SOUTHERN PACIFIC REPORT REFERENCES

VOLUME 1 OF 2

STONE LIONS ENVIRONMENTAL CORPORATION

KG COH003817

The Southern Pacific Project - A Preliminary Report

Prepared for Girardi & Keese

April 19, 1999

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STONE LIONS ENVIRONMENTAL CORPORATION

The Southern Pacific Project - Addendum

Prepared for Girardi & Keese

July 1, 1999

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Introduction

Since the completion of the Southern Pacific Project Preliminary Report dated April 19, 1999, records have been found which demonstrate that industrial waste from a third waste disposal site went to the Southern Pacific Wood Treatment facility. The site in question was the BFI waste disposal site in Geismer, Louisiana, which is sometimes identified as the pits located at Darrow, Louisiana. The site operated from 1966 to 1979.

The following describes the BFI waste disposal site and lists the known chemical constituents, potentially responsible parties, and operators or former operators related to the BFI site.

Description of the BFI Waste Disposal Site

The BFI waste disposal site was a hazardous waste and solid waste disposal operation located on a 52 acre strip of land near Geismer, Louisiana. The BFI waste disposal site was operated by U.T. Alexander from 1966 to 1972 at which time Browning Ferris Industries (BFI) purchased the site. The site was used for disposal of styrene tar, atrazine sludge, "hex" waste, and other kinds of industrial waste. Five ponds were used for the disposal of styrene tar. The origin of atrazine sludge and other kinds of waste is uncertain. Styrene tar originated from Foster Grant Company, Inc. and Cos-Mar, Inc. Dow Chemical Company is known to have disposed of "hex" waste.

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The styrene tar producers that transported waste to the site were Foster Grant Company and Cos-Mar, Inc. Gulf Oil Corporation apparently transported styrene tar directly to Lowe Chemical Company as a means of disposal of styrene tar. Each of these companies operated styrene production facilities in and around Baton Rouge, Louisiana.

In August of 1972, it was estimated that the amount of tar in the disposal pits at Darrow was approximately 4.4 million gallons. It was also estimated that two thirds came from Cos-Mar, Inc. and one third from Foster Grant. The amount of styrene tar removed from the pits in Geismer through March 25, 1976 was two million gallons. Approximately three million gallons remained. A total of 4,174,770 gallons of styrene tar was apparently delivered to Joc Oil Aromatics, Inc. from the BFI pits at Geismar between August, 1975 and July, 1976. In 1978 and 1979, styrene tar was also removed and transported to what is now the Brio Superfund site. From Joc Oil/Brio, a part of the waste was sold to Southern Pacific in Houston.

In 1973, some 15,000 cattle were quarantined after hexachlorobenzene infected cattle were found in a herd near the BFI dump site. Since 1974, the BFI waste disposal site has been cited for styrene tar leaks into the Bayou Conway, a stream which drains into the Mississippi River. BFI was forced by the Louisiana Stream Control Commission to pay a $10,000 fine for a 1974 leak.

BFI closed this site in 1979 under a closure plan with the Louisiana Department of Health and Human Resources.

The following tables list the chemical constituents of BFI wastes, the potentially responsible parties, and operators or former operators related to the BFI waste disposal site.

Chemical Constituents of BFI Wastes

atrazine
dichlorobenzene
diethylterephthalate
hexachlorobenzene
phenanthrene
tolylene diamine isomer

Potentially Responsible Parties

Cos-Mar, Inc.
Dow Chemical Company
Foster Grant Chemical Company, Inc.
Gulf Oil Corporation

Operators or Former Operators of Darrow Pits

U.T. Alexander
Browning-Ferris Industries

Information Sources

1. List of number of gallons of styrene tar entitled "Gallons of Styrene Tar from BFI Pit at Geismar Delivered by Commercial Fuel Oil to Joc Oil Aromatics, Inc.", undated.

2. Letter from Harley Brown, BFI, to Robert LeHeur, Louisiana Stream Control Commission, April 5, 1976.

3. BFI Darrow Draft Report by William DeVille, November 8, 1982.

4. Memo from William A. Fontenot, Environmental Specialist, to Peter M. Arnow, Chief, Environmental Enforcement, re: BFI-Darrow, September 3, 1982.

5. Letter from Gus Von Bodungen, Air Control Section, Louisiana State Department of Health to G. W. Engelhardt, Air Control Section, Louisiana State Department of Health, re: Survey of Styrene Tar Industry in Louisiana, August 23, 1972.

6. Lodge, Bill. "National Waste Firm Gobbling Independent La. Sites," State Times, June 16, 1978.

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AVERY

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AIR POLLUTION ENGINEERING MANUAL

SECOND EDITION

Compiled and Edited
by
John A. Danielson

AIR POLLUTION CONTROL DISTRICT
COUNTY OF LOS ANGELES

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Air Quality Planning and Standards
Research Triangle Park, N.C. 27711

May 1973

fore needing replacement. One tungsten carbide burring wheel will dress more than 2000 tires and can be reconditioned several times, giving a total life of over 8000 tires per wheel. In contrast, for a conventional buffing machine, one rasp will buff about 250 passenger tires or 50 truck tires before needing to be replaced. About 1 to 3 pounds of rubber per passenger tire or 5 to 10 pounds per truck tire are removed in the process.

Water Spray at Rasp

A fine mist of water sprayed on the rasp has also been employed to eliminate smoke generation at the source by cooling and lubricating the rasp (Figure 318). The quantity of water sprayed is determined by an electronic controller which operates in conjunction with a current sensor in the rasp-head motor circuit. An airflow of about 2000 cfm is required to capture the emissions from this device.

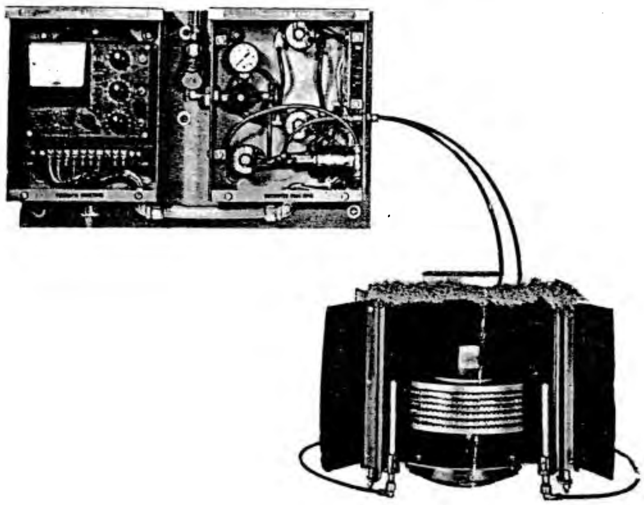

Figure 318. Water injection unit; spray heads (lower right) mounted in the rasp exhaust hood apply water to the rasp (B and J Manufacturing Company, Glenwood, Ill.).

Maintenance and operating costs for the system are very low, and experience indicates that rasp life is almost doubled. Also, because the rubber compounds are not oxidized by too much heat, the bonding strength is higher and more uniform.

COST OF POLLUTION CONTROL

Table 115 shows the comparative capital costs of the various components of air pollution control equipment required for tire buffing equipment. These costs are only part of the total picture and are chosen to compare the influence of the type of air pollution control equipment on the unit tire cost. No buffing machinery capital costs, installation costs, or tire handling costs are included.

Table 115. COST OF AIR POLLUTION CONTROL EQUIPMENT FOR NEW TIRE BUFFING INSTALLATIONS[a]

Air pollution control component	Number of buffing machines			For each machine above three add
	1	2	3	
Blower, duct, cyclone	$1200	$2000	$2500	$ 500
With baghouse after cyclone	3400	6000	7700	1500
Add dry filters after baghouse	4200	7400	9500	1800
Water cooling, cyclone	2700	5000	7000	2000

[a] Costs are based on year 1969. These costs are valid within ± 25%.

WOOD TREATING EQUIPMENT

INTRODUCTION

Wooden utility poles, pilings, posts, and lumber are subject to destruction from decay, insects, marine borers, fire, weathering, absorption of water, and chemical action. In order to prevent this destruction, surface coatings are applied, or preservatives and fire retardants are impregnated into wood by application of pressure. The air pollution aspects of applying preservatives and fire retardants will be discussed in this section on wood treating. Surface coating is discussed in Chapter 12.

There are two general kinds of preservatives--insoluble oils and water solutions. Insoluble oils include creosote, solutions of creosote-coal tar, creosote-petroleum oils, pentachlorophenol, and other oil-borne preservatives. In recent years, treatment with insoluble oils has shifted away from creosote to pentachlorophenol and other oil-borne preservative solutions. Insoluble oil treatment results in darkened wood surfaces and rather strong odors. Applications of insoluble oil treatment include utility poles, pilings, and railroad ties where painting is not required. During the past years, there has also been a shift in treatment away from insoluble oils to water-borne (water soluble) preservatives because they leave wood surfaces clean and free of odors; the surfaces also can be painted. Fire-retardant formulations are solutions of water-soluble compounds.

The composition standards for preservatives are described in the American Wood Preservers' Association Standards (AWPA P Standards). Coal tar creosote is a dark oily liquid derived directly from coal tar or from distillation fractions of coal tar. It is either used directly or compounded with other preservatives such as petroleum oils and pentachlorophenol. Water-borne preservatives include "Wolman Salts," a tradename for a preservative consisting chiefly of sodium fluoride along with small amounts of arsenates, phenolic salts, or metal dichromates. Another water-soluble preservative with the tradename "Chemonite," ammoniacal copper arsenite (ACA), is made by dissolving cupric hydroxide, arsenic trioxide, and acetic acid in aqua ammonia.

METHODS OF TREATING WOOD

Coal tar creosote solutions and petroleum oils are shipped to the treating plant in tank cars or trucks. While the heating of these oils in the tank cars and trucks is not required for pumping to storage, heating is customary to reduce the heating requirements at the retorts during wood treating. Oil-borne preservatives, aromatic oils, and creosote usually are blended at the treating plant. In treating with water-borne preservatives and fire-retardant formulations, various chemicals are blended into water solutions at the treating plant.

Regardless of whether preservatives are solutions of creosote, oil-borne or water-borne preservatives, or flame retardants, the same type of process equipment is employed as shown in Figure 319. Air-seasoned wood in the form of poles, timbers, pilings, and lumber is transported on railroad trams pulled by gasoline- or diesel-powered locomotives. The wood-laden trams are rolled into long, horizontal, heavy-walled vessels called retorts. Retorts usually have inside diameters of 6 to 8 feet and lengths up to 150 feet to accommodate long poles. A typical wood treating plant consists of one to six of these retorts. Each retort contains steam coils for indirect heating of the preservatives and internal steam jets for heat conditioning or for direct cleaning of the surface of the wood. Auxiliary equipment includes a vacuum system capable of producing a vacuum of over 22 inches of mercury absolute on the retort and a pressure system capable of hydraulic pressures up to 250 psig within the retort. The vacuum system consists of a condenser and receiver followed by a reciprocating vacuum pump or a two-stage steam ejector system with barometric condensers. Hydraulic pressure usually is produced by steam-driven reciprocating pumps.

Pressure processes for injection of preservative are described in the AWPA Treating Standards or Commodities Standards (C Standards). Process conditions are specified for different kinds of wood, the service for the treated wood, and the particular preservative used.

A processing cycle can be classified into two steps, the conditioning step and the treating step. Wood is conditioned in the retort by immersing it in hot preservative at atmospheric pressure or under vacuum to expand the cells of the wood and remove moisture; the cells of the wood also may be expanded by blowing superheated steam into the wood. In the treating step following the conditioning step, hydraulic pressure is employed to force the preservative into the cells of the wood.

Cleanup follows hydraulic injection. The wood is subjected to heat and vacuum to remove excess preservative, and live steam may be used to clean the surface of the wood when insoluble oils are used. Vacuum is applied after the steam cleaning period to remove excess moisture and retard subsequent bleeding of the preservative.

The processing time varies even for the same kind of wood since differences in cell structure affect preservative penetration. Cell differences are the result of variations in growing conditions for each tree, such as weather, water, soil, and nutrients. Moisture content of the wood also affects processing time.

C Standards set limits on process variables for conditioning such as maximum steaming temperatures and duration, minimum vacuum, maximum temperature of preservative, and duration. Process variable limits for the treating step include: minimum and maximum pressure, maximum expansion bath temperature, and maximum temperature and duration for final steaming when steaming is permitted.

Results of the treatment include the pounds of preservative injected per cubic foot of wood on a "gauge basis" or an "assay basis." Gauge basis is a measurement immediately after treating based on the ratio of the total weight of liquid or solid preservative impregnated to the total volume of wood charged. The volume of liquid preservative used is determined by measuring the difference in the liquid level in the preservative tank before and after treating. The weight of preservative is then determined from the specific gravity and composition of the treating solution. Inert carriers such as water or petroleum oils are not included in determining preservative weight. The quantity of preservative used also may be determined by weighing wood before and after treating. For example, on a gauge basis, Douglas fir crossarms for utility poles require only 4 pounds of creosote per cubic foot of wood, while Douglas fir pilings for ocean service require 20 pounds of creosote per cubic foot of wood.

A more precise measurement is the assay basis, which specifies the weight of dry preservative

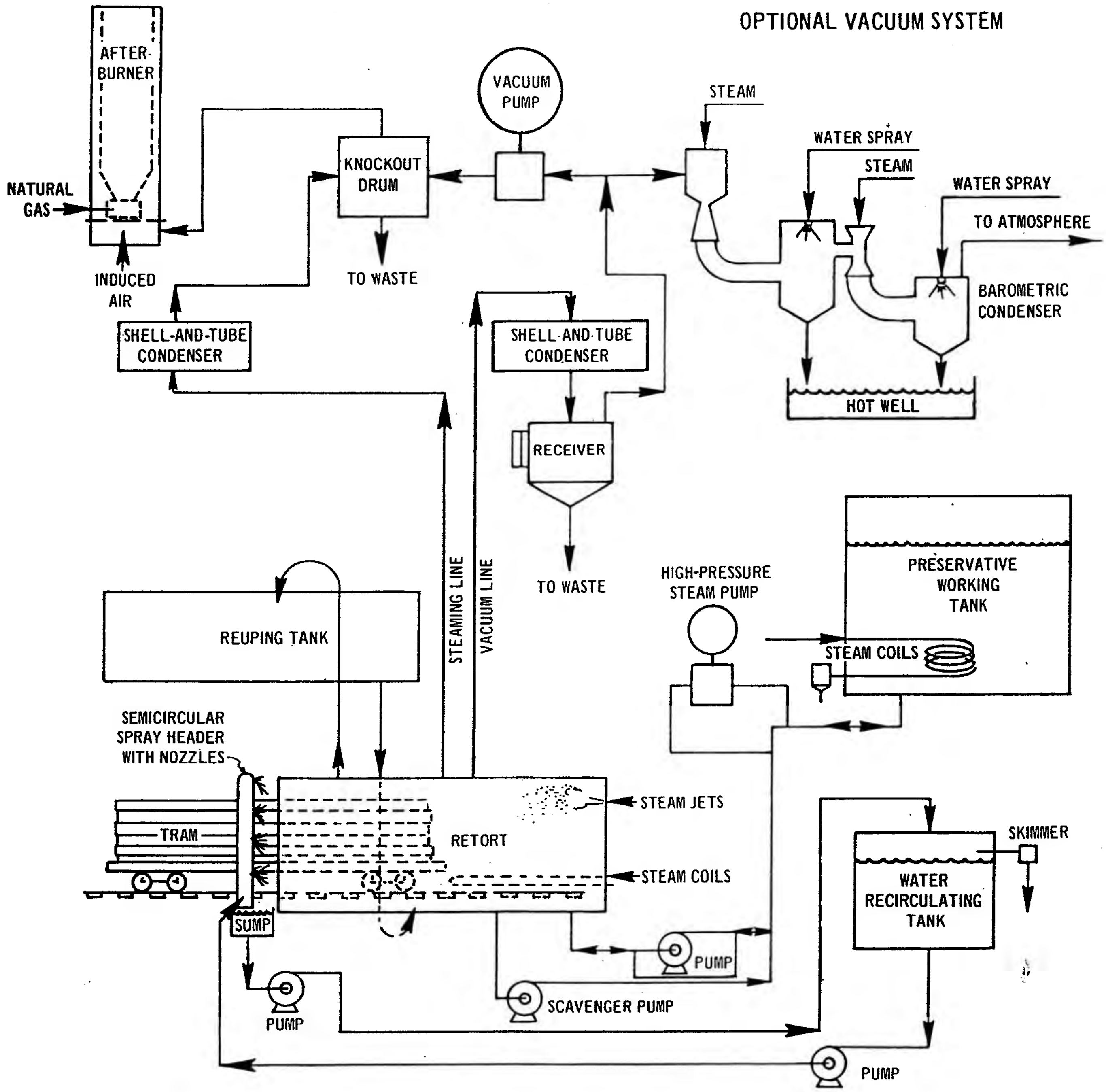

Figure 319. Diagram of a wood-treating plant using creosote solutions, aromatic oils, and oil-borne preservatives.

(liquid or solid) per cubic foot of wood for a given zone of penetration into the wood. Bored cores are taken from a specified number of wood pieces in each treated charge. The cores are analyzed by AWPA A Standards for penetration. Preservative concentration and penetration depth vary, and C Standards are written for the kind of wood and service for this wood. Typical examples are: crossarms must contain at least 0.2 pound pentachlorophenol (solids) per cubic foot at 100 percent penetration of sapwood (wood zone nearest the bark); pilings must contain 20 pounds of creosote (liquid) per cubic foot at a minimum depth of 1 inch and at 85 percent of sapwood depth if sapwood depth is 2 inches or less or at 1.75 inches maximum if sapwood depth is more than 2 inches.

There are two basic variations of pressure processes for impregnating preservatives: empty cell and full cell. The difference between the empty-cell process and the full-cell process involves only the pressure injection step. Conditioning steps which precede pressure injection and cleanup steps which follow can be identical for either process.

In the empty-cell process, the retort is either filled with air at atmospheric pressure (Lowry Process) or pressurized with compressed air up to some specified level (Rueping Process). The retort is then filled completely with preservative liquid and hydraulically pressurized to the C Standard selected for the kind of wood and service. In each of the two empty-cell processes described above, air imprisoned in the cells of the wood opposes the hydraulic pressure and restricts penetration by forcing out part of the preservative.

