet contractual water content requirements, dry-bed dehydration is used before gas enters the main transmission line to remove any remaining water vapor. This unit produces an average of 368 gpd of wastewater which flows to the south flare pit. Hydrocarbons are then burned off, and the evaporation ponds receive the wastewater.

3.1.5 Gasoline-Plant Operations (C)

Some natural gas contains significant amounts of natural gas liquids (propane and butanes) and heavier hydrocarbons such as pentane, hexane and others. These hydrocarbons (natural gasoline) are extracted in the gasoline plant (not to be confused with gasoline produced in a petroleum refinery). Approximately 3300 gpd of gasoline plant wastewater is produced and routed to the south flare pit. Following burn-off of waste hydrocarbons, the wastewater is pumped to the evaporation ponds.

3.1.6 Sulfur Plant Sump (C)

A concrete sump at the north end of the sulfur plant receives small amounts of liquid from A and B stills which does not fall out in the reflux drums. Liquids from the sulfur plant inlet scrubber sump are also piped to this sump. Effluent from the sump, which is too small to accurately quantify, flows via a 2-inch PVC line to the collection basin adjacent to Pond 1.

3.1.7 Sulfur Plant Boilers (NC)

Sulfur is removed from acid gases by the Claus process, in which an aluminum oxide catalyst oxidizes H_2S to H_2O (steam) and elemental sulfur. The process is exothermic, and a waste-heat boiler is used to recover thermal energy and cool the outlet gas stream. Steam from the sulfur plant is used in the sulfur and main plants' steam systems. A small amount of water is periodically "blown down" from the sulfur plant boiler unit as a normal facet of proper boiler operations. This blowdown is discharged to the evaporation ponds.

3.1.8 Water Treatment (NC)

Makeup water from the San Juan River and the Farmers' Mutual Ditch is treated by filtration and ion exchange "softening" to produce boiler feedwater. Wastewater is produced by filter backwash and ion exchange regeneration. Evaporators are also used in water treatment to further purify the softened water. These units are "blown down" periodically. Approximately 16,662 gpd of wastewater is produced, and discharged to the evaporation ponds.

3.1.9 Boilers (NC)

The main boiler plant produces steam for power generation, gas processing units and general process heating. Some additional steam is also produced by the sulfur plant (see 3.1.6). In order to maintain proper boiler operation, a certain quantity of boiler water is "blown down" and replaced with purified makeup water (see 3.1.7). This prevents an increase in the TDS of the boiler water, which could lead to scale formation and/or corrosion. Approximately 28,917 gpd of blowdown water is produced and discharged to the evaporation ponds. Boilers consume 70,489 gpd; subtracting the blowdown leaves 41,572 gpd which are lost through deaeration, stripping process and other plant losses, most of which are evaporative (small amounts of condensate are collected in drains which flow to the evaporation ponds). Evaporative losses represent about 11% of the daily steam throughput of 375,357 gpd (water). Steam is recycled at an efficiency of 89%.

3.1.10 Cooling Towers (NC)

Evaporative cooling tower water is used to cool compressed gases for transportation (pipeline gas), for product cooling (propane, butane), and for other general cooling of process units and/or products. Cooling towers recycle much of their water, but some is "blown down" and replaced to prevent TDS buildup. Of the 96,451 gpd of makeup water, 16,111 gallons are "blown down" to the evaporation ponds, and 80,340 gallons are lost daily to evaporation.

3.1.11 Domestic Sewage (NC)

Total discharge is estimated to be less than 2000 gpd for each septic tank (Plate 3). Discharge from two in-plant septic tanks is routed to leach fields. A third septic tank for the boiler house restroom discharges to the 8-inch plant drain flowing to Pond 1.

3.1.12 Storm Water (NC)

The San Juan River Plant is located on a topographic "saddle" with excellent natural drainage (Plate 1). Storm water from the south side of the process area is collected in concrete-lined ditches, which discharge to grade on the south side of the plant. On the north side of the plant, storm water is collected in concrete-lined ditches which drain to natural, unlined channels. These channels then drain to evaporation Pond 1.

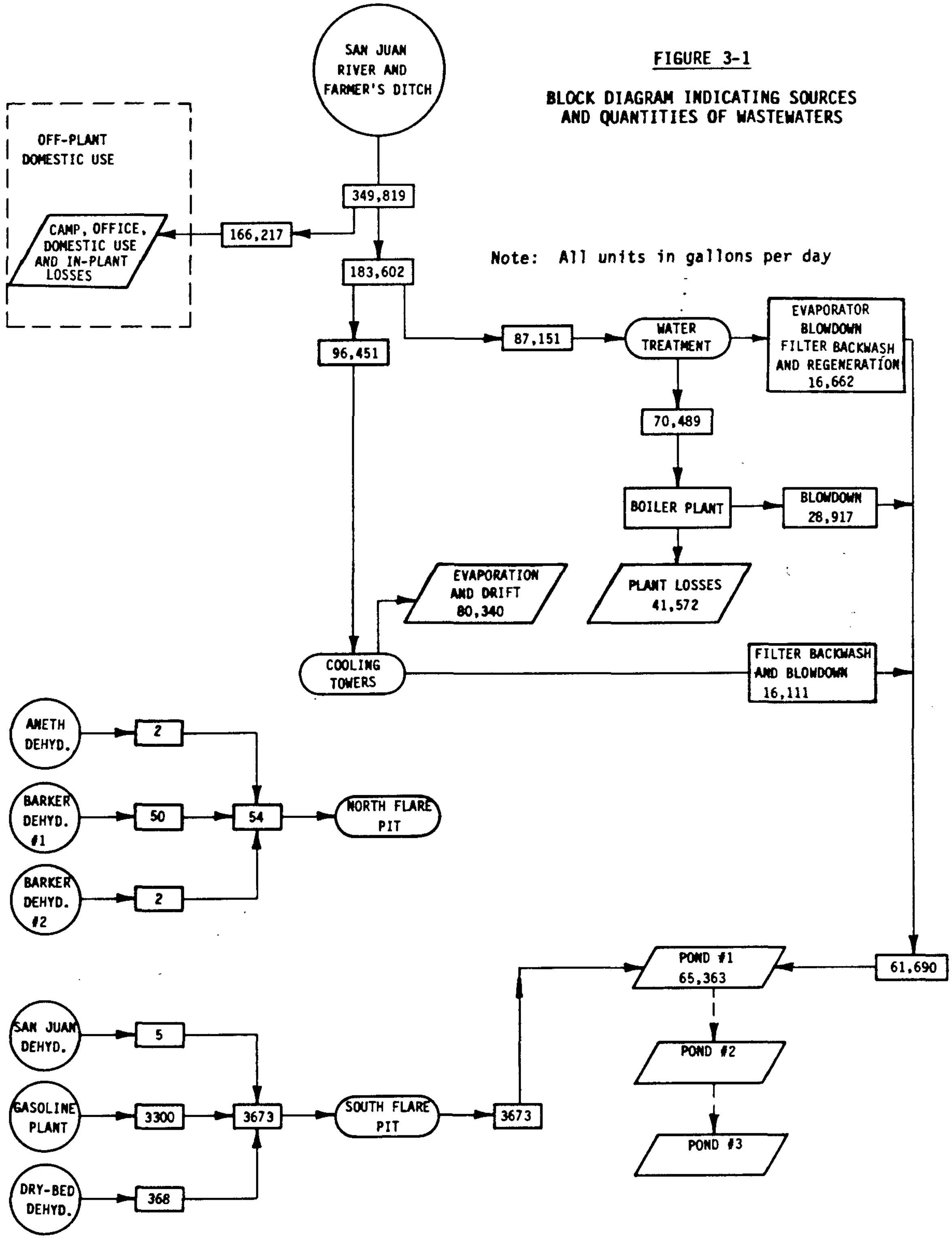
3.2 WASTE QUANTITY AND FLOW CHARACTERISTICS

The San Juan River Plant produces approximately 24 million gallons of process wastewater per year, which is presently discharged to 3 unlined evaporation ponds with a combined surface area of 29 acres. A materials balance of plant intake water, gas production and estimated plant water losses indicate a total discharge of 65,363 gpd (23,877,205 gallons/ year). Wastewater sources for process and non-process waste streams and estimated water usage is shown in Figure 3-1.

Conceptual design modifications proposed in this discharge plan (see Plate 6 and Section 4.3) utilize this discharge rate for all design

FIGURE 3-1

BLOCK DIAGRAM INDICATING SOURCES AND QUANTITIES OF WASTEWATERS



calculations. EPNG is also currently conducting a flow monitoring program to accurately determine wastewater production at the San Juan River Plant; however, the above estimate of discharge is a reasonable, conservative discharge rate to use for initial engineering calculations.

Table 3-1 summarizes previous analyses of these wastestreams and Table 3-2 gives analyses of evaporation pond waters. It is apparent that the quality of the wastewater in the ponds is generally good. Some concentration of dissolved constituents has occurred in Pond 3 due to evaporation. Toxic pollutants (as defined in Section 1-101.UU of the WQCC Regulations) are not anticipated in the pond effluent. Chlorinated organic substances are not discharged at the site.

Based upon available chemical analyses, some toxic pollutants may be present in contact wastewater. However this wastestream represents only 5% of the total discharge and will be managed in double-lined lagoons equipped with leak detection devices. No toxic pollutants are anticipated in the non-contact wastewater stream.

Table 3-3 summarizes steam production for 1985. Because steam production and power generation are largely responsible for wastewater production, they are used as a basis for calculation of monthly variations in wastewater flows.

3.2.1 Boiler Blowdown

Boiler blowdown produces approximately 10,555,700 gallons per year, or approximately 28,900 gpd (44% of total wastewater). This non-contact waste stream is slightly elevated in TDS (1,140 mg/l) compared to WQCC standards.

Sulfur plant boiler blowdown is not metered but is estimated to be less than 300 gallons per day. Boiler blowdown flows to Pond 1 via an 8-inch line which terminates in a collection basin.

TABLE 3-1
SAN JUAN RIVER PLANT WASTEWATER ANALYSES BY EFFLUENT SOURCE
(ALL ANALYSES IN MG/L)

	J85-0056 Water, 6" Drain	J85-0069 Water, 8" Drain	J85-0067 Boiler Blowdown	J85-0068 Evaporator Blowdown
COD	54.8	346.0	212.0	77.2
Nitrate-N	<0.1	<0.1	8.99	<0.1
Oil & Grease	3.61	8.02	3.35	3.28
TOC	4.0	91.0	43.0	8.0
O-phosphate	<0.1	<0.1	30.0	<0.1
Cyanide	0.017	ND	0.006	0.007
Phenolics	ND	ND	ND	ND
Arsenic	<0.002	ND	<0.002	<0.002
Barium	<0.2	<0.2	<0.2	<0.2
Cadmium	0.79	ND	ND	ND
Calcium	44.2	134.0	<1.0	1.97
Chromium	ND	0.063	ND	ND
Hardness	152.0	463.0	4.53	5.29
Lead	ND	ND	0.06	ND
Magnesium	10.0	31.3	1.1	0.09
Mercury	<0.001	<0.001	<0.001	<0.001
Potassium	2.13	12.3	0.32	1.54
Selenium	ND	ND	ND	ND
Silver	<0.01	ND	ND	ND
Sodium	950.0	787.0	280.0	298.0
Zinc	0.01	0.45	1.08	0.06
Alkalinity (total)	93.8	150.0	436.0	143.0
Alkalinity (Bicarbonate)	114.0	183.0	0.0	0.0
Chloride	15.1	1,190.0	52.7	821.0
Fluoride	<0.1	<0.1	1.80	<0.1
TDS	1,850.0	2,710.0	1,140.0	1,240.0
Sulfate	142.0	137.0	30.1	172.0
Carbon tetrachloride	ND	ND	ND	ND
PCE	ND	ND	ND	ND
1.1.2-Trichloroethane	ND	ND	ND	ND
PCB's	<0.0001	<0.0001	<0.0001	<0.0001
Benzene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
EDC	ND	ND	ND	ND
DCE	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Xylenes	ND	ND	ND	ND

ND = not detected

6" Drain is from water purification plant and B cooling tower blowdown

8" Drain is from south flare pit, A cooling tower blowdown and plant drains

Laboratory reports are included in Appendix D

TABLE 3-1 (Continued)
SAN JUAN RIVER PLANT WASTEWATER ANALYSES BY EFFLUENT SOURCE
(ALL ANALYSES IN MG/L)

	8603030915 Sulfur Plant Sludge Sump	WQCC Ground Water Standards
COD	16,500.0	NS
Oil & Grease	31.8	NS
TOC	4,080.0	NS
O-phosphate	<0.1	NS
Cyanide	0.014	0.2
Phenolics	0.073	0.005
Arsenic	<0.02	0.1
Barium	<0.5	1.0
Cadmium	<0.01	0.01
Calcium	5.14	NS
Chromium	0.03	0.05
Hardness	14.0	NS
Lead	<0.05	0.05
Magnesium	0.29	NS
Mercury	<0.001	0.002
Potassium	0.45	NS
Selenium	<0.01	0.05
Silver	<0.01	0.05
Sodium	1.50	NS
Zinc	0.03	10.0
Alkalinity (total)	3,210.0	NS
Alkalinity (Bicarbonate)	3,920.0	NS
Chloride	2.71	250.0
Fluoride	4.58	1.6
TDS	448.0	1000.0
Sulfate	22.2	600.0
Carbon tetrachloride	ND	0.01
1.1.2-Trichloroethane	ND	NS
Benzene	18,500.0	0.01
Toluene	32,900.0	15.0
Ethylbenzene	ND	NS
Xylenes	10,200.0	NS

ND = not detected
NS = No standard
Laboratory reports are included in Appendix D

TABLE 3-2
SAN JUAN RIVER PLANT EVAPORATION POND WASTEWATER ANALYSES

	J85-0059 Pond No. 1	J85-0060 Pond No. 2	J85-0061 Pond No. 3	WQCC Ground Water Standards
COD	234.0	279.0	1,800.0	NS
Nitrate-N	<0.1	<0.1	<0.1	10.0
Oil & Grease	3.40	1.95	5.10	NS
TOC	53.0	52.0	121.0	NS
O-phosphate	<0.1	<0.1	<0.1	NS
Cyanide	0.006	0.008	0.023	0.2
Phenolics	ND	ND	ND	0.005
Arsenic	<0.002	<0.002	<0.002	0.1
Barium	<0.2	<0.2	<0.2	1.0
Cadmium	ND	ND	ND	0.01
Calcium	98.0	144.0	1,190.0	NS
Chromium	0.048	0.042	0.021	0.05
Hardness	349.0	518.0	4,740.0	NS
Lead	0.007	ND	ND	0.05
Magnesium	25.2	38.4	429.0	NS
Mercury	<0.001	<0.001	<0.001	0.002
Potassium	9.85	15.2	83.2	NS
Selenium	ND	ND	ND	0.05
Silver	ND	ND	0.007	0.05
Sodium	881.0	1,720.0	12,900.0	NS
Zinc	0.24	0.13	0.08	10.0
Alkalinity (total)	183.0	164.0	206.0	NS
Alkalinity (Bicarbonate)	223.0	200.0	251.0	NS
Chloride	1,370.0	2,210.0	12,000.0	250.0
Fluoride	<0.1	<0.1	<0.1	1.6
TDS	2,690.0	4,120.0	54,600.0	1000.0
Sulfate	200.0	155.0	12,000.0	600.0
Carbon tetrachloride	ND	ND	ND	0.01
PCE	ND	ND	ND	0.02
1,1,2-Trichloroethane	ND	ND	ND	0.01
PCB's	<0.0001	<0.0001	<0.0001	0.001
Benzene	0.156	0.094	ND	0.01
Toluene	0.221	ND	ND	0.75
EDC	ND	ND	ND	0.02
DCE	ND	ND	ND	0.0005
Ethylbenzene	ND	ND	ND	0.75
Xylenes	ND	ND	ND	0.62

ND = not detected
NS = No standard
Laboratory reports are included in Appendix D

TABLE 3-3
EPNG/SJRP MONTHLY STEAM PRODUCTION FOR 1985

Month	Steam Production (1000 #/Hour)	Percentage of Total Annual Production
January	127.7	8.8
February	128.7	8.9
March	129.5	8.9
April	128.1	8.8
May	124.0	8.6
June	104.4	7.2
July	114.7	7.9
August	110.2	7.6
September	104.6	7.2
October	120.0	8.3
November	125.9	8.7
December	129.9	9.0
TOTAL (1985)	1,447.7	99.9
Total (June-Sept.)	433.9	
Total (Oct.-May)	1,013.8	
Monthly Average		
1985	120.6	
June-Sept. (4 months)	108.5	
Oct.-May (8 months)	126.7	

3.2.2 Cooling Tower Blowdown

Wastewater from cooling towers comprises 5,880,500 gallons per year, or about 16,111 gpd (25% of process wastewater). Although this non-contact wastewater has not been characterized explicitly, analyses of commingled streams are shown in Table 3-1. The 6-inch drain carries only non-contact wastewater and should be representative of cooling tower blow-down. This wastewater flows to Pond 1.

3.2.3 Water Treatment (Softener, CCD Regeneration, Filter Backwash and Evaporators)

Treatment of water for domestic and process use produces 6,081,600 gallons per year of wastewater, or about 16,650 gpd. This non-contact source amounts to 25% of total wastewater. Filter backwash flows through a 6" underground line (gravity drain) to Pond 1. This wastestream will be resampled due to the presence of concentration of cadmium and cyanide. Evaporator blowdown (1240 mg/l TDS) flows through a 2-inch steel line which connects to the 8-inch boiler blowdown line. Softener and CCD regeneration is routed to the 8-inch plant drain on the east side of the plant. As expected, TDS in these discharges are slightly elevated above WQCC standards (Table 3-1).

3.2.4 Other Wastewater (Gas Dehydration, Gasoline Plant, Miscellaneous)

Contact wastewater from dehydration of residue gas, gasoline plant effluent and miscellaneous wastewater from other process units typically contains some free hydrocarbons. Gas dehydration and other contact water flows through a separation sump to the flare pits (Plates 4, 5). These waste streams total 1,360,350 gallons per year, or about 3,727 gpd (4% of total discharge).

In the flare pits, waste hydrocarbons are burned off and the aqueous phase from the south flare pit is pumped to a sump from which it flows to the 8-inch underground line and to Pond 1. This wastewater flowing in the 8-inch drain is commingled with non-contact wastewater from cooling tower "A" and plant drains. Analyses from the 8-inch drain (Table 3-1) show that TDS exceeds WQCC standards. All other species analyzed were within acceptable limits.

Small amounts (less than 1 gpd) of condensed water are periodically drained from the flare stack to the ponds.

3.2.5 Sulfur Plant Sump

A volume of effluent which is too small to accurately quantify is discharged from the sulfur plant sump through a 2-inch PVC line to the collection basin adjacent to Pond 1. This contact wastewater contains benzene and toluene at levels in excess of WQCC standards.

3.2.6 Domestic Sewage

Discharge from two in-plant septic tanks flows to leach fields. A third septic tank for the boiler house restroom discharges to the 8-inch plant drain.

3.2.7 Chemicals, Additives and Preservatives

The type and known quantities of chemicals and additives used in both contact and non-contact processes at the San Juan River Plant are summarized in Table 3-4. Appendix A contains Material Safety Data Sheets for all trade name products and chemical hazard information for generic compounds from Sax's Dangerous Properties of Industrial Materials.

It should be noted that the San Juan River Plant will be discontinuing the use of the Toxene products, Antipol-662 and Hydro D-100, in the near future and replacing them with Betz 2020, Betz 2040, Slimicide C41 and Betz 445 due to problems with heat exchanger fouling caused by micro-organisms which are resistant to the Toxene products. Material Safety Data Sheets have also been provided in Appendix A for these products.

3.2.8 Possible Variation in Wastewater Chemistry and Quantity

Gasoline plant processing at the San Juan River Plant is seasonal. Processing peaks in the winter months when demand is high, and is reduced in spring, summer and fall. Because the gasoline plant contributes less

TABLE 3-4
CHEMICALS USED AT SAN JUAN RIVER PLANT (ANNUAL AMOUNTS)

WATER TREATING

1.	Alum. Sulfate	(Settling Tank) 1825 lbs
2.	Chlorine	(Gas - Domestic Use) 3000 lbs
3.	Cat Floc T	(Domestic Filters) 1-55 Gal. Drum

COOLING TOWERS

4.	Antipol - 662	7 Drums-
5.	Sulfuric Acid	1900 Gallons
6.	Toxene 35	(20 Gal/Month) 4-1/3 Drums
7.	Toxene 37	(20 Gal/Month) 4-1/3 Drums
8.	Toxene 39	(20 Gal/Month) 4-1/3 Drums
9.	Hydro. D-100 (for B cooling tower)	(3 Gal/Day) 20 Drums

BOILER FEED CHEMICALS

10.	Corless 202-A	(2 Gal/Day)	13 Drums
11.	Corless 130	(1 Gal/Day)	7 Drums
12.	Caustic Soda	(5 lbs/Day)	1825 lbs/Year
13.	Deox-21	(3 lbs/Day)	1095 lbs/Year
14.	Hymol-82	(1 Gal/Day)	7 Drums
15.	Salt (Softener-Boiler Feed Water)		660,000 lbs

CLOSED JACKET AND OIL COOLING WATER SYSTEMS AT COMPRESSION PLANT

16.	Chromine T.	5 Gallons
17.	Quest 40	5 Gallons
18.	Hymol-82	5 Gallons
19.	Antifoam-47 (1 Quart/Month)	5 Gallons

GAS TREATING

20.	MEA	3,400 Gallons
21.	MDEA	2,500 Gallons
22.	Absorption Oil (Kerosene)	55,000 Gallons

LUBE OIL

23.	Shell Turbo 32	1,000 Gallons
24.	Shell Mysella 40	6,100 Gallons

TABLE 3-4
CHEMICALS USED AT SAN JUAN RIVER PLANT ANNUALLY (CONT.)

	DEGREASING AGENTS	
25.	Varsol 1	1,000 Gal/year
	PIPELINE CORROSION INHIBITORS	
26.	KONTOL KP-196	2.11 Gal/day
	BETZ WATER TREATMENT ADDITIVES	
27.	Betz 2020	4,825 lbs/year
28.	Betz 2040	5,765 lbs/year
29.	Slimicide 041	34 lbs/wk
30.	Betz 445 (Detergent)	57 lbs/wk

than 5% of the total wastewater volume, no major changes in wastewater chemistry are anticipated on a seasonal basis.

The yearly discharge of 24 to 26 million gallons per year (63,000 to 71,000 gpd) is based on data from past operations; actual daily discharges may be expected to vary. The 24-26 million gallon figure was used as a conservative basis for calculating evaporation, salt loading, and pond size. This ensures that waste management systems will have adequate capacity for all reasonably anticipated loadings.

The monthly steam production records are summarized in Table 3-3. The percentage of total production for each month is also presented. Because steam production and power generation processes are responsible for a significant portion of the wastewater, variations in steam production rates produce variations in wastewater production. Wastewater production would tend to peak in the months of October through May, but falls to approximately 86% of the winter maximum during the remainder of the year. EPNG is presently conducting a study of wastewater flows to permit final design and sizing of the new proposed wastewater management system for the San Juan River Plant.

3.3 SPILL/LEAK PREVENTION AND HOUSEKEEPING PRACTICES

3.3.1 Operating and Maintenance Procedures

The El Paso San Juan River Plant is operated in a manner to prevent and mitigate any unplanned releases to the environment. Plant process and storage units are regularly observed by a number of personnel during normal operations, and any evidence or sign of spills/leaks are routinely reported to supervisory personnel so that repairs or cleanup can be promptly effected. Routine maintenance procedures conducted at the San Juan Plant also help to assure that equipment remains functional and that the possibility of spills/leaks is minimized.

The majority of process and storage units at the San Juan Plant are bermed or curbed and have underdrains or natural diversions which will direct any unplanned spills or releases to existing waste management areas.

3.3.2 Chemical and Environmental Hazards

A number of process and non-process chemicals or additives (Table 3-4) used at the San Juan Plant could present a threat to the environment only in the event of a major spill or release. The majority of the chemicals are used in very small quantities (5 gallons to 20 barrels per year) and any spills or leaks would be very small in volume and easily contained in the immediate area.

Major spills could result from the release of lubricating or process oils, amines, caustics and acids. Major spills of wastewater could also result from possible dike failures at any of the wastewater ponds.

3.3.3 Cleanup Procedures

Cleanup procedures would obviously vary with the nature and extent of any unplanned release. Spills of acids and bases are relatively easy to control and general procedures would include neutralization of the material in-place before a final evaluation is made on its ultimate disposal. Once neutralization is confirmed by sampling and pH determination, it is quite probable that no further actions will be required to ensure protection of human health and the environment.

Spills or leaks of hydrocarbons could potentially occur from the lube oil storage tanks, the used oil storage tanks and the absorption oil columns. Lube oils are stored in two 800 gallon tanks located on the east boundary of the storage yard. Any releases would be attenuated by the natural earth material in the immediate vicinity of the tanks. Used oils are stored in two 10,500 gallon tanks and one 8800 gallon tank. Any releases from the tanks would be contained in the berms around the tanks. Two 1,800 gallon absorption oil columns are located in the gas treating area. Releases of material from these columns would follow the natural drainage in the process area and flow towards the north, where it would be intercepted by either the stormwater drain system or by the underground drain system leading to the disposal ponds.

If an oil spill occurs, general cleanup procedures would involve minor earthwork to prevent migration, and recovery of as much free liquid as possible. Recovered oil would then be transported off-site for reclamation. Any material which may have soaked in the soil will be left in place and will be disked periodically to enhance biodegradation.

Spills of other organic materials which might occur at the drum storage area will be small in nature and easily contained. If a spill occurs, any free liquids will be contained by earthwork, recovered if possible and held in storage pending a decision on final disposal. Based on existing literature, analysis, and regulatory guidelines, any contaminated soil will either be left in place, transferred to other existing waste-management areas (if no incompatibilities exist), or transported off-site for proper disposal.

Potential releases could result from dike failure at any of the wastewater ponds. Should a potential or actual release occur, several types of earth moving equipment are available to promptly repair damage to any dikes. Any liquids which have been released will be collected, where practical, and reintroduced into the wastewater treatment system as is practical.

3.3.4 Reporting

Should a release of materials occur, EPNG will provide oral notification to NMOCD as soon as possible after discovery as required by WQCC Regulation 1-203.

3.3.5 General Housekeeping Procedures

EPNG strives to reduce the potential for spills and leaks in all non-process areas. Records from 1972 to present indicate that no liquid spills are documented at the San Juan River Plant. Interviews with plant personnel have also indicated that no liquid spills occurred between the 1950's and 1972.

Non-process chemicals are used in relatively small quantities at the plant and are managed in a manner to prevent discharges to the environment. Any chemical spills which might occur would be immediately contained and disposed of according to proper guidelines.

Chemicals such as cleaning solvents will be collected and recycled. EPNG currently uses a non-halogenated solvent, Varsol, for degreasing operations. The spent solvent which contains various aromatic compounds is combined with other hydrocarbon fractions and is shipped off-site to the EPNG Blanco Plant for recycling. No solvent is disposed of on site.

4.0 EFFLUENT DISPOSAL

4.1 EXISTING OPERATIONS

Throughout the history of operation of the San Juan River Plant, EPNG has disposed of all industrial aqueous wastes in three on-site evaporation ponds (Plate 1). Domestic sewage produced on-site is disposed of by septic tanks and leach fields. Used lube oils are collected and recycled. All aqueous wastes are conveyed by underground pipelines to the collection basin adjacent to Pond 1 or directly to Pond 1 (see Plates 3, 4, 5). Wastewater from the collection basin flows through short (50 to 200 feet), unlined ditches to the pond.

4.1.1 Evaporation Ponds

Plates 1, 3, 4 and 5 and Figure 3-1 illustrate the sources, transport and disposal of aqueous wastes. All wastewater flows or is pumped to Pond 1. Wastewater is then pumped via an underground line to Pond 2. When, and if, water levels in Pond 2 reach a point approximately 3 feet below the top of the dikes, a buried pipe carries the excess wastewater to Pond 3. The evaporation ponds were constructed by EPNG in the 1950's on an as needed basis. No detailed plans or specifications were prepared, and therefore none are currently available.

The total area of each evaporation pond and their volumes are listed in Table 4-1. The 29 acres of ponds have a capacity (at 2.0 feet of freeboard) of approximately 32,000,000 gallons, or 98 acre feet. This is 134% of the calculated 1986 annual wastewater production of 23,877,200 gallons (73.3 acre-feet).

Table 4-2 shows the floating-pan evaporation data for Farmington, New Mexico, and a calculated water balance for the evaporation ponds. The ponds have a maximum evaporative capacity of 121 acre-feet per year, or 165% of estimated 1985 input. The monthly balance figures show that, if one were to begin with empty ponds in September, pond storage would peak at 14.85 acre-feet in February, but decrease to zero by May. Evaporation Ponds 1 and 2 at the San Juan Plant are never totally empty because EPNG generally maintains several feet of water in Ponds 1 and 2 and uses Pond

TABLE 4-1
POND DIMENSIONS AND CAPACITIES

	Pond #1	Pond #2	Pond #3	Totals
Area (ft^2)	82,000	624,000	580,800	1,286,800
Area (Acres)	1.88	14.33	13.33	29.54
Depth (ft)	4.0	4.0	2.5	
Volume (Ac.Ft.)	7.52	57.32	33.33	98.17
Volume (ft^3)	328,000	2,496,000	1,452,000	4,276,000
Volume (gallons)	2,452,784	18,665,088	10,858,056	31,975,928

TABLE 4-2

WATER BALANCE FOR EXISTING EVAPORATION PONDS

(BASED ON 29 AVAILABLE ACRES)

Month	Precipitation[1] (ft)	Floating Pan Evap.[1] (ft)	Deficit (ft)	Deficit (Acre-ft)	Wastewater Input[2] (Acre-ft)	Net Storage[3] (Acre-ft)
O	.083	.316	-.233	-6.76	6.41	0
N	.038	.169	-.131	-3.80	6.41	0
D	.053	.083	-.030	-.87	6.41	5.54
J	.043	.080	-.037	-1.07	6.41	10.88
F	.046	.130	-.084	-2.44	6.41	14.85
M	.051	.316	-.265	-7.69	6.41	13.58
A	.048	.528	-.480	-13.92	6.41	6.07
M	.038	.668	-.630	-18.27	6.41	0
J	.033	.736	-.703	-20.39	5.51	0
J	.076	.728	-.652	-18.91	5.51	0
A	.084	.615	-.531	-15.40	5.51	0
S	.080	.476	-.396	-11.48	5.51	0
	0.673	4.845	-4.172	-121.00	73.32	0

[1]Data from Gabin and Lesperance

[2]Wastewater input is weighted according to steam-production data, June, July, August and September figure is 86% of winter-month input (see Table 3-3)

[3]Net storage is accumulation in ponds, assumes empty ponds at start of water-balance year (October)

3 as an overflow pond. This is because the full 29 acres is seldom needed or used for evaporation. The water balance presented in Table 4-2 is based on the use of all 29 acres for evaporation. This closely approximates the proposed modifications (see Section 4.3).

Table 4-3 presents a calculation of dissolved solids accumulation in the ponds. These calculations indicate that over the 29 available acres solids will accumulate at a rate of 0.01 ft/year. Therefore, 100 years are required to generate one foot of solids. An understanding of salt build-up is important when considering the long term storage capacity of the ponds.

The evaporation ponds are constructed on and of Blancot-Notal soils, which have a permeability of 0.2 to 2.0 in/hour (0.4 to 4.0 ft/day). In the ponds, the lower figure (0.4 ft/day) is more appropriate. This is due to compaction of the material during construction and siltation (settling of fine silt and clay) on the pond bottoms. Table 4-4 illustrates the assumptions and calculations used in estimating pond seepage. Seepage is calculated according to methods developed by Cedergren (1977).

Cedergren has recognized that, under certain steady-state conditions, the predominant seepage regime involves horizontal flow. The ground water mound surrounding the ponds (see Section 5.3.2) closely resembles the example cited by Cedergren. Mound height (head differential) and gradient were determined from water-table maps (Plate 7). Pond perimeters were measured from the same maps. These approximate calculations indicate a <u>maximum</u> seepage of 10,000 gallons per day or 3,650,000 gallons per year (15% of total discharge) if all ponds are full. More representative conditions (Ponds 1 and 2 full) indicate a seepage of 8300 gallons per day.

An alternative approach where Pond 1 is full all year, Ponds 1 and 2 are full for 6 months, and Ponds 1, 2 and 3 are full for three months results in a much smaller seepage rate. This scenario is presented in Table 4-5,

TABLE 4-3
CALCULATION OF SALT ACCUMULATION

Q in = 26,000,000 gallons/year x 3.785 l/gallon = 98,410,000 l/year

$$2690 \text{ mg/l} \times \frac{1\text{g}}{1000 \text{ mg}} = 2.7 \text{ g/l}$$

2.7 g/l x 98,410,000 l/year = 265,707,000 g/year

$$265{,}707{,}000 \text{ g/year} \times \frac{1 \text{ tonne}}{1{,}000{,}000 \text{ g}} = 266 \text{ tonnes/year}$$

if salts have a density of 2.0 g/cm^3 (2.0 tonnes/m^3)

$$\text{then sludge volume is } 266 \text{ tonnes/year} \times \frac{1 \text{ m}^3}{2.0 \text{ tonnes}} = 133 \text{ m}^3\text{/year}$$

133 m^3/year x 35.311 ft^3/m^3 = 4696 ft^3/year

$$4696 \text{ ft}^3\text{/year} \times \frac{1 \text{ acre}}{43{,}560 \text{ ft}^2} = .1078 \text{ acre-ft/year}$$

$$.1078 \text{ acre-ft/year} \times \frac{1 \text{ pond area}}{29 \text{ acres}} = .0037 \frac{\text{pond area-ft}}{\text{year}}$$

Double the figure .0037 for safety: .0037 x 2 = .0074

and round up to 0.01 pond-area-ft/year.

(1 Tonne = 1000 Kilograms ~ 2200 pounds)

TABLE 4-4
CALCULATION OF POTENTIAL SEEPAGE

	Perimeter (ft)	Mound Height (ft)	Area (ft^2)	Gradient
Pond 1	1250	30	37,500	.02
Pond 2	3350	30	100,500	.02
Pond 3	3550	30	106,500	.02
Ponds 1 and 2	4600	30	138,000	.02
Ponds 1, 2 and 3	5700	30	171,000	.02

$$Q = KAi$$

where: Q = flow, K = permeability, i = gradient

	K (ft/day)	A (ft^2)	i (ft/ft)	Q (ft^3/day)	Q (gallons/day)
Pond 1	.4	37,500	.02	300	2,243
Pond 2	.4	100,500	.02	804	6,012
Pond 3	.4	106,500	.02	852	6,731
Ponds 1 and 2	.4	138,000	.02	1368	8,256
Ponds 1, 2 and 3	.4	171,000	.02	1104	10,229

TABLE 4-5

DISCHARGE-WEIGHTED SEEPAGE CALCULATION

Pond 1:	182.5 days	x	2,243 gpd =	409,347.5	gallons
Ponds 1 and 2:	91.5 days	x	8,256 gpd =	755,424.0	gallons
Ponds 1, 2 and 3:	91.5 days	x	10,229 gpd =	935,953.5	gallons
				2,100,725.0	gallons/year

$$\frac{2{,}100{,}725 \text{ gallons/year}}{26{,}000{,}000 \text{ gallons/year}} = 0.080 \text{ or } 8\% \text{ of flow}$$

and indicates a seepage rate of 2,100,725 gallons/year, or 9% of total discharge (1985 discharge of 23,877,205 gallons/year).

4.1.2 Flare Pits

Contact wastewater containing hydrocarbons is diverted to 2 unlined flare pits, hereinafter referred to as north and south flare pits (see Plates 1 and 2, Figure 3-1). The discharge to the flare pits (3227 gpd) is only about 5% of the total discharge of 65,363 gpd. In the south flare pit, free hydrocarbons are burned off, and the remaining wastewater is then diverted by underflow pipes to Pond 1. The south pit has an area of approximately 20,000 ft^2, and is about 4 to 6 feet deep. The north flare pit is approximately the same size, but receives only about 54 gpd on an intermittent basis. Both flare pits will be closed as part of EPNG's proposed modifications (see Section 4.3).

4.1.3 Domestic Sewage

Discharge from two in-plant septic tanks is routed to leach fields. A third septic tank for the boiler house restroom discharges to the 8-inch plant drain. Sewage from on-site office and working areas is collected in small septic tanks, and discharged through 3 leach fields (Plate 3). None of the domestic sewage discharged to leach fields is commingled with plant wastewater. Total volumes are estimated to be significantly less than 2000 gallons/day for each leach line. No analyses are available.

4.2 OFF-SITE DISPOSAL

No waste materials other than residential-type refuse generated in the employee housing are currently shipped off-site for disposal. Used oils that are recovered from process waste streams are transported to the El Paso Natural Gas Blanco Plant where they are recycled.

In 1985, wastewater was used by the New Mexico Highway Department for use in pile driving operations and by a private drilling contractor for use in oil well drilling. This practice of giving water away for off-site use is no longer permitted.

4.3 PROPOSED MODIFICATIONS: WASTEWATER SEGREGATION AND TOTAL EVAPORATION

EPNG proposes to provide two separate wastewater management systems. Waste streams which come into contact with hydrocarbons (contact wastewater) will be run through a phase separation unit to remove any free hydrocarbons, then discharged to lined total evaporation ponds equipped with leak detection devices. Non-contact waste streams will be discharged to the existing unlined ponds. The need for any structural modifications to existing ponds will be assessed. Detailed plans and specifications for the proposed modifications will be presented to NMOCD in a separate submission, pursuant to WQCC Regulation 1-202 B and C.

The total dissolved solids content of the ground water underlying the existing unlined ponds and in the general area is greater than 10,000 mg/l (see Section 5.3). Because non-contact input wastewater has a TDS of approximately 2700 mg/l (see Table 3-2, Pond 1 analysis), no significant degradation of ground water quality is anticipated due to seepage from the unlined ponds. In fact, seepage of non-contact wastewater will generally improve the ground water quality.

4.3.1 Design Considerations

Phase separation and lined ponds with leak detection have been selected for the contact-wastewater evaporation pond to ensure isolation of hydrocarbon-bearing streams, enhanced oil recovery and optimum evaporation.

Wastewater currently flows through several unlined ditches to Pond 1. These ditches will be eliminated and all contact wastewater will be conveyed by gravity flow in buried pipes to the proposed lined ponds. Non-contact wastewaters will also be conveyed by gravity flow in buried pipes to the unlined evaporation ponds, eliminating all surface conveyances.

A total wastewater flux of about 65,363 gpd, or about 24,000,000 gallons per year (73.3 acre-feet per year) has been calculated based on 1985 data. About 5% of this total is contact wastewater. Average annual floating-pan evaporation is 4.17 feet per year, indicating that an evaporative capacity (surface area) of about 1 acre would be sufficient for total evaporation of contact wastewater. A cold, wet winter, however, would increase discharge while reducing net evaporation.

Also, much of the contact wastewater is produced in the period between September and May, when evaporation is lowest. For these reasons, and the fact that any oily residue will reduce evaporation, a surface area of 1.4 acres is proposed for contact wastewater to safely hold <u>all</u> of the plant's maximum expected contact wastewater discharge, plus a reserve capacity. A water balance for the proposed 1.4 acre lined pond is included as Table 4-6.

Some changes are presently anticipated for Ponds 1, 2 and 3. The collection area will be redesigned and graded to be a part of evaporation Pond 1 to avoid any overflows or potential for discharges of non-contact wastewater to grade. The existing dikes will be stabilized and reinforced as required to minimize any seepage.

4.3.2 Conceptual Design

The proposed wastewater-management system (Plate 6) incorporates 4 major elements:

1. Primary segregation of contact and non-contact waste streams, with a lined pond for total evaporation of contact wastewater,

2. A two-celled set of evaporation/holding ponds with compacted-earth dikes and membrane liners of HDPE on the side slopes and the bottoms for contact wastewater,

3. A leak-detection/leachate collection (LD/LC) system to detect and locate potential leaks in the contact-wastewater ponds, and to control accumulation of leachate which might cause structural damage for all impoundments, and

TABLE 4-6
NET CHANGES IN PROPOSED EVAPORATION-POND
STORAGE FOR CONTACT WASTEWATER

Month	Input (Acre-feet)	Evaporation (Feet)	Evaporation (Acre-feet)	Difference (Acre-feet)	Pond Storage (Acre-feet)
S	.269	-.4	-.560	-.291	0
O	.313	-.23	-.322	-.009	0
N	.313	-.13	-.182	+.131	.131
D	.313	-.03	-.042	+.271	.402
J	.313	-.04	-.056	+.257	.659
F	.313	-.08	-.112	+.201	.860
M	.313	-.27	-.378	-.065	.795
A	.313	-.48	-.672	-.365	.430
M	.313	-.63	-.882	-.569	0
J	.269	-.70	-.980	-.711	0
J	.269	-.65	-.910	-.641	0
A	.269	-.53	-.742	-.473	0
	3.58	-4.17	-5.832		

$$\text{Safety factor} = \frac{\text{Evaporative Capacity}}{\text{Input}}$$

$$= \frac{5.832 \text{ Acre-feet}}{3.58 \text{ Acre-feet}} = 1.63 \times 100\% = 163\%$$

4. Discharge of non-contact wastewater to the existing, unlined evaporation ponds after assessing a need for and implementing modifications to the dikes and collection area.

Plate 6 presents the typical conceptual-design details for the contact wastewater lagoons. The design is based on available data and is conservative in terms of capacity and structural strength.

The design of the proposed contact wastewater lagoon is based on a normal wastewater flow of about 4000 gpd, or 1,460,000 gallons per year. It is also necessary to ensure that adequate capacity exists for any period of excessive flow (upsets) or unusually wet weather. Contact wastewater is typically oily and an oil film can significantly reduce evaporation, therefore additional evaporative capacity is required. The lagoon is sized to evaporate 160% of the maximum input (6400 gpd) (Table 4-6). Total storage capacity of the two cell system is approximately 4.6 acre feet, or 1,500,000 gallons. This would allow storage of an entire year's normal output of contact wastewater.

Because wastewater entering this lagoon may periodically contain significant amounts of free and dissolved organic compounds (e.g., an upset condition which reduces efficiency of phase separator), the entire pond will be lined with oil-resistant high-density polyethylene (HDPE). This material has excellent strength, and is highly resistant to degradation by oily substances or by ultraviolet radiation from sunlight. Sludges or oily wastes which may accumulate in the pond are anticipated to be of minimal volume, and will be retained in the pond. These may be removed for recycling if necessary.

The existing ponds are more than adequate in area for the total evaporation of all wastewater (see Table 4-2). If some minor modifications of these ponds are needed to improve structural stability, the total area available for evaporation will remain approximately the same. Because the wastewater influx will be reduced by the segregation of contact wastewater, the existing ponds will be more than adequate for total evaporation.

The following discussion outlines the proposed construction of the lined ponds for contact wastewater. After excavation, the bottoms of all pond cells will be lined with a 6-inch layer of compacted, native clay or synthetic liner. This layer will then be covered with 1.0 foot of clean sand. The sand and the underliner form a "drainage blanket" which channels leachate to the LD/LC pipelines. The LD/LC pipes (2 per cell) lie parallel to the long sides of the cell. By giving the cell floors a slight slope from center to edge, and along their long axis, any leachate will flow through the sand blanket to the pipes, and hence to the collection sewers.

Each leachate collection drain (4-inch perforated PVC pipe) should be located under the pond's flat bottom, within a few feet of the edge of the dike. This allows the drain to <u>locate</u> leaks in the half of the cell in which it is installed, and also to provide drainage for a high-stress area where the liner bends. Any leachate will flow by gravity through the sewer to a sump where it will be returned to the system.

Manholes have been included at each junction between the leachate drains and the collection sewer. These allow inspection for the presence of leachate, measurement of flow from individual drains, determination of the source of any leachate, and inspection and maintenance of the LC/LD system.

4.3.3 Schedule For Implementation

Figure 4-1 shows the anticipated sequence of events for implementation of the plan.

4.4 CLOSURE PLANS

The following Closure Plans details the methods for closure of the existing and proposed wastewater ponds and the existing flare pits at the

FIGURE 4-1 SEQUENCE OF EVENTS FOR IMPLEMENTATION OF PROPOSED MODIFICATIONS

JOB 1	NMOCD REVIEW OF DISCHARGE PLAN APPLICATION	(60 DAYS)
JOB 2	EPNG RESPONSE TO NMOCD COMMENTS	(45 DAYS*)
JOB 3	NMOCD APPROVAL OF DISCHARGE PLAN	(60 DAYS)
JOB 4	PREPARATION OF DETAILED PLANS AND SPECIFICATIONS	(60 DAYS)
JOB 5	NMOCD REVIEW OF DESIGNS	(45 DAYS)
JOB 6	DESIGN CHANGES IN RESPONSE TO NMOCD COMMENTS	(30 DAYS)
JOB 7	CONTRACTOR BIDDING AND NEGOTIATIONS	(21 DAYS)
JOB 8	CONSTRUCTION OF PROPOSED FACILITIES	(120 DAYS AS WEATHER PERMITS)

* DEPENDENT UPON NMOCD REQUESTS FOR ADDITIONAL INFORMATION

El Paso Natural Gas San Juan River Plant. Modifications of the existing ponds, to comply with the modifications proposed in this plan, may require temporary closure of the evaporation ponds. The methodology to temporarily close these ponds cannot be determined until subsurface investigations are completed at the site.

4.4.1 Flare Pit Closure

After construction of the proposed wastewater management system, all discharges to the flare pits will be discontinued and the pits isolated to prevent accumulation of other liquid wastes. Stormwater run-off will be directed away from the pits by berms or other engineered structures and any accumulated precipitation will be pumped out as feasible.

The length of time necessary for total drying of the flare pits will depend on climatic conditions. Clean soil may be mixed with the remaining sludges if it appears that the drying period will be lengthy. Before closure activities proceed, samples will be collected from the sludge layer for analysis. Analytical parameters will include toxic metals and organics listed in Section 3-301.A. of the WQCC Regulations.

When contained sludges have dried sufficiently to support earth moving equipment, closure activities will begin. The dried sludge and/or soil-sludge mixture will be leveled if necessary and fill will be added to bring the soil level up to the original ground surface. Additional soil will then be added and graded so that the finished surface will have a slight convex slope (1 - 1 1/2 feet at the apex) with respect to ground level. This dome will provide for natural subsidence of the fill material and prevent ponding of precipitation on the protective cap.

Fill material will consist of soil in the existing berms supplemented with earthen material obtained from local sources. Fill material will be a sandy loam or of similar composition. The natural topography will be maintained unless it is necessary to alter diversion paths for stormwater run-off.

