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EVALUATION OF ORGANIC CONSTITUENTS IN POND SLUDGES AT THE JAL NO. 4 PLANT

El Paso Natural Gas Company

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EL PASO NATURAL GAS COMPANY
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EVALUATION OF ORGANIC CONSTITUENTS IN SLUDGES AT THE JAL NO. 4 PLANT WASTE DISPOSAL PONDS

Prepared by
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Environmental Affairs Department
El Paso Natural Gas Company
El Paso, Texas

September 1981

EVALUATION OF ORGANIC CONSTITUENTS
IN SLUDGES AT THE JAL NO. 4 PLANT
WASTE DISPOSAL PONDS

I. Introduction

The New Mexico Oil Conservation Division (OCD) requested evaluation of organic constituents that may be present in the sludges of the Jal No. 4 plant ponds. The evaluation would be an addendum to the August 1981 Jal No. 4 Plant Closure Plan. This report describes the protocol to be used to obtain field information, chemical analyses of sludges and compliance standards. Information verbally agreed to in a meeting held on Santa Fe, New Mexico on August 31, 1982 between OCD and El Paso Natural Gas Company (El Paso) is also included.

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II. Field Information

There are eight ponds or depressions that require determination of the areal extent and depth of sludges. A field survey of each pond will be made to determine the areal extent of sludge. That information will be shown on an aerial photograph (El Paso Drw. No. 5004.19-1) at a scale of one inch to one hundred feet. The number and location of cross sections for each pond will be determined in the field. Each cross section will be indicated on the aerial photograph. A subsurface profile of the sludge will be obtained using an auger or backhoe to a depth of at least six inches into native soils at each cross section. The sludge profile will be drawn onto a cross section exhibit. The quantity of sludge in each pond will be determined using the average end area method for volume determination. A sludge sample will be collected at one cross section per pond and its location noted on the drawings.

A history of the ponds and depressions will be investigated to determine their past use and time in service. This will be accomplished by researching engineering records, reviewing aerial photographs and discussing past disposal practices with plant personnel. Pond No. 3 is believed to be the oldest industrial waste pond at the plant. If this can be substantiated, it should represent the worst case with respect to concentration of organic constituents and quantity of sludge. If the chemical analysis of the sludge indicates there is no significant amount of organic constituents leachable from the sludge, the likelihood of groundwater contamination from other pond sludges should also be insignificant.

III. Sampling Strategy

Sludge samples will be collected from all ponds and depressions that are known to have received industrial wastewater. The sample locations will be selected after determining the areal extent and depth of sludge. Because the sampling involves collection for analysis of volatile organics such as benzene, mixing and compositing of sludge samples will not be accomplished. Instead, the area containing the thickest sludge layer will be selected since it should present the best environment in which volatile organics would be retained. The sample will be collected at or near the interface of the native soils and sludge.

IV. Sampling Methodology

The sampling equipment will be either a hand auger or shovel. In very thick sludges a backhoe will be used to uncover the upper layers of sludge to permit easy access to the lower levels for depth determination and sample collection.

The sample will be transferred to a glass bottle with the opening covered with aluminum foil and sealed to prevent further loss of volatile organics to the atmosphere. The bottle will be placed in a cooler packed with ice to maintain as low a temperature as possible during transport.

The temperature of the sludge will be taken at the time of collection. High temperatures increase the likelihood of loss of volatile organics to the atmosphere. For example, temperatures exceeding 100°F would indicate that the chance of volatile organics being present would be very slight.

The samples will be transported to Raba Kistner Consultants, Inc., El Paso, Texas for analysis. Documentation and control necessary to identify and trace the samples from collection to final analysis will be accomplished in accordance with U. S. Environmental Protection Agency (EPA) recommendations.

El Paso's Permian Division will identify potential sources of soil that may be used to cap the ponds as described in the August 1981 closure plan. Samples of the material will be collected and tested to determine the materials' permeability. The evaluation will indicate the desired compaction to be accomplished during construction.

V. Analytical Methodology

The samples will be analyzed for organic constituents using two methods of extraction: (1) general component extraction and (2) EPA leachate extraction. The general component extraction would include distillation, ultrasonic or heat (Soxhlet) method to determine essentially the entire concentration of organic constituents present. However, these methods cannot indicate the portion of the constituent concentration that could be leached from the sludge under normal conditions. The EPA leachate extraction method would indicate only that portion of the total concentration that potentially could be leached from the sludge and migrate down or outward from the area.

The cost of the EPA leachate extraction method is more costly than the general component extraction method. For economic reasons El Paso proposed and OCD agreed to keep the number of leachate tests to a minimum. The general component method test can be used for comparison. For example, Ponds 3 and 8 would have two samples collected and analyzed using both extraction methods. The remaining ponds would be analyzed using only the general component extraction method. The results of the general component method would be used only as an indicator because it cannot define the leachable organic portion of the sample. The analytical results obtained from the two methods on samples from ponds 3 and 8 will be compared to determine if there is a correlation in results obtained from the two methods. If the results from a general component extraction method indicates the quantity of organics may exceed the standard that sample will be retested using the EPA leachate extraction method.

VI. Constituents to be Analyzed

The organic constituents to be evaluated in this study are listed in the New Mexico Water Quality Control Commission (NMWQCC) Regulations (as amended through August 1982 Part 3-103A). The OCD agreed to establish the standard for concentration comparison to 100 times the Human Health Standard. The constituents are listed in Table 1 and indicate the standard to be used.

TABLE 1

ORGANIC CONSTITUENTS TO BE EVALUATED

IN JAL NO. 4 PLANT SLUDGES

Constituent	Human 1/ Health Standard mg/L	Standard 2/ For Extraction Analysis mg/L
Benzene	0.01	1.0
Polychlorinated biphenyls (PCB's)	0.001	0.1
Toluene	15.0	1500.
Carbon Tetrachloride	0.01	1.0
1, 2-dichloroethane (EDC)	0.02	2.0
1, 1-dichloroethylene (1, 1-DCE)	0.005	0.5
1, 1, 2, 2-Tetrachloroethylene (PCE)	0.02	2.0
1, 1, 2-Trichloroethylene (TCE)	0.1	10.0
Total Organic Carbon	NO STANDARD	-----

1/ Human health standard established for groundwater in accordance with NMWQCC Regulation Part 3-103.A.

2/ The method agreed to by the OCD parallels the U.S. Environmental Protection Agency's EP Toxicity characteristic determination described in 40 CFR 261.24.

VII. Schedule

Two of the ponds recently contained wastewater. These ponds will be pumped to the classifier tank and ultimately be disposed of in the plant injection well. Because the sludges will remain saturated for some time it is not practical to attempt to collect samples until they have had a chance to dry. It is believed that two months should be sufficient to allow drying to a point that sampling can be accomplished. The sampling and surveying will take several weeks to accomplish. The laboratory may require up to one month to conduct the leachate extraction, dependent upon the condition of the samples. Following receipt and evaluation of the sludge, a report of findings and recommendations will likely take a month to complete. The OCD agreed to a maximum of six months to accomplish the tasks outlined above. Therefore, assuming the wastewater in the two ponds as being pumped into the classifier on September 1, 1982 the project should be complete by the end of February 1983.

VIII. Discussion

The findings of the study may indicate that no standards are exceeded. Although the August 1981 closure plan indicated no hazardous concentration of inorganics existed, a caliche cap was proposed to be installed on ponds 1 and 2. Because of the more detailed study required by OCD, the results may indicate that capping any of the ponds may not be necessary. Therefore, site grading may be all that is required. The OCD agreed that if the results indicate there is no leachable quantities of inorganics or organics, the need for capping is obviated.

Consulting Geotechnical, Materials and Environmental Engineers
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P682-003
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ENVIRONMENTAL AFFAIRS
ABC

Mr. Forrest Sprester
El Paso Natural Gas Co.
Environmental Affair Department
P.O. Box 1492
El Paso, Texas 79978

Dear Mr. Sprester:

Presented herein are the methodologies of chemical analysis, detection limits and cost for the ten parameters in your oil pit sludge samples. Two analytical schemes are proposed for the analysis of total components and EPA EP leachable organics.

We appreciate the opportunity to provide this technical service to you. We are looking forward to receiving samples from you. Should you have any questions concerning our technical approaches and costs, please do not hesitate to call us.

Very truly yours,

RABA-KISTNER CONSULTANTS, INC.

Francis Y. Huang, Ph.D.
Manager, Chemical Research
and Development

Carlton R. Williams, P.E.
Director, Environmental
Engineering Sciences

/ps

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METHODOLOGIES

1. Analytical Schemes

The ten parameters interested in the dry oil pit sludge can be divided into three catagories:

(1) Volatile organics (7 components)

(2) Nonvolatile-polychlorinated biphenyls, and

(3) General characteristics - total phenolics and total organic carbons.

In keeping with the requirements of this project and the nature of the chemical constituents in the sample, these three catagories of parameters should be determined using different techniques. The methods proposed to use are described hereafter.

Scheme A (see Figure 1):

This analytical scheme is designed to analyze the total composition of the ten parameters in the sample.

Catagory 1 - Volatile Organics

In order to recover the volatile organics in the solid sample, heating and concentration in the analysis of these compounds shall be avoided. Ultrasonic extraction is an ideal technique because it possess several advantages over other technique: 1) Lesser amount of solvent required; 2) Heating is not necessary; 3) Contamination from the laboratory glassware is limited; 4) Procedure is relatively simple, and 5) It can be operated in a closed system. In this technique, the sampel will be placed in a minivial and organic solvent is then added to the vial. After being ultrasonicated for a period of time, the extract is subjected to screening analysis on a gas chromatography (GC) with flame ionization detector (FID) and electron capture detector (ECD). Any detected component of the interested parament will be confirmed on a gas chromatography-mass spectrometer - computer system (GC/MS/COM). Ultrasonic extraction of organics in solid has been thoroughly investigated.[1,2] For these volatile compounds, a solvent system containing methanol and carbon disuefide will be employed.

Catagory 2 - Polychlorinated Biphenyls (PCBs)

Analytical procedures for PCBs in spilled material have been well documented in EPA methodologies.[3] Soxhlet extraction using organic solvents is the most effective method for extrating nonvolatile organics from solid material. This technique requires less attention from analyst in working on the samples. Long extraction time can be applied to achieve high recovery.

As it can be expected, the oil pit sludges are rich in organic materials which might interfer with the analysis of PCBs using GC/ECD technique. If the interferences are encountered, a clean-up procedure shall be employed. Florisil chromatography is an effective method for the removal of interferences from the sample for PCBs analysis.[4]

PCBs is a generic term for polychlorinated biphenyls. It consists of serveral commonly used Anochlors. In this proposal, the type of Arochlor will be determined by the pattern recognition method on GC chromatograms. GC/MS technique will be used to confirm the findings.

Catagory 3 - General Parameters

a) Total Recoverable Phenolics

The analysis will be performed in accordance with EPA Method 420.1.[5] Phenols in the solid sludge will be acidified in a water slurry mixture and distilled. Color response of phenolic materials with 4-aminoantipyrine is then measured spectrophotometrically. The amount of color produced is a function of the concentration of phenoic material.

b) Total Organic Carbon

The total organic carbons in the sludge will be analyzed using Walkley-Black Method.[6] Oxidizable matter in a sludge sample is oxidized by $Cr_2O_7^{2-}$. The excess $Cr_2O_7^{2-}$ is determined by titration with standard $FeSO_4$ solution, and the quantity of substances oxidized is calculated from the amount of $Cr_2O_7^{2-}$ reduced.

Scheme B (see Figure 2)

For the evaluation of the leachable parameter in water, this analytical scheme provides the analytical approach for the analysis of the ten parameter. Basically, a leachate will be generated from the sludge in accordance with the EPA EP method.[7] The resulting aqueous solution is then subjected to analysis for the various catagories of parameter interested.

Catagory 1 - Volatile Organic

A purge/trap technique, EPA Method 624[8], will be employed. The volatile organics is first purged from the water and absorbed onto a trap. After being desorbed from the trap, the seven components then are analyzed on GC/MS.

Catagory 2 - Polychlorinated Biphenyls (PBCs)

The leachate will be subjected to liquid - liquid extraction with organic solvent. The PCB - containing extract then will be concentrated, screened on GC/EC, and/or cleaned up on florisil column for GC/MS confirmation. EPA Method 625[8] will be employed.

Catagory 3 - Total Phenolics

The procedure is identical to that of solid in Scheme A; however, the leachate will be used instead of solid sample.

Catagory 4 - Total Organic Carbon (TOC)

The TOC in the leachate will be measured in accordance with EPA Method 415.1[5] Organic carbon in the leachate is converted to carbon dioxide (CO_2) by catalytical combustion. The CO_2 formed is converted to methane (CH_4) and measured by a flame ionization detector. The amount of CH_4 is directly proportional to the concentration of carbonaceous material in the leachate.

2. Instrumentation

Gas Chromatograph (GC) and Gas Chromatograph-Mass Spectrometer (GC/MS) will be used exclusively for the entire analytical scheme. A Perkin-Elmer Sigma 1 GC with electron capture (ED) detector and flame ionization detector (FID) will be used. All the data will be manipulated through a computerized console. This GC will be used primarily for screening the extracts for organic constituents. Quantitative determination of the components will also be conducted on this unit once the identification of the compounds are confirmed by GC/MS. Several column systems will be involved in accordance with the types of compounds interested. Basically, a 6-ft x 2mm glass column filled with OV-1 and QF-1 non-polar phase will be used for PCBs and other non-volatile chlorinated compounds while a 6-ft x 2mm glass colunn filled with SP-1000 on carbopak B will be used for volatile organics. ECD will be employed for chlorinated compounds used and FID will be operated for benzene and toluene.

A Hewlett-Packard 5992 B Gas Chromatograph-Mass Spectrometer (GC/MS) with a computer system will be used for the confirmation of the compounds detected on GC. This system has the capabilities of monitoring the characteristics ions of each interested organic in this project. Electron impact mass spectrometer will provide sufficient information for the identification.

A software will be prepared to search for these compounds in each run. Detected ion signals and intensities will be stored both in magnetic tapes and on the hard copies of output. The quantitating of each compounds can be calculated based on the areas of each characteristic ion. However, GC signals will be used as primary data for quantitative calculation.

REFERENCES

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3. "Sampling Methods and Analytical Procedure Manual for PCB Disposal: Interim Report - Tentative Method of Testing for Polychlorinated Biphenyls in Spilled Material", US EPA, Feb. 10, 1978.

4. "Polychlorinated Biphenyls (PCBs) by Gas Chromatography", ASTM D 3534-80.

5. Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, 1979.

6. "Methods of Soil Analysis - Part 2. Chemical and Microbiological Properties", C.A. Black, ed., Chapt 90. American Society of Agronomy, 1965.

7. "Test Methods for Evaluating Solid Waste Physical/Chemical Methods", SW-846, US EPA, 1980.

8. "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations", Federal Register, vol 44, No. 233, Dec. 3, 1979.

FIGURE 1: ANALYTICAL SCHEME A (TOTAL COMPONENTS)

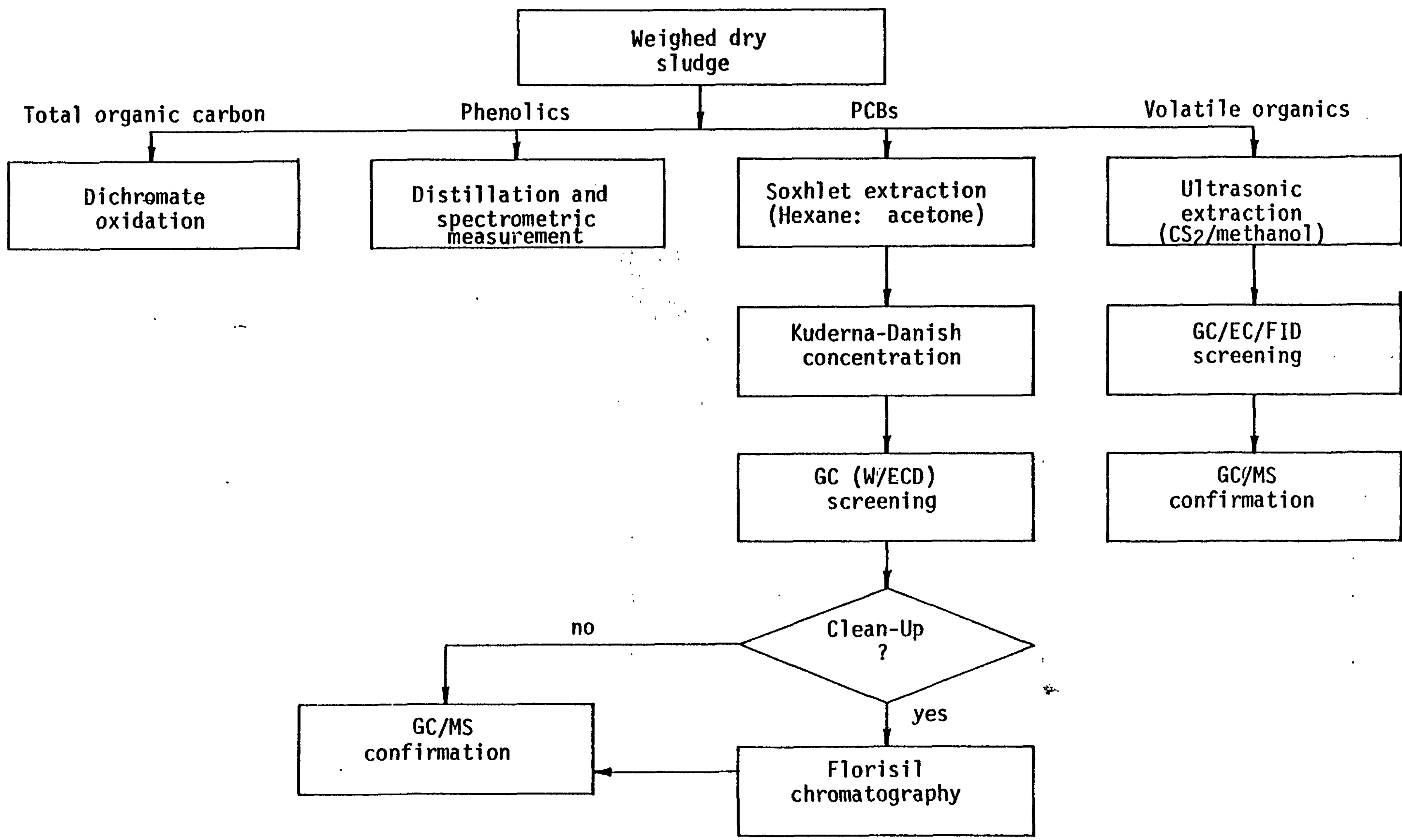
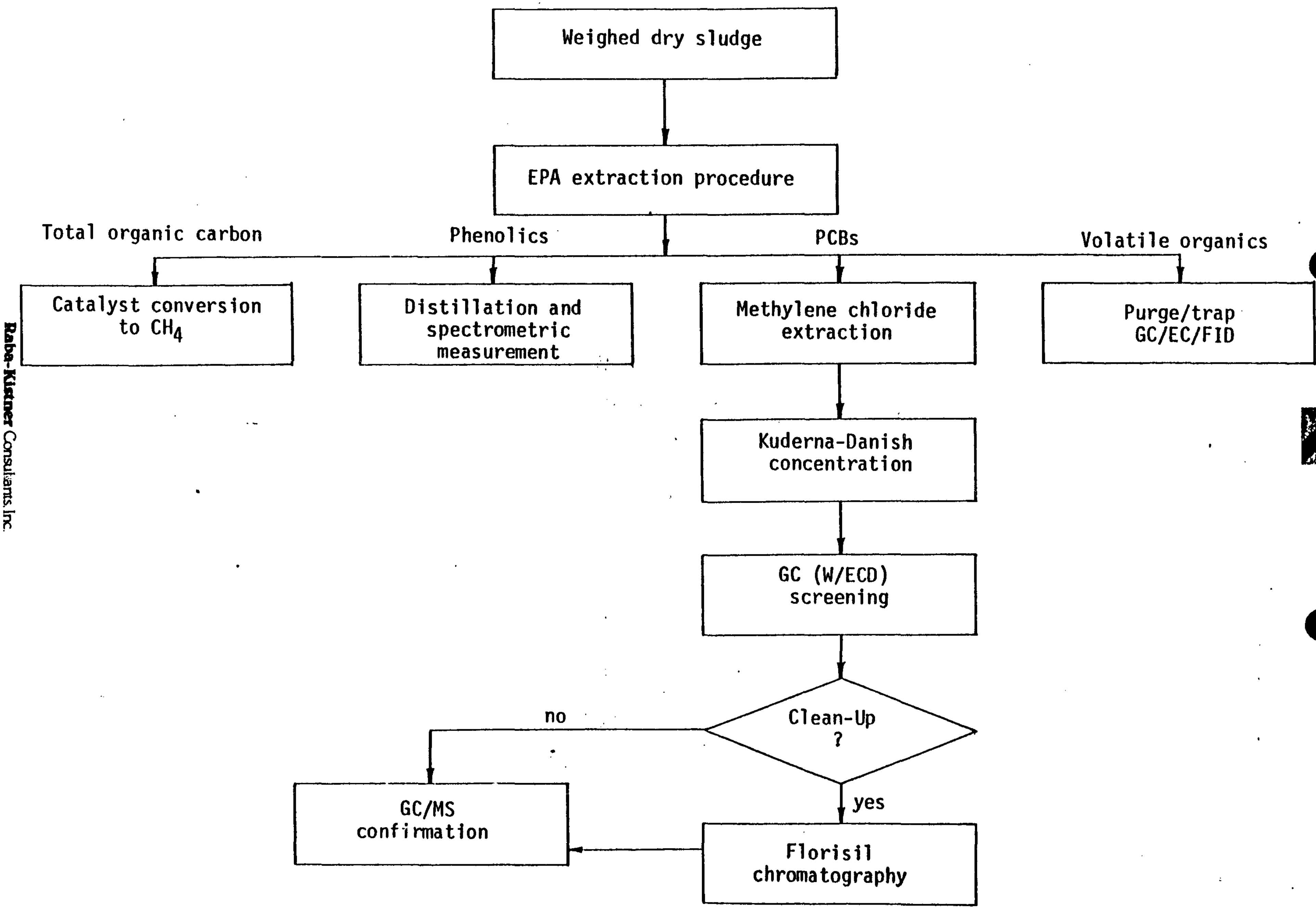