In the full-cell process, the retort is completely filled with preservative while under vacuum and then hydraulically pressurized as specified in the C Standard. There is negligible air in the cells of the wood to oppose hydraulic pressure, and thus penetration is greater for the full-cell than for the empty-cell process.

Empty-cell processes result in stratified bands of preservative located at the interface between layers of wood at lower levels in a specified penetration zone. The full-cell process results in a continuous fill for the entire depth of the penetration zone without stratified bands. Thus, the empty-cell process is used for light treatment, and the full-cell process for heavy treatment. For example, the empty-cell process is used to inject 4 to about 12 pounds creosote per cubic foot (assay basis), and the full-cell process to inject over 12 pounds creosote per cubit foot. Water-borne preservatives are injected only by the full-cell process. Creosote solutions and oil-borne preservative solutions may be injected by either process.

Only the Rueping empty-cell process requires the use of a special vessel (the Reuping tank). Following the conditioning step, the retort is emptied of preservative except for a quantity located in the bottom, which does not contact the charge of wood. The retort is pressurized with compressed air to the C Standard selected. The elevated Reuping tank is filled with hot preservative, and the hot preservative in this tank is allowed to slowly displace the compressed air in the retort. When the retort is completely filled with preservative, it is sealed and hydraulically pressurized to the C Standard selected.

A typical processing cycle for creosote treatment using the full-cell process is as follows: Wood is charged to the retort and subjected to a vacuum of 22 inches of mercury absolute within the retort. During the conditioning step, the wood under vacuum in the retort is immersed in creosote solution at 170° to 210° F. During this period, the vacuum is pulled from a small vapor space at the top of the retort. The hot creosote under vacuum causes moisture to vaporize and to be expelled from the cells of the wood which expand under heat. The vacuum period continues until the collection rate of condensate in a receiver below the water-cooled shell-and-tube condenser slows to a predetermined level, which indicates that the wood is dry and ready for pressure injection. This vacuum period can vary from one to several hours, or it may extend for several days.

While the vacuum is maintained, the retort is filled completely with creosote at 170° to 210° F. The retort is subjected to hydraulic pressure of about 100 psig for periods up to several hours to force the creosote into the cells of the wood.

Following pressure injection, with the wood still submerged in creosote, the retort is subjected to an expansion bath to remove excess creosote. The expansion bath consists of a vacuum period, during which the creosote may be reheated to 220° F. Then the vacuum is broken and the creosote is pumped out. A vacuum period may follow pump out to further remove excess preservative. Superheated steam at 8 to 12 psig may be injected to clean the surface of the wood. Then the wood is subjected to a final vacuum period to remove moisture, cool the surface of the wood, and retard subsequent bleeding of the creosote. Following the final vacuum period, the wood is removed from the retort. Depending upon the C Standard selected, one complete processing cycle may vary from 6 to over 60 hours.

A typical processing cycle for ammoniacal copper arsenite (ACA) treatment using the full-cell process is as follows (see Figure 320): The conditioning step consists of sealing the wood in the retort and subjecting it to a vacuum of about 25 inches of mercury for a period of 30 to 60 minutes. Saturated steam at 5 to 10 psig is injected directly into the retort until retort pressure reaches 5 psig. Steam injection is continued for 1 to 6 hours at 5 psig to expand the cells of the wood. The steam is shut off, and the wood is again subjected to a vacuum of about 25 inches of mercury for up to 2 hours to remove moisture from the cells of the wood. During the treating step, the retort is completely filled with ACA solution at ambient temperature. Hydraulic pressures of 75 to 150 psig are applied to the retort from 1 to 30 hours to inject the ACA into the cells of the wood. Hydraulic pressure is released, and the solution is pumped from the retort. A final vacuum period of at least 20 inches of mercury is maintained for an hour or more in order to remove residual solution and reduce the concentration of ammonia vapors before the treated wood is removed from the retort.

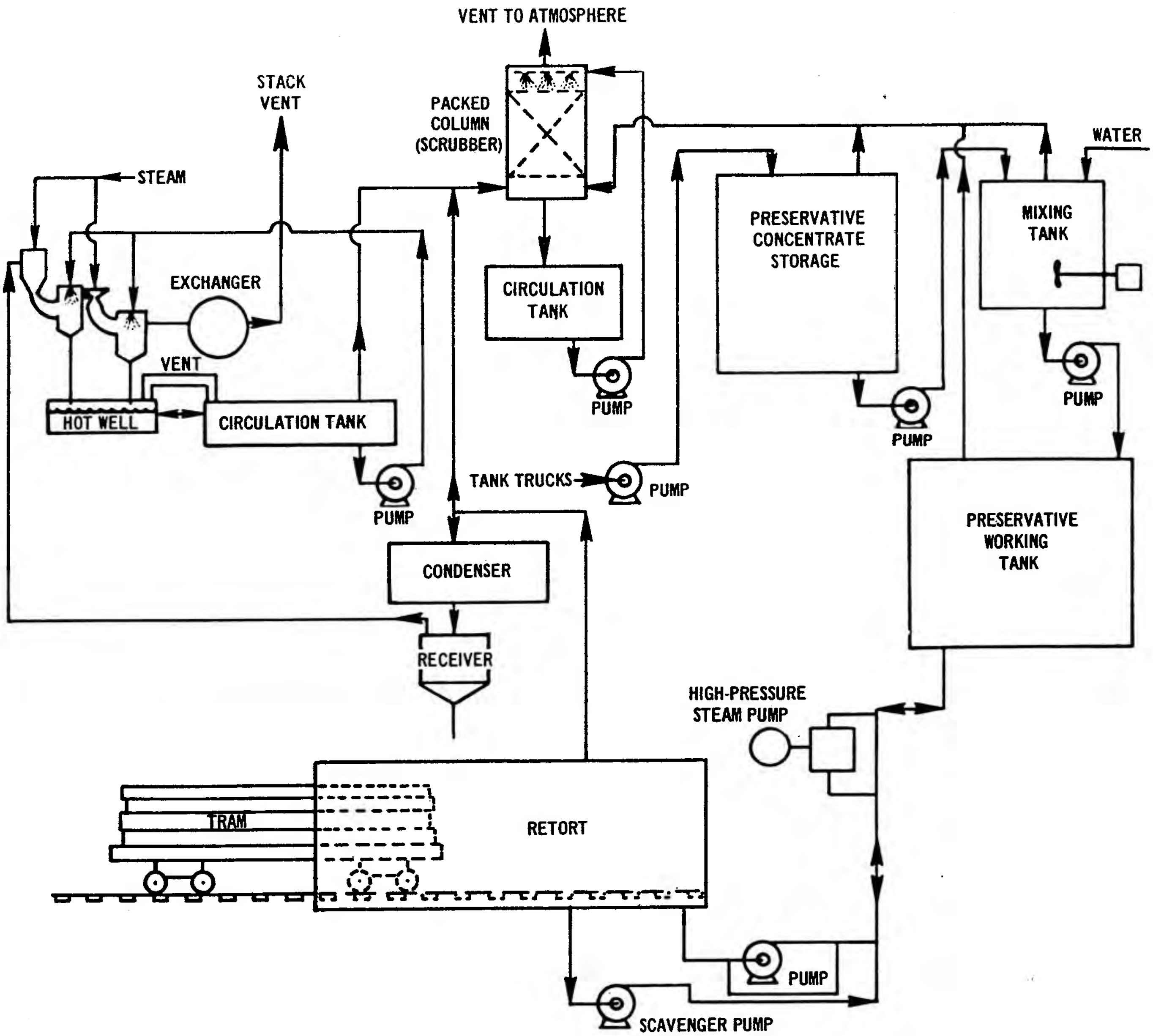

Figure 320. Diagram of a wood-treating plant using ammoniacal copper arsenite (ACA) preservative.

THE AIR POLLUTION PROBLEM

The operation of equipment used for treating wood with creosote solutions and oil-borne preservatives results in the emission of air contaminants in excess of air pollution regulations governing opacity and concentration.

When these materials are heated, some of the lower boiling organic compounds volatilize as aerosols to form dense white emissions. The emission from treated wood on the tram cars immediately after removal from the retort usually exceeds 60 percent opacity beyond the opaque water vapor breakoff point and continues to exceed 40 percent opacity up to 20 minutes. Emissions of 60 percent opacity or more beyond the opaque steam plume from the open end of the retort continue only during the few minutes it takes to remove the treated wood and recharge the retort.

Source tests revealed excessive particulate concentrations in the vacuum exhaust and in the exhaust during the steam cleaning period. Particulates averaged 0.95 grain per scf or 3.6 pounds per hour in 440 scfm of gas from a vacuum pump venting one retort during the initial vacuum period. Particulate concentration averaged 19 grains per scf or 75 pounds per hour

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in 460 scfm of gas from steam cleaning wood in one retort. Control of these emission sources requires the installation of an air pollution control device. Where vacuum is produced by a two-stage steam ejector system with barometric condensers, the vent from the vacuum system does not exceed opacity regulations or regulations governing the concentration and quantity of air contaminants. The vacuum steam ejector system has barometric condensers which, in effect, act as scrubbers in controlling the emissions. Two source tests indicated particulate concentrations of 0.125 and 0.260 grain per scf.

Preserving wood with ACA results in the emission of ammonia vapors during vacuum and gas purging of the retort, from mixing and storage tanks for the preservatives, and from the treated wood immediately following removal from the retort. Although ammonia vapors do not cause opacity problems, the vapor can cause a nuisance.

Ammonia vapors entering the two-stage vacuum system are scrubbed by barometric condensers so that the vacuum exhaust to the atmosphere contains negligible ammonia odors. The barometric hot well, barometric condenser recirculation tank, and preservative mixing and storage tanks emit ammonia vapors and should be sealed and vented to a control device as shown in Figure 320.

A steam plume may be present along with invisible ammonia vapors when the end cover of the retort is removed and the treated wood is pulled from it. A final vacuum of at least 20 inches of mercury absolute should be maintained for a minimum of 1 hour prior to removal of the wood in order to reduce the quantity of residual ammonia in the treated wood to a level which can safely be emitted to the atmosphere. With this vacuum period, the ammonia emitted is not detectable at a distance of 75 feet from this source; consequently, air pollution control equipment is not required.

Treating wood with other water-soluble preservatives and fire retardant formulations generally does not result in the emission of air contaminants.

HOODING AND VENTILATION REQUIREMENTS

An enclosure or building to collect all the air contaminants emitted upon opening a retort would have to cover the entire end of the retort and extend over 200 feet to accommodate railroad track and switching gear, retort appurtenances such as movable track, swing cover and piping, and tram cars loaded with wood up to 150 feet in length. Exhaust rates would have to be extremely large to provide adequate ventilation within this enclosure for the safety and comfort of the workers. Any device to control emissions from such a structure would of necessity be very large and costly. As an alternative, some method is needed to eliminate or reduce the emissions as the wood is removed from the retort.

AIR POLLUTION CONTROL EQUIPMENT

A practical solution to the air pollution problem occurring when wood treated with solutions of creosote and oil-borne preservatives is removed from the retort is to spray the surface of the wood with large quantities of water (Figure 321) to cool the surface of the wood from about 180° F to below 115° F. At this lower surface temperature, the volatilization of organic particulates is greatly reduced, and opacities which exceed 60 percent white opacity beyond the end of the steam plume before spraying are reduced to 10 percent white opacity or less. Figure 322 shows emissions from treated wood on tram cars following removal from the retort with and without water sprays.

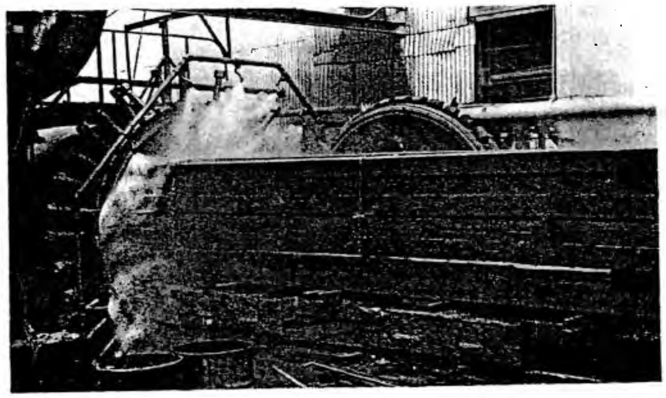
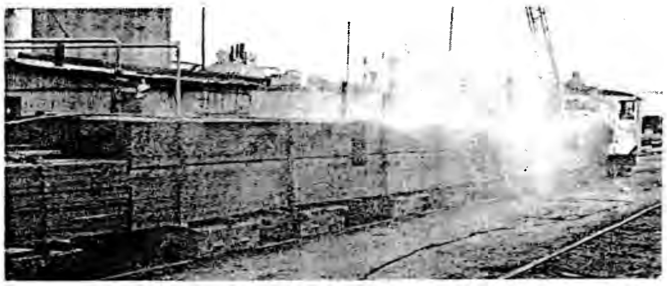


Figure 321. Treated lumber on railroad cars being pulled from retort through a permanently installed spray header (J.H. Baxter and Company, Long Beach, Calif.).

A header containing spray nozzles is mounted within a few inches of the open end of the retort to blanket the entire open end with sprays. If space is available between the hinged retort cover in an open position and the retort itself, a permanently mounted semicircular header can be installed as shown in Figure 321. Without the necessary space, a portable header with spray nozzles (Figure 323) can be moved into position after the hinged cover is placed in a fully open position. About a dozen or more flat spray nozzles are arranged in a semicircle on each header. A railroad switch engine moves the treated wood on tram cars from the retort slowly through the water sprays at a uniform speed of not more than 17 fpm. A minimum of 300 gallons of water per minute is sprayed on the batch of treated wood for a total of at least 2500 gallons.

a. With sprays.



b. Without sprays.

Figure 322. Emissions from treated lumber after removal from retort with and without water sprays (J.H. Baxter and Company, Long Beach, Calif.).

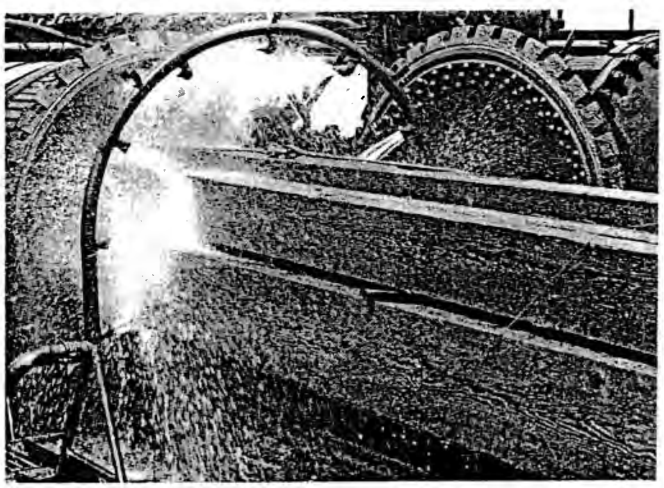


Figure 323. Treated lumber being pulled through a portable spray header (Forest Products Division, Koppers Company, Inc., Wilmington, Calif.).

Emissions which would normally escape from the retort when the hinged cover is open are controlled by continued operation of the vacuum system venting to the control equipment. Emissions are greatly reduced by installing a scavenger pump to remove most of the source of emissions, i.e., the hot residual preservative lying at the bottom of the retort. Spray water is collected in tanks equipped with a skimmer to remove insoluble preservatives prior to respraying. Following skimming operations, the concentration of creosote remaining in the recirculating water is about 0.0002 percent by weight. Since the spray water is heated up several degrees each time it is sprayed, the spray system should be designed with a large enough capacity to keep the spray water near ambient air temperatures or a spray tower or spray pond should be installed. The cooling load on the spray system can be reduced by extending the final vacuum period to a minimum of 1 hour. The longer the final vacuum period, the lower the surface temperatures of the treated wood when removed from the retort.

During the steam cleaning of wood near the end of the treating process, emissions to the atmosphere are at a maximum and may exceed 19 grains per scf. To comply with regulations governing particulate losses, the control device must have an efficiency over 96 percent. In one instance, a venturi scrubber capable of this high collection efficiency was rejected because of high initial costs and high operating costs. High operating costs were based upon the calculated pressure drop of at least 35 inches of water column required across the venturi throat to collect micron size particulates.

Incineration of air contaminants in an afterburner is a proven method for controlling emissions during the steam cleaning period and during operation of the vacuum pump. Figure 324 shows an afterburner venting wood treating equipment. The volume of contaminated gaseous effluent varies from about 300 to 1200 scfm. A surface condenser and knockout tank must be installed ahead of the afterburner to condense live steam during steam cleaning of the wood and to reduce the load of the afterburner. Provisions should be made for frequent internal cleaning of this surface condenser since naphthalene crystals from steam distillation of creosote will cause fouling. A special duct is installed at the inlet to the afterburner to keep gas velocities well above flame propagation velocities in the reverse direction and thus prevent flashback.

The afterburner should be designed for an exit temperature of 1500° F and a retention time of 0.3 second or more in the combustion zone. Source tests show efficiencies of 99 percent based upon the complete combustion of gaseous and particulate organic contaminants when operting at 1400° F exit temperature. The afterburner exhaust contains particulate concentrations of 0.04 grain per scf, and at this concentration there are no visible emissions.

Studies show that afterburner operating costs can be reduced by recovering the heat from the afterburner exhaust gases. A shell-and-tube exchanger can be installed at the outlet from the afterburner to heat boiler feed water or to supplement the steam producing facilities of the wood-treating

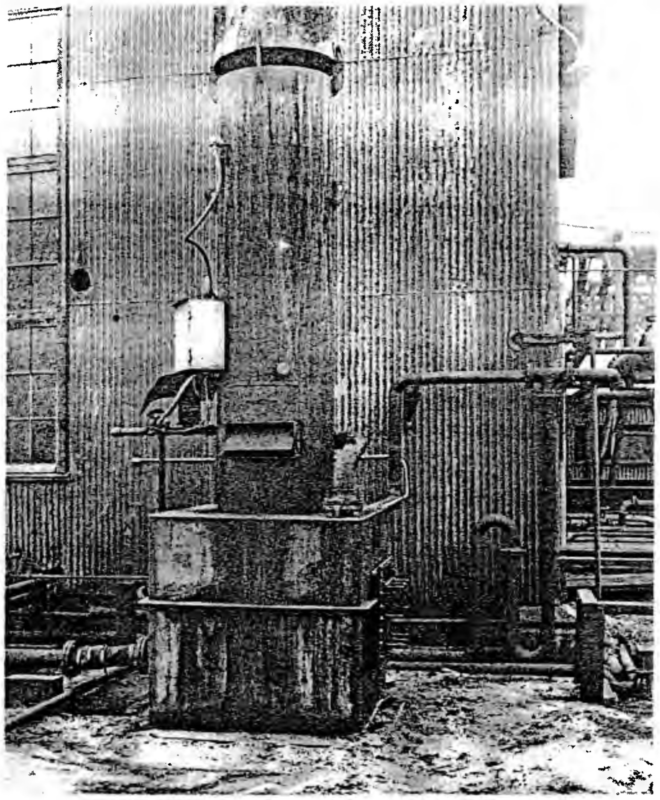


Figure 324. Afterburner mounted above knockout tank venting wood-treating equipment (Forest Products Division, Koppers Company, Inc., Wilmington, Calif.).

plant. A recent installation of a waste heat boiler venting an afterburner showed a payout time for the boiler of less than 4 years.