The closed flare pits will be inspected on an annual basis for erosion and woody plant intrusion. Inspections will also be made after severe storms to detect any erosion, piping or subsidence. If any conditions that could threaten the integrity of the protective cap are discovered, repairs will be made as soon as possible.

5.0 SITE CHARACTERISTICS

The plant is located within the west-central part of the San Juan Basin (Figure 5-1); a large asymmetric structural depression that contains up to 15,000 feet of Paleozoic and Mesozoic sediments (Fassett and Hinds, 1971). Topographic relief within 1 mile of EPNG's plant is about 360 feet with elevations ranging from 5140 to 5500 feet above sea level (Figure 5-2). The area is characterized by bedrock hillsides and mesas and Plio-Pleistocene gravel terraces of the San Juan and Animas Rivers. All these features are cut by steep-walled arroyos. Drainage is southwesterly via Stevens Arroyo into the westerly-flowing San Juan River. Average annual precipitation in the area is approximately 8 to 10 inches per year. Vegetation is characterized by desert brush that covers approximately 40% of the surface.

EPNG conducted an investigation of the site hydrogeology. Twelve boreholes were drilled and ten piezometers were installed on-site. Plate 7 shows the location of each borehole and piezometer. Appendix B contains the lithologic logs for each borehole and the completion details of a typical piezometer. Samples were obtained from selected piezometers to determine the general water chemistry of the site. Specific conductance and pH were determined in the field for ground water at each piezometer. These data permitted an evaluation of the existing waste management system and the proposed modifications discussed in Section 4.0 were selected based upon the results of this study.

5.1 REGIONAL GEOLOGY

The stratigraphy of the San Juan Basin is comprised of sedimentary rocks ranging in age from Cambrian to Holocene. Figure 5-3 shows the stratigraphy of rocks that occur near the plant. The greatest recorded stratigraphic thickness in the basin is 14,423 feet in an oil well located in Section 7, T. 29 N., R. 5 W. near the structural center of the basin (Fassett and Hinds, 1971). During Late Cretaceous time, three basin-wide cycles of transgression and regression resulted in intertonguing lithology (sandstone, shale, siltstone, and coal) found throughout Cretaceous rocks in the Basin. A sequence of Late Cretaceous to present age rocks

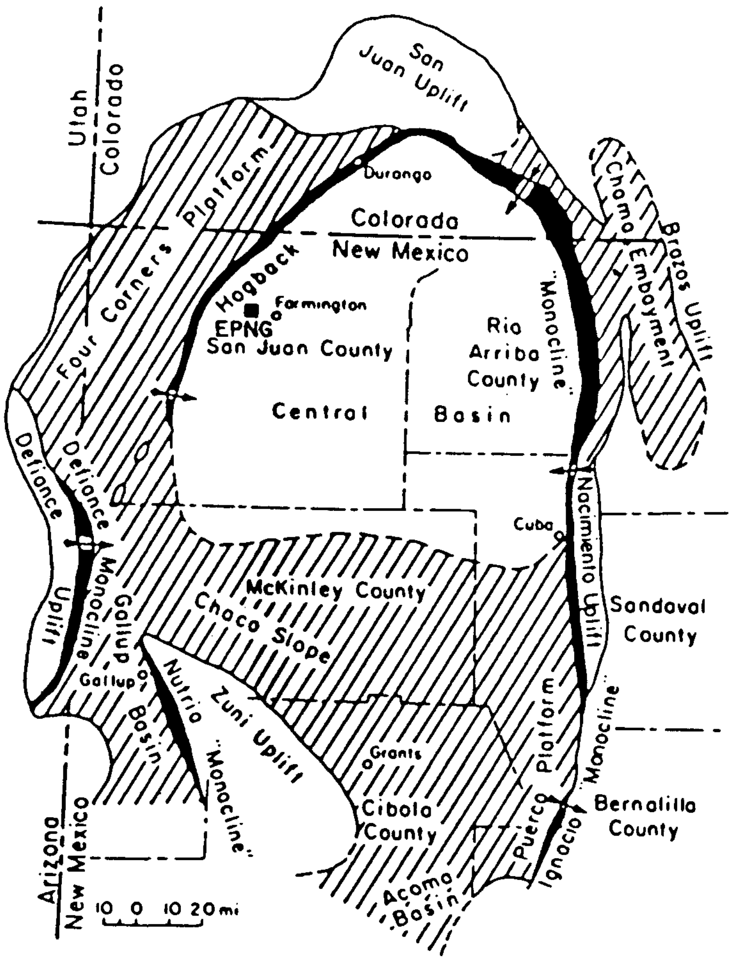


FIGURE 5-1

Diagram of the San Juan Basin showing structural components and location of the El Paso Natural Gas Plant (Stone and others, 1983)

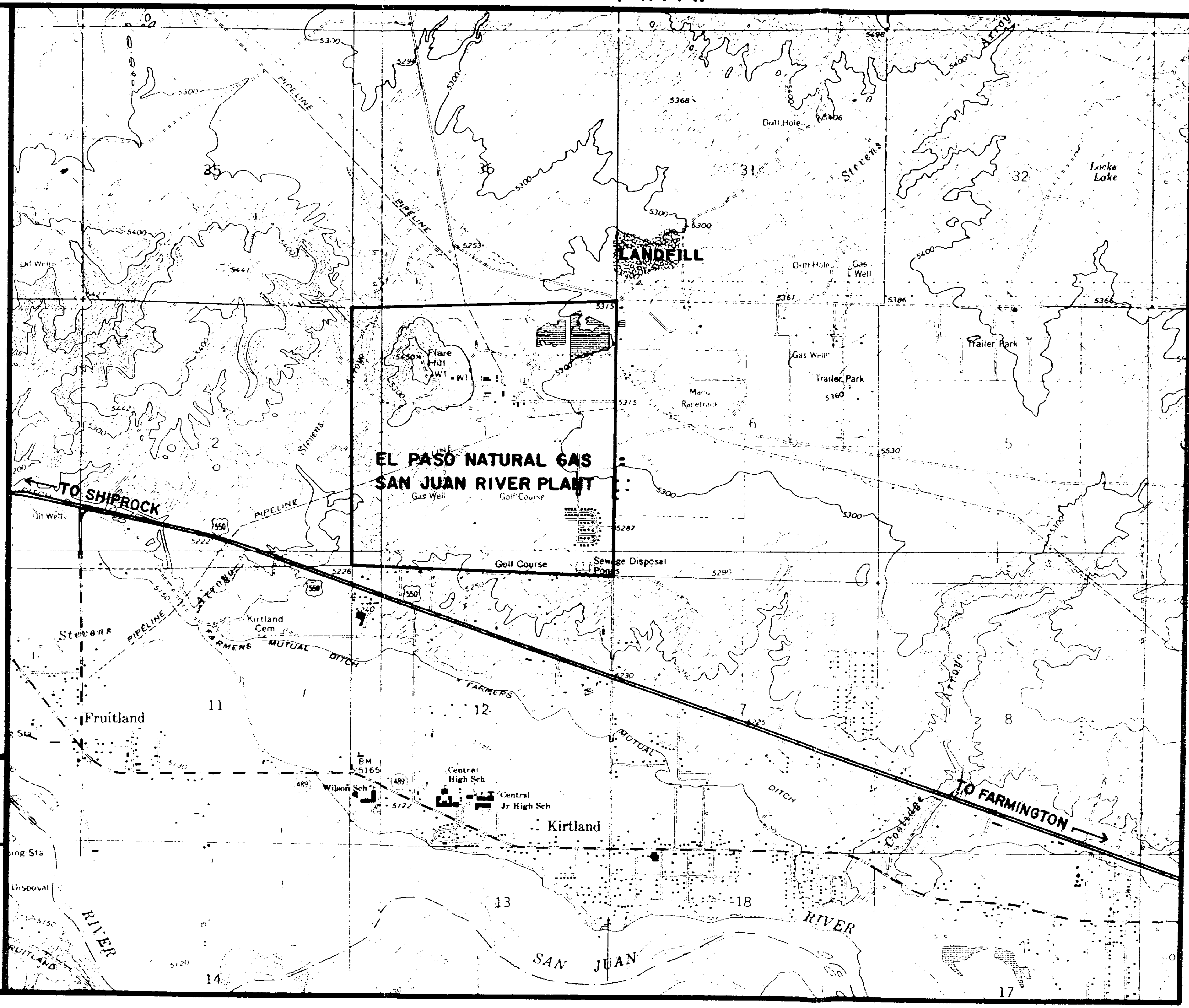


FIGURE 5-2
LOCATION MAP OF EPNG
SAN JUAN RIVER PLANT

CLIENT: EL PASO NATURAL GAS CO.	
DATE: 11-10-85	
DRAWN BY: SELKE	
CHECKED BY:	
REVISED:	
SCALE: 1" = 2000'	

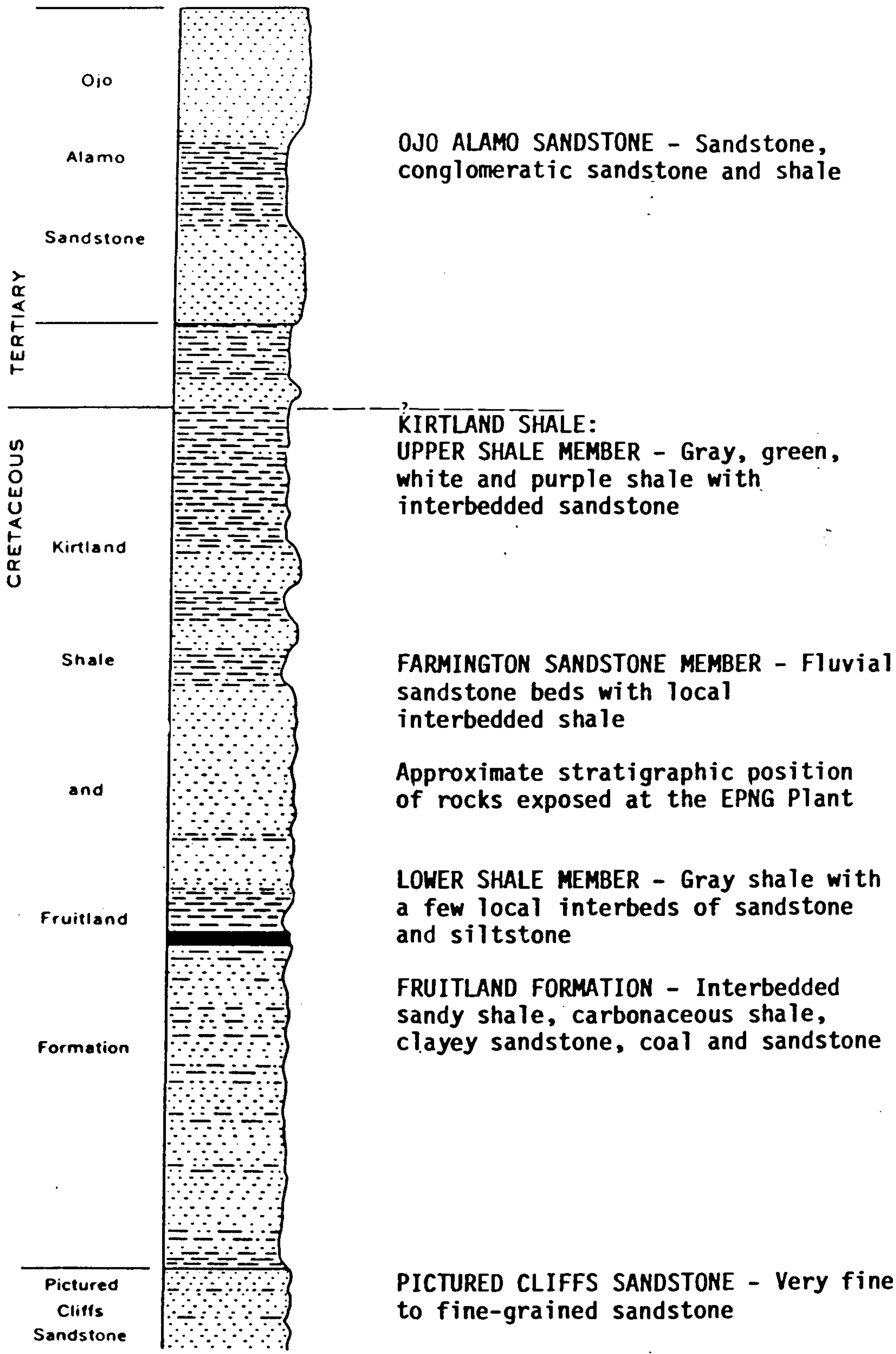


FIGURE 5-3

Stratigraphic column of rocks outcropping near the El Paso Natural Gas Company Plant (Fassett and Hinds, 1971) which crop out in the northwest section of central basin host numerous sandstone aquifers, which are the source of many domestic and non-domestic water supplies in northwest New Mexico.

Most of the central basin is covered by Tertiary-age sediments of fluvial and alluvial origin. Erosion has removed most of the Tertiary section from the El Paso Natural Gas San Juan River Plant Site.

Thick Quaternary deposits are restricted to the San Juan, Animas and La Plata Valleys. Extensive terrace deposits are found along the valleys of the San Juan River and its major tributaries.

The plant site is underlain by Late Cretaceous rocks of the Kirtland Shale that were deposited in the coastal-swamp, flood plain, and river and flood plain environments that succeeded the final regression of the Pictured Cliffs Sea (Figure 5-4).

The Kirtland Shale is composed of three members; the Upper Shale, the Farmington Sandstone, and the Lower Shale. The Upper Shale Member is a purple, green, white and gray shale with interbedded sandstone and low-grade coal lenses. Below this member lies the Farmington Sandstone Member, which consists of a fine to medium-grained fluvial sandstone with local interbedded shale. The Farmington Sandstone is known to produce oil and gas in some areas. The Lower Shale Member is composed of gray shale with a few local interbeds of low grade coal, sandstone and siltstone.

Figure 5-5 shows geologic cross sections of the plant area. Identification of stratigraphic horizons is difficult because these rocks are deeply weathered by surface processes and the contact between the Kirtland Shale and the Fruitland Formation is gradational. Attitudes of the few available outcrops in the area indicate an approximate northwest to southeast strike of beds and a dip of 5 degrees to the east-northeast.

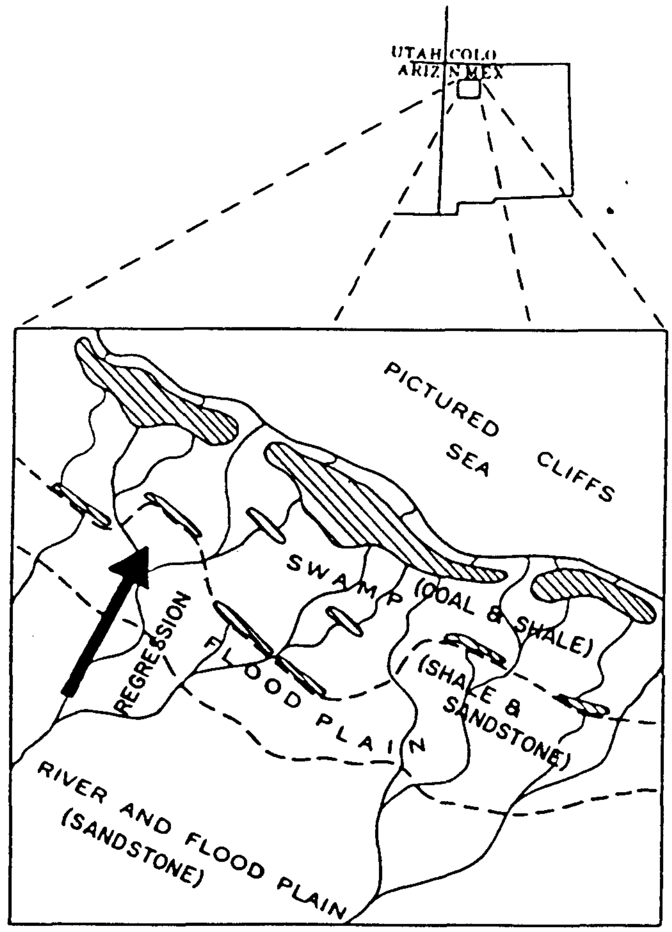


FIGURE 5-4

Paleographic diagram showing the depositional environments of rocks that now compose the Kirtland Shale and Fruitland Formations (Fassett and Hinds, 1971)

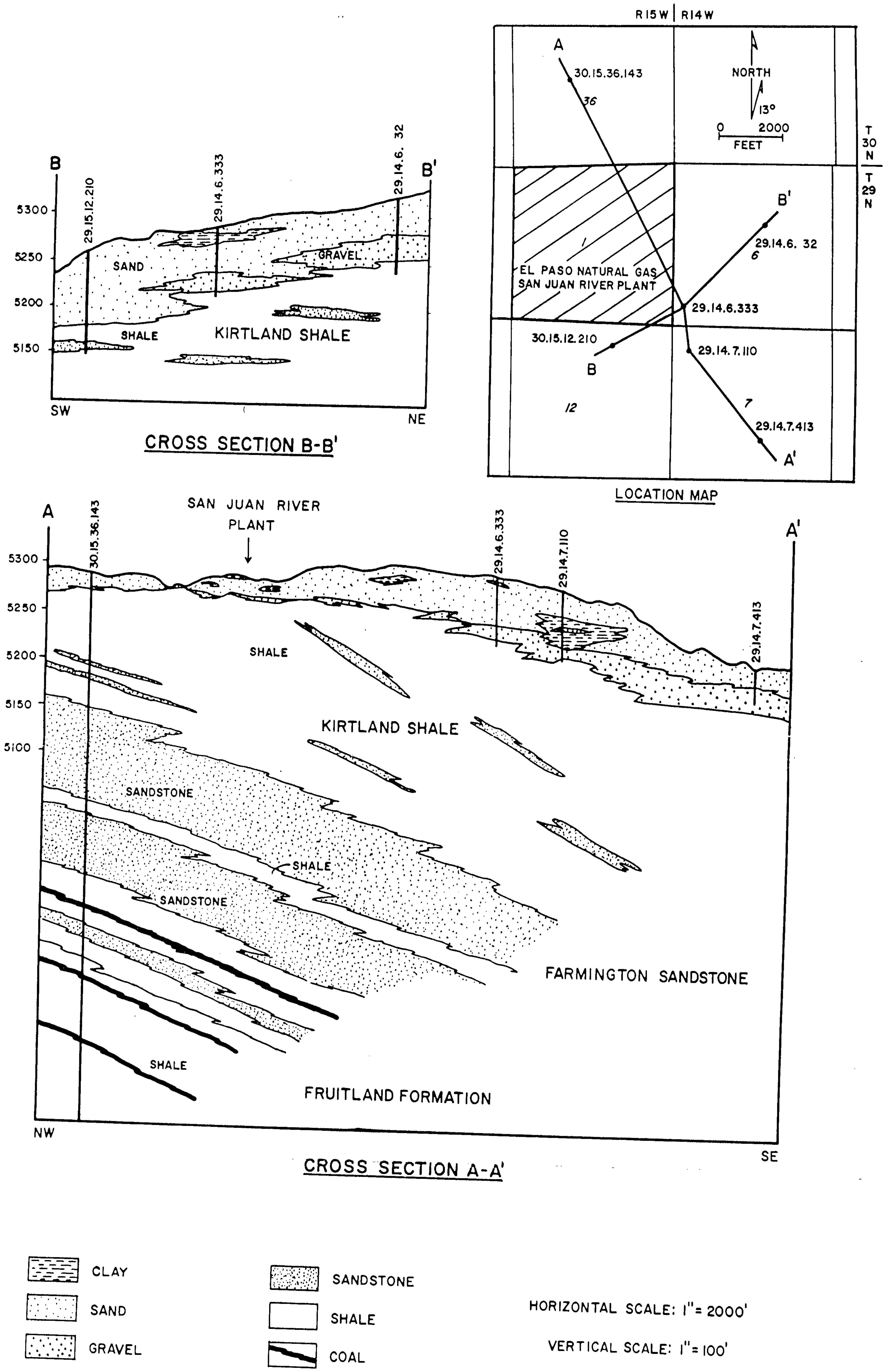


FIGURE 5-5

Geologic Cross Sections for Area Around El Paso Natural Gas San Juan River Plant

Underlying the Kirtland shale and cropping out to the west of the plant is the Fruitland Formation which contains coal reserves that are mined extensively. The Fruitland Formation is composed of interbedded sandy shale, carbonaceous shale, clayey sandstone, coal and sandstone. Coal beds are the most continuous rock units in the Fruitland and may be traced locally for several miles. Most individual beds of sandstone are discontinuous and pinch out laterally, usually within a few hundred or thousand feet making correlation of horizons within this formation difficult.

5.2 GEOMORPHOLOGY AND SOILS

The plant is located on a broad, gently sloping mesa which has developed as a result of in-situ weathering of shallow-dipping shale and sandstone bedrock and river erosion and deposition. Localized areas of finegrained alluvial valley fill (Stevens Arroyo and smaller drainages), along with the weathered bedrock, form the major substrates for soil formation at the site. A 20-foot thick terrace deposit (capping Flare Hill) is also present at the northwest corner of EPNG property. Three major soil associations are identified on the plant site; Doak Sheppard Shiprock, Haplargid-Blackstone-Torriorthents and Blancot-Notal. The plant is located upon the Doak-Sheppard-Shiprock association which is derived mainly from sandstone and shale. Permeability is moderately slow (0.6 - 2.0 in/hour) in Doak soils to very rapid (6.0 - 20 in/hour) in Sheppard soils (Appendix C). Runoff for this soil association is moderate to low and water erosion potential is slight.

The evaporation ponds are constructed in soils of the Blancot-Notal association which is formed in weathered bedrock and alluvium. Permeability is moderate (0.2 - 2.0 in/hr) to very slow (0.2 - 0.6 in/hr) and water capacity is high (0.13-0.19 in/in). Runoff is medium and water erosion potential is moderate (Appendix C).

The Haplargid-Blackstone-Torriorthents complex is the third soil association present on the site. Permeability of this soil is highly variable (0.6 - 20 in/hr). Runoff is slow to rapid and water erosion potential is slight to severe. Topographically upgradient and off EPNG property from the plant, in Stevens Arroyo, the soil permeabilities are slow to moderate (0.2 - 6.0 in/hr). The majority of these are Group D soils that are developed to only shallow depths.

5.3 REGIONAL AND LOCAL HYDROLOGY AND GROUND WATER QUALITY

5.3.1 Regional Ground Water Hydrology and Water Quality

Three major ground water systems are present in the Cretaceous and younger age sedimentary deposits of this area of the San Juan basin:

- Confined aquifers within Cretaceous and Tertiary sandstone units,
- Water-table aquifers in Cretaceous and Tertiary sandstone units near their outcrop areas
- Water-table aquifers in Quaternary alluvium in river valleys and tributaries

The Cretaceous sandstone aquifers of the San Juan Basin were deposited along strand plain beaches or at wave-dominated delta fronts in various coastal environments. The complexity of these intertonging fluvial and marine deposits is a result of alternating transgressive/regressive pulses of the epicontinental sea that was present at this time. Occurrence of ground water resources that are associated with these sandstone aquifers is a function of their distribution within the units containing them. Recharge of the sandstone aquifers hosted in Cretaceous sandstones is dependant upon outcrop distribution, elevation, climate of outcrop areas, lithologic characteristics of the unit and leakage from other units. Outcrops generally occur as narrow, sinuous belts, few of which lie in areas of high precipitation. Most recharge is a result of the limited infiltration, although leakage from adjacent units occurs locally. Hydraulic conductivity is usually low due to the fine-grained textures characteristic of these marine sediments.

Ground water quality in Cretaceous sandstone aquifers is controlled by several factors. Total dissolved solids (TDS) concentrations increase as a function of increasing ground water residence time and reduced transmissivity of aquifer materials. Figures 5-6 and 5-7 show the specific conductance (which is related to TDS concentration) of water from wells completed in Cretaceous aquifers. Fresher water is associated with high-transmissivity zones while saline water is associated with low transmissivity zones. Ground water moving along the sandstone-shale interfaces that are common to these rocks tends to exhibit increased TDS concentrations (Stone and others, 1973). Water from these confined aquifers is suitable for stock and domestic use in some areas, although in most cases it is not considered a major source.

The Tertiary sandstone aquifers of the basin were deposited in fluvial or alluvial environments. Recharge to ground water is by infiltration through formation exposures along the flanks of the Nacimiento Uplift and on the broad plateaus that occur in the central part of the basin. The amount of recharge to Tertiary aquifers is higher than that of Cretaceous aquifers due to broader exposures in areas of high precipitation. Ground water in these aquifers flows from upland recharge areas to discharge areas along canyon floors. Springs and seeps result due to regional topographic and geomorphic controls. The hydraulic conductivity of the Tertiary sandstones varies significantly, as a function of grain size, sorting and cementation. The hydraulic gradient is controlled by topography but the structural attitude of the formations can alter the flow direction of gradient. Erosion has removed these units from much of the basin flanks.

Tertiary-sandstone hosted aquifers have generally lower TDS concentrations than Cretaceous aquifers and commonly provide major sources of water for domestic and agricultural usage. The complex intertonguing of sandstone and shale units is the primary influence on specific conductance which can be as high as 10,500 um/cm. Tertiary rocks crop out east of the plant and are stratigraphically above the site.

Quaternary-sediment hosted aquifers occur primarily as valley fill in the major river valleys and consist of gravel, sand, silt and clay. Ground

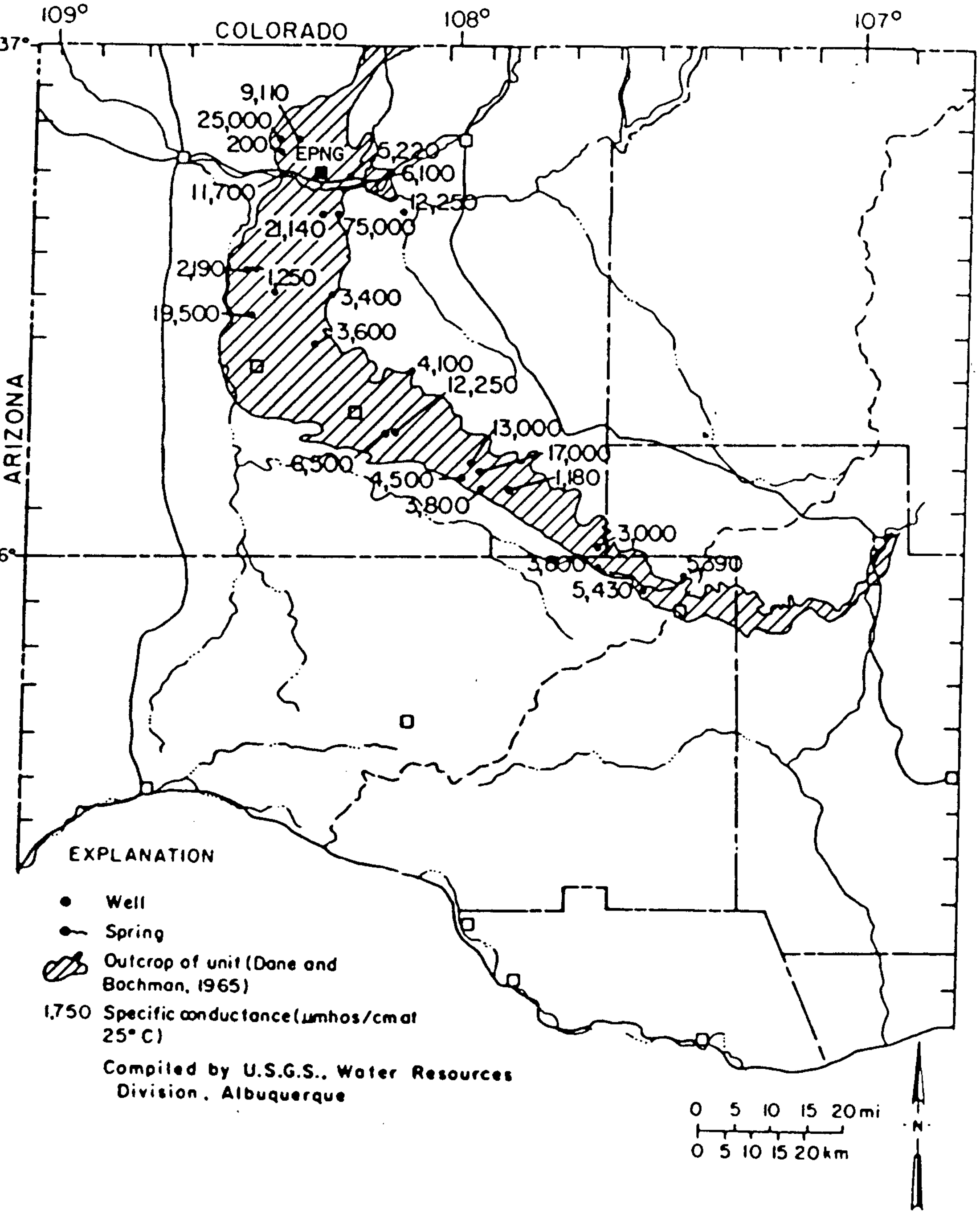


FIGURE 5-6

Specific Conductance from Wells and Springs
in the Cretaceous Kirtland Shale-Fruitland Formation
(Stone and others, 1983)

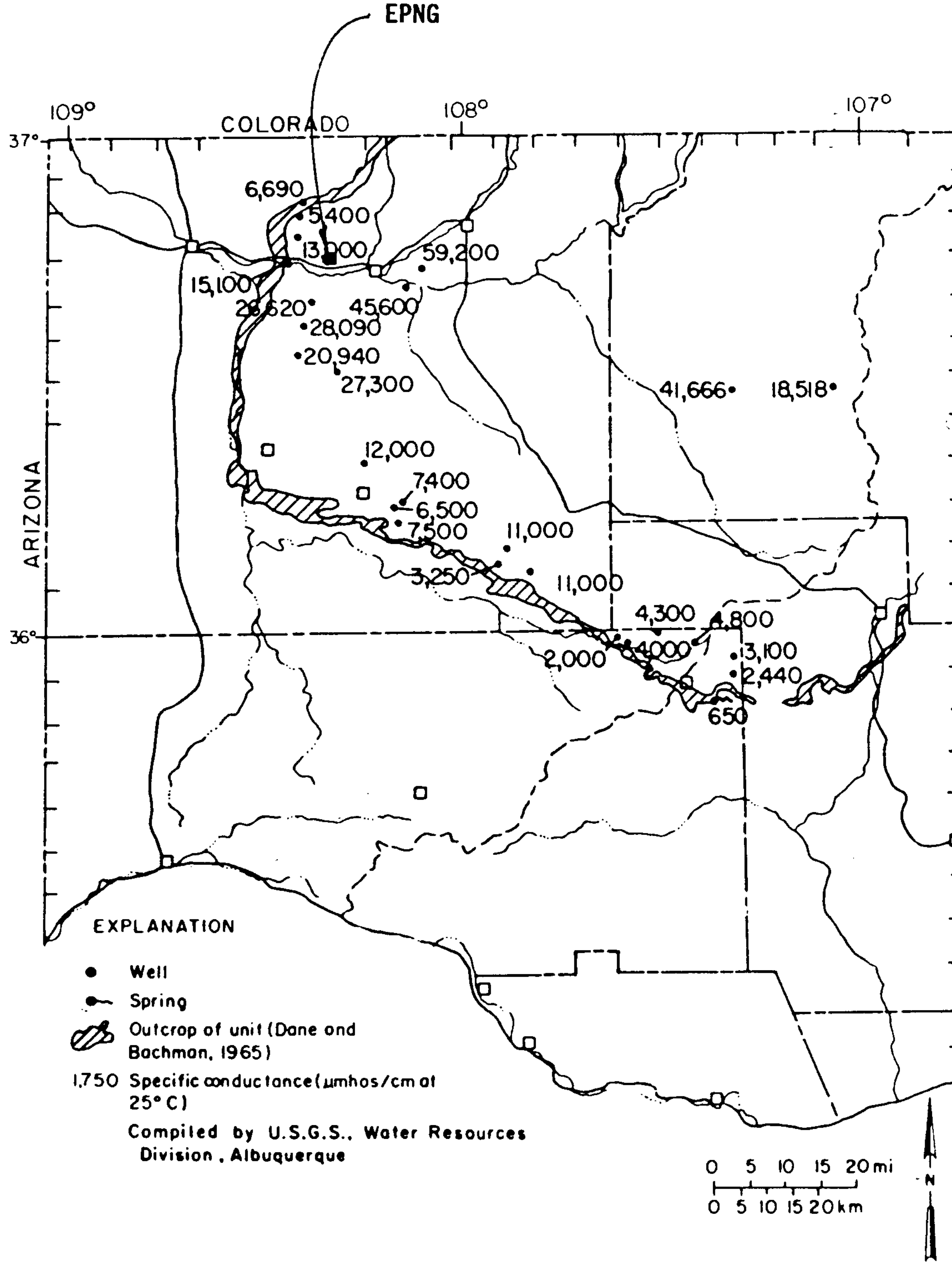


FIGURE 5-7

Specific Conductance from Wells and Springs
in the Cretaceous Pictured Cliffs Sandstone
(Stone and others, 1983)

water recharge results from drainage from irrigated lands, infiltration of surface runoff and leakage from bedrock aquifers. Flow directions are concurrent with topographic slope and river-flow directions, and hydraulic conductivity can be extremely high.

As Figure 5-8 shows, the quality of ground water (in terms of specific conductance) in Quaternary River Valley alluvium is highly variable and specific conductance may range from less than 1,500 to 6,000 um/cm (Stone and others, 1983). Water from this source is used for stock, irrigation and domestic purposes. In arroyos and tributaries of the major rivers the ground water quality is also highly variable and specific conductance can be significantly higher than 6,000 um/cm.

5.3.2 Local Ground Water Hydrology and Quality

From regional studies and site observations, three hydrologic regimes exist at the San Juan site:

- Confined sandstone aquifers within the Kirtland Shale with an average (regional) specific conductance of over 10,000 um/cm
- A thin water-table aquifer hosted by colluvium and alluvium in a swale on the north side of the EPNG plant site, with a TDS content of 17,500 mg/l; this unit is the uppermost water-bearing unit under the waste-management units
- A shallow, gravel/cobble aquifer in various levels of terrace gravels surrounding the San Juan River; this unit is believed to be present on the south side of the EPNG plant site, well away from the evaporation ponds

The confined aquifers are composed of localized sandstones in the Cretaceous Kirtland Shale. Based upon logs of nearby wells and exposures at the plant site, the uppermost confined aquifer lies at least 100 feet below ground level at the site (see Appendix D and Figure 5-5).

The average of 26 measurements of specific conductance from wells in this unit is 10,600 um/cm, with values ranging from 650-59,200 um/cm (Figure 5-7). Local data is restricted to a single well located within one-half

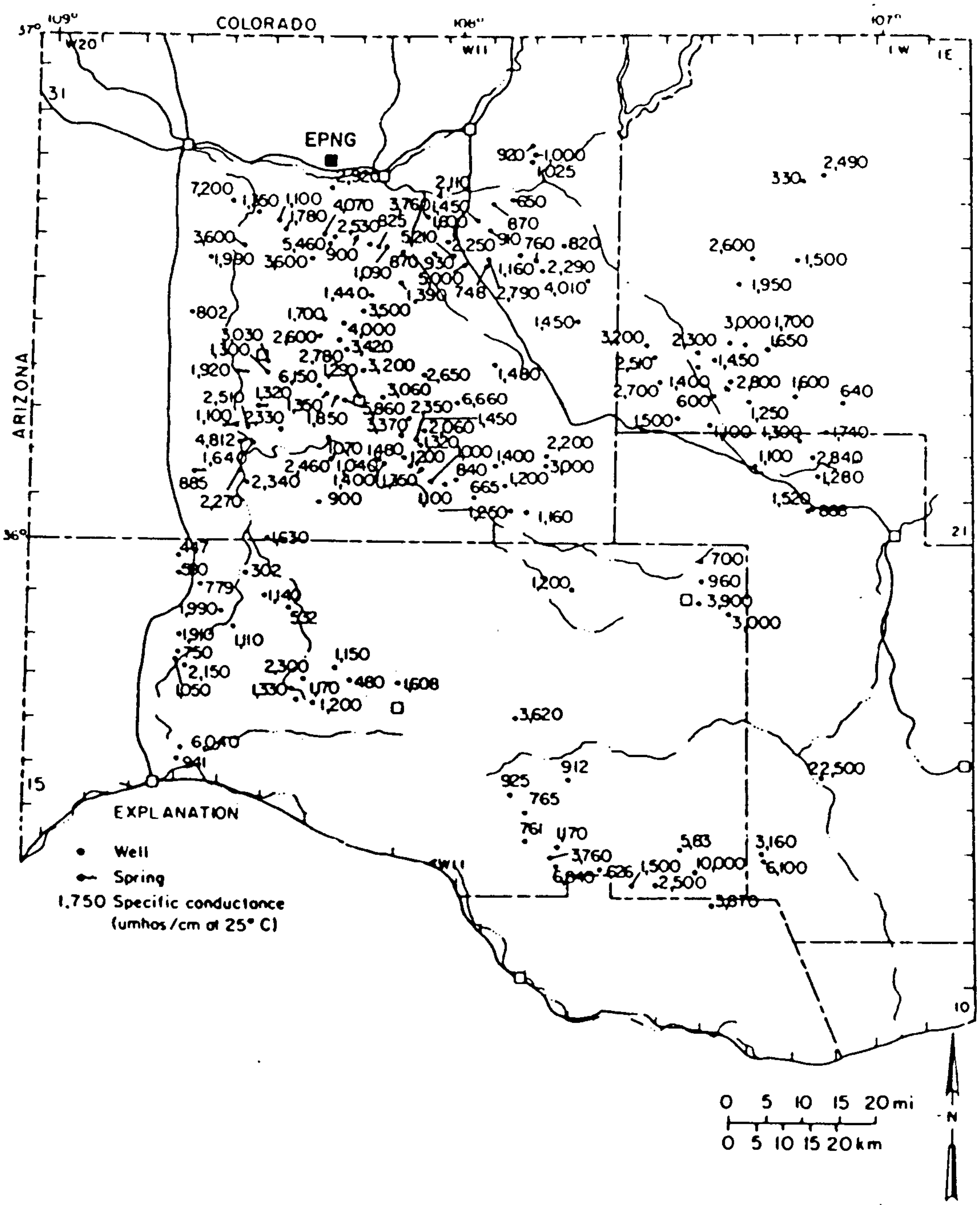


FIGURE 5-8

Specific Conductance from Selected Wells and Springs in Quaternary Valley-Fill Deposits (Stone and others, 1983)

mile of EPNG property. This Kirtland Sandstone well had a specific conductance of 6570 um/cm. This conductivity is likely to represent higher TDS due to the relationship between the ubiquitous SO_4 ions dissolved in these aquifers and specific conductance. Ground water analyses (Appendix D) show that TDS is typically twice the value of specific conductance.

Because of the poor water-quality in the confined Kirtland aquifers, few wells are completed in this aquifer. A search of New Mexico State Engineer well records has identified only 1 Kirtland water well (30.15.36.321) within 1 mile of the evaporation ponds (Figure 5-9). Published reports identified an additional well, located in the area of Stevens Arroyo, northwest of the plant. No water wells completed in Kirtland sandstones are present on the site and a thorough visual inspection and survey of the area did not identify any undocumented wells.

No water supply wells are completed in the thin, alluvial/colluvial, water-table aquifer developed on the Kirtland Shale. This fine-grained unit is discussed in more detail in Section 5.3.3.

Several wells are completed in terrace gravels and San Juan River alluvium upgradient from the plant site. This unit appears to be hydraulically connected to the fine-grained Kirtland Shale water-table aquifer. This unit is discussed in more detail in Section 5.3.3.

5.3.3 Characteristics of the Uppermost Water-Bearing Unit

Section 5.3.2 identified three separate water bearing units at the site. One of these units, the fine-grained alluvial aquifer developed on the Kirtland Shale, can potentially be affected by discharges from the San Juan River Plant's existing unlined evaporation ponds. Analyses of ground water samples from this unit (Appendix D) and a field survey of specific conductance of ground water in exploratory piezometers (Plate 8) shows that TDS is typically twice the value of specific conductance. The average TDS content of water in this unit is 17,500 mg/l.

30.15.36.143 ● WATER WELL LOCATION (FROM NM STATE ENGINEER WELL RECORDS)

30.15.36.321 ○ WATER WELL LOCATION (FROM TABLE 6, NMBM HYDRO REPORT 6)

NORTH

13°

0 2000

FEET

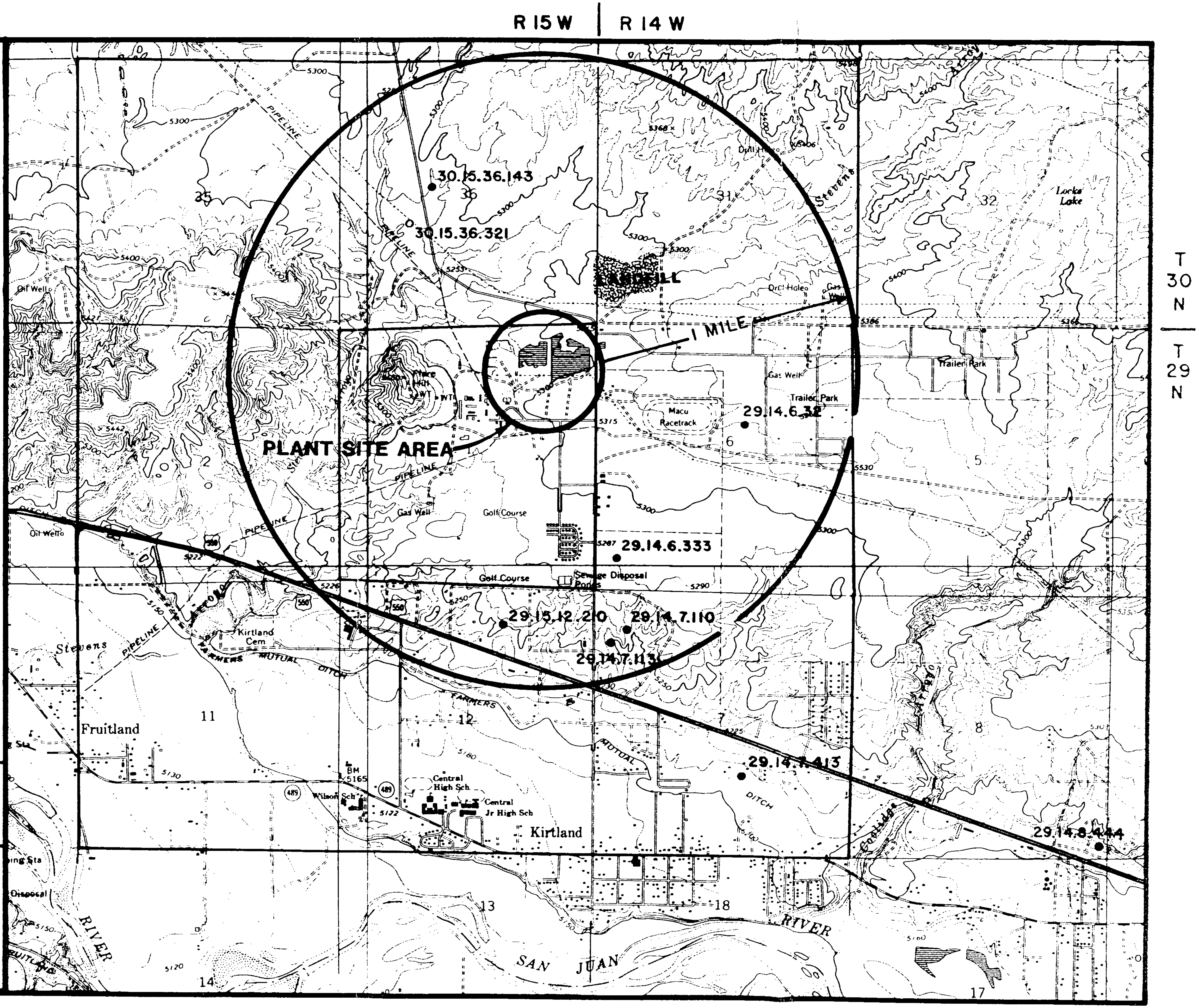


FIGURE 5-9
I MILE AREA OF INVESTIGATION
AT EPNG SAN JUAN RIVER PLANT

CLIENT: EL PASO NATURAL GAS CO.	
DATE: 11-12-85	
DRAWN BY: GRAEF/SELKE	
CHECKED BY:	
REVISED:	
SCALE: 1"=2000'	

Information assembled to date indicates that neither of the other two geohydrologic units which underlie the plant site could be affected by existing or proposed waste-management practices. Although the terrace-gravel aquifer may be hydraulically connected with the alluvial-colluvial unit, this gravel unit cannot be directly affected by the existing waste management unit because the gravel unit is found either up-gradient from the waste management (to the east) or off-gradient from the waste management unit (to the south). Therefore, any seepage from the waste management unit would migrate toward Stevens Arroyo and not directly enter this gravel unit. The confined Kirtland Shale aquifers are not hydraulically connected to any surface discharges and cannot be affected by the waste management practices at the San Juan River Plant.

Regional and site water level data for the fine-grained and coarse-grained water table aquifers indicates a gradient of 0.025 in the S35°W direction (Figure 5-10 and Plate 7). Based upon lithologic data in well logs and on-site drilling (Appendix B), the hydraulic conductivity of the terrace deposits is estimated to range between 100-1000 gal/day/ft^2. Based on field estimates of a porosity of 25% for these sands and gravels, the range of pore velocities of ground water is calculated using Darcy's law:

$$V = \frac{Kg}{n}$$

where: K = conductivity (ft/sec)
g = gradient (ft/ft)
n = porosity

The results of this calculation indicate a pore velocity of 1.55×10^{-5} to 1.55×10^{-4} ft/sec, or 488 to 4888 feet per year. Plate 7 shows the total extent of the terrace gravel aquifer. This unit was not observed in outcrop or in boreholes in the northern portion of the plant.