FIGURE 2: ANALYTICAL SCHEME B (EPA EP LEACHATE)



METHOD DETECTION LIMITS OF THE CHEMICAL ANALYSIS OF THE ORGANICS IN OIL PIT SLUDGE

Parameters	Detection Limits for Ultrasonic Extraction (μg/g)[1]	EPA Leachate (μg/l)[2]	Soxhlet Extraction (μg/g)[1]
I. Volatile Organics			
Benzene	1.0	0.1	---
Carbon Tetrachloride	0.07	0.007	---
1,1-dichloroethane	0.04	0.004	---
1,2-dichloroethylene (DCE)	0.06	0.006	---
Tetrachloroethylene (TCE)	0.07	0.007	---
Trichloroethylene (TCE)	0.05	0.005	---
Toluene	1.0	0.1	---
II. PCB's			
Arochlor 1016	---	5.0	0.1
Arochlor 1221	---	5.0	0.1
Arochlor 1232	---	5.0	0.1
Arochlor 1242	---	5.0	0.1
Arochlor 1248	---	5.0	0.1
Arochlor 1254	---	5.0	0.1
Arochlor 1260	---	5.0	0.1

III. Total Phenolics 50 μg/l (leachate) 0.25 μg/g (sludge)

IV. Total Organic Carbons 1 mg/l (leachate) 10 μg/g (sludge)

1. The detection limits are based on the amount of individual parameter that can be detected per unit weight of dry sludge sample. These limits are determined by GC/EC and GC/FID.

2. These limits are the lowest recognizable levels of each parameters leachated in the water. They are determined by Purge/Trap GC/ED and GC/FID.

UNIT COST

Scheme A - total components (dry sludge)

Volatile organics		$ 95.00
Polychlorinated byphenyls (PCB's)		85.00
Total phenolics		30.00
Total organic carbon		25.00
	Total	$235.00

Scheme B - EP leachate

Volatile organics		$155.00
Polychlorinated byphenyls (PCB's)		135.00
Total phenolics		25.00
Total organic carbon (TOC)		25.00
Leachate generation		50.00
	Total	$370.00

NOTE: A 10% deduction in cost will be applied if more than ten samples are submitted.

Evaluation of Organic Constituents
In Pond Sludges at the Jal No. 4 Plant

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El Paso Natural Gas Company
Environmental Affairs Department
El Paso, Texas

March 1983

EVALUATION OF ORGANIC CONSTITUENTS IN POND SLUDGES AT THE JAL NO. 4 PLANT

Introduction

The New Mexico Oil Conservation Division (OCD) in August 1982 requested an evaluation of sludges for organic constituents contained in the abandoned ponds at El Paso Natural Gas Company's (EPNG) Jal No. 4 Plant. The evaluation would be an addendum to the Jal No. 4 Plant Discharge Plan which was submitted to the OCD in August 1981. This report describes the protocol used to obtain field information and chemical analyses, results of the analyses and comparison to the New Mexico Water Quality Control Commission standards.

The evaluation is arranged in such a manner as to respond in as much detail as possible to Part 3 of the New Mexico Water Quality Control Commission (NMWQCC) Regulations and additional requests made by the OCD. EPNG has assembled, evaluated and included information from all known sources in describing the history of waste disposal ponds at the plant.

EPNG coordinated with the OCD representative all phases of this study before taking any significant action. For example, a written proposal of the evaluation was submitted to OCD in September 1982 and received OCD approval prior to field sampling. Following sampling and researching the plant's pond history a presentation was made to OCD in January 1983 to be assured that the evaluation was being accomplished in an acceptable manner.

Background

The Jal No. 4 Plant was constructed in 1952 and consisted of a gasoline plant, a purification plant, a dehydration plant and appropriate compression facilities. The plant treated, compressed and transported natural gas to EPNG's main transmission line for consumption further west. The plant was upgraded in 1959 with the addition of a new fractionating plant and underground storage wells. Other additions to the processes have been added or deleted from time to time but the plant function has not changed significantly since construction.

A 11.12 acre area of the eastern portion of the 181-acre plant site was dedicated for unlined ponds used for disposal of wastewater from 1952 to 1981. However, due to fluctuations in quantities of gas production and process changes the location of ponds have shifted and ponds have been added or deleted; the total 11.12 acres were not used at any one time. In fact, as shown in Table 1, about 8.35 acres were used for disposal of wastewater or to capture rainfall runoff.

Prior to installation of the disposal system described in the Discharge Plan, wastewater was disposed of in the unlined ponds shown on Figure 1 (Map Pocket) and aerial photographs Figures 2 through 9. The largest ponds were Pond Nos. 1 and 3 which were in continuous service from 1952 to 1981. Other ponds were added and deleted as the need arose. None of the ponds designed to receive wastewater have been totally free of oily wastes. The aerial photographs also show ponds constructed for the sole purpose of holding storm runoff; these may or may not have received oily wastes from plant runoff. A number designation for the ponds is shown on Figure 1 and a description of each pond use, length of service and approximate date of construction is shown in Table 1. Ponds 9, 10 and 11 are brine storage ponds related to the underground liquid hydrocarbon storage facility and are not considered wastewater disposal ponds. Ponds 6 and 7 were naturally occurring low areas which have received runoff waters as well as overflow from the wastewater ponds; over time they were modified to become wastewater disposal ponds.

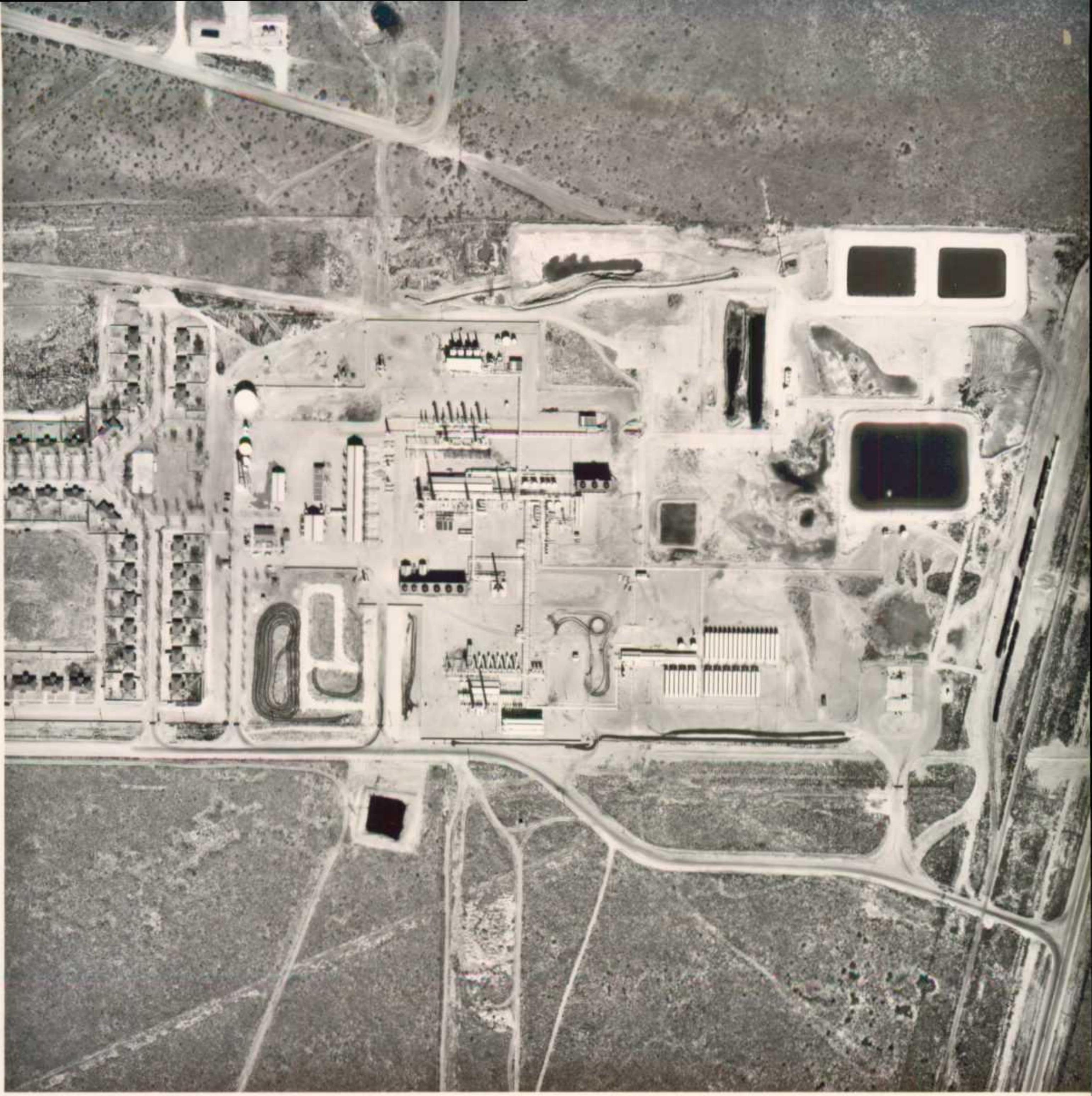
Except for the brine ponds, all the ponds have been drained by either evaporation or evacuation to the classifier. Of some 20 ponds, eight were identified as containing 5.96 acres and 53.71 acre-feet of sludge. Closure of the ponds will be accomplished following degradation

Table 1

Summary of Pond History and Sludge Volumes for Jal No. 4 Plant

Pond No.	Date of Construction	Duration of use (years)	Purpose	Area (acre)	Sludge Depth (feet)	Sample No.	Estimated Volume of Sludge (Ac.-Ft.)	Comments
1	1952	31	Wastewater from processes and domestic waste	1.16	Unknown	NA [1/]	NA	Plant constructed in 1952; See Figure 1 for pond locations Pond full of water during evaluation
2	1976	5±	Wastewater from processes	0.17	NA	NA	NA	
3	1952	31	Wastewater from processes	0.69	6.0	82-099 82-100	4.14	
4	Prior 1961	12±	Old flare pit & received wastewater from processes	0.18	9.0	82-094	1.62	Figure 4; abandoned pond
5	Prior 1965	17±	Runoff of processes wastewater	0.64	10.0	82-095	6.4	
6	Prior 1961	21±	Runoff of processes wastewater	1.37	7.0	82-092	9.59	
7	1961	20	Runoff of processes wastewater	1.58	11.5±	82-093 82-096	18.17	
8	1961	20	Runoff of processes wastewater	0.89	9.0	82-097 82-098	8.01	
9	1952	31	Brine water storage	0.98	Lined pond	NA	NA	(Ponds 9, 10 & 11 are associated with the underground liquid hydrocarbon storage facility)
10	1952	31	Brine water storage	0.92	Lined pond	NA	NA	
11	1952	31	Brine water storage	0.87	Lined pond	NA	NA	
12	Prior 1965	5±	Rainfall runoff (Duck Pond)	0.58	NA	NA	NA	Figure 4; abandoned pond
13	Prior 1965	2±	Rainfall runoff	0.05	NA	NA	NA	Figure 5; abandoned pond
14	Prior 1961	15±	Drip production	0.45	10.0	82-101	4.5	Figure 5; abandoned pond
15	Prior 1961	15±	Rainfall runoff and wastewater from processes	0.16	8.0	82-102	1.28	Figure 4; abandoned pond
16	Prior 1967	2±	Wastewater from processes	0.03	Unknown	NA	NA	Figure 5; abandoned pond; site covered by plant process
17	Prior 1961	10±	Flare pit	0.05	Unknown	NA	NA	Figure 5; abandoned pond; site covered by plant process
18	Prior 1965	10±	Wastewater from processes	0.03	Unknown	NA	NA	Figure 6; abandoned pond; site covered by plant process
19	Prior 1961	5±	Wastewater from processes	0.05	Unknown	NA	NA	Figure 2 & 3; abandoned pond; site, covered with plant process
20	Prior 1961	5±	Wastewater from processes	0.27	Unknown	NA	NA	Figure 2 & 3; abandoned pond; Gulf Oil Property
			TOTAL	11.12		TOTAL	53.71	