The contaminant load on the afterburner can also be reduced to a great extent by reducing the steam consumption rate used for cleaning to a minimum.

When wood is treated with ACA, the emission of ammonia vapors can cause nuisance violations; however, the emissions do not violate any of the other air pollution regulations. Ammonia vapors released when treated wood is removed from the retort can be substantially reduced by employing a 1-hour vacuum period prior to removal.

Ammonia vapors emitted from the retort, the barometric condenser hot wall, the barometric condenser recirculation tank, and the preservative mixing and storage tanks are vented to a packed scrubber by displacement only. A diagram of this system is shown in Figure 320. An exhaust fan is not required since gas flow rates should remain as slow as possible for efficient operation of the scrubber. The packed scrubber shown in Figure 325 is 18 inches in diameter and is filled with 4 feet of 1-inch Raschig rings. For

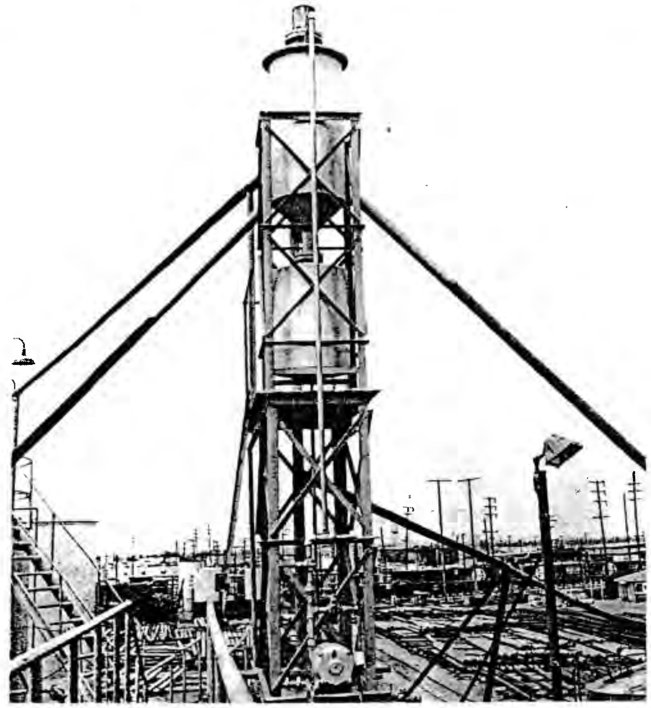


Figure 325. Packed column venting wood-treating equipment (J.H. Baxter and Company, Long Beach, Calif.).

efficient absorption of ammonia vapors, recirculating water to the contact barometric condenser and the circulating water to the packed scrubber should be cooled and kept below $1\frac{1}{2}$ percent ammonia by weight.

CERAMIC SPRAYING AND METAL DEPOSITION EQUIPMENT

INTRODUCTION

Aqueous slurries of porcelain or vitreous enamels and ceramic glaze often are sprayed onto ceramic or metallic articles in spray booths using conventional spray equipment. Metals, metal alloys, and metal oxides are deposited on articles of metal and other materials, also in spray booths, usually by spraying in a molten, atomized state using a gas as a carrier and special spray equipment.

In ceramic spraying operations, a spray gun, operated by compressed air, is used to apply the coating on the object to be covered. Sometimes, in the process called airless spraying, the coating material itself is pressurized.

In metal deposition, three basic methods of applying the coating are in use. These are metallizing, thermal spraying, and plasma arc or flame spraying. These are discussed later in this section.

2, 34, 43, 138

3, 24

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TEXAS AIR CONTROL BOARD
Laboratory
8520 Shoal Creek Boulevard
Austin, Texas 78758

Sample: Conroe Creosote Co.
Koppers Company
Southern Pacific Wood Treating

ACL # 2127, 2129, 2130

Delivered By: Charlie Goerner

Description: Analyze for: phenol, dioxins, cresol, PCP, benzene

Date Sampled: June 15, 1979

LABORATORY ANALYSIS

Of the compounds requested for analysis PCP was found to be present in a concentration of about 7%. There was a trace of both phenol and cresol. Benzene and dioxin were below detectable limits.

June 15, 1979
Date Received

January 8, 1980
Date Reported

Henry J. Krauss
Analysis Performed by
Henry J. Krauss

FORM NO. ACB-55

TEXAS AIR CONTROL BOARD
Laboratory
8520 Shoal Creek Boulevard
Austin, Texas 78758

Sample: Conroe Creosote Co.
Koppers Company
Southern Pacific Wood Treating

ACL # 2127, 2129, 2130

Delivered By: Charlie Goerner

Description: Analyze for: phenol, dioxins, cresol, PCP, benzene

Date Sampled: June 15, 1979

LABORATORY ANALYSIS

~~The samples were found to contain mostly PCP with a trace of phenol and [illegible] were [illegible] limits of [illegible] analysis.~~

Of the compounds requested for analysis PCP was ~~the~~ found to be present in a concentration of about 7% There was a trace of both Phenol and cresol. Benzene and dioxin were below detectable limits

June 15, 1979
Date Received

January 7, 1980
Date Reported

Henry J. Krauss
Analysis Performed by
Henry J. Krauss

KG COH003837

FORM NO. ACB-55

Texas Air Control Board

AUSTIN TEXAS

INTEROFFICE

FROM Henry J. Krauss TO Mike Ryan/Charlie Goerner,P.E./Mike Peters

SUBJECT Region 7 Request for property line sampling - ACL # 2127, 2129, 2130

After an analysis of the feed treating solution from Conroe Creosoting Company, Southern Pacific Wood Preservative Works and Koppers Company for dioxin, phenol, benzene, cresol and PCP it has been determined the samples contain [redacted] There were a great many other compounds present but only the above five were analyzed for.

We suggest that any downwind sampling of those plants be done with Isopropyl alcohol in an absorption tube.

*PCP in a concentration of about 7%. The samples also contained a trace of phenol and cresol. Benzene and dioxins, if present, are below detectable limit.

SIGNED Henry J Krauss

DATE January 9, 1980

FORM NO. ACB-28

EMERALD
ENVIRONMENTAL
SERVICES, LTD.

FAX COVER PAGE

TO: Jim Tarr **FROM:** Gene Speller
COMPANY: Stone Lions Environmental Corp
FAX NO: (310)377-1172
TELEPHONE NO: (310)377-6677
PAGES: 6 (includes cover page)

DATE: 6/04/01

MESSAGE:

Jim,

Attached are copies of TNRCC archived laboratory documents concerning analysis for Pentachlorophenol (PCP), dioxins, cresol, and benzene at Southern Pacific Wood Treating, Koppers Company and Conroe Creosote Co. in 1979.

These records were provided by the TNRCC via fax on 6/4/01. A verbal request for these records were made on 5/22/01 by Gene Speller to Scott Mgebroff (TNRCC Lab Director).

I discussed these laboratory reports with Scott on 6/4/01. He agreed that the results are not clear but that they imply PCP was found in samples for all three companies, including Southern Pacific. There were no other documents found in archived records concerning TACB ACL Nos. 2127, 2129 & 2130.

Regards,
Gene

Gene Speller

D:\CLIENT-S\SLions\Corresp\2001\FaxJTReSP7.wpd

17045 El Camino Real, Suite 100 ● Houston, Texas 77058 ● (281) 480-9697 ● Fax (281) 480-9699

MONITORING **Texas Natural Resource Conservation Commission** OPERATIONS

Office of Compliance & Enforcement

Protecting Texas by Reducing and Preventing Pollution

BUILDING B
RECEPTIONIST - (512) 239-1716
FAX - DIAL - (512) 239-1605

FAX TRANSMITTAL

TO:
Name: Gene Speller
Organization:
FAX Number: (281) 480-9699

FROM:
Name: Barbara Blair (Scott Mgebroff)
Section:
Telephone Number: (512) 239-1716

NOTES:
ACL 2127, 2129 + 2130 as requested.

Total number of pages being sent including this cover letter: - 5

(If you do not receive this fax in its entirety, please call (512) 239-1716 for assistance.)

Texas Air Control Board

AUSTIN TEXAS

INTEROFFICE

FROM Henry J. Krauss TO Mike Ryan/Charlie Goerner, P.E./Mike Peters

SUBJECT Region 7 Request for Property line sampling - ACL # 2127, 2129, 2130

After an analysis of the feed treating solution from Conroe Creosoting Company, Southern Pacific Wood Preservative Works and Koppers Company for dioxin, phenol, benzene, cresol and PCP it has been determined that the samples contain PCP in a concentration of about 7%. The samples also contained a trace of phenol and cresol. Benzene and dioxin, if present, were below detectable levels. There were a great many other compounds present but only the above five were analyzed for.

We suggest that any downwind sampling of those plants be done with Iso-propyl alcohol in an absorption tube.

SIGNED Henry J Krauss

DATE January 8, 1980

KG COH003841

FORM NO. ACB-30

4, 33

Southern Pacific Wood Treatment Facility:
An assessment of the potential health hazards involved in emissions from the operation.

Presentation of Topics:

Cindy Blackburn
Cindy Blackburn
Engineering Tech I
September 1978
BA for CB

I Introduction

The following report addresses the question of whether or not the Southern Pacific (SP) wood preservation operation presents a health hazard to those people living and/or working within the immediate area of the facility. Selected compounds have been reviewed with regard to 1) their physical properties 2) their toxicity, and 3) possible sampling techniques. These compounds were chosen after researching the components and potential contaminants, which may be involved in a process like SP's. The intent of this paper is to present information that may be used to assess the environmental and toxicological impact of SP.

SP utilizes a 30-70 mixture of creosote and oil to treat lumber that is solely utilized for railroad ties. The cresote is supplied by Kopper's, and it is rated Grade 1 according to the standards of the AWPA (American Wood Preserver's Association). Currently, oil is obtained from Dixie Chemical Co. Each month, SP uses 400,000-500,000 gallons of this preservative mixture to treat approximately 133,000 railroad ties. They operate 24 hours per day, 7 days per week.

II Creosote

Creosote is the basic, essential material SP utilizes to treat its railroad ties. The material possesses waterproofing and fungicidal characteristics. Creosote is obtained through the distillation of coal tar. Maximum allowable standards for creosote have not been established, since it is composed of a varying mixture of phenols. Different sources report the boiling point of creosote anywhere from 195°-400° C.

Toxicity:

Cresote is rapidly absorbed through the gastrointestinal track and the skin. Excretion mainly occurs via the urine in conjugated form. When the creosote vapors contact the skin or mucous membranes, intense burning and itching may result. Greyish yellow to bronze pigmentation may result, especially in individuals with fair complexions (1).

Sampling/Analysis:

When the creosoting material is exposed to heat, toxic fumes are released. It is the individual components of these fumes that need to be analyzed. The following compounds discussed in this paper possibly comprise the the fumes emitted in SP's operation.

III Phenol

BP= 181.9° C*
FP=79.4°C (CC)
TLV= 5ppm

Toxicity:

With chronic exposure to low concentrations of phenol digestive disturbances frequently occur: vomiting, diarrhea and loss of appetite. Headaches and dizziness

* BP= boiling point
FP= flash point, cc= closed cup
TLV= threshold limit value

KG COH003844

may be symptomatic of central nervous system effects. Kidney and liver damage may result upon chronic inhalation of phenol vapors. Locally, dermatitis and skin reactions may develop. (2)

Sampling/Analysis:

Standard methods for sampling phenol in the atmosphere are available according to Bill Kwie of this office.

IV Cresol

Isomer	BP°C	FP°C (CC)
ortho	190.8	81.8
para	201.8	94.4
Meta	202.8	94.4

TLV (all isomers)= 5 ppm

Toxicity:

Cresol is the major type of phenol obtained from the distillation of coal tar. Cresol is similar to phenol in its action on the body, although the effects produced by cresol are less severe. Systemic poisoning by cresol has rarely been reported. The main hazard accompanying its use in wood treatment is the corrosive action on the skin and mucous membranes. O-cresol is the most toxic of the three isomers, because it has the highest volatility (3).

Sampling/Analysis:

Procedures for sampling cresol are similar to those for phenol. Separation of the isomers becomes difficult at low concentration levels.

V Benzene *

BP= 80°C
FP= 12°C (CC)
TLV= 10 ppm

Toxicity:

Benzene is rated as a "suspect carcinogen" for man. Locally, benzene vapors may irritate the skin, eyes and mucous membranes. Chronic, low level exposure may alter the blood elements, and anemia can result. The vapor of benzene may produce an intoxicating "high," followed by central nervous system (CNS) depression. Drowsiness, fatigue and headaches are symptomatic of exposure (4).

Sampling/Analysis:

Sampling for benzene in the atmosphere is relatively easy, according to Bill Kwie. Standard methods are available.

* I have included benzene in this report, as it has been suspected to be a contaminant in the oil which Dixie Chemical supplies to SP.

VI Pentachlorophenol (PCP)

BP= 310°C

TLV= .046 ppm (=0.5 μg/M^3)

Toxicity:

PCP causes intense irritation to eyes, mucous membranes and the upper respiratory tract. Upon systemic absorption, PCP may produce intoxication; followed by sweating, dyspnea, and in extreme cases, collapse. Radical uncoupling of the oxidation and phosphorylation cycles may occur in tissues (5).

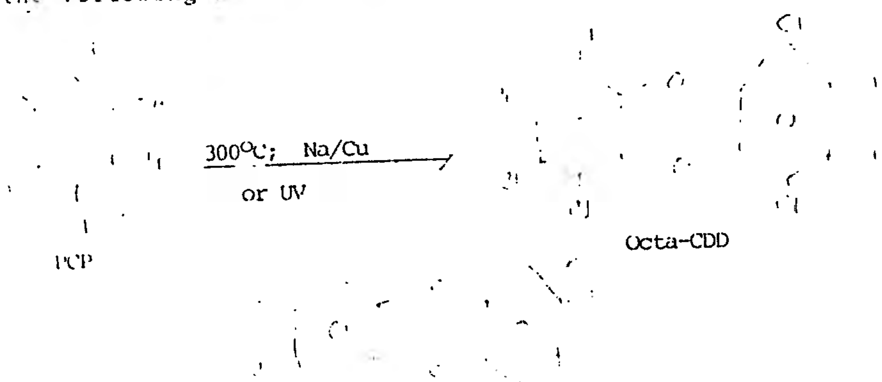
Sampling/Analysis:

Sampling of PCP in the atmosphere is difficult, since it is subject to decomposition. A fiberglass filter paper can be used to collect dust, and subsequently analyzed for PCP.

Reportedly, SP ceased to use PCP when they quit treating railroad ties used in bridge construction. However, a report presented by Kopper's at an EPA Science Advisory Board meeting indicates that PCP may be a constituent of the creosoting material sold to SP. Upon exposure to heat and light PCP has the potential to form more toxic substances.

VII Dioxins

If PCP is present in SP's materials, dioxin formation could result from uv irradiation (sunlight) or by pyroysis of the preservors (6). For example, PCP may act as the precursor to the following chlorinated dibenzodioxins (CDD's):



TCDD

The different congeners of the CDD's are of special interest, because they exhibit a wide range of toxicological properties. Attached is a listing of the LD_{50}'s of the CDD isomers.

2,3,7,8- Tetrachlorodibenzo-p-dioxin (TCDD)

Toxicity:

TCDD is the most acutely toxic synthetic organic chemical known, having an LD_{50} of 2 μg/kg in guinea pigs. It has been shown to be teratogenic, embryotoxic, and carcinogenic. TCDD has the potential to induce hepatocellular carcinomas and and squamous cell carcinomas in the lungs. Locally, hyperpigmentation of the skin may result.

Several chemical congeners of TCDD have similar toxic properties, although they are not as potent. For example, Hexa-CDD produces effects similar to those of TCDD, yet it has a higher LD_{50}: 60-100 µg/kg for guinea pigs. In contrast, Octa-CDD is practically non-toxic in acute dosages, but it is a suspected carcinogen (6).

Sampling/Analysis

Sampling for these CDD's is difficult and dangerous, especially with TCDD. Most likely, the existence of any harmful CDD isomers in SP's process would be contingent upon the presence of PCP in its process feed. According to Jim Lindgren from the TACB office in Austin, it is possible to detect PCP in SP's treatment material through liquid chromatography.

VIII Vinyl Chloride (VC)

B P = -13.4°C
F P = 77.8°C
TLV = 1 PPM

As mentioned earlier in this report, VC is not a normal constituent of creosoting materials. However, through the investigations of the TACB, it was discovered that SP had been utilizing processing oil that was contaminated with VC. From December 1977 to July 1978, SP obtained this contaminated material from Dominguez and Sapp's (D & S) styrene tar pits at the Texas City Wye. This process modification apparently resulted in significant emissions of VC. Thus, Paul Henry of this office, cited SP on a Regulation VI violation for operating without a permit for process modification. On July 19, 1978, the Region VII office was notified that SP stopped using the contaminated material from D & S.

Sampling for VC at SP's operation would still be beneficial for the following reasons:

1) Background levels of VC would be established at SP's facility.

2) The determined values would reflect the effect of discontinuing to use the contaminated oil. An ambient air survey for VC was conducted at SP by Southwest Research Institute (SRI) in May 1978. The methods used by SRI have been questioned by Bill Kwie of this office.

3) Results would be obtained with standard sampling procedures.