The fine-grained alluvial/colluvial unit (with a similar gradient and porosity) has an estimated hydraulic conductivity range of 1-20 gal/day/

30.15.36.143 •5178 — WATER WELL LOCATION WITH ELEVATION OF WATER TABLE

—5150— CONTOUR OF WATER TABLE AQUIFER

– – – – – – APPROXIMATE CONTACT BETWEEN KIRTLAND SHALE AND FRUITLAND FORMATION

· · · · · · · · · · CONTACT PROJECTED BENEATH ALLUVIUM

NORTH

13°

0 2000

FEET

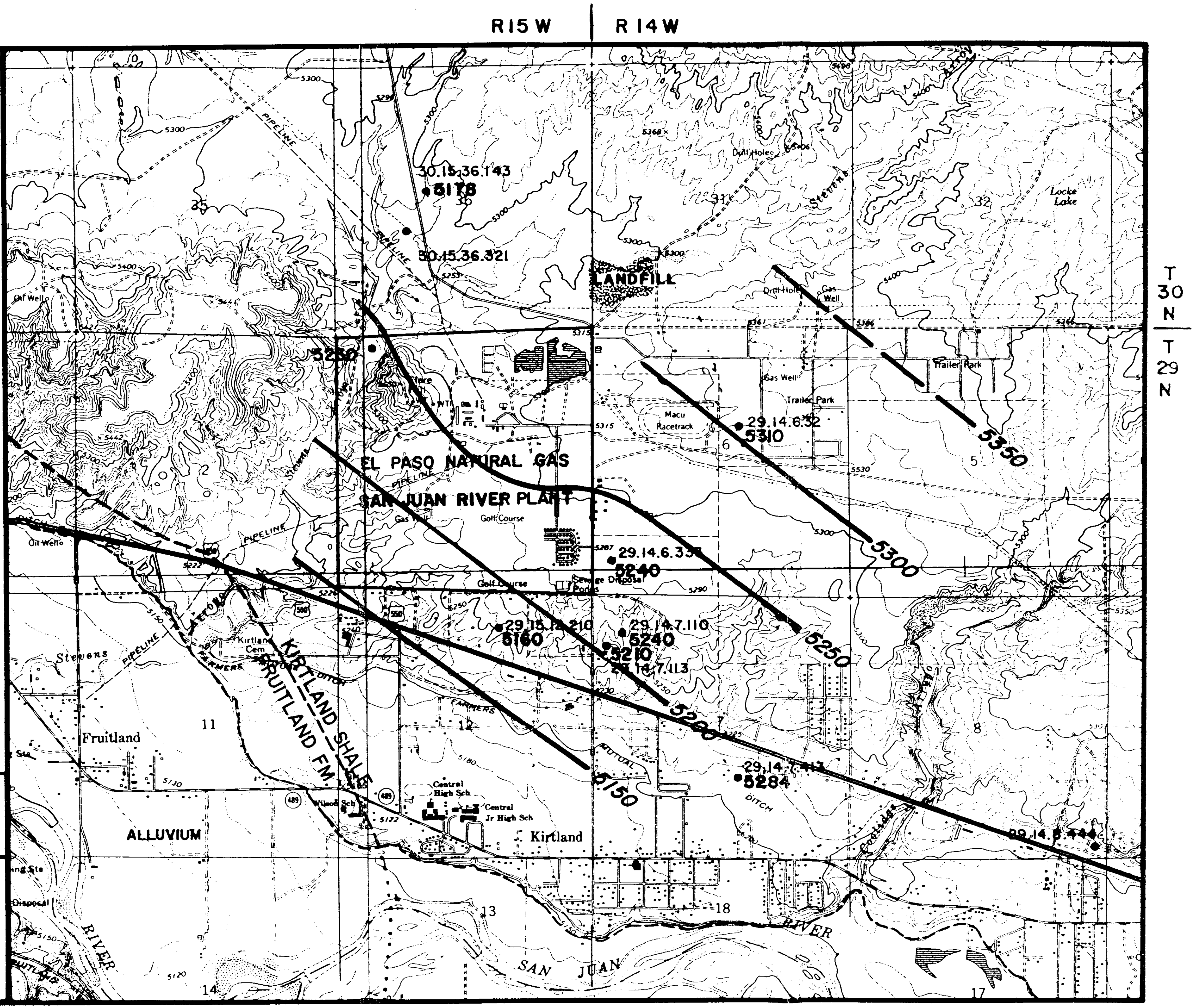


FIGURE 5-10

POTENTIOMETRIC SURFACE MAP OF EPNG SAN JUAN RIVER PLANT REGION

CLIENT: EL PASO NATURAL GAS CO.	
DATE: 11-10-85	
DRAWN BY: GRAEF / SELKE	
CHECKED BY:	
REVISED:	
SCALE: 1" = 2000'	

[redacted]

ft^2 (1.55 x 10^{-7} to 3.1 x 10^{-6} ft/sec). This results in an approximate porewater velocity of 5 to 98 feet per year.

The hydraulic gradient of the uppermost water bearing unit shows a flow path which is subparallel to topography (Plate 7). At the plant site, water in the fine-grained alluvial unit is derived from:

a) Recharge from uplands north of the plant site

b) Leakage from Stevens Arroyo alluvium upstream from the plant (Section 31, T. 30 N., R. 14 W.)

c) Input from upgradient septic tank/leach fields

d) Leakage from impoundments at the plant site

Ground water in this fine-grained unit apparently discharges to the Stevens Arroyo alluvium located west of the plant site (Plate 7).

As expected background water quality in the fine-grained alluvium is elevated in TDS. The slow pore-water velocity results in a long residence time within the unit and, over time, the fine-grained unit is chemically attacked by ground water resulting in the release of sodium, sulfate and other ions. Evapotranspiration by phreatophytes can also result in naturally elevated TDS in ground water. Man-made contributions to the unit, such as septic tank/leach field discharges and potential leachate from the county landfill (SW 1/4 SW 1/4 Section 31, T. 30 N., R. 14 W.) will also tend to elevate the TDS of ground water entering the plant site.

Plate 8 shows the specific conductance of ground water at the site and Table 5-1 presents the results of ground water quality analyses. Laboratory reports are presented in Appendix D. Ground water pH is constant throughout the site (Table 5-1). Based upon the TDS and specific conductance values observed on the site, the TDS ranges from 13,600 to 28,000 mg/l. Analyses of water samples taken from piezometers showed lead and chromium to be elevated above WQCC standards. Wastewater does not show elevated lead or chromium values. Despite filtering prior

TABLE 5-1
CHEMICAL ANALYSIS OF GROUND WATER
(ALL VALUES IN MG/L)

Well #	Specific* Conductance	TDS	pH	Lead	Chromium	Benzene	Toluene	Xylene	Phenols
				DECEMBER SAMPLING					
P-2	8,200	NA	7.0	0.18	0.03	NA	NA	ND	<0.005
P-5	6,800	NA	7.1	NA	NA	ND	ND	ND	NA
P-6	11,000	22,400	6.9	NA	NA	ND	ND	ND	NA
P-7	6,900	NA	7.0	NA	NA	1.32	ND	ND	NA
P-8	14,000	NA	7.4	0.29	0.08	NA	NA	ND	<0.005
P-9	7,700	16,900	7.1	0.11	0.06	ND	ND	ND	<0.005
P-10	8,900	NA	7.2	NA	NA	12.8	0.318	ND	NA
P-11	9,800	19,000	7.2	NA	NA	ND	ND	ND	NA
P-12	3,900	NA	7.3	NA	NA	ND	ND	ND	NA
				JANUARY SAMPLING**					
P-7	NA	NA	NA	NA	NA	0.1	ND	0.041	NA
P-10	NA	NA	NA	NA	NA	0.19	0.0839	0.369	NA
				FEBRUARY/MARCH SAMPLING***					
P-4	NA	13,600	NA	NA	NA	NA	NA	NA	NA
P-7	NA	NA	NA	0.25	0.04	0.308	NQ	5.1	NA
P-8	NA	NA	NA	0.4	0.08	ND	ND	ND	NA
P-9	NA	NA	NA	0.26	0.05	ND	ND	ND	NA
P-10	NA	NA	NA	0.16	0.04	ND	ND	ND	NA
P-12	NA	NA	NA	0.08	0.04	ND	ND	ND	NA
WQCC Standards	NS	1,000	6-9	0.05	0.05	0.01	0.75	0.62	0.005

*units of conductivity are umhos/cm
**confirmation analyses for organics in wells 7 & 10
***confirmation analyses

Laboratory reports are included in Appendix D
ND = Not detected
NA = Not analyzed
NS = No standard

to analysis, the elevated metals concentration in the water samples may be due to metal ions sorbed to colloidal particles rather than existing as dissolved ions.

The specific conductance in wells 4, 6, 7 and 10 reveals that northwestern flowing ground water leaving the plant site (Wells 7, 10) is of significantly better quality than natural ground water in Stevens Arroyo (Wells 4, 6). Poor quality ground water from Stevens Arroyo entering the plant site and evapotranspiration on the plant site combine to result in a natural deterioration of ground water quality. As can be seen from an examination of data from wells 6 and 4 data (Plate 8), the specific conductance of ground water is affected by evapotranspiration and the release of ions from solution in the fine-grained unit. Ground water in Well 10 is influenced by the fresh water pond which has a TDS of 270 mg/l. Apparently, natural processes are largely responsible for the observed ground water specific conductance in the uppermost ground water zone.

Well 11 is located on a ground water divide and is relatively unaffected by any potential leachate from the evaporation ponds. Additionally, evapotranspiration processes (phreatophytes) are not extreme in this area and the well water quality should not be affected by landfill leachate nor septic tank discharges. Well 11 represents the approximate natural background water quality in the shallow aquifer at the San Juan site. This value for specific conductance is consistent with expected conductance in similar units (e.g. Kirtland Shale). In the fine-grained alluvial/colluvial aquifer derived from Kirtland Shale, ground water leaving the plant site is not elevated in TDS with respect to background quality. The TDS of local ground water may be improved due to seepage from some impoundments.

Analyses performed on Wells 7 and 10 detected benzene and toluene. Wells 7, 9, 10 and 12 were sampled to confirm the initial analyses. Based upon the most recent analyses well 7 is the only well in which organics were detected. The source of the odor and dissolved hydrocarbons encountered in the wells is presently under investigation.

5.4 SURFACE WATER HYDROLOGY AND FLOODING POTENTIAL

The San Juan River, which drains the site area, is a tributary to the Colorado River. Water from the San Juan-Colorado River system is used mostly for irrigation and power generation which cause variable stream discharge patterns. Surface flow in the San Juan River is controlled by Navajo Dam, which forms a reservoir with a 1,700,000 acre-feet capacity (Stone, et. al., 1983). Downstream from the dam and upstream from the plant the Animas and La Plata Rivers contribute substantial flow to the San Juan River. Flooding potential from these rivers is negligible because the plant is located 150 feet higher than the San Juan River and is well outside the floodplain of the 100 year flood.

The major local drainage is Stevens Arroyo. This ephemeral drainage flows northeast to southwest for approximately 25,000 feet at a 0.005 topographic gradient before reaching the plant area. Stevens Arroyo cuts across the northwest corner of EPNG property approximately 1/4 to 1/2 miles form the plant facilities. The volume of water produced by a 100 year flood event (Table 5-2) can be easily contained by Stevens Arroyo. The elevation difference between the waste impoundments and Stevens Arroyo (40 feet) eliminates potential for flooding from this source.

Although the ponds are located in a broad, shallow swale, no distinct drainage patterns cut across the impoundments. Sheet runoff is the only potential for run-on to the waste management units. Averaging a height of 5 feet, the dikes that contain the plant's wastewater are more than adequate protection against a 100-year runoff event of 2.6 inches in 24 hours (Tables 5-2 and 5-3). The new proposed ponds will be constructed such as to be protected against the 100-year flood.

TABLE 5-2
HYDROLOGIC DATA SHEET
EL PASO NATURAL GAS
SAN JUAN RIVER PLANT

Drainage Area	A =	3840 Acres
Runoff Curve No.	Cn =	90 (40% cover, D-Group)
Time of Concentration	Tc =	2.3 hr.
Channel-Loss Factor	Clf =	0.7
	Pa =	8 in.
	Ta =	$52^{o}F$

Unit Discharge cfs/ac-in = 0.28

Recurrence Interval	10 years	25 years	50 years	100 years
Rainfall (24 hour)	1.60 in	2.00 in	2.20 in	2.60 ins
Direct Runoff (Q) (in)	0.75 in	1.10 in	1.28 in	1.62 ins
Net Runoff (Qn) (in)	0.53 in	0.77 in	0.90 in	1.13 in
Peak Discharge (cfs)	569.90 cfs	827.90 cfs	967.70 cfs	1215.00 cfs
Volume of Runoff (acre-ft)	169.60 ac-ft	246.40 ac-ft	288.00 ac-ft	361.60 ac-ft

Note: Computations in Appendix 5-C follow the methods cited in Chapter 2, U.S.S.C.S. Engineering Manual for Conservation Practices

TABLE 5-3
CALCULATION OF 10, 25, 50 AND 100-YEAR FLOODS

(From U.S.S.C.S. Engineering Field Manual For Conservation Practices)

drainage area		A=3840 acres
runoff curve no.		Cn=90 (assume 40% cover, D-group)
time of concentration		DTc=2.3 hrs.
channel-loss factor		Clf=0.7
normal annual precip.		Pa=8 in
average annual temp.		Ta=52°F
climatic index		CI=100 Pa/Ta^2=0.3
unit discharge		=0.28 cfs/ac-in
rainfall:	10 yr	= 1.6 in
	25 yr	= 2.0 in
	50 yr	= 2.2 in
	100 yr	= 2.6 in
direct runoff:	10 yr	= 0.75 in
	25 yr	= 1.10 in
	50 yr	= 1.28 in
	100 yr	= 1.62 in
net runoff:	10 yr	Qn = Q*Clf=0.75*0.7=0.53 in
(Qn)	25 yr	Qn = 1.10*0.7=0.77 in
	50 yr	Qn = 1.28*0.7=0.90 in
	100 yr	Qn = 1.62*0.7=1.13 in
peak discharge	10 yr	= A*Qn unit discharge = 3840*.53*.28=569.9 cfs
	25 yr	= 3840*0.77*0.28=827.9 cfs
	50 yr	= 3840*0.90*0.28=967.7 cfs
	100 yr	= 3840*1.13*0.28=1215.0 cfs
volume of runoff	10 yr	= Qn*A/12=.53*3840/12=169.6 ac-ft
	25 yr	= 0.77*3840/12=246.4 ac-ft
	50 yr	= 0.90*3840/12=288.9 ac-ft
	100 yr	= 1.13*3840/12=361.6 ac-ft

6.0 MONITORING AND REPORTING

On a quarterly basis and following major storms, each pond will be inspected and the level of each pond will be determined from staff gauges. Samples of contact and non-contact wastewater will be obtained annually and analyzed for all WQCC 3-103 parameters except radioactive species. Any records related to waste characterization or pond integrity will be retained by El Paso for at least five years.

Because the TDS content of the uppermost water-bearing unit under the evaporation ponds (existing and proposed) exceeds 10,000 mg/l, no ground water monitoring is required or proposed (NMWQCC Regulation 3-101.A).

Any changes, anticipated or otherwise, to the disposal system will be reported to NMOCD.

7.0 BASIS FOR APPROVAL

The existing site conditions and proposed modifications to the wastewater management system at El Paso's San Juan River Plant act together to ensure that there will be no present or future danger to ground water having foreseeable future use as the result of discharges to existing and proposed waste management units. No present or foreseeable future users of ground water in the San Juan River Plant area can be affected for the following reasons:

- El Paso has proposed to cease discharges of contact wastewater to the existing unlined ponds and divert this waste stream to a lined, wastewater evaporation pond with leak detection systems (Sections 4.3.2 and 4.4.1)
- Contact wastewaters will undergo hydrocarbon separation prior to total evaporation in lined ponds (Section 4.3)
- 96% of all wastewaters are derived from non-contact processes and are of relatively good quality (Section 3.2)
- There is no significant potential for wastewater release due to flooding by a 100-year storm (Section 5.4)
- Ground water under the existing and proposed waste-management units has a TDS content in excess of 10,000 mg/l
- EPNG is wholly committed to carrying out sound disposal practices and to this end submits the plan outlining the proposed procedures. Likewise, EPNG is committed to cooperating fully with NMOCD in honoring requests for additional information or clarification of existing information related to the Discharge Plan.

8.0 SUMMARY OF DISCHARGE PLAN REQUIREMENTS

1) Annual analysis of samples taken from contact and non-contact wastewater evaporation ponds

2) Quarterly monitoring of pond levels

3) Quarterly inspection of ponds

4) Reporting of all significant leaks or spills to NMOCD within 10 days, and notification within 30 days of any corrective action taken

5) Modification of dikes and collection area as required to prevent seepage or discharges to grade

6) Maintain records of pond integrity and wastewater characterization for at least five years.

9.0 REFERENCES CITED

Cedergren, Harry R., Seepage, Drainage, and Flow Nets, Second Edition, John Wiley & Sons, New York.

Fassett, J.E. and Hinds, J.S., 1971, Geology and Fuel Resources of the Fruitland Formation and Kirtland Shale of the San Juan Basin, New Mexico and Colorado, U.S.G.S. Professional Paper 676.

Keetch, C.W., 1980, U.S. Soil Conservation Service Soil Survey of San Juan County, New Mexico, Eastern Part.

Sax, N. Irving, 1979, Dangerous Properties of Industrial Materials, Fifth Edition.

Stone, W.J., Lyford, F.P., Frenzel, P.F., Mizell, N.H., Padgett, E.T., 1983, Hydrology and Water Resources of San Juan Basin, New Mexico, New Mexico Bureau of Mines and Mineral Resources, Hydrologic Report 6.

Gabin, V.L. and Lesperance, L.E., New Mexico Climatological Data, Precipitation, Temperature, Evaporation, and Wind Monthly and Annual Means 1850-1975

U.S. Soil Conservation Service, 1985, Engineering Field Manual for Conservation Practices, Chapter 2, Peak Rates or Discharge for Small Watersheds.

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DISCHARGE PLAN FOR EL PASO NATURAL GAS COMPANY'S SAN JUAN RIVER PLANT SAN JUAN COUNTY, NEW MEXICO

PLATES 1 THROUGH 8

El Paso
Natural Gas Company

APRIL, 1986

ENGINEERING RECORD	
DRAWN BY	*Aero-Graphics*
TRACED BY	
CHECKED BY	
APPROVED	
DATE	
PHOTO DATE	10-18-82
CONTOUR INTERVAL	2'

200 0 200 400
SCALE IN FEET

PLATE 1

SITE MAP SHOWING DRAINAGE FROM PLANT

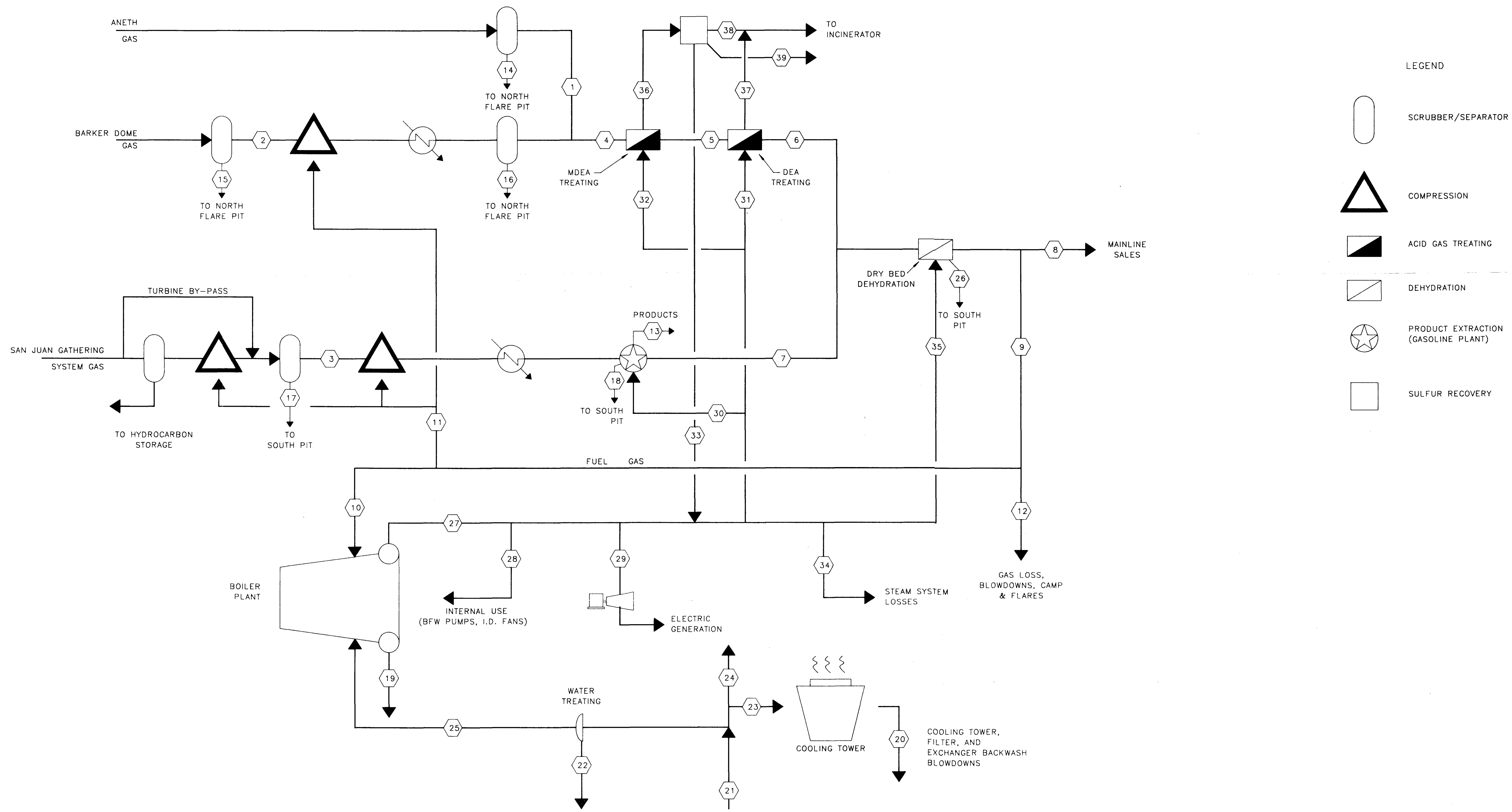
SAN JUAN RIVER PLANT
SEC. 1, TWS. 29-N, RANGE 15-W
SAN JUAN COUNTY, NEW MEXICO

DWG. NO.

OIL CONSERVATION DIVISION
SANTA FE

aero-graphics

Contours Have Been Adjusted To Match Rectified Photo Base



MATERIAL BALANCE

STREAM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13
SERVICE	INLET GAS	INLET GAS	INLET GAS	MDEA PLANT INLET	DEA PLANT INLET	TREATED GAS	GASOLINE PLANT OUTLET	PLANT OUTLET	TOTAL FUEL GAS	BOILER FUEL	COMPRESS. FUEL	FUEL LOSSES & FLARES	GASOLINE PLANT PRODUCTS
COMPS													
C02	2.9	208.9	31.0	211.8	159.0	0.4	31.0	28.9	2.5	1.8	0.4	0.2	
H2S	1.1	41.7		42.8	.08	TRACE		TRACE	TRACE	TRACE	TRACE	TRACE	
N2	16.5	21.9	16.2	38.4	38.4	38.4	16.2	50.2	4.4	3.2	0.8	0.4	
C1	681.8	1336.4	2668.4	2018.2	2018.2	2018.2	2668.4	4314.7	371.9	274.7	66.2	30.8	
C2	183.0	13.8	265.0	196.8	196.8	196.8	265.0	425.2	36.6	27.1	6.5	3.0	
C3	19.3	5.2	109.0	24.5	24.5	24.5	85.8	101.6	8.7	6.4	1.6	0.7	23.2
i-C4	0.2	1.5	17.2	1.7	1.7	1.7	6.4	7.5	.6	0.5	0.1	0.1	10.8
N-C4	0.6	1.9	27.6	2.5	2.5	2.5	10.2	11.7	1.0	0.8	0.2	0.1	17.4
i-C5	0.1	0.9	8.8	1.0	1.0	1.0	0.6	1.5	.1	0.1	<0.1	<0.1	8.2
N-C5	0.1	0.7	6.7	0.8	0.8	0.8	0.5	1.2	.1	0.1	<0.1	<0.1	6.2
C6+	0.1	2.0	8.9	2.1	2.1	2.1	0.6	2.5	.2	0.2	<0.1	<0.1	8.3
H20	0.1	0.2	0.5	0.3	3.7	3.7	3.4						
SULFUR													
MIXED HC													
TOTAL	905.8	1635.1	3158.8	2540.9	2449.5	2290.1	3088.1	4945.0	426.1	314.9	75.9	35.3	74.1
STATE	GAS	GAS	GAS	GAS	GAS	GAS	GAS	GAS	GAS	GAS	GAS	GAS	LIQUID
FLOW													
GAL/DAY													22237
MMSCF/D	8.2	14.9	28.7	23.1	22.3	20.8	28.1	44.9	3.9	2.9	0.7	0.3	
#/HR													

STREAM NO.	14	15	16	17	18	19	20	21	22	23	24	25	26
SERVICE	SCRUBBER BLOW DOWN	SCRUBBER BLOW DOWN	SCRUBBER BLOW DOWN	SCRUBBER BLOW DOWN	GASOLINE PLANT BLOWDOWN	BOILER BLOWDOWN	COOLING TOWER BLOWDOWN	MAKEUP WATER	WATER TREATER WASTE	COOLING TOWER MAKEUP	CAMP, OFFICE, & OTHER WTR.	BOILER WATER MAKEUP	DEHY WATER BLOWDOWN
COMPS				COMPONENT FLOW RATES ARE IN MOLES/HOUR									
C02													
H2S													
N2													
C1													
C2													
C3													
i-C4													
N-C4													
i-C5													
N-C5													
C6+													
H20	0.04	0.9	0.04	<.01	57.3	557.6	310.7	6745.4	321.3	1859.8	3205.1	1359.2	7.1
SULFUR													
MIXED HC	TRACE	TRACE	TRACE	.01	0.8								TRACE
TOTAL	0.04	0.9	0.04	.01	58.1	557.6	310.7	6745.4	321.3	1859.8	3205.1	1359.2	7.1
STATE	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
FLOW													
GAL/DAY	2	50	2	5	3300	28917	16111	349819	16662	96451	166217	70489	368
MMSCF/D													
#/HR													

STREAM NO.	27	28	29	30	31	32	33	34	35	36	37	38	39	STREAM NO.
SERVICE	STEAM PRODUCT-ION	BOILER PLT. STM. USE	ELECTRIC GEN. STM. USE	GASOLINE PLT. STM. USE	DEA PLT. STM. USE	MDEA PLT. STM. USE	STM. FROM SULFUR PLANT	STEAM SYSTEM LOSSES	DEHY. STEAM USE	ACID GAS	ACID GAS	CLAUS TAIL GAS	SULFUR	SERVICE
COMPS														COMPS
C02										52.8	158.6	52.0		C02
H2S										42.0	0.8	1.9		H2S
N2														N2
C1														C1
C2														C2
C3														C3
i-C4														i-C4
N-C4														N-C4
i-C5														i-C5
N-C5														N-C5
C6+														C6+
H20	6497.5	1455.6	3055.6	632.8	693.9	666.7	225.1	67.2	150.4	4.0	6.6	4.0		H20
SULFUR													40.1	SULFUR
MIXED HC														MIXED HC
TOTAL	6497.5	1455.6	3055.6	632.8	693.9	666.7	225.1	67.2	150.4	98.8	166.0	57.9	40.1	TOTAL
STATE	STEAM	STEAM	STEAM	STEAM	STEAM	STEAM	STEAM	STEAM	STEAM	GAS	GAS	GAS	LIQUID	STATE
FLOW														FLOW
GAL/DAY														GAL/DAY
MMSCF/D										0.9	1.5	0.5		MMSCF/D
#/HR	116955	26201	55000	11390	12491	12000	4052	1217	2708				1283.2	#/HR

NOTES:
1. COMBUSTION PRODUCTS (N2 & H20) OMITTED FROM SULFUR PLANT BALANCE.
2. H2S IN STREAMS 36 AND 37 IS EMITTED TO ATMOSPHERE AS S02.
3. COMPOSITION AND FLOW OF STREAMS 14, 15, 16, 17, ARE ESTIMATED.
4. INTERMITTENT FLOWS SHOWN AS EQUIVALENT CONTINUOUS BASIS.
5. BALANCE BASED UPON CALCULATED AVERAGES FOR 1985

LEGEND

DWG. NO.	TITLE

REFERENCE DRAWINGS

NO.	DATE	BY	DESCRIPTION	W.O.

REVISIONS

APP.	PRT.	SEP.	DATE	TO	W.O.

PRINT RECORD

ENG. RECORD		DATE
DRAFTING DESIGN	A.W.	2/86
COMPUTER GRAPHICS	MD	2/11/86
CHECKED		
PROJECT APPROVAL		
DESIGN APPROVAL		
COMPUTER SAVE NAME	SJR227	

El Paso
NATURAL GAS COMPANY

PLATE 2

BLOCK FLOW DIAGRAM AND
TYPICAL MATERIAL BALANCE
SAN JUAN RIVER PLANT

SCALE: NONE
W.O.:
DWG. NO. 2SJ-1-P37
REV.


PLATE 3
POTABLE WATER,
STORM WATER & DOMESTIC
WASTEWATER SCHEMATIC
SOLID WASTE BURIAL SITES
SAN JUAN RIVER PLANT
SEC. 1, TWS. 29-N, RANGE 15-W
SAN JUAN COUNTY, NEW MEXICO
ENGINEERING RECORD
DRAWN BY Aero-Graphics
TRACED BY
CHECKED BY
APPROVED
DATE
PHOTO DATE 10-18-82
CONTOUR INTERVAL 2'
200 0 200 400
SCALE IN FEET
DWG. NO.
FRESH WATER
POND #1
POND #3
POND #2
PUMP HOUSE
PROPERTY LINE & FENCE
FRESH WATER TANK
FRESH WATER TANK
SEPTIC
SEPTIC
SEPTIC
PLANT FENCE
FRESH WATER INPUT FROM SAN JUAN RIVER
FRESH WATER INPUT FROM FARMER'S MUTUAL DITCH
NAT. CHANNEL STORMWATER
PIGGING
ABANDONED FLARE PIT
ASBESTOS BURIAL PIT (CLOSED IN 1981)
SOLID WASTE BURIAL PIT FOR OIL FILTERS; CHARCOAL FILTER MEDIA

NOTES

1. CLASS LOCATION AND JURISDICTION DETERMINED BY DWELLING UNIT COUNT (BUILDING INTENDED FOR HUMAN OCCUPANCY) WITHIN 660' OF SYSTEM
2. DWELLING UNIT COUNT WITHIN 660' LIMIT
   - A. 4 ELECT. & INST. SHOP
   - B. 3 MACH. WELD & COFFEE SHOP
   - C. 4 OFFICES
   - D. 1 COMPRESSOR BLDG.
   - E. 3 GASOLINE TREATING PLANT (WORK STATIONS)
   - F. 2 BOILER & GENERATOR PLANT (WORK STATIONS)

   17 TOTAL UNITS
3. GATHERING LINES NOT UNDER D.O.T. JURISDICTION

   TRANSMISSION OR GATHERING LINES UNDER D.O.T. JURISDICTION.

CLASS LOCATION DATA

LINE NO	O.D.	LINE DESIGNATION	BEGIN	END	CL. LOC	METER NO
		ALL GAS PLANT PIPING			2	
3200.0	16"	BLANCO-FRUITLAND LINE (INCL. SEP.& RES)	-8+00	3+16	2	
3202.0	24"	BARKER DOME LINE	864+00	869+80	2	
1207.0	16"	ANETH-SAN JUAN LINE	-11+00	-17+00	2	
1201	24"	SAN JUAN 1ST LOOP LINE	875+23	881+33	2	
		PLANT SUCTION	0+00	2+60	2	
	16"	TURBINE SUCTION	2+60	6+50	2	
	16"	TURBINE SUCTION	2+60	6+50	2	
	8"	BY PASS LINE (VA.0-VA. 1/2 LN 3200)	-0+24	2+26	2	

REVISIONS

NO	DATE	BY	DESCRIPTION
A	3-8-79	LD	Added Notes & Dwelling Units
B	7-31-81	LD	Photo-Revised Per 1981 Photography
C	2-8-85	TCB	Changed Part Of Line 3202 To Non-Jurisdictional

ENGINEERING RECORD

DRAWN BY	Aero-Graphics
TRACED BY	
CHECKED BY	
APPROVED	R L G
DATE	7-14-78
PHOTO DATE	10-29-76
PHOTO RECHECK	6-8-81

CHANGES ADDES 2/27/86 BY D.S.

El Paso NATURAL GAS COMPANY

PLATE 4
PRODUCT/WASTEWATER SCHEMATIC

N-1/2 SAN JUAN RIVER PLANT
SAN JUAN COUNTY, NEW MEXICO

0 200 300 SCALE IN FEET

DWG. NO. 5202.14-1 SHEET 1 OF 2 REV. C

APR 2 0 1986

DRAFTING BY AERO-GRAPHICS, INC.

CLASS LOCATION DATA

LINE NO.	O.D.	LINE DESIGNATION	BEGIN	END		METER NO.	LINE NO.		
		ALL GAS PLANT PIPING			2				
1200	24"	SAN JUAN LINE	881+33	——	1				
1201	24"	SAN JUAN 1st LOOP LINE	875+ 3	881+33	2				
3201	20"	BLANCO - FRUITLAND LOOP LINE	0+00	——	1				
3222	16"	BLANCO - FRUITLAND LOOP LINE	0+00	——	1				
	16"	TURBINE SUCTION	2+60	6+50	2				
	15"	TURBINE DISCHARGE	2+60	6+50	2				
		PLANT SUCTION	0+00	2+60	2				

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	6-9-79	LD	Corrected Location Of Valve No. 1/2
B	7-31-81	LD	Photo-Revised Per 1981 Photography

ENGINEERING RECORD

DRAWN BY	Aero-Graphics
TRACED BY	
CHECKED BY	
APPROVED	R. L. G.
DATE	7-14-78
PHOTO DATE	10 29-76
PHOTO REVISED	6-8-81

0 100 200 300
SCALE IN FEET

El Paso NATURAL GAS COMPANY

PLATE 5

PRODUCT/WASTEWATER SCHEMATIC
S-1/2 SAN JUAN RIVER PLANT
SAN JUAN COUNTY, NEW MEXICO

Changes Added 2/27/85

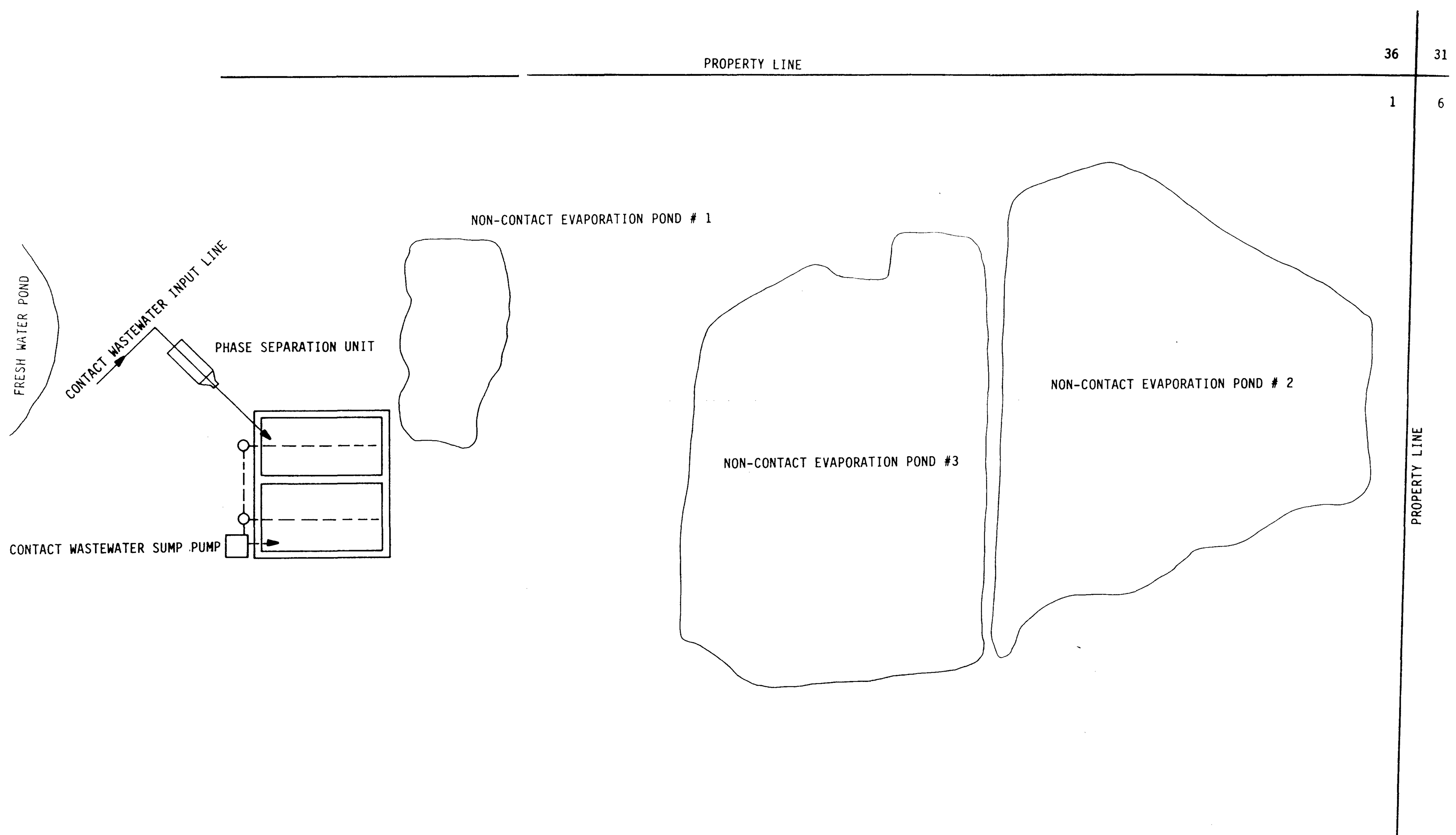
APR 29 1985
OIL CONSERVATION DIVISION
SANTA FE

DWG. NO. 5202.14-2

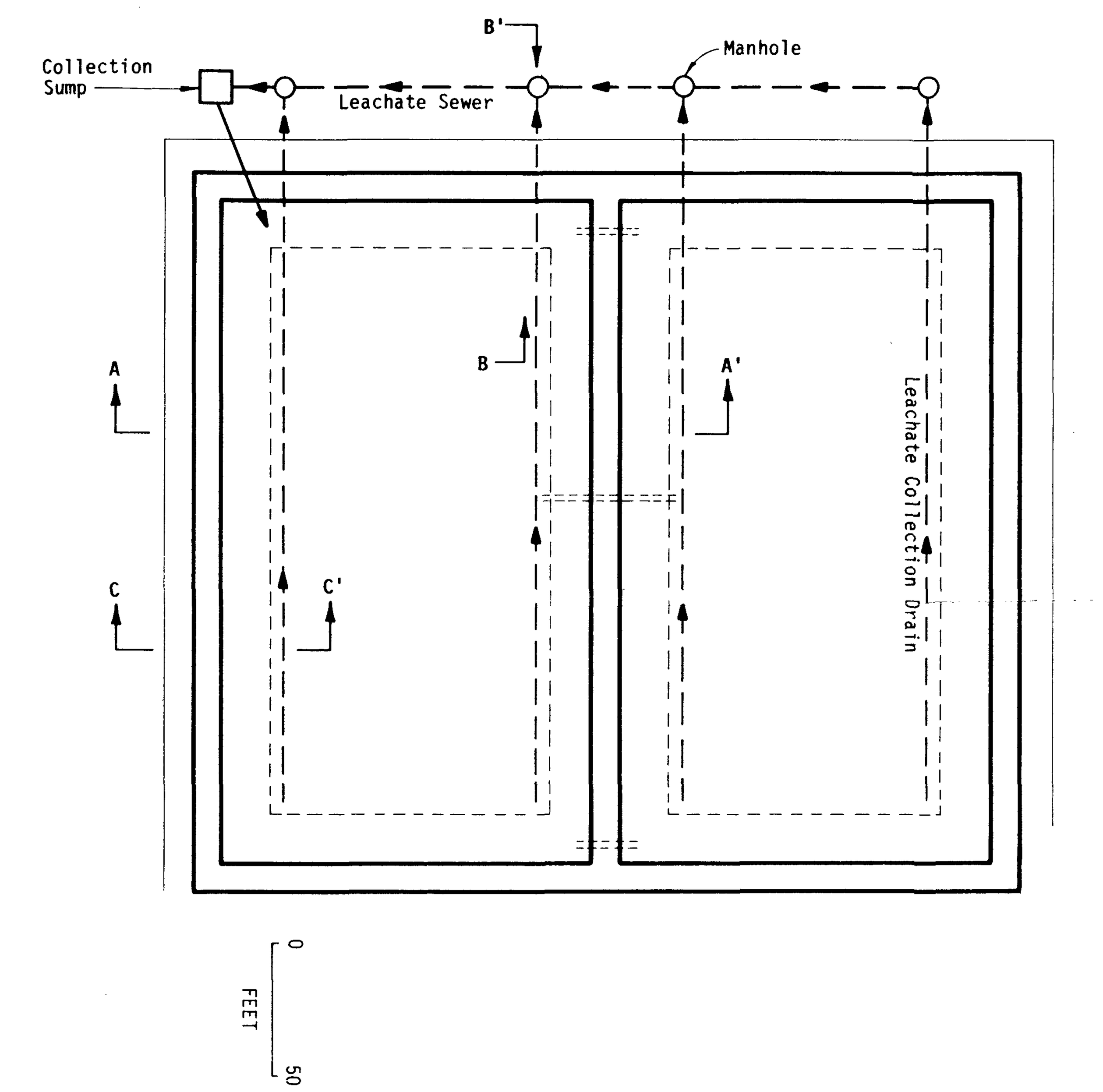
SHEET 2 OF 2

B
REV.

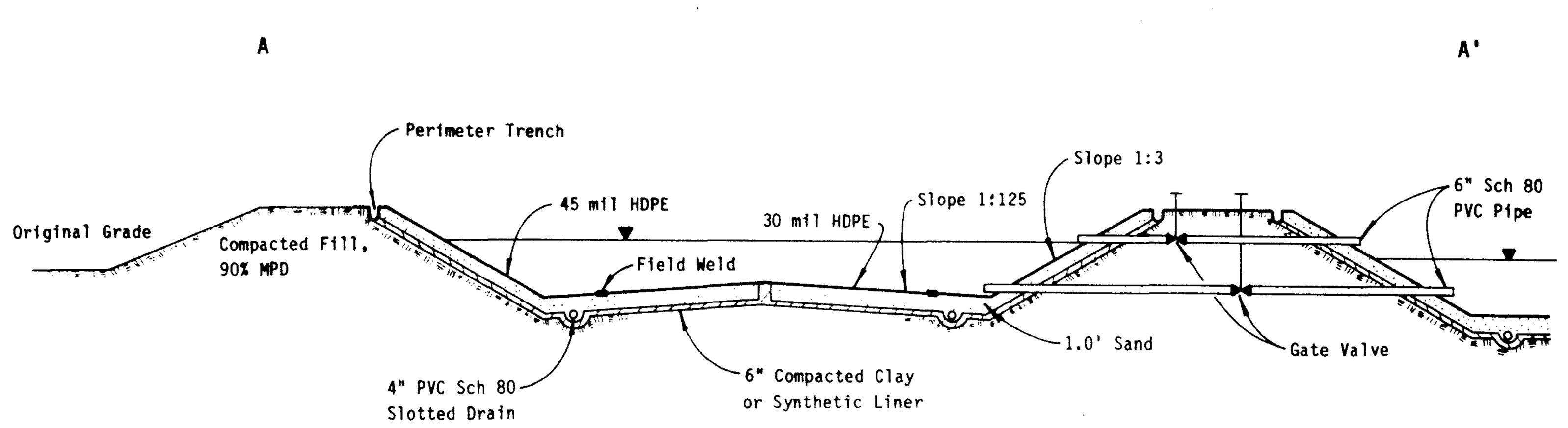
PRODUCTION BY Aero-graphics



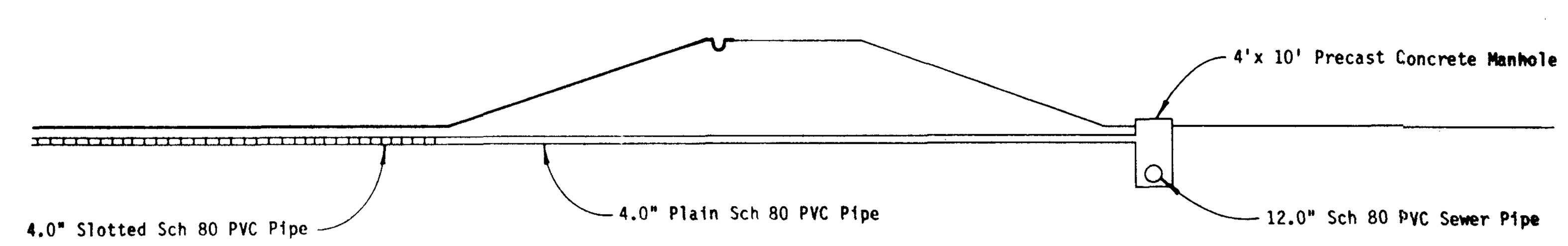
SITE LAYOUT



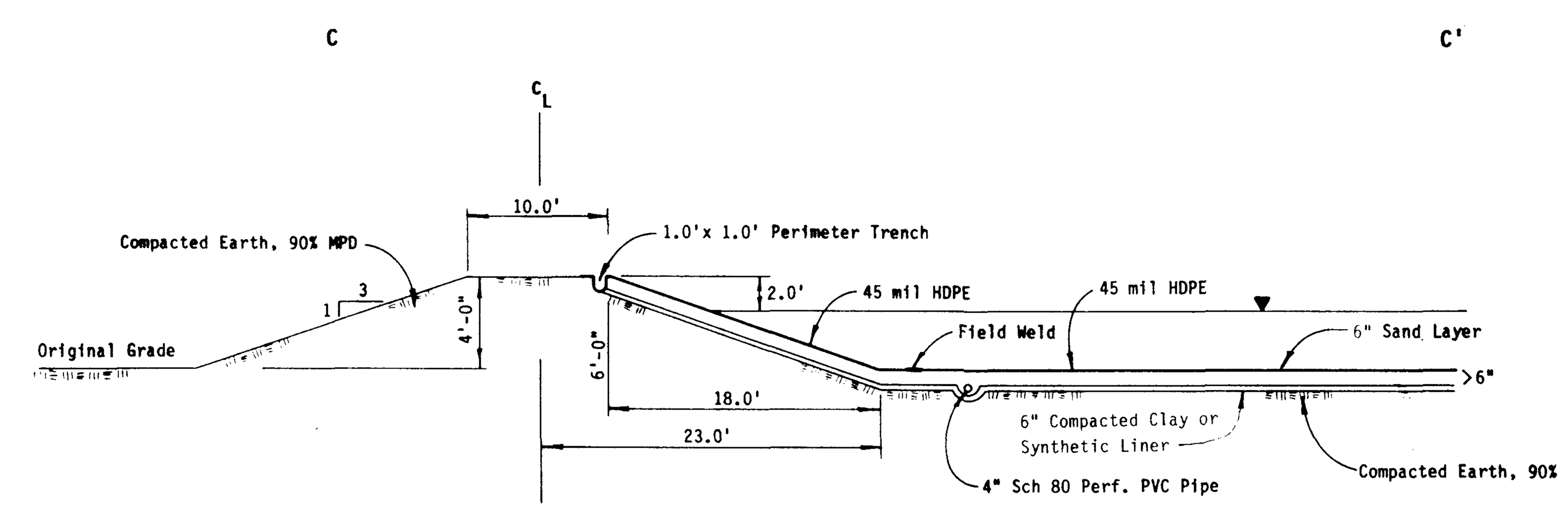
SCHEMATIC LAYOUT FOR
EVAPORATIVE PONDS FOR CONTACT WASTEWATER
(SEE CROSS-SECTIONS A-A', B-B', C-C' FOR DETAILS)



CROSS SECTION A-A'
not to scale



CROSS SECTION B-B'
not to scale



CROSS SECTION C-C'
not to scale

ENGINEERING RECORD	
DRAWN BY	Aero-Graphics
TRACED BY	
CHECKED BY	
APPROVED	
DATE	
PHOTO DATE	10-18-82
CONTOUR INTERVAL	2'

200 0 200 400
SCALE IN FEET

PLATE 6

CONCEPTUAL DESIGN OF MODIFICATIONS TO WASTEWATER MANAGEMENT SYSTEM

SAN JUAN RIVER PLANT
SEC. 1, TWS. 29-N, RANGE 15-W
SAN JUAN COUNTY, NEW MEXICO

DWG. NO.