1/ NA means not applicable



El Paso Natural Gas Company

FIGURE 2

AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 2–16–61

El Paso Natural Gas Company

FIGURE 3
AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 3–9–61

NO SCALE

El Paso Natural Gas Company

FIGURE 4

AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 6–13–65

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NO SCALE

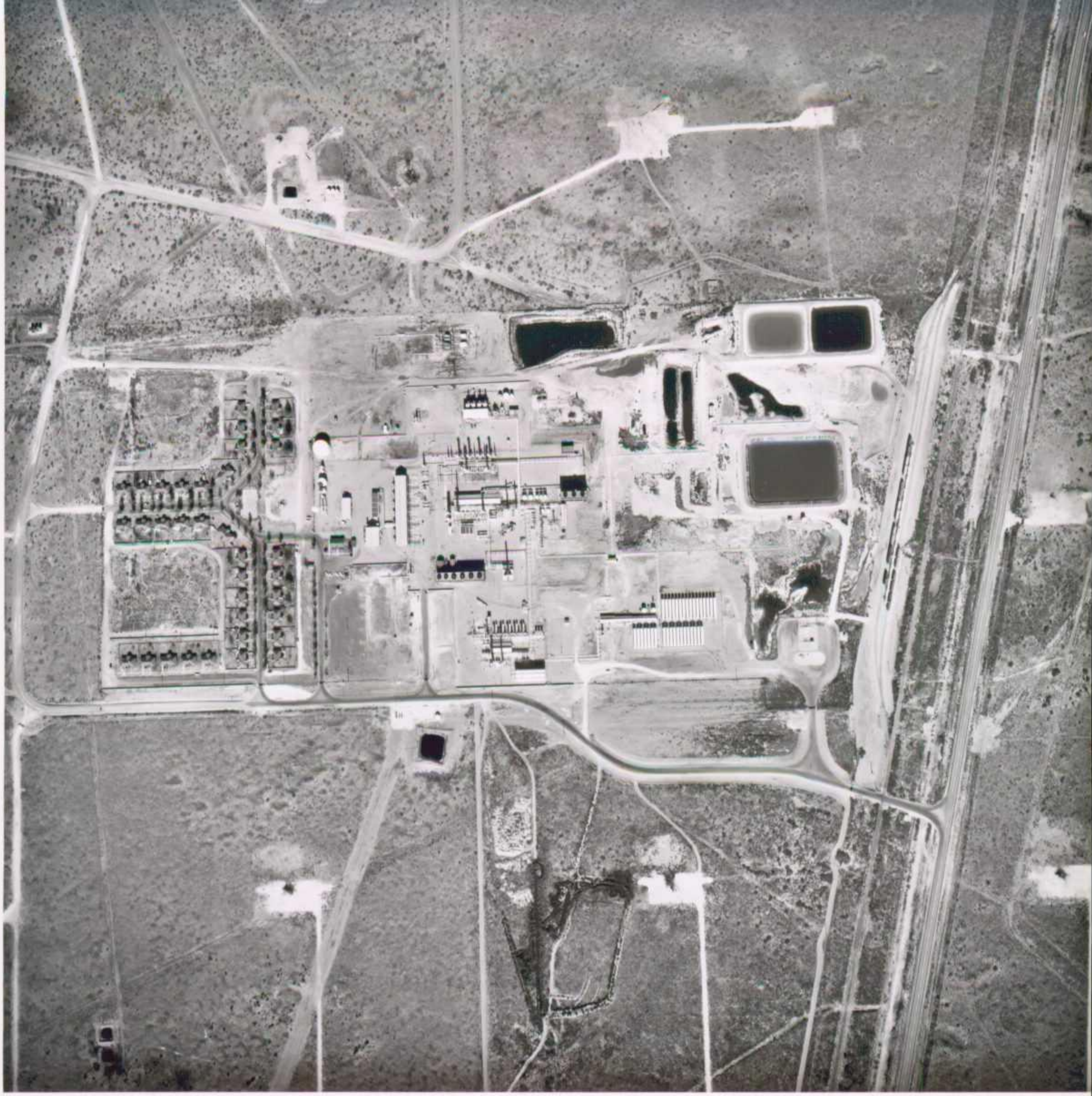

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FIGURE 5

AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 11–17–67

N

NO SCALE

FIGURE 6

AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 5–27–72

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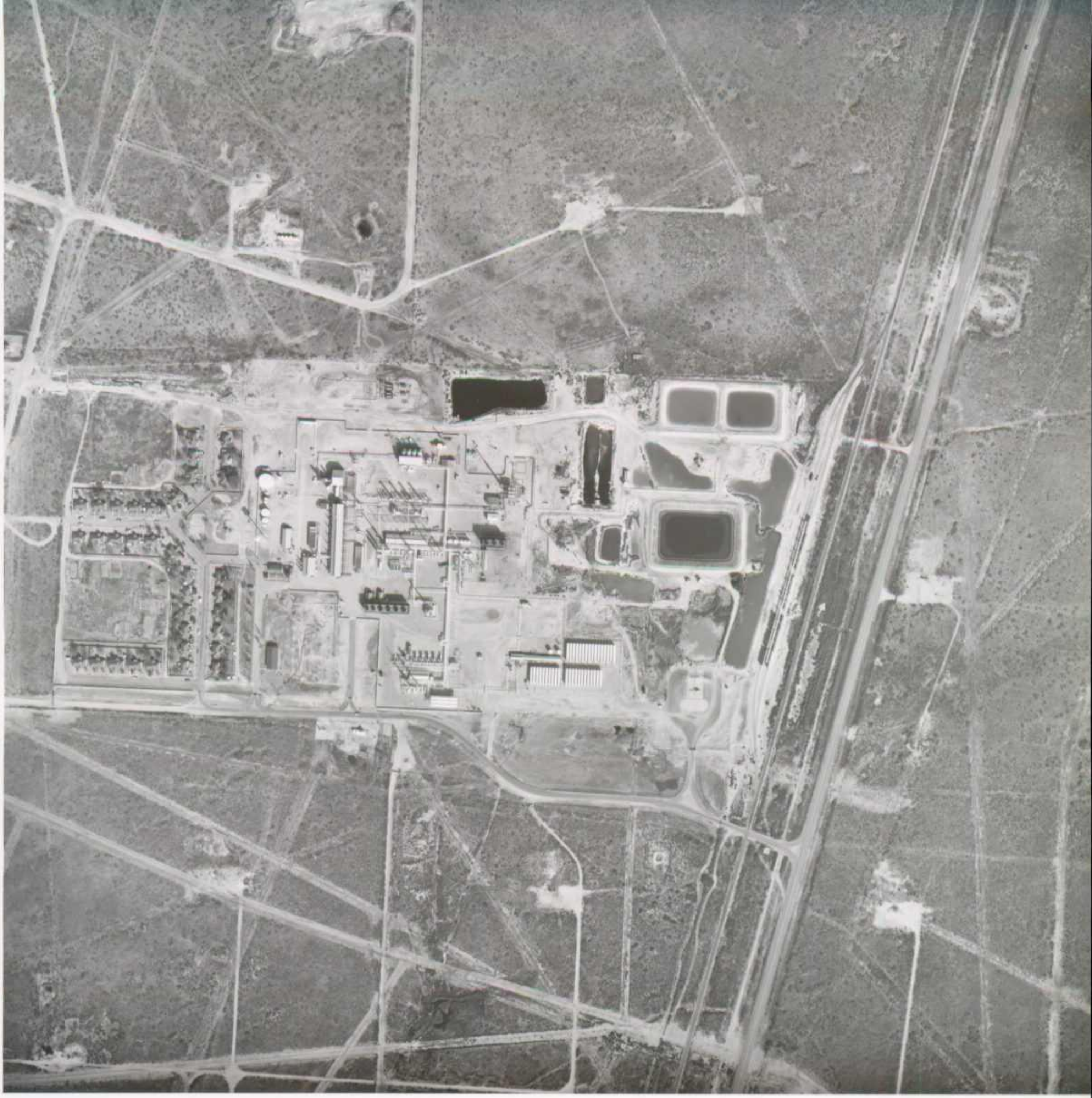
NO SCALE



El Paso Natural Gas Company

FIGURE 7

AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 11–4–76

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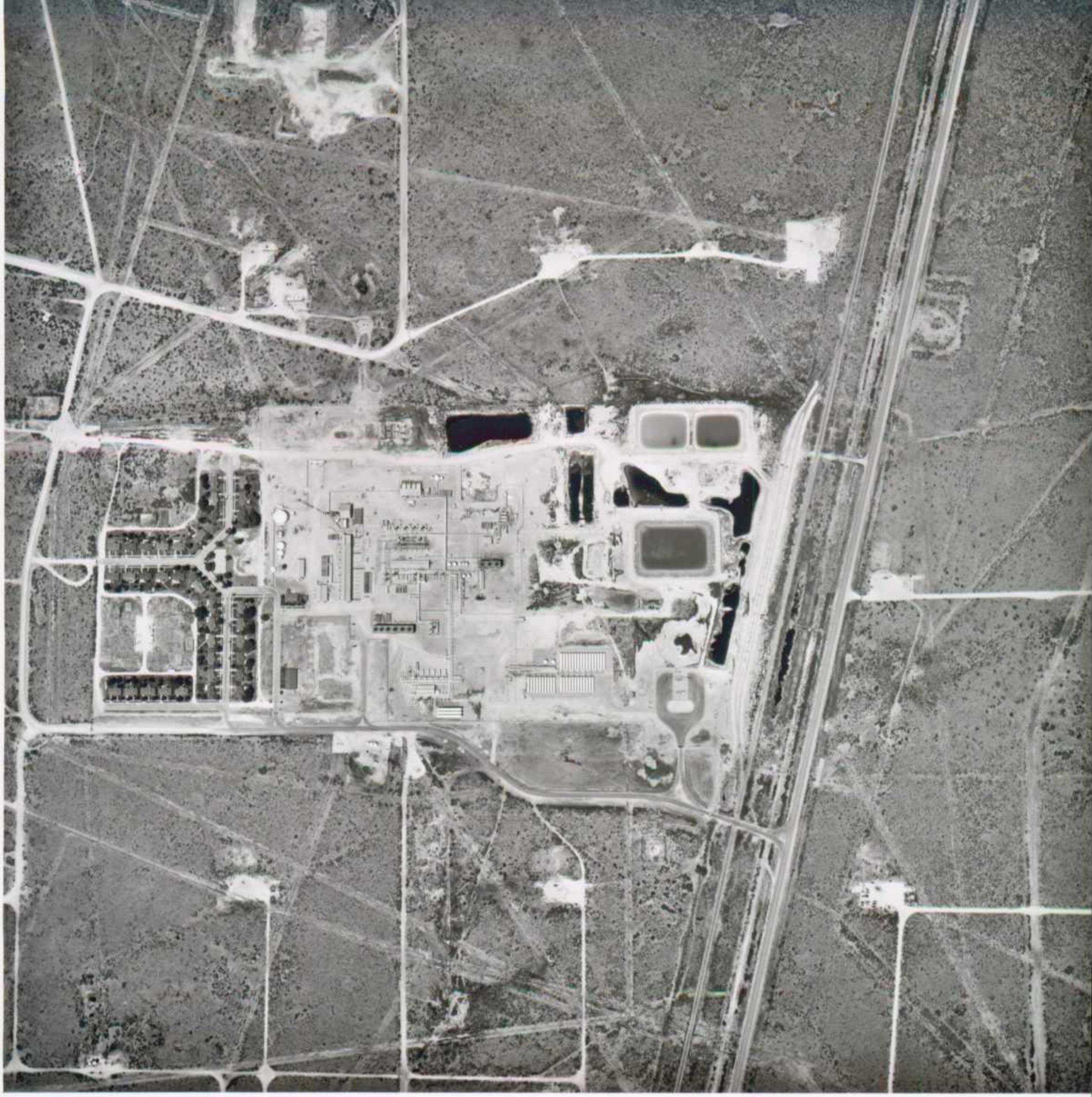
NO SCALE



El Paso Natural Gas Company

FIGURE 8

AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 6–22–79

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NO SCALE

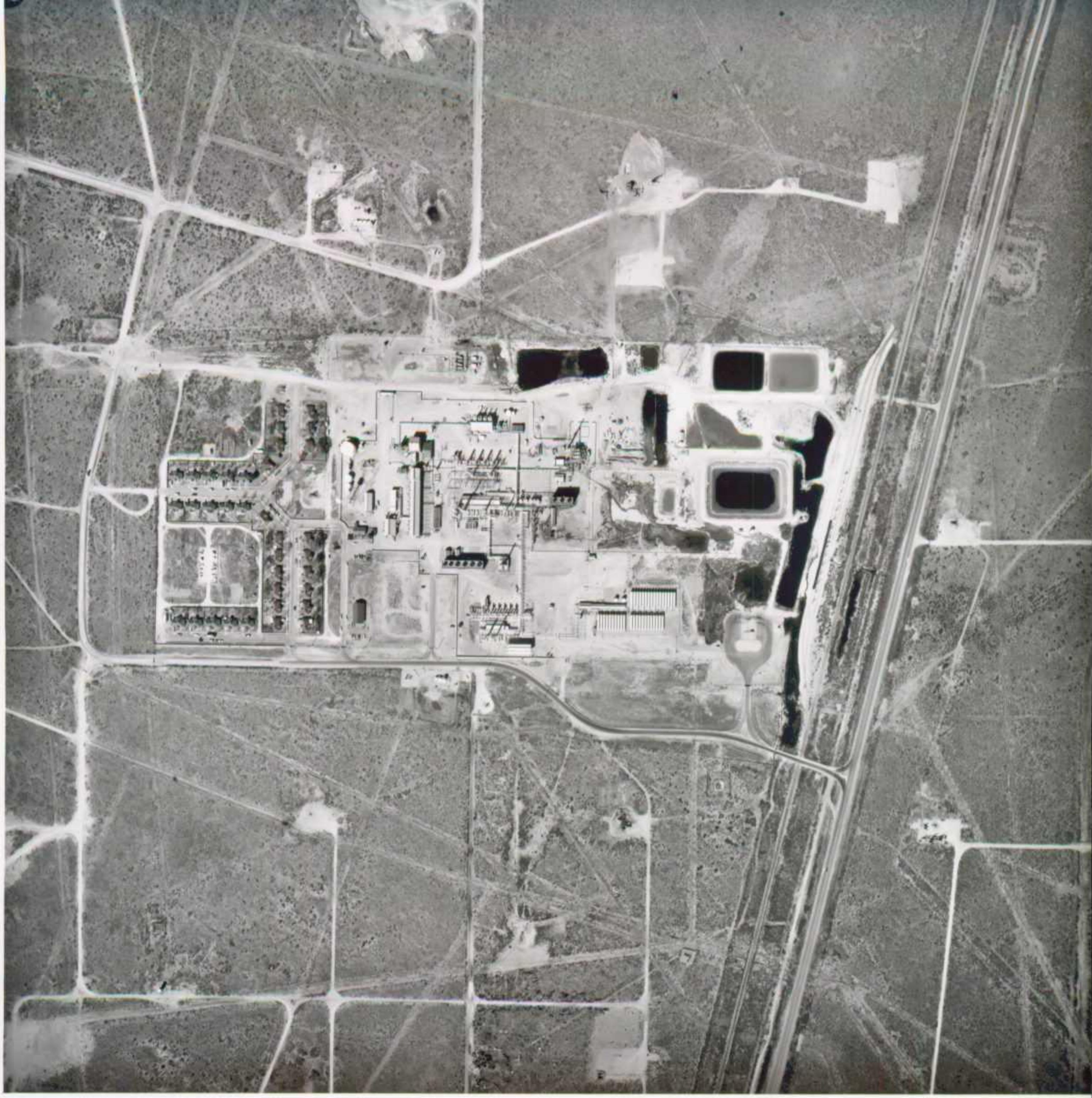

FIGURE 9

AERIAL VIEW OF
EL PASO NATURAL GAS COMPANY'S
JAL NO. 4 PLANT
SOUTHERN LEA COUNTY, NEW MEXICO

DATE OF PHOTO: 2–12–81

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of the organic sludge contained in the drying ponds. The sludges from the ponds which were active in 1981 were tested for inorganic constituents and recommendations made to OCD to close the ponds (George 1981). The inorganic constituents were below the standards set by the Resource Conservation and Recovery Act (RCRA) regulations. However, the report recommended the use of a caliche cap over the ponds in order to reduce the amount of water which would enter the zone occupied by the sludge due to infiltration of natural precipitation (George 1981). The results of this study will revise the recommended closure procedure, as will be discussed in the following sections.

Sampling Methodology

Following the investigation of the history of wastewater disposal ponds at the Jal No. 4 Plant, a plan was prepared by EPNG's Environmental Affairs Department describing the intended actions, schedule and constituent standard to be used in the evaluation. This plan was discussed and approved by OCD prior to initiating the evaluation. The approved plan is shown in Appendix A. The study methodology is described in three parts: (1) Field, (2) Sampling and (3) Analytical work.

Field Methodology. A survey and cross-section of the ponds were made at areas where sludge sampling and subsurface investigation of sludge distribution would be conducted. A profile was obtained from this information in order to determine the quantity of sludge contained in the drying ponds using the "Average-End-Area" method. Subsurface information was obtained using a backhoe and hand auger. Photographs of the excavated pits were taken for inclusion in Appendix B as visual documentation to support written descriptions contained herein.

Sampling Strategy. Sludge samples were collected from all ponds and depressions that had indications of having received industrial wastes. The sample locations were selected after determining the areal extent and depth of sludge. Because the sampling involved analysis of volatile organics such as benzene, mixing and compositing of sludge was not accomplished. Instead, the area containing the thickest sludge layer was selected to present the best environment in which volatile organics would be retained. In addition, care was taken whenever possible to collect the sample at or near the interface of the *in situ* soil and sludge. These details were taken into consideration in order to represent the worst case situation for presence of organics.

Sampling Methodology. The equipment used to collect sludge samples included a hand auger and small shovel. In sludges up to a depth of 12 feet a backhoe was used to gain access to the lower levels in order to use the shovel for collecting the sample.

Each sample was transferred to a glass bottle, the opening covered with aluminum foil and sealed to prevent loss of volatile organics. The bottles were packed in an ice chest to maintain the sludge at a constant temperature. However, the temperature of the samples measured in the field at the time of sampling ranged from 65°F to 100°F depending upon the depth of sample, time of day, and exposure to the sun. Any small fluctuation in temperature that may have occurred during transport is not believed to have adversely affected the results of the analysis.

The samples were transported to the El Paso office of Raba-Kistner Consultants, Inc. who transferred the samples to their laboratory in San Antonio, Texas. A single sample was submitted to Chaparral Lab, Mesilla Park, NM for inorganic analysis. Documentation and control necessary to identify and trace the samples from collection to final analysis were accomplished in accordance with U.S. Environmental Protection Agency (EPA) recommendations. The chain-of-custody sheets are shown in Appendix C.

Analytical Methodology. The samples submitted to Raba-Kistner Laboratory were analyzed for organic constituents using two methods of extraction: (1) General component extraction and (2) EPA leachate extraction. The general component extraction included distillation and an ultrasonic and heat (Soxhlet) methods to determine essentially the entire concentration of organic constituents present. However, these methods cannot indicate the portion of the constituent concentration that could be leached from the sludge under normal conditions. The EPA leachate extraction method is designed to indicate only that portion of the total concentration that potentially could be leached from the sludge and percolate downward from the site.

Because the EPA leachate extraction method is more costly than the general component extraction method, El Paso proposed, and OCD agreed, that the number of leachate tests be kept to a minimum and the general component test be used for comparison. For example, from the historical documentation, Ponds 3 and 8 were known to have been receiving industrial wastes between 1952 to 1981 and should, therefore contain the highest concentration of organics. Samples from these pits were collected, split, and analyzed using both methods. The remaining ponds were analyzed using only the component method. The results of the component method were used as an indicator because the method cannot define the leachable organic portion of the sample. This method also represented the worst possible case since it should represent the total organics present. The specific methodologies prepared for EPNG by Raba-Kistner for constituent analysis are shown in greater detail in Appendix D.

The sample submitted to Chaparral Laboratory was analyzed using the EPA leachate extraction method. The EPA leachate extraction method is described in EPA's Test Methods for Evaluating Solid Waste, SW-846 (1982).

Both laboratories are certified by the New Mexico Environmental Improvement Division.

Findings and Discussion

The organic constituents evaluated in this study are listed in Table 2. OCD agreed to EPNG's proposal to establish the standard for concentration comparison to be 100 times the standard set forth in the NMWQCC regulations which would apply the 100-fold attenuation factor as utilized in the EP toxicity threshold values for hazardous wastes (40 CFR 261.24) as utilized by the EPA.

Table 2
Organic Constituents Evaluated in the Samples
Collected from Natural Gas Plant Wastewater Pond Sludges

Constituent	NMWQCC 1/ Standard (mg/L)	Accepted OCD 2/ Extraction Standard (mg/L)
Benzene	0.01	1.0
Polychlorinated Biphenyls (PCB)	0.001	0.1
Toluene	15.0	1500
Carbon Tetrachloride	0.01	1.0
1,2-Dichloroethane (EDC)	0.02	2.0
1,1-Dichlorethylene (1,1-DCE)	0.005	0.5
1,1,2,2-Tetrachloroethylene (PCE)	0.02	2.0
1,1,2,2-Trichloroethylene (TCE)	0.1	10.0
Total Organic Carbon (TOC)	No Standard	
Phenols	0.005	0.5

1/ Standards established for groundwater in accordance with NMWQCC Regulation Part 3-103A (August 1983).

2/ Standards agreed to by New Mexico Oil Conservation Division are similiar to the U.S. Environmental Protection Agency's EP toxicity determination described in 40 CFR 261.24.

A standard acceptable to OCD was important for this study because there presently does not exist a regulation either at the State or Federal level with which to compare the findings. The results of the organics testing are shown in Table 3. Except for total phenols, none of the constituents measured exceeded the accepted standard.

Phenols and related compounds are commonly found in natural gas industry discharges and are of particular concern as they are toxic to aquatic life, create an oxygen demand and impart a taste and odor to drinking water with only small concentrations of their chlorinated derivatives (EPA 1976). Primary sources of phenolics in plant wastewaters are cooling tower additives, waste oil and waste oil by-products (Gloyna and Ford 1978).

Phenols inhibit biological growth in water and wastes. Because of this characteristic, chlorinated phenols have been used extensively for microbiological control in industry. At natural gas plants the compound sodium pentachlorophenate has been used at low concentrations (about 200 mg/L) to inhibit the growth of aerobacter aerogenes in cooling towers (Betz 1972). Sodium pentachlorophenate is a soluble and stable material that does not react with most inorganic or organic chemicals that may contaminate cooling water systems. However, typical wastewater organisms will acclimate to the phenols and biologically break them down to inoccuous substances if given sufficient time (Ford 1977). Chemical oxidation is another means of wastewater treatment which does occur to some extent in pond disposal systems.