Toxicity

Vinyl Chloride is a proven human carcinogen. Epidemiological studies have shown an increased incidence of lung, lymphatic, brain, hepatic, and urinary tract cancers upon exposure. Systemic effects include CNS depression, dizziness and headaches. Short term exposure may cause frostbite, because of VC's low boiling point. Lung congestion and irritation may result with chronic exposure (1).

Sampling & Analysis

Current, standard procedures are readily available for the sampling of VC, according to Bill Kwie.

KG COH003847

IX Recommendations & Conclusion

A multitude of compounds (not merely the individual concentration levels of the compounds), may itself be indicative of the threat of those residing in the vicinity of SP. Synergism and/or the combination of effects is a very real phenomenon, although nearly impossible to assess. Therefore, we must depend upon our abilities to discern the individual components of a larger situation. With that in mind, I submit the following procedure be undertaken to evaluate SP.

1) Atmospheric sampling for VC at the following sites:
   a. at the property lines
   b. at the vessel openings
   c. at the truck unloading site
   d. at the truck vents
   e. at the location of tie transfer

The sampling should be conducted under the worst operating conditions; i.e., when the retort vessels are opened, and when unloading occurs. I recommend priority sampling for VC in order to conclude the previous controversy regarding this compound.

2) Analyzing SP's process feed for the presence of PCP. This should indicate the potential for dioxin formation. Also, treatment temperatures inside the vessels should be checked, as dioxin formation is favored at higher temperatures($\sim 300^\circ C$).

3) Atmospheric sampling for phenol and cresol. Again, treatment temperatures will affect emissions, due to the volatility of the compounds.

4) Analysis of the liquid feed supplied by Dixie Oil for benzene.

5) Comprehensive evaluation of above sampling results with suggestions for possible control measures such as:
   a. reducing treatment temperatures
   b. installation of a hydraulic spray system at vessel openings to decrease the volatization of hazardous substances
   c. relocation of the facility to an area which is less densely populated.

The operation at SP may constitute more than just an odor nuisance to those residing in the immediate vicinity. Quite possibly, these residents may be exposed to harmful emissions. Hopefully, the material presented in this paper will serve to assist in the evaluation of SP.

X Approximate Single Dose Oral LD_{50} of CDD isomers

Chlorination	Guinea Pigs	µg/kg	Mice
2,8 (di)	>300,000		--
2,3,7 (tri)	29,444		>3,000
2,3,7,8 (tetra)	2		284
1,2,3,7,8 (penta)	3.1		337
1,2,4,7,8 (penta)	1,125		>5,000
1,2,3,4,7,8 (hexa)	72.5		825
1,2,3,6,7,8 (hexa)	70-100		1,250
1,2,3,7,8,9 (hexa)	60-100		>1,440
1,2,3,4,6,7,8 (hepta)	>180		--
1,2,3,4,6,7,8,9 (octa)			>4g/kg bw

From McConnell, et al. The comparative toxicity of chlorinated dibenzo-p-dioxin isomers in mice and guinea pigs. Toxicology and applied pharmacology (in press). 1978.

REFERENCES

1. Sax, N.I. Dangerous Properties of Industrial Materials. Von Nostrand Reinhold Company, Toronto. 1968.

2. U. S. Army Environmental Hygiene Agency. Aberdeen Medical Surveillance Guide. Aberdeen Proving Ground, Md. 1975.

3. Fairhall, LT. Industrial Toxicology, 2nd Edition. Hafner Publishing Company, New York. 1969.

4. Casarett, L.J. and J. Doull. Toxicology, the basic science of poisons. MacMillan Publishing Co., Inc., New York. 1975.

5. Hunter, Donald. The diseases of occupations, 5th Edition. The English Universities Press, Ltd. London. 1974.

6. Environmental Health Advisory Committee, Science and Advisory Board. Report of the ad hoc study group on pentachlorophenol contaminants. E.P.A., Washington, D.C. March 1978.

BIENNIAL INSPECTION - S.I.P.

SOUTHERN PACIFIC WOOD PRESERVATION WORKS

4910 Liberty

Houston, Texas

116-840-1

March 21 & 23, 1978

I met with Mr. M. A. Lane, Plant Superintendent, to conduct a plant inspection and review recent Rule 5 notices issued.

This facility treats approximately 1.6 million railroad ties per year. They handle between 400,000 and 500,000 gallons of creosote and oil per month. The ties are treated with a 30% creosote and 70% oil mixture. This oil is a styrene-benzene bottoms blending solution. The creosote is Grade 1 usually supplied by Koppers.

The oil and creosote are pumped into a sump by truck and then into holding tanks. There is a fan that pulls off the sump and it releases a deordeorizing agent into the exhaust stream. From the sump the material goes into closed holding tanks and then mixed and into the five cylinders where the ties are impregnated. Four of these cylinders are 8' x 145' and one is 6' x 85'. This is a solution pressure system in which the creosote is sprayed on the ties and pressured into the wood. They have two steam generators that produce 250 lbs/in² and are rated at 33000 lbs/hr. Each cylinder can hold 900 - 1300 railroad ties. They are operated 24 hrs/day, seven days/wk. Each treatment takes approximately 24 hours. When the cylinders are opened and the ties are pulled out they are at 190°F. This is the time when the most odor is produced and continues until the ties cool down. The ties are stockpiled in the yard and then shipped out. The ties remaining on the yard all have the characteristic creosote odor but it can only be detected close to the ties.

They had used pentachlorophenol to treat ties for bridge construction but this chemical is no longer used.

The odor of creosote is always present on the property. Odor is most likely to go off the property when the cylinders are opened. Apparently the resurgence of complaints being called in is because of the change in the weather and the opening of windows allowing any odor present to enter the homes. This seems to be the pattern during early spring as seen by complaints called and notices issued in March & April of previous years. A complaint on odor can usually be confirmed because of the nature of the business. Mr. Lane says that all they could do is move and that they are negotiating for three possible sites in other sections of Texas which would be more happy to have their facility supplying jobs with less problem with the creosote odor.

Our office received a call from the TACB and Gene Speller said that he was going to make an inspection at this facility on March 23rd, so I decided to return to see if the TACB had detected an additional problem.

Mr. Speller informed Mr. Lane & myself that some of the styrene-benzene bottoms blending solution that is being supplied to them may be contaminated by vinyl chloride. These oils are being supplied by Domingurs & Sapp Co. They have supplied 40,000 gallons/week for the last 2½ - 3 months. The rest of the oil is supplied by Dixie Chemical. The oil supplied by Domingurs & Sapp is taken from waste pits in Texas City (Galveston County). The state is going to test for vinyl chloride bottoms. The pits have been previously tested and 1 ppm of vinyl chloride was found. The OSHA standard for 15 minute ceiling level is approximately 1 ppm.

Mr. Speller told Mr. Lane that he would notify them in writing as to the results of their sample. This would be in about a month. Mr. Lane asked how the vinyl chloride could be disposed of and Mr. Speller said it could be incinerated (Rollins) or deep well injected.

Mr. Lane then informed us that he had already stopped received shipments from Domingurs because of the possibility of chlorine and copper in the oils. They are having a sample tested by Southwest Lab and should have results about March 27,1978. They do not want CL or copper in the oil because of the possibility of HCL formed which would reduce their steel piping and lines. Mr. Domingurs had told Mr. Lane that he need not worry because iron sulfide would be formed in the cylinders and would coat them and act as a protecting agent. Mr. Lane still stopped receiving shipment and told us that he would tell Mr. Domingurs about our visit and would not accept anymore shipment even if there is no chlorine or copper until getting results from the TACB's analysis.

Mr. Speller and I both felt that the major odor source occured when the cylinders were opened. This should be the only source of problem. We did detect a sulfur type odor during our plant tour but were not sure of the exact source. This company does operate in compliance except during those times when a nuisance complaint is found and a violation of Rule 5 is issued.

Rules & Regulations reviewed.

General Rules reviewed especially Rule 5.

Regulation I

Rule 101.1	No outdoor burning.
Rule 102	No incinerator.
Rule 103	No visible particulate fumes, only steam. ?
Rule 104	Plant roadways unpaved. Have a rough surface of large gravel and rocks. Some particulate can become airborne.
Rule 105	No source other than roadway particulate.
Regulation II	Sulfur Compounds
	1. Some sources of sulfur compounds. Odor detected. SO_2 should be below .28 ppm.
Regulation III	Not Applicable
Regulation IV	Not Applicable
Regulation V	Not Applicable
Regulation VI	Reviewed
Regulation VII	Nitrogen Compound
	1. Boiler capacity 33,000 lbs/hr.

Robert J. Stahl
Tech III

RJS:db

01/10/2001 TNRCC

KG COH003853

P-00426

5

KG COH003854

NO. 2000-38068

CLARENCE ABRAHAM, et al.	§	**IN THE DISTRICT COURT OF**
	§	
vs.	§	**HARRIS COUNTY, TEXAS**
	§	
UNION PACIFIC RAILROAD COMPANY	§	
	§	**295TH JUDICIAL DISTRICT**

DEFENDANT UNION PACIFIC RAILROAD COMPANY'S ANSWERS TO PLAINTIFFS' FIRST AMENDED SET OF SPECIAL INTERROGATORIES

TO: Plaintiffs, by and through their attorney of record, U. Lawrence Bozé, 2208 Blodgett, Houston, Texas 77004 and Harold V. Dutton, Jr., 2323 Caroline, Houston, Texas 77004.

COMES NOW Union Pacific Railroad Company, Defendant in the above-entitled and numbered cause, and serves its Response to Plaintiffs' First Amended Set of Special Interrogatories as attached.

Respectfully submitted

PHELPS DUNBAR LLP

By: ____________________
David Lee Crawford
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Deborah A. Newman
Texas Bar No. 01237257
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**signed by permission*

ATTORNEYS FOR DEFENDANT UNION PACIFIC RAILROAD COMPANY

KG COH003856

CERTIFICATE OF SERVICE

This is to certify that a true copy of the foregoing Defendant Union Pacific Railroad Company's Answers to Plaintiff's First Amended Set of Special Interrogatories has been forwarded to:

U. Lawrence Bozé
U. Lawrence Bozé & Associates
2208 Blodgett
Houston, Texas 77004

Harold V. Dutton, Jr.
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Girardi & Keese
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by Certified U.S. Mail, Return Receipt Requested on this **7th day of December 2001.**

Deborah A. Newman

INTERROGATORIES

Interrogatory No. 1.:

Please state the years Southern Pacific Transportation Company (or any of its affiliated companies) owned and/or operated the facility known as the Houston Wood Preserving Works ("HWPW") located at 4910 Liberty Road in Houston, Texas.

Answer:

Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Southern Pacific Transportation Company began wood preserving operations at the facility located at 4910 Liberty Road in Houston, Texas in 1911. Wood preserving operations ceased in 1984.

Interrogatory No. 2.:

Reserved.

Answer:

Interrogatory No. 3.:

Identify (the current name, address, and telephone number) of each person with knowledge of the Southern Pacific Transportation Company Houston Wood Preserving Works Operation formerly located at 4910 Liberty Road in Houston, Texas (persons such as M.A. Lane, Plant Superintendent, G.F. Bozeman, E&M Manager, Frank Bozeman, Superintendent, Water and Fuel Supply, R.S. Kilpatrick, Environmental Engineer, but excluding the named Plaintiffs herein).

Answer:

Objection. This interrogatory is vague and overbroad as it does not limit or define the scope of knowledge of the facility. Subject to and without waiving these objections,

M.A. "Art" Lane
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(408) 243-8301

Steve Davis
Former HWPW laborer
Address and telephone number unknown

Manuel Palacios
Former HWPW Engineer
6415 Gainsville
Houston, TX 77020-3109

Joseph Guilbeau
Former HWPW Engineer
Address and telephone number unknown

Interrogatory No. 4.:

To the extent information is available, for each year of operation, please identify each material used at the Houston Wood Preserving Works facility (located at 4910 Liberty Road, Houston, Texas) in the process of treating wood ties, the volumes of such materials used each year, and the identity, by name, address and telephone number of the suppliers of that material.

Answer:

Defendant Union Pacific objects to this interrogatory to the extent it is overbroad and unduly burdensome. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the operations of the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific

Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

The materials used in the process of treating wood ties were naptha, creosote, creosote extender, pentacholorophenol (limited quantities), cross ties, piling and poles.

Lumber, including cross ties, poles and piling, was purchased from KL Barton & Son, P.O. Box 540, Garrison, Texas, 75946, William Somerville & Son in Dallas, Texas, Audrey Smith Lumber Co., 412 Heather Dr., Granbury, Texas, 76048 and other local vendors. Gross & Janes, 433 Foote Ave., St. Louis, MO, 63119, , supplied cross ties. Creosote was purchased from U.S. Steel, Koppers, Bernuth Lembcke, International Creosoting, Reilly Industries, Inc., Ashland Chemical Company and other local vendors. Creosote extender was purchased from Lowe Chemical Company, Dixie Oil Processors, Hard-Lowe Chemical Company, JOC Oil Aromatics, Friendswood Oil Processing Company, Dominguez & Sapp and other local vendors. Naptha was purchased from Shell Oil Company, Humble Oil Company and a successor to Ashland Oil Company. Pentachlorophenol was not used after 1965 and its use prior to this time was negligible. It is not known what company the pentacholrophenol was purchased from.

Southern Pacific Transportation Company treated cross ties based upon demand which varied from year to year and month to month. It is believed that Southern Pacific Transportation Company's Houston Wood Preserving Works operated at or near capacity from 1961 to 1984. The maximum number of cross ties the facility had the capacity to treat from 1962 to 1972 was approximately 900,000 cross ties per year. Assuming that Southern Pacific Transportation Company treated the maximum number of cross ties per year during this time period, Southern Pacific Transportation would have used approximately 900,000 cross ties, 1,170,000 gallons of creosote, 2,730,000 gallons of creosote extender, and 158,000 gallons of naptha for each year of operation during this time period. Again, these figures are based upon the assumption that the facility was operating at maximum capacity with no down time for repairs and/or shutdowns.

From 1973 to 1984, Southern Pacific Transportation Company had the capacity to treat a maximum of approximately 1,500,000 cross ties per year. As noted above, cross ties were produced based upon demand which varied from year to year and month to month. Assuming that Southern Pacific Transportation Company treated the maximum number of cross ties per year during this time period, Southern Pacific Transportation Company would have used approximately 1,500,000 cross ties, 2,044,800 gallons of creosote, 4,771,200 gallons of creosote extender, and 288,000 gallons of Naptha for each year of operation during this time period. These calculations are based upon the assumption that the facility was operating at maximum capacity with no down time for repairs and/or shutdowns.

<u>Interrogatory No. 5.</u>:

To the extent information is available, for each year of operation, please state the size (in terms of square feet or acres) of the Houston Wood Preserving Works facility formerly located at 4910 Liberty Road in Houston, Texas.

<u>Answer:</u>

The Houston Wood Preserving Works facility located at 4910 Liberty Road is set on approximately 33 acres.

<u>Interrogatory No. 6.</u>:

To the extent information is available, for each year of operation, please state the volume (gallons or pounds) of each material used (each day, week, month and/or year) in the wood treatment operation known as Houston Wood Preserving Works located at 4910 Liberty Road in Houston, Texas.

<u>Answer:</u>

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waving these objections, see Answer to Interrogatory 4.

Interrogatory No. 7.:

To the extent information is available, for each year of operation, please state the capacity of the operation known as the Houston Wood Preserving Works facility formerly located at 4910 Liberty Road (capacity in terms of number of ties treated each day, week, month and/or year and the amount of wood treatment material necessary to meet that capacity).

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waving these objections, see Answer to Interrogatory 4.

Interrogatory No. 8.:

To the extent information is available, for each year of operation, please state the number (or approximate number) of wood ties treated at the Houston Wood Preserving Works facility formerly located at 4910 Liberty Road in Houston, Texas (number of ties treated by day, week and/or year).

Answer:

Objection. This interrogatory is overbroad, unduly burdensome, and the information sought is not reasonably available. Subject to and without waving these objections, see Answer to Interrogatory 4.

Interrogatory No. 9.:

To the extent information is available, for each year of operation, please identify the supplier of each material used in the treatment operation known as the Houston Wood Preserving Works formerly located at 4910 Liberty Road in Houston, Texas and the volume and type of materials supplied by each entity.

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waving these objections, see Answer to Interrogatory 4.

Interrogatory No. 10.:

Please identify the types of wastes that were generated each day, week, month or year by the Houston Wood Preserving Works operation formerly located at 4910 Liberty Road in Houston, Texas, and the quantities of such waste.

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Additionally, this interrogatory is not limited as to time. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the types of wastes generated at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office, and third: the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

The waste material generated from the facility consisted mainly of lumber byproducts generated from the facility's framing activities. The lumber byproducts consisted of the ends of cross ties and wood shavings from the boring of cross ties and framing of switch and bridge material. The operation also generated sap water extracted from the timber during the treating process and cylinder bottom sludge generated from the treating process.

Interrogatory No. 11.:

To the extent information is available, for each year of operation, please describe how waste material was disposed of at the Houston Wood Preserving Works facility formerly located at 4910 Liberty Road in Houston, Texas.

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the disposal of waste generated at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant

Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

The lumber waste was loaded into movable containers located at the facility and deposited in dumpsters on a daily basis. Once the dumpsters were full, Western Refuse would transport the loaded dumpsters off site.

From approximately 1959 to 1961, the sap water was either evaporated or discharged into a wood-lined ditch that ran along the southern border of the facility and parallel to the railroad tracks. In1975 the sap water was no longer discharged into the ditch but rather was discharged in accordance with an industrial permit into the City of Houston's sanitary sewer. By 1979, a significant portion of the sap water was evaporated in the treating cylinders and the remaining sap water was disposed of off-site by Empax, Malone Trucking Company, Lowe Chemical Company, Dixie Oil Processors and other retailers that supplied creosote extender.

Beginning in approximately 1981, tank bottoms and sap water were stored in two 12,500 gallon railroad tank cars for off-site disposal.

Interrogatory No. 12.:

To the extent information is available, for each year of operation, please describe how each treatment reactor vessel was cleaned.

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to how each treatment reactor vessel was cleaned at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

The treatment cylinders were not cleaned every year but on an as needed basis. Southern Pacific Transportation Company employees cleaned the treatment cylinders using various tools, including scrapers, high pressure hoses and pneumatic shovels, which cleaned or dislodged material located on or between the cylinder coils.