FRESH WATER POND
5290
POND #1
5274
POND #3
5289
POND #2
5304
PROPERTY LINE & FENCE
PLANT FENCE
AREAL EXTENT OF COBBLE/GRAVEL AQUIFER
LEGEND
(5) 5289 PIEZOMETER WITH NUMBER AND WATER LEVEL ELEVATION
ENGINEERING RECORD
DRAWN BY Aero-Graphics
TRACED BY
CHECKED BY
APPROVED
DATE
PHOTO DATE 10-18-82
CONTOUR INTERVAL 2'
200 0 200 400
SCALE IN FEET
PLATE 7
POTENTIOMETRIC SURFACE OF UPPERMOST WATER-BEARING UNIT
SAN JUAN RIVER PLANT
SEC. 1, TWS. 29-N, RANGE 15-W
SAN JUAN COUNTY, NEW MEXICO
DWG. NO.

LEGEND

(5) 6800 um — PIEZOMETER WITH NUMBER AND GROUND WATER SPECIFIC CONDUCTANCE

ENGINEERING RECORD	
DRAWN BY	Aero-Graphics
TRACED BY	
CHECKED BY	
APPROVED	
DATE	
PHOTO DATE	10-18-82
CONTOUR INTERVAL	2'

200 0 200 400
SCALE IN FEET

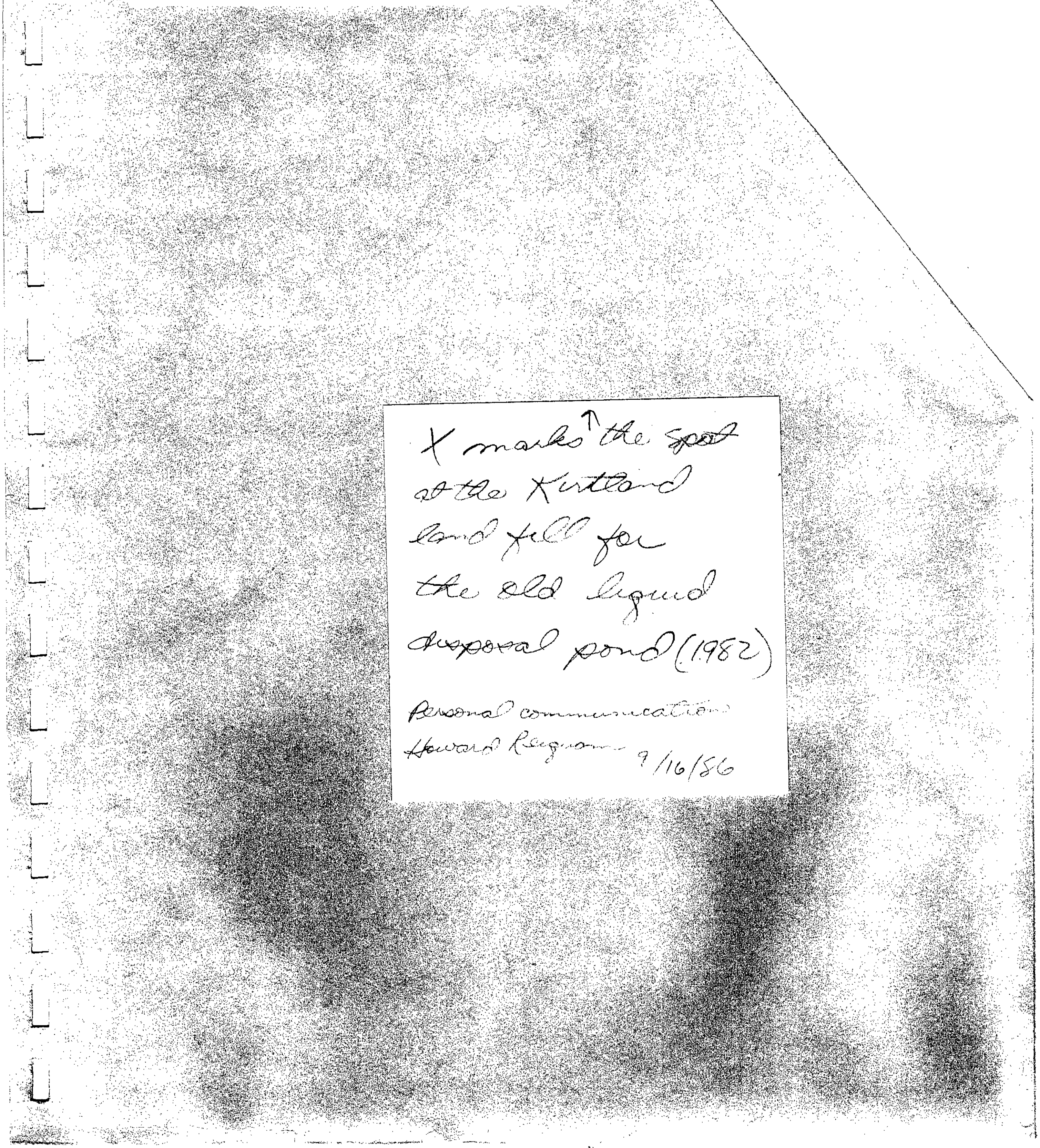
PLATE 8

SPECIFIC CONDUCTANCE OF UPPERMOST WATER-BEARING UNIT

SAN JUAN RIVER PLANT
SEC. 1, TWS. 29-N, RANGE 15-W
SAN JUAN COUNTY, NEW MEXICO

DWG. NO.

PLATE 1



X marks the spot
at the Kirtland
land fill for
the old liquid
disposal pond (1982)

Personal communication
Howard Reguson 9/16/86

Work Copy

DISCHARGE PLAN FOR EL PASO NATURAL GAS COMPANY'S SAN JUAN RIVER PLANT SAN JUAN COUNTY, NEW MEXICO

APPENDICES A THROUGH D

El Paso
Natural Gas Company

APRIL, 1986

APPENDICES
FOR EPNG DISCHARGE PLAN

APPENDIX A-3

APPENDIX A

MATERIALS-SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y. 12305

MATERIALS INFORMATION SERVICES

NO. 92

ALUMINUM SULFATE, LIQUID

Date October 1981

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: ALUMINUM SULFATE, LIQUID
DESCRIPTION: An acidic salt solution in water
OTHER DESIGNATIONS: Alum, Sulfuric acid aluminum salt, CAS #010 043 013
MANUFACTURER: Available from several suppliers, including:

Essex Chemical Corp 1401 Broad Street Clifton, N.J. 07015	Cities Service Co. 3445 Peachtree Road N.E. Atlanta, Georgia 30326

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Aluminum Sulfate Hydrates in water $[Al_2(SO_4)_3 \cdot 49.6\ H_2O]$	>99	No TLV Established Mouse, Intraperitoneal LD_{50} 270 mg/kg

SECTION III. PHYSICAL DATA

Boiling point, 1 atm deg C (F) ---- 101 (214)
Vapor pressure -------------- (water solvent)
Solubility in water --------------- complete
pH ------------------------------- 2 - 3.5

Specific gravity (H_2O=1) ------- 1.33
Solidification point, deg F --- 4-15
Molecular weight, $Al_2(SO_4)_3$ -- 342.14

Appearance & Odor: Clear liquid with greenish or brown tint; no odor

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER

Extinguishing Media: Use that which is appropriate for the surrounding fire.
Noncombustible material. Alum is used as a flame retardant.
Spilled alum or flooring can cause slippery footing.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not polymerize.
This is a moderately acidic liquid which is slowly corrosive to mild steel.
It is incompatible with alkaline material.
Evaporation of water from this material produces hydrates, for example, $Al_2(SO_4)_3 \cdot 18H_2O$. Heating above 86.5 C eliminates water of hydration. Above 770 C, anhydrous $Al_2(SO_4)_3$ decomposes to the oxide, liberating sulfur oxides.

NO. 92

SECTION VI. HEALTH HAZARD INFORMATION	TLV (See Sect II)

Liquid alum is an acidic salt that can irritate eyes, skin, open wounds and mucous membranes. Inhalation of mists can be irritating to the respiratory tract and lungs. Chronic overexposure to the skin can cause contact dermatitis. (Aluminum sulfate is used as a food additive and appears on the GRAS list.)

FIRST AID:
- Eye Contact: Flush with running water for 15 min. including under the eyelids.
- Skin Contact: Remove contaminated clothing. Wash affected area with soap and water.
- Inhalation: Remove to fresh air.
- Ingestion: Give large amounts of water or milk to drink to dilute.

Seek medical assistance for further treatment, observation and support.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Provide adequate ventilation. Clean-up personnel need protection against contact with this acidic (pH 2-3.5) material. Liquid spills can cause extremely slippery footing. Cover with lime or soda ash to neutralize and pick up for disposal.
DISPOSAL: Bury neutralized waste in an approved landfill.
Follow Federal, State, and Local regulations.

AQUATIC TOXICITY: EPA category D with LC_{50} 100-500 mg $Al_2(SO_4)_3$/L

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general exhaust ventilation in areas of use. If misting conditions exist, wear an activated carbon filter respirator suitable for sulfuric acid mists; local exhaust ventilation may also be needed.
The use of chemical safety goggles and/or a faceshield is advised where splashing of material is possible. Avoid skin contact by wearing rubber or plastic gloves. Additional acid resistant clothing may be desirable if exposure is severe.
Eyewash stations and washing facilities should be readily accessible.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away fron sources of heat. Protect containers from physical damage. Liquid alum is corrosive to ferrous metals and mild steel. Use acid resistant tanks for storage and piping (plastic rubber lined, plastic lined, or stainless steel).
Avoid contact with skin and eyes.
Safety shoes are recommended when handling drums.

DATA SOURCE(S) CODE: 1,4-7,10

APPROVALS: MIS CRD J. M. Nielsen

Industrial Hygiene and Safety DW 10-12-81

MEDICAL REVIEW: 21 October 1981

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y. 12305

Phone: (518) 385-4085 DIAL COMM 8*235-4085

MATERIALS INFORMATION SERVICES

NO. 53

CHLORINE

Date July 1979

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: CHLORINE
OTHER DESIGNATIONS: Cl_2, CAS # 007 782 505
DESCRIPTION: A gas shipped in steel cylinders as a liquid under its own vapor pressure.
MANUFACTURER: Available from many suppliers.

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Chlorine *Current OSHA ceiling limit. ACGIH TLV (1978) is 1 ppm with a STEL of 3 ppm for up to 15 minutes exposure. NIOSH (1976) proposed a ceiling limit of 0.5 ppm (15 minute sampling time). (Controversy going on whether OSHA standard should include ceiling limit or not.)	> 99	8-hr TWA 1 ppm (C) or 3 mg/m^3 *

SECTION III. PHYSICAL DATA

Boiling point at 1 atm, deg C --------- -34	Density at 0 C:
Vapor pressure at 20 C, mm Hg --------- 4800	Gas at 1 atm, g/liter ---- 3.214
Vapor density (Air=1) ----------------- 2.49	Liquid at 3.65 atm, g/cc -- 1.47
Water solubility at 20 C, 1 atm, g/l -- 7.3	Molecular weight -----------70.91

Appearance & Odor: A greenish-yellow gas or clear, amber-colored liquid with a suffocating, pungent, irritating odor. The odor recognition threshold (100% of test panel, unfatigued) is reported at 0.314 ppm. The odor is easily noticed at 1.9-3.5 ppm and has been reported as intolerable at 2.6-41 ppm, depending on the observer.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
Non-flammable				

Use extinguishing media that is appropriate for the surrounding fire. Use water spray to cool intact, fire-exposed containers (one ton tanks and cylinders will release chlorine when a fusible metal safety plug melts at 158-165F.) If possible, have specially trained personnel remove intact cylinders from fire area.

Chlorine will support the burning of most combustible materials, just as oxygen does. Flammable gases and vapors can form explosive mixtures with chlorine.

Firefighters must use self-contained breathing equipment, eye protection, and full protective clothing when fighting fires in which chlorine is involved.

SECTION V. REACTIVITY DATA

Chlorine is stable in steel containers at room temperature when dry. [Intense local heat (above 215°C) on steel walls can cause steel to ignite in chlorine.]

It is a powerful oxidizing agent which reacts violently with reducing agents and combustible materials. Materials such as acetylene, turpentine, other hydrocarbons, ammonia, hydrogen, ether, powdered metals, etc. must be kept away from chlorine.

It reacts with H_2S and H_2O forming HCl; it combines with CO and SO_2 to form phosgene and sulfuryl chloride (toxic and corrosive materials).

Wet chlorine (150 ppm water) corrosively attacks most common metals. Handling chlorine requires special materials technology.

GENERAL ELECTRIC

SECTION VI. HEALTH HAZARD INFORMATION

TLV 1 ppm or 3 mg/m^3 (C)

Chlorine believed to damage the body by local corrosive effects only; no systemic effects. 5-8 ppm in air will be severely irritating to eyes, nose, and respiratory tract of most individuals in a few minutes (10 ppm intolerable for avg. person). Higher level exposures produce coughing, dyspnea, burns of the skin, conjunctivitis, pulmonary edema (may be delayed) and death, depending on concentration and time of exposure (35-51 ppm, lethal in an hour; a few deep breaths fatal at 1000 ppm). Reduced respiratory capacity (especially among smokers) and dental erosion can result from chronic low level exposure. Any contact with liquid chlorine causes burns, blistering and tissue destruction.

FIRST AID: Call physician IMMEDIATELY for any person overexposed to chlorine!

Eye Contact: Flush eyes with water for at least 15 minutes, holding eyelids open. If medical help is not readily available, continue flushing with water.

Skin Contact: (Treat for inhalation exposure first!) Remove contaminated clothing under a safety shower. Wash exposed skin areas thoroughly with water.

Inhalation: Remove to fresh air. Restore breathing when required. Have trained person administer oxygen until victim breathes easily on his own. Keep warm and at rest! In mild cases, give milk to relieve throat irritation.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Establish written emergency plans and special training of personnel where chlorine is used.

Notify safety personnel. Provide ventilation. Exclude from area all except specially trained, assigned personnel with approved self-contained breathing equipment and appropriate protective clothing. Find and stop leak. (Large uncontrollable leaks require environmental consideration and possible evacuation of surrounding area.)

Move leaking container to isolated area. Position to release gas not liquid.

When possible draw off chlorine to process or to disposal system.

DISPOSAL: Bubble through a large volume of 15% aqueous NaOH or other alkali. Suitably dispose of resulting solution. Follow Federal, State and local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Provide suitable venting for low lying areas. Use enclosed, isolated processing and handling whenever possible. Full face-piece respirators must be available for non-routine and emergency use: canister gas mask below 5000 ppm in air and self-contained breathing equipment for other conditions.

Workers should be provided with chemical safety goggles and impervious gloves. Full protective clothing must be used when needed to prevent exposure to chlorine, liquid or gas. Daily change of work clothes and showering after work shift are recommended.

Eyewash stations and chemical safety showers must be available in areas of handling and storage of chlorine.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store chlorine containers in well-ventilated areas of low fire potential, away from incompatible materials (see Sec. V) and away from sources of heat and ignition. Protect containers from weather and physical damage; follow standard safety procedures for containers of compressed, corrosive gases. Provide special training to workers handling chlorine. Regularly inspect (and test) piping and containment used for chlorine service. Liquid levels should be less than 85% of tank or cylinder capacity.

Use preplacement and periodic medical exams; preclude from workplace exposure to chlorine those with cardiac, pulmonary or chronic respiratory problems.

Special Ref: "Chlorine and Hydrogen Chloride", Chapter 5, National Academy of Science, Washington, DC (1976).

DATA SOURCE(S) CODE: 2-12, 17, 19, 24, 26

APPROVALS: MIS, CRD [signature]

Industrial Hygiene and Safety [signature]

MEDICAL REVIEW: 12/79

SECTION V HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE

On the basis of animal testing, we would not expect this product to produce any skin or eye irritation. The acute oral LD_{50} (rats) is 14.6 ml/kg.

EMERGENCY AND FIRST AID PROCEDURES

Good First Aid should be followed in all cases of exposure.

In case of eye contact, flush with plenty of water for at least 15 minutes. If irritation develops, call a physician.

SECTION VI REACTIVITY DATA

STABILITY	STABLE	X	CONDITIONS TO AVOID
	UNSTABLE		

INCOMPATABILITY (Materials to Avoid)

Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS

Unknown

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
MAY OCCUR	NO X	

SECTION VII SPILL OR LEAK PROCEDURES

REPORTABLE QUANTITIES (RQ) IN LBS. OF EPA HAZARDOUS SUBSTANCES IN PRODUCT

1. N/A
2.
3.

NOTIFY EPA OF PRODUCT SPILLS EQUAL TO OR EXCEEDING N/A LBS.

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Dispose of in accordance with local, state, and federal regulations. Dike area to contain as much spilled material as possible. Remove any remaining material by absorbing on vermiculite or other suitable absorbing material and place in a sealed metal container for disposal. Product will make surfaces slippery. Hose contaminated surfaces thoroughly.

WASTE DISPOSAL METHOD

Flush product waste with plenty of water.
Dispose of in accordance with local, state, and federal regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify Type)

Not Required

VENTILATION	LOCAL EXHAUST	SPECIAL
	Not Required	
Normal	MECHANICAL (General) Not Required	OTHER

PROTECTIVE GLOVES	EYE PROTECTION
Not Required	Not Required

OTHER PROTECTIVE EQUIPMENT

Not Required

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Exercise caution in the storage and handling of all chemical substances.
Wash thoroughly after handling. Keep container closed.

OTHER PRECAUTIONS

ANTIPOL 662

QUICK IDENTIFIER

Continental Products of Texas

100 Industrial • P.O. Box 3627 • Odessa, Texas 79760

Telephone No. (915) 337-4681

NFPA Designation 704

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT

FIRE: 0
HEALTH: 2
REACTIVITY: 0
SPECIFIC HAZARD:

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name (used on label) (Trade Name & Synonyms): ANTIPOL 662

Chemical Name: Zinc Organic Phosphonate

Formula: $Zn_xC_xH_x(PO_4)_x$

Chemical Family: Metal Organic

Cas No.

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
Zinc Chloride		1 mg/m^3

SECTION 3 - PHYSICIAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: None

Specific Gravity (H_2O = 1): No

Vapor Pressure (mm Hg): None

Percent Volatile by Volume (%): No

Vapor Density (Air = 1): None

Evaporation Rate (______ = 1): No

Solubility in Water: 100%

Reactivity in Water: NA

Appearance and Odor: White Powder

Flash Point: None COC

Flammable Limits in Air % by Volume: NA
Lower Upper

Extinguisher Media: None

Auto-Ignition Temperature: NA

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [X] UNSTABLE [ ]

CONDITIONS TO AVOID

INCOMPATABILITY (MATERIALS TO AVOID): NA

HAZARDOUS DECOMPOSITION PRODUCTS: NA

Hazardous Polymerization — CONDITIONS TO AVOID: NA

MAY OCCUR ____ WILL NOT OCCUR X

Threshold Limit Value 1 mg/M^3 (Source - ACGIH)

Signs and Symptoms of Exposure

1. Acute Overexposure May cause damage to mucous membranes

2. Chronic Overexposure May cause sensory problems (ACGIH)

Medical Conditions Generally Aggravated by Exposure NA

Chemical Listed as Carcinogen or Potential Carcinogen: UN	National Toxicology Program Yes [X] No [ ]	I.A.R.C. Monographs Yes [X] No. [ ]	OSHA Yes [X] No.
OSHA Permissible Exposure Limit: Exceeds 2%	ACGIH Threshold Limit Value: 1 mg/M^3	Other Exposure Limit Used: NA	

Emergency and First Aid Procedures

1. Inhalation Remove to fresh air.

2. Eyes Flush with plenty of water.

3. Skin Flush with water, remove clothing.

4. Ingestion Do Not induce vomiting, give large quantities of milk or water. Call physician. Never give anything by mouth to an unconscious person.

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type) Dust respirator

Ventilation Yes | Local Exhaust Yes | Mechanical (General) Yes | Special NA | Other NA

Protective Gloves No | Eye Protection Safety Glasses

Other Protective Clothing or Equipment NA

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage None

Steps to be Taken in Case Material is Released or Spilled Flush with water to chemical sewer.

Waste Disposal Methods Dispose of according to State and Federal regulations for chemical waste.

Date Issued 11-13/85

Continental Products of Texas

Prepared by Eric Klim

Eric Klim

Abbreviation Used
NA Not Applicable
ND Not Determined
UN Unknown

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y. 12305
Phone: (518) 385-4085 DIAL COMM 8*235-4085

MATERIALS · INFORMATION · SERVICES

No. 9
SULFURIC ACID, CONCENTRATED
REVISION B
Date October 1980

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: SULFURIC ACID, CONCENTRATED
OTHER DESIGNATIONS: Oil of Vitriol, Hydrogen Sulfate, H_2SO_4, GE Material D4A2, CAS #007 664 939
DESCRIPTION: Material consists of about 93-98% H_2SO_4 with water and traces of impurities.
MANUFACTURER: Available from many suppliers.

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Hydrogen Sulfate (H_2SO_4) Water	93-98 Balance*	TLV 1 mg/m^3 for sulfuric acid†
*Material is obtained by the reaction of SO_3 and water. Can contain low impurity levels, such as 0.02% max of iron as Fe. Properties vary with H_2SO_4 content. †Current OSHA standard and ACGIH (1980) TLV. NIOSH has a 10-hr-TWA, 40 hr work week, of 1 mg/m^3.		Human, mist inhal. TCLo 3 mg/m^3, 24 wk (Toxic Mouth Effects) Rat, Oral LD_{50} 2140 mg/kg

SECTION III. PHYSICAL DATA

	93.19% H_2SO_4	98.33% H_2SO_4	100% H_2SO_4
Boiling point, 1 atm, deg C	ca 281	ca 338	ca 330 (dc)
Specific gravity (60/60 F)	1.8354	1.84	1.84
Deg. Baume	66	--	--
Volatiles, % at 340 C	ca 100	ca 100	ca 100
Melting point, deg C	ca -34	ca 3	10.4
Vapor press, mm Hg @ 100 F	<1	--	--

Water solubility: Completely miscible.
Appearance & Odor: Clear, colorless, hygroscopic oily liquid with no odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None - nonflammable	N/A	N/A	N/A	N/A

Even though sulfuric acid is nonflammable, it is hazardous when present in a fire area. Small fires may be smothered with suitable dry chemical. Cool exterior of storage tanks of H_2SO_4 with water to avoid rupture if exposed to fire. Do not add water or other liquid to the acid! The acid, especially when diluted with water, can react with metals to liberate flammable hydrogen gas.
Sulfuric acid mists and vapors from a fire area are corrosive. (See Sect. V.)
Firefighters to wear self-contained breathing equipment and full protective clothing.

SECTION V. REACTIVITY DATA

Sulfuric acid is stable under normal conditions of use and storage. It does not undergo hazardous polymerization.
It is a strong mineral acid reacting with bases and metals. The concentrated acid is a strong oxidizing agent and can cause ignition of combustible materials on contact. The concentrated aid is also a dehydrating agent, picking up moisture readily from the air or other materials.
Reacts exothermically with water. (Acid should always be added slowly to water. Water added to acid can cause boiling and uncontrolled splashing of the acid.)
Sulfur oxides can result from decomposition and from oxidizing reactions of sulfuric acid.

GENERAL ELECTRIC

NO. 9

SECTION VI. HEALTH HAZARD INFORMATION

TLV 1 mg/m^3

Concentrated sulfuric acid is a strong mineral acid, an oxidizing agent, and a dehydrating agent that is rapidly damaging to all human tissue with which it comes in contact. Ingestion may cause severe injury or death. Eye contact gives severe or permanent injury. Inhalation of mists can damage both the upper respiratory tract and the lungs.

FIRST AID:

Eye Contact: Immediately flush eyes with plenty of running water for at least 15 minutes (including under the eyelids). Speed in diluting and rinsing out acid with water is extremely important if permananet eye damage is to be avoided. Obtain medical help as soon as possible.

Skin Contact: Immediately flush affected areas with water, removing contaminated clothing under the safety shower. Continue washing with water and get medical attention.

Inhalation: Remove to fresh air. Restore breathing. Call a physician immediately.

Ingestion: Dilute acid immediately with large amounts of milk or water, then give milk of magnesia to neutralize. Do not induce vomiting; if it occurs spontaneously, continue to administer fluid. Obtain medical attention as soon as possible.

Maintain observation of patient for possible delayed onset of pulmonary edema.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Prevent contact with the acid. Provide adequate ventilation to control workplace concentrations. Minor leaks or spills can be diluted with plenty of water and neutralized with soda ash or lime. If water is not available, cover contaminated area with sand, ashes, or gravel and neutralize with soda ash or lime.

Major spills must be handled by a predetermined plan. Contact supplier for assistance in this planning and to meet local requirements and disposing of large amounts.

DISPOSAL: Follow Federal, State, and Local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general ventilation to meet current TLV requirements in the workplace. Where mists are up to 50 mg/m^3, a high efficiency particulate respirator with full facepiece is warranted; a Type C supplied air respirator with full facepiece operated in pressure demand mode is used to 100 mg/m^3. Avoid eye contact by use of chemical safety goggles or face shield where splashing may occur. Imperious protective clothing, such as rubber gloves, aprons, boots, and suits are recommended to avoid body contact with this acid.

Eyewash fountain and safety showers with deluge type heads should be readily available where this material is handled or stored.

Comprehensive preplacement and annual medical examinations with emphasis on dental erosion, cardiopulmonary system, and mucous membrane irritation and cough.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Sulfuric acid in carboys or drums should be stored in clean ventilated storage areas having acid resistant floors with good drainage. Keep out of direct sunlight, do not store above 32 C. Storage facilities to be separate from metallic powders, chromates, chlorates, nitrates, carbides, oxidizables, etc. Soda ash, sand or lime should be kept in general storage or work areas for emergency use. Protect containers against physical damage. Glass bottles need extra protection. Sulfuric acid is highly corrosive to most metals especially below 77% H_2SO_4. Avoid breathing mist or vapors. Avoid contact with skin or eyes. Do not ingest. Do not add water to concentrated acid. Do not smoke. Use nonsparking tools and vapor-proof type electrical fixtures.

DATA SOURCE(S) CODE: 2-12, 19, 20, 24, 26, 31, 37-39

APPROVALS: MIS CRD J.M. Nielsen

Industrial Hygiene and Safety JJW 10-14-80

MEDICAL REVIEW: Oct. 26, 1980

GENERAL ELECTRIC

Continental Products of Texas

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Telephone No. [illegible]

[illegible]

QUICK IDENTIFIER

MATERIAL SAFETY DATA SHEET

NFPA Designation 704

HAZARD RATING
4 - EXTREME
3 - HIGH
2 - MODERATE
1 - SLIGHT
0 - INSIGNIFICANT

FIRE: 0
HEALTH: 2
REACTIVITY: 0
SPECIFIC HAZARD:

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms) TOXSENE 35

Chemical Name NA

Formula NA

Chemical Family NA

Cas No. NA (Information according to Suppliers MSDS)

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
NA		NA

SECTION 3 - PHYSICIAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point $209^{o}F$

Specific Gravity ($H_2O = 1$) 1.01

Vapor Pressure (mm Hg) UN

Percent Volatile by Volume (%) 80%

Vapor Density (Air = 1) NA

Evaporation Rate (________ = 1) Water

Solubility in Water Complete

Reactivity in Water NA

Appearance and Odor Light straw to water white liquid

Flash Point none

Flammable Limits in Air % by Volume NA

Lower Upper

Extinguisher Media NA

Auto-Ignition Temperature NA

Special Fire Fighting Procedures NA

Unusual Fire and Explosion Hazards NA

SECTION 4 - PHYSICAL HAZARDS

Stability STABLE X UNSTABLE

CONDITIONS TO AVOID NA

INCOMPATABILITY (MATERIALS TO AVOID) NA

HAZARDOUS DECOMPOSITION PRODUCTS NA

Hazardous Polymerization

CONDITIONS TO AVOID NA

MAY OCCUR ______ WILL NOT OCCUR X

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value: NA

Signs and Symptoms of Exposure

1. Acute Overexposure: Corrosive. Causes eye damage and skin irritation

2. Chronic Overexposure: NA

Medical Conditions Generally Aggravated by Exposure: NA

Chemical Listed as Carcinogen or Potential Carcinogen: UN

National Toxicology Program: Yes [ ] No [X]

I.A.R.C. Monographs: Yes [ ] No. [X]

OSHA: Yes [ ] No. [ ]

OSHA Permissible Exposure Limit: NA

ACGIH Threshold Limit Value: NA

Other Exposure Limit Used: NA

Emergency and First Aid Procedures

1. Inhalation: UN - Remove to fresh air.

2. Eyes: Flush eyes with plenty of water for at least 15 minutes. Call physician.

3. Skin: Flush skin with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before reuse.

4. Ingestion: Fatal if swallowed.Avoid contamination of food.If swallowed drink promptly large quantities of milk, egg whites, gelatin solution or if these are not available drink large amounts of water. Avoid alcohol. Call physician immediately. Note to physician: Probable mucosal damage may contraindicate use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): NA

Ventilation: Yes

Local Exhaust: Non-recirculating

Mechanical (General):

Special:

Other:

Protective Gloves: Rubber gloves

Eye Protection: Safety goggles or face shield

Other Protective Clothing or Equipment: Face shield

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: Toxic to fish keep out of lakes, streams or ponds. Do not contaminate water by cleaning of equipment or disposal of wastes. Do not use,pour,spill or store nea[r] heat or open flame.

Steps to be Taken in Case Material is Released or Spilled: Hose down area of spill.Do not allow this product to come in contact with g[...] or plants.Do not allow in drinking water or swimming pool.

Waste Disposal Methods: Dispose of according to State and Federal Regulations

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Date Issued 11/22/85

Continental Products of Texas

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

Prepared by Eric Klim

Eric Klim

Continental Products of Texas

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Telephone No. (915) 337-4651

QUICK IDENTIFIER

NFPA Designation 704

FIRE	2
HEALTH	2
REACTIVITY	0
SPECIFIC HAZARD	

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms) TOXSENE 37

Chemical Name: Methylene bis(thiocyanate), MBT

Formula: NA

Chemical Family: NA

Cas No.: NA

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
NA		

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: NA

Specific Gravity ($H_2O = 1$): 1.04

Vapor Pressure (mm Hg): NA

Percent Volatile by Volume (%): NA

Vapor Density (Air = 1): NA

Evaporation Rate (________ = 1): NA

Solubility in Water: < 5%

Reactivity in Water: Soluble

Appearance and Odor: Creamy beige liquid, organic odor

Flash Point: 127°F TOC

Flammable Limits in Air % by Volume: NA

Lower Upper

Extinguisher Media: CO_2, Water, Dry Foam

Auto-Ignition Temperature: NA

Special Fire Fighting Procedures: Wear self contained breathing apparatus

Unusual Fire and Explosion Hazards: None

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [X] UNSTABLE [ ]

CONDITIONS TO AVOID: DOT Flammable material

INCOMPATABILITY (MATERIALS TO AVOID): Open flame. Strong oxidizing agents & temperatures > 212°F.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition produces carbon dioxide, sulfur dioxide, nitrous oxide and water.

Hazardous Polymerization

CONDITIONS TO AVOID: Avoid temperatures above 300°F.

MAY OCCUR ____ WILL NOT OCCUR X

Threshold Limit Value NA

Signs and Symptoms of Exposure

1. Acute Overexposure: Will cause eye damage if splashed on will cause skin irritation

2. Chronic Overexposure: NA

Medical Conditions Generally Aggravated by Exposure: NA

Chemical Listed as Carcinogen or Potential Carcinogen: UN

National Toxicology Program: Yes [ ] No [X]

I.A.R.C. Monographs: Yes [ ] No. [X]

OSHA: Yes [ ] No. [ ]

OSHA Permissible Exposure Limit: NA

ACGIH Threshold Limit Value: NA

Other Exposure Limit Used: NA

Emergency and First Aid Procedures

1. Inhalation: Remove to fresh air. Exact effects unknown. Get medical attention immediately.

2. Eyes: Immediately flush with water and get medical attention at once. Will cause eye damage.

3. Skin: May be harmful or fatal if absorbed thru skin. Irritating to skin, remove contamina clothing and wash skin with soap and water at once. If irritation persists get medical help. Wash contaminated clothing before reuse.

4. Ingestion: Harmful or fatal if swallowed. Get prompt medical help. If person is conscious, v water or milk to dilute. Induce vomiting.

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): None

Ventilation: Yes | Local Exhaust: Yes | Mechanical (General): Yes | Special: NA | Other: NA

Protective Gloves: Rubber gloves

Eye Protection: Chemical safety goggles which are dust and splash proof or face shield

Other Protective Clothing or Equipment: Impervious clothing, rubber boots. Safety shower/eye wash located in immediate area.

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: Protect from freezing & temperatures in excess of 140°F. Keep container closed when not in use. Do Not store near heat or open flame.

Steps to be Taken in Case Material is Released or Spilled: Collect liquid with absorbent material. Do Not flush to open sewer or water sourses.

Waste Disposal Methods: Dispose of according to State and Federal Regulations.

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Date Issued: 11/22/85

Continental Products of Texas

Abbreviations Used:
NA Not Applicable
ND Not Determined
UN Unknown

Prepared by: Eric Klin

Continental Products of Texas

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QUICK IDENTIFIER

NFPA Designation 704

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT

FIRE	0
HEALTH	0
REACTIVITY	0
SPECIFIC HAZARD	

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name (used on label) (Trade Name & Synonyms): TOXSENE-39

Chemical Name: NA

Formula: NA

Chemical Family: NA

Cas No.: NA

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
NA		

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: above 212°F.

Specific Gravity (H_2O = 1): 1.15

Vapor Pressure (mm Hg): Same as water

Percent Volatile by Volume (%): 46%

Vapor Density (Air = 1): same as H_2O

Evaporation Rate (________ = 1): 1

Solubility in Water: miscible

Reactivity in Water:

Appearance and Odor: Clear brown solution with slight odor

Flash Point: Above 212°F

Flammable Limits in Air % by Volume: Not Flammable
Lower Upper

Extinguisher Media: Water fog, carbon dioxide, dry chemical apparatus

Auto-Ignition Temperature:

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [X] UNSTABLE [ ]

CONDITIONS TO AVOID: None

INCOMPATABILITY (MATERIALS TO AVOID): None

HAZARDOUS DECOMPOSITION PRODUCTS: None

Hazardous Polymerization

CONDITIONS TO AVOID: None

MAY OCCUR ______ WILL NOT OCCUR __X__

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value NA

Signs and Symptoms of Exposure

1. Acute Overexposure Harmful if swallowed. Not normally irritating to skin. Mildly irritating to eye

2. Chronic Overexposure NA

Medical Conditions Generally Aggravated by Exposure NA

Chemical Listed as Carcinogen or Potential Carcinogen UN

National Toxicology Program Yes [ ] No [X]

I.A.R.C. Monographs Yes [ ] No. [X]

OSHA Yes [ ] No [X]

OSHA Permissible Exposure Limit NA

ACGIH Threshold Limit Value NA

Other Exposure Limit Used NA

Emergency and First Aid Procedures

1. Inhalation Remove to fresh air.

2. Eyes Wash with plenty of clear, cool water. May be mildly irritating.

3. Skin Wash with plenty of clear, cool water. Not normally irritating.

4. Ingestion Induce vomiting and obtain medical attention.

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type) No special protection needed.

Ventilation yes

Local Exhaust normal

Mechanical (General)

Special

Other

Protective Gloves rubber gloves

Eye Protection Safety goggles

Other Protective Clothing or Equipment none

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage Keep containers closed when not in use.

Steps to be Taken in Case Material is Released or Spilled Absorb in sawdust or sand and bury in an approved location. Do not reuse empty drum.

Waste Disposal Methods Dispose of according to State and Federal Regulations

Date Issued 11/22/85

Continental Products of Texas

Prepared by Eric Klim

Eric Klim

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

Continental Products of Texas

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Telephone No. (915) 337-4681

QUICK IDENTIFIER

NFPA Designation 704

Fire	0
Health	1
Reactivity	0
Specific Hazard	

HAZARD RATING
- 4 = EXTREME
- 3 = HIGH
- 2 = MODERATE
- 1 = SLIGHT
- 0 = INSIGNIFICANT

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms) HYDROCHEM D-100

Chemical Name: Sodium Acrylamide

Formula: NA

Chemical Family: Acrylic Polymer

Cas No.

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
Not determined to be hazardous		

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: 215°F

Specific Gravity (H_2O = 1): 1.1

Vapor Pressure (mm Hg): 260 (at 275°F)

Percent Volatile by Volume (%): 75%

Vapor Density (Air = 1): 1

Evaporation Rate (______ = 1): 1

Solubility in Water: 100%

Reactivity in Water:

Appearance and Odor: Light amber, odorless

Flash Point: none COC

Flammable Limits in Air % by Volume: Lower Upper

Extinguisher Media: Water, Dry chemical, CO_2

Auto-Ignition Temperature:

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE X UNSTABLE ☐ CONDITIONS TO AVOID None

INCOMPATABILITY (MATERIALS TO AVOID)

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION: CONDITIONS TO AVOID None

MAY OCCUR ______ WILL NOT OCCUR X

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value: NA

Signs and Symptoms of Exposure

1. Acute Overexposure: May cause irritation
2. Chronic Overexposure: NA

Medical Conditions Generally Aggravated by Exposure: NA

Chemical Listed as Carcinogen or Potential Carcinogen: UN

National Toxicology Program: Yes [ ] No [X]

I.A.R.C. Monographs: Yes [ ] No. [X]

OSHA: Yes [ ] No. [X]

OSHA Permissible Exposure Limit: NA

ACGIH Threshold Limit Value: NA

Other Exposure Limit Used: NA

Emergency and First Aid Procedures

1. Inhalation: Remove victim to fresh air
2. Eyes: Flush eyes with plenty of water
3. Skin: Wash area with water
4. Ingestion: Induce vomiting, call a physician

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): NA

Ventilation: Local Exhaust: yes | Mechanical (General): yes | Special: | Other:

Protective Gloves: Rubber

Eye Protection: Safety glasses

Other Protective Clothing or Equipment: None

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: None

Steps to be Taken in Case Material is Released or Spilled: Wash area with water

Waste Disposal Methods: Dispose of according to State and Federal Regulations

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Date Issued: 11/20/85

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Prepared by: Eric Klim

Eric Klim

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

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NFPA Designation 704

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT

Fire	Health	Reactivity	Specific Hazard
1	1	0	

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms) CORLESS 202A

Chemical Name: Amino methyl propylamine

Formula: $NH_2C_4H_9$

Chemical Family: Amine

Cas No.: Blend

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
NA		

SECTION 3 - PHYSICIAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: 220° F.

Specific Gravity (H_2O = 1): 1.05

Vapor Pressure (mm Hg): 10

Percent Volatile by Volume (%): 25 %

Vapor Density (Air = 1): 0.8

Evaporation Rate (________ = 1)

Solubility in Water: 100%

Reactivity in Water: NA

Appearance and Odor: Clear to light amber, ammonia odor

Flash Point: 155°F. COC

Flammable Limits in Air % by Volume: NA
Lower Upper

Extinguisher Media: Water, CO_2, Foam

Auto-Ignition Temperature: NA

Special Fire Fighting Procedures: NA

Unusual Fire and Explosion Hazards: Keep away from strong oxidizing agents such as chromate, nitrate, chloride

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [x] UNSTABLE [ ]

CONDITIONS TO AVOID: Contact with strong oxidizing agents

INCOMPATABILITY (MATERIALS TO AVOID): NA

HAZARDOUS DECOMPOSITION PRODUCTS: NA

Hazardous Polymerization — CONDITIONS TO AVOID: NA

MAY OCCUR ____ WILL NOT OCCUR x

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value NA

Signs and Symptoms of Exposure

1. Acute Overexposure

2. Chronic Overexposure

Medical Conditions Generally Aggravated by Exposure NA

Chemical Listed as Carcinogen or Potential Carcinogen UN

National Toxicology Program Yes [ ] No [X]

I.A.R.C. Monographs Yes [ ] No. [X]

OSHA Yes [ ] No [X]

OSHA Permissible Exposure Limit

ACGIH Threshold Limit Value NA

Other Exposure Limit Used

Emergency and First Aid Procedures

1. Inhalation Remove to fresh air

2. Eyes Flush with water for 15 minutes

3. Skin Wash off with water, remove contaminated clothing

4. Ingestion Induce vomiting

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type) NA

Ventilation — Local Exhaust yes — Mechanical (General) NA — Special NA — Other NA

Protective Gloves Rubberized gloves

Eye Protection Safety Glasses

Other Protective Clothing or Equipment NA

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage Keep away from strong oxidizing agents

Steps to be Taken in Case Material is Released or Spilled Wash area with water

Waste Disposal Methods Dispose of according to State and Federal regulations

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Date Issued: 11/15/85

Continental Products of Texas

Abbreviations Used

N.A. Not Applicable

Continental Products of Texas

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Page 1 of Two

CORLESS 130
QUICK IDENTIFIER

MATERIAL SAFETY DATA SHEET

NFPA Designation 704

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT

FIRE: 1
HEALTH: 2
REACTIVI: 0
SPECIFIC HAZARD:

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms): CORLESS 130

Chemical Name: Amino Ethyl Piperazine

Formula: NH $C_2H_4C_6H_8$

Chemical Family: Piperazine Amine

as No.: NA

ECTION 2 - HAZARDOUS INGREDIENTS

azardous Component(s)	%	Threshold Limit Value (units)
Amino Ethyl piperazine	30	Oral - Rat 2140 (RTECT) Dermal - Rabbit 880 (RTECT)

ECTION 3 - PHYSICIAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

oiling oint: 230° F.

Specific Gravity ($H_2O = 1$): 0.97

Vapor Pressure (mm Hg): 760

rcent Volatile by Volume (%): (@ 230°F.) 70 %

Vapor Density (Air = 1): NA

Evaporation Rate (________ = 1): 1

lubility Water: 100%

Reactivity in Water:

Appearance and Odor: Dark amber, ammonia odor

sh int: 420°F COC

Flammable Limits in Air % by Volume: NA
Lower Upper

Extinguisher Media: Water, CO_2, Dry chemical

Auto-Ignition Temperature: NA

Special Fire hting Procedures: None

usual Fire and Explosion Hazards: None

CTION 4 - PHYSICAL HAZARDS

tab E [X] UNSTABLE [ ]

CONDITIONS TO AVOID: NA

I OMPATABILITY (MATERIALS TO AVOID): NA

H ZARDOUS DECOMPOSITION PRODUCTS: NA

zar us lym zation

CONDITIONS TO AVOID: NA

OCCUR [ ] WILL NOT OCCUR [X]

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y.

MATERIALS · INFORMATION · SERVICES

NO. 3

SODIUM HYDROXIDE

Revision A

Date September 1977

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: SODIUM HYDROXIDE
OTHER DESIGNATIONS: Caustic Soda, Soda Lye, NaOH, GE Material D4B4, ASTM D456,
DESCRIPTION: This material is an anhydrous solid (flake, pellet, etc.) CAS# 001 310 732
MANUFACTURER: Available from many suppliers.

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Typical content:		Ceiling Limit
Sodium Hydroxide (NaOH)	96	2 mg/m^3
Impurities:		
Sodium Carbonate (Na_2CO_3)	0.5-2.5	
Sodium Chloride (NaCl)	0.01-2.1	
Sodium Sulfate (Na_2SO_4)	0.02-0.1	
Potassium, Calcium and Magnesium	0.1	
Silicon Dioxide (SiO_2)	0.03	
Other metals (total)	0.01	

SECTION III. PHYSICAL DATA

Boiling point, 1 atm, deg C --- 1388
Specific gravity (20/4 C) ----- 2.13
Volatiles --------------------- non-volatile at room temperature
Melting point, deg C ---------- 318

Vapor pressure, mm Hg @ 1000 C ---- 42
@ 1200 C ---- 232
Viscosity at 350 C, cps ----------- 4.0
Water solubility, %, @ 0 C ------ 29.6
@ 100 C ------ 77.5

Appearance & odor: White or off-white, hygroscopic solid; no odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None - not combustible	N/A	N/A	N/A	N/A

Although it is not combustible, it can be hazardous if present in a fire area. The following should be known for fire fighting: (1) It can melt and flow when heated (m.p. 318 C). (2) Hot or molten material can react violently with water (splattering). (3) Can react with certain metals, such as aluminum, to generate flammable hydrogen gas. (See also Reactivity Data, Section V)

SECTION V. REACTIVITY DATA

It is a stable material under normal conditions of storage. No self-polymerization. No hazardous decomposition products. Slowly it can pick up moisture from the air and react with carbon dioxide from the air to form sodium carbonate.

Sodium hydroxide can react violently with strong acids and with many organic chemicals, expecially with nitrocarbons and chlorocarbons. (Will react with trichloroethylene to form spontaneously flammable dichloroacetylene.) It generates much heat when it dissolves in water.

Avoid contact with leather and wool and with aluminum, tin, zinc, and alloys which contain these metals.

SECTION VI. HEALTH HAZARD INFORMATION

TLV (Ceiling Value) 2 mg/m^3

Sodium hydroxide is a strong alkali and is dangerous when improperly handled. It can be destructive to all human tissue it contacts, producing severe burns. Eye contact can produce severe or permanent injury. Dust or mist inhalation can injure the entire respiratory tract.