In the case of the Jal No. 4 Plant, the ponds were not designed to provide optimum treatment for the wastes being discharged. The continuous heavy organic loading in all the ponds very likely did not allow time for either biological processes or chemical oxidation to totally remove the phenols. This hypothesis is supported by the relatively high concentrations of phenols found in the sludges. However, the samples are considered to represent the worst case situation because they were all collected at the bottom of the sludge layer where oxygen was absent. In anaerobic conditions, phenols are very slowly reduced or oxidized. In

Table 3
Results of Organic Constituent Testing of Wastewater Pond Sludges

Sample	Plant	Pond No.	Unit	Benzene	PCB 1/	Toluene	Carbon Tetrachloride	EDC	1,1-DCE	PCE	TCE	TOC	Total Phenol	Sodium Pentachlorophenate
82-092	Jal No. 4	6	µg/g	<1.0	<0.1	<1.0	<0.07	<0.06	<0.04	<0.07	<0.05	0.19%wt	<0.25	
82-093	Jal No. 4	7	µg/g	<1.0	<0.1	<1.0	<0.07	<0.06	<0.04	<0.07	<0.05	0.22%wt	<0.25	
82-094	Jal No. 4	4	µg/g	<1.0	<0.1	<1.0	<0.07	<0.06	<0.04	<0.07	<0.05	0.19%wt	<0.25	
82-095	Jal No. 4	5	µg/g	<1.0	<0.1	<1.0	<0.07	<0.06	<0.04	<0.07	<0.05	0.27%wt	1.76	
82-096	Jal No. 4	7	µg/g	<1.0	<0.1	<1.0	<0.07	<0.06	<0.04	<0.07	<0.05	0.14%wt	<0.25	
82-097	Jal No. 4	8	µg/g	<1.0	<0.1	<1.79	<0.07	<0.06	<0.04	<0.07	<0.05	0.26%wt	<0.35	
82-098 3/	Jal No. 4	8	mg/L	0.11	<5.0	<0.11	<0.007	<0.006	<0.004	<0.007	0.49	67 mg/L	91.3	<1.6
82-099	Jal No. 4	3	µg/g	378.4	0.16 2/	15.70	<0.07	<0.06	<0.04	1.48	<0.05	7.98%wt	4.22	
82-100 3/	Jal No. 4	3	mg/L	0.09	<5.0	<0.1	<0.007	<0.006	<0.004	<0.12	0.96	1830 mg/L	365	<1.6
82-101	Jal No. 4	14	µg/g	65.8	<0.1	<3.1	<0.07	<0.06	<0.04	<0.07	<0.05	6.53%wt	1.06	
82-104	Jal No. 3	A	µg/g	<1.0	3.6 2/	<1.0	<0.07	<0.06	<0.04	<0.07	<0.05	25.26%wt	1.75	
82-106 3/	Jal No. 3	B	mg/L	0.25	<5.0	<1.0	<0.007	<0.006	<0.004	<0.007	0.82	2050 mg/L	<0.91	
82-107	Jal No. 3	B	µg/g	260.7	4.1 2/	7.4	<0.07	<0.06	<0.04	<0.44	<0.05	3.96%wt	<0.25	
OCD Standard	EPA Leachate		mg/L	1,000	100	1,500,000	100	2,000	500	2,000	10,000	-	5	
	Total Extraction 6/		µg/g	20	2	30,000	20	40	10	40	200	-		
Detection Limit	EPA Leachate 4/		mg/L 4/	0.1	5.0	0.1	0.007	0.006	0.004	0.007	0.005	1 mg/L	50	
	Total Extraction 5/		µg/g 5/	1.0	0.1	1.0	0.07	0.06	0.04	0.07	0.05	10µg/g	0.25	

1/ Analysis of PCB's included Arochlor Nos. 1016, 1221, 1232, 1242, 1248, 1254 and 1260.
2/ Value indicated is for Arochlor 1254 with the remaining Arochlor species <0.1 mg/L.
3/ One hundred (100) grams of the sludge were leached with 2 liters of deionized water in accordance with EPA-EP Toxicity Test Method.
4/ These limits are the lowest recognizable levels of each parameters leached in the water. They are determined by Purge/Trap GC/ED and GC/FID.
5/ The detection limits are based on the amount of individual parameter that can be detected per unit weight of dry sludge sample. These limits are determined by GC/EC and GC/FID.
6/ There is no standard established for constituents obtained using a total extraction method from sludge. The values only indicate a concentration at which further testing using EPA leachate extraction should be accomplished.

fact, phenols are one of the most difficult compounds to remove anaerobically, hence they persist in groundwater (Kincannon 1972).

After receiving the test results for total phenols, an inquiry was made to determine if sources of phenols other than waste oils had existed. According to plant personnel sodium pentachlorophenate had been used in the Jal No. 4 cooling towers. Therefore, the two samples indicating the highest concentration of phenols were retested for sodium pentachlorophenate. The test results indicated that there was no detectable concentration of sodium pentachlorophenate.

It must be noted that the sludge samples containing the highest phenol concentration had not been dry a sufficient time to permit biological degradation of the phenols. If the sludge had had a chance to dry from three to nine months it would have been decomposed in the dry soil. Wet soil has been observed to inhibit consumption of the sludge by microbes for much longer periods, i.e., greater than a year (Hess 1979). Hence, the sludge must be allowed time to dry before closing the ponds. Once the sludge has decomposed, the pond area should be graded to provide positive drainage to prevent any accumulation of standing water. The organics already contained in the vadose zone will remain for many years and slowly degrade as air invades the soil once hydraulic loading ceases.

Although results of inorganic analyses were reported in the original closure plan by George (1981), additional sampling and analyses were conducted to assure that inorganic loading of the sludges had not occurred in Pond No. 15. Pond No. 15 was selected for analysis because it appeared to have received some industrial wastes. Table 4 shows the results of the test along with the threshold values of characteristic EP toxicity contaminants for comparison. As can be seen from the table, none of the inorganic constituents were present in a concentration considered hazardous.

Table 4
Results of Inorganic Chemical Analyses Conducted
On Sludge Samples Collected from Jal No. 4 Plant Pond No. 15
and Maximum Allowable Concentration

Constituent	Pond No. 15 Sample No. 82-102 (mg/L)	Maximum Allowable Concentration 1/ (mg/L)
Silver	.05	5
Arsenic	.003	5
Barium	2.7	100
Cadmium	.020	1.0
Chromium	.05	5
Mercury	.0002	0.2
Selenium	.001	1.0
Lead	.5	5
Final pH	7.4	
Volume of Acetic Acid, ml	400	

1/ 40 CFR § 261.24, 45 FR:331

Total extraction of the majority of the samples was accomplished primarily as an indicator to determine the presence of organics. The total extraction procedure differs from the EPA leachate extraction in that total extraction removes nearly all the organics present and the EPA leachate extraction removes only that portion that may be leached from the sample in the environment. The limited results obtained using these two methods are difficult to correlate but in general the concentrations should be higher using the total extraction method than the EPA leachate method. The OCD standard was modified from μg/L to obtain a "calculated" total extraction standard in μg/g using the following relationship:

$$1 \ \mu g/L \times 2L/100 \ g = .02 \ \mu g/g \qquad \text{(Equation 1)}$$

The conversion factor is derived from the fact that the EPA leachate method requires two liters of deionized water be washed through 100 grams of sample while the total extraction method does not require dilution. Equation 1 was used to convert the OCD standard to the "calculated" total extraction standards shown in Table 3.

If the result of a total extraction analysis had exceeded the "calculated" total extraction standard shown in Table 3, the sample was to be analyzed again using the EPA leachate method. OCD had agreed that the EPA leachate test results would be the method to determine compliance. Benzene was found in concentrations higher than the "calculated" total extraction standard of 20 μg/g in three samples. The two samples with the highest concentration of Benzene were retested using the EPA leachate extraction procedure and found to have much less than the accepted OCD standard. The third sample had less than one-fourth the concentration of the retested samples using the total extraction procedure, which should reflect a correspondingly smaller leachable portion. The remaining constituents, as shown in Table 3, were less than the "calculated" total extraction standard and no further EPA leachate testing was deemed necessary.

The results of cross-sectioning the ponds are shown in Figures 10 through 14 (Map Pocket) and summarized in Table 1. The amount of sludge was determined from field observations. For example, the depth of sludge was determined by color, odor and density of the soils. In most cases it was very clear where *in situ* soil began and the sludge ended, e.g., the soil beneath the sludge had retained its light brown color as compared to the overlying black organic sludge. However, where blow sand had accumulated in the ponds, in some instances in excess of 10 feet in depth, the organics had filled the interstices of the sand and colored the soil black making it very difficult to determine the difference between *in situ* soil and sludge. In these cases the density of the materials was the only guide. Photographs were taken at each test pit and are included in Appendix B. The field information was plotted on the cross sections (Figure 10-14) of the ponds clearly having a definable sludge layer.

As was discussed above, the organics listed in Table 2 were not found in concentrations that exceed the standard accepted by OCD. However, even if a standard was exceeded there would be no percolation of that constituent to the groundwater as long as hydraulic loading does not occur. That loading does not occur can be shown using the water balance method for predicting leachate generation from an abandoned pond.

Infiltration of water is the principal mode of leachate generation from any disposal operation whether it is a landfill or disposal pond. The infiltration into the soil cover and any subsequent percolation down to the groundwater will be determined by surface conditions and climatological characteristics of the area.

In order to assess the leachate potential at the Jal No. 4 Plant, a procedure based on the water balance method developed by Thornthwaite and Mather (1957) and expanded by Mather (1978) was utilized. The water balance is based upon the relationship among precipitation, evapotranspiration, surface runoff and soil moisture storage. The method centers around the amount of free water present in the soil. Until the field capacity of the soil is reached, the moisture in the soil is regarded as being a balance between what enters it as a result of precipitation and what leaves through evapotranspiration. Therefore, comparing the monthly moisture loss from the soil to monthly precipitation will obtain values that indicate either percolation of precipitation or water deficit.

The amount of available water that can be stored in a given profile depends upon the soil characteristics and structure and depth of the root zone. For the sandy loam soils of the Jal No. 4 Plant area with a cover of grasses, the available water equals 200 millimeters per meter. Assuming the maximum root zone is within the uppermost 1.25 meters (Weaver 1968), the soil moisture storage would be 250 millimeters at field capacity.

The evapotranspiration values used in this report are those developed by Thornthwaite and Mather (1957) and discussed by Fenn et al. (1975).

Surface runoff depends upon the intensity and duration of the storm, the antecedent soil moisture condition, the permeability and infiltration capacity of the cover soil, slope and the amount and type of vegetative cover. In this evaluation the "Rational Formula" for runoff was used. This method normally underestimates surface runoff; however, it does provide a better result in determining the leachate generation potential than ignoring it altogether. A runoff coefficient of 0.1 was used in the calculations (Sprester 1981).

A summary of the annual water balance is shown in Table 5. The detailed water balance calculations for Lea County are shown in Table 6.

Table 5
Summary of Mean Annual Water Balance for Lea County, New Mexico

Parameters	Inches
Precipitation	11.67
Runoff	0.09
Infiltration (I)	11.58
Actual Evapotranspiration (AET)	11.58
Percolation	0

As expected, the Lea County area does not experience significant annual percolation. Analysis of the water balance calculations presented above points out three important aspects of leachate generation in the Southwest.

First, except for artificially loading the soils through irrigation, runoff collection or wastewater disposal, leachate problems are nonexistent as indicated in Figure 15. However, individual, intense thunderstorms may cause some leachate to be generated but even this would be held in the soil for an indeterminate period. As long as old embankments of a pond remain, rainfall runoff will pond in the lowest portion of the impoundment causing artificial loading of the sludge which may generate leachate.

Second, the time of year that a leachate is most likely to percolate is December-January as indicated in Figure 15.

Third, the water balance calculations are based on mean monthly climatic values determined over a 30 year period. The average annual precipitation does not indicate a leachate problem, but an above average year may result in an entirely different finding.

Table 6
Water Balance Data for
Southern Lea County, New Mexico

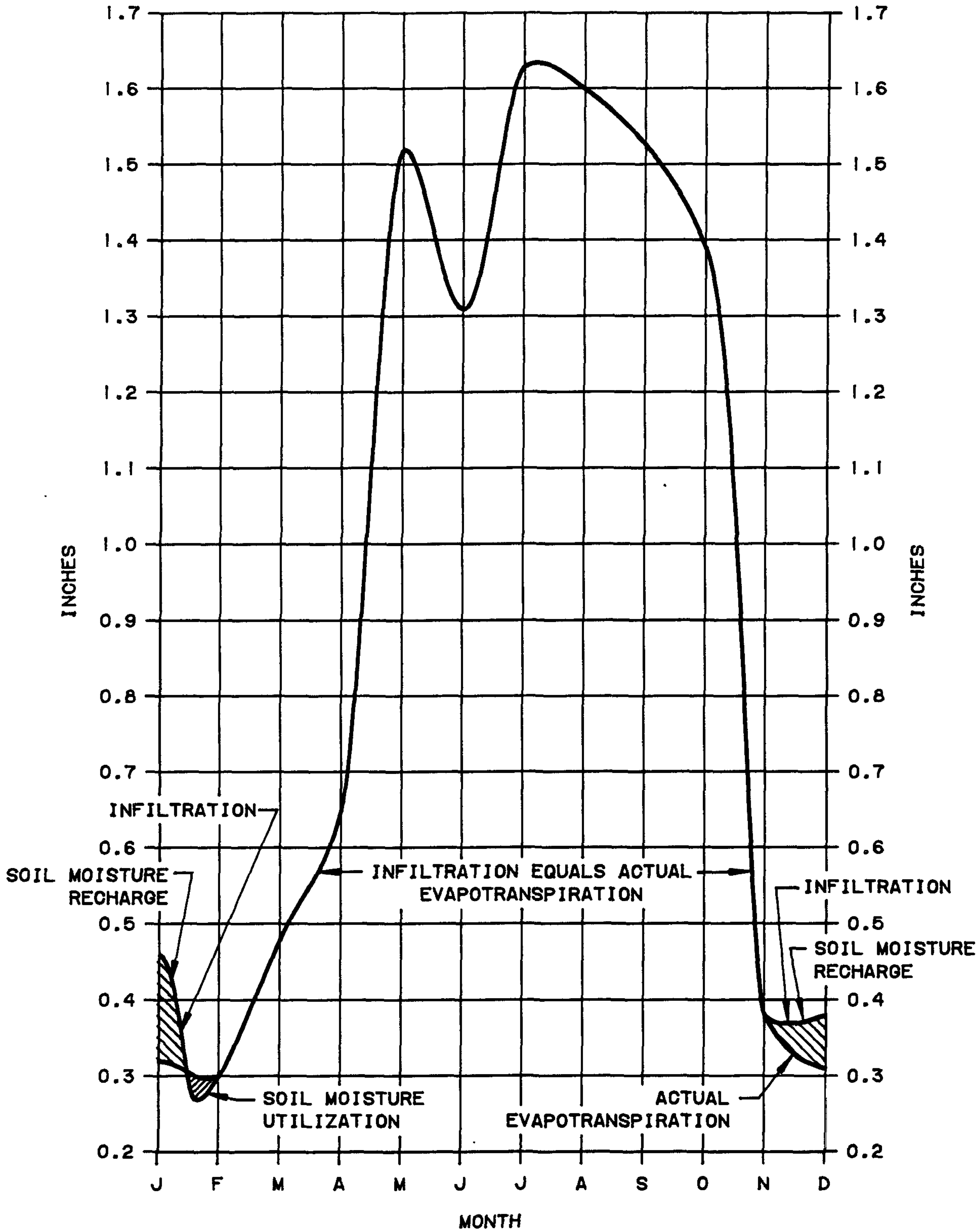
Parameter 4/	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Potential Evapotranspiration 1/	0.32	0.51	1.22	2.43	4.22	5.85	6.57	5.84	4.02	2.31	0.83	0.31	
Rainfall 2/	0.39	0.35	0.51	.81	1.73	1.85	1.98	2.55	2.50	1.73	.40	0.48	15.28
Surface Runoff Coefficient 3/	0	0	0	0	0	0	0	0	0	0	0	0	0
Surface Runoff	0	0	0	0	0	0	0	0	0	0	0	0	0
Infiltration (I) [Rain-Runoff]	0.39	0.35	0.51	0.81	1.73	1.85	1.98	2.55	2.50	1.73	0.40	0.48	15.28
Infiltration-potential Evaporation	+0.07	-0.16	-0.71	-1.62	-2.49	-4.00	-4.59	-3.29	-1.52	-0.58	-0.43	+0.17	-19.39
Σ Neg. (I-PET)	0.17	0.36	0.26	-0.48	-1.17	-1.92	-3.56	-3.86	-3.15	-1.95	-0.97	-0.14	-17.99
Storage	1	1	1	1	1	1	1	1	1	1	1	1	1
Change in Soil Moisture	0	0	0	0	0	0	0	0	0	0	0	0	0
Actual Evapotranspiration (AET) 4/	0.39	0.67	1.93	4.05	6.71	9.85	11.16	9.13	5.54	2.89	1.26	0.48	54.06
Percolation	0	0	0	0	0	0	0	0	0	0	0	0	0

1/ Thornthwaite and Mather, 1957.

2/ Period of record for Jal, New Mexico is 1937-1975, NOAA, Climatography of United States No. 60, Climate of Texas, National Climate Center, Asheville, NC, 1977.

3/ Surface Runoff Coefficient is ∿.1 if precipitation is greater than potential evapotranspiration, otherwise the value is zero.

4/ All values in inches except surface runoff coefficient. Water holding capacity is root zone of soil is 4.0 inches.



El Paso NATURAL GAS COMPANY

FIGURE 15
WATER BALANCE FOR SOUTHERN LEA COUNTY NEW MEXICO

In conclusion, leachate generation can be minimized by proper site grading and drainage design of the final surface. Once a pond has been closed the leachate generated from the artificial leaching of this soil will cease shortly after the area has been regraded to permit positive drainage away from the closed pond.

Conclusions

1. Approximately eleven acres of the Jal No. 4 Plant area have been used for ponds of which eight acres were used for wastewater disposal.

2. There is approximately 54 acre-feet of oily sludge contained in the abandoned ponds.

3. Of the ten organic constituents evaluated, only total phenols exceeded the accepted Standard of 100 times the New Mexico Water Quality Control Commission Regulation Standard of 0.005 mg/L. The probable source of the phenols is the waste oil and oil by-products previously disposed of in the ponds.

4. Although sodium pentachlorophenol was used in the Jal No. 4 Plants cooling tower, retesting of several sludge samples did not find the chemical in a concentration above the detection limits.

5. Because the sludges in the pond were anaerobic and remained saturated, the biological and chemical breakdown of the phenols were inhibited. If the sludge is given sufficient time to dry, the phenols will breakdown biologically and the sludge should decompose within nine months to a compost-like material.

6. Inorganic sampling and analysis of Pond No. 15 sludges did not indicate that hazardous concentrations of heavy metals existed. This conclusion confirms the earlier report concerning inorganics prepared by George (1981) which indicated that there are no hazardous wastes contained in the abandoned ponds.

7. Although the sludge did not exhibit the presence of large amounts of leachable constituents, leachate generation will be eliminated by providing proper site grading of the final surface. Once the ponds have been properly closed, further artificial leaching of the sludge will cease. Hence, the caliche cap recommended in an earlier report by George (1981) is not necessary and the ponds may be backfilled with local soils.

8. The organics contained in the sludge and vadose zone will remain for many years but will slowly degrade as air invades the drying soil.

Recommendation

Based on the findings of this evaluation the abandoned ponds can be properly closed by backfilling the ponds using local soils. The area should also be site graded using local soils to prevent standing water on or near the abandoned ponds to prevent hydraulic loading that could result in the formation of a leachate.

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APPENDIX A

EVALUATION OF ORGANIC CONSTITUENT IN SLUDGES AT THE JAL No. 4 PLANT WASTE DISPOSAL PONDS

EVALUATION OF ORGANIC CONSTITUENTS IN SLUDGES AT THE JAL NO. 4 PLANT WASTE DISPOSAL PONDS

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September 1982

EVALUATION OF ORGANIC CONSTITUENTS
IN SLUDGES AT THE JAL NO. 4 PLANT
WASTE DISPOSAL PONDS

I. Introduction

The New Mexico Oil Conservation Division (OCD) requested evaluation of organic constituents that may be present in the sludges of the Jal No. 4 plant ponds. The evaluation would be an addendum to the August 1981 Jal No. 4 Plant Closure Plan. This report describes the protocol to be used to obtain field information, chemical analyses of sludges and compliance standards. Information verbally agreed to in a meeting held in Santa Fe, New Mexico on August 31, 1982 between OCD and El Paso Natural Gas Company (El Paso) is also included.

II. Field Information

There are eight ponds or depressions that require determination of the areal extent and depth of sludges. A field survey of each pond will be made to determine the areal extent of sludge. That information will be shown on an aerial photograph (El Paso Drw. No. 5004.19-1) at a scale of one inch to one hundred feet. The number and location of cross sections for each pond will be determined in the field. Each cross section will be indicated on the aerial photograph. A subsurface profile of the sludge will be obtained using an auger or backhoe to a depth of at least six inches into native soils at each cross section. The sludge profile will be drawn onto a cross section exhibit. The quantity of sludge in each pond will be determined using the average end area method for volume determination. A sludge sample will be collected at one cross section per pond and its location noted on the drawings.