Interrogatory No. 13.:

Please identify any and all warnings given to employees at the Southern Pacific Transportation Company Houston Wood Preserving Works facility located at 4910 Liberty Road in Houston, Texas, concerning the health effects of any of the materials used to treat the wood ties.

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the warnings given to employees working at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Southern Pacific Transportation Company held mandatory safety meetings for the employees at the Houston Wood Preserving Works facility on the last working day of each month. Smaller safety meetings were held on a weekly and daily basis. During the safety meetings, Southern Pacific Transportation Company emphasized that personal hygiene was an important part of the employee's job performance. A check list was prepared for each employee covering the general safety points that an individual employee should perform while on duty. Every employee signed and was provided a copy of the check list. The employees were also instructed to read the Material Safety Data Sheets regarding the precautions and safety measures they should take when dealing with all of the chemicals/solutions located on the premises.

Additionally, Southern Pacific Transportation Company posted a safety sheet on the facility's bulletin board listing various safety tips regarding working with the treatment solutions including, but not limited to, exercise good personal hygiene, change clothes daily, wash hands prior to eating, wear the proper clothing and safety equipment ,and take daily baths.

Interrogatory No. 14.:

Please identify any and all warnings given to employees working at Southern Pacific Transportation Company Houston Wood Preserving Works facility located at 4910 Liberty Road in Houston, Texas, concerning the health effects caused by vapors released from the wood treatment reactor vessels or from the ties themselves.

Answer:

Objection. This interrogatory is vague, overbroad, unduly burdensome, ambiguous and propounded solely for the purpose of harassment. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the warnings given to employees at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Material Safety Data Sheets were provided regarding the effects, if any, of the chemicals located at the facility. Investigation into this interrogatory continues.

Interrogatory No. 15.:

Please state whether during the operation of the Houston Wood Preserving Works facility at 4910 Liberty Road in Houston, Texas, Southern Pacific Transportation Company was aware of any health effects caused by any of the materials used to treat the wood ties.

Answer:

Objection. This interrogatory is vague, overbroad and unduly burdensome. Subject to and without waiving these objections, yes.

Interrogatory No. 16.:

Please state whether any of the Southern Pacific employees working at the Liberty Road Houston Wood Preserving Works facility ever complained to Southern Pacific Transportation Company about injuries caused to them by the materials used to treat the wood ties.

Answer:

Objection. This interrogatory is vague, overbroad, ambiguous and unduly burdensome. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to whether Southern Pacific employees working at the Houston Wood Preserving Works facility complained to Southern Pacific about injuries caused to them by the materials used to treat the wood ties. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad

Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Southern Pacific Transportation Company received a complaint in 1980 that eleven employees complained of stomach problems after ingesting water containing creosote. The employees were immediately sent and treated at a local medical clinic and returned to work the next day. Upon investigation, it was determined that the incident was caused by a leaking pump seal. The seal was repaired and no additional complaints followed. Aside from the instant lawsuit and the aforementioned, Southern Pacific did not receive any specific complaints from its employees that they were injured by the materials used to treat the wood ties.

Interrogatory No. 17.:

If any Southern Pacific Transportation Company employee working at the Houston Wood Preserving Works facility at the 4910 Liberty Road, Houston, Texas facility complained to Southern Pacific Transportation Company about the injuries caused to them by the materials used to treat the wood ties, please identify the employee by name, address and telephone number, and the date of the complaint and the nature of the complaint.

Answer:

See answer to Interrogatory 16.

Interrogatory No. 18.:

Please state whether Southern Pacific Transportation Company provided the employees working at the Liberty Road Houston Wood Preserving Works facility any safety equipment in connection with the operation of the wood treatment facility (such as ventilators, respirators, goggles, gloves, etc.).

Answer:

Objection. This interrogatory is vague and overbroad. Subject to and without waiving these objections, yes.

Interrogatory No. 19.:

At any time during the operation of the Liberty Road Houston Wood Preserving Works, did Southern Pacific Transportation Company receive any literature that indicated that breathing the vapors from the Creosote storage tanks or the wood tie reactor vessels, or dermal contact with the materials used in the wood treatment process cause any adverse health effects either acutely or chronically. If so, identify the literature.

Answer:

Objection. This interrogatory is overbroad, vague and unduly burdensome as the term "literature" is not defined. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to whether Southern Pacific received any literature indicating that contact with creosote caused adverse health effects. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Material Safety Data Sheets were provided for the chemicals located at the facility.

Interrogatory No. 20.:

Please state whether Southern Pacific Transportation Company conducted (or had professionals conduct) any air, soil, or water tests to determine whether there were contaminants in the air, soil, or water at or around the HWPW facility which were directly related to the wood treatment operation.

Answer:

Objection. This interrogatory is vague, overbroad, unduly burdensome and not limited in time. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, yes.

Interrogatory No. 21.:

If Southern Pacific Transportation Company did conduct any air, soil, or water testing at the Liberty Road HWPW, please state the date of such tests, the contaminant tested for, the type of test conducted, and the results of such test.

Answer:

Objection. This interrogatory is vague, overbroad, unduly burdensome and the information sough is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to whether Southern Pacific conducted air, soil or water testing at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Investigation into these matters continues.

Interrogatory No. 22.:

At the Liberty Road HWPW facility, please describe the type of creosote Southern Pacific Transportation Company used in its wood treatment operation.

Answer:

AWPA Grade 1, low residue creosote.

Interrogatory No. 23.:

Please list any and all insurance coverage applicable to the claims made herein (by policy number, insurer, limits of coverage, the insurer's name, and the like).

Answer:

Southern Pacific Transportation Company obtained insurance coverage from a number of insurance entities during the time periods relevant to the pending litigation. Southern Pacific Transportation Company is presently in litigation with a number of those insurers regarding various historical operations, including some of the matters at issue in this litigation. To date, no insurer has accepted the defense or indemnity of any of the claims in this litigation. To the extent necessary, copies of policies can be made available at a reasonable time and place for inspection.

Interrogatory No. 24.:

Please state the facts upon which you base the assertion in the Original Answer that "[i]ntervenors' claims are time-barred by the three year limitations period provided in the Federal Employer's Liability Act. *See* 45 U.S.C. 56."

Answer:

Objection. This interrogatory is overbroad and unduly burdensome. Subject to and without waiving these objections and without referring to each individual claim, Plaintiffs' claims are barred for three reasons: (1) the symptoms Plaintiffs attribute to working at the Houston Wood Preserving Works facility were diagnosed by a doctor three years prior to the inception of this lawsuit; (2) Plaintiffs were subjectively aware of symptoms they attribute to working at the Houston Wood Preserving Works facility three years prior to the inception of this lawsuit; and (3) Plaintiffs died three years prior to the inception of this lawsuit.

Interrogatory No. 25.:

Please identify the documents upon which you base the assertion in the Original Answer that "[i]ntervenors' claims are time-barred by the three year limitations period provided in the Federal Employer's Liability Act. *See* 45 U.S.C. 56."

Answer:

Defendant will supplement.

Interrogatory No. 26.:

To the extent information is available, for each year of operation, please state whether treated wood ties were stored at 4910 Liberty Road in Houston, Texas. If so, please state the precise location of storage and the maximum number of ties so stored, as well as the average number of ties stored at any given time.

Answer:

Objection. This interrogatory is vague, overbroad and unduly burdensome. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the storage of cross ties at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

The maximum number of treated cross ties Southern Pacific Transportation Company kept as inventory was 35,000 to 40,0000 cross ties. The cross ties were bundled, stacked, banded, and stored adjacent to the loading station.

Interrogatory No. 27.:

Did Southern Pacific Transportation Company prepare plot plans (i.e. dimensional and location maps and diagrams of the major pieces of equipment used in the wood treatment operation, as well as such maps and diagrams of the major structures) of the Houston Wood Preserving Works facility located at 4910 Liberty Road in Houston, Texas? If so, please identify where plaintiffs can obtain copies, i.e. which governmental entities received copies of these plot plans.

Answer:

See attached.

Interrogatory No. 28.:

At the HWPW were the wood ties dried with naphtha prior to the application of the creosote and creosote extender? If so, please identify the chemical constitutes and physical properties of the naphtha so used.

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to whether naptha was used to dry cross ties prior to application of the creosote and creosote extender at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a

Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Yes, Southern Pacific Transportation Company used naptha as a drying agent prior to applying the creosote and creosote extender. Southern Pacific Transportation Company purchased the naptha on the open market from reputable companies including Shell Oil Company and Humble Oil Company. The precise chemical composition of the naptha is unknown.

Interrogatory No. 29.:

To the extent information is available, for each year of operation, please identify which of the following compounds were a chemical constituent of the creosote or creosote extender material used by Southern Pacific Transportation Company at its Houston Wood Preserving Works facility located at 4910 Liberty Road in Houston, Texas: hydrogen cyanide, acrylonitrile, methylene chloride, chloroform, benzene, chlorobenzene, 1,1-dichloroethane, 1,2-dichloroethane, trans-1,2-dichloroethane, 1,1,1-trichloroethane, 1,2-trichloroethane, trichloroethylene, ethylbenzene, tetrachloroethylene, toluene, vinylchloride, styrene, 1,1,2,2-tetrachloroethane, phenol, bis(2-chloroethyl)ether, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, fluorene, naphthalene, phenanthrene, di-n-butylppphthalate, 2,4-dimethylphenol, hexachlorobenzene, pyrene, anthracene, sulfur, barium, calcium cerium, cobalt, chromium, copper, iron, lead, magnesium, manganses, mercury, nickle, silicon, silver, tin, titanium, vanadium, zinc, zirconium, phosphorous, benzene, toluene, carbon tetrachloride, 1,2,4-tricholorbenzene, hexachlorobenzene, 2,4,6-trichlorophenol, pentachlorophenol, pentachloroethane, tetrachlorobenzene, pentachlorobenzene, acenaphthylene, acenaphthene, flourene, phenanthrene, fluoranthen, butylbenzylphthalate, benzo(k)fluoranthene, benzo(a)pyrene, indent(1,2,3-cd)pyrene, dibenzo(g,h,i)perylene, 1,2,4-trimethylbenzene, acetophenone, tetramethylbenzene, tetralix, 2-methylnaphthalene, biphenyl, 2-ethylnaphthalene, 2,3-dimethylnaphthalene, aluminum, and creosol.

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires into the specific chemical compounds that comprised the creosote and creosote extender used at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Investigation into this interrogatory continues.

Interrogatory No. 30.:

Please identify which companies delivered materials to Southern Pacific's HWPW for use in its wood treatment operation and the time period during which the material was received from each company.

Answer:

Objection. This interrogatory is vague, overbroad, ambiguous and unduly burdensome. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, see answer to Interrogatory 4.

Interrogatory No. 31.:

Did Southern Pacific Transportation Company Houston Wood Preserving Works Liberty Road facility receive material from Dominguez & Sapp Enterprises for use in its wood treatment operation? If so, identify what material was received, the volume of the material and the dates of receipt of that material for use at the HWPW Liberty Road facility.

Answer:

Objection. This interrogatory is vague, overbroad, ambiguous and unduly burdensome. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to whether Southern Pacific received material from Dominguez & Sapp Enterprises for use in its wood treatment operation at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Southern Pacific Transportation Company received approximately 600,000 gallons of creosote extender from Dominguez & Sapp from approximately December 1977 to July 1978. The creosote extender consisted of tank bottoms and styrene tars.

Interrogatory No. 32.:

Please identify any and all tests done by Southern Pacific Transportation Company to determine the chemical composition and/or toxicity of the materials and chemicals used in its wood treatment operation at 4910 Liberty Road in Houston, Texas.

Answer:

Objection. This interrogatory is vague, overbroad, ambiguous and unduly burdensome. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory requests that Defendant Union Pacific identify all tests performed by Southern Pacific to determine the chemical composition and/or toxicity of the materials and chemicals used in the wood treatment operation at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a

Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Based upon the information available, Southern Pacific occasionally contacted independent laboratories to determine the chemical composition of the creosote extender purchased from local vendors.

Interrogatory No. 33.:

Did Southern Pacific Transportation Company provides (sic) its employees with any material safety data sheets relating to the materials used at the Liberty Road HWPW facility?

Answer:

Yes.

Interrogatory No. 34.:

Were there ever any fires at the Liberty Road HWPW involving the reactor vessels used to treat the wood ties or the storage facilities for the materials (such as Creosote and/or Creosote Extender or a blend of the two) used to treat the wood ties at the Liberty Road facility?

Answer:

Objection. This interrogatory is overbroad, unduly burdensome and the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to whether there were any fires involving the reactor vessels or the material storage facilities at the Houston Wood Preserving Works facility.

Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

There were approximately three flash fires from 1961 to 1982 in the reactor vessels. In approximately 1981, an explosion occurred near the storage facilities when a contract welder, in violation of Southern Pacific Transportation Company's specific orders, used a cutting torch on one of the working tanks.

Interrogatory No. 35.:

To the extent information is available, for each year of the operation, please identify (by name, size, location, and purpose) each structure at the Liberty Road HWPW facility.

Answer:

Enclosed are overhead photographs of the Houston Wood Preserving Works facility. Any additional information concerning the structures depicted on the maps can be obtained through deposition testimony.

Interrogatory No. 36.:

To the extent information is available, for each year of operation, please identify the type of vessels used to heat and pressure treat the wood ties, including the number of vessels and the sizes of the vessels, as well as the make and model of each vessel.

Answer:

The cylinders used to treat the cross ties were made of welded steel. The make and model of the cylinders is unknown. From 1961 to 1972, there were three treating cylinders eight feet in diameter and one hundred and forty-five feet long and one treating cylinder eight feet in diameter and eighty-five feet long. In 1973, an additional cylinder that was eight feet in diameter and one hundred and forty-five feet long was added to the facility and was used until the facility ceased treating operations.

Interrogatory No. 37.:

Please state how many employees worked at the HWPW during any given shift.

Answer:

Objection. This interrogatory is vague, overbroad and unduly burdensome. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the number of employees working on any given shift at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union

Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

The number of employees working at the facility varied depending upon the work that had to be performed, the shift, and the demand for cross ties. As a general rule, from 1973 to 1984 there were approximately eighty-five employees working on the day shift and approximately twenty-five on the night shift.

Interrogatory No. 38.:

Please identify (by name, address, and telephone number) all employees who worked at the HWPW.

Answer:

Objection. This interrogatory is vague, overbroad and unduly burdensome. Additionally, the interrogatory is not limited in time and the information sought is not reasonably available. Subject to and without waiving these objections, Union Pacific Railroad Company does not have the information necessary to respond to this interrogatory.

Interrogatory No. 39.:

To the extent information is available, for each year of operation please state the schedule of the operation, i.e. whether it was operated 24 hours a day seven days a week or on some other set schedule.

Answer:

Objection. This interrogatory is vague, overbroad and unduly burdensome. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the schedule of operation at the Houston Wood Preserving Works facility. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office; and third, the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

The schedule of operation was dictated by the demand for cross ties. From 1972 to 1984 the facility generally operated as follows: the yard crew worked five days a week and one shift per day; the treating crew operated five days a week and three shifts per day with an employee being assigned to monitor the facility during the remaining two days per week.

Interrogatory No. 40.:

Please identify the chemical constituents of the creosote extender material received from Hard-Lowe Chemical Co., Lowe Chemical Company, Phoenix Chemical Company, JOC Oil Aromatics, Friendswood Oil Processing Co., Dixie Oil Processors, Inc., Dominquez and Sapp, or any other supplier.

Answer:

Objection. This interrogatory is vague, overbroad and unduly burdensome. Additionally, the information sought is not reasonably available. Subject to and without waiving these objections, Defendant Union Pacific is answering this interrogatory based upon the information that is presently available to it upon reasonable diligence. Discovery into these matters continues, and additional information may be learned in the course of that discovery that may impact the answer to this interrogatory.

This interrogatory inquires as to the chemical constituents of the creosote extender purchased from various suppliers. Based upon the information presently available, documents concerning the Houston Wood Preserving facility would have been maintained in three primary locations: first, the Houston Wood Preserving facility itself; second, the Southern Pacific Transportation Company's Houston office, and third: the Southern Pacific Transportation Company's San Francisco office. No documents that were maintained or kept at the Houston Wood Preserving Facility were maintained after wood preserving operations ceased in 1984. Additionally, Defendant Union Pacific has been unable to locate at this time any documents concerning the Houston Wood Preserving Works that would have been maintained by the Southern Pacific Transportation Company's Houston office or the Southern Pacific Transportation Company's San Francisco office. Further, effective Sunday, February 1, 1998, Union Pacific Railroad Company was merged legally with and into Southern Pacific Transportation Company, a Delaware corporation. Also, on February 1, the Southern Pacific Transportation Company changed its name to Union Pacific Railroad Company. Because of the legal merger of Union Pacific Railroad Company into Southern Pacific Transportation Company, Union Pacific Railroad Company is now a Delaware corporation and no longer a Utah corporation. There is no longer any company named Southern Pacific Transportation Company.

This present lawsuit has been filed over fifteen years after wood preserving operations at the Houston Wood Preserving Works facility were concluded. Defendant Union Pacific has attempted to answer this interrogatory based upon information provided by former Southern Pacific Transportation Company employees and any information that can be ascertained from the presently existing documents. Subject to any additional information that becomes available and without waiving the aforementioned objections, Defendant Union Pacific answers as follows:

Southern Pacific purchased Number 6 fuel oil, styrene tars and tank bottoms for use as creosote extender. Union Pacific does not possess any documents reflecting the precise chemical constituents of the creosote extender.

VERIFICATION

STATE OF NEBRASKA §
§
COUNTY OF ___________ §

Comes now Ruth Sauser, Discovery Manager for Union Pacific Railroad Company, being first duly sworn on her oath, and states that she is authorized on behalf of Union Pacific Railroad Company to make the foregoing Defendant Union Pacific Railroad Company's Response to Plaintiff's First Set of Special Interrogatories, and that while she does not have personal knowledge of all facts cited therein, the information has been collected and the answers made after a reasonable search of all available records and that she has read the foregoing Responses, and that the information contained therein is true and accurate based on her best knowledge, information and belief. Therefore, the foregoing responses are verified on behalf of Defendant Union Pacific Railroad Company.

____
Ruth Sauser

SWORN TO AND SUBSCRIBED BEFORE ME this ______ day of ____________________, 2001, to certify which witness my hand and seal of office.