FIRST AID

Eye contact - Wash eyes immediately with plenty of running water for no less than 15 minutes, including under the eyelids and all surfaces. Speed in rinsing out the eyes with water after contact is extremely important if permanent injury is to be avoided. Contact physician as soon as possible.

Ingestion - Immediately dilute chemical by drinking large amounts of water or milk, then neutralize with dilute vinegar or fruit juice. Vomiting may occur spontaneously, but do not induce it. Contact a physician promptly.

Inhalation - Remove from exposure to mist or dust and get prompt medical help.

Skin contact - Wash contact area promptly with large quantities of water. (Dilute acetic acid, vinegar, can be used to neutralize.) Remove contaminated clothing under the shower. Prolong washing in serious cases until medical help arrives - even for an hour or longer. Physician should see all cases other than minor exposures to small areas of skin.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

When solid sodium hydroxide is spilled in a dry condition, it can be promptly shoveled up for recovery or disposal. (CAUTION! Avoid dusting. Avoid contact with the skin.) Control the disposal of the waste solid. (Delay in clean up may allow absorption of moisture from the atmosphere and may increase the difficulties of clean up.) Flush contaminated surfaces with water and neutralize with dilute acid, preferably acetic acid, to remove final traces. (Sodium bicarbonate may also be used to partially neutralize.) Finally, rinse with water.

Disposal of waste is greatly dependent on local conditions and requirements. Pre-emergency plans should be made to meet legal and technical requirements. Waste caustic should never be deliberately discharged directly into sewers or surface waters. (First, convert to neutral salts and dilute well with water.)

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide adequate ventilation to meet TLV requirements, especially where dusting or misting conditions can exist. Use filter-type respirator for mist and dust protection where needed.

Use chemical safety goggles! A plastic face shield can also be used.

Use rubber gloves, rubber apron or protective clothing, rubber boots where needed to prevent contact with sodium hydroxide, especially when solutions are prepared.

Eye wash fountains and safety showers must be immediately available!

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Workers should not be permitted to handle this material without proper training or to work with it without protective equipment.

Store in well-sealed containers. Avoid handling conditions that may lead to spills and leaks, or to formation of mist or dust.

Wherever this material is stored, unloaded, handled or used abundant water (preferably running water) should be available for emergency use.

Drains for storage or use areas for this material should have retention basins for pH adjustment and dilution of spills and flushings before discharge.

This material is classified as a CORROSIVE by the Department of Transportation.

The pellet form is probably the safest solid form for handling and dispensing.

APPROVALS: MIS, CRD J. M. V[illegible]

Industrial Hygiene and Safety [illegible]

MEDICAL REVIEW:

Continental Products of Texas

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Telephone No. (915) 337-4681

QUICK IDENTIFIER

NFPA Designation 704

HAZARD RATING
4 - EXTREME
3 - HIGH
2 - MODERATE
1 - SLIGHT
0 - INSIGNIFICANT

FIRE: 0
HEALTH: 1
REACTIVITY: 0
SPECIFIC HAZARD:

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms) DeOx-21

Chemical Name: Sodium Sulfite — Formula: Na_2SO_3

Chemical Family: Sulfur

Cas No.

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
Sulfurous Acid		1 ppm 0.1 mg/m^3
Sodium Sulfite	99%	
Cobalt Sulfate	1%	

SECTION 3 - PHYSICIAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: NA — Specific Gravity (H_2O = 1): 2.63 — Vapor Pressure (mm Hg): NA

Percent Volatile by Volume (%): NA — Vapor Density (Air = 1): NA — Evaporation Rate (______ = 1): NA

Solubility in Water: 100% — Reactivity in Water: NA

Appearance and Odor: White powder - odorless

Flash Point: None COC — Flammable Limits in Air % by Volume: NA (Lower / Upper) — Extinguisher Media: NA — Auto-Ignition Temperature: NA

Special Fire Fighting Procedures: NA

Unusual Fire and Explosion Hazards: Will emit sulfur dioxide fumes when heated dry above 500°F.

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [X] UNSTABLE [ ] — CONDITIONS TO AVOID: NA

INCOMPATABILITY (MATERIALS TO AVOID): NA

HAZARDOUS DECOMPOSITION PRODUCTS: NA

Hazardous Polymerization — CONDITIONS TO AVOID: NA

MAY OCCUR ____ WILL NOT OCCUR X

Threshold Limit Value: 0.1 mg/m^3 (NIOSH)

Signs and Symptoms of Exposure

1. Acute Overexposure: May irritate eyes and skin
2. Chronic Overexposure: NA

Medical Conditions Generally Aggravated by Exposure: UN

Chemical Listed as Carcinogen or Potential Carcinogen: UN

National Toxicology Program: Yes [ ] No [X]

I.A.R.C. Monographs: Yes [ ] No. [X]

OSHA: Yes [ ] No. [ ]

OSHA Permissible Exposure Limit: 1 ppm

ACGIH Threshold Limit Value: 0.1 mg/m^3

Other Exposure Limit Used: NA

Emergency and First Aid Procedures

1. Inhalation: Can irritate nose, throat and lungs. Get to fresh air if overexposed
2. Eyes: Flush with water
3. Skin: Wash off
4. Ingestion: Do not induce vomiting, drink plenty of liquids

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): NA

Ventilation — Local Exhaust: Yes — Mechanical (General): Yes — Special — Other

Protective Gloves: Rubberized Gloves

Eye Protection: Safety Glasses

Other Protective Clothing or Equipment: None

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: Avoid excess heat - over 250°F

Steps to be Taken in Case Material is Released or Spilled: Sweep or wash with water

Waste Disposal Methods: Dispose of according to State and Federal Regulations

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Date Issued: 11/16/85

Continental Products of Texas

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

Prepared by: Eric Klir

Eric Klir

HYMOL 82

QUICK IDENTIFIER

Continental Products of Texas

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Telephone No. (915) 337-4651

NFPA Designation 704

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT

FIRE: 0
HEALTH: 1
REACTIVITY: 0
SPECIFIC HAZARD:

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms): HYMOL 82

Chemical Name: Sodium Tripolyphosphate

Formula: $(Na)x(PO_3)x$

Chemical Family: Inorganic Phosphate

Cas No.

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
Ingredients determined non-hazardous, per 29 CFR 1910.1200		

[illegible]

Point	220°F	Specific Gravity (H_2O = 1)	1.2	Vapor Pressure (mm Hg)	760
Percent Volatile by Volume (%)	NA	Vapor Density (Air = 1)	1	Evaporation Rate (________ = 1)	1
Solubility in Water	100%	Reactivity in Water			

Appearance and Odor: Dark amber liquid, odorless

Flash Point	None COC	Flammable Limits in Air % by Volume	Lower / Upper	Extinguisher Media	Water, CO_2, Dry chemical
				Auto-Ignition Temperature	

Special Fire Fighting Procedures: NA

Unusual Fire and Explosion Hazards: NA

SECTION 4 - PHYSICAL HAZARDS

Stability STABLE [X] UNSTABLE [ ] CONDITIONS TO AVOID: None

INCOMPATABILITY (MATERIALS TO AVOID): NA

HAZARDOUS DECOMPOSITION PRODUCTS: NA

Hazardous Polymerization — CONDITIONS TO AVOID: None

MAY OCCUR ____ WILL NOT OCCUR ____

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value NA

Signs and Symptoms of Exposure

1. Acute Overexposure May irritate eyes, skin slightly

2. Chronic Overexposure NA

Medical Conditions Generally Aggravated by Exposure NA

Chemical Listed as Carcinogen or Potential Carcinogen NA

National Toxicology Program Yes [ ] No [X]

I.A.R.C. Monographs Yes [ ] No. [X]

OSHA Yes [ ] No. [X]

OSHA Permissible Exposure Limit NA

ACGIH Threshold Limit Value NA

Other Exposure Limit Used NA

Emergency and First Aid Procedures

1. Inhalation Slight irritant, remove from exposure

2. Eyes May burn, flush with water for 15 minutes

3. Skin Wash with water

4. Ingestion Drink plenty of liquids

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type)

Ventilation Local Exhaust Yes Mechanical (General) Yes Special Other

Protective Gloves Rubber gloves

Eye Protection Safety Glasses

Other Protective Clothing or Equipment NA

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage NA

Steps to be Taken in Case Material is Released or Spilled Wash area with water

Waste Disposal Methods Dispose of according to State and Federal Regulations

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Date Issued: 11/16/85

Continental Products of Texas

Prepared by Eric Klim

Eric Klim

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

Continental Products of Texas

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Telephone No. (915) 337-4681

CHROMINE T
QUICK IDENTIFIER

NFPA Designation 704

HAZARD RATING	
4 - EXTREME	FIRE: 0
3 - HIGH	HEALTH: 3
2 - MODERATE	REACT.: 0
1 - SLIGHT	SPECIFIC HAZARD: CS
0 - INSIGNIFICANT	

CS-Carcinogen Suspect

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms) CHROMINE T

Chemical Name: Sodium Bichromate-Chromic Acid

Formula: $Na_2Cr_2O_7 \cdot H_6CrO_4$+Water

Chemical Family: Organic Chromates

Cas No. Blend

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
Sodium Bichromate	Confidential	0.05 mg/m^3, ACGIH
Zinc Chloride	Confidential	1 mg/m^3, ACGIH

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: 212° F

Specific Gravity (H_2O = 1): 1.4

Vapor Pressure (mm Hg) (212°F): 760

Percent Volatile by Volume (%): 60%

Vapor Density (Air = 1): NA

Evaporation Rate (________ = 1): 1

Solubility in Water: 100%

Reactivity in Water: NA

Appearance and Odor: Dark amber - odorless

Flash Point: None COC

Flammable Limits in Air % by Volume: NA

Lower Upper

Extinguisher Media: CO_2, water, Dry Chemical.

Auto-Ignition Temperature: NA

Special Fire Fighting Procedures: May release toxic fumes if involved in fire

Unusual Fire and Explosion Hazards: NA

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [X] UNSTABLE [ ]

CONDITIONS TO AVOID: NA

INCOMPATABILITY (MATERIALS TO AVOID): Amines or strong reducing agents

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride, zinc oxide

Hazardous Polymerization

CONDITIONS TO AVOID: NA

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value: 0.05 mg/m^3 based on Cr^{+6}, ACGIH

Signs and Symptoms of Exposure

1. Acute Overexposure: Skin ulcers, dermatitis
2. Chronic Overexposure: Potential carcinogen

Medical Conditions Generally Aggravated by Exposure: UN

Chemical Listed as Carcinogen or Potential Carcinogen: Certain Chromium compounds have demonstrated to be carcinogenic on the basis of epedemialogical investigations

National Toxicology Program: Yes [X] No [ ]

I.A.R.C. Monographs: Yes [X] No. [ ]

OSHA: Yes [X] No. [ ]

OSHA Permissible Exposure Limit:

ACGIH Threshold Limit Value: 0.05 mg/m^3 in water soluble form Cr^{6+}

Other Exposure Limit Used: NA

Emergency and First Aid Procedures

1. Inhalation: Avoid breathing dust, remove to fresh air
2. Eyes: Flush with water for 15 minutes
3. Skin: Wash off with water, remove contaminated clothing
4. Ingestion: Do Not induce vomiting, give plenty of liquids, water or milk, call physician. Never give anything by mouth to an unconscious person

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): NA

Ventilation — Local Exhaust: Yes; Mechanical (General): Yes; Special: NA; Other: NA

Protective Gloves: Rubber gloves

Eye Protection: Safety glasses

Other Protective Clothing or Equipment: NA

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: Prevent prolonged skin contact

Steps to be Taken in Case Material is Released or Spilled: Wash with water into a contained area (sump or holding tank)

Waste Disposal Methods: Dispose of according to State and Federal Regulations
DOT Class I hazardous waste

Date Issued: 11/15/85

Continental Products of Texas

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

Prepared by: Eric Klin
Eric Klin

Continental Products of Texas

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Telephone No. (915) 337-4681

QUEST 40
QUICK IDENTIFIER

NFPA Designation 704

HAZARD RATING	
4 = EXTREME	
3 = HIGH	
2 = MODERATE	
1 = SLIGHT	
0 = INSIGNIFICANT	

FIRE: 0
HEALTH: 1
REACTIVITY: 0
SPECIFIC HAZARD:

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name: (used on label) (Trade Name & Synonyms) QUEST 40

Chemical Name: Nitrilotriacetic Acid   Formula: NA

Chemical Family: Organic chelating agent

Cas No. 5064-31-3

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)
Nitrilotriacetic Acid		≈ 10 mg/m^3
Non-Hazardous		

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point: NA
Specific Gravity (H_2O = 1): NA
Vapor Pressure (mm Hg): NA

Percent Volatile by Volume (%): 0.5 %
Vapor Density (Air = 1): NA
Evaporation Rate (________ = 1): NA

Solubility in Water: 50%
Reactivity in Water: Soluble

Appearance and Odor: Clear liquid, no odor

Flash Point: NA
Flammable Limits in Air % by Volume: UN (Lower / Upper)
Extinguisher Media: Water, Dry Chemical, CO_2, Foam
Auto-Ignition Temperature: UN

Special Fire Fighting Procedures: NA

Unusual Fire and Explosion Hazards: NA Non-flammable

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [X] UNSTABLE [ ]
CONDITIONS TO AVOID: Do not get into eyes

INCOMPATABILITY (MATERIALS TO AVOID): No specific incompatability

HAZARDOUS DECOMPOSITION PRODUCTS: NA

Hazardous Polymerization
CONDITIONS TO AVOID: NA

MAY OCCUR ____ WILL NOT OCCUR X

Threshold Limit Value $\approx$ 10 mg/m^3 Respirable 5 mg/m^3 (ACGIH) TLV/VWA

Signs and Symptoms of Exposure

1. Acute Overexposure: May cause irritation to eyes and skin and throat

2. Chronic Overexposure: NA

Medical Conditions Generally Aggravated by Exposure: UN

Chemical Listed as Carcinogen or Potential Carcinogen: UN

National Toxicology Program: Yes [ ] No [X]

I.A.R.C. Monographs: Yes [ ] No. [X]

OSHA: Yes [ ] No. [X]

OSHA Permissible Exposure Limit:

ACGIH Threshold Limit Value: $\approx$ 10 mg/m^3

Other Exposure Limit Used: NA

Emergency and First Aid Procedures

1. Inhalation: Remove to fresh air

2. Eyes: Flush eyes with plenty of water for at least 15 minutes

3. Skin: Wash skin with plenty of water for at least 15 minutes

4. Ingestion: Induce vomiting, consult a physician

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): NA

Ventilation: yes | Local Exhaust: yes | Mechanical (General): yes | Special: NA | Other: NA

Protective Gloves: Rubber

Eye Protection: Safety Goggles

Other Protective Clothing or Equipment: NA

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: NA

Steps to be Taken in Case Material is Released or Spilled: Wash down drain

Waste Disposal Methods: Dispose of according to State and Federal Regulations

Date Issued: 11/22/85

Continental Products of Texas

Prepared by: Eric Klim

Eric Klim

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

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Telephone No. (915) 337-4681

ANTIFOAM 4...
QUICK IDENTIFIER

NFPA Designation 704

HAZARD RATING
4 - EXTREME
3 - HIGH
2 - MODERATE
1 - SLIGHT
0 - INSIGNIFICANT

FIRE	0
HEALTH	0
REACTIVITY	0
SPECIFIC HAZARD	

MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTITY

Common Name (used on label) (Trade Name & Synonyms): ANTIFOAM 47

Chemical Name: Methyl Silane

Formula: $(CH_3)xSi+SiO_2$

Chemical Family: Organic Silicone

Cas No.: NA

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Component(s)	%	Threshold Limit Value (units)

Not classified as hazardous Per 29 CFR 1910.1200

SECTION 3 - PHYSICIAL & CHEMICAL CHARACTERISTICS (Fire & Explosive Data)

Boiling Point	$212^{\circ}F$	Specific Gravity (H_2O = 1)	1.1	Vapor Pressure (mm Hg)	NA
Percent Volatile by Volume (%)	90 %	Vapor Density (Air = 1)	NA	Evaporation Rate (____ = 1)	1
Solubility in Water	90%	Reactivity in Water	Soluble		

Appearance and Odor: White emulsion, no odor

Flash Point	None COC	Flammable Limits in Air % by Volume (Lower / Upper)	NA	Extinguisher Media	NA	Auto-Ignition Temperature	NA

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

SECTION 4 - PHYSICAL HAZARDS

Stability: STABLE [X] UNSTABLE [ ] CONDITIONS TO AVOID

INCOMPATABILITY (MATERIALS TO AVOID): NA

HAZARDOUS DECOMPOSITION PRODUCTS: NA

Hazardous Polymerization: CONDITIONS TO AVOID: Prevent freezing

MAY OCCUR ____ WILL NOT OCCUR X

Threshold Limit Value: NA

Signs and Symptoms of Exposure

1. Acute Overexposure: NA

2. Chronic Overexposure: May cause slight transitory eye irritation.

Medical Conditions Generally Aggravated by Exposure:

Chemical Listed as Carcinogen or Potential Carcinogen: UN

National Toxicology Program: Yes [ ] No [X]

I.A.R.C. Monographs: Yes [ ] No. [X]

OSHA: Yes [ ] No. [X]

OSHA Permissible Exposure Limit: NA

ACGIH Threshold Limit Value: NA

Other Exposure Limit Used: NA

Emergency and First Aid Procedures

1. Inhalation: NA

2. Eyes: Flush with water

3. Skin: Flush with water

4. Ingestion: Induce vomiting, drink plenty of liquids

SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): None

Ventilation

Local Exhaust: None

Mechanical (General): None

Special:

Other:

Protective Gloves: None

Eye Protection: None

Other Protective Clothing or Equipment: None

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: Prevent freezing

Steps to be Taken in Case Material is Released or Spilled: None

Waste Disposal Methods: According to State and Federal Regulations

Date Issued: 11-7-85.

Continental Products of Texas

Prepared by: Eric Klin

Eric Klin

Abbreviations Used
NA Not Applicable
ND Not Determined
UN Unknown

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y. 12305

Phone: (518) 385-4085 DIAL COMM 8*235-4085

MATERIALS INFORMATION SERVICES

No. 418

MONOETHANOLAMINE

Date June 1979

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: MONOETHANOLAMINE
OTHER DESIGNATIONS: Ethanolamine, 2-Aminoethanol, β-Aminoethyl Alcohol, Ethylolamine, Colamine, Glycinol, MEA, $NH_2CH_2CH_2OH$, CAS # 000 141 435
MANUFACTURER: Available from several sources, including:
Union Carbide Corporation
270 Park Avenue
New York, NY 10017 Telephone: (212)551-3763

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Monoethanolamine *Current OSHA permissible exposure level. ACGIH (1978) 8-hr TWA is 3 ppm or 8 mg/m^3, with STEL of 6 ppm or 15 mg/m^3.	99	8-hr TWA 3 ppm* or 6 mg/m^3 (sic) Rat, oral LD_{50} 2.1 g/kg Rabbit, skin LD_{50} 1 g/kg

SECTION III. PHYSICAL DATA

Boiling point at 1 atm, deg C	ca 170	Specific gravity 20/4 C	1.02
Vapor pressure at 20 C, mm Hg	0.4	Melting point, deg C	10.3
Vapor density (Air=1)	2.1	Molecular weight	61.1
Water solubility	Miscible	Viscosity at 25 C, cps	19
pH at 20 C, 1% solution in water	11.5		

Appearance & Odor: A colorless, hygroscopic liquid with a mild ammoniacal odor. The odor threshold (50% of test panel) has been reported as 3-4 ppm.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
185 F (CC)				

Extinguishing Media: Water spray, carbon dioxide, "alcohol" foam, or dry chemical. Use water spray to cool fire-exposed containers, to dilute liquid to less flammable solutions, and to flush non-ignited material away from hazardous exposures.

This combustible liquid is a moderate fire hazard when exposed to heat or flames.

Firefighters should wear self-contained breathing apparatus and protective clothing when fighting fires involving this material.

SECTION V. REACTIVITY DATA

This material is stable in closed containers at room temperature. It does not polymerize.

It is a combustible material and is incompatible with oxidizing agents and sources of heat or ignition. Products of oxidation can include nitrogen oxides and CO.

It is a primary amine which generates heat upon reaction with acidic materials, such as sulfuric, hydrochloric, and acetic acids. It reacts with CO_2 from the air.

It is corrosive to copper, copper alloys, galvanized iron and, for heat flux conditions above 100 C metal temperature or for aqueous solutions (except below 15% concentration at/below room temperature), aluminum.

GENERAL ELECTRIC

NO. 418

SECTION VI. HEALTH HAZARD INFORMATION	TLV 3 ppm (See Sect. II)

Contact with liquid can seriously injure the eyes and will moderately irritate the skin. Prolonged or repeated contact with the skin can be highly irritating, but the material is not believed to be a sensitizer. It can penetrate the skin as shown in tests with rabbits. Contacts with a 10% solution in water can be damaging.

Mist or vapors from heated liquid are irritating to the eyes and upper respiratory tract and may be harmful. Ingestion can damage the mouth, throat, and digestive tract and produce nausea and chemical irritant effects. FIRST AID:

Eye Contact: Flush eyes thoroughly with plenty of running water for at least 15 minutes including under the eyelids; then get immediate medical help (see ophthalmologist if possible).

Skin Contact: Remove contaminated clothing. Wash exposed areas of skin well with soapy water. If large areas of skin were contacted or if irritation persists, get medical help.

Inhalation: Remove to fresh air. Get medical help.

Ingestion: Give fruit juice, diluted vinegar, milk or water to drink. Induce vomiting. Get medical help.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel when large spills occur. Those involved in clean up need protection against vapor or mist inhalation and contact with liquid. Provide ventilation Eliminate sources of ignition. Contain and pick up spill as a liquid or with an inert absorbent solid. Neutralize trace residues or small spills with sodium bisulfate and flush to the drain with lots of water to dilute.

DISPOSAL: Scrap or a solution in a flammable solvent can be burned in an approved incinerator with afterburner and scrubber (to reduce nitrogen oxide emissions). Follow Federal, State and local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Use additional local exhaust ventilation or a hood where material is heated or misted. Approved chemical cartridge or canister respirators with fullface protection should be available for emergency or nonroutine use above the TLV.

Protect workers from contact with liquid by use of impervious gloves, safety goggles, and clean body-covering clothing; where splashing is possible, face shield, apron, etc may be required.

A safety shower and an eyewash station are needed where this material is used or handled.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a well ventilated area, preferably at 65-95 F. Protect containers from physical damage. Store away from sources of heat and ignition, oxidizing agents, acidic materials.

Monoethanolamine is generally stored and handled in plain steel equipment. Aluminum can be used, but do not use aluminum in contact with aqueous solutions of monoethanolamine without careful evaluation.

Prevent eye and skin contact with this material. Do not inhale vapors. Follow good hygienic practice; chronic effects not fully established.

DATA SOURCE(S) CODE: 1-12, 18, 20, 23

APPROVALS: MIS, CRD J. M. Nielsen

Industrial Hygiene and Safety [signature]

MEDICAL REVIEW: 12/79

MATERIAL SAFETY DATA SHEET

Dow Chemical U.S.A. Midland, MI 48674 Emergency Phone: 517-636-4400

MSD: 000913 Page: 1

PRODUCT NAME: METHYLDIETHANOLAMINE (MDEA)

Effective Date: 12/29/83 Date Printed: 10/16/85 Product Code: 55520

1. INGREDIENTS:

Methyldiethanolamine	99%

2. PHYSICAL DATA:

BOILING POINT: 240-255C
VAP PRESS: <20 mmHg
VAP DENSITY: 4
SOL. IN WATER: Complete
SP. GRAVITY: 1.04-1.06
APPEARANCE: Pale straw liquid.
ODOR: Amine odor.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: 270F; >200F
METHOD USED: COC; TCC (setaflash)

FLAMMABLE LIMITS
LFL: Not determined
UFL: Not determined

EXTINGUISHING MEDIA: Water fog, foam, alcohol foam, CO2, dry chemical, water spray.

FIRE & EXPLOSION HAZARDS: Not available.

FIRE-FIGHTING EQUIPMENT: Not available.

(Continued on Page 2)
(R) Indicates a trademark of The Dow Chemical Company

PRODUCT NAME: METHYLDIETHANOLAMINE

Effective Date: 12/29/83   Date Printed: 10/16/85   Product Code: 55520

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID)

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Oxidizing material.

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Wash small amounts with water. Dike to avoid contamination of sewer system with large amounts.

DISPOSAL METHOD: Dispose of by incineration in accordance with all local, state, and federal requirements.

6. HEALTH HAZARD DATA:

EYE: May cause moderate irritation with corneal injury.

SKIN CONTACT: Short single exposure not likely to cause significant skin irritation. Prolonged or repeated exposure may cause skin irritation, even a burn. May cause more severe severe response if confined or skin is abraded.

SKIN ABSORPTION: A single prolonged skin exposure is not likely to result in absorption of harmful amounts.

INGESTION: Single dose oral toxicity is low; the LD50 for rats is likely between 2000-3980 mg/kg.

INHALATION: Excessive exposure may cause irritation to upper respiratory tract.

SYSTEMIC & OTHER EFFECTS:

(Continued on Page 3)

7. FIRST AID:

EYES: Irrigate with flowing water immediately and continuously for 15 minutes. Refer to medical personnel.

SKIN: Wash off in flowing water or shower. Remove contaminated clothing and wash before reuse.

INGESTION: If swallowed, induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call a physician. (Never give anything by mouth to or attempt to induce vomiting in an unconscious person.)

INHALATION: Remove to fresh air if effects occur. Consult medical.

NOTE TO PHYSICIAN: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): None established.

VENTILATION: Local exhaust ventilation may be necessary.

RESPIRATORY PROTECTION: None required ordinarily. If respiratory irritation is experienced, use an approved air-purifying respirator.

SKIN PROTECTION: Use protective clothing impervious to this material; selection of specific items such as gloves, boots, apron or full-body suit will depend on operation.

EYE PROTECTION: Chemical workers goggles. Eye fountain and safety shower in or near work area.

(Continued on Page 4)

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Avoid prolonged or repeated contact with skin. Wash thoroughly after handling.

MSDS STATUS: Revised 6 and 8.

SHELL TURBO® Oils

Premium-quality turbine and general-purpose rust- and oxidation-inhibited circulating oils.

SHELL TURBO* Oils provide excellent lubrication of precision turbines in industrial and marine service. These oils are also suitable for general plant lubrication and in circulating, hydraulic and gear systems requiring rust- and oxidation-inhibited oils without extreme pressure or antiwear properties.

SHELL TURBO Oils have achieved a long record of reliable performance because of these features:

- **Good water separation and low foaming properties**—Particularly important to minimize rusting and prevent cavitation in critical areas such as sleeve bearings.
- **Noncorrosive. Protect equipment against rust**—SHELL TURBO Oils inhibit corrosion of bearing housings and governor mechanisms, help increase machine life. These oils help prevent rust, even when salt water is present.
- **Resist oxidation over a long service life**—SHELL TURBO Oils resist thickening and sludging, minimize deposits that could cause malfunction of governor mechanisms and reduce efficiency of oil coolers.

Where to buy SHELL TURBO Oils

Your Shell Jobber is the person to see for supplies of SHELL TURBO Oils. He's listed in the Yellow Pages under "Oils—Lubricating." Call him today. He'll be glad to give you information about other premium-quality Shell lubricants, too.

Shell Oil Company
Manager, Commercial Communications
One Shell Plaza
Houston, Texas 77002

*SHELL TURBO is a trademark and is used as such in this writing.

Typical properties of SHELL TURBO Oils:

	ASTM Test Method	SHELL TURBO Oil Grades								
		32	46	68	78[1]	100	150	220	320	460
Gravity, °API	D 1298	31	30	29	30	29	27	28	27	26
Color	D 1500	1.0	1.0	1.0	0.5	1.0	2.0	4.0	5.0	6.0
Pour point, °F	D 97	15	0	0	10	0	0	10	10	10
Flash point, C.O.C., °F	D 92	400	425	460	460	480	475	480	520	530
Viscosity, cSt at 40°C	D 445	30.1	44.0	63.0	75.0	97.0	147	210	305	420
Viscosity, cSt at 100°C	D 445	5.05	6.5	8.2	9.2	10.7	14	18	23	28
Viscosity index	D 2270	92	95	95	95	94	93	93	93	93
Neutralization No., TAN-C	D 974	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Cu corrosion, 3 hr. at 212°F	D 130	1	1	1	1	1	1	1	1	1
Rust test	D 665B	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Interfacial tension, 77°F, dynes/cm	D 971	20	20	20	—	23	25	—	—	—
Emulsion test, minutes	D 1401	6	9	10	17	10	15	17	17	30
Turbine oil stability test, hours	D 943	2,000+	2,000+	2,000+	—	2,000+	—	—	—	—
Turbine oil stability test, MIL TOST, sludge, mg		14	15	18	20	20	—	—	—	—

[1]Approved under MIL-L-17331G and Amendment 1.

Shell

MATERIAL SAFETY DATA SHEET

MAR 22 1985

SAN JUAN SAFETY

97002 (REV 1-83)

MSDS NUMBER ▶ 65,000-2

SECTION I — NAME

PRODUCT	Shell 8122 Gas Engine Oil 40
CHEMICAL/ SYNONYMS	Lubricating Oil
CHEMICAL FAMILY	Hydrocarbon
SHELL CODE	67209
C.A.S. NUMBER	Mixture

24 HOUR EMERGENCY ASSISTANCE

SHELL 713-473-9461
CHEMTREC 800-424-9300

HAZARD RATING
LEAST 0 ▶ SLIGHT 1 ▶ MODERATE 2 ▶ HIGH 3 ▶ EXTREME 4

HEALTH
FIRE
REACTIVITY

SECTION II — INGREDIENTS

COMPOSITION	%	TOXICITY DATA
Shell 8122 Gas Engine Oil 40	100	Not Determined
Petroleum Hydrocarbons	96	Oral LD_{50}, rat >5g/kg* Dermal LD_{50}, rabbit >2g/kg*
Polyalkenyl Succinimide	2	
Detergent Inhibitor containing Ba, S, Ca	2	
Organic Zinc Dithiophosphate	<0.5	
		*Values are estimates based upon tests using similar oils.

SECTION III — HEALTH INFORMATION

Lubricating oils are generally considered to be of a low order of acute toxicity to humans and experimental animals.

Exposure to vapors or mist of this product may cause pulmonary irritation, dizziness and nausea. Prolonged or repeated contact may cause various skin disorders such as dermatitis, folliculitis or oil acne.

The petroleum hydrocarbons in this product are a complex mixture of paraffinic, naphthenic and aromatic hydrocarbons. As in other petroleum oils, the aromatics contain polycyclic compounds of various concentrations and structures. Some of these polycyclics may be those which have been shown to induce cancer in animals under laboratory conditions. Epidemiologic studies on other petroleum products containing polycyclic aromatics suggested the possibility of skin cancer induction in man after prolonged and repeated contact. Inhalation of mists arising from oils containing these materials may also present a cancer hazard.

This specific product has not been tested in long-term, chronic exposure tests. Therefore, the presence of polycyclic aromatic hydrocarbons requires that handling procedures and safety precautions in this MSDS be followed to minimize employees' exposure.

SECTION IV — OCCUPATIONAL EXPOSURE LIMITS

Oil Mist, Mineral:
ACGIH-TLV/TWA = 5 mg/m³; ACGIH-TLV/STEL = 10 mg/m³
OSHA-PEL/TWA = 5 mg/m³ (see NIOSH/OSHA Occupational Health Guide

SECTION VIII — REACTIVITY

STABILITY ▶ [ ] UNSTABLE [X] STABLE

HAZARDOUS POLYMERIZATION ▶ [ ] MAY OCCUR [X] WILL NOT OCCU

CONDITIONS AND MATERIALS TO AVOID

Avoid heat, open flames, oxidizing materials and mist formation.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, sulfur oxides, phosphorus oxides and unidentified organic materials may be formed during combustion.

SECTION IX — EMPLOYEE PROTECTION

RESPIRATORY PROTECTION

If exposure may or does exceed occupational exposure limits (Sec.IV) use a NIOSH-approved respirator to prevent overexposure. In accord with 29 CFR 1910.134 use either an atmosphere-supplying respirator or an air-purifying respirator for organic vapors and particulates.

PROTECTIVE CLOTHING

Wear gloves and other protective clothing as required to minimize skin contact. Wear safety glasses or goggles to avoid eye contact.

ADDITIONAL PROTECTIVE MEASURES

--

SECTION X — ENVIRONMENTAL PROTECTION

SPILL OR LEAK PROCEDURES

May burn although not readily ignitable. Use cautious judgment when cleaning up large spills.

Large spills: Wear respirator and protective clothing as appropriate. Shut off source of leak if safe to do so. Dike and contain. Remove with vacuum trucks or pump to storage/salvage vessels. Soak up residue with an absorbent such as clay, sand or other suitable material; dispose of properly.
Small spills: take up with an absorbent material and dispose of properly.

WASTE DISPOSAL

Place in an appropriate disposal facility in compliance with local regulations.

ENVIRONMENTAL HAZARDS

This product is an "oil" under the Clean Water Act. KEEP OUT OF SURFACE WATERS AND ANY WATER COURSES OR SEWERS ENTERING OR LEADING TO

SECTION V — EMERGENCY AND FIRST AID PROCEDURES

YE CONTACT: Flush with water for 15 minutes while holding eyelids open. Get medical attention.

KIN CONTACT: Remove contaminated clothing and wipe excess off. Wash with soap and water or a waterless hand cleaner followed by soap and water. Do not reuse clothing until thoroughly cleaned. If irritation persists, get medical attention.

INHALATION: Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention.

INGESTION: Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical advice.*

NOTE TO THE PHYSICIAN: In general, emesis induction is unnecessary high viscosity, low volatility products, i.e. most oils and greases.

SECTION VI — PHYSICAL DATA

BOILING POINT (°F)	N. A.	MELTING POINT (°F)	N. A.	VAPOR PRESSURE (mmHg)	N. A.
SPECIFIC GRAVITY (H_2O=1)	0.90	% VOLATILE BY VOLUME	N. A.	VAPOR DENSITY (AIR=1)	N. A.
SOLUBILITY IN WATER	Insoluble	EVAPORATION RATE (BUTYL ACETATE=1)	N. A.	N.A. = Not Available	

EARANCE AND ODOR

Light brown oil. Slight odor.

SECTION VII — FIRE AND EXPLOSION HAZARDS

ASH POINT AND METHOD USED	FLAMMABLE LIMITS % VOLUME IN AIR	LOWER	UPPER
[illegible]5°F PMCC		N. A.	N. A.

EXTINGUISHING MEDIA

Use water fog, foam, dry chemical or CO_2. Do not use a direct stream of ter. Product will float and can be reignited on surface of water.

ECIAL FIRE FIGHTING PROCEDURES AND PRECAUTIONS

Do not enter confined fire space without proper protective equipment cluding a NIOSH approved self-contained breathing apparatus. Cool re-exposed containers with water.

USUAL FIRE AND EXPLOSION HAZARDS

ne Unusual

SECTION XI — SPECIAL PRECAUTIONS

inimize skin contact. Wash with soap and water before eating, drinking, moking or using toilet facilities. Launder contaminated clothing before reuse. Properly dispose of contaminated leather articles, including shoes, hat cannot be decontaminated.

SECTION XII — TRANSPORTATION REQUIREMENTS

DEPARTMENT OF ANSPORTATION LASSIFICATION ▶

[ ] FLAMMABLE LIQUID	[ ] COMBUSTIBLE LIQUID	[ ] OXIDIZING MATERIAL	[ ] NON-FLAMMABLE GAS
[ ] FLAMMABLE SOLID	[ ] POISON, CLASS A	[ ] CORROSIVE MATERIAL	[X] NOT HAZARDOUS BY D.O.T. REGULATIONS
[ ] FLAMMABLE GAS	[ ] POISON, CLASS B	[ ] IRRITATING MATERIAL	[ ] OTHER-Specify below

.T. PROPER SHIPPING NAME

one

THER REQUIREMENTS

ll of Lading Commodity Description: Petroleum Lubricating Oil

ECTION XIII — SUPPLEMENTARY HEALTH/REGULATORY INFORMATION

A - Clean Water Act (CWA)
is product is classified as an oil under Section 311 of the Clean Water Act. Spills entering (a) surface waters or (b) any watercourses or sewers ntering/leading to surface waters that cause a sheen MUST be reported to e National Response Center, 800-424-8802.

PA - Resource Conservation and Recovery Act (RCRA)
produced, this material is a product and not a waste. If discarded or tended to be discarded as is, it exhibits the characteristic of EP oxicity as defined in RCRA (40 CFR 261.24) based upon its barium content. e EPA hazardous waste number is D005.

BE SAFE
READ OUR PRODUCT SAFETY INFORMATION AND PASS IT ON
(PRODUCT LIABILITY LAW REQUIRES IT)

John P. Lepeni
Manager

SHELL OIL COMPANY
PRODUCT SAFETY AND COMPLIANCE
P.O. BOX 4320
HOUSTON, TEXAS 77210
(713) 241-4819

DATE PREPARED
April 14, [illegible]

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y. 12305

MATERIALS · INFORMATION · SERVICES

NO. 1257

VARSOL 1

Date May 1982

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: VARSOL 1
DESCRIPTION: Petroleum solvent or mineral spirits.
OTHER DESIGNATIONS: GE Material D5B8, ASTM D235, ASTM D484, Type 1
MANUFACTURER: Exxon Co.
P.O. Box 2180
Houston, Texas Tel: (713) 656-3424

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Mixture of petroleum hydrocarbons	100	8-hr TWA 100 ppm*
Typical Composition: Vol %		
Aromatics (C_8 and higher) 18		Rat, Oral
Olefins 1		LD_{50} >5 g/kg
Saturates 81		
Sulfur content 1 ppm		Rabbit, Dermal
*ACGIH(1982) TLV for Stoddard Solvent. Animal studies by Exxon Corp. medical research has shown that male rats exposed to similar vapors at 100 ppm had kidney damage. Additional studies are being conducted to validate these findings and to determine if a revised TLV should be recommended.		LD_{50} >2 g/kg

SECTION III. PHYSICAL DATA

Boiling range, 1 atm, deg C ----	155-205	Specific gravity, 15.6/15.6C --	ca 0.79
Vapor pressure, 25C, mmHg ------	<10	Evaporation rate (nBuAc=1) ----	<0.1
Vapor density (Air=1) ----------	ca 4.8	Volatiles, % ------------------	100
Solubility in water -----------	Negligible	Molecular weight (avg) --------	ca 140

Appearance & odor: Water-white liquid; mineral spirits odor (no long-lasting odor after evaporation).

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
ca 42C (108F) TCC	254C (ASTM D2155)	% by Volume @ 25C	0.9	6.0

Extinguishing Media: Dry chemical, carbon dioxide, foam, water spray or fog. Water spray can be used to keep fire-exposed containers cool to avoid pressure rupture.
This material is an OSHA Class II Combustible Liquid. It is a dangerous fire hazard if heated or sprayed in air.
Firefighters should wear self-contained breathing apparatus for fighting fires in enclosed areas.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not polymerize.
Incompatible with strong oxidizing agents such as chlorine, conc. oxygen, calcium hypochlorite, nitric acid, etc.
Thermal-oxidative degradation may produce carbon monoxide and partially oxidized hydrocarbons.

NO. 1257

SECTION VI. HEALTH HAZARD INFORMATION	TLV 100 ppm (See Sect II)

Varsol, like all petroleum distillates, is a central nervous system depressent. Symptoms of overexposure to high vapor conc. range from headache and dizziness to possible convulsions and unconsciousness.

Eye contact with the liquid may cause conjunctivitis. Prolonged or repeated skin contact causes a defatting effect, resulting in irritation, drying, cracking and dermatitis.

FIRST AID:

Eye Contact: Flush thoroughly with running water for 15 min. including under eyelids. Get medical help if irritation persists.

Skin Contact: Remove contaminated clothing. Wash affected area with soap and water. Get medical help if large area contacted or if irritation persists.

Inhalation: Remove to fresh air. Restore and/or support breathing as required. (Administer oxygen if breathing difficult). Contact physician for further treatment, observation and support.

Ingestion: Do not induce vomiting. Contact physician immediately. Aspiration hazard. Give a few ounces of USP mineral oil to drink.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of leaks or spills. Remove sources of heat or ignition.

Provide explosion-proof ventilation. Clean-up personnel need protection against inhalation and skin contact. Contain spill and recover free liquid if possible. Use absorbent (sand, earth, sawdust, etc) to clean up residue. Do not discharge into sewers or surface waters. (Notify authorities if product enters, or may enter, sewer or waterway.)

DISPOSAL: Waste material may be burned in an approved incinerator.

Follow Federal, State, and Local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide adequate general and local exhaust ventilation to meet TLV requirements. Local exhaust hoods should have at least 60 fpm face velocity. Use explosion-proof electrical equipment and services. Have air-supplied or self-contained respiratory apparatus available for nonroutine or emergency use or when working in a confined or enclosed area. (Canister respirator may be suitable for short time usage.)

Wear impermeable gloves and additional protective clothing to prevent prolonged or repeated skin contact. Use safety goggles and/or faceshield for eye protection where splashing is possible. An eyewash station is desirable where splashing is probable. A safety shower may be desirable where large amounts are used.

Launder contaminated clothing before reuse. thoroughly dry contaminated shoes before reuse.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, well-ventilated area away from sources of heat, flame, ignition and strong oxidizing agents. Protect containers from physical damage. Keep containers closed when not in use. Use safety cans for small amounts.

Handling and storage conditions must be suitable for OSHA Class II Combustible liquid.

Bond and ground containers for transfers to avoid static sparks.

Avoid inhalation of vapors. Avoid prolonged or repeated contact with skin. Prevent eye contact with liquid. Prohibit smoking or flame in use areas. Ventilate area where used. Electrical services to meet code.

DOT Classification: COMBUSTIBLE LIQUID

DATA SOURCE(S) CODE: 1,2, MSDS #334

APPROVALS: MIS CRD J. M. Nielsen

Industrial Hygiene and Safety JW 5.12.82

MEDICAL REVIEW: 19 May 1982

GENERAL ELECTRIC

ORPORATION

MATERIAL SAFETY DATA SHEET

Date 7/15/82

(Approved by U.S. Department of Labor as "Essentially Similar" to Form OSHA-20)

I PRODUCT IDENTIFICATION

TRETOLITE DIVISION, Petrolite Corporation 69 Marshall Avenue, St. Louis, Missouri 63119 U.S.A.	EMERGENCY TELEPHONE NO. (314) 961-3500

FORMULA # KP-196 BAYPORT TRADE NAME: KONTOL

HEMICAL DESCRIPTION: A solution of acylated amines and diethylamine in aromatic hydrocarbons and hexanols.

II HAZARDOUS INGREDIENTS

MATERIAL	%	TLV (UNITS)
Diethylamine	< 45	10 ppm
Aromatic Hydrocarbons	< 10	25 ppm

III PHYSICAL DATA

ILING POINT, 760 mm Hg		FREEZING POINT:	
SPECIFIC GRAVITY (H_2O=1)	@60°F 0.82	VAPOR PRESSURE @	
APOR DENSITY (AIR=1)		SOLUBILITY IN WATER	Insoluble
RCENT VOLATILES WEIGHT	> 65	EVAPORATION RATE	

PEARANCE AND ODOR: Amber Liquid. Sharp ammoniacal odor.

IV. FIRE AND EXPLOSION HAZARD DATA

ASH POINT ST METHOD)	12°F SFCC ASTM D-3828 Flammable Liquid			
AMMABLE LIMITS IN AIR, % BY VOLUME	LOWER		UPPER	
XTINGUISHING EDIA	CO_2 or dry powder			
CIAL FIRE IGHTING PROCEDURES	Self contained breathing apparatus may be required if material is in a fire.			
USUAL FIRE AND XPLOSION HAZARDS	Flammable Liquid			

V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	
EFFECTS OF OVEREXPOSURE	Contact may cause severe eye irritation and causes skin irritat dermatitis & possible sensitization vapors can cause irritation mucous membranes & respiratory irritation. Ingestion can cause severe gastro intestinal irritation, nausea, and vomiting.
EMERGENCY AND FIRST AID PROCEDURES	Flush eyes with water and get medical attention. Wash skin with soap and water. Administer oxygen if necessary.

VI REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID	
UNSTABLE	STABLE		
	X		

INCOMPATIBILITY (MATERIALS TO AVOID)	Strong oxidizing agents and strong mineral acids.
HAZARDOUS DECOMPOSITION PRODUCTS	Oxides of nitrogen.

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID	
MAY OCCUR	WILL NOT OCCUR		
	X		

VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	DIKE TO PREVENT ENTERING ANY WATERWAY. COVER WITH SAND, DIRT OR SUITABLE CHEMICAL ADSORBENT.
WASTE DISPOSAL METHOD	AFTER MATERIAL IS ADSORBED PICK UP SAND, DIRT OR CHEMICAL ADSORBENT AND TAKE TO AN APPROVED LAND FILL.

VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE)	Chemical Respirator with Organic Cartridge if TLV's exceeded. Self contained breathing apparatus if emergency.			
VENTILATION	LOCAL EXHAUST	Recommended	SPECIAL	
	MECHANICAL (GENERAL)		OTHER	
PROTECTIVE GLOVES		Synthetic	EYE PROTECTION	Chemical Goggles
OTHER PROTECTIVE EQUIPMENT	Impervious clothing or rubber gauntlets, apron and boots.			

IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Avoid breathing of vapors and contact with skin or eyes. Avoid sparks and open flames as material is an extremely ~~flammable liquid.~~
OTHER PRECAUTIONS	Launder contaminated clothing before reuse.

BETZ LABORATORIES, INC.
4636 SOMERTON ROAD, TREVOSE, PA. 19047

BETZ MATERIAL SAFETY DATA SHEET

24 HOUR EMERGENCY TELEPHONE (HEALTH OR ACCIDENT) 215/355-3300

PRODUCT: BETZ 2020
EFFECTIVE DATE 2/89

PRODUCT APPLICATION : WATER-BASED DEPOSIT CONTROL AGENT.

-----SECTION 1-----------HAZARDOUS INGREDIENTS---------------

INFORMATION ON PHYSICAL HAZARDS, HEALTH HAZARDS, PEL'S AND TLV'S FOR SPECIFIC PRODUCT INGREDIENTS AS REQUIRED BY THE OSHA HAZARD COMMUNICATIONS STANDARD ARE LISTED. REFER TO SECTION 4 (PAGE 2) FOR OUR ASSESSMENT OF THE POTENTIAL ACUTE AND CHRONIC HAZARDS OF THIS FORMULATION.

THIS PRODUCT CONTAINS NO HAZARDOUS INGREDIENTS BY OSHA REGULATIONS OR ANY STATE RIGHT-TO-KNOW REGULATIONS.