A history of the ponds and depressions will be investigated to determine their past use and time in service. This will be accomplished by researching engineering records, reviewing aerial photographs and discussing past disposal practices with plant personnel. Pond No. 3 is believed to be the oldest industrial waste pond at the plant. If this can be substantiated, it should represent the worst case with respect to concentration of organic constituents and quantity of sludge. If the chemical analysis of the sludge indicates there is no significant amount of organic constituents leachable from the sludge, the likelihood of groundwater contamination from other pond sludges should also be insignificant.

III. Sampling Strategy

Sludge samples will be collected from all ponds and depressions that are known to have received industrial wastewater. The sample locations will be selected after determining the areal extent and depth of sludge. Because the sampling involves collection for analysis of volatile organics such as benzene, mixing and compositing of sludge samples will not be accomplished. Instead, the area containing the thickest sludge layer will be selected since it should present the best environment in which volatile organics would be retained. The sample will be collected at or near the interface of the *in situ* soils and sludge.

IV. Sampling Methodology

The sampling equipment will be either a hand auger or shovel. In very thick sludges a backhoe will be used to uncover the upper layers of sludge to permit easy access to the lower levels for depth determination and sample collection.

The sample will be transferred to a glass bottle with the opening covered with aluminum foil and sealed to prevent further loss of volatile organics to the atmosphere. The bottle will be placed in a cooler packed with ice to maintain as low a temperature as possible during transport.

The temperature of the sludge will be taken at the time of collection. High temperatures increase the likelihood of loss of volatile organics to the atmosphere. For example, temperatures exceeding 100°F would indicate that the chance of volatile organics being present would be very slight.

The samples will be transported to Raba Kistner Consultants, Inc., El Paso, Texas for analysis. Documentation and control necessary to identify and trace the samples from collection to final analysis will be accomplished in accordance with U. S. Environmental Protection Agency (EPA) recommendations.

El Paso's Permian Division will identify potential sources of soil that may be used to cap the ponds as described in the August 1981 closure plan. Samples of the material will be collected and tested to determine the materials' permeability. The evaluation will indicate the desired compaction to be accomplished during construction.

V. Analytical Methodology

The samples will be analyzed for organic constituents using two methods of extraction: (1) general component extraction and (2) EPA leachate extraction. The general component extraction would include distillation, ultrasonic or heat (Soxhlet) method to determine essentially the entire concentration of organic constituents present. However, these methods cannot indicate the portion of the constituent concentration that could be leached from the sludge under normal conditions. The EPA leachate extraction method would indicate only that portion of the total concentration that potentially could be leached from the sludge and migrate down or outward from the area.

The cost of the EPA leachate extraction method is more costly than the general component extraction method. For economic reasons El Paso proposed and OCD agreed to keep the number of leachate tests to a minimum. The general component method test can be used for comparison. For example, Ponds 3 and 8 would have two samples collected and analyzed using both extraction methods. The remaining ponds would be analyzed using only the general component extraction method. The results of the general component method would be used only as an indicator because it cannot define the leachable organic portion of the sample. The analytical results obtained from the two methods on samples from ponds 3 and 8 will be compared to determine if there is a correlation in results obtained from the two methods. If the results from a general component extraction method indicates the quantity of organics may exceed the standard that sample will be retested using the EPA leachate extraction method.

VI. Constituents to be Analyzed

The organic constituents to be evaluated in this study are listed in the New Mexico Water Quality Control Commission (NMWQCC) Regulations (as amended through August 1982 Part 3-103A). The OCD agreed to establish the standard for concentration comparison to 100 times the Human Health Standard. The constituents are listed in Table 1 and indicate the standard to be used.

TABLE 1
ORGANIC CONSTITUENTS TO BE EVALUATED
IN JAL NO. 4 PLANT SLUDGES

Constituent	Human 1/ Health Standard mg/L	Standard 2/ For Extraction Analysis mg/L
Benzene	0.01	1.0
Polychlorinated biphenyls (PCB's)	0.001	0.1
Toluene	15.0	1500.
Carbon Tetrachloride	0.01	1.0
1, 2-dichloroethane (EDC)	0.02	2.0
1, 1-dichloroethylene (1, 1-DCE)	0.005	0.5
1, 1, 2, 2-Tetrachloroethylene (PCE)	0.02	2.0
1, 1, 2-Trichloroethylene (TCE)	0.1	10.0
Total Organic Carbon	NO STANDARD	-----

1/ Human health standard established for groundwater in accordance with NMWQCC Regulation Part 3-103.A.

2/ The method agreed to by the OCD parallels the U.S. Environmental Protection Agency's EP Toxicity characteristic determination described in 40 CFR 261.24.

VII. Schedule

Two of the ponds recently contained wastewater. These ponds will be pumped to the classifier tank and ultimately be disposed of in the plant injection well. Because the sludges will remain saturated for some time it is not practical to attempt to collect samples until they have had a chance to dry. It is believed that two months should be sufficient to allow drying to a point that sampling can be accomplished. The sampling and surveying will take several weeks to accomplish. The laboratory may require up to one month to conduct the leachate extraction, dependent upon the condition of the samples. Following receipt and evaluation of the sludge, a report of findings and recommendations will likely take a month to complete. The OCD agreed to a maximum of six months to accomplish the tasks outlined above. Therefore, assuming the wastewater in the two ponds as being pumped into the classifier on September 1, 1982 the project should be complete by the end of February 1983.

VIII. Discussion

The findings of the study may indicate that no standards are exceeded. Although the August 1981 closure plan indicated no hazardous concentration of inorganics existed, a caliche cap was proposed to be installed on ponds 1 and 2. Because of the more detailed study required by OCD, the results may indicate that capping any of the ponds may not be necessary. Therefore, site grading may be all that is required. The OCD agreed that if the results indicate there is no leachable quantities of inorganics or organics, the need for capping is obviated.

APPENDIX B

EL PASO NATURAL GAS COMPANY'S

JAL No. 4 PLANT

AREA PONDS - PHOTOGRAPHS

Photo No. I
(November 16, 1982)
Showing Test Pit in Pond No. 8
Looking From West to East
Reference: Figure I for Pit Location.

Photo No. 2
(November 16, 1982)
Trench By Existing Flare - Pit, Pond No. 17
2.0' - Dark Brown Soil
3.0' - Light Brown Caliche
3'+ - Red Brown Sand Caliche
Reference: Figure I For Pit Location.

Photo No. 3
(November 16, 1982)
Old Abandoned Pond Near Front Gate - Pond No. 12
(Duck Pond - 1965 Plant Photograph)
0.5' - Top Soil
1.0' - Sand
7.5' - Red Sand With Black Root Organics
9' Total Depth of Pit.
Reference: Figure 1 for Pit Location

Photo No. 4
(November 16, 1982)
Showing Test Pit In Pond No. 6
Looking From North to South @
3 + 06 N, 25+27 E
1.0' - Top Soil Sand Brown
2.0' - Black Organics
1.5' - Brown Sand
2.5' - Light Brown Caliche
7.0' Total Depth of Pit
Sample Taken No. 82-092
Reference: Figure 1 For Pit Location

Photo No. 5
(November 16, 1982)
Showing Test Pit in South End of Pond No. 7
Looking From West to East
3.5' - Sand - Caliche, Light Brown
1.5' - Red Brown Sand with Some Caliche
4.0' - Black Organics Mixed with Soil
<u>1.0'</u> - Stain Grey Caliche

10'-0" - Total Depth of Pit
Sample Taken No. 82-093
Reference: Figure 1 For Pit Location

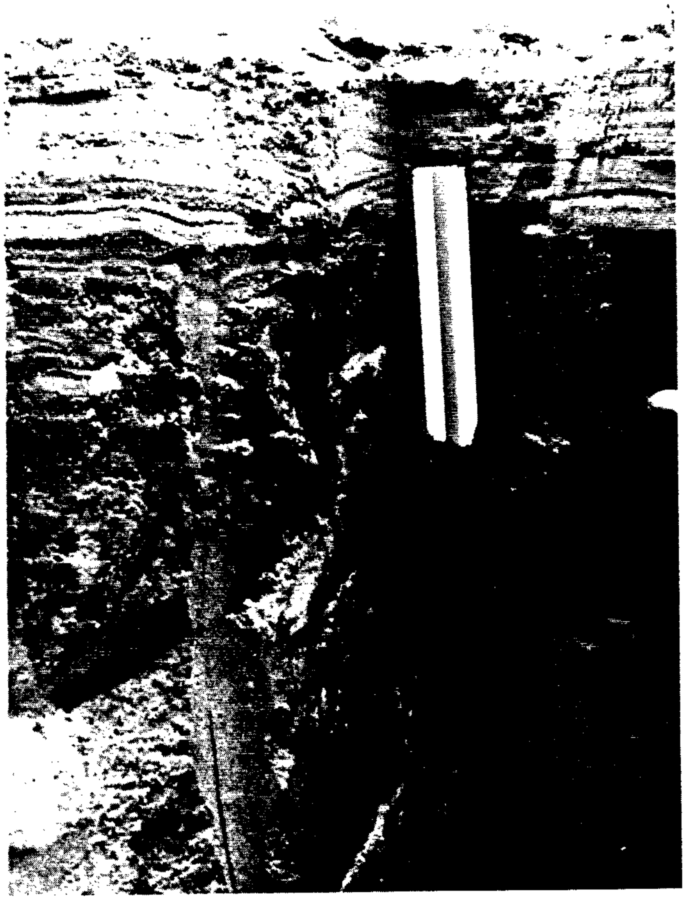

Photo No. 6
(November 16, 1982)
Showing Test Pit In South End of Pond No. 7
Looking from East to West, Showing Soil
Layer Formations Just Below Surface of Pond.
Reference: Figure 1 For Pit Location

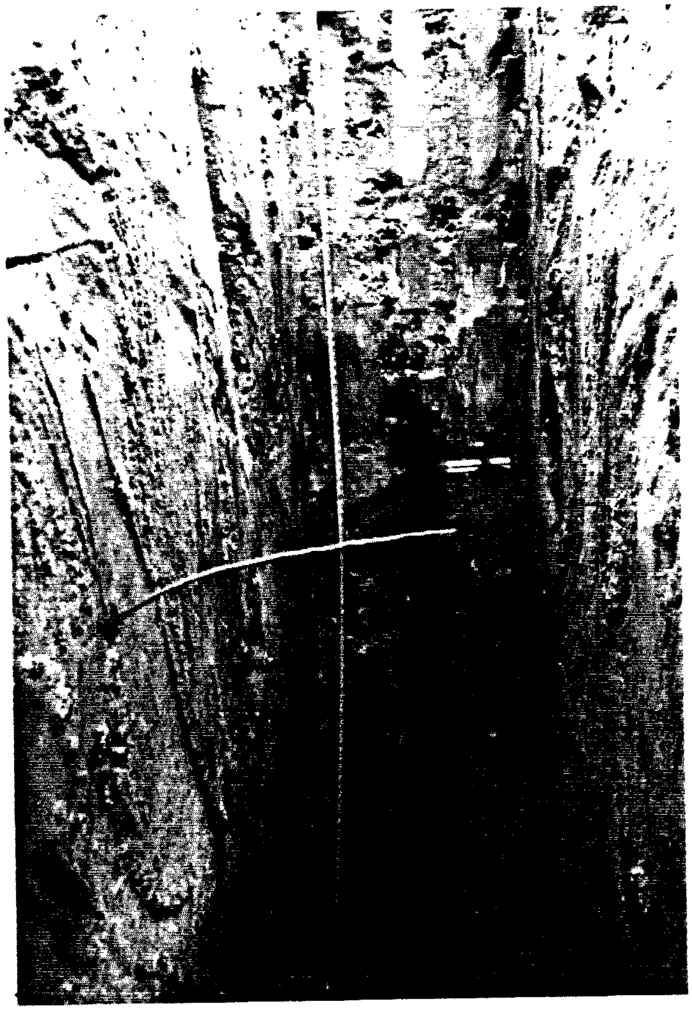

Photo No. 7
(November 16, 1982)
Showing Test Pit In Pond No. 4
Looking East to West
1.5' - Blow Sand Brown
7.5' - Fill Material Mixed With Organics, Black
Below 7.5' Caliche With Organic Streaks
9.0' Total Depth of Pit.
Sample Taken No. 82-094
Reference: Figure 1 For Pit Location.

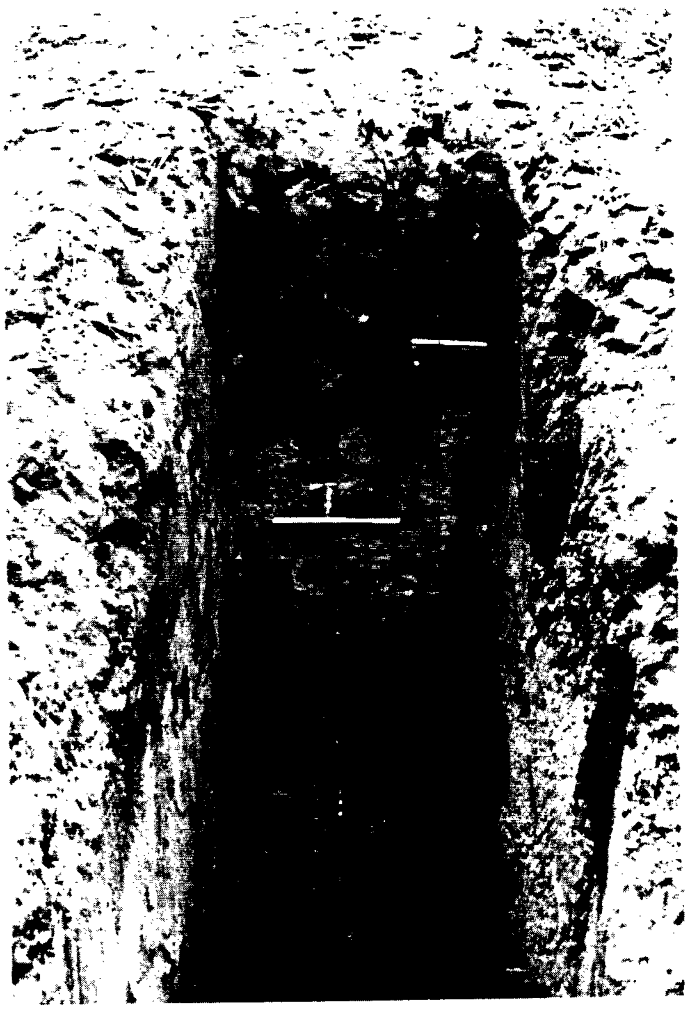

Photo No. 8
(November 16, 1982)
Showing Test Pit in Getty Property, West of Pond 4
Looking East to West
1.0' - Blow Sand Brown
1.0' - Dark Brown Sand
2.0' - Caliche - Grey
2.0' - Grey Brown Sand
1.0' - Brown Sand, Streaks of Red
7.0' Total Depth of Pit.
Reference: Figure 1 For Pit Location

Photo No. 9
(November 16, 1982)
Showing Test Pit In Pond No. 5
Looking At Side of Pit
Depth 10' - All Fill Material
Sample No. 82-095
Reference: Figure I For Pit Location

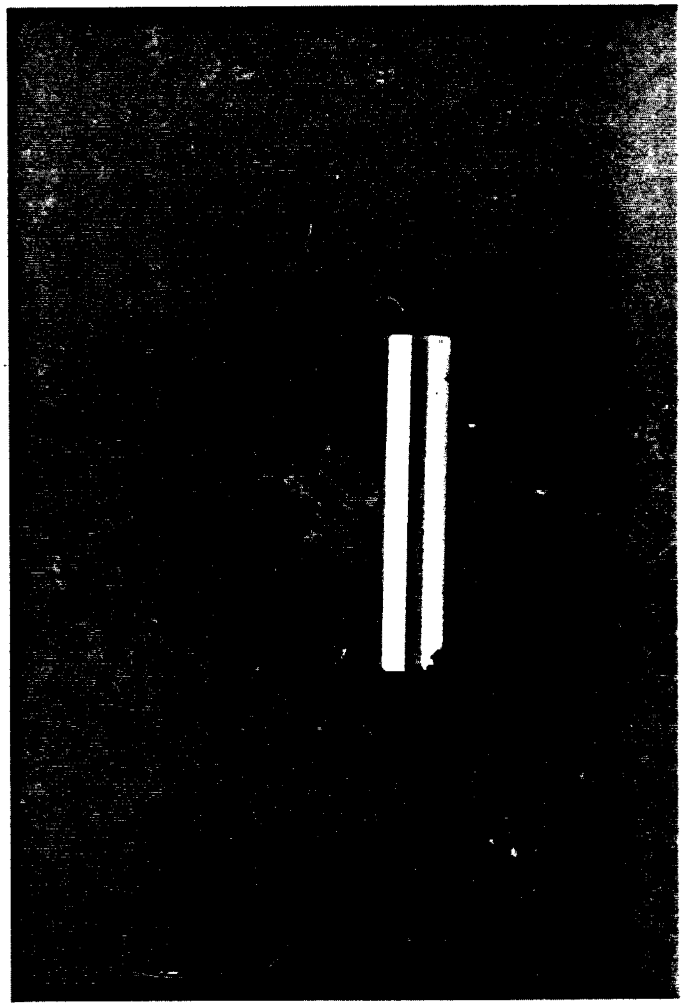

Photo No. 10
(November 16, 1982)
Showing Test Pit In Pond No. 5
Looking North to South
Depth 10' - All Fill Material
Sample No. 82-095
Reference: Figure I For Pit Location

Photo No. 11
(November 16, 1982)
Showing Test Pit In North Section of Pond 7
Looking West to East
Depth of Pit 13' - All Mixed Fill Material with Organics.
Sample No. 82-096
Reference: Figure 1 For Pit Location

Photo No. 12
(November 16, 1982)
Showing Test Pit In Pond No. 8 At East End
Looking North to South
1.0' - Layers of Sediments, Dried Colors
2.0' - Mixed Red Sand
6.0' - Black Organics - Streaks of Red
9.0' Total Depth of Pit
Sample No. 82-097
Reference: Figure 1 For Pit Location

Photo No. 13
(November 16, 1982)
Showing Test Pit In Pond No. 8 At East End
Looking At Side of Pit
1.0' - Layers of Sediments, Dried Colors
2.0' - Mixed Red Sand
6.0' - Black Organics - Streaks of Red.
Sample No. 82-098
Reference: Figure 1 For Pit Location

Photo No. 14
(November 17, 1982)
Showing Test Pit In Pond No. 14 "Drip Production"
Looking At Side Of Pit
5.0' - Black Organic Material, Soft
0.5' - Dark Black Sticky Layer
2.5' - Red Sand, Streaks of Black
2.0' - Light Color Caliche With Streaks Of Black
10.0' Total Depth of Pit
Sample No. 82-101
Reference: Figure 1 For Pit Location

Photo No. 15
(November 17, 1982)
Showing Test Pit In Pond No. 14 "Drip Production"
Looking North to South
5.0' - Black Organic Material, Soft
0.5' - Dark Black Sticky Layer
2.5' - Red Sand Streaks of Black
2.0' - Light Color Caliche With Streaks of Black
10.0' - Total Depth of Pit
Sample No. 82-101
Reference: Figure 1 For Pit Location