(SEAL)

____
Notary Public in and for
The State of Nebraska

VERIFICATION

STATE OF NEBRASKA §
§
COUNTY OF Douglas §

Comes now William C. Burri, Director-Occupational Claims for Union Pacific Railroad Company, being first duly sworn on his oath, and states that he is authorized on behalf of Union Pacific Railroad Company to make the foregoing Defendant Union Pacific Railroad Company's Response to Plaintiff's First Set of Special Interrogatories, and that while he does not have personal knowledge of all facts cited therein, the information has been collected and the answers made after a reasonable search of all available records and that he has read the foregoing Responses, and that the information contained therein is true and accurate based on his best knowledge, information and belief. Therefore, the foregoing responses are verified on behalf of Defendant Union Pacific Railroad Company.

WCBurri
William C. Burri

SWORN TO AND SUBSCRIBED BEFORE ME this 10th day of December, 2001, to certify which witness my hand and seal of office.

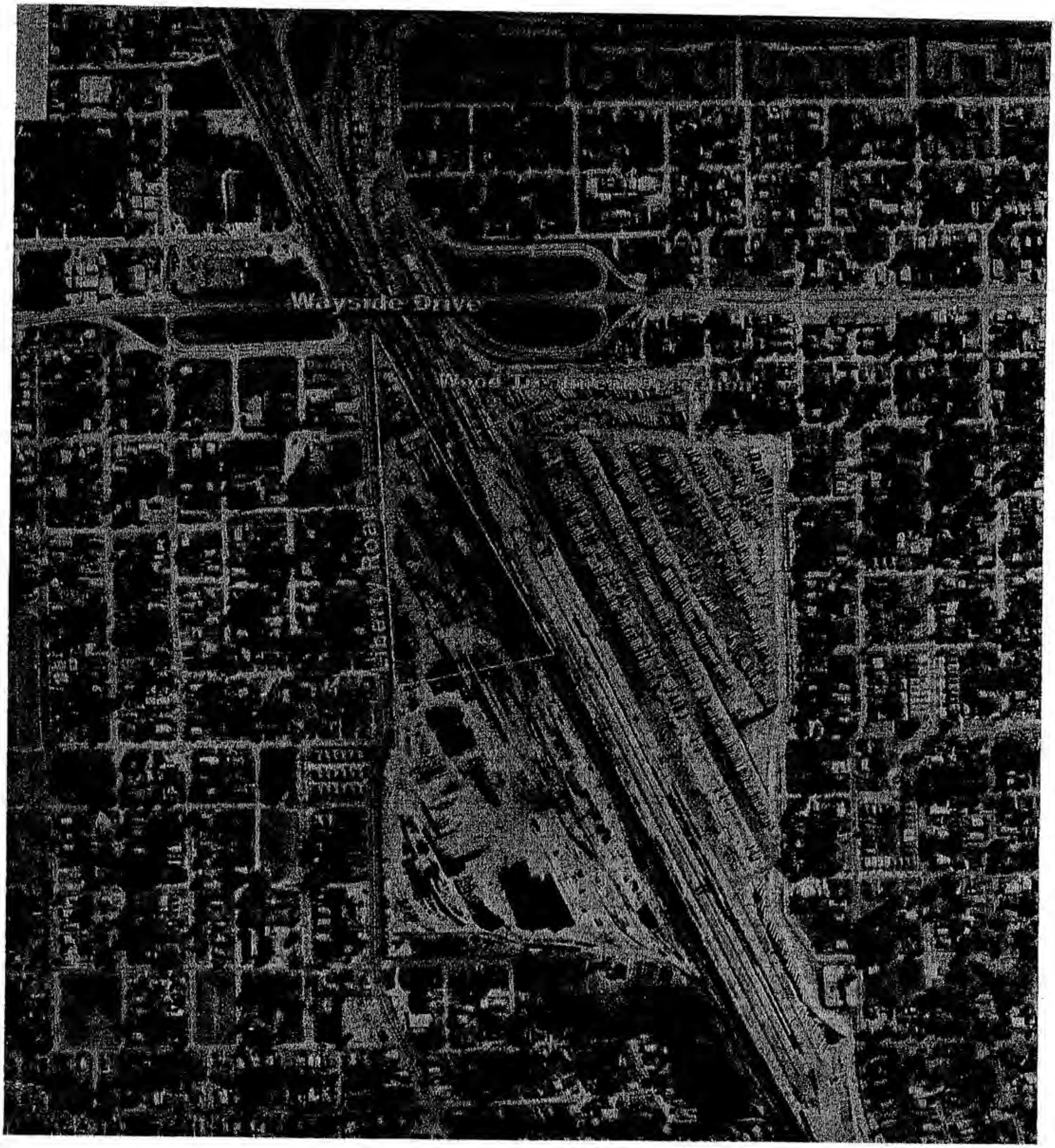
GENERAL NOTARY-State of Nebraska
BARBARA A. ANDERSON
My Comm. Exp. Nov. 8, 2003

Barbara A. Anderson
Notary Public in and for
The State of Nebraska

9

KG COH003890

Southern Pacific Transportation Company
Houston Wood Treatment Operation



Photograph taken October 17, 1975

KG COH003891

7, 8, 10, 12, 13, 14, 15,
16, 18, 19, 23, 153

KG COH003892

H6-6672H

TEXAS AIR CONTROL BOARD

MAY 31 1 11 PM '84

Southern Pacific Transportation Company
4910 Liberty Rd.
Houston, Texas

Mr. Bozeman took us (Bob Dwivedi and Dipak V. Desai) around the plant. The following is confirmation of points contained in Mr. Bozeman's (E & M Manager, S.P.) letter to Mr. Dallas E. Evans (Chief, BAQC).

1) No blending was going on in the blending tank area. Mr. Bozeman further assured us that no blending would be taking place.

2) All charcoal filters are being replaced. An order has been placed since 4/02/84 with White Tucker Co. (Xerox copy of the original purchase order is attached).

3) The in place masking system was pointed out to us (a fan blower that injected apple blossom mask into a duct that connects vent lines from different processes, and is located at the blending shed (at present, blending is not being done).

4) Treated ties allowed to cool slightly before being removed from the retorts - the retorts were being used and therefore Mr. Bozeman gave his own verbal guarantee to that effect and I have no reason to doubt him.

5) The waste storage pond was closed. In fact all that I could see was a freshly dirt-filled site (approximately 100' x 50') with tiny little tubes (4" dia) projecting out of the ground. These were monitoring wells, used to monitor the effect of the landfill, which was approved by the Texas Department of Water Resources and the previously stored waste was disposed of by Impact & Rollins.

6) Mr. Bozeman said that he was continuing efforts to eliminate odors.

7) New experimental gasketting material was already in place at the retort openings but since the retorts were being used, he could not show that to us, but I had to take his word for it. (No fugitive emissions were seen coming out of the retorts).

8) The plant will be shutdown May 31, 1984 (according to the company representatives, Mr. Bozeman and Mr. Lame).

The following is a brief process description:

1) Raw/green wood is mounted onto railroad trams and wheeled into four retorts, each 145' long and 8' in diameter, and also into one other retort, 85' long and 8' in diameter.

2) This process of wood treatment is called a full cell process.

3) Once the retort door is shut, a pressure of 14.7 psia is maintained inside the retort and hot naphtha (which boils at about 300°F) is pumped into the retort such that approximately an 18" high liquid naphtha level is maintained. Steam coils carrying steam provide indirect heat inside the retort (no steam ever comes into contact with the wood or the naphtha inside the retort). Most wood sap contains acetic-type acid liquid that boils at 244°F and 14.7 psia. Thus when the temperature inside the retort exceeds 300°F, as much of the free and fibre-bound moisture of the wood as possible has been boiled off and by this time the naphtha on the floor starts boiling and the naphtha vapor acts as a drying agent by going into the wood and further removing the fibre-bound moisture.

01/10/2001 TNRCC

KG COH003893

P-00436

Southern Pacific
Transportation Company
Dipak V. Desai

4) When more than 50% of the fibre-bound sap has been removed, no more drying is done. The naphtha vapors and sap vapors are pumped to a surface condensor where water cools the temperature of the vapors from 300°F to a mixture at 120°F. This is a very likely source of odor when vented to atmosphere.

5) A process of gravity separation separates water and waste oil/sap by which, water is removed from the bottom (using calgon water treatment filters) and the top floating oil is taken to tanks to be removed by waste disposal companies.

6) The now dry, hot wood is kept inside of the retort and a partial vacuum of about 11 psia is created. This creates a suction force and sucks in the creosote/oil solution. The retort fills up with creosote and now a gradual hydraulic pressure of up to 200 psia is applied onto the wood, thereby injecting creosote into the wood. When no more creosote goes in, the creosote is pumped back to creosote storage and at this point, the treated wood inside the retort is at about 190°F. A final one-hour partial vacuum is maintained to bleed and remove all creosote (steam pumps).

7) When the retort doors are opened, the creosote still adhered to the wood and the retort walls may vaporize, causing visibility and odor problems.

Plant Equipment:

1) Six creosote storage tanks, approximately 40' high, 20' diameter.
2) Four naphtha storage tanks, approximately 30' high, 10' in diameter.
3) A shed for blending tanks, a masking agent pump.
4) Four, 145' long by 8' diameter retorts and one 85' long by 8' diameter retort.
5) Two Boilers

Name plates: T & No. = 3143 & 3144

Mfr: Combustion Engineering, Inc.

Type: VP

Contract No: 17457-PBH

Mfr. Nos: 5942 & 5944

Each Heating Surface: Boiler sq ft = 2690
Waterwall sq ft = 1125

Year built: 1958

Max. Pressure: 250 psi

6) One finished tie loadout center
7) One shed acts as pretreated tie sorter and tie classifier.

8) One tank, about 30' tall by 15' diameter acts as make up water for the two boilers.

9) Two tanks, in the shape of a shell about 15' long by 3' in diameter contain compressed air which is used to drive pumps, used in the process.

10) Two or more wastewater stationary tanks and also railroad trucks serve as wastewater disposal containers.

D. Desai

Dipak V. Desai, P.E., Engineer I
Engineering Section
Bureau of Air Quality Control

DVD:jr

Attachment: A rough layout of plant equipment

cc: TACB

We need this

11, 17

10.8 Wood Preserving[1-3]

Wood preservation is the pressure or thermal impregnation of chemicals into wood to provide effective long-term resistance to attack by fungi, bacteria, insects, and marine borers. By extending the service life of timber products, wood preservation reduces the need for harvest of already stressed forestry resources, reduces operating costs in industries such as utilities and railroads, and ensures safe working conditions where timbers are used as support structures.

Seventy-five percent of the wood treatment plants in the United States are concentrated in two distinct regions. One of these regions extends from east Texas to Maryland, corresponding roughly to the natural range of southern pines, which is the major species utilized. The second, smaller region is along the Pacific coast, where Douglas fir and western red cedar are the predominant species. The remaining 25 percent of wood treatment plants are scattered throughout the United States.

10.8.1 Process Description[2-9]

10.8.1.1 Preservatives -

There are two general classes of wood preservatives: oils, such as creosote and petroleum solutions of pentachlorophenol; and waterborne salts that are applied as water solutions. The effectiveness of the preservatives varies greatly and can depend not only upon its composition, but also upon the quantity injected into the wood, the depth of penetration, and the conditions to which the treated material is exposed in service.

10.8.1.2 Conditioning -

With most wood treating methods, significant amounts of free water in the wood cell cavities may slow or prevent the entrance of the preservative chemical. Therefore, wood moisture content must be reduced prior to treatment. Moisture reduction can be accomplished by using artificial conditioning treatments or by air-seasoning (i.e., storing the untreated wood outdoors in piles). Unseasoned wood that is exposed to the open air generally dries slowly until it comes into approximate equilibrium with the relative humidity of the air. However, some wood species will rot before the air drying is complete.

Because certain wood species will rot before air drying can be completed in some climates, wood is artificially conditioned by one of three primary methods: (1) steaming-and-vacuum, (2) boiling-under-vacuum (commonly referred to as the Boulton process), and (3) kiln drying. Vapor drying also has been used but currently is used rarely, if ever. These conditioning treatments remove a substantial amount of moisture from the wood and also heat the wood to a more favorable treating temperature. Steaming and Boultonizing have the added effect of disinfecting the wood. In segregated systems, conditioning is performed in separate "clean" cylinders that do not contain preservative.

The steaming and vacuum method of conditioning is used primarily for treating southern pine poles. Steaming and vacuum may be performed in a dedicated cylinder or in the same cylinder used for treating the wood. In this process, the wood charge is heated with live steam. Then, a vacuum is drawn.

The Boulton process is used primarily for Douglas fir and hardwoods. The Boulton process usually is performed in the same cylinder used to treat the wood. In this process, the cylinder is charged with wood, and heated preservative is used to heat the wood charge for 1 to 24 hours. At that point, a vacuum is drawn. Finally, the preservative is returned to the work tank. This step is referred to as "blow back" from the practice of using compressed air to blow the preservative back into the work tank. However, many treatment systems use pumps to withdraw preservative from the treatment cylinder and return it to the work tank. Although such systems do not actually blow back the preservative, the term still is used to refer to this step of the process.

10.8.1.3 Treating -

Most wood-preserving methods may be classified as either pressure processes, in which the wood is placed in a treating cylinder or retort and impregnated with preservative under considerable force, and nonpressure processes, which do not involve the use of induced pressure. Nonpressure processes can be classified as thermal processes, in which heat is applied, and nonthermal processes, such as brushing, spraying, dipping, and soaking. Nonpressure processes generally are used only with oilborne preservatives. Because the majority of wood treated annually is impregnated by pressure methods in closed cylinders, only pressure processes are discussed in the following sections.

Pressure processes operate on the same general principle, though they may differ in the specifics of the process. The treatment is carried out in steel cylinders or retorts. Most units conform to size limits of 2 to 3 meters (m) (6 to 9 feet [ft]) in diameter and up to 46 m (150 ft) or more in length, and are built to withstand working pressures up to 1,720 kilopascals (kPa) (250 pounds per square inch [psi]). The wood is loaded on special tram cars and moved into the retort, which is then closed and filled with preservative. Applied pressure forces preservatives into the wood until the desired amount has been absorbed. Three processes, the full-cell, modified full-cell, and empty-cell, are in common use. These processes are distinguished by the sequence in which vacuum and pressure are applied to the retort. The terms "empty" and "full" refer to the level of preservative retained in the wood cells. The full-cell process achieves a high level of retention of preservative in the wood cells, but less penetration than the empty-cell process, and the empty-cell process achieves relatively deep penetration with less preservative retention than does the full- cell process.

Full-Cell Process -

The full-cell (Bethel) process is used when maximum preservative retention levels are desired, such as when treating timbers with creosote for protection against marine borers. Figure 10.8-1 presents a flow diagram for the full-cell pressure treating process. In addition to creosote, the full-cell process also is used primarily with waterborne preservatives. The full-cell process steps are listed below:

1. The charge of wood is sealed in the treating cylinder, and an initial vacuum is applied for approximately half an hour to remove as much air as possible from the wood and from the cylinder;

2. The preservative, either heated or at ambient temperature depending on the system, enters the cylinder without breaking the vacuum;

3. After the cylinder is filled, the cylinder is pressurized until no more preservative will enter the wood or until the desired preservative retention is obtained;

4. At the end of the pressure period, the pressure is released, and the preservative is removed from the cylinder; and

5. A final vacuum may be applied to remove the excess preservative that would otherwise drip from the wood.

If the wood is steam-conditioned, the preservative is introduced after the vacuum period following steaming. In segregated systems, the steam conditioning and preservative application steps are conducted in separate cylinders. The final steps in the process are the unloading of the retort and storage of the treated wood.

Modified Full-Cell Process -

The modified full-cell process generally is used for the application of waterborne preservatives. This method is similar to the full-cell process except for the initial vacuum levels. The modified full-cell process uses less vacuum than the full cell; the vacuum levels are determined by the wood species being treated and the preservative retention levels desired. The flow diagram shown in Figure 10.8-1 also characterizes the modified full-cell pressure treating process.

Empty-Cell Process -

The empty-cell process obtains deep preservative penetration with a relatively low net preservative retention level. If oil preservatives are used, the empty-cell process most likely will be used, provided it will yield the desired retention level. The Rueping process and the Lowry process are the two most commonly used empty-cell processes. Both use compressed air to drive out a portion of the preservative absorbed during the pressure period. Figure 10.8-2 presents a flow diagram for the empty-cell pressure treating process.

In the Rueping process, compressed air is forced into the treating cylinder containing the charge of wood to fill the wood cells with air prior to preservative injection. Pressurization times vary with wood species. For some species only a few minutes of pressurization are required, while more resistant species may require pressure periods of from 30 minutes to 1 hour. Air pressures used typically range from 172 to 690 kPa (25 to 100 psi) depending on the net preservative retention desired and the resistance of the wood.

After the initial pressurization period, preservative is pumped into the cylinder. As the preservative enters the treating cylinder, the air escapes into an equalizing or Rueping tank at a rate which maintains the pressure within the cylinder. When the treating cylinder is filled with preservative, the pressure is raised above that of the initial air and maintained until the wood will take no more preservative or until enough has been absorbed to leave the desired preservative retention level after the final vacuum.

After the pressure period, the preservative is removed from the cylinder and surplus preservative is removed from the wood with a final vacuum. This final vacuum may recover from 20 to 60 percent of the gross amount of preservative injected. The retort then is unloaded, and the treated wood stored.

The Lowry process is an empty-cell process without the initial air pressure Preservative is pumped into the treating cylinder without either an initial air pressurization or vacuum, trapping the air that is already in the wood. After the cylinder is filled with the preservative, pressure is applied and the remainder of the process is identical to the Rueping process.

The advantage of the Lowry process is that full-cell equipment can be used without the accessories required by the Rueping process, such as an air compressor, an extra tank for the preservative, or a pump to force the preservative into the cylinder against the air pressure. However, both processes are used widely and successfully.

10.8.2 Emissions[2-3,6,9-17]

For waterborne preservatives, emissions from wood preserving processes generally are not significant. For oilborne preservatives, the primary sources of emissions from wood preservation processes are (1) the treated charge immediately after removal from the treating cylinder, (2) the vacuum system (conditioning cycle and final vacuum cycle), and (3) displaced air from working tank blow backs. The two process emission points are the work tank vent and the vacuum system. Figures 10.8-1 and 10.8-2 identify which process steps are associated with emissions from these two process emission points. Table 10.8-1 presents emission factors for organic pollutant emissions from creosote wood preserving. Table 10.8-2 presents emission factors for inorganic pollutant emissions from chromated copper arsenate wood preserving.