-----SECTION 2-----------TYPICAL PHYSICAL DATA--------------------------

PH: AS IS (APPROX.) 5.3	ODOR: MILD
FL.PT.(DEG.F): >200 SETA(CC)	SP.GR.(70F)OR DENSITY: 1.123
VAPOR PRESSURE(MMHG): 20	VAPOR DENSITY(AIR=1): <1
VISC CPS70F: 19.5	%SOLUBILITY(WATER): 100
EVAP.RATE: <1 ETHER=1	APPEARANCE: LIGHT YELLOW
PHYSICAL STATE: LIQUID	FREEZE POINT(DEG.F): 26

-----SECTION 3-----------REACTIVITY DATA-------------------------------

STABLE

THERMAL DECOMPOSITION (DESTRUCTIVE FIRES) YIELDS ELEMENTAL OXIDES.

PRODUCT: BETZ 2020

-----SECTION 4------------HEALTH HAZARD EFFECTS------------------------

ACUTE SKIN EFFECTS *** PRIMARY ROUTE OF EXPOSURE
SLIGHTLY IRRITATING TO THE SKIN
ACUTE EYE EFFECTS ***
SLIGHTLY IRRITATING TO THE EYES
ACUTE RESPIRATORY EFFECTS ***
MISTS/AEROSOLS MAY CAUSE IRRITATION TO UPPER RESPIRATORY TRACT
CHRONIC EFFECTS OF OVEREXPOSURE***
NO EVIDENCE OF POTENTIAL CHRONIC EFFECTS.
MEDICAL CONDITIONS AGGRAVATED ***
NOT KNOWN

SYMPTOMS OF EXPOSURE ***
MAY CAUSE REDNESS OR ITCHING OF SKIN,IRRITATION AND/OR TEARING OF EYES(DIRECT CONTACT).

-----SECTION 5------------FIRST AID INSTRUCTIONS----------------------

SKIN CONTACT***
REMOVE CONTAMINATED CLOTHING.WASH EXPOSED AREA WITH A LARGE QUANTITY OF SOAP SOLUTION OR WATER FOR 15 MINUTES
EYE CONTACT***
IMMEDIATELY FLUSH EYES WITH WATER FOR 15 MINUTES.IMMEDIATELY CONTACT A PHYSICIAN FOR ADDITIONAL TREATMENT
INHALATION EXPOSURE***
REMOVE VICTIM FROM CONTAMINATED AREA TO FRESH AIR.APPLY APPROPRIATE FIRST AID TREATMENT AS NECESSARY
INGESTION***
DO NOT FEED ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSIVE VICTIM DILUTE CONTENTS OF STOMACH.INDUCE VOMITING BY ONE OF THE STANDARD METHODS.IMMEDIATELY CONTACT A PHYSICIAN

-----SECTION 6------------SPILL,DISPOSAL AND FIRE INSTRUCTIONS---------

SPILL INSTRUCTIONS***
VENTILATE AREA,USE SPECIFIED PROTECTIVE EQUIPMENT.CONTAIN AND ABSORB ON ABSORBENT MATERIAL.PLACE IN WASTE DISPOSAL CONTAINER. THE WASTE CHARACTERISTICS OF THE ABSORBED MATERIAL,OR ANY CONTAMINATED SOIL, SHOULD BE DETERMINED IN ACCORDANCE WITH RCRA REGULATIONS.
FLUSH AREA WITH WATER.WET AREA MAY BE SLIPPERY.IF SO,SPREAD SAND OR GRIT.
DISPOSAL INSTRUCTIONS***
WATER CONTAMINATED WITH THIS PRODUCT MAY BE SENT TO A SANITARY SEWER TREATMENT FACILITY,IN ACCORDANCE WITH ANY LOCAL AGREEMENT,A PERMITTED WASTE TREATMENT FACILITY OR DISCHARGED UNDER A NPDES PERMIT
PRODUCT(AS IS)-
INCINERATE OR BURY IN APPROVED LANDFILL
FIRE EXTINGUISHING INSTRUCTIONS***
FIREFIGHTERS SHOULD WEAR POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS(FULL FACE-PIECE TYPE).
DRY CHEMICAL,CARBON DIOXIDE,FOAM OR WATER.FOAM OR WATER CREATE A SLIPPERY CONDITION.SPREAD SAND OR GRIT

PRODUCT: BETZ 2020

-----SECTION 7-----------SPECIAL PROTECTIVE EQUIPMENT----------------

VENTILATION PROTECTION***
   ADEQUATE VENTILATION
RECOMMENDED RESPIRATORY PROTECTION***
   IF VENTILATION IS INADEQUATE OR SIGNIFICANT PRODUCT EXPOSURE IS LIKELY,
   USE A RESPIRATOR WITH DUST/MIST CARTRIDGES
RECOMMENDED SKIN PROTECTION***
   RUBBER GLOVES
   REPLACE AS NECESSARY
RECOMMENDED EYE PROTECTION***
   SPLASH PROOF CHEMICAL GOGGLES

-----SECTION 8-----------STORAGE AND HANDLING PRECAUTIONS-------------

STORAGE INSTRUCTIONS***
   KEEP CONTAINER CLOSED
   PROTECT FROM FREEZING
HANDLING INSTRUCTIONS***
   IMMEDIATELY REMOVE CONTAMINATED CLOTHING,WASH BEFORE REUSE
   NORMAL CHEMICAL HANDLING

-----SECTION 9-----------FEDERAL REGULATIONS-------------------------

OSHA(29CFR)-FOR RESPIRATORY PROTECTION USE PROPERLY FITTED MSHA/NIOSH
   APPROVED RESPIRATORY EQUIPMENT WITHIN USE LIMITATIONS.OTHERWISE,USE SUPPLIED
   AIR APPARATUS.
CWA(40CFR)REPORTABLE QUANTITY: AS IS PRODUCT (HAZARDOUS SUBSTANCE)
   NOT APPLICABLE
RCRA(40CFR): IF DISCARDED,THIS MATERIAL BEARS HW# NOT APPLICABLE
DOT(49CFR)CLASSIFICATION: NOT APPLICABLE
NFPA/HMIS : HEALTH - 1 ; FIRE - 0 ; REACTIVITY - 0 ; SPECIAL - NONE

****

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WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO
BE ACCURATE AS OF THE DATE HEREOF, BETZ LABORATORIES,INC.MAKES NO WARRANTY
WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

HAROLD M. HERSH
ENVIRONMENTAL INFORMATION COORDINATOR

BETZ LABORATORIES, INC.
4636 SOMERTON ROAD TREVOSE, PA. 19047

BETZ MATERIAL SAFETY DATA SHEET

24 HOUR EMERGENCY TELEPHONE (HEALTH OR ACCIDENT) 215/355-3300

PRODUCT: BETZ 2040
EFFECTIVE DATE 10/84

PRODUCT APPLICATION : WATER-BASED CORROSION INHIBITOR/DEPOSIT CONTROL AGENT.

-----SECTION 1------------HAZARDOUS INGREDIENTS---------------

INFORMATION ON PHYSICAL HAZARDS, HEALTH HAZARDS, PEL'S AND TLV'S FOR SPECIFIC PRODUCT INGREDIENTS AS REQUIRED BY THE OSHA HAZARD COMMUNICATIONS STANDARD ARE LISTED. REFER TO SECTION 4 (PAGE 2) FOR OUR ASSESSMENT OF THE POTENTIAL ACUTE AND CHRONIC HAZARDS OF THIS FORMULATION.

POTASSIUM HYDROXIDE***(CAUSTIC POTASH);CAS#1310-58-3;CORROSIVE;TOXIC IF ORALLY INGESTED;PEL:NONE;TLV:2.0MG/M3(CEILING).

PHOSPHONIC ACID,(1-HYDROXYETHYLIDINE)BIS-***HEDP;CAS#2809-21-4;EYE IRRITANT;PEL:NONE;TLV:NONE.

1-H-BENZOTRIAZOLE,METHYL***(TOLYLTRIAZOLE;TTA);CAS#29385-43-1; IRRITANT(EYE);TOXIC BY INHALATION;PEL:NONE;TLV:NONE.

-----SECTION 2------------TYPICAL PHYSICAL DATA-------------------------

PH: AS IS (APPROX.) 12.0	ODOR: MILD
FL.PT.(DEG.F): >200 SETA(CC)	SP.GR.(70F)OR DENSITY: 1.436
VAPOR PRESSURE(MMHG): 18	VAPOR DENSITY(AIR=1): <1
VISC CPS70F: 14	%SOLUBILITY(WATER): 100
EVAP.RATE: <1 ETHER=1	APPEARANCE: YELLOW
PHYSICAL STATE: LIQUID	FREEZE POINT(DEG.F): -11

-----SECTION 3------------REACTIVITY DATA------------------------------

STABLE

THERMAL DECOMPOSITION (DESTRUCTIVE FIRES) YIELDS ELEMENTAL OXIDES.

PRODUCT: BETZ 2040

-----SECTION 4------------HEALTH HAZARD EFFECTS-----------------------

ACUTE SKIN EFFECTS *** PRIMARY ROUTE OF EXPOSURE
   SEVERE IRRITANT TO THE SKIN
ACUTE EYE EFFECTS ***
   CORROSIVE TO THE EYES
ACUTE RESPIRATORY EFFECTS ***
   MISTS/AEROSOLS CAUSE IRRITATION TO UPPER RESPIRATORY TRACT
CHRONIC EFFECTS OF OVEREXPOSURE***
   PROLONGED OR REPEATED CONTACT MAY CAUSE PRIMARY IRRITANT DERMATITIS.
MEDICAL CONDITIONS AGGRAVATED ***
   NOT KNOWN

SYMPTOMS OF EXPOSURE ***
   CAUSES SEVERE IRRITATION,BURNS OR TISSUE ULCERATION WITH SUBSEQUENT
   SCARRING.

PRECAUTIONARY STATEMENT BASED ON TESTING RESULTS ***
   MAY BE TOXIC IF ORALLY INGESTED,ABSORBED THROUGH SKIN OR INHALED.

-----SECTION 5------------FIRST AID INSTRUCTIONS---------------------

SKIN CONTACT***
   REMOVE CONTAMINATED CLOTHING.WASH EXPOSED AREA WITH A LARGE QUANTITY OF
   SOAP SOLUTION OR WATER FOR 15 MINUTES
EYE CONTACT***
   IMMEDIATELY FLUSH EYES WITH WATER FOR 15 MINUTES.IMMEDIATELY CONTACT A
   PHYSICIAN FOR ADDITIONAL TREATMENT
INHALATION EXPOSURE***
   REMOVE VICTIM FROM CONTAMINATED AREA TO FRESH AIR.APPLY APPROPRIATE
   FIRST AID TREATMENT AS NECESSARY
INGESTION***
   DO NOT FEED ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSIVE VICTIM
   DO NOT INDUCE VOMITING.IMMED.CONTACT PHYSICIAN.DILUTE CONTENTS OF
   STOMACH USING 3-4 GLASSES MILK OR WATER

-----SECTION 6------------SPILL,DISPOSAL AND FIRE INSTRUCTIONS---------

SPILL INSTRUCTIONS***
   VENTILATE AREA,USE SPECIFIED PROTECTIVE EQUIPMENT.CONTAIN AND ABSORB
   ON ABSORBENT MATERIAL.PLACE IN WASTE DISPOSAL CONTAINER. THE WASTE
   CHARACTERISTICS OF THE ABSORBED MATERIAL,OR ANY CONTAMINATED SOIL,
   SHOULD BE DETERMINED IN ACCORDANCE WITH RCRA REGULATIONS.
   FLUSH AREA WITH WATER.WET AREA MAY BE SLIPPERY.IF SO,SPREAD
   SAND OR GRIT.
DISPOSAL INSTRUCTIONS***
   WATER CONTAMINATED WITH THIS PRODUCT MAY BE SENT TO A SANITARY
   SEWER TREATMENT FACILITY,IN ACCORDANCE WITH ANY LOCAL AGREEMENT,A
   PERMITTED WASTE TREATMENT FACILITY OR DISCHARGED UNDER A NPDES PERMIT
   PRODUCT(AS IS)-
      INCINERATE OR BURY IN APPROVED LANDFILL
FIRE EXTINGUISHING INSTRUCTIONS***
   FIREFIGHTERS SHOULD WEAR POSITIVE PRESSURE SELF-CONTAINED BREATHING
   APPARATUS(FULL FACE-PIECE TYPE).
   DRY CHEMICAL,CARBON DIOXIDE,FOAM OR WATER.FOAM OR WATER CREATE A SLIPPERY
   CONDITION.SPREAD SAND OR GRIT

PRODUCT: BETZ 2040

-----SECTION 7-----------SPECIAL PROTECTIVE EQUIPMENT-----------------

VENTILATION PROTECTION***
ADEQUATE VENTILATION TO MAINTAIN AIR CONTAMINANTS BELOW EXPOSURE LIMITS
RECOMMENDED RESPIRATORY PROTECTION***
IF VENTILATION IS INADEQUATE OR SIGNIFICANT PRODUCT EXPOSURE IS LIKELY, USE A RESPIRATOR WITH DUST/MIST CARTRIDGES
RECOMMENDED SKIN PROTECTION***
RUBBER GLOVES
REPLACE AS NECESSARY
RECOMMENDED EYE PROTECTION***
SPLASH PROOF CHEMICAL GOGGLES

-----SECTION 8-----------STORAGE AND HANDLING PRECAUTIONS-------------

STORAGE INSTRUCTIONS***
KEEP CONTAINER CLOSED
PROTECT FROM FREEZING
HANDLING INSTRUCTIONS***
IMMEDIATELY REMOVE CONTAMINATED CLOTHING,WASH BEFORE REUSE
ALKALINE.CORROSIVE TO EYES.DO NOT MIX WITH ACIDIC MATERIAL.

-----SECTION 9-----------FEDERAL REGULATIONS-------------------------

OSHA(29CFR)-FOR RESPIRATORY PROTECTION USE PROPERLY FITTED MSHA/NIOSH APPROVED RESPIRATORY EQUIPMENT WITHIN USE LIMITATIONS.OTHERWISE,USE SUPPLIED AIR APPARATUS.
CWA(40CFR)REPORTABLE QUANTITY: AS IS PRODUCT (HAZARDOUS SUBSTANCE) 165 GAL (POTASSIUM HYDROXIDE)
RCRA(40CFR): IF DISCARDED,THIS MATERIAL BEARS HW# D002
DOT(49CFR)CLASSIFICATION: NOT APPLICABLE
NFPA/HMIS : HEALTH - 2 ; FIRE - 0 ; REACTIVITY - 0 ; SPECIAL - NONE

****

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BETZ MATERIAL SAFETY DATA SHEET

24 HOUR EMERGENCY TELEPHONE (HEALTH OR ACCIDENT) 215/355-3300

PRODUCT: SLIMICIDE C41 EFFECTIVE DATE 6/85

PRODUCT APPLICATION : SOLVENT-BASED MICROBIAL CONTROL AGENT.

-----SECTION 1-----------HAZARDOUS INGREDIENTS--------------

INFORMATION ON PHYSICAL HAZARDS, HEALTH HAZARDS, PEL'S AND TLV'S FOR SPECIFIC PRODUCT INGREDIENTS AS REQUIRED BY THE OSHA HAZARD COMMUNICATIONS STANDARD ARE LISTED. REFER TO SECTION 4 (PAGE 2) FOR OUR ASSESSMENT OF THE POTENTIAL ACUTE AND CHRONIC HAZARDS OF THIS FORMULATION.

B-BROMO-B-NITROSTYRENE***CAS#7166-19-0;POTENTIAL REPRODUCTIVE TOXIN; PEL:NONE;TLV:NONE.

METHYLENE BIS(THIOCYANATE)***CAS#6317-18-6;POTENTIAL REPRODUCTIVE TOXIN; PEL:NONE;TLV:NONE.

AROMATIC SOLVENTS,PREMIUM***CAS#64742-94-5;COMBUSTIBLE LIQUID;EYE IRRITANT; PEL:NONE;TLV:100PPM MANUFACTURERS' SUGGESTED.

OCTYLPHENOXYPOLYETHOXYETHANOL***CAS#9036-19-5;EYE IRRITANT;PEL:NONE;TLV:NONE.

DIMETHYLFORMAMIDE***(DMF);CAS#68-12-2;COMBUSTIBLE;TOXIC(INHALATION);REPRODUCTIVE TOXIN(EMBRYOTOXIC IN ANIMALS);POTENTIAL LIVER AND KIDNEY TOXIN;PEL:10 PPM(SKIN);TLV:10PPM(SKIN).

----SECTION 2-----------TYPICAL PHYSICAL DATA----------------------

PH: 5%EXTRACT (APPROX.) 3.3	ODOR: HYDROCARBON
FL.PT.(DEG.F): 147 SETA(CC)	SP.GR.(70F)OR DENSITY: 0.973
VAPOR PRESSURE(MMHG): 6	VAPOR DENSITY(AIR=1): >1
VISC CPS70F: 14.8	%SOLUBILITY(WATER): 0
EVAP.RATE: <1 ETHER=1	APPEARANCE: YELLOW
PHYSICAL STATE: LIQUID	FREEZE POINT(DEG.F): <-30

----SECTION 3-----------REACTIVITY DATA------------------------------

STABLE

THERMAL DECOMPOSITION (DESTRUCTIVE FIRES) YIELDS ELEMENTAL OXIDES.

PRODUCT: SLIMICIDE C41

-----SECTION 4------------HEALTH HAZARD EFFECTS-----------------------
ACUTE SKIN EFFECTS *** PRIMARY ROUTE OF EXPOSURE
SEVERE IRRITANT TO THE SKIN.ABSORBED BY SKIN.SKIN SENSITIZER.
ACUTE EYE EFFECTS ***
CORROSIVE TO THE EYES
ACUTE RESPIRATORY EFFECTS *** PRIMARY ROUTE OF EXPOSURE
VAPORS,GASES,MISTS AND/OR AEROSOLS CAUSE IRRITATION TO UPPER RESPIRATORY TRACT. PROLONGED EXPOSURE MAY CAUSE DIZZINESS AND HEADACHE.
CHRONIC EFFECTS OF OVEREXPOSURE***
PROLONGED OR REPEATED EXPOSURES MAY CAUSE LIVER AND KIDNEY TOXICITY,MAY CAUSE REPRODUCTIVE SYSTEM TOXICITY,OR MAY CAUSE DEFATTING-TYPE DERMATITIS.
MEDICAL CONDITIONS AGGRAVATED ***
NOT KNOWN

SYMPTOMS OF EXPOSURE ***
INHALATION MAY CAUSE IRRITATION OF MUCOUS MEMBRANES AND RESPIRATORY TRACT; SKIN CONTACT CAUSES SEVERE IRRITATION OR BURNS.

PRECAUTIONARY STATEMENT BASED ON TESTING RESULTS ***
MAY BE TOXIC IF INHALED.
-----SECTION 5------------FIRST AID INSTRUCTIONS----------------------
SKIN CONTACT***
REMOVE CONTAMINATED CLOTHING.WASH EXPOSED AREA WITH A LARGE QUANTITY OF SOAP SOLUTION OR WATER FOR 15 MINUTES
EYE CONTACT***
IMMEDIATELY FLUSH EYES WITH WATER FOR 15 MINUTES.IMMEDIATELY CONTACT A PHYSICIAN FOR ADDITIONAL TREATMENT
INHALATION EXPOSURE***
REMOVE VICTIM FROM CONTAMINATED AREA TO FRESH AIR.APPLY APPROPRIATE FIRST AID TREATMENT AS NECESSARY
INGESTION***
DO NOT FEED ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSIVE VICTIM DO NOT INDUCE VOMITING.IMMED.CONTACT PHYSICIAN.DILUTE CONTENTS OF STOMACH USING 3-4 GLASSES MILK OR WATER

-----SECTION 6------------SPILL,DISPOSAL AND FIRE INSTRUCTIONS---------
SPILL INSTRUCTIONS***
VENTILATE AREA,USE SPECIFIED PROTECTIVE EQUIPMENT.CONTAIN AND ABSORB ON ABSORBANT MATERIAL.PLACE IN WASTE DISPOSAL CONTAINER.THE CONTAMINATED ABSORBANT SHOULD BE CONSIDERED A PESTICIDE AND DISPOSED OF IN AN APPROVED PESTICIDE LANDFILL.SEE PRODUCT LABEL STORAGE AND DISPOSAL INSTRUCTIONS.
REMOVE IGNITION SOURCES.FLUSH AREA WITH WATER.SPREAD SAND OR GRIT. ACTIVE INGREDIENTS MAY BE DEGRADED BY TREATING WITH AN AQUEOUS SOLUTION OF 5% SODIUM HYDROXIDE AND 5% SODIUM SULFITE OR SODIUM BISULFITE.ALTHOUGH LESS EFFICIENT,A COMBINATION OF CAUSTIC SODA AND SODIUM THIOSULFATE MAY ALSO BE USED.
DISPOSAL INSTRUCTIONS***
WATER CONTAMINATED WITH THIS PRODUCT MAY BE SENT TO A SANITARY SEWER TREATMENT FACILITY,IN ACCORDANCE WITH ANY LOCAL AGREEMENT,A PERMITTED WASTE TREATMENT FACILITY OR DISCHARGED UNDER A NPDES PERMIT
PRODUCT(AS IS)-
BURY IN AN APPROVED PESTICIDE FACILITY OR DISPOSE OF IN ACCORDANCE WITH LABEL INSTRUCTIONS
FIRE EXTINGUISHING INSTRUCTIONS***
FIREFIGHTERS SHOULD WEAR POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS(FULL FACE-PIECE TYPE).
DRY CHEMICAL,CARBON DIOXIDE,FOAM OR WATER

PRODUCT: SLIMICIDE C41

-----SECTION 7-----------SPECIAL PROTECTIVE EQUIPMENT----------------

VENTILATION PROTECTION***
  ADEQUATE VENTILATION TO MAINTAIN AIR CONTAMINANTS BELOW EXPOSURE LIMITS
RECOMMENDED RESPIRATORY PROTECTION***
  IF VENTILATION IS INADEQUATE OR SIGNIFICANT PRODUCT EXPOSURE IS LIKELY,
  USE RESPIRATOR WITH ORGANIC VAPOR,ACID GASSES AND DUST/MIST
  CARTRIDGES.FOLLOW MANUFACTURERS GUIDELINES FOR VAPORS WITH POOR WARNING
  PROPERTIES
RECOMMENDED SKIN PROTECTION***
  GAUNTLET-TYPE NEOPRENE GLOVES,CHEMICAL RESISTANT APRON
  REPLACE AS NECESSARY
RECOMMENDED EYE PROTECTION***
  SPLASH PROOF CHEMICAL GOGGLES.FACE SHIELD

-----SECTION 8-----------STORAGE AND HANDLING PRECAUTIONS-------------

STORAGE INSTRUCTIONS***
  KEEP CONTAINER CLOSED
  KEEP AWAY FROM FLAMES OR SPARKS.GROUND DRUMS DURING FILLING OR
  DISCHARGE OPERATIONS
HANDLING INSTRUCTIONS***
  IMMEDIATELY REMOVE CONTAMINATED CLOTHING,WASH BEFORE REUSE
  COMBUSTIBLE

-----SECTION 9-----------FEDERAL REGULATIONS--------------------------

FIFRA(40CFR):EPA REG.NO. 3876-   127
OSHA(29CFR)-FOR RESPIRATORY PROTECTION USE PROPERLY FITTED MSHA/NIOSH
  APPROVED RESPIRATORY EQUIPMENT WITHIN USE LIMITATIONS.OTHERWISE,USE SUPPLIED
  AIR APPARATUS.
CWA(40CFR)REPORTABLE QUANTITY: AS IS PRODUCT (HAZARDOUS SUBSTANCE)
  TREAT AS OIL SPILL
RCRA(40CFR): IF DISCARDED,THIS MATERIAL BEARS RW1# NOT APPLICABLE
DOT(49CFR)CLASSIFICATION: COMBUSTIBLE
NFPA/HMIS : HEALTH - 2 ; FIRE - 1 ; REACTIVITY - 0 ; SPECIAL - NONE

****

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HAROLD M. HERSH
ENVIRONMENTAL INFORMATION COORDINATOR

Dangerous Properties of Industrial Materials

Fifth Edition

N. IRVING SAX

Assisted by:

Marilyn C. Bracken/Robert D. Bruce/William F. Durham/Benjamin Feiner/
Edward G. Fitzgerald/Joseph J. Fitzgerald/Barbara J. Goldsmith/John H. Harley/
Robert Herrick/Richard J. Lewis/James R. Mahoney/John F. Schmutz/
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VNR VAN NOSTRAND REINHOLD COMPANY
NEW YORK CINCINNATI ATLANTA DALLAS SAN FRANCISCO
LONDON TORONTO MELBOURNE

SODIUM CHLORIDE. Syns: *salt, halite, sea salt.* Colorless, transparent crystals or white crystalline powder. NaCl, mw: 58.45, mp: 801°, bp: 1413°, d: 2.165, vap. press: 1 mm @ 865°.

Acute tox data: Oral LD_{50} (rat) = 3000 mg/kg; ip LD_{50} (mice) = 2602 mg/kg; sc LD_{LO} (rat) = 3500 mg/kg. [*3*] In a human TD_{LO} = 8200 mg/kg for 23 days ⟶ blood pressure problems.

THR = MOD via oral, ip and sc routes. An exper teratogen via pa routes. [*3*] When bulk sodium chloride is heated to high temp., a vapor is emitted which is irr, particularly to the eyes. Ingestion of large amounts of sodium chloride can cause irr of the stomach. Improper use of salt tablets may produce this effect. A substance which migrates to food from packaging materials. [*109*] Violent reaction with BrF_3, Li. [*19*]

KEROSENE. Syn: *fuel oil # 1.* A pale yellow to water-white oily liquid. A mixture of petroleum hydrocarbons, chiefly of the methane series, having 10–16 atoms of C. bp: 175°–325°, ulc: 40, flash p: 100°–165°F (CC), d: 0.80 to <1.0, lel = 0.7%, uel = 5.0%, autoign. temp.: 410°F, vap. d: 4.5.

Acute tox data: Oral LD_{50} (rat or rabbit) = 28 g/kg; [*2*] iv LD_{50} (rabbit) = 180 mg/kg. [*3*]

THR = HIGH via iv and VERY LOW via oral routes. Inhal of HIGH conc of vapor can cause headache and stupor. Ingestion causes irr of the stomach and intestines with nausea and vomiting. Aspiration of vomitus can cause serious pneumonitis, particularly in young children. It is a susp carc. [*14*] See mineral oils.

Fire Hazard: Mod, when exposed to heat or flame; can react with oxidizing materials.

Explosion Hazard: Mod, when exposed to heat or flame.

To Fight Fire: Foam, CO_2, dry chemical.

APPENDIX B

APPENDIX B

NEW MEXICO STATE ENGINEER WELL RECORDS AND GCL WELL LOGS FROM DRILLING PROGRAM

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Western Coal Co. Owner's Well No. GT-1

Street or Post Office Address P.O. Box 1026

City and State Albuquerque, New Mexico 87103

Well was drilled under Permit No. SJ-971-Explore-1 and is located in the:

a. ___ ¼ SW ¼ SE ¼ NW ¼ of Section 36 Township 30N Range 15W N.M.P.M.

b. Tract No. 605 of Map No. ___ of the ___
New Mexico Coal Lease #M-19340

c. Lot No ___ of Block No. ___ of the ___
Subdivision, recorded in San Juan County.

d. X= 2,100,399.4 feet, Y=342,253.6 feet, N.M. Coordinate System west Zone in the ___ Grant.

(B) Drilling Contractor Daniel's Drilling Co. License No. WD-488

Address Roswell, New Mexico

Drilling Began 4/4/78 Completed 4/12/78 Type tools Drag Bit Size of hole 5 5/8 in.

Elevation of land surface or top of well at well is 5297.3 ft. Total depth of well 532 ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well 101.5 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water Bearing Formation	Estimated Yield (gallons per minute)
524.1	532.0 bottom of hole	2.1	Pictured Cliffs Sandstone	N/A

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
4½ O.D.	8.7	welded N/A	surface	496	496	N/A	None	

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
0	496	5 5/8	20		pumped through pipe stem
300	496	4 1/2		18	pumped through pipe stem then reamed

Section 5. PLUGGING RECORD

Plugging Contractor ___

Address ___

Plugging Method ___

Date Well Plugged ___

Plugging approved by: ___

State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received August 13, 1980

Quad ___ FWL ___ FSL ___

SJ 971-Explore-1 Use Monitoring Location No. T30N.R15W.36.143

Depth in Feet From	To	Thickness in Feet	Color and Type of Material Encountered
0.0	11.0	11.0	Shale, tan, sandy
11.0	95.5	84.5	Shale, gray
95.5	95.9	0.4	Sandstone, gray, hard
95.9	110.8	14.9	Shale, gray
110.8	111.7	0.9	Sandstone, gray
111.7	143.0	31.3	Shale, gray
143.0	242.0	99.0	Sandstone, gray
242.0	255.0	13.0	Shale, gray
255.0	273.0	18.0	Sandstone, gray, hard
273.0	319.0	46.0	Sandstone, gray
319.0	355.4	36.4	Shale, gray
FRUITLAND 355.4	356.2	0.8	Coal
356.2	376.0	19.8	Shale, gray
376.0	386.0	10.0	Sandstone, gray
386.0	411.0	25.0	Shale, gray
411.0	418.6	7.6	Sandstone, gray
418.6	424.4	5.8	Coal
424.4	480.0	55.6	Shale, gray
480.0	483.6	3.6	Shale, gray, hard
483.6	484.0	0.4	Core loss
484.0	492.4	8.4	Shale, gray, hard
492.4	492.5	0.1	Core loss
492.5	495.8	3.3	Shale, gray, hard
495.8	498.95	3.15	Coal
498.95	499.25	0.3	Shale, carbonaceous
499.25	499.85	0.6	Coal

Section 7. REMARKS AND ADDITIONAL INFORMATION

524 532 PICTURED CLIFFS SS

TD 532

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above ... hole

Driller

From	To	in Feet	
499.85	500.80	0.95	Shale, black, hard
500.80	504.2	3.4	Coal
504.2	504.7	0.5	Shale, black, hard, carbonaceous
504.7	506.4	1.7	Coal
506.4	506.8	0.4	Shale, black, hard, with coal
506.8	511.2	4.4	Coal
511.2	511.3	0.1	Shale, light tan, hard
FRUITLAND 511.3	517.2	5.9	Coal
PICTURED CLIFFS 517.2	518.3	1.1	Shale, gray, hard
518.3	522.0	3.7	Siltstone, gray, very hard
522.0	524.1	2.1	Shale, gray with sandstone
524.1	532.0	7.9	Sandstone, gray with shale
532.0	--		T.D.

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above [illegible] hole

Driller

[illegible]

STATE ENGINEER OFFICE

WELL RECORD

[illegible] 11 25

Section 1. GENERAL INFORMATION

[illegible] ENGINEER OFFIC

(A) Owner of well David P. [illegible] Owner's Well No. S J-291

Street or Post Office Address Box 774

City and State Kirkland, N.M. 87417

Well was drilled under Permit No. S J-291 and is located in the:

a. E ½ ¼ NW ¼ NE ¼ ¼ of Section 12 Township 29 Range 15 N.M.P.M.

b. Tract No. ______ of Map No. ______ of the ______

c. Lot No. ______ of Block No. ______ of the ______
Subdivision, recorded in ______ County

d. X= ______ feet, Y= ______ feet, N.M. Coordinate System ______ Zone in the ______ Grant.

(B) Drilling Contractor Loon(Shorty)Thompson License No. W.D. 527

Address P.O. Box 1651 Farmington, N.M. 87401

Drilling Began 8/4/77 Completed 8/11/77 Type tools Cable tool Size of hole 6 in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well ______ ft.

Completed well is [X] shallow [ ] artesian. Depth to water upon completion of well 110 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
100	110	10	Gravel	15

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6	19	welded			110	None	None	

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 5. PLUGGING RECORD

Plugging Contractor ______
Address ______
Plugging Method ______
Date Well Plugged ______
Plugging approved by ______

State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

Date Received 8/23/77 FOR USE OF STATE ENGINEER ONLY

Quad ______ FWL ______ FSL ______

File No. SJ-291 Use Dom. Location No. 29N.15W.12 210 San Juan Co.

From	To	in Feet	Color and Type of Material Encountered
0	~~111~~ 80	80	~~XXX~~ Sand
80	100	20	Blue Shale
100	110	10	Gravel

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Dale Dalley Owner's Well No. 1
Street or Post Office Address PO Box 1347
City and State Kirtland, N.M. 87417

Well was drilled under Permit No. SJ1883 and is located in the:

a. W1/2 ¼ SW 1/4 NE 1/4 ¼ of Section 6 Township 29 N Range 14W N.M.P.M.
7 3 2

b. Tract No. ______ of Map No. ______ of the ______

c. Lot No. ______ of Block No. ______ of the ______
Subdivision, recorded in San Juan County.

d. X= ______ feet, Y= ______ feet, N.M. Coordinate System ______ Zone in the ______ Grant.

(B) Drilling Contractor D.W. Elliott & Sons License No. WD-0910

Address PO Box 485 Aztec, NM 87410

Drilling Began 9-1-84 Completed 9-5-84 Type tools Cable Size of hole 6 5/8 in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well 75 ft.

Completed well is ☑ shallow ☐ artesian. Depth to water upon completion of well 30 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
0	75	75	Sand & Gravel	12

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6 5/8	21	Weld	0	75	75	None	55	65
5 Plastic casing			0	75			40	75

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

84 SEP 18 AM 11:20
STATE ENGINEER OFFICE
DISTRICT I
ALBUQUERQUE, N. MEX

Section 5. PLUGGING RECORD

Plugging Contractor ______
Address ______
Plugging Method ______
Date Well Plugged ______
Plugging approved by:

______
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received 9/18/84

Quad ______ FWL ______ FSL ______

File No. SJ-1883 Use Dom Location No. 29N.14W.6.W½SW¼NE¼ (SJ

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	35	35	Brown Sand
35	65	30	Gravel (water)
65	75	10	Shell

Section 7. REMARKS AND ADDITIONAL INFORMATION

Drilled [illegible]/58 Steel casing & lined with 5 plastic & gravel packed

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

David W. Elliott
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Paul Hansen Owner's Well No.
Street or Post Office Address P. O. Box 822
City and State Kirtland, New Mexico 87413

Well was drilled under Permit No. SJ-1407 and is located in the:

a. SW ¼ SW ¼ SW ¼ ¼ of Section 6 Township 29N Range 14W N.M.P.M.

b. Tract No. of Map No. of the

c. Lot No. of Block No. of the
Subdivision, recorded in County.

d. X= feet, Y= feet, N.M. Coordinate System Zone in the Grant.

(B) Drilling Contractor John Pattics, Johnnie's Lucky "7" Drilling License No. WD-777

Address P. O. Box 651, Tucumcari, NM 88401

Drilling Began 7-1-81 Completed 7-5-81 Type tools Cable Size of hole 6 in.

Elevation of land surface or at well is ft. Total depth of well 70 ft.

Completed well is [X] shallow [ ] artesian. Depth to water upon completion of well 52 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
65	68	3	brown sand & gravel	2

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
5			0	68	68	n/a	none	

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

82 JUN 9 AM 8:29
STATE ENGINEER
ALBUQUERQUE, N. MEX.

Section 5. PLUGGING RECORD

Plugging Contractor
Address
Plugging Method
Date Well Plugged
Plugging approved by:

State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received

Quad FWL 29N.14W.6.333

File No. SJ-1407 Use Dom Location No. San Juan

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	5	5	brown sand
6	13	8	white sandy clay
14	48	35	reddish brown sand
49	68	20	brown sand & gravel
69	70	2	grey sandy shale

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Revised June 1972

STATE ENGINEER OFFICE
WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Gorden A. Helmer Owner's Well No. 1
Street or Post Office Address Box 1073
City and State Kirtland, N. M. 87417

Well was drilled under Permit No. S-J 1568 and is located in the:

a. ___ ¼ NW ¼ NW ¼ ___ ¼ of Section 7 Township 29N Range 14W N.M.P.M.

b. Tract No. ___ of Map No. ___ of the ___

c. Lot No. 8 of Block No. ___ of the Vista Grande
Subdivision, recorded in San Juan County.

d. X= ___ feet, Y= ___ feet, N.M. Coordinate System ___ Zone in the ___ Grant.

(B) Drilling Contractor C. & C. Liquid Removers License No. WD 809

Address P. O. Box 663, Bloomfield, N. M. 87413-0663

Drilling Began 5-23-82 Completed 5-24-82 Type tools Rotary Size of hole 6 5/8 in.

Elevation of land surface or ___ at well is ___ ft. Total depth of well 72 ft.

Completed well is ☑ shallow ☐ artesian. Depth to water upon completion of well 30 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
60'	70'	10'	Grey Shale & Sandy Gravel	12 gal per min

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6"	15 lb.	welded	9	72'	72'	Standard double Drive Shoe	60'	69'

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

82 JUN 7 AM 8:23
STATE ENGINEER OFFICE
ALBUQUERQUE, N. MEX.

JUN 28 AM 10:
STATE ENGINEER
SANTA FE

Section 5. PLUGGING RECORD

Plugging Contractor ___
Address ___
Plugging Method ___
Date Well Plugged ___
Plugging approved by:

___
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received 6/2/82

Quad ___ FWL ___ FSL ___

File No. SJ-1568 Use Dom Location No. 29N.14W.7 110

Ats

San Juan County

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	24'	24'	Sand
24'	30'	6'	Brown Clay
30'	35'	5'	Gravel
35'	50'	15'	Grey Clay
50'	60'	10'	Grey Shale
60'	70'	10'	Grey Shale & Sandy Gravel
70'	72'	2'	Grey Shale

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

SJ 12 51

Section 1. GENERAL INFORMATION

(A) Owner of well Lowell Harris — Owner's Well No. SJ-451
Street or Post Office Address
City and State Farmington, N. M. 87401

Well was drilled under Permit No. SJ 451 and is located in the:

a. SE ¼ NW ¼ SE ¼ of Section 7 Township 29N Range 14W N.M.P.M.

b. Tract No. ______ of Map No. ______ of the ______

c. Lot No. ______ of Block No. ______ of the ______
Subdivision, recorded in San Juan County.

d. X= ______ feet, Y= ______ feet, N.M. Coordinate System ______ Zone in the ______ Grant.

(B) Drilling Contractor [illegible] License No. WD 527

Address [illegible] Farmington, N.M. 87401

Drilling Began 2/2/77 Completed 2/2/77 Type tools Cable tool Size of hole ___ in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well 6 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 24 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
[illegible]	31	7	Gravel	40

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6	19	Welded			32	None	None	

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

STATE ENGINEER-ALBUQUERQUE, N. M.
RECEIVED
SEP 20 1977
A.M. P.M.
7,8,9,10,11,12,1,2,3,4,5,6

Section 5. PLUGGING RECORD

Plugging Contractor
Address
Plugging Method
Date Well Plugged
Plugging approved by

State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received 9/15/77

Quad ______ FWL ______ FSL ______

File No. SJ-451 Use Dom. Location No. 29N.14W.7 413

San Juan Co.

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	20	20	Sand
20	32	12	Boulders
32	39	7	Gravel

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections [illegible] Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. Whe[illegible] [illegible] record, only Section 1(a) and Section 5 need be completed.

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well ______ Owner's Well No. ______
Street or Post Office Address ______
City and State ______

Well was drilled under Permit No. ______ and is located in the:

a. ______ ¼ ______ ¼ ______ ¼ ______ ¼ of Section ______ Township ______ Range ______ N.M.P.M.

b. Tract No. ______ of Map No. ______ of the ______

c. Lot No. ______ of Block No. ______ of the ______
Subdivision, recorded in ______ County.

d. X= ______ feet, Y= ______ feet, N.M. Coordinate System ______ Zone in the ______ Grant.

(B) Drilling Contractor ______ License No. ______

Address ______

Drilling Began ______ Completed ______ Type tools ______ Size of hole ______ in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well ______ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well ______ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
[illegible]	[illegible]	[illegible]	[illegible]	

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
7	[illegible]			[illegible]				
15	[illegible]							
5	[illegible]		[illegible]	[illegible]			[illegible]	80

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

ENGINEER OFFICE 87501 11 52

Section 5. PLUGGING RECORD

Plugging Contractor ______
Address ______
Plugging Method ______
Date Well Plugged ______
Plugging approved by:

______
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received Aug. 29, 1977

Quad ______ FWL ______ FSL ______

File No. SJ-376 Use Dom. Location No. 29N.14E. 8 444

Section 6. LOG OF HOLE

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	Blue water sand

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

[illegible signature]
Driller

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Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

[illegible] AM 11 43

Section 1. GENERAL INFORMATION

(A) Owner of well Jack Swearingen Owner's Well No. ____
Street or Post Office Address Box 305, STATE ENGINEER OFFICE
City and State Kirtland, New Mexico SANTA FE, N.M. 87501

Well was drilled under Permit No. SJ226 and is located in the:

a. ____ ¼ [illegible] ¼ [illegible] ¼ [illegible] ¼ of Section 7 Township 29[illegible] Range 14. [illegible] N.M.P.M.

b. Tract No. ____ of Map No. ____ of the ____

c. Lot No. ____ of Block No. ____ of the ____
Subdivision, recorded in San Juan County.

d. X= ____ feet, Y= ____ feet, N.M. Coordinate System ____ Zone in the ____ Grant.

(B) Drilling Contractor [illegible] License No. [illegible]

Address Rt. 3, Box 934, Flora Vista, New Mexico, [illegible]

Drilling Began 5/[illegible] 77 Completed [illegible]/77 Type tools cable Size of hole 6 5/8 in.

Elevation of land surface or ____ at well is [illegible] ft. Total depth of well [illegible] ft.

Completed well is ☐ shallow ☒ artesian. Depth to water upon completion of well [illegible] ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
[illegible]	1[illegible]	1[illegible]	[illegible] Water Sand	5

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor ____
Address ____
Plugging Method ____
Date Well Plugged ____
Plugging approved by:

State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received May 31, 1977

Quad ____ FWL ____ FSL ____

File No. SJ-226 Use Dom. Location No. 29N.14W.7 113 San Juan Co.

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	[illegible]	[illegible]	Over Burden
[illegible]	[illegible]	[illegible]	[illegible]

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

[illegible]
Driller

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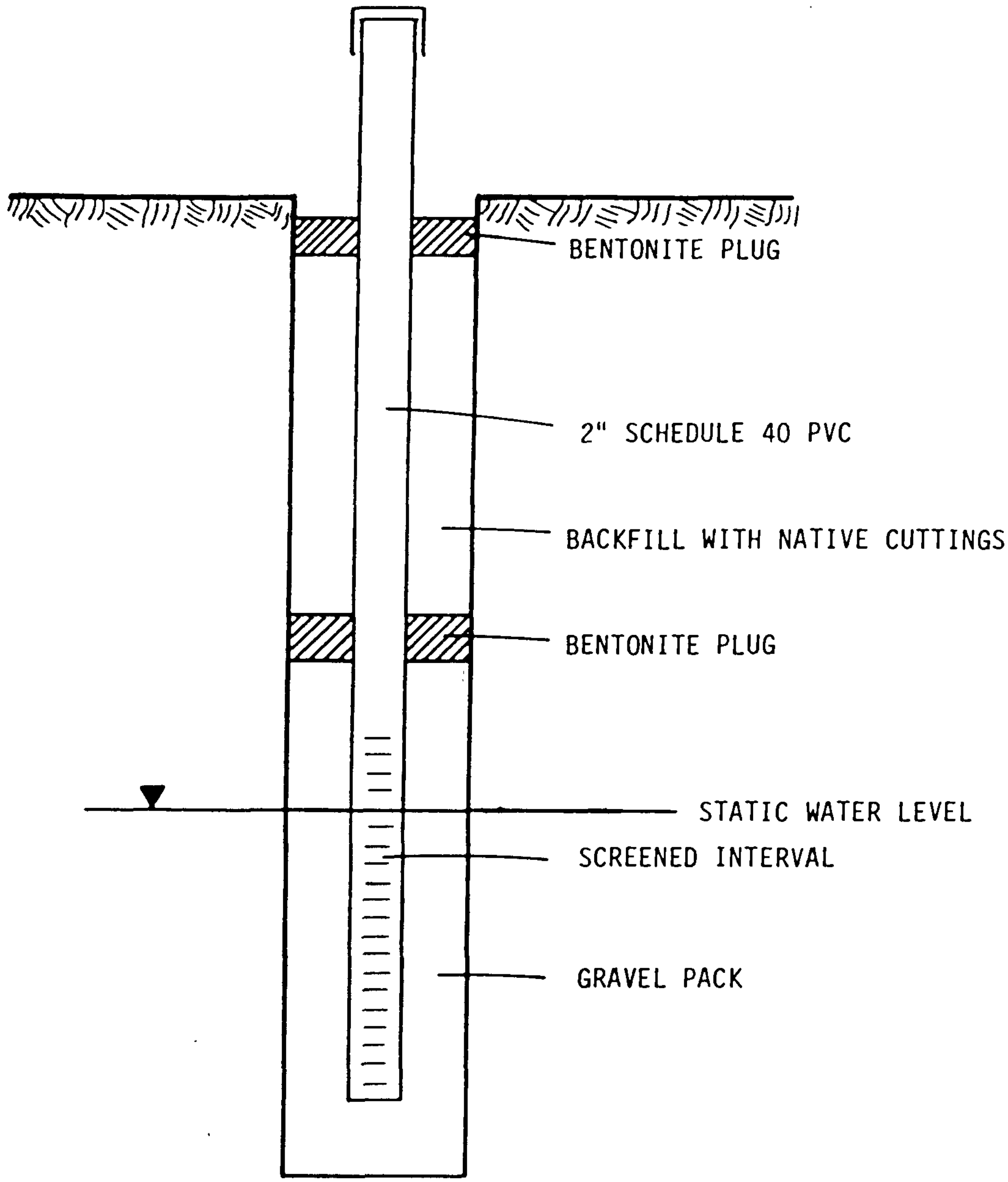
LOGS OF GCL BOREHOLES

BOREHOLES AND WELLS LOCATED ON PLATES 6 AND 7

LOGS OF GCL BOREHOLES



Typical Piezometer Installed at EPNG San Juan River Plant

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Client El Paso Natural Gas Co. Well Number MW-1

___ ¼ ___ ¼ ___ ¼ ___ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-17-85 Completion Date 12-18-85

Logs Run Lithology Logged By Selke

Elevation ______ Spud In (Fm.) ______

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

Depth	RUN	FROM	TO	BLOW COUNTS	REMARKS
0					0-20.0 buff to brn, fn-med gr sand
	1	0	5.0		
5	2	5.0	10.0		
10	3	10.0	12.5	15-21-22-23	(2' core)
	3	12.5	15.0		
15	4	15.0	20.0		
20	5	20.0	22.5	10-18-26-23	(2' core) ~20.0-26.0 very coarse gravel & cobbles
					auger refusal at 22.5'
					air rotary refusal at 22.5'
25					mud rotary refusal at 26.0'
					* no moisture encountered in MW-1
30					
35					
40					
45					

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page 1 of 1

Client: El Paso Natural Gas Co. Well Number: P-2

____ ¼ ____ ¼ ____ ¼ ____ ¼ S 1 T 29N R 15W State: New Mexico

County: San Juan Contractor: Western Technologies, Inc.