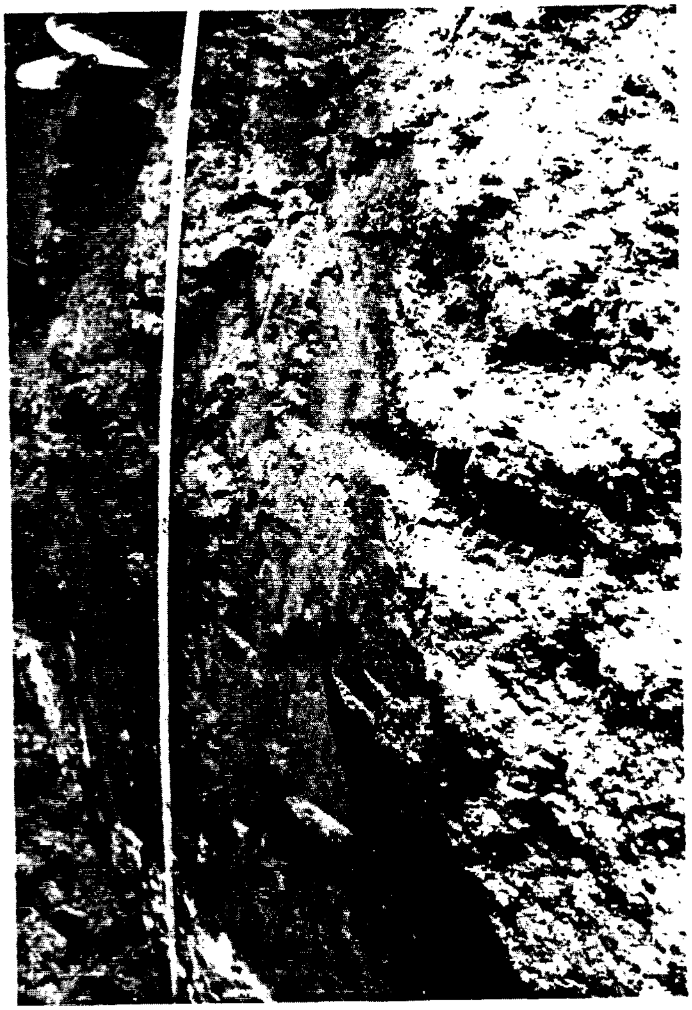

Photo No. 16
(November 17, 1982)
Showing Test Pit In Pond No. 15
Looking South to North
6.0' - Red Sand, Some Streaks of Black, Roots
2.0' - Light Grey Ash Material, Very Hard
8.0' - Total Depth of Pit
Sample No. 82-102
Reference: Figure 1 For Pit Location

APPENDIX C

CHAIN OF CUSTODY
RECORDS FOR SLUDGE
SAMPLES COLLECTED FROM
JAL No. 4 PLANT'S
WASTE DISPOSAL PONDS

EL PASO NATURAL GAS COMPANY
ENVIRONMENTAL AFFAIRS DEPARTMENT
EL PASO, TEXAS
(915) 543-2600

Collector's Sample No. 82-107

CHAIN OF CUSTODY RECORD

Location of Sampling: __ Producer __ Hauler ✓ Disposal Site

__ Other: ____

Sample Shipper Name: EL PASO NATURAL GAS COMPANY EAD

Address: P.O. BOX 1492 EL PASO TEXAS 79978
number street city state zip

Collector's Name F.R. SPRESTER / O. Uribe Telephone: (915) 541-6138
/signature 2407

Date Sampled NOV. 17, 1982 Time Sampled 1330 hours ____

Type of Process Producing Waste OIL/WASTEWATER DISCHARGE FROM NATURAL GAS PROCESSING PLANT.

Field Information QUART SIZE MASON JAR, GLASS WITH ALUMINUM FOIL COVER. SAMPLE TAKEN ONE FOOT BELOW SURFACE. ORGANICS

Sample Receiver:

1. RABA-KISTNER CONSULTANTS INC. 406 CHELSEA, EL PASO, TEXAS
name and address of organization receiving sample

2. ____

3. Raba-Kistner Consultants, Inc. 10526 Gulfdale, San Antonio

Chain of Possession:

1. Osias Uribe — ENVIRONMENTAL TECH. — NOV. ~~22~~ 17-22, 1982
signature — title — inclusive dates

2. [signature] — Lab Manager — November 22, 1982
signature — title — inclusive dates

3. Francis Y. Huang — Manager, Chemical R.&D. — November 23, 1982 Tuesday
signature — title — inclusive dates
December 21, 1982 Tuesday (analysis completed)

EL PASO NATURAL GAS COMPANY
ENVIRONMENTAL AFFAIRS DEPARTMENT
EL PASO, TEXAS
(915) 543-2600

Collector's Sample No. 82-092
THRU
82-106
TOTAL OF 15

CHAIN OF CUSTODY RECORD

Location of Sampling: ___ Producer ___ Hauler ✓ Disposal Site

___ Other: ___

Sample Shipper Name: EL PASO NATURAL GAS COMPANY - ENVIRONMENTAL AFFAIRS DEPT.

Address: P.O. BOX 1492 (number, street) EL PASO (city) TEXAS (state) 79978 (zip)

Collector's Name F.R. SPRESTER / O. Urile (signature) Telephone: (915) 541-6138
541-2407

Date Sampled NOV. 16, 1982 Time Sampled ___ hours ___

Type of Process Producing Waste WASTEWATER FROM INDUSTRIAL PROCESS

Field Information SAMPLES OBTAINED USING BACKHOE, AUGER & SHOVEL FOR SURFACE COMPOSITES.

Sample Receiver:

1. RABA-KISTNER CONSULTANTS, INC. 406 CHELSEA
name and address of organization receiving sample

2. ___

3. Raba-Kistner Consultants, Inc. 10526 Gulfdale, San Antonio

Chain of Possession:

1. Orias Urile (signature) — ENVIRONMENTAL TECH. (title) — NOV. 18, 1982 THURSDAY (inclusive dates)

2. [signature] (signature) — Raba-Kistner Laboratory Manager EL PASO TX (title) — Nov 18, 1982 Thursday (inclusive dates)

3. Francis Y. Huang (signature) — Manager, Chemical R&D. (title) — NOV. 22, 1982 Monday (inclusive dates) DEC. 21, 1982 Tuesday (analysis completed)

EL PASO NATURAL GAS COMPANY
ENVIRONMENTAL AFFAIRS DEPARTMENT
EL PASO, TEXAS
(915) 543-2600

ANALYSIS REQUEST

PART I: FIELD SECTION

COLLECTOR SPRESTER/URIBE DATE SAMPLED 11-16-82 TIME ______ HOURS

LABORATORY SAMPLE NUMBER	COLLECTOR'S SAMPLE NO.	TYPE OF SAMPLE*	FIELD INFORMATION **
			BACK HOE
	82-092	SLUDGE	7'- 1' TOP SOIL SAND, BROWN; 2' ORGANIC BLACK; 1.5' BROWN SAND 2.5' LT. BW CALICHE
	82-093	"	10'- 3.5'- SAND/CALICHE LIGHT BROWN; 1.5'- RED BROWN SAND, SOME CALICHE; 4.0'- ORGANICS BLACK MIXED SOIL; 1.0'- STAIN GREY CALICHE
	82-094	"	9'- 1.5 BLOW BRN. SAND; 7.5' FILL MATERIAL MIXED ORGANICS BLK 7.5' CALICHE WITH ORGANIC STREAKS.
	82-095	"	10'- FILL MATERIAL
	82-096	"	13'- ALL MIXED FILL MATERIAL WITH ORGANICS
	82-097	"	9'- 1.0' LAYERS/CALICHE MATERIAL MIXED SOIL; 2.0' RED SAND MIXED; 6.0' ORGANICS BLK., STREAKS OF RED.
	82-098	"	" " " " "
	82-099	"	SLUDGE SAMPLE AT TWO FEET DEPTH
	82-100	"	" " " " " "

ANALYSIS REQUESTED ORGANIC CONSTITUENTS

SPECIAL HANDLING AND/OR STORAGE QUART SIZE MASON JAR GLASS, ALUMINUM FOIL COVERING OPENING.

PART II: LABORATORY SECTION **

RECEIVED BY Francis Y. Huang TITLE Manager, Chemical R&D DATE Nov. 22, 1982

ANALYSIS REQUIRED ______

* Indicate whether sample is soil, sludge, etc.
** Use back of page for additional information relative to sample location

EL PASO NATURAL GAS COMPANY
ENVIRONMENTAL AFFAIRS DEPARTMENT
EL PASO, TEXAS
(915) 543-2600

ANALYSIS REQUEST

PART I: FIELD SECTION

COLLECTOR Sprester/Uribe DATE SAMPLED 11-16-82 TIME ________ HOURS

LABORATORY SAMPLE NUMBER	COLLECTOR'S SAMPLE NO.	TYPE OF SAMPLE*	FIELD INFORMATION **
	82-101	Sludge	10' { 5' Mixed Fill Material with Organics, Blk. 6" Dark Blk Soft Material, Sticky Layer 2.5' Red Soil, Streaks of Black 2.0' Lt. Color Caliche, Hard, Streaks of Blk.
	82-102	"	8' - 6' Red Soil Sand, Some Streaks Blk, Roots 2' Grey Lt. Ash, Very Hard
	* 82-103	"	Composite Surface Sample - Inorganics
	82-104	"	Sludge Sample at One Foot Depth - Organics
	* 82-105	"	Composite Surface Sample - Inorganics
	82-106	"	Sludge Sample at One Foot Depth - Organics

ANALYSIS REQUESTED Organic Constituents, Note Samples 82-103 & 82-105 are for Inorganics.

SPECIAL HANDLING AND/OR STORAGE All Samples Glass Quart Size Mason Jar with Aluminum Cover.

PART II: LABORATORY SECTION **

RECEIVED BY Francis Y. Huang TITLE Manager, Chemical R.&D. DATE Nov. 22, 1982

ANALYSIS REQUIRED ________

* Indicate whether sample is soil, sludge, etc.
** Use back of page for additional information relative to sample location

EL PASO NATURAL GAS COMPANY
ENVIRONMENTAL AFFAIRS DEPARTMENT
EL PASO, TEXAS
(915) 543-2600

ANALYSIS REQUEST

PART I: FIELD SECTION

COLLECTOR F.R. Sprester/O. Uribe DATE SAMPLED Nov. 16 & 17 TIME N/A HOURS

LABORATORY SAMPLE NUMBER	COLLECTOR'S SAMPLE NO.	TYPE OF SAMPLE*	FIELD INFORMATION **
	82-092	Sludge	N/A
	82-093	Sludge	N/A
	82-094	Sludge	N/A
	82-095	Sludge	N/A
	82-096	Sludge	N/A
	82-097	Sludge	N/A
	82-099	Sludge	N/A
	82-101	Sludge	N/A
	82-104	Sludge	N/A
	82-107	Sludge	N/A

ANALYSIS REQUESTED General component extraction for the following; Benzene, Polychlorinated Biphenyls (PCB's), Toluene, Carbon Tetrachloride, EDC, 1,1-DCE, PCE, TCE, Total Organic Carbon and Phenols.

SPECIAL HANDLING AND/OR STORAGE Quart size Mason Jars - Glass, with aluminum foil cover.

PART II: LABORATORY SECTION **

RECEIVED BY *Francis Y. Hung* TITLE *Manager, Chemical R.& P.* DATE *NOV. 22, 1982*

ANALYSIS REQUIRED

* Indicate whether sample is soil, sludge, etc.
** Use back of page for additional information relative to sample location

EL PASO NATURAL GAS COMPANY
ENVIRONMENTAL AFFAIRS DEPARTMENT
EL PASO, TEXAS
(915) 543-2600

ANALYSIS REQUEST

PART I: FIELD SECTION

COLLECTOR F. R. Sprester/O. Uribe DATE SAMPLED Nov. 16 & 17 TIME N/A HOURS

LABORATORY SAMPLE NUMBER	COLLECTOR'S SAMPLE NO.	TYPE OF SAMPLE*	FIELD INFORMATION **
	82-100	Sludge	N/A
	82-106	Sludge	N/A
	82-098	Sludge	N/A

ANALYSIS REQUESTED EPA Leachate Extraction; Benzene, Polychlorinated Biphenyls (PCB's), Toluene, Carbon Tetrachloride, EDC, 1,1-DCE, PCE, TCE, Total Organic Carbon, and Phenols.

SPECIAL HANDLING AND/OR STORAGE Quart size Mason Jars, glass, with aluminum foil cover

PART II: LABORATORY SECTION **

RECEIVED BY Francis J. Huang TITLE Manager, Chemical R.&D. DATE Nov. 22, 1982

ANALYSIS REQUIRED

* Indicate whether sample is soil, sludge, etc.
** Use back of page for additional information relative to sample location

APPENDIX D

SPECIFIC METHODOLOGIES USED IN THE ORGANIC ANALYSES PERFORMED BY RABA-KISTNER CONSULTANTS, INC.

METHODOLOGIES

1. Analytical Schemes

The ten parameters interested in the dry oil pit sludge can be divided into three catagories:

(1) Volatile organics (7 components)

(2) Nonvolatile-polychlorinated biphenyls, and

(3) General characteristics - total phenolics and total organic carbons.

In keeping with the requirements of this project and the nature of the chemical constituents in the sample, these three catagories of parameters should be determined using different techniques. The methods proposed to use are described hereafter.

Scheme A (see Figure 1):

This analytical scheme is designed to analyze the total composition of the ten parameters in the sample.

Catagory 1 - Volatile Organics

In order to recover the volatile organics in the solid sample, heating and concentration in the analysis of these compounds shall be avoided. Ultrasonic extraction is an ideal technique because it possess several advantages over other technique: 1) Lesser amount of solvent required; 2) Heating is not necessary; 3) Contamination from the laboratory glassware is limited; 4) Procedure is relatively simple, and 5) It can be operated in a closed system. In this technique, the sampel will be placed in a minivial and organic solvent is then added to the vial. After being ultrasonicated for a period of time, the extract is subjected to screening analysis on a gas chromatography (GC) with flame ionization detector (FID) and electron capture detector (ECD). Any detected component of the interested parament will be confirmed on a gas chromatography-mass spectrometer - computer system (GC/MS/COM). Ultrasonic extraction of organics in solid has been thoroughly investigated.[1,2] For these volatile compounds, a solvent system containing methanol and carbon disuefide will be employed.

Catagory 2 - Polychlorinated Biphenyls (PCBs)

Analytical procedures for PCBs in spilled material have been well documented in EPA methodologies.[3] Soxhlet extraction using organic solvents is the most effective method for extrating nonvolatile organics from solid material. This technique requires less attention from analyst in working on the samples. Long extraction time can be applied to achieve high recovery.

As it can be expected, the oil pit sludges are rich in organic materials which might interfer with the analysis of PCBs using GC/ECD technique. If the interferences are encountered, a clean-up procedure shall be employed. Florisil chromatography is an effective method for the removal of interferences from the sample for PCBs analysis.[4]

PCBs is a generic term for polychlorinated biphenyls. It consists of serveral commonly used Anochlors. In this proposal, the type of Arochlor will be determined by the pattern recognition method on GC chromatograms. GC/MS technique will be used to confirm the findings.

Catagory 3 - General Parameters

a) Total Recoverable Phenolics

The analysis will be performed in accordance with EPA Method 420.1.[5] Phenols in the solid sludge will be acidified in a water slurry mixture and distilled. Color response of phenolic materials with 4-aminoantipyrine is then measured spectrophotometrically. The amount of color produced is a function of the concentration of phenoic material.

b) Total Organic Carbon

The total organic carbons in the sludge will be analyzed using Walkley-Black Method.[6] Oxidizable matter in a sludge sample is oxidized by $Cr_2O_7^{2-}$. The excess $Cr_2O_7^{2-}$ is determined by titration with standard $FeSO_4$ solution, and the quantity of substances oxidized is calculated from the amount of $Cr_2O_7^{2-}$ reduced.

Scheme B (see Figure 2)

For the evaluation of the leachable parameter in water, this analytical scheme provides the analytical approach for the analysis of the ten parameter. Basically, a leachate will be generated from the sludge in accordance with the EPA EP method.[7] The resulting aqueous solution is then subjected to analysis for the various catagories of parameter interested.

Catagory 1 - Volatile Organic

A purge/trap technique, EPA Method 624[8], will be employed. The volatile organics is first purged from the water and absorbed onto a trap. After being desorbed from the trap, the seven components then are analyzed on GC/MS.

Catagory 2 - Polychlorinated Biphenyls (PBCs)

The leachate will be subjected to liquid - liquid extraction with organic solvent. The PCB - containing extract then will be concentrated, screened on GC/EC, and/or cleaned up on florisil column for GC/MS confirmation. EPA Method 625[8] will be employed.

Catagory 3 - Total Phenolics

The procedure is identical to that of solid in Scheme A; however, the leachate will be used instead of solid sample.

Catagory 4 - Total Organic Carbon (TOC)

The TOC in the leachate will be measured in accordance with EPA Method 415.1[5] Organic carbon in the leachate is converted to carbon dioxide (CO_2) by catalytical combustion. The CO_2 formed is converted to methane (CH_4) and measured by a flame ionization detector. The amount of CH_4 is directly proportional to the concentration of carbonaceous material in the leachate.

2. Instrumentation

Gas Chromatograph (GC) and Gas Chromatograph-Mass Spectrometer (GC/MS) will be used exclusively for the entire analytical scheme. A Perkin-Elmer Sigma 1 GC with electron capture (ED) detector and flame ionization detector (FID) will be used. All the data will be manipulated through a computerized console. This GC will be used primarily for screening the extracts for organic constituents. Quantitative determination of the components will also be conducted on this unit once the identification of the compounds are confirmed by GC/MS. Several column systems will be involved in accordance with the types of compounds interested. Basically, a 6-ft x 2mm glass column filled with OV-1 and QF-1 non-polar phase will be used for PCBs and other non-volatile chlorinated compounds while a 6-ft x 2mm glass colunn filled with SP-1000 on carbopak B will be used for volatile organics. ECD will be employed for chlorinated compounds used and FID will be operated for benzene and toluene.

A Hewlett-Packard 5992 B Gas Chromatograph-Mass Spectrometer (GC/MS) with a computer system will be used for the confirmation of the compounds detected on GC. This system has the capabilities of monitoring the characteristics ions of each interested organic in this project. Electron impact mass spectrometer will provide sufficient information for the identification.

A software will be prepared to search for these compounds in each run. Detected ion signals and intensities will be stored both in magnetic tapes and on the hard copies of output. The quantitating of each compounds can be calculated based on the areas of each characteristic ion. However, GC signals will be used as primary data for quantitative calculation.

REFERENCES

1. Sykes, A.L., Wagoner, D.E., and Decker, C.E., "Determination of Perchloroethylene in the Sub-Park-per-Billion Range in Ambient Air by Gas Chromatography witOh Electron Capture Detection", Analytical Chemistry, 52, 1630 (1980).

2. Handa, T., Keto, Y., Yamamura, T., and Ishii, T., "Correlation Between the Concentrations of Polynuclear Aromatic Hydrocarbons and those of Particulates in an Urban Atmosphere", Environmental Science Technology, 15, 416 (1980).

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4. "Polychlorinated Biphenyls (PCBs) by Gas Chromatography", ASTM D 3534-80.

5. Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, 1979.

6. "Methods of Soil Analysis - Part 2. Chemical and Microbiological Properties", C.A. Black, ed., Chapt 90. American Society of Agronomy, 1965.

7. "Test Methods for Evaluating Solid Waste Physical/Chemical Methods", SW-846, US EPA, 1980.

8. "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations", Federal Register, vol 44, No. 233, Dec. 3, 1979.