The elevated temperature of the treated charge when it is pulled from the cylinder causes some of the lower boiling point organic compounds to volatilize as aerosols, forming a white emission plume that typically dissipates within a few minutes.

Volatile organic compound emissions include those organic compounds present in the wood that are released when heated during conditioning and treatment, and the polycyclic aromatic hydrocarbons (PAHs) that are evaporated from the creosote solution and removed from the retort through the vacuum system during the Boulton (boiling-under-vacuum) process and during the final vacuum applied during the Rueping process. Creosote emissions can be estimated as the sum of the emissions of the PAHs. Polycyclic aromatic hydrocarbons are included in the class of compounds referred to as polycyclic organic matter (POM), which is listed as a hazardous air pollutant in the Clean Air Act.

The emission point for the steaming and vacuum method of conditioning is the vacuum pump system vent. Vacuum systems include condensers, which are considered part of the process equipment and not separate emission control devices. The emission points for the Boulton process are the vacuum pump vent during the vacuum stage of the conditioning process and the work tank vent during the blow back or preservative withdrawal stage of the conditioning process.

Working tank blow backs also occur at the end of a preservative treatment cycle when the treating solution is returned to the work tank. The air displaced by the returning solution is vented via a control device to the atmosphere. In some systems, the displaced air in the work tank is vented back into the treatment cylinder to fill the head space created as the preservative is withdrawn from the cylinder. In such systems, there are no emissions associated with blow backs. A problem may arise when the quantity of preservative being blown back is not monitored closely and air begins to blow up through the work tank. Volatile compounds are picked up by the air as it bubbles up through the treating solution and are carried out through the tank vent.

Fugitive emissions of various preservative constituents may occur after the treated wood is removed from the retort. The fugitive emission rate is a function of the vapor pressure, which is driven by temperature. Emission rates are greatest immediately after the wood is removed from the retort and generally decline afterward. Reference 16 describes a method for estimating fugitive emissions from creosote-treated wood storage as a function of time, temperature, and the effective surface area of the treated wood. Additional information and a discussion of that method can be found in Reference 17, which is the background report for this AP-42 section. However, in the absence of a reliable method for estimating the effective surface area, that method is not presented in this AP-42 section.

In addition to the three primary process emission sources, emissions are generated from waste water treatment and organic liquid storage tanks. Oilborne wood treatment plants frequently have onsite waste water treatment facilities designed to separate organic materials from the waste water generated during the treating process. This wastewater treatment is a potential source of VOC and HAP emissions. Emission factors for waste water treatment sources are presented in AP-42 Section 4.3, Waste Water Collection, Treatment And Storage.

Liquid storage tanks for the various preservatives are also sources of VOC and HAPs. Emissions from these storage tanks are covered in AP-42 Chapter 7, Liquid Storage Tanks.

10.8.3 Controls[2,10-12]

There are few options for controlling fugitive emission losses from treated charges. Constructing a ventilation hood to collect VOC emanating from the freshly treated charge is economically infeasible due to the size of the hood needed for covering the cylinder end and drip pad. The effectiveness of controlling emissions by using water to cool freshly treated wood by spraying or quenching is questionable. A primary drawback to water quench systems is that the contaminant is merely transferred to water, resulting in the need for an effluent treatment system. In addition, water quench systems generate significant amounts of waste water, which include listed hazardous substances, and, thus, is not desirable.

A 1993 survey of 97 wood preserving facilities found that at least eight facilities used wet scrubbers for controlling emissions from creosote wood preserving; use of both venturi scrubbers and packed-bed scrubbers was reported. One facility also reported using a packed-bed scrubber to control VOC emissions from a PCP wood preserving process. At least two creosote facilities used condensers and one facility used an incinerator to control VOC emissions from creosote wood preserving. The results of one emissions test on the incinerator-controlled facility indicated a VOC control efficiency of more than 99 percent for the Boulton process and first blowback. None of the wood preserving facilities currently in operation use incineration for emission control. A few facilities control emissions from creosote wood preserving processes by means of a knock-out tank followed by a venturi scrubber. The results of an emission test on such a system indicated a VOC control efficiency of 75 percent.

Odorous emissions from the steam jet vacuum system suggest that a single-pass water-cooled condenser may not condense all of the organics in the exhaust. One option for correcting this problem is to install a larger condenser capable of further reducing the organic content in the vapor. A properly sized condenser with adequate cooling water will condense virtually all of the organics in the exhaust stream Another option is to modify the vacuum system to include two steam jet ejectors in series with a barometric (direct contact) intercondenser between them. In this system, the barometric intercondensers condense the oily vapors in the steam and remove them with the intercondensed water. A third option is to replace the steam jet ejectors with a vacuum pump and duct the exhaust vapors to an activated carbon adsorption system or to an afterburner. Both are efficient means for removing organic compounds from the exhaust gas.

Working tank blow back vapors can be controlled by bubbling the vapors through water or through a water spray before venting to the atmosphere. However, the effectiveness of these systems will deteriorate if the water is allowed to reach saturation and is not changed periodically. Another option for controlling these vapors is to incinerate them in an afterburner along with the vacuum system exhaust. However, incinerators are not in use currently at any domestic wood preserving facilities.

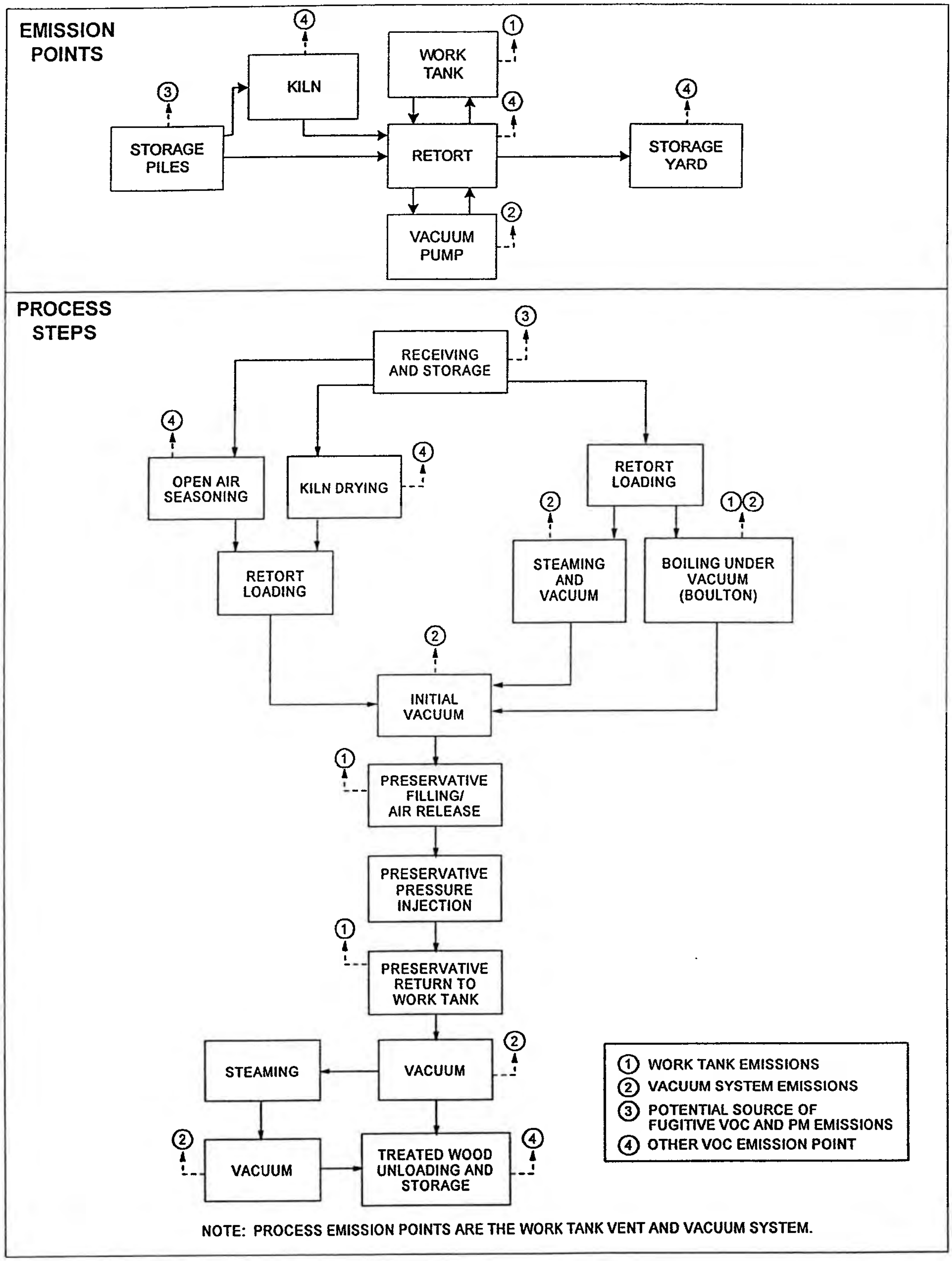


Figure 10.8-1. Flow diagram of the full-cell and modified full-cell pressure treating processes.

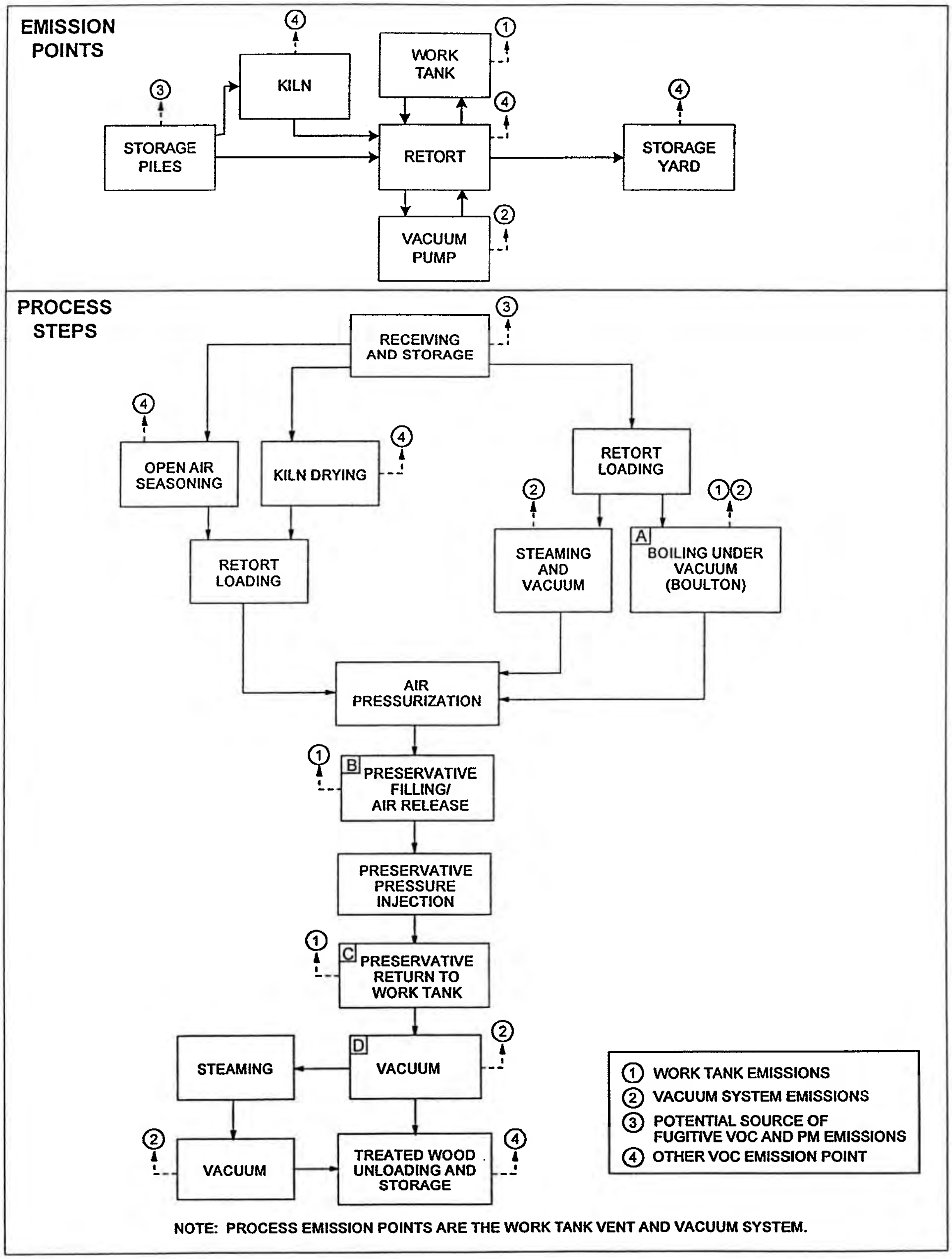


Figure 10.8-2. Flow diagram for the empty-cell pressure treating process.

TABLE 10.8.-1. EMISSION FACTORS FOR CREOSOTE EMPTY-CELL WOOD PRESERVING[a]
EMISSION FACTOR RATING: E

Process	CASRN	Pollutant	Emission Factor
Treatment cycle without conditioning, uncontrolled emissions (SCC: 3-07-005-30) (Includes steps B, C, and D shown in Figure 10.8-2)		VOC[b]	7.4×10^{-4}
	83-32-9	Acenaphthene	6.3×10^{-7}
	208-96-8	Acenaphthylene	1.7×10^{-6}
	120-12-7	Anthracene	1.6×10^{-8}
	56-55-3	Benzo(a)anthracene	1.7×10^{-8}
	205-99-2	Benzo(b)fluoranthene	1.6×10^{-8}
	207-08-9	Benzo(k)fluoranthene	6.0×10^{-9}
	50-32-8	Benzo(a)pyrene	8.2×10^{-9}
	86-74-8	Carbazole	3.6×10^{-7}
	218-01-9	Chrysene	8.4×10^{-9}
	132-64-9	Dibenzofuran	1.8×10^{-6}
	206-44-0	Fluoranthene	8.6×10^{-8}
	86-73-7	Fluorene	7.8×10^{-8}
	91-20-3	Naphthalene	4.6×10^{-6}
	85-01-8	Phenanthrene	2.8×10^{-7}
	129-00-0	Pyrene	7.3×10^{-8}
Treatment cycle with conditioning by Boulton process, uncontrolled emissions (SCC: 3-07-005-40) (Includes steps A, B, C, and D shown in Figure 10.8-2)		VOC[b]	5.8×10^{-3}
	83-32-9	Acenaphthene	9.9×10^{-6}
	208-96-8	Acenaphthylene	2.8×10^{-5}
	120-12-7	Anthracene	1.3×10^{-7}
	56-55-3	Benzo(a)anthracene	1.3×10^{-7}
	205-99-2	Benzo(b)fluoranthene	1.3×10^{-7}
	207-08-9	Benzo(k)fluoranthene	4.8×10^{-8}
	50-32-8	Benzo(a)pyrene	6.5×10^{-8}
	86-74-8	Carbazole	2.9×10^{-6}
	218-01-9	Chrysene	6.7×10^{-8}
	132-64-9	Dibenzofuran	3.5×10^{-5}
	204-44-0	Fluoranthene	6.8×10^{-7}
	86-73-7	Fluorene	3.9×10^{-6}
	91-20-3	Naphthalene	7.9×10^{-5}
	85-01-8	Phenanthrene	1.9×10^{-6}
	129-00-0	Pyrene	5.8×10^{-7}

Table 10.8-1 (cont.).

[a] References 12 and 16, except where noted. Factors are in units of pounds per cubic foot (lb/ft^3) of wood treated. To convert to kilograms per cubic meter (kg/m^3), multiply by 16. CASRN = Chemical Abstract Services Registry Number. SCC = source classification code.

[b] References 10 and 16. Volatile organic compounds as propane, based on Method 25A test results.

Table 10.8-2. EMISSION FACTORS FOR INORGANIC POLLUTANT EMISSIONS FROM CHROMATED COPPER ARSENATE EMPTY-CELL WOOD PRESERVING[a]

EMISSION FACTOR RATING: E

Source	CASRN	Name	Emission Factor
Treatment cycle with conditioning, uncontrolled emissions (SCC 3-07-005-43)	7440-47-3 7440-50-8	Chromium Copper	1.4×10^{-9} 1.9×10^{-9}

[a] Reference 11. Includes emission from artificial conditioning cycle and final vacuum only. Factors represent uncontrolled emissions. Emission factor units are pounds per cubic foot (lb/ft^3) of wood treated. To convert to kilograms per cubic meter (kg/m^3), multiply by 16. CASRN = Chemical Abstract Services Registry Number. SCC = Source Classification Code.

References For Section 10.8

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2. C. C. Vaught and R. L. Nicholson, *Evaluation Of Emission Sources From Creosote Wood Treatment Operations*, EPA-450/3-89-028, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1989.

3. Electronic communication (e-mail) from Nick Bock, Kerr-McGee Chemical Corporation, to George Parris, American Wood Preservers Institute, September 17, 1998.

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5. Written communication from Martin Wikstrom, American Wood Preservers Institute, to Dallas Safriet, U. S. Environmental Protection Agency, Research Triangle Park, NC, February 18, 1994.

6. Written communication from Gene Bartlow, American Wood Preservers Institute, Vienna, VA, to Dallas Safriet, U. S. Environmental Protection Agency, Research Triangle Park, NC, January 10, 1997.

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11. *Wood Treatment Plant Emission Test Report, Kerr-McGee Chemical Corporation, Avoca, Pennsylvania, EMB Report 94-WDT-01,* U. S. Environmental Protection Agency, Research Triangle Park, NC, September 1994.

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13. *Final Emission Data Report: Emission Testing Program At Koppers Superfund Site, Oroville, CA,* prepared for U. S. Environmental Protection Agency, Region IX, by Ebasco Services, Incorporated, December 1989.

14. *Koppers Industries, Incorporated, Pittsburgh, Pennsylvania, Susquehanna Wood Treating Facilities Vacuum Pump Emissions Study,* Chester Environmental, Pittsburgh, PA, April 1994.

15. *Koppers Industries, Incorporated, Oroville, CA, AB 2588 Emissions Test Program, Test Date: October 8 through 12, 1990*, Best Environmental, Hayward, CA, November 14, 1990.