Spud Date: 12-17-85 Completion Date: 12-17-85

Logs Run: Lithology Logged By: Selke

Elevation: ____ Spud In (Fm.): ____

Remarks: Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

RUN	FROM	TO	BLOW COUNTS	REMARKS
1	0	2.5	8-8-9-14-21	0-5.0 buff to brn, fn-med gr clayey sand
1	2.5	5.0	25-17-12-16-14	
2	5.0	7.5	5-6-14-10-10	5.0-7.5 brn, med-co gr sand & gravel
2	7.5	10.0	9-10-14-16-16	7.5-25.0 buff to brn, fn-med gr sand w/ local increases in clay content
3	10.0	12.5	6-5-9-5-14	
3	12.5	15.0	5-6-8-10-15	(13.0 saturated)
4	15.0	17.5	4-8-12-12-20	
4	17.5	20.0	—	water
5	20.0	25.0	—	

Depth: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45

Litho | Recov

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page 1 of 1

Client El Paso Natural Gas Co. Well Number P-3

___ ¼ ___ ¼ ___ ¼ ___ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-16-85 Completion Date 12-16-85

Logs Run Lithology Logged By Selke

Elevation ______ Spud In (Fm.) ______

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

RUN	FROM	TO	BLOW COUNTS	REMARKS
1	0	2.5	4-5-4-8-14	0-10.0 brn, fn-med gr sand
1	2.5	5.0	10-11-17-21-28	
2	5.0	7.5	13-12-13-28-41	
2	7.5	10.0	38-49-42-62-61	
3	10.0	12.5	28-38-95-104(3")	10.0-12.5 sand & gravel 12.5-14.0 large cobbles (up to 6")
3	12.5	14.0	100(3")	auger refusal at 14.0

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page 1 of 1

Client El Paso Natural Gas Well Number Well Point

___ ¼ ___ ¼ ___ ¼ ___ ¼ S___ T___ R___ State N.M

County San Juan Contractor Geoscience Consultants

Spud Date 2-25-86 Completion Date 2-25-86

Logs Run N/A Logged By N/A

Elevation ___ Spud In (Fm.) ___

Remarks Well point in Steven's arroyo, TD FROM TOC 9'10", Screened interval 4'-9'.

Depth | Litho | recov

5'

WATER LEVEL 6'7" 2-26-86

TD 9'

10'

Conductance 10,000 umhos/cm (uncalibrated)

labeled as number 4 on Plates

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page 1 of 1

Client El Paso Natural Gas Co. Well Number P-5

¼ ¼ ¼ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-16-85 Completion Date 12-16-85

Logs Run Lithology Logged By Selke

Elevation Spud In (Fm.)

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

Depth	RUN	FROM	TO	BLOW COUNTS	REMARKS
0	1	0	2.5	9-9-9-12-8	0-25.0 buff to brn silt + fn-med gr sand w/ local areas of increased clay content
	1	2.5	5.0	6-5-8-10-11	
5					
	2	5.0	7.5	6-8-12-18-25	
	2	7.5	10.0	10-10-10-14-15	
10	3	10.0	12.5	6-8-10-10-11	
	3	12.5	15.0	5-7-8-10-11	(13.0 saturated)
15					
	4	15.0	17.5	5-6-9-9-13	
	4	17.5	20.0	6-9-9-16-21	
20					
	5	20.0	25.0	——	water
25					
30					
35					
40					
45					

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page 1 of 1

Client El Paso Natural Gas Co. Well Number P-6

___ ¼ ___ ¼ ___ ¼ ___ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-18-85 Completion Date 12-18-85

Logs Run Lithology Logged By Selke

Elevation ___ Spud In (Fm.) ___

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

Depth	RUN	FROM	TO	BLOW COUNTS	REMARKS
0					0-12.5 fn-med gr sand, mod yelsh brn 10 YR 5/4 to grsh orng 10 YR 7/4 where saturated
	1	0	5.0	—	
5					(saturated)
	2	5.0	10.0	—	
10					
	3	10.0	15.0	—	12.5-15.0 sandy clay?, dusky brn 5 YR 2/2
15					
20					
25					
30					
35					
40					
45					

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Client El Paso Natural Gas Co. Well Number P-7

___ ¼ ___ ¼ ___ ¼ ___ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-19-85 Completion Date 12-19-85

Logs Run Lithology Logged By Selke

Elevation ______ Spud In (Fm.) ______

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings. 2' split spoon cores every 5'

Depth | Litho | Recov

RUN	FROM	TO	BLOW COUNTS	REMARKS
1	0	2.5	1-0-1-1	0-17.5 silty sandy clay, pale yelsh orng 10YR 8/6 to lt olive gry (5Y 5/2) with local black intervals that are slightly petroliferous (most prominant from 5.0-12.5')
1	2.5	5.0		
2	5.0	7.5	2-11-13-24	
2	7.5	10.0		
3	10.0	12.5	14-21-30-50(5¾)	
3	12.5	15.0		
4	15.0	18.5	—	17.5-18.5 lt gry sandstone lense? auger refusal at 18.5'

0 5 10 15 20 25 30 35 40 45

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page 1 of 1

Client El Paso Natural Gas Co. Well Number P-8

¼ ¼ ¼ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-17-85 Completion Date 12-17-85

Logs Run Lithology Logged By Selke

Elevation Spud In (Fm.)

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

Depth | Litho | recov.

RUN	FROM	TO	BLOW COUNTS	REMARKS
1	0	2.5	5-4-5-4-4	0-2.5 Co. clayey sand, mod ylsh brn 10YR5/4 v. abd salt x^ls (gypsum, anhydrite, NaCl?
1	2.5	5.0	4-6-8-14-23	2.5 10.0 silty clay, dk ylsh brn (10YR 4/2) to mod brn 5YR 4/4 in streaks
2	5.0	7.5	5-15-21-28-35	(no core 2.5-5.0)
2	7.5	10.0	7-18-25-30-53	
3	10.0	12.5	26-88-47-91-53	10.0-22.5 fn.gr. clayey sand, ylsh gry 5Y7/2
3	12.5	15.0	——	(12.5-17.5 saturated?)
4	15.0	17.5	50(3½")	
4	17.5	20.0	——	
5	20.0	25.0	——	22.5-30.0 sandy clay (weathered shale) mod lt gry N5 to olive gry 5Y4/1
				(~23.0 saturated)
6	25.0	30.0	——	(25.0-30.0 soupy mud)

0 5 10 15 20 25 30 35 40 45

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WELL LOGGING FORM

Page 1 of 1

Client El Paso Natural Gas Co. Well Number P-9

___ ¼ ___ ¼ ___ ¼ ___ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-18-85 Completion Date 12-18-85

Logs Run Lithology Logged By Selke

Elevation ______ Spud In (Fm.) ______

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

Depth	RUN	FROM	TO	BLOW COUNTS	REMARKS
0					0-10.0 brn clayey sand to sandy clay
	1	0	5.0	—	
5					
	2	5.0	10.0	—	
10					10.0-15.0 lt gry, fn-med gr, semi-consolidated sand increasing in clay content w/ depth
	3	10.0	15.0	—	
15					(saturated)
	4	15.0	20.0	—	15.0-30.0 brn, silty clay
20					(soupy mud ~ 20.0)
	5	20.0	25.0	—	
25					
	6	25.0	30.0	—	
30					
35					
40					
45					

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WELL LOGGING FORM

Page 1 of 1

Client: El Paso Natural Gas Co. Well Number: P-10

___ ¼ ___ ¼ ___ ¼ ___ ¼ S 1 T 29N R 15W State New Mexico

County: San Juan Contractor: Western Technologies, Inc.

Spud Date: 12-19-85 Completion Date: 12-19-85

Logs Run: Lithology Logged By: Selke

Elevation: ______ Spud In (Fm.): ______

Remarks: Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

Depth	Litho	Recov	RUN	FROM	TO	BLOW COUNTS	REMARKS
0							0-2.5 lt brn, f-gr sand w/minor clay
			1	0	5.0	—	2.5-5.0 gray fn gr sand - extremely petroliferous
5			2	5.0	10.0	—	5.0-15.0 lt gy, fn gr, semi-consolidated sand increasing in clay content w/depth
10							(~8.0 petroliferous soupy water)
			3	10.0	15.0	—	
15							
20							
25							
30							
35							
40							
45							

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Client El Paso Natural Gas Co. Well Number P-11

___ ¼ ___ ¼ ___ ¼ ___ ¼ S 1 T 29N R 15W State New Mexico

County San Juan Contractor Western Technologies, Inc.

Spud Date 12-18-85 Completion Date 12-19-85

Logs Run Lithology Logged By Selke

Elevation ______ Spud In (Fm.) ______

Remarks Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings. Flush joint well casing

Depth	RUN	FROM	TO	BLOW COUNTS	REMARKS
0					0-10.0 brn, fn-med gr sand & clayey sand
	1	0	5.0	—	
5	2	5.0	10.0	—	
10					10.0-25.0 lt gry, fn gr. semi-consolidated sand - increasing in brnsh color & clay content w/depth
	3	10.0	15.0	—	
15	4	15.0	20.0	—	
20	5	20.0	25.0	—	
25	6	25.0	30.0	—	25.0-40.0 brn, sandy clay
30	7	30.0	35.0	—	(32.5-40.0 soupy mud)
35	8	35.0	40.0	—	
40					
45					

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page 1 of 1

Client: El Paso Natural Gas Co. Well Number: P-12

¼ ¼ ¼ ¼ S 1 T 29N R 15W State: New Mexico

County: San Juan Contractor: Western Technologies, Inc.

Spud Date: 12-19-85 Completion Date: 12-19-85

Logs Run: Lithology Logged By: Selke

Elevation: Spud In (Fm.):

Remarks: Drilled with hollow-stem auger and logged from split spoon core and/or auger cuttings.

RUN	FROM	TO	BLOW COUNTS	REMARKS
				0-15.0 v. fn-fn gr, buff to lt brn sand
1	0	5.0	—	
2	5.0	10.0	—	
3	10.0	15.0	—	
4	15.0	20.0	—	15.0-22.5 fn gr, buff to lt brn sand w/ minor gravel
5	20.0	25.0	—	22.5-25.0 gravel & saturated sand
				25.0-30.0 ? black soupy material w/ sour petroliferous odor - probably sand or clayey sand or sandy clay???
6	25.0	30.0	—	

Depth: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45

Litho | recov

APPENDIX C

APPENDIX C

SOIL CHARACTERISTICS NEAR SAN JUAN RIVER PLANT

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
Ap------------------ Apishapa	0-5	30-40	0.2-0.6	0.14-0.18	7.4-8.4	2-16	Moderate	0.17	5	4	1-2
	5-81	35-60	0.06-0.2	0.10-0.14	7.9-9.0	4-16	High-------	0.17			
As------------------ Apishapa	0-6	40-60	0.06-0.2	0.10-0.14	7.4-8.4	2-16	High-------	0.17	5	4	1-2
	6-81	35-60	0.06-0.2	0.10-0.14	7.9-9.0	4-16	High-------	0.17			
AT*:											
Atrac--------------	0-3	18-27	0.2-2.0	0.13-0.19	7.4-7.8	<2	Low--------	0.32	5	6	---
	3-44	18-35	0.6-2.0	0.13-0.19	7.4-9.0	<2	Moderate	0.17			
	44-60	15-30	0.6-6.0	0.08-0.17	7.4-9.0	<2	Low--------	0.15			
Florita------------	0-4	15-20	2.0-6.0	0.08-0.13	7.4-7.8	<2	Low--------	0.24	5	3	---
	4-12	3-8	2.0-6.0	0.03-0.05	7.4-7.8	<2	Low--------	0.10			
	12-43	10-18	2.0-20	0.08-0.13	7.4-7.8	<2	Low--------	0.17			
	43-60	3-8	>20	0.03-0.05	7.4-7.8	<2	Low--------	0.10			
Travessilla--------	0-2	15-20	2.0-6.0	0.08-0.13	7.4-8.4	<2	Low--------	0.17	1	3	---
	2-12	15-27	2.0-6.0	0.08-0.17	7.4-8.4	<2	Low--------	0.20			
	12	---	---	---	---	<2	-----------	----			
Av------------------ Avalon	0-14	12-17	2.0-6.0	0.11-0.13	7.9-8.4	2-8	Low--------	0.37	3	3	.5-.8
	14-53	20-30	0.6-2.0	0.15-0.17	7.9-8.4	2-8	Low--------	0.43			
	53-72	15-25	2.0-6.0	0.10-0.12	7.9-8.4	2-8	Low--------	0.32			
Ax------------------ Avalon	0-2	12-17	2.0-6.0	0.11-0.13	7.9-8.4	2-8	Low--------	0.37	3	3	.5-.8
	2-80	20-30	0.6-2.0	0.15-0.17	7.9-8.4	2-8	Low--------	0.43			
Ay------------------ Avalon	0-18	15-25	0.6-2.0	0.16-0.18	7.9-8.4	2-8	Low--------	0.43	3	4L	.5-.8
	18-60	20-30	0.6-2.0	0.15-0.17	7.9-8.4	2-8	Low--------	0.43			
AZ*:											
Avalon-------------	0-3	12-17	2.0-6.0	0.11-0.13	7.9-8.4	2-8	Low--------	0.37	3	3	---
	3-60	20-30	0.6-2.0	0.15-0.17	7.9-8.4	2-8	Low--------	0.43			
Sheppard-----------	0-3	5-15	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.15	5	2	---
	3-60	5-10	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.15			
Shiprock-----------	0-3	10-20	2.0-6.0	0.09-0.12	7.4-8.4	<2	Low--------	0.24	5	3	.5-.6
	3-60	10-18	2.0-6.0	0.09-0.12	7.4-9.0	<4	Low--------	0.24			
BA*. Badland											
BB*:											
Badland.											
Monierco-----------	0-2	10-15	2.0-6.0	0.08-0.13	7.4-8.4	<2	Low--------	0.24	1	3	---
	2-14	18-35	0.2-0.6	0.13-0.19	7.4-9.0	<2	Moderate	0.32			
	14	---	---	---	---	---	-----------	----			
Rock outcrop.											
BC*:											
Badland.											
Rock outcrop.											
Persayo------------	0-2	27-35	0.2-0.6	0.15-0.19	7.9-9.0	<8	Moderate	0.37	1	4L	.5-1
	2-12	27-35	0.2-0.6	0.15-0.19	7.9-9.0	<8	Moderate	0.37			
	12	---	---	---	---	---	-----------	----			
Be------------------ Beebe	0-6	5-10	6.0-20	0.06-0.08	7.4-8.4	2-4	Low--------	0.20	5	2	.5-.8
	6-67	5-10	>20	0.03-0.08	7.4-8.4	2-4	Low--------	0.17			
	67-81	5-10	>20	0.02-0.04	7.4-8.4	2-4	Low--------	0.15			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
Bf------------------ Beebe Variant	0-8	5-15	6.0-20	0.06-0.12	7.4-8.4	2-4	Low--------	0.20	5	2	.5-1
	8-67	5-10	6.0-20	0.05-0.08	7.4-8.4	2-4	Low--------	0.20			
	67-81	5-10	6.0-20	0.03-0.06	7.4-8.4	2-4	Low--------	0.15			
Bk------------------ Blackston	0-11	15-25	0.6-2.0	0.14-0.17	7.9-8.4	<2	Low--------	0.28	3	5	.5-1
	11-27	15-30	0.6-2.0	0.07-0.10	7.9-9.0	4-8	Low--------	0.10			
	27-80	0-5	6.0-20	0.03-0.06	7.9-8.4	4-8	Low--------	0.10			
Bm------------------ Blackston	0-9	15-25	0.6-2.0	0.14-0.17	7.9-8.4	<2	Low--------	0.28	3	5	.5-1
	9-25	15-30	0.6-2.0	0.07-0.10	7.9-9.0	4-8	Low--------	0.10			
	25-60	0-10	6.0-20	0.03-0.06	7.9-8.4	4-8	Low--------	0.10			
BP*:											
Blackston--------	0-12	15-25	0.6-2.0	0.14-0.17	7.9-8.4	<2	Low--------	0.28	3	5	.5-1
	12-30	15-30	0.6-2.0	0.07-0.10	7.9-9.0	4-8	Low--------	0.10			
	30-60	0-10	6.0-20	0.03-0.06	7.9-8.4	4-8	Low--------	0.10			
Farb-------------	0-7	15-20	2.0-6.0	0.08-0.13	7.4-8.4	<2	Low--------	0.32	1	3	---
	7-10	10-20	2.0-6.0	0.06-0.13	7.4-8.4	<2	Low--------	0.28			
	10	---	---	---	---	---	-----------	----			
BR*:											
Blancot----------	0-6	15-26	0.2-2.0	0.13-0.19	7.9-8.4	<2	Low--------	0.32	5	6	---
	6-60	20-35	0.6-2.0	0.13-0.19	7.9-9.0	<4	Moderate	0.28			
Fruitland--------	0-8	5-10	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.24	5	3	.6-.8
	8-60	5-18	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.28			
BT*:											
Blancot----------	0-2	15-26	0.2-2.0	0.13-0.19	7.9-8.4	<2	Low--------	0.32	5	6	---
	2-60	20-35	0.6-2.0	0.13-0.19	7.9-9.0	<4	Moderate	0.28			
Notal------------	0-3	28-35	0.2-0.6	0.15-0.19	7.9-9.0	4-8	Moderate	0.32	5	4L	---
	3-60	40-50	<0.06	0.13-0.19	7.9-9.0	4-8	High-------	0.43			
BU------------------ Buckle	0-5	18-27	0.6-2.0	0.13-0.19	7.4-8.4	<2	Low--------	0.37	5	6	---
	5-44	25-35	0.2-0.6	0.15-0.19	7.9-9.0	<2	Moderate	0.37			
	44-66	20-35	0.6-2.0	0.13-0.19	7.9-9.0	<2	Moderate	0.37			
Da------------------ Doak	0-6	15-27	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low--------	0.37	5	5	.5-.6
	6-60	25-35	0.2-0.6	0.15-0.18	7.4-9.0	2-4	Moderate	0.37			
Db------------------ Doak	0-4	15-27	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low--------	0.37	5	5	.5-.6
	4-60	25-35	0.2-0.6	0.15-0.18	7.4-9.0	2-4	Moderate	0.37			
Dc------------------ Doak	0-3	15-27	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low--------	0.37	5	5	.5-.6
	3-60	25-35	0.2-0.6	0.15-0.18	7.4-9.0	2-4	Moderate	0.37			
Dd------------------ Doak	0-5	27-30	0.2-0.6	0.15-0.18	7.4-8.4	<2	Moderate	0.32	5	6	.5-.6
	5-60	25-35	0.2-0.6	0.15-0.18	7.4-9.0	2-4	Moderate	0.37			
DH*:											
Doak-------------	0-5	15-27	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low--------	0.37	5	5	.5-.6
	5-69	25-35	0.2-0.6	0.15-0.18	7.4-9.0	2-4	Moderate	0.37			
Avalon-----------	0-14	20-27	0.6-2.0	0.16-0.18	7.9-8.4	2-8	Low--------	0.43	3	4L	---
	14-60	20-27	0.6-2.0	0.15-0.17	7.9-8.4	2-8	Low--------	0.43			
DS*:											
Doak-------------	0-3	15-27	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low--------	0.37	5	5	.5-.6
	3-60	25-35	0.2-0.6	0.15-0.18	7.4-9.0	2-4	Moderate	0.37			
Sheppard---------	0-3	5-10	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.15	5	2	---
	3-60	5-10	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.15			
Shiprock---------	0-3	10-20	2.0-6.0	0.09-0.12	7.4-8.4	<2	Low--------	0.24	5	3	.5-.6
	3-60	10-18	2.0-6.0	0.09-0.12	7.4-9.0	<4	Low--------	0.24			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
Du*:											
Doak------------	0-5	18-20	0.6-2.0	0.13-0.17	7.4-8.4	<2	Low--------	0.37	5	3	.5-.6
	5-19	18-35	0.2-0.6	0.13-0.19	7.4-9.0	<2	Moderate	0.32			
	19-60	18-35	0.2-0.6	0.13-0.19	7.9-9.0	2-4	Moderate	0.37			
Uffens----------	0-6	10-20	0.6-6.0	0.08-0.14	7.4-8.4	4-8	Low--------	0.20	1	3	---
	6-18	25-35	0.2-0.6	0.05-0.10	>7.8	>16	Moderate	0.32			
	18-60	20-30	0.2-0.6	0.05-0.10	>7.8	>16	Moderate	0.28			
Dw*:											
Doak------------	0-3	18-20	0.6-2.0	0.13-0.17	7.4-8.4	<2	Low--------	0.37	5	3	.5-.6
	3-15	18-35	0.2-0.6	0.13-0.19	7.4-9.0	<2	Moderate	0.32			
	15-60	18-35	0.2-0.6	0.13-0.19	7.9-9.0	2-4	Moderate	0.37			
Uffens----------	0-4	10-20	0.6-6.0	0.08-0.14	7.4-8.4	4-8	Low--------	0.20	1	3	---
	4-22	25-35	0.2-0.6	0.05-0.10	>7.8	>16	Moderate	0.32			
	22-60	20-30	0.2-0.6	0.05-0.10	>7.8	>16	Moderate	0.28			
DZ*. Dune land											
FA*:											
Farb------------	0-7	15-20	2.0-6.0	0.08-0.13	7.4-8.4	<2	Low--------	0.32	1	3	---
	7-10	10-20	2.0-6.0	0.06-0.13	7.4-8.4	<2	Low--------	0.28			
	10	---	---	---	---	---	----------	----			
Persayo---------	0-2	28-35	0.2-0.6	0.15-0.19	7.9-9.0	<8	Moderate	0.37	1	4L	.5-1
	2-15	28-35	0.2-0.6	0.15-0.19	7.9-9.0	<8	Moderate	0.37			
	15	---	---	---	---	---	----------	----			
Rock outcrop.											
FP*. Fluvaquents											
Fr--------------- Fruitland	0-7	5-10	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.24	5	3	.6-.8
	7-60	5-18	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.28			
Fs--------------- Fruitland	0-6	5-10	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.24	5	3	.6-.8
	6-60	5-18	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.28			
Ft--------------- Fruitland	0-6	10-18	2.0-6.0	0.08-0.13	7.4-8.4	2-4	Low--------	0.24	5	3	.5-.8
	6-60	10-20	2.0-6.0	0.08-0.13	7.4-8.4	2-4	Low--------	0.28			
Fu--------------- Fruitland	0-8	10-25	0.6-2.0	0.15-0.17	7.4-8.4	<4	Low--------	0.28	5	5	.6-.8
	8-60	5-18	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.28			
Fw--------------- Fruitland	0-3	10-25	0.6-2.0	0.15-0.17	7.4-8.4	<4	Low--------	0.28	5	5	.6-.8
	3-60	5-18	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.28			
FX*:											
Fruitland-------	0-4	5-10	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.24	5	3	.6-.8
	4-60	5-18	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.28			
Persayo---------	0-2	28-35	0.2-0.6	0.15-0.19	7.9-9.0	<8	Moderate	0.37	1	4L	.5-1
	2-18	18-35	0.2-0.6	0.15-0.19	7.9-9.0	<8	Moderate	0.37			
	18	---	---	---	---	---	----------	----			
Sheppard--------	0-4	5-10	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.15	5	2	---
	4-60	5-10	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.15			
Fy*:											
Fruitland-------	0-9	5-10	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.24	5	3	.6-.8
	9-60	5-18	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low--------	0.28			
Slickspots.											

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
Ga----------------- Garland	0-4	18-25	0.6-2.0	0.16-0.18	7.4-8.4	2-4	Low--------	0.32	4	6	.5-.8
	4-24	20-30	0.6-2.0	0.19-0.21	7.4-9.0	2-4	Moderate	0.28			
	24-60	5-15	>6.0	0.03-0.05	7.9-8.4	<2	Low--------	0.10			
Gr----------------- Green River	0-6	10-18	2.0-6.0	0.08-0.12	7.9-8.4	2-8	Low--------	0.24	5	3	.5-.8
	6-60	15-18	0.6-2.0	0.09-0.12	7.9-8.4	2-8	Low--------	0.28			
GY*: Gypsiorthids.											
Badland.											
Stumble-----------	0-8	0-10	6.0-20	0.06-0.08	7.9-8.4	<2	Low--------	0.17	5	2	---
	8-60	0-10	6.0-20	0.06-0.08	7.9-9.0	<4	Low--------	0.15			
HA*: Haplargids.											
Blackston---------	0-11	18-27	2.0-6.0	0.07-0.13	7.9-8.4	2-4	Low--------	0.17	1	5	---
	11-28	15-30	0.2-0.6	0.08-0.13	8.5-9.0	<2	Low--------	0.17			
	28-60	5-15	6.0-20	0.05-0.07	7.9-8.4	<2	Low--------	0.15			
Torriorthents.											
HU*: Huerfano----------	0-1	20-25	0.6-2.0	0.15-0.17	7.9-9.0	>4	Moderate	0.32	1	4L	---
	1-15	20-35	0.2-0.6	0.15-0.19	>7.8	>4	Moderate	0.32			
	15	---	---	---	---	---	-----------	-----			
Muff--------------	0-4	10-20	0.6-2.0	0.15-0.17	7.4-8.4	2-4	Low--------	0.28	3	3	---
	4-24	25-30	0.06-0.2	0.14-0.16	>7.8	4-8	Moderate	0.24			
	24	---	---	---	---	---	-----------	-----			
Uffens------------	0-9	10-20	0.6-6.0	0.08-0.14	7.4-8.4	4-8	Low--------	0.20	1	3	---
	9-20	25-35	0.2-0.6	0.05-0.10	>7.9	>16	Moderate	0.32			
	20-60	20-30	0.2-0.6	0.05-0.10	>7.9	>16	Moderate	0.28			
Ma----------------- Mayqueen	0-4	5-10	6.0-20.0	0.06-0.10	7.9-8.4	<2	Low--------	0.24	5	2	<.5
	4-16	7-17	2.0-6.0	0.10-0.14	7.9-8.4	<2	Low--------	0.28			
	16-60	5-10	6.0-20.0	0.07-0.10	7.9-8.4	<2	Low--------	0.24			
MO----------------- Monierco	0-5	10-20	2.0-6.0	0.08-0.13	7.4-8.4	<2	Low--------	0.24	1	3	---
	5-16	18-35	0.2-0.6	0.13-0.19	7.4-9.0	<2	Moderate	0.32			
	16	---	---	---	---	---	-----------	-----			
PO----------------- Penistaja	0-2	10-20	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low--------	0.24	5	3	.5-.9
	2-67	20-30	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32			
PP*: Penistaja---------	0-3	10-20	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low--------	0.24	5	3	.5-.9
	3-60	20-30	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32			
Buckle------------	0-13	18-27	0.6-2.0	0.13-0.19	7.4-8.4	<2	Low--------	0.37	5	6	---
	13-47	27-35	0.2-0.6	0.15-0.19	7.9-9.0	<2	Moderate	0.37			
	47-66	20-35	0.6-2.0	0.13-0.19	7.9-9.0	<2	Moderate	0.37			
PT*: Penistaja---------	0-3	10-20	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low--------	0.24	5	3	.5-.9
	3-60	20-30	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32			
Travessilla-------	0-2	15-20	0.6-2.0	0.13-0.17	7.4-8.4	<2	Low--------	0.24	1	3	---
	2-12	15-27	2.0-6.0	0.08-0.17	7.4-8.4	<2	Low--------	0.20			
	12	---	---	---	---	<2	-----------	-----			
PX*. Pits											

See footnote at end of table.

APPENDIX D

APPENDIX D

CHEMICAL ANALYSES OF WASTEWATER AND GROUND WATER

PONDS AND WASTES
(EPNG)

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner Consultants, Inc.
10526 Gulfdale/P.O. Box 32217
San Antonio, Texas 78216
(512) 342-4216

To: El Paso Natural Gas Company
618 Reilly
Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: 085-0059, Water, San Juan River Plant, Pond No. 1, Near Pump Suction, R-KCI 6-7328

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
COD	Fed. Reg. No. 45	234	
Nitrate-N	EPA 300.0	<0.1	
Oil and Grease	EPA 413.1	3.40	
TOC	EPA 415.1	53	
O-Phosphate	EPA 300.0	<0.1	
Cyanide (Total)	EPA 335.2	0.006	
Phenolics	EPA 420.1	<0.005	
Arsenic	EPA 206.3	<0.002	

Special Comments:

1. Analytical Methods are documented in a) EPA 600/4-79-020, March, 1983, b) Standard Methods, 16th Edition, 1985, and c) Federal Register, Vol. 49, October, 1984.

cc: Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.
by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0059, Water, San Juan River Plant, Pond No. 1, Near Pump Suction, R-KCI 6-7328

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Barium	EPA 208.2	<0.2	
Cadmium	EPA 213.2	<0.005	
Calcium	EPA 215.1	98.0	
Chromium	EPA 218.2	0.048	
Hardness	EPA 130.2	349	As $CaCO_3$
Lead	EPA 239.2	0.007	
Magnesium	EPA 242.1	25.2	
Mercury	EPA 245.2	<0.001	

Special Comments:

Raba-Kistner Consultants, Inc.

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Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0059, Water, San Juan River Plant, Pond No. 1, Near Pump Suction, R-KCI 6-7328

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Potassium	EPA 258.1	9.85	
Selenium	EPA 270.3	<0.005	
Silver	EPA 272.2	<0.005	
Sodium	EPA 273.1	881	
Zinc	EPA 289.1	0.24	
Alkalinity (Total)	Std. Method 403	183	As $CaCO_3$
Alkalinity (Bicarbonate)	Std. Method 403	223	As HCO_3
Chloride	EPA 300.0	1,370	

Special Comments:

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Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0059, Water, San Juan River Plant, Pond No. 1, Near Pump Suction, R-KCI 6-7328

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Fluoride	EPA 300.0	<0.1	
TDS	EPA 160.1	2,690	
Sulfate	EPA 300.0	200	
Carbon Tetrachloride	EPA 624	<0.005	
PCE	EPA 624	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
PCB's	EPA 608	<0.0001	
Benzene	EPA 624	0.156	

Special Comments:

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Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0059, Water, San Juan River Plant, Pond No. 1, Near Pump Suction, R-KCI 6-7328

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Toluene	EPA 624	0.221	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

Raba-Kistner Consultants, Inc.
by Francis Y. Huang
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Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

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Consultants, Inc.

P.O. Box 690287, San Antonio, TX 78269-0287
12821 W. Golden Lane, San Antonio, TX 78249
(512) 699-9090

To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/17/86
Date Reported: 3/25/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603141045 , Water, Pond 1, EPNG San Juan Plant, R-KCI 6-8394

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Total Nitrogen	EPA 351.3[1]	0.465	

Special Comments:

1. EPA 600/4-79-020, March, 1983.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

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San Antonio, Texas 78216
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To: El Paso Natural Gas Company
618 Reilly
Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0060, Water, San Juan River Plant, Pond No. 2 Near S.W. Corner, R-KCI 6-7329

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
COD	Fed. Reg. No. 45	279	
Nitrate-N	EPA 300.0	<0.1	
Oil and Grease	EPA 413.1	1.95	
TOC	EPA 415.1	52	
O-Phosphate	EPA 300.0	<0.1	
Cyanide (Total)	EPA 335.2	0.008	
Phenolics	EPA 420.1	<0.005	
Arsenic	EPA 206.3	<0.002	

Special Comments:

1. Analytical Methods are documented in a) EPA 600/4-79-020, March, 1983, b) Standard Methods, 16th Edition, 1985, and c) Federal Register, Vol. 49, October, 1984.

cc: Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.

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Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: 385-0060, Water, San Juan River Plant, Pond No. 2 Near S.W. Corner, R-KCI 6-7329

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Barium	EPA 208.2	<0.2	
Cadmium	EPA 213.2	<0.005	
Calcium	EPA 215.1	144	
Chromium	EPA 218.2	0.042	
Hardness	EPA 130.2	518	As $CaCO_3$
Lead	EPA 239.2	<0.005	
Magnesium	EPA 242.1	38.4	
Mercury	EPA 245.2	<0.001	

Special Comments:

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Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0060, Water, San Juan River Plant, Pond No. 2 Near S.W. Corner, R-KCI 6-7329

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Potassium	EPA 258.1	15.2	
Selenium	EPA 270.3	<0.005	
Silver	EPA 272.2	<0.005	
Sodium	EPA 273.1	1,720	
Zinc	EPA 289.1	0.13	
Alkalinity (Total)	Std. Method 403	164	As $CaCO_3$
Alkalinity (Bicarbonate)	Std. Method 403	200	As HCO_3
Chloride	EPA 300.0	2,210	

Special Comments:

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Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0060, Water, San Juan River Plant, Pond No.2 Near S.W. Corner, R-KCI 6-7329

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Fluoride	EPA 300.0	<0.1	
TDS	EPA 160.1	4,120	
Sulfate	EPA 300.0	155	
Carbon Tetrachloride	EPA 624	<0.005	
PCE	EPA 624	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
PCB's	EPA 608	<0.0001	
Benzene	EPA 624	0.094	

Special Comments:

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Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0060, Water, San Juan River Plant, Pond No. 2 Near S.W. Corner, R-KCI 6-7329

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0061, Water, San Juan River Plant, Pond No. 3 at N.W. Corner, R-KCI 6-7330

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
COD	Fed. Reg. No. 45	1,800	
Nitrate-N	EPA 300.0	<0.1	
Oil and Grease	EPA 413.1	5.10	
TOC	EPA 415.1	121	
O-Phosphate	EPA 300.0	<0.1	
Cyanide (Total)	EPA 335.2	0.023	
Phenolics	EPA 420.1	<0.005	
Arsenic	EPA 206.3	<0.002	

Special Comments:

1. Analytical Methods are documented in a) EPA 600/4-79-020, March, 1983, b) Standard Methods, 16th Edition, 1985, and c) Federal Register, Vol. 49, October, 1984.

cc: Dr. Henry Van, EPNG, El Paso

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0061, Water, San Juan River Plant, Pond No. 3 at N.W. Corner, R-KCI 6-7330

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Barium	EPA 208.2	<0.2	
Cadmium	EPA 213.2	<0.005	
Calcium	EPA 215.1	1,190	
Chromium	EPA 218.2	0.021	
Hardness	EPA 130.2	4,740	As $CaCO_3$
Lead	EPA 239.2	<0.005	
Magnesium	EPA 242.1	429	
Mercury	EPA 245.2	<0.001	

Special Comments:

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(512) 342-4216

To: El Paso Natural Gas Company
618 Reilly
Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0061, Water, San Juan River Plant, Pond No. 3 at N.W. Corner, R-KCI 6-7330

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Potassium	EPA 258.1	83.2	
Selenium	EPA 270.3	<0.005	
Silver	EPA 272.2	0.007	
Sodium	EPA 273.1	12,900	
Zinc	EPA 289.1	0.08	
Alkalinity (Total)	Std. Method 403	206	As $CaCO_3$
Alkalinity (Bicarbonate)	Std. Method 403	251	As HCO_3
Chloride	EPA 300.0	12,000	

Special Comments:

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D., CPC

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

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To: El Paso Natural Gas Company
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Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0061, Water, San Juan River Plant, Pond No. 3 at N.W. Corner, R-KCI 6-7330

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Fluoride	EPA 300.0	<0.1	
TDS	EPA 160.1	54,600	
Sulfate	EPA 300.0	12,000	
Carbon Tetrachloride	EPA 624	<0.005	
PCE	EPA 624	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
PCB's	EPA 608	<0.0001	
Benzene	EPA 624	<0.005	

Special Comments:

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San Antonio/El Paso

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0061, Water, San Juan River Plant, Pond No. 3 at N.W. Corner, R-KCI 6-7330

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

Raba-Kistner Consultants, Inc.

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To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/17/86
Date Reported: 3/25/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603141100, Water, Collection Basin, EPNG San Juan Plant, R-KCI 6-8395

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Total Nitrogen	EPA 351.3[1]	0.476	

Special Comments:

1. EPA 600/4-79-020, March, 1983.

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Austin / El Paso / San Antonio

Report of Chemical Analysis

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Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0056, Water, San Juan River Plant, 6" Water Treatment Bldg. Drain, R-KCI 6-7327

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
COD	Fed. Reg. No. 45	54.8	
Nitrate-N	EPA 300.0	<0.1	
Oil and Grease	EPA 413.1	3.61	
TOC	EPA 415.1	4.0	
O-Phosphate	EPA 300.0	<0.1	
Cyanide (Total)	EPA 335.2	0.017	
Phenolics	EPA 420.1	<0.005	
Arsenic	EPA 206.3	<0.002	

Special Comments:

1. Analytical Methods are documented in a) EPA 600/4-79-020, March, 1983, b) Standard Methods, 16th Edition, 1985, and c) Federal Register, Vol. 49, October, 1984.

cc: Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.
by Francis Y. Huang
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San Antonio/El Paso

Report of Chemical Analysis

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To: El Paso Natural Gas Company
618 Reilly
Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0056, Water, San Juan River Plant, 6" Water Treatment Bldg. Drain, R-KCI 6-7327

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Barium	EPA 208.2	<0.2	
Cadmium	EPA 213.2	0.79	
Calcium	EPA 215.1	44.2	
Chromium	EPA 218.2	<0.005	
Hardness	EPA 130.2	152	As $CaCO_3$
Lead	EPA 239.2	<0.005	
Magnesium	EPA 242.1	10.0	
Mercury	EPA 245.2	<0.001	

Special Comments:

Raba-Kistner Consultants, Inc.
by Francis Y. Huang
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Report of Chemical Analysis

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0056, Water, San Juan River Plant, 6" Water Treatment Bldg. Drain, R-KCI 6-7327

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Potassium	EPA 258.1	2.13	
Selenium	EPA 270.3	<0.005	
Silver	EPA 272.2	~~0.029~~ <0.01	
Sodium	EPA 273.1	950	
Zinc	EPA 289.1	0.01	
Alkalinity (Total)	Std. Method 403	93.8	As $CaCO_3$
Alkalinity (Bicarbonate)	Std. Method 403	114	As HCO_3
Chloride	EPA 300.0	15.1	

Special Comments:

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0056, Water, San Juan River Plant, 6" Water Treatment Bldg. Drain, R-KCI 6-7327

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Fluoride	EPA 300.0	<0.1	
TDS	EPA 160.1	1,850	
Sulfate	EPA 300.0	142	
Carbon Tetrachloride	EPA 624	<0.005	
PCE	EPA 624	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
PCB's	EPA 608	<0.0001	
Benzene	EPA 624	<0.005	

Special Comments:

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0056, Water, San Juan River Plant, 6" Water Treatment Bldg. Drain, R-KCI 6-7327

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

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Attn: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11-04-85
Date Reported: 11-15-85
Submitted By: EPNG; Farmington, NM

Sample Description/Code: J85-0066, Water, San Juan River Plant, 6" Drain From Water Treating Area, R-KCI 6-7326

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
PCE	EPA 624[1]	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
Benzene	EPA 624	<0.005	
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

C.C. Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

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Attention: Mr. Kenneth E. Beasley

Project No:	685-003
Date Received:	11/04/85
Date Reported:	11/15/85
Submitted By:	EPNG, Farmington, N.M.

Sample Description/Code: J85-0068, Water, San Juan River Plant, Evaporator Blowdown, R-KCI 6-7332

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
COD	Fed. Reg. No. 45	77.2	
Nitrate-N	EPA 300.0	<0.1	
Oil and Grease	EPA 413.1	3.28	
TOC	EPA 415.1	8	
O-Phosphate	EPA 300.0	<0.1	
Cyanide (Total)	EPA 335.2	0.007	
Phenolics	EPA 420.1	<0.005	
Arsenic	EPA 206.3	<0.002	

Special Comments:

1. Analytical Methods are documented in a) EPA 600/4-79-020, March, 1983, b) Standard Methods, 16th Edition, 1985, and c) Federal Register, Vol. 49, October, 1984.

cc: Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0068, Water, San Juan River Plant, Evaporator Blowdown, R-KCI 6-7332

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Barium	EPA 208.2	<0.2	
Cadmium	EPA 213.2	<0.005	
Calcium	EPA 215.1	1.97	
Chromium	EPA 218.2	<0.005	
Hardness	EPA 130.2	5.29	As $CaCO_3$
Lead	EPA 239.2	<0.005	
Magnesium	EPA 242.1	0.09	
Mercury	EPA 245.2	<0.001	

Special Comments:

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0068, Water, San Juan River Plant, Evaporator Blowdown, R-KCI 6-7332

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Potassium	EPA 258.1	1.54	
Selenium	EPA 270.3	<0.005	
Silver	EPA 272.2	<0.005	
Sodium	EPA 273.1	298	
Zinc	EPA 289.1	0.06	
Alkalinity (Total)	Std. Method 403	143*	As $CaCO_3$
Alkalinity (Bicarbonate)	Std. Method 403	0	As HCO_3
Chloride	EPA 300.0	821	

Special Comments:

*Initial pH was 11.2.

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Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0068, Water, San Juan River Plant, Evaporator Blowdown, R-KCI 6-7332

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Fluoride	EPA 300.0	<0.1	
TDS	EPA 160.1	1,240	
Sulfate	EPA 300.0	172	
Carbon Tetrachloride	EPA 624	<0.005	
PCE	EPA 624	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
PCB's	EPA 608	<0.0001	
Benzene	EPA 624	<0.005	

Special Comments:

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Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0068, Water, San Juan River Plant, Evaporator Blowdown, R-KCI 6-7332

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

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To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B. V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603031806, Water, Evaporator Blowdown, EPNG San Juan Plant, R-KCI 6-8230.

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Chromium	EPA 218.2[1]	<0.01	
Lead	EPA 239.2	<0.05	
BOD_5	Std. Method 507[2]	9.0	

Special Comments:

1. EPA 600/4-79-020, March, 1984.
2. Standard Methods, 16th Edition, 1985.

Raba-Kistner Consultants, Inc.

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Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/17/86
Date Reported: 3/25/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603141210, Water, Water Softener Backwash, EPNG, San Juan Plant, R-KCI 6-8396

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Total Nitrogen	EPA 351.3[1]	0.432	

Special Comments:

1. EPA 600/4-79-020, March, 1983.

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0069, Water, San Juan River Plant, 8" Plant W/W Drain, R-KCI 6-7333

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
COD	Fed. Reg. No. 45	346	
Nitrate-N	EPA 300.0	<0.1	
Oil and Grease	EPA 413.1	8.02	
TOC	EPA 415.1	91	
O-Phosphate	EPA 300.0	<0.1	
Cyanide (Total)	EPA 335.2	<0.005	
Phenolics	EPA 420.1	<0.005	
Arsenic	EPA 206.3	<0.002	

Special Comments:

1. Analytical Methods are documented in a) EPA 600/4-79-020, March, 1983, b) Standard Methods, 16th Edition, 1985, and c) Federal Register, Vol. 49, October, 1984.

cc: Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: 085-0069, Water, San Juan River Plant, 8" Plant W/W Drain, R-KCI 6-7333

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Barium	EPA 208.2	<0.2	
Cadmium	EPA 213.2	<0.005	
Calcium	EPA 215.1	134	
Chromium	EPA 218.2	0.063	
Hardness	EPA 130.2	463	As $CaCO_3$
Lead	EPA 239.2	<0.005	
Magnesium	EPA 242.1	31.3	
Mercury	EPA 245.2	<0.001	

Special Comments:

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0069, Water, San Juan River Plant, 8" Plant W/W Drain, R-KCI 6-7333

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Potassium	EPA 258.1	12.3	
Selenium	EPA 270.3	<0.005	
Silver	EPA 272.2	<0.005	
Sodium	EPA 273.1	787	
Zinc	EPA 289.1	0.45	
Alkalinity (Total)	Std. Method 403	150	As $CaCO_3$
Alkalinity (Bicarbonate)	Std. Method 403	183	As HCO_3
Chloride	EPA 300.0	1,190	

Special Comments:

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0069, Water, San Juan River Plant, 8" Plant W/W Drain, R-KCI 6-7333

SUMMARY OF ANALYSIS

1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Fluoride	EPA 300.0	<0.1	
TDS	EPA 160.1	2,710	
Sulfate	EPA 300.0	137	
Carbon Tetrachloride	EPA 624	<0.005	
PCE	EPA 624	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
PCB's	EPA 608	<0.0001	
Benzene	EPA 624	<0.005	

Special Comments:

Raba-Kistner Consultants, Inc.
by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner
Consultants, Inc.
10526 Gulfdale/P.O. Box 32217
San Antonio, Texas 78216
(512) 342-4216

To: El Paso Natural Gas Company
618 Reilly
Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0069, Water, San Juan River Plant, 8" Plant W/W Drain, R-KCI 6-7333

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

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Francis Y. Huang, Ph.D., CPC

Report of Chemical Analysis

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To: El Paso Natural Gas Co.
618 Reilly
Farmington, New Mexico 87401

Attn: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11-04-85
Date Reported: 11-15-85
Submitted By: EPNG; Farmington, NM

Sample Description/Code: J85-0065, Water, San Juan River Plant, 8' Drain Line at Manhole, R-KCI 6-7325

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
PCE	EPA 624[1]	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
Benzene	EPA 624	<0.005	
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

C.C. Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D., CPC

San Antonio/El Paso

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
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Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0067, Water, San Juan River Plant, Boiler Blowdown, R-KCI 6-7331

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
COD	Fed. Reg. No. 45	212	
Nitrate-N	EPA 300.0	8.99	
Oil and Grease	EPA 413.1	3.35	
TOC	EPA 415.1	43	
O-Phosphate	EPA 300.0	30.0	
Cyanide (Total)	EPA 335.2	0.006	
Phenolics	EPA 420.1	<0.005	
Arsenic	EPA 206.3	<0.002	

Special Comments:

1. Analytical Methods are documented in a) EPA 600/4-79-020, March, 1983, b) Standard Methods, 16th Edition, 1985, and c) Federal Register, Vol. 49, October, 1984.

cc: Dr. Henry Van, EPNG, El Paso

Raba-Kistner Consultants, Inc.
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Report of Chemical Analysis

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Farmington, New Mexico 87401

Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0067, Water, San Juan River Plant, Boiler Blowdown, R-KCI 6-7331

SUMMARY OF ANALYSIS 1

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Barium	EPA 208.2	<0.2	
Cadmium	EPA 213.2	<0.005	
Calcium	EPA 215.1	<1.0	
Chromium	EPA 218.2	<0.005	
Hardness	EPA 130.2	4.53	As $CaCO_3$
Lead	EPA 239.2	0.06	
Magnesium	EPA 242.1	1.1	
Mercury	EPA 245.2	<0.001	

Special Comments:

Raba-Kistner Consultants, Inc.