FIGURE 1: ANALYTICAL SCHEME A (TOTAL COMPONENTS)

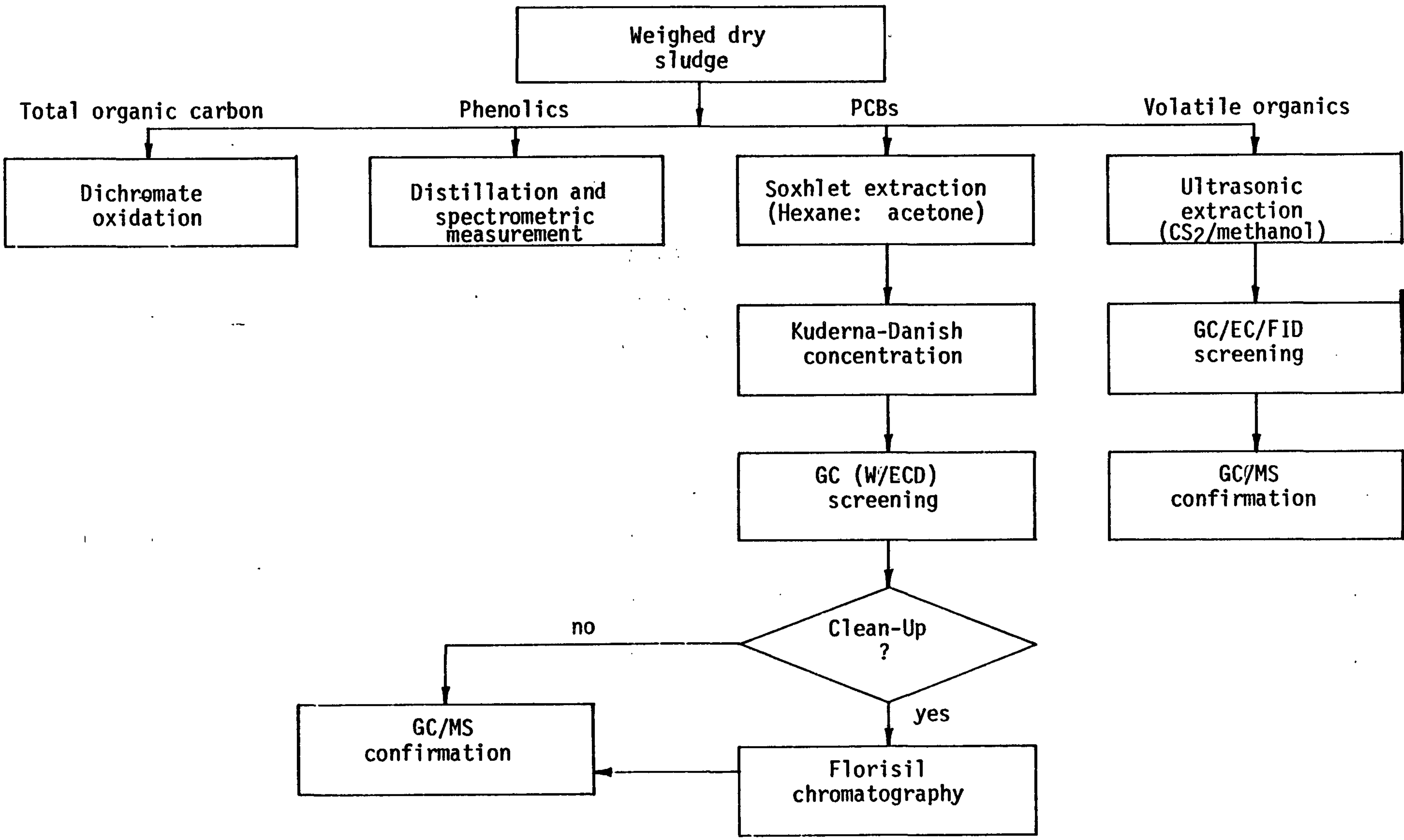
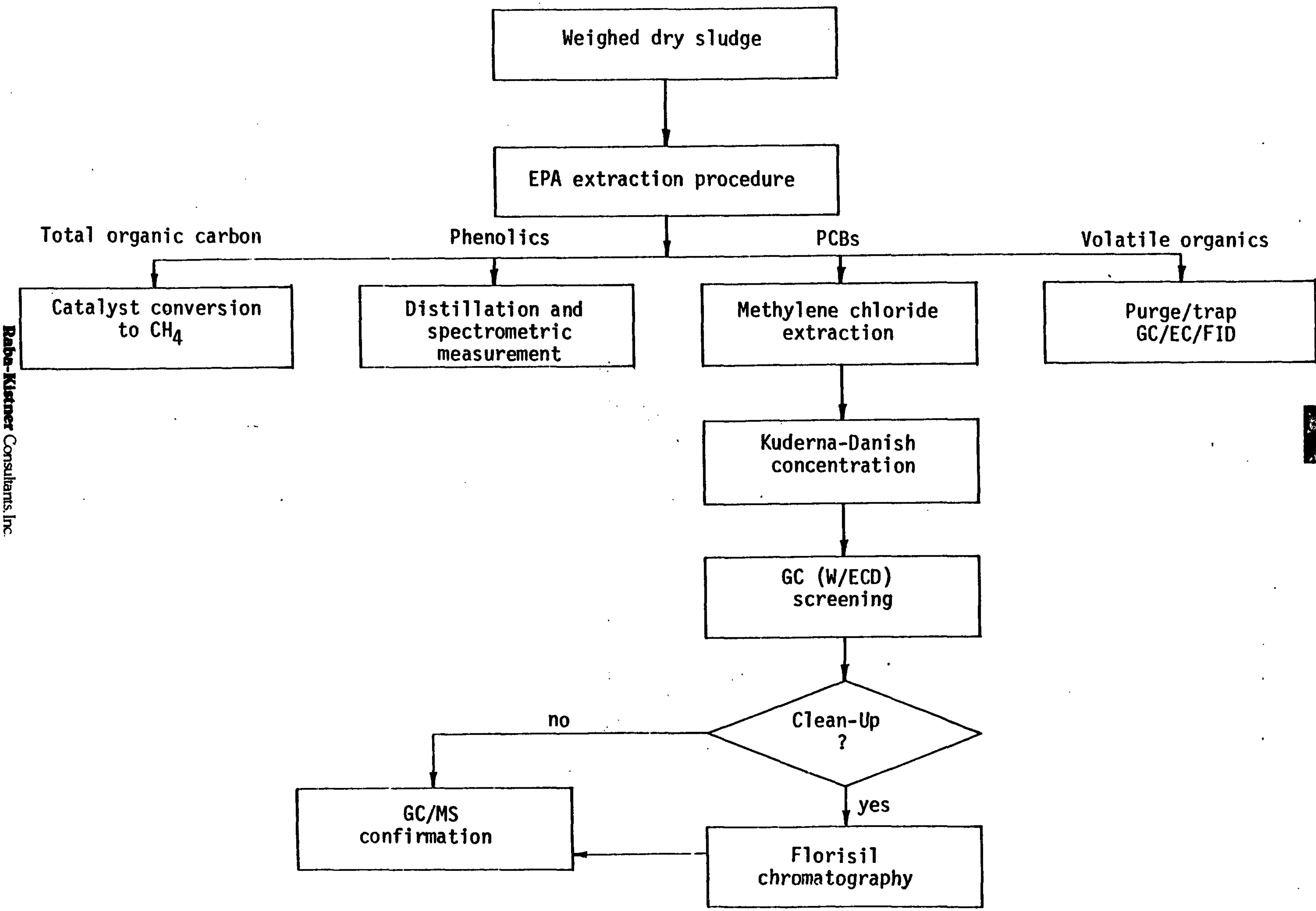


FIGURE 2: ANALYTICAL SCHEME B (EPA EP LEACHATE)



METHOD DETECTION LIMITS OF THE CHEMICAL ANALYSIS OF THE ORGANICS IN OIL PIT SLUDGE

Parameters	Detection Limits for Ultrasonic Extraction (μg/g)[1]	EPA Leachate (μg/l)[2]	Soxhlet Extraction (μg/g)[1]
I. Volatile Organics			
Benzene	1.0	0.1	---
Carbon Tetrachloride	0.07	0.007	---
1,1-dichloroethane	0.04	0.004	---
1,2-dichloroethylene (DCE)	0.06	0.006	---
Tetrachloroethylene (TCE)	0.07	0.007	---
Trichloroethylene (TCE)	0.05	0.005	---
Toluene	1.0	0.1	---
II. PCB's			
Arochlor 1016	---	5.0	0.1
Arochlor 1221	---	5.0	0.1
Arochlor 1232	---	5.0	0.1
Arochlor 1242	---	5.0	0.1
Arochlor 1248	---	5.0	0.1
Arochlor 1254	---	5.0	0.1
Arochlor 1260	---	5.0	0.1

III. Total Phenolics 50 μg/l (leachate) 0.25 μg/g (sludge)

IV. Total Organic Carbons 1 mg/l (leachate) 10 μg/g (sludge)

1. The detection limits are based on the amount of individual parameter that can be detected per unit weight of dry sludge sample. These limits are determined by GC/EC and GC/FID.

2. These limits are the lowest recognizable levels of each parameters leachated in the water. They are determined by Purge/Trap GC/ED and GC/FID.

METHODOLOGY FOR ANALYSIS OF SODIUM PENTACHLOROPHENATE IN SLUDGE SAMPLES

Sodium pentachlorophenate (trade name Santobrite) is a sodium salt of pentachlorophenol. The salt in sludge is converted back to phenol upon acidification with acid and, in turn, can be distilled out into a aqueous solution. EPA Method 420 1[1] is used to carry out the distillation step. One hundred (100) grams of the sludge is mixed with water and pH adjusted to form a slurry for distillation.

Pentachlorophenol in the distillate is then extracted with methylene chloride in accordance with EPA Method 625[2]. After drying and condensation, the extract is subjected to analysis using Gas Chromatogram - Mass Spectrometer (GC/MS) with a Single-Ion Monitoring (SIM) software program for the characteristic mass ions, 165, 264, 266 and 268. The detected peak area of characteristic ion 266 of pentachlorophenol is used for quantitiation calculation.

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1. Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, 1979.
2. "Guidelines Estabilishing Test Procedures for the Analysis of Pollutants; Proposed Regulations," Federal Register, Vol. 44, No. 233, Dec, 3, 1979.


SURGE TANK (LOCATED NEAR DISPOSAL WELL)
21'-7" O.D. X 24'-0" HEIGHT
1500bbl CAPACITY
1/4" CARBON STEEL PLATE
SALT WATER DISPOSAL LINE TO WELL SDW-214
PROPERTY LINE
POND No. 1
1.16 Ac.±
POND No. 2
0.17 Ac.±
POND No. 17
0.05 Ac.±
FIGURE 5
BRINE POND
POND No. 10
0.92 Ac.±
BRINE POND
W.E. 3312.6
POND No. 11
0.87 Ac.±
POND No. 19
0.05 AC.±
CLASSIFIER
20'-4" O.D. X 18'-4" HEIGHT
925bbl CAPACITY
1/4" CARBON STEEL PLATE W/40 MI. EPOXY COATING
OIL STORAGE TANK
12'-3" O.D. X 16'-4" HEIGHT
335bbl CAPACITY
1/4" CARBON STEEL PLATE W/40 MI. EPOXY COATING
WELL No. 1
POND No. 18
0.03 Ac.±
FIGURE 6
POND No. 16
0.03 Ac.±
FIGURE 5
JAL No. 4 CLASSIFIER
CONTENGENCY POND
12,980bbl CAPACITY
POND No. 3
0.69 Ac.±
FIGURE 11
POND No. 8
0.89 Ac.±
FIGURE 10
A
4" DIAMETER DISCHARGE LINE TO TRUCK FILL STAND
PLANT WASTEWATER INFLOW
CARBON STEEL PIPING
BRINE POND
W.E. 3298.9
POND No. 9
0.98 Ac.±
POND No. 4
0.18 Ac.±
FIGURE 4 & 13
POND No. 20
0.27 Ac.±
POND No. 5
0.64 Ac.±
FIGURE 14
POND No. 7
1.58 Ac.±
POND No. 15
0.16 Ac.±
82-102
FIGURE 4
POND No. 6
1.37 Ac.±
FIGURE 12
B
NEW MEXICO HIWAY 18
N
PROPERTY LINE
31 32
6 5
POND No. 13
0.05 Ac.±
FIGURE 4
POND No. 14
0.45 Ac.±
FIGURE 5
POND No. 12
0.58 Ac.±
FIGURE 4
-LEGEND-
A DRAINAGE AREA PREDICTION POINT
DRAINAGE DIVIDE FOR PLANT AREA
CLASSIFIER (JAL No. 4)
EXCAVATED TEST PIT
82-092 SAMPLE NUMBER AND LOCATION
CORE SAMPLE LOCATION
CROSS SECTION AREA
ABANDONED POND
Contour Lines Have Been Adjusted To Match Rectified Photo Base
ENGINEERING RECORD
DRAWN BY Aero-Graphics
TRACED BY
CHECKED BY J. T. C.
APPROVED F. S.
DATE
PHOTO DATE 2-12-81
CONTOUR INTERVAL 2'
0 100 200 400
SCALE IN FEET
El Paso NATURAL GAS COMPANY
PIPELINE SERVICES DIVISION
EL PASO, TEXAS
WASTE WATER PONDS LOCATIONS FROM
1952 THRU 1981
JAL NO. 4 PLANT
SEC. 5,6,31,32, TWS. 23-S & 24-S, RANGE 37-E
LEA COUNTY, NEW MEXICO
FIGURE 1
DWG. NO. 500419-2
REV.

SCALE
HORIZONTAL : 1" = 20'
VERTICLE : 1" = 4'

NOTE
+ INDICATE AREA WHERE CORING SAMPLES WERE TAKEN. MATERIALS FOUND AND DEPTH ARE ALSO GIVEN.

FIGURE 10

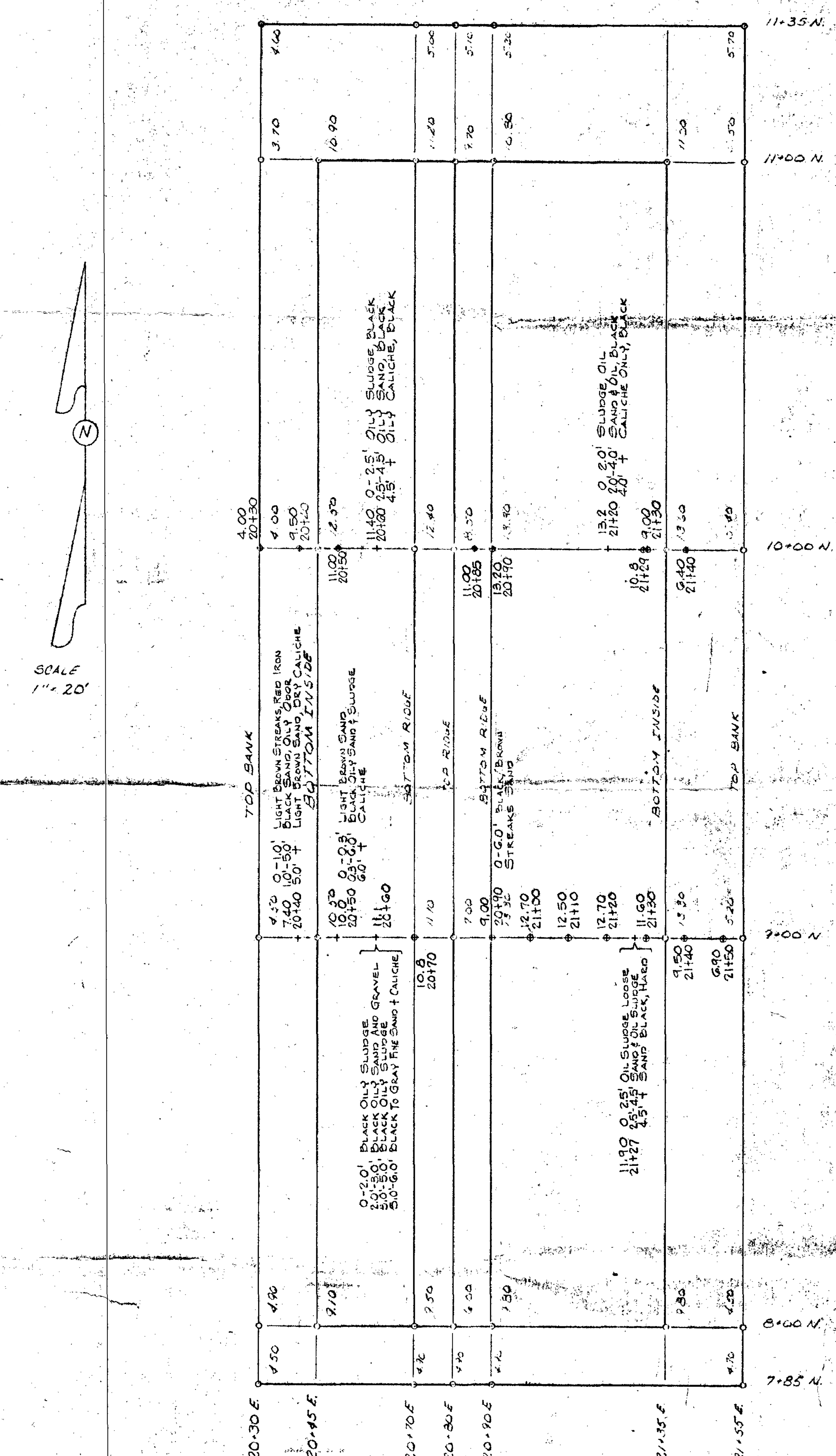
ENG. RECORD		DATE
DRAWN	SLE	11-9-92
CHECKED		
CHECKED		
PROJ. APP.		
DESIGN APP.		

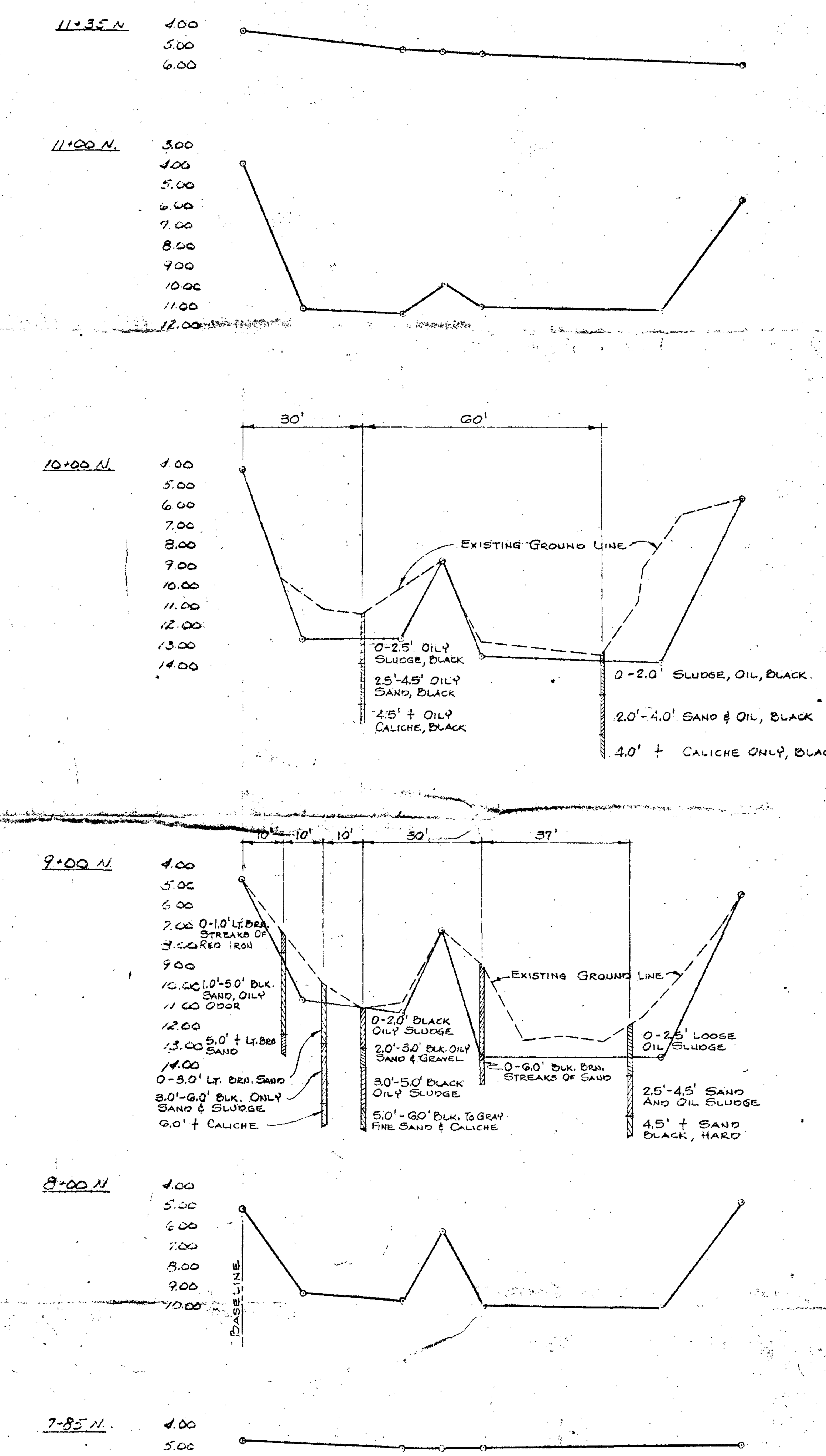
El Paso Natural Gas Company

JAL #4 PLANT
PIT #8

SCALE: SHOWN
DWG. NO. JFJ4-1-1
W.O.
REV.