16. *Calculated Emissions From Creosote-Treated Wood Products (Cross-Ties And Poles)*, AquaAeTer, Brentwood, TN, and American Wood Preservers Institute, Vienna, VA, October 13, 1994.

17. *Emission Factor Documentation For AP-42 Section 10.8, Wood Preserving, Final Report*, U. S. Environmental Protection Agency, Research Triangle Park, NC, August 1999.

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RECEIVED

JUL 2[illegible]

Texas Department of Water Resources

INTEROFFICE MEMORANDUM

TO : George Green, Chief, Field Support Section DATE: July 13, 1979

THRU :

FROM : Tom Kearns, District 7 Field Representative

SUBJECT: Southern Pacific Transportation Company - Wood Preserving Plant - 4910 Liberty Road - Houston

On July 3, 1979, a complainant, Ms. Emma Dunn, 2616 Kirk Street, Houston, telephoned the District office to report a harsh smelling discharge of waste materials from the subject facility into a drainage ditch near her house. The complaint was originally relayed to the City of Houston Water Pollution Department for investigation; however, an independent investigation by the District staff was made on July 6 and again on July 10, 1979. Mr. Art Lane, Wood Treatment Plant Manager, and Mr. Frank Bozeman, Environmental Coordinator, Southern Pacific, were contacted.

FINDINGS:

1. Southern Pacific has owned and operated a cross tie wood treating plant at the Liberty Road address for over 50 years. Cross ties are treated with cresote and petroleum derivatives (styrene tar) for preservation. The cresote is heated by steam and impregnated by vacuum.

2. For the past thirty years or so, steam from the wood treatment plant has been blown down to an open ditch, which tranverses east-west for a distance of two hundred yards and runs parallel to the south boundary of the railroad yard (see plot map). The ditch then empties into a 12" diameter culvert which feeds off-property onto 1-2 acre open field not owned or leased by Southern Pacific. Drainage from this area is westward along the railroad track and eventually flows into storm sewers leading to Buffalo Bayou.

3. The steam also transports a considerable amount of cresote which enters the steam lines through leaks in the coils. Southern Pacific, not wanting to return the steam/oil mixture to the boilers, simply elected to discharge the material off-site. The discharge is not permitted. A discharge of thirty years has obviously resulted in the accumulation of a large amount of oil in the area which receives the discharge (see photos). Analysis of a sample of the oil collected July 6, 1979 shows a phenol concentration of 3660 mg/l. A sample collected July 10 in a drainage ditch 30 yards downstream shows 322 mg/l phenol. (See plot map for locations).

4. The accumulated cresote/oil mixture off-site has begun to encroach upon several residences in the area, and also into several smaller drainage ditches in front of private residences. Apparently the neighbors have not been very concerned about the accumulation of waste adjacent to their homes until the middle of May 1979, when some of the waste caught fire and burned with vigor until extinguished by the Houston Fire Department.

5. To prevent a recurrence of the problem and to eliminate the discharge of contaminated materials off-site, Southern Pacific has proposed to: 1) install a steam condensate system to recycle the water and collect the oil. The system is scheduled to be operational within two weeks; the system will not have a discharge off-site. 2) the company has contracted with a commercial disposal firm to begin cleanup of all off-site contaminated areas. Southern Pacific proposes to remove for disposal the top 6-10 inches of contaminated topsoil. They may also purchase the contaminated property as well.

RECOMMENDATION:

The District office will monitor the cleanup efforts to insure all the material is collected and properly disposed of. The District office has also requested that Southern Pacific submit in writing their plans to eliminate the discharge and clean the area of waste products.

The District office has also warned area residences to avoid contact with the waste materials.

T. D. McKeown
Signed

Merton J. Coloton
Approved

TK/tom

25, 40, 42

AVERY

KG COH003914

Koppers Company, Inc., Organic Materials Group
Industrial Products Division
440 College Park Drive, Monroeville, PA 15146
Telephone 412-327-3000

F. G. Owen

Research and Development Dept.

KOPPERS

R. A. Kilpatrick

March 20, 1980

Dr. Conan P. Furber
Manager - Special Projects
Research and Test Department
Association of American Railroads
American Railroads Building
1920 L Street, N.W.
Washington, DC 20036

Dear Conan:

During the first part of February, a plant visit was made to the Southern Pacific Railroad creosote treating facility in Houston, TX. As you know, the American Association of Railroads (AAR) had two representatives, Mr. Jack Buckingham and Mr. Peter Conlon; three individuals from Koppers Company, representing the American Wood Preservers Institute (AWPI), Dr. William Lederer, Mr. Charles Flickinger, and myself; three individuals from the Southern Pacific Railroad-San Francisco location, Mr. Louis Dewey, Mr. M. J. Karlovic, and Mr. J. B. Vernon. The Southern Pacific Houston plant manager, Mr. Art Lane, provided this group with a tour of the treating plant operation.

In summary, the comments given will reflect the opinions and observations of my two colleagues, plus my own:

1. The physical plant operation, along with the housekeeping, was excellent. In general, work practices definitely appear to reduce and minimize both normal inhalation and dermal exposure to the creosote treating solution.

2. The plant treats crossties with a petroleum/creosote solution in the approximate ratio of 70% petroleum and 30% Grade I Creosote. The type of petroleum used is an aromtic "still bottoms" petroleum material supplied from a Monsanto chemical plant operation. This material is unique, and there are no other petroleum/creosote treating plant operations that are known to use this type of aromatic petroleum material. Mr. Art Lane indicated that sometime during mid-year 1980, the Southern Pacific would discontinue using this material because it would no longer be available. Due to the somewhat unknown chemical nature of the still bottoms material, this should be expedited as quickly as possible. As Mr. Lane indicated, a No. 6 or Bunker C oil would be a satisfactory replacement.

3. There are also several areas in the plant in which consideration should be given to providing shower facilities and a separate lunch room area for the treating plant personnel.

4. With respect to both dermal and inhalation exposure, the Southern Pacific management has expressed concern that several creosote suppliers have provided material safety data sheets on creosote which indicate that if poor industrial hygiene practices are not followed, skin cancer may develop. This type of statement appears on the creosote material safety data sheet prepared by American Coke and Coal Chemicals Institute (ACCCI) in conjunction with several of the creosote suppliers. The Koppers Company material safety data sheet for creosote uses the following statements.

   "Effects of Overexposure: Irritating to skin and eyes. Vapor and fumes evolved on heating irritating to eyes, nose, throat, and skin."

   "Other Precautions: Do not take internally. Avoid prolonged or repeated contact with skin."

   Koppers' justification for this approach is based on the fact that even though animal studies may indicate chronic toxicity, there is no evidence to show that workers develop skin cancer. Also important is that most plants currently stress that workers follow good industrial hygiene practices. It must be conceded that work practices and environmental concern have become of primary interest to most industries only within the past 15 to 20 years.

5. Koppers has recently performed industrial hygiene exposure monitoring in conjunction with morbidity studies or workers at five of its creosote-coal tar treating plants. The inhalation exposures were low, essentially at or below one-half the OSHA Coal Tar Pitch Volatiles, Benzene Solubles (CTPV) permissible exposure level for an 8-hour work day, 5-day work week which is 0.2 milligrams per cubic meter. This information is given in the enclosed report by Mr. C. W. Flickinger.

   The morbidity study was conducted by Tabershaw Occupational Medicine Associates, PA of Rockville, MD. Those workers examined were employed at five plants which were monitored for CTPV. The study showed no evidence of cancer, including that for skin, among the workers. A summary of these health findings on the creosote workers is enclosed.

The above two reports, as well as numerous other papers and reports developed by the creosote wood treating industry, both suppliers and treaters, and submitted through the AWPI, have been given to the EPA. This information was developed to support the re-registration of creosote wood preservative products.

Dr. Conan Furber
March 20, 1980
Page 3.

If you or the Southern Pacific personnel have any questions concerning the industrial hygiene monitoring or related subjects, please do not hesitate to get in contact with us.

Sincerely,

KOPPERS COMPANY, INC.
Industrial Products Division

David A. Webb

David A. Webb
Chairman
AWPI/EPTG No. 5 (Creosote Committee)

DAW/bjm

Enclosures

cc: Mr. L. F.Dorman - AWPI
Mr. C. W. Flickinger
Dr. W. H. Lederer

bcc: J. F. [illegible]
W. C. Locke
R. G. [illegible]

SUMMARY OF HEALTH FINDINGS

FROM THE EXAMINATION OF

329 CREOSOTE WORKERS

Conducted by Tabershaw Occupational

Medicine Associates, PA of Rockville, Md.

For the Forest Products Group of

KOPPERS COMPANY, INC of Pittsburgh, Pa.

Presented to the Environmental Protection

Agency, Washington, DC.

February 28, 1980

SUMMARY OF HEALTH FINDINGS

FROM THE EXAMINATION OF

329 CREOSOTE WORKERS

A cross-sectional clinical morbidity (health examination) study of 329 workers at five high pressure Creosote/Coal tar wood preservation plants of the Forest Products Group of Koppers Company Inc. was conducted by Tabershaw Occupational Medicine Associates, P.A. between July 1978 and December 1979. One of the plants used pentachlorophenol as a wood preservative in addition to using creosote/coal tar preservative.

The components of the examination were chosen on the basis of possible toxicologic effects determined from published toxicologic literature and from clinical and occupational experience. The examination of the creosote workers was directed toward evidence of pathologic and toxicologic processes in the lungs, liver, kidneys, bladder, blood cells and skin. Carcinogenic concern was directed toward the lung, bladder and skin.

The 329 examined creosote workers came from five plants in five states and accumulated about 3000 person-years of employment at these plants. Half of the examined workers had been employed in the plant for over five years, 30% over 10 years, and 10% over 20 years. Three-quarters of those eligible for the examination participated with participation rates similar in each age group. The findings of the examined workers can be reasonably expected to represent those of the entire workforce.

The examinations revealed little evidence of occupational disease. The only clinical finding thought to represent an outcome from environmental exposures was the presence of a pustular folliculitis condition primarily on the anterior thigh found consistantly throughout the plants. This finding was observed in three per cent of the workers.

Examination of the lungs, liver, kidneys, and blood cells were normal and revealed no excess prevalence of abnormal findings. Occasional findings were found in excess prevalence at one plant but not at the others. One plant had a high prevalence of elevated C-reactive protein titers, another had a high prevalence of elevated basophil counts and triglyceride levels, and another had a high prevalence of benign tumours and keratoses. In each case, careful examination did not reveal an explanation of the finding, nor was it observed elsewhere.

No evidence of cancer was observed among these workers. C-reactive protein screening revealed a number of workers with elevated titers, but no cancer was found. Only one worker had a suspicious x-ray finding which is thought to be non-malignant. Sixteen workers(5%) has an atypical reading on the sputum cytology (Class II), but none had a suspicious or presumptive reading (Class III or IV). Only two workers showed any atypia in the urine cytology examination.

No skin cancer was observed. Based on the NCHS HANES-1 findings, two cases of skin cancer would have been expected to be observed and six cases would have had to be observed in order to observe an excess. The absence of any skin cancer cases clearly indicates the absence of a significant increased risk.

In summary, examination of 329 creosote workers with an average experience of over five years revealed a three percent prevalence of pustular folliculitis as the only finding thought to be related to the occupational exposures of Creosote workers.

2/28/80

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LOUISIANA STATE DEPARTMENT OF HEALTH

INTER-DIVISIONAL CORRESPONDENCE

Environmental
AUG 25 1972

SUBJECT: Survey of Styrene Tar Industry in Louisiana	DATE OF LETTER 8/23/72	ATTENTION	DATE REC'D	DATE F'WD	HANDLED
	ORIGINATED BY GVB	1.			
FROM: Gus Von Bodungen, Asst. Chief Air Control Section	TYPED BY jad	2.	Kensington		
	APPROVED GVB	3.	Hayes		
TO: G. W. Engelhardt, Chief Air Control Section	DATE REC'D	4.			
	DATE F'WD	FILED:	DATE	BY	

As part of the investigation and evaluation of the styrene tar disposal problem at Gulf Disposal, Inc. in Darrow, Louisiana a survey was made of the three styrene producers in Louisiana by Henry Ledet and Gus Von Bodungen. In addition a visit was made to Lowe Chemical Company near Clear Lake, Texas by Gus Von Bodungen to evaluate a styrene tar cracking plant. The three styrene monomer producers are Foster Grant Company, Inc. in Baton Rouge, Marbon Division, Cos-Mar Plant in Carville and Gulf Oil Corporation in Welcome. The three styrene producers use the same method of forming styrene. All three plants are of the Badger design and construction. The Gulf and Cos-Mar plants are identical in size. Each plant is discussed and a discussion of the Lowe Chemical Company plant in Clear Lake, Texas is included.

FOSTER GRANT COMPANY

The styrene plant was inspected by Henry Ledet and the writer on Monday, August 7, 1972. Mr. Charles Brewer, Plant Manager, was involved in Union negotiations and could not meet with us. Mr. L. T. Bufkin, Production Superintendent, discussed the styrene tar disposal method with us. Foster Grant operates two styrene monomer plants; the old plant and the Badger Plant. The old plant uses the same process but is very small. Annual production consists of 750,000,000 pounds of styrene monomer. Styrene tar is produced as a by-product at the rate of 3% of total production which is equivalent to 22,500,000 pounds or approximately 2,250,000 gallons per year. This assumes an average density of 10 pounds per gallon for the tar. In the process elemental sulfur is used as an inhibitor to prevent polymerization to polystyrene or other polymers.

The styrene tar is disposed of by Gulf Disposal, Inc. Tank trucks take the hot styrene tar (200°F.+) to the disposal pits at Darrow.

The styrene tar is held in temporary storage at Foster Grant. The tank is insulated and steam coils are used for maintaining the temperature above 200°F. The storage tank capacity is 2000 barrels. Foster Grant maintains a pit to the rear of the property to dispose of the styrene tar when it cannot be delivered to Gulf Disposal. We inspected the pit. There was a water cap on the pit well in excess of 12 inches. There were no significant styrene tar odors from the pit. There was a black crust on the pit covering most of the surface. Mr. Bufkin advised that this was discarded Aluminum Chloride catalyst. The catalyst may have been a help to minimize odors. I asked Mr. Bufkin if there was a waterline to maintain the water cap and he said no. Any water on the pit is the

KG COH003922

result of drainage or has to be trucked in. I advised that the lack of a suitable water supply may create a problem and that we may have some future correspondence with Foster Grant on this.

Mr. Bufkin stated that Foster Grant is developing an inorganic non-sulfur polymerization inhibitor. This would allow the use of the tar for fuel or re-processing. Presently, the presence of Sulfur (15-16%) in the tar precludes its use as fuel because of the resulting formation of SO_2 in stack gases. The old plant was used for the pilot process and Mr. Bufkin stated that one barge load of monomer had been successfully processed. Mr. Bufkin stated that the local plant was waiting on Corporate approval to switch to the new inhibitor. He stated that a limited amount of experimentation in the Badger plant would be performed prior to the change. Foster Grant would use the styrene tar for fuel or reprocess it.

MARBON DIVISION
COS-MAR PLANT

The Cos-Mar plant was inspected by Henry Ledet and the writer on Friday, August 11, 1972. Mr. B. Kistler, acting plant manager, discussed the styrene tar disposal method with us. Cos-Mar produces 530,000,000 of styrene per year. Styrene tar is produced at a rate of 2¼% which is roughly equivalent to 12,500,000 pounds. Cos-Mar uses a density of 9 pounds per gallon for the tar which converts to approximately 1 1/3 million gallons of tar. Mr. Kistler stated that Cos-Mar stopped using Gulf Disposal or Industrial Waste Disposal for handling the tar several months ago. The tar is presently trucked to Clear Lake, Texas by Gibbon Truck Line. Cos-Mar also furnishes polyethylbenzene as cutter stock to dilute the sulfur content of the tar to 10% or less. The major cost of processing the styrene tar consists of the freight fee which is in the range of $.60 per hundred weight or roughly six cents per gallon. Based on the freight rate, plant size and Gulf Oil's similar costs for an identical size plant and equivalent quantity of tar to be disposed of, it appears that Marbon Division is spending over $200,000 per year for styrene tar disposal. The styrene tar is stored in a heated insulated tank with steam coils to maintain temperature near 200°F. There is a natural gas blanket maintained in the 72,000 gallon capacity storage tank.

Mr. Kistler estimated the amount of tar in the disposal pits at Darrow to be approximately 40,000,000 pounds. At a density of 9 pounds per gallon this is equivalent to 4.4 million gallons. Kistler estimated 2/3 came from the Cos-Mar plant and 1/3 from Foster-Grant. Marbon Division has purchased a Viking rotary gear pump for possible use in pumping styrene tar from the pits at Darrow. Mr. Kistler has done some preliminary sampling of the disposal pits and found the sulfur content of the tar to be approximately 10%. This is a preliminary figure and more complete sampling is required. This 10% figure would put the concentration in a satisfactory range for possible reprocessing at Lowe Chemical in Clear Lake, Texas. I can state quite assuredly that Marbon Division is concerned about the styrene tar pits in Darrow and are providing technical support in the possible styrene tar reclaiming investigation.

GULF OIL CORPORATION

The Gulf Oil Corporation plant at Welcome was inspected by Henry Ledet and the writer on Friday, August 8, 1972. Mr. Jimmy McCartney, Plant Manager for the Gulf plant, described the method used at his plant for disposing the styrene tar. In addition, Mr. McCartney gave me a "typical" styrene tar analysis from his plant. At this time this is the only analysis we presently have in our possession on styrene tar.

Gulf Oil manufactures 500,000,000 pounds per year of styrene monomer at this plant. This plant is identical in size to Cos-Mar's plant in Geismar. Styrene tar is formed at a rate of 2.6% of styrene production which is equivalent to approximately 13 million pounds or 1½ million gallons of tar. The styrene tar is held in an insulated tank and is capable of storing an 8 or 9 day supply of styrene tar. Gulf "cools" the tar to 170°F. in this tank. The coils can be used to pipe steam to raise temperature if required. The styrene tar is loaded into Gibbon Truck Line tank trucks by means of a nozzle which reaches to the bottom of the tank. The tar is pumped with a Goulds Centrifugal pump with a capacity of 300 gpm. Loading time for a 43,000 pound load is approximately 15-20 minutes. Storage capacity for styrene tar is similar to that at Cos-Mar. Mr. McCartney advised that Gulf gives the tar to Lowe Chemical Company, provides polyethylbenzene for