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Report of Chemical Analysis

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0067, Water, San Juan River Plant, Boiler Blowdown, R-KCI 6-7331

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Potassium	EPA 258.1	0.32	
Selenium	EPA 270.3	<0.005	
Silver	EPA 272.2	<0.005	
Sodium	EPA 273.1	280	
Zinc	EPA 289.1	1.08	
Alkalinity (Total)	Std. Method 403	436*	As $CaCO_3$
Alkalinity (Bicarbonate)	Std. Method 403	0	As HCO_3
Chloride	EPA 300.0	52.7	

Special Comments:

*Initial pH was 12.6.

Raba-Kistner Consultants, Inc.
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San Antonio/El Paso

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0067, Water, San Juan River Plant, Boiler Blowdown, R-KCI 6-7331

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Fluoride	EPA 300.0	1.80	
TDS	EPA 160.1	1,140	
Sulfate	EPA 300.0	30.1	
Carbon Tetrachloride	EPA 624	<0.005	
PCE	EPA 624	<0.005	
1,1,2-Trichloroethane	EPA 624	<0.005	
PCB's	EPA 608	<0.0001	
Benzene	EPA 624	<0.005	

Special Comments:

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Attention: Mr. Kenneth E. Beasley

Project No: 685-003
Date Received: 11/04/85
Date Reported: 11/15/85
Submitted By: EPNG, Farmington, N.M.

Sample Description/Code: J85-0067, Water, San Juan River Plant, Boiler Blowdown, R-KCI 6-7331

SUMMARY OF ANALYSIS [1]

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Toluene	EPA 624	<0.005	
EDC	EPA 624	<0.005	
DCE	EPA 624	<0.005	
Ethylbenzene	EPA 624	<0.005	
Xylenes	EPA 624	<0.005	

Special Comments:

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Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
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To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603031805, Water, Boiler Blowdown, EPNG San Juan Plant, R-KCI 6-8229.

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Chromium	EPA 218.2[1]	<0.01	
Lead	EPA 239.2	0.07	
BOD_5	Std. Method 507[2]	39.5	

Special Comments:

1. EPA 600/4-79-020, March, 1984.
2. Standard Methods, 16th Edition, 1985.

Raba-Kistner Consultants, Inc.

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Report of Chemical Analysis

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Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603030915, Water, Sulfur Sludge Pit, EPNG San Juan Plant, R-KCI 6-8223 (Sulfur Plant Sump)

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results[5] (mg/L)	Miscellaneous
Total Alkalinity	Std. Method 403[1]	3,210	as CaC03
Bicarbonate	Std. Method 403	3,920	as HC03
Chloride	EPA 300.0[2]	2.71	
Fluoride	EPA 300.0	4.58	
Hardness	EPA 130.2	14.0	as CaC03
Oil and Grease	EPA 413.2	31.8	
O-Phosphate	EPA 300.0	<0.1	
Phenolics	EPA 420.1	0.073	

Special Comments:

1. Standard Methods, 16th Edition, 1985.
2. EPA 600/4-79-020, March, 1984.
3. Federal Register, Vol. 45, April, 1980.
4. Federal Register, Vol. 49, October, 1984.
5. The analyses were conducted on the homogenized sample except that for anions, hardness and TDS.

Raba-Kistner Consultants, Inc.

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Austin / El Paso / San Antonio

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Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 860303915, Water, Sulfur Sludge Pit, EPNG San Juan Plant, R-KCI 6-8223

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Sulfate	EPA 300.0	22.2	
Cyanide	EPA 335.2	0.014	
COD	HACH[3]	16,500	
TDS	EPA 160.1	448	
TOC	EPA 415.1	4,080	
Volatile Organics	EPA 624[4]	See attached Report	(PCE included)
Arsenic	EPA 206.3	<0.02	
Barium	EPA 208.2	<0.5	

Special Comments:

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
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Austin / El Paso / San Antonio

Report of Chemical Analysis

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Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 860303915, Water, Sulfur Sludge Pit, EPNG, San Juan Plant, R-KCI 6-8223

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Cadmium	EPA 213.2	<0.01	
Calcium	EPA 215.1	5.14	
Chromium	EPA 218.2	0.03	
Lead	EPA 239.2	<0.05	
Magnesium	EPA 242.1	0.29	
Mercury	EPA 245.2	<0.001	
Potassium	EPA 258.1	0.45	
Selenium	EPA 270.3	<0.01	

Special Comments:

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Report of Chemical Analysis

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Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 860303915, Water, Sulfur Sludge Pit, EPNG San Juan Plant, R-KCI 6-8223

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Silver	EPA 272.2	<0.01	
Sodium	EPA 273.1	1.50	
Zinc	EPA 289.1	0.03	

Special Comments:

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Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

R-KCI Lab No. 6-8223 (8603030915) Project No. 686-036

PURGEABLE

Compound	Concentration (μg/L)	Method Detection Limits (μg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1-Dichloroethene	N.D.	2.8
1,1-Dichloroethane	N.D.	4.7
Trans-1,2-Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2-Dichloroethane	N.D.	2.8
1,1,1-Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2-Dichloropropane	N.D.	6.0
Trans-1,3-Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2-Trichloroethane	N.D.	5.0
cis-1,3-Dichloropropene	N.D.	5.0
Benzene	18,500	4.4
2-Chloroethylvinyl Ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2-Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	32,900	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	10,200	5.0

N.D. = Not Detected

WELLS (EPNG)

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
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To: Geoscience Consultants, Inc.
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Albuquerque, NM 87102

Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-2 (8512201000), Well Water, EPNG San Juan River Plant, R-KCI 6-7632

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Phenolics	EPA 420.1[1]	<0.005 mg/L	
Lead	EPA 239.2	0.18 mg/L	Filtered
Chromium	EPA 218.2	0.03 mg/L	Filtered

Special Comments:

1. EPA 600/4-79-020, March, 1983.

Raba-Kistner Consultants, Inc.

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Report of Chemical Analysis

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Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/01/86
Date Reported: 3/19/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8602261645, Water, Well Point #4, EPNG San Juan Plant, R-KCI 6-8165

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
TDS	EPA 160.1[1]	13,600 mg/L	

Special Comments:

1. EPA 600/4-79-020, March, 1984.

Raba-Kistner Consultants, Inc.

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Report of Chemical Analysis

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Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-5 (8512200900), Well Water, EPNG San Juan River Plant, R-KCI 6-7633

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

Raba-Kistner Consultants, Inc.

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R-KCI Lab. No. 6-7633 Project No. 685-133

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

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Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-6 (8512201145), Well Water, EPNG San Juan River Plant, R-KCI 6-7634

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
TDS	EPA 160.1[1]	22,400 mg/L	
Volatile Organics	EPA 624[2]	see attached report	

Special Comments:

1. EPA 600/4-79-020, March, 1983.
2. Federal Register, Vol. 49, October, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D., CPC

R-KCI Lab. No. 6-7634

Project No. 685-133

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (μg/L)	Method Detection Limits (μg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

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Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-7 (8512201455), Well Water, EPNG San Juan River Plant, R-KCI 6-7635

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	Note 2

Special Comments:

1. Federal Register, Vol. 49, October, 1984.
2. The sample contained large amounts of hydrocarbons which were not identified.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

R-KCI Lab. No. 6-7635 Project No. 685-133

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	1,320	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner
Consultants, Inc.
10526 Gulfdale/P.O. Box 32217
San Antonio, Texas 78216
(512) 342-4216

To: El Paso Natural Gas Company
618 Reilly
Farmington, NM 87401

Attn: Mr. Kenneth E. Beasley

Project No: 686-003-01
Date Received: 1/11/86
Date Reported: 1/16/86
Submitted By: EPNG, Farmington, NM

Sample Description/Code: J86-002, Well Water, Borehole No. 7, San Juan River Plant, R-KCI 6-7827

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	See attached report	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

CC: Mr. Loren Gearhart, EPNG, El Paso

Raba-Kistner Consultants, Inc.

by Frank Y. Huang

R-KCI Lab No. 6-7827 Project No. 686-003-01

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	100	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	41.9	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner Consultants, Inc.
P.O. Box 690287, San Antonio, TX 78269-0287
12821 W. Golden Lane, San Antonio, TX 78249
(512) 699-9090

To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603031610, Water, Well No. 7, EPNG San Juan Plant, R-KCI 6-8225

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Chromium	EPA 218.2[1]	0.04	
Lead	EPA 239.2	0.25	

Special Comments:

1. EPA 600/4-79-020, March, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

R-KCI Lab No. 6-3158 (8602251145) Project No. 686-036

PURGEABLES

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1-Dichloroethene	N.D.	2.8
1,1-Dichloroethane	N.D.	4.7
Trans-1,2-Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2-Dichloroethane	N.D.	2.8
1,1,1-Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2-Dichloropropane	N.D.	6.0
Trans-1,3-Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2-Trichloroethane	N.D.	5.0
cis-1,3-Dichloropropene	N.D.	5.0
Benzene	308	4.4
2-Chloroethylvinyl Ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2-Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	5,060	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner
Consultants, Inc.
10526 Gulfdale/P.O. Box 32217
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(512) 342-4216

To: Geoscience Consultants, Inc.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-8 (8512201115), Well Water, EPNG San Juan River Plant, R-KCI 6-7636

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Phenolics	EPA 420.1[1]	<0.005 mg/L	
Lead	EPA 239.2	0.29 mg/L	Filtered
Chromium	EPA 218.2	0.08 mg/L	Filtered

Special Comments:

1. EPA 600/4-79-020, March, 1983.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D., CPC

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner
Consultants, Inc.

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12821 W. Golden Lane, San Antonio, TX 78249
(512) 699-9090

To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/01/86
Date Reported: 3/19/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8602261515, Water, Well No. 8, EPNG San Juan Plant, R-KCI 6-8163

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	
Chromium	EPA 218.2[2]	0.08	
Lead	EPA 239.2[2]	0.40	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.
2. EPA 600/4-79-020, March 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

R-KCI Lab No. 6-8163 (8602261515) Project No. 686-036

PURGEABLES

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1-Dichloroethene	N.D.	2.8
1,1-Dichloroethane	N.D.	4.7
Trans-1,2-Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2-Dichloroethane	N.D.	2.8
1,1,1-Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2-Dichloropropane	N.D.	6.0
Trans-1,3-Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2-Trichloroethane	N.D.	5.0
cis-1,3-Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2-Chloroethylvinyl Ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2-Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner Consultants, Inc.
10526 Gulfdale/P.O. Box 32217
San Antonio, Texas 78216
(512) 342-4216

To: Geoscience Consultants, Inc.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-9 (8512190500), Well Water, EPNG San Juan River Plant, R-KCI 6-7637

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
TDS	EPA 160.1[1]	16,900 mg/L	
Phenolics	EPA 420.1	<0.005 mg/L	
Lead	EPA 239.2	0.11 mg/L	Filtered
Chromium	EPA 218.2	0.06 mg/L	Filtered
Volatile Organics	EPA 624[2]	see attached report	

Special Comments:

1. EPA 600/4-79-020, March, 1983.
2. Federal Register, Vol. 49, October, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D., CPC

R-KCI Lab. No. 6-7637 Project No. 685-133

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner Consultants, Inc.
P.O. Box 690287, San Antonio, TX 78269-0287
12821 W. Golden Lane, San Antonio, TX 78249
(512) 699-9090

To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/01/86
Date Reported: 3/19/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8602251015, Water, Well No. 9, EPNG San Juan Plant, R-KCI 6-8156

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

R-KCI Lab No. 6-8156 (8602251015) Project No. 686-036

PURGEABLES

Compound	Concentration (μg/L)	Method Detection Limits (μg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1-Dichloroethene	N.D.	2.8
1,1-Dichloroethane	N.D.	4.7
Trans-1,2-Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2-Dichloroethane	N.D.	2.8
1,1,1-Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2-Dichloropropane	N.D.	6.0
Trans-1,3-Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2-Trichloroethane	N.D.	5.0
cis-1,3-Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2-Chloroethylvinyl Ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2-Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner Consultants, Inc.
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To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/01/86
Date Reported: 3/19/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8602261600, Water, Well No. 9, EPNG San Juan Plant, R-KCI 6-8164

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Chromium	EPA 218.2[1]	0.05	
Lead	EPA 239.2[1]	0.26	

Special Comments:

1. EPA 600/4-79-020, March, 1984.

Raba-Kistner Consultants, Inc.
by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner Consultants, Inc.
10526 Gulfdale/P.O. Box 32217
San Antonio, Texas 78216
(512) 342-4216

To: Geoscience Consultants, Inc.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-10 (8512201435), Well Water, EPNG San Juan River Plant, R-KCI 6-7638

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	Note 2

Special Comments:

1. Federal Register, Vol. 49, October, 1984.
2. This sample contained large amounts of hydrocarbons which were not identified.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

R-KCI Lab. No. 6-7638 Project No. 685-133

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	12,800	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	318	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner Consultants, Inc.
10526 Gulfdale/P.O. Box 32217
San Antonio, Texas 78216
(512) 342-4216

To: El Paso Natural Gas Company
618 Reilly
Farmington, NM 87401

Attn: Mr. Kenneth E. Beasley

Project No: 686-003-01
Date Received: 1/11/86
Date Reported: 1/16/86
Submitted By: EPNG, Farmington, NM

Sample Description/Code: J86-001, Well Water, Borehole No. 10, San Juan River Plant, R-KCI 6-7826

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	See attached report	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

CC: Mr. Loren Gearhart, EPNG, El Paso

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D. CPC

R-KCI Lab No. 6-7826 Project No. 686-003-01

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (ug/L)	Method Detection Limits (ug/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	190	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	83.9	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	369	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner
Consultants, Inc.

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To: Geoscience Consultants, Ltd.
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Albuquerque, NM 87102

Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/01/86
Date Reported: 3/19/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8602251115, Water, Well No. 10, EPNG San Juan, R-KCI 6-8157

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang

Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

R-KCI Lab No. 6-8157 (8602251115) Project No. 686-036

PURGEABLES

Compound	Concentration (µg/L)	Method Detection Limits (µg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1-Dichloroethene	N.D.	2.8
1,1-Dichloroethane	N.D.	4.7
Trans-1,2-Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2-Dichloroethane	N.D.	2.8
1,1,1-Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2-Dichloropropane	N.D.	6.0
Trans-1,3-Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2-Trichloroethane	N.D.	5.0
cis-1,3-Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2-Chloroethylvinyl Ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2-Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

Raba-Kistner
Consultants, Inc.

P.O. Box 690287, San Antonio, TX 78269-0287
12821 W. Golden Lane, San Antonio, TX 78249
(512) 699-9090

To: Geoscience Consultants, Ltd.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Ms. B. V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603031310, Water, Well No. 10, EPNG San Juan Plant, R-KCI 6-8224.

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Chromium	EPA 218.2[1]	0.04	
Lead	EPA 239.2	0.16	

Special Comments:

1. EPA 600/4-79-020, March, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

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10526 Gulfdale/P.O. Box 32217
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To: Geoscience Consultants, Inc.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-11 (8512190830), Well Water, EPNG San Juan River Plant, R-KCI 6-7639

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
TDS	EPA 160.1[1]	19,000 mg/L	
Volatile Organics	EPA 624[2]	See attached report	

Special Comments:

1. EPA 600/4-79-020, March, 1983.
2. Federal Register, Vol. 29, October, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

R-KCI Lab. No. 6-7639 Project No. 685-133

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (μg/L)	Method Detection Limits (μg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

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To: Geoscience Consultants, Inc.
500 Copper Avenue N.W., Suite 325
Albuquerque, NM 87102

Attn: Mr. Randall T. Hicks

Project No: 685-133
Date Received: 12/26/85
Date Reported: 1/21/86
Submitted By: Geoscience Consultants, Inc.

Sample Description/Code: P-12 (8512201345), Well Water, EPNG San Juan River Plant, R-KCI 6-7640

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

R-KCI Lab. No. 6-7640 Project No. 685-133

PURGEABLES
(EPA METHOD 624 and 603)

Compound	Concentration (μg/L)	Method Detection Limits (μg/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1 - Dichloroethene	N.D.	2.8
1,1 - Dichloroethane	N.D.	4.7
Trans- 1,2 - Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2 - Dichloroethane	N.D.	2.8
1,1,1 - Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2 - Dichloropropane	N.D.	6.0
Trans - 1,3 - Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2 - Trichloroethane	N.D.	5.0
cis - 1,3 - Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2 - Chloroethylvinyl ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2 - Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
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To: Geoscience Consultants, Ltd.
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Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/01/86
Date Reported: 3/19/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8602261300, Water, Well No. 12, EPNG San Juan Plant, R-KCI 6-8162

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results	Miscellaneous
Volatile Organics	EPA 624[1]	see attached report	

Special Comments:

1. Federal Register, Vol. 49, October, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

R-KCI Lab No. 6-8162 (8602261300) Project Nc. 686-036

PURGEABLES

Compound	Concentration (ug/L)	Method Detection Limits (ug/L)
Chloromethane	N.D.	5.0
Bromomethane	N.D.	5.0
Vinyl Chloride	N.D.	10.0
Chloroethane	N.D.	5.0
Methylene Chloride	N.D.	2.8
Trichlorofluoromethane	N.D.	5.0
1,1-Dichloroethene	N.D.	2.8
1,1-Dichloroethane	N.D.	4.7
Trans-1,2-Dichloroethene	N.D.	1.6
Chloroform	N.D.	1.6
1,2-Dichloroethane	N.D.	2.8
1,1,1-Trichloroethane	N.D.	3.8
Carbon Tetrachloride	N.D.	2.8
Bromodichloromethane	N.D.	2.2
1,2-Dichloropropane	N.D.	6.0
Trans-1,3-Dichloropropene	N.D.	5.0
Trichloroethene	N.D.	1.9
Dibromochloromethane	N.D.	3.1
1,1,2-Trichloroethane	N.D.	5.0
cis-1,3-Dichloropropene	N.D.	5.0
Benzene	N.D.	4.4
2-Chloroethylvinyl Ether	N.D.	5.0
Bromoform	N.D.	4.7
1,1,2,2-Tetrachloroethane	N.D.	6.9
Tetrachloroethene	N.D.	4.1
Toluene	N.D.	6.0
Chlorobenzene	N.D.	6.0
Ethylbenzene	N.D.	7.2
Xylenes	N.D.	5.0

N.D. = Not Detected

Report of Chemical Analysis

Consulting Geotechnical, Materials and Environmental Engineers
Geologists, Scientists and Chemists

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To: Geoscience Consultants, Ltd.
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Attn: Ms. B.V. Nicholas

Project No: 686-036
Date Received: 3/06/86
Date Reported: 3/24/86
Submitted By: Ms. Nicholas, Geoscience

Sample Description/Code: 8603031650, Water, Well No. 12, EPNG San Juan Plant, R-KCI 6-8226

SUMMARY OF ANALYSIS

Determination	Analytical Method	Results (mg/L)	Miscellaneous
Chromium	EPA 218.2[1]	0.04	
Lead	EPA 239.2	0.08	

Special Comments:

1. EPA 600/4-79-020, March, 1984.

Raba-Kistner Consultants, Inc.

by Francis Y. Huang
Francis Y. Huang, Ph.D., CPC

Austin / El Paso / San Antonio

File Copy

DISCHARGE PLAN FOR EL PASO NATURAL GAS COMPANY'S SAN JUAN RIVER PLANT

NON-CONTACT WASTEWATER DISPOSAL

El Paso
Natural Gas Company

SAN JUAN COUNTY, NEW MEXICO

DECEMBER, 1987

DISCHARGE PLAN APPLICATION
FOR EL PASO NATURAL GAS COMPANY'S
SAN JUAN RIVER PLANT
NON-CONTACT WASTEWATER

December, 1987

Submitted to

NEW MEXICO OIL CONSERVATION DIVISION
P.O. Box 2088
Santa Fe, New Mexico 87501

RECEIVED
DEC 30 1987
OIL CONSERVATION DIVISION
SANTA FE

Affirmation:

"I hereby certify that I am familiar with the information contained in and submitted with this application and that such information is true, accurate and complete to the best of my knowledge."

Donald N. Bigbie   12/30/87

Donald N. Bigbie, Vice President   Date

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1.0 EXECUTIVE SUMMARY

El Paso Natural Gas Company (EPNG), P.O. Box 4990, Farmington, New Mexico, 87499 proposes to discharge approximately 8,070,000 gallons per year of wastewater to a land application system located on the plant property. The plant is located in Section 1, Township 29 North, Range 15 West, San Juan County, near Kirtland New Mexico. The wastewater is generated from units which do not cause it to contact hydrocarbons. For this reason the wastewater is referred to as "non-contact".

All wastewater at the San Juan River Plant was previously discharged to surface impoundments located on the plant site. Contact and non-contact streams have now been separated. Contact wastewater will be discharged to a lined pond with a leak detection system in accordance with a discharge plan (GW-33) which was approved by NMOCD on December 29, 1986.

An extensive study of hydrological, geological and soil conditions as well as vegetation was conducted at the proposed disposal site during a feasibility study for land application of non-contact wastewater. All data pertinent to the study was submitted to the New Mexico Oil Conservation Division (NMOCD) prior to preparation of this discharge plan. For this reason the plan is abbreviated and will liberally reference the information found in the Phase I and Phase II final reports titled "Land Application Feasibility Study, San Juan River Plant" as well as the San Juan River Plant Discharge Plan GW-33. Some data may also be reproduced in the plan for clarity.

The feasibility study has demonstrated that land application of non-contact wastewater from the plant will not result in the degradation of groundwater in the area. Topside management procedures and a monitoring program will allow operation of the site in an environmentally sound manner. EPNG feels that this discharge plan will allow disposal which is consistent with the regulatory requirements for non-degradation of water sources as well as its own commitment to protect the environment.

2.0 GENERAL INFORMATION

2.1 NAME OF DISCHARGER/LEGALLY RESPONSIBLE PARTY

All correspondence regarding this discharge plan should be sent to EPNG San Juan Division headquarters at the address below:

Donald N. Bigbie
Vice President
San Juan Division
El Paso Natural Gas
P.O. Box 4990
Farmington, New Mexico 87499
(505)-325-2841

2.2 LOCAL REPRESENTATIVE OR CONTACT

A copy of all correspondence and all questions should be directed to the San Juan Division Compliance Engineer:

Kenneth E. Beasley
San Juan Division
El Paso Natural Gas Company
P.O. Box 4990
Farmington, New Mexico 87499
(505)-325-2841

EPNG requests that copies of correspondence also be sent to:

Environmental Affairs
El Paso Natural Gas Company
P.O. Box 1492
El Paso, Texas 79978
Attn: H. Van
(915)-541-2832

2.3 LOCATION OF DISCHARGE

The San Juan River Plant is located in Section 1, Township 29 North, Range 15 West, San Juan County, New Mexico, approximately 8 miles west of Farmington and 1.7 miles north of Kirtland, New Mexico. Highway 550 and County Road 61 provide access to the plant. Figure 2-1 is a vicinity map showing the San Juan River Plant area and proposed land application site.

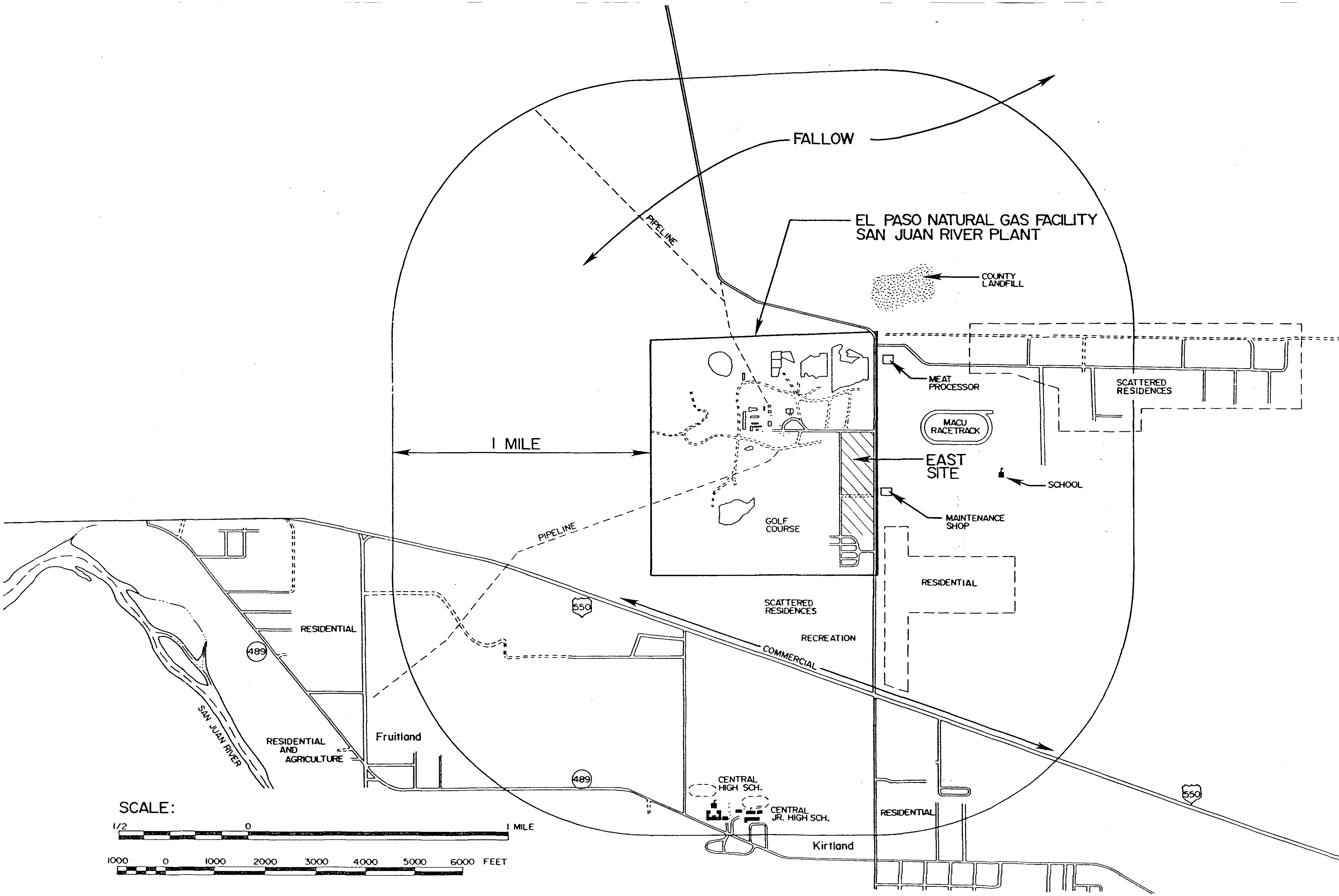

FIGURE 2-1. SURROUNDING LAND USE.

2.4 LOCAL LAND USE

The San Juan River Plant is bounded on the north and west by state and public lands. Approximately 30 tracts of privately-owned land have been identified bordering the eastern and southern perimeter of the plant site. Figure 2-1 also depicts surrounding land use.

2.5 TYPE OF NATURAL GAS OPERATION

The activities at the San Juan River Plant include natural gas processing, compression and operation of peripheral utilities. These utilities include boilers, water treatment facilities and cooling water systems.

Low pressure sour gas from the Barker Dome field is compressed to approximately 800 psi. This stream is then combined with sour natural gas from EPNG's Aneth Plant and the mixed stream passed through an amine treating unit for the removal of CO_2 and H_2S. Most (>96%) of the hydrogen sulfide resulting from this process is then sent to a sulfur recovery unit that produces elemental liquid sulfur as a commercial by-product. When sulfur content of the gas is low enough to preclude emissions in excess of 7 tons per day, acid gas is passed to the flare system. Gasoline plant operations at San Juan River Plant have ceased at this time and are not expected to resume in the foreseeable future.

3.0 EFFLUENT SOURCES AND CHARACTERISTICS

3.1 NON-CONTACT EFFLUENT SOURCES AND VOLUMES

3.1.1 Settling Tank Blowdown

Raw water filters at the water treatment plant are backwashed to the settling tank as a water conservation measure. It is necessary to periodically blow down some raw water and suspended solids which have accumulated. The estimated flow is .25 million gallons per year (M-Gal/year).

3.1.2 Cooling Tower Blowdown

Evaporative cooling towers are used for general cooling in utilities and process units. Much of the water is recycled but some blowdown is required to preclude exceeding operating limits for TDS. The estimated blowdown from Cooling Tower "A" is 1.07 M-Gal/year and from Cooling Tower "B" is 2.0 M-Gal/year.

3.1.3 Evaporator Blowdown

A flash-type evaporator is used to produce high-quality water for process use. Blowdown from this unit is required to reduce TDS and preclude scale formation or corrosion. Estimated effluent volume is 2.75 M-Gal/year.

3.1.4 Boiler Blowdown

The boilers at San Juan River Plant produce steam for power generation and other process needs. The majority of the steam is produced by fired boilers although a small amount is produced by exothermic reaction at the sulfur recovery unit. As in the evaporator, boiler blowdown is required to reduce TDS. The estimated volume of effluent is 2.00 M-Gal/year.

3.2 WASTEWATER CHARACTERISTICS

The chemical characteristics of the various wastestreams are presented in Table 3-1. The settling tank was not in operation at the time of sampling. However, since the tank blowdown is made up of raw water with some suspended solids a raw water analysis has been presented to characterize this stream. TDS of the effluent sources ranges from 240 mg/l to 2,130 mg/l. The weighted averages for the wastewater constituents have been calculated based on percent flow. The calculated value for TDS in the final wastestream is 1,419 mg/l. Significant seasonal changes in quality or flow rate are not expected.

Table 3-1. Wastewater Analysis by Effluent Source, El Paso Natural Gas Company San Juan River Plant *.

Parameters (reported in mg/l)	Settling Tank J87-22	Cooling Tower A J87-26	Cooling Tower B J87-28	Evaporator Blowdown J87-23	Boiler Blowdown J87-24	Weighted Averages
COD	< 25	46	90	77.2	212	108.0
TOC	3	18	29	8	43	23
TDS	240	1,350	2,130	1,240	1,140	1,419
E.C. (umhos/cm)	350	1,500	3,000	1,900	1,800	2,047
SAR	0.6	1.6	2.1	56.4	45.9	5.3
Oil & Grease	1.50	1.00	1.70	3.28	3.35	2.55
Total K Nitrogen	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	0.40
Nitrate-N	0.50	< 0.10	< 0.10	< 0.10	8.99	2.32
Ammonia	< 0.40	< 0.40	< 0.40	0.59	< 0.40	0.46
O-phosphate	< 0.1	< 0.1	< 0.1	< 0.1	30	7.5
Alkalinity (total)	100	27	18	50	0	28
Alkalinity (HCO3)	NA	NA	NA	NA	NA	NA
Arsenic	< 0.010	< 0.010	< 0.010	< 0.002	< 0.002	0.005
Barium	< 0.30	< 0.30	0.40	< 0.20	< 0.20	0.27
Boron	0.52	0.85	0.67	0.4	< 0.3	0.5
Cadmium	< 0.01	< 0.01	< 0.01	< 0.005	< 0.005	0.007
Calcium	33	170	270	1.97	< 1	91
Chloride	13	51	64	821	53	316
Chromium	< 0.02	0.05	0.03	< 0.005	< 0.005	0.018
Copper	0.01	0.17	0.10	0.01	0.24	0.11
Cobalt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05
Cyanide	0.024	0.006	< 0.005	0.007	0.006	0.007
Floride	< 0.1	< 0.1	< 0.1	< 0.1	1.8	0.5
Lead	< 0.05	0.10	0.11	< 0.005	0.06	0.06
Magnesium	10	50	70	0.09	1.1	24.6
Manganese	< 0.01	0.08	0.04	< 0.01	< 0.01	0.03
Mercury	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Molybdenum	< 0.01	0.02	0.03	0.01	< 0.01	0.02
Nickel	0.08	0.21	0.15	< 0.01	< 0.01	0.07
Potassium	1.60	7.80	13.00	1.54	0.32	4.91
Selenium	< 0.01	< 0.01	< 0.01	< 0.005	< 0.005	0.007
Silver	< 0.01	< 0.01	< 0.01	< 0.005	< 0.005	0.007
Sodium	15	90	150	298	280	221
Sulfate	77	730	1,140	450	30	543
Zinc	0.09	0.34	1.40	0.06	1.08	0.68
Estimated Flow (millions-gallons/year)	0.25	1.07	2.00	2.75	2.00	8.07

* Weighted average based on percent flow
E.C. values for evaporator blowdown and boiler blowdown are estimates.
Values reported below detection (<) are averaged at the detection limit.

4.0 PROPOSED DISPOSAL METHODS

EPNG proposes to discharge high-quality non-contact wastewater onto the surface of the land on a 26-acre plot located in the eastern portion of the plant property. The proposed land application area is delineated in Figure 2-1 as "East Site". Figure 4-1 shows the breakdown of the land application area into two-acre subplots which will receive wastewater at different application rates depending on climatic conditions throughout the year. Startup of the system is estimated to take place within 180 days from the date of approval for this discharge plan.

All non-contact wastewater will be collected by gravity drainage on the north side of the plant. From there it will be transferred by pump to storage on the south side of the plant. The storage will be an above-ground tank or double-lined pond with leak detection system depending on final design and economic constraints. A pumping system will take the water from storage and deliver it to the land application system.

A sideroll irrigation system will be employed to apply the wastewater over the land surface. The sprinkler assembly itself will be oriented from east to west and will roll over the subplots from north to south. Existing flora as described in Section 8.0 of the Phase I Final Report will be irrigated using the system. Minimal site preparation is anticipated since native species will be used as ground cover. Berming or other steps will be taken to preclude runoff or runon.

As described in Section 5.0 of the Phase II final report, the acreage requirements for land disposal will vary due to seasonal changes in evapotranspiration. The minimum acreage required will be used during different periods. This will allow sufficient hydraulic loading to promote leaching and prevent the accumulation of salts in the root zone. The use of raw water to accomplish salt leaching is not anticipated. Study of the site during operation may identify the need for small amounts of additional leach water later but present indications are that none will be required. The two-acre subplots will be employed as necessary to satisfy disposal requirements with the heavy use areas changed from year to year. This will ensure uniform waste application over the site.

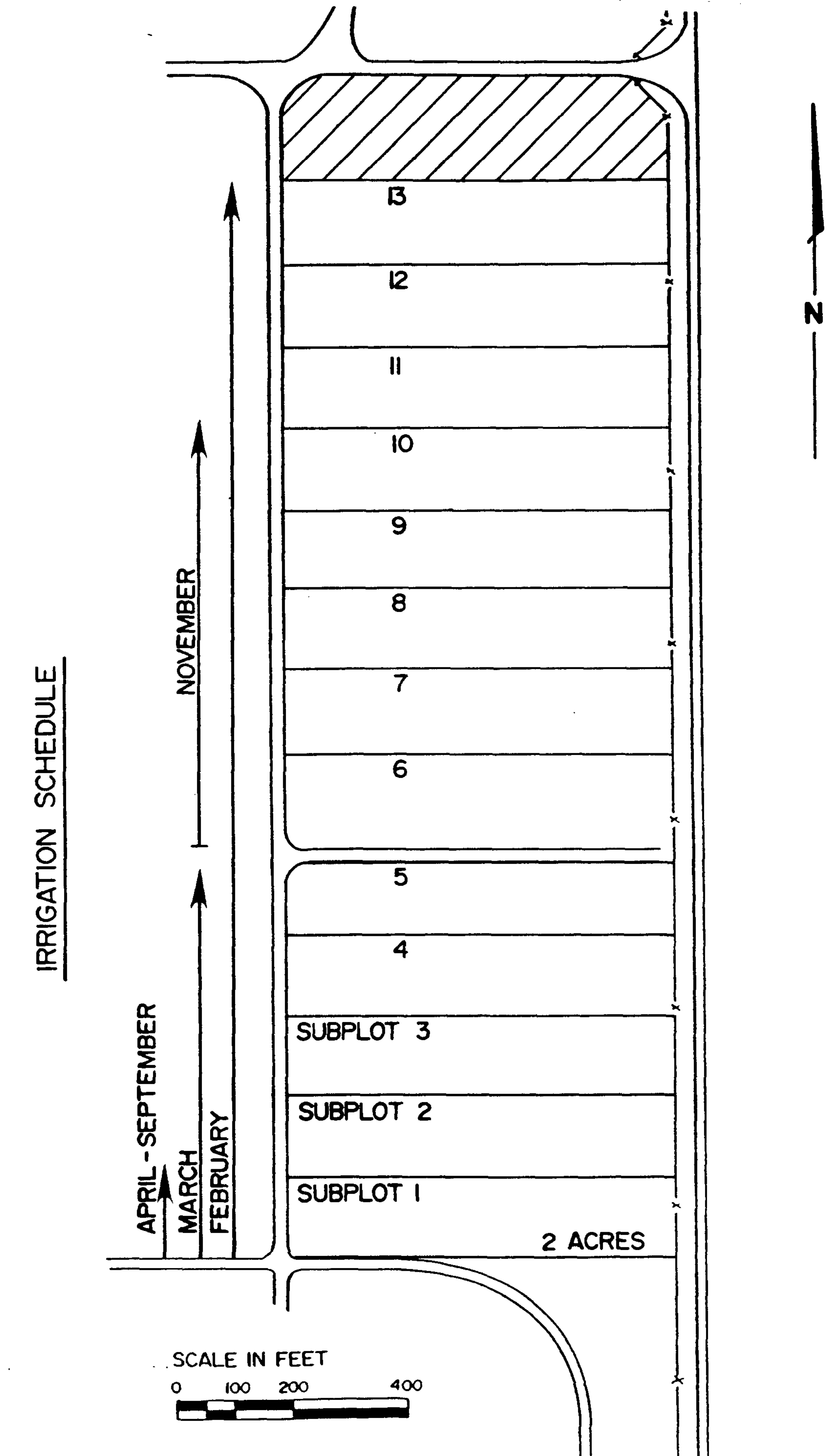

FIGURE 4-1. IRRIGATION SUBPLOTS AND INITIAL IRRIGATION SCHEDULE.

5.0 SITE CHARACTERISTICS

The site has been studied in considerable detail as part of the land application feasibilty study. A brief discussion of the topography and subsurface is presented here. Detailed information can be found in Sections 3 through 6 of the Phase I Final report and Section 3 of the Phase II Final Report.

5.1 SURFACE FEATURES

The proposed land application site has a surface area of approximately 26 acres and lies at the east end of the plant property. It is relatively flat, with a surface gradient of approximately .01 ft./ft. Sheet flow would be expected to trend toward the southwest in the northern 2/3 of the plot and toward the south in the southern 1/3 of the site. The majority of the soils exhibit a rapid infiltration rate (Sheppard = 8.9 in./hr.) which would essentially preclude surface runoff.

5.2 GEOLOGY AND HYDROLOGY

Numerous borings, piezometer installations and monitor well completions were performed as part of the first discharge plan exercise as well as during the Phase I and II studies. These activities enabled conclusions to be drawn regarding subsurface characteristics and the native groundwater.

The discharge site is underlain by consolidated sediments of the Kirtland formation capped with approximately 70 feet of alluvial sediments consisting of fluvial deposits with some gravel and cobble terrace deposits. The depth of these sediments does vary somewhat over the site depending on the upper erosional surface of the Kirtland shale.

The alluvium itself contains the acquifer of concern and the one most characterized during the study. Data shows depth to groundwater in excess of 50 feet. Flow is to the south with a very slight trend to the east. This flow pattern and locations of the various investigatory perforations are depicted in Figure 5-1.

5.3 GROUNDWATER QUALITY

Samples were taken from piezometers, monitor wells and private wells to characterize the native groundwater. The data collected shows that groundwater quality in the proposed land application area is variable with TDS concentrations ranging from 1,400 mg/l to 5,400 mg/l. The average TDS value in the monitoring wells was 4,500 mg/l while that of the privately-owned wells outside the plant property was 2,775 mg/l.

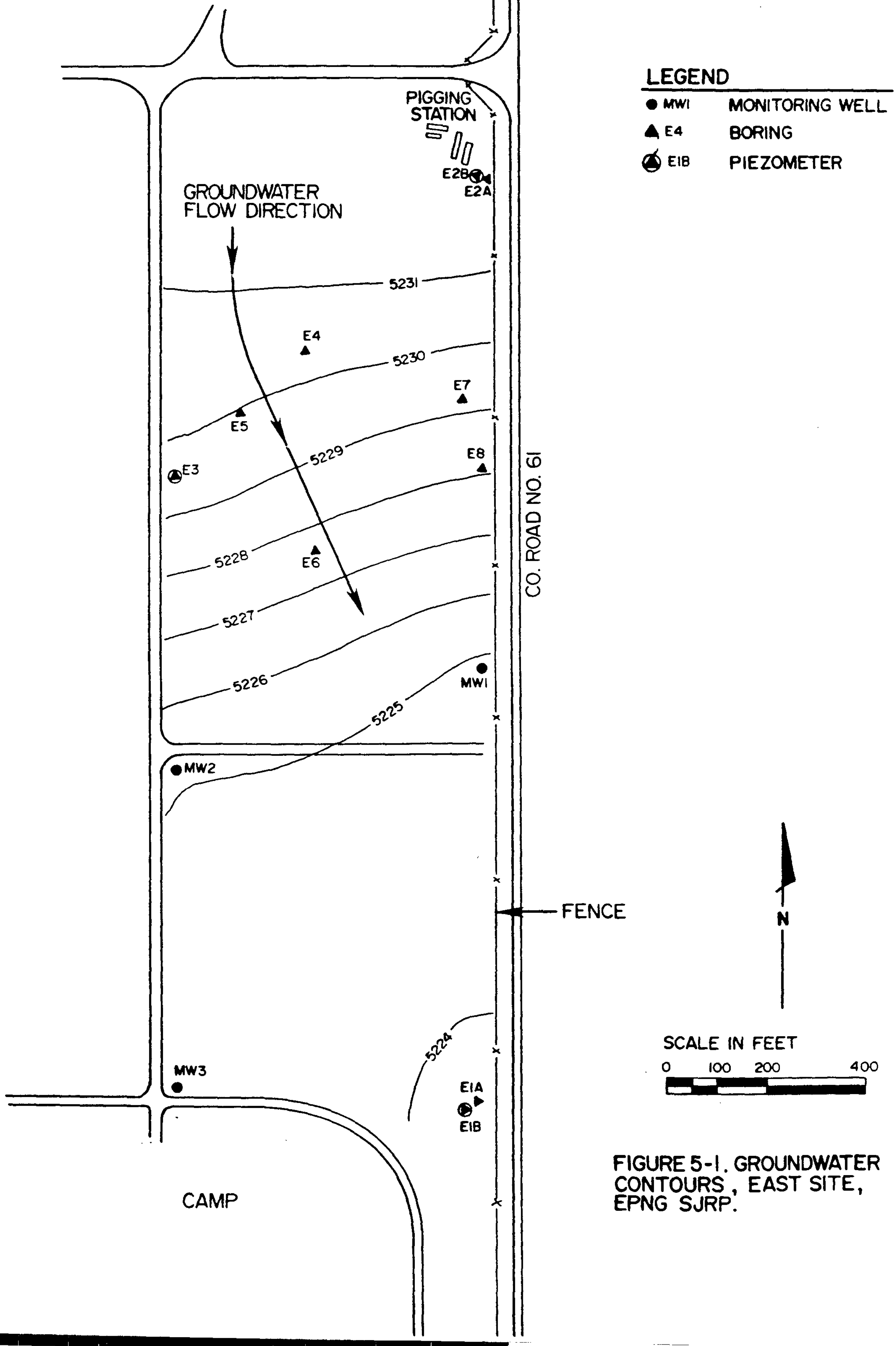

FIGURE 5-1. GROUNDWATER CONTOURS, EAST SITE, EPNG SJRP.

6.0 MONITORING AND REPORTING

Monitoring and sampling at the land application site are addressed in section 7.0 of the Phase II Final Report. The following paragraphs summarize those procedures and provide clarification of a few points discussed with NMOCD subsequent to submission of the report.

During the first year of operation wastewater will be analyzed monthly to allow adequate characterization of the discharge for management purposes. The frequency will be reduced after the first year of operations unless operational changes dictate more frequent analysis from time to time. Parameters to be checked include TDS, EC, pH, NO_3, TKN, SAR, cations and anions, and flow rate. Wastewater samples will be collected eight hours apart during a 24-hour period of steady-state flow. Standard accepted sample collection and preservation practices will be adhered to, including the following:

1. Allow water to flow from the sample connection until EC and pH are stabilized.

2. Rinse containers in the effluent.

3. Preserve samples immediately as required.

4. Place samples on ice and ship immediately to the laboratory.

Groundwater sampling will be conducted once a quarter during the first year of operation to establish baseline information. It is anticipated that some samples will be collected prior to startup of the system as well. Annual sampling will be conducted after the first year of operation. These samples will be collected in the last quarter of the year. Groundwater samples will be analyzed for EC, pH, TDS, SAR, Ca, Cl, Mg, Na, SO_4, NO_3, TKN, CO_3, and HCO_3. As before, standard monitor well care, sampling, preservation and shipping techniques will be followed, including washing the bailer with soap and water and rinsing with distilled water.

Unsaturated zone monitoring will be conducted to measure soil salinity, monitor the migration of waste constituents, evalute root zone leaching requirements, and provide information for determining application rates.

Soil cores will be collected yearly from all active plots during the last quarter of the year after the active growing season. Those plots designated for continuous irrigation throughout the growing season will be sampled semi-annually. Equal volumes of soil will be taken from five random locations in each plot and composited. This exercise will be carried out for samples at depths of 0 to 12 inches, 12 to 24 inches, and 24 to 36 inches. This will yield composites for each of the three depths. Samples will be analyzed for EC, pH, NO_3, ESP, soluble cations and anions, organic matter, gypsum requirement, and moisture content.

Finally, lysimeters will be employed to sample liquids moving through the soil profile. Two lysimeters will be installed per irrigation plot, one at the bottom of the root zone, the other at a depth of 10 feet. Samples from the lysimeters will provide information on the salts leaching from the root zone and give early indication of any wastewater constituent migration toward the groundwater. The sampling schedule for lysimeters will be the same as for the soil corings. Samples will be analyzed for EC, pH, NO_3, SAR, soluble anions and cations.

The monitoring program will assist location personnel in ensuring that operations are consistent with good environmental practices as well as all conditions of the discharge plan. NMOCD will be advised of analytical results which indicate constituent levels outside the normal operating range which appear to jeopardize safe operation of the system. At that time, EPNG and NMOCD will discuss suggested courses of action.

7.0 Closure

EPNG has begun planning the development of a closure plan for existing wastewater impoundments at the San Juan River Plant site. This plan will address all NMOCD concerns for non-degradation of ground or surface water due to former disposal practices. This plan will be submitted to NMOCD no later than March 1, 1988.