LEGEND | REFERENCE DRAWINGS | REVISIONS | PRINT RECORD





B.M. - 5.50
@ 11+00 N.
21+55 E.

NOTE:
+ INDICATE AREAS WHERE CORING SAMPLES WERE TAKEN. MATERIAL FOUND AND DEPTHS ARE ALSO GIVEN.

SCALE
VERTICLE : 1" = 4'
HORIZONTAL : 1" = 20'

FIGURE 11

NO.	DATE	BY	DESCRIPTION	W.O.	APP.
"A"	1-5-83	S.E.	CORRECTED PIT WIDTH		

LEGEND — REFERENCE DRAWINGS (DWG. NO., TITLE) — REVISIONS — PRINT RECORD

ENG. RECORD		DATE
DRAWN	SLE	11-11-82
CHECKED		
CHECKED	T.H.R.	11-11-82
PROJ. APP.		
DESIGN APP.		

El Paso Natural Gas Company

JAL # 4 PLANT
PIT # 3

SCALE: SHOWN
DWG. NO. JFJ4-1-2
REV. "A"

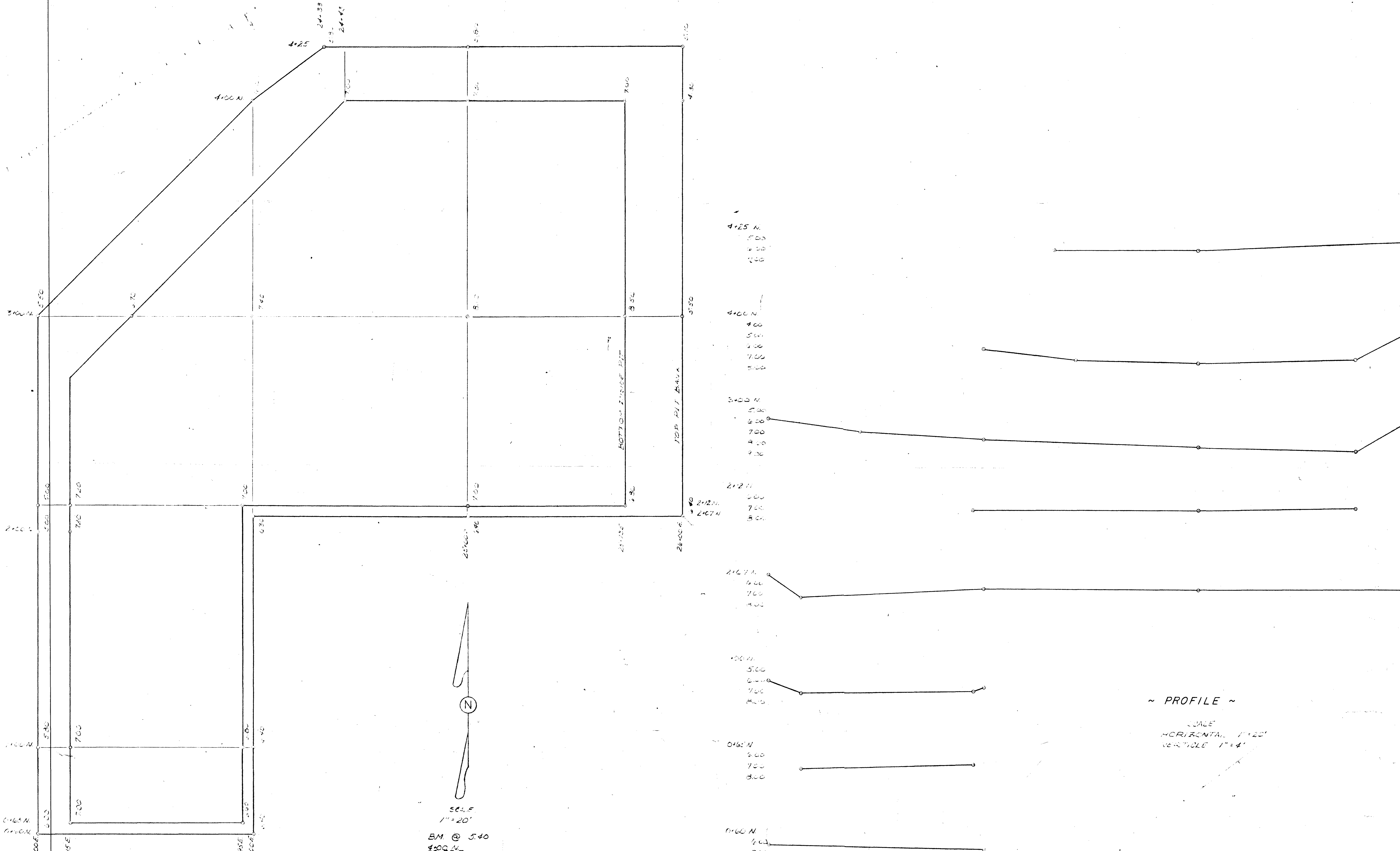


FIGURE 12

ENG. RECORD		DATE
DRAWN	SLF	11-24-82
CHECKED		
CHECKED		
PROJ. APP.		
DESIGN APP.		

El Paso Natural Gas Company

JAL # 4 PLANT

PIT # 6

SCALE: SHOWN

W.O.

DWG. NO. JFJ4-1-3

REV.

LEGEND

DWG. NO.	TITLE

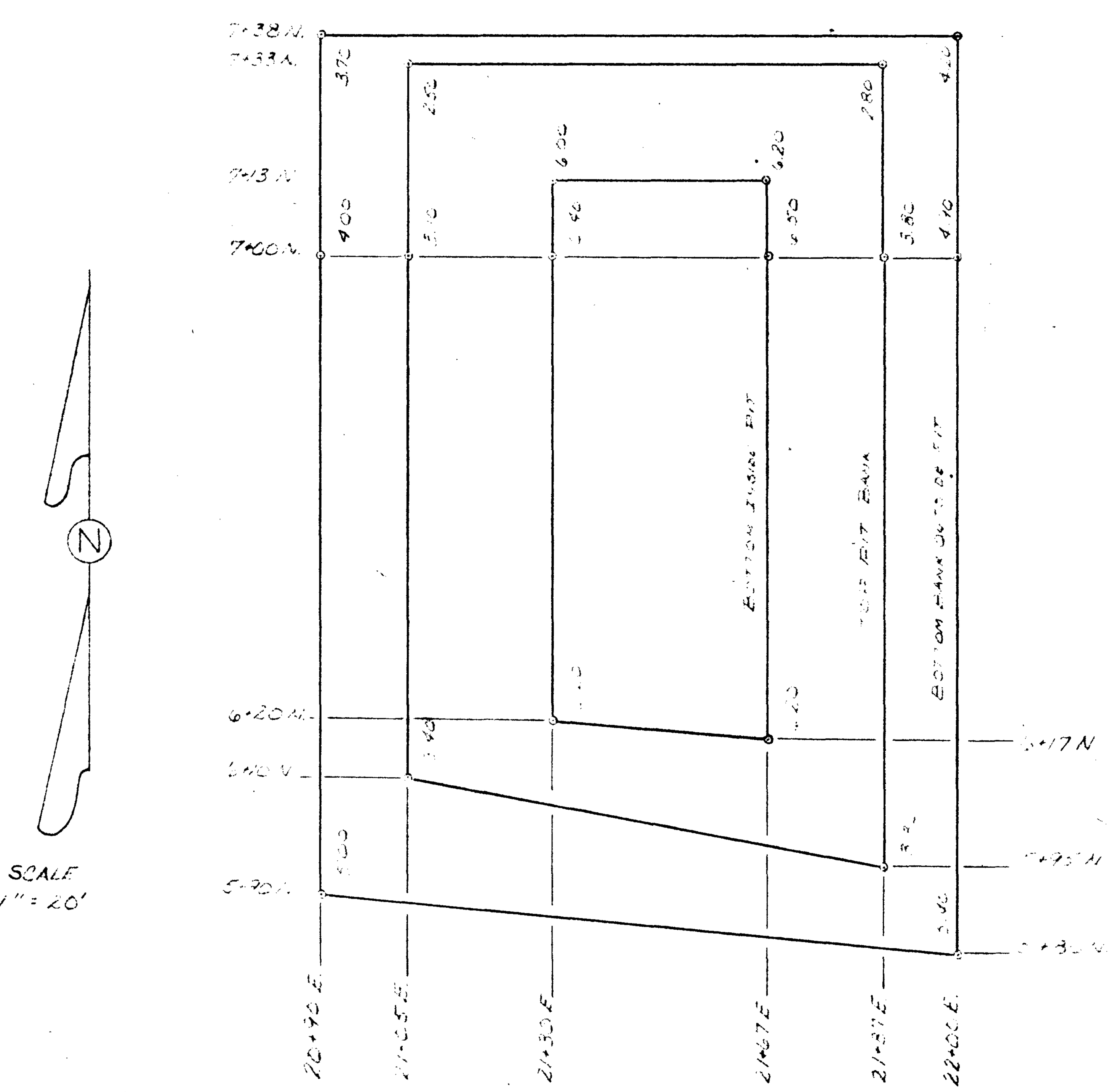
REFERENCE DRAWINGS

NO.	DATE	BY	DESCRIPTION	W. O.	APP.

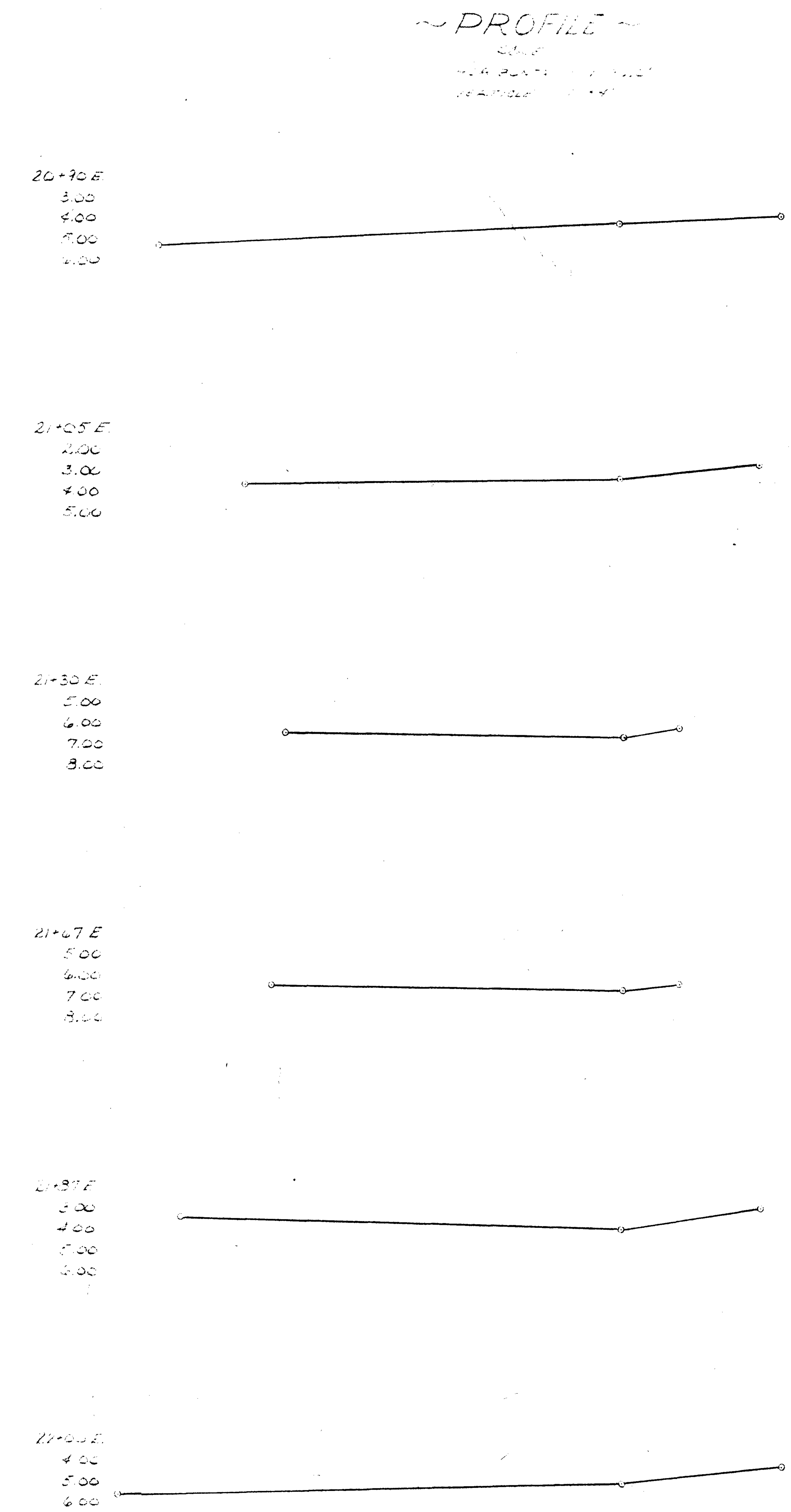
REVISIONS

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

PRINT RECORD



SCALE
1" = 20'



B.M. @ 4.80
7+00 N.
22+75 E.

FIGURE 13

LEGEND

DWG. NO.	TITLE

REFERENCE DRAWINGS

NO.	DATE	BY	DESCRIPTION	W. O.	APP.

REVISIONS

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

PRINT RECORD

ENG. RECORD		DATE
DRAWN	SLE	-82
CHECKED		
CHECKED		
PROJ. APP.		
DESIGN APP.		

El Paso Natural Gas Company

JAL # 4 PLANT
PIT # 4

SCALE: SHOWN
W.O.
DWG. NO. JFJ4-1-4
REV.

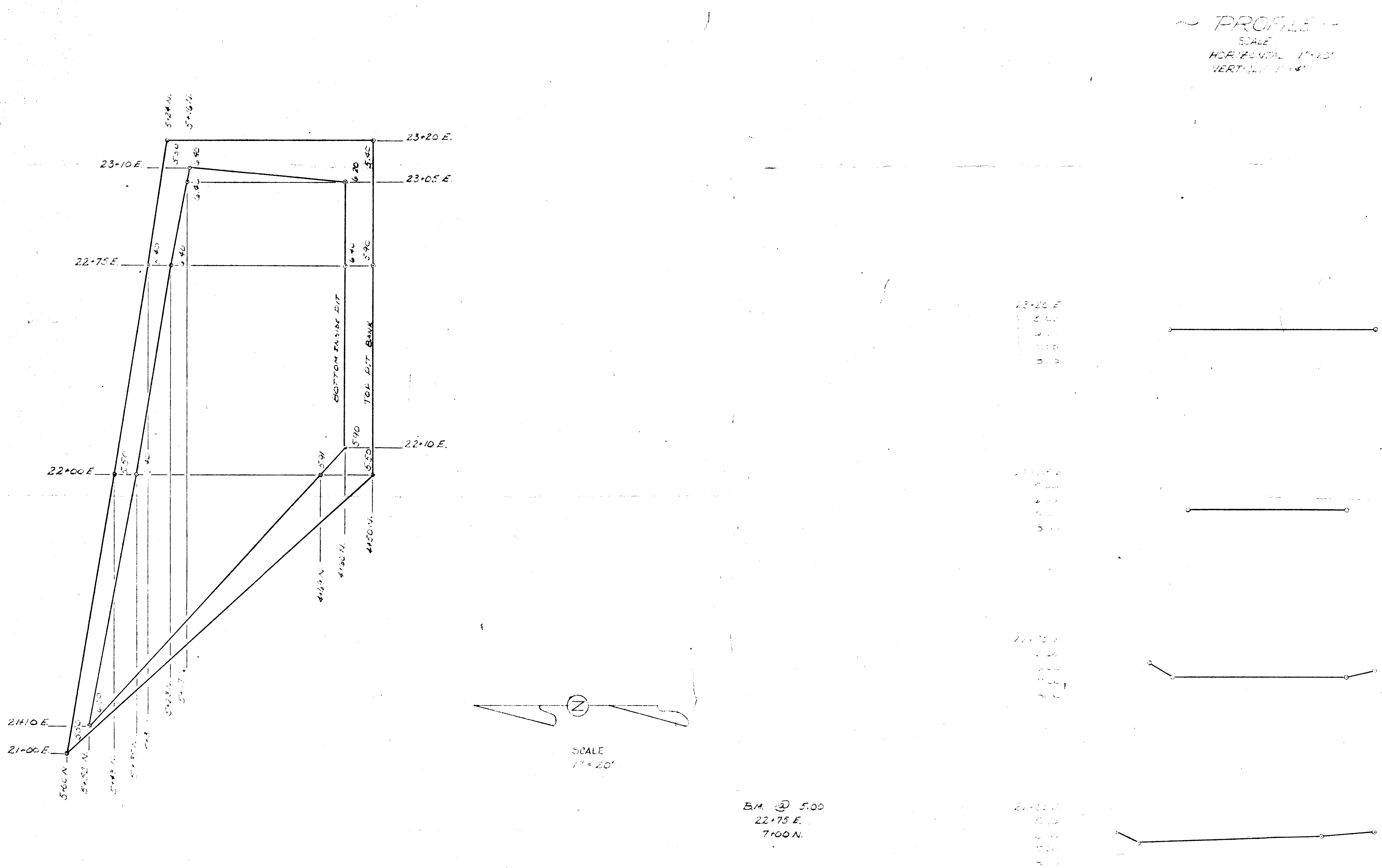


FIGURE 14

El Paso Natural Gas Company

JAL # 4 PLANT
PIT # 5

ENG. RECORD		DATE
DRAWN	S.L.E.	12-14-82
CHECKED		
CHECKED		
PROJ. APP.		
DESIGN APP.		

SCALE: SHOWN
W.O.
DWG. NO. JFJ4-1-5
REV.

LEGEND | REFERENCE DRAWINGS (DWG. NO. | TITLE) | REVISIONS (NO. | DATE | BY | DESCRIPTION | W. O. | APP.) | PRINT RECORD (PRT. | SEP. | DATE | TO | W.O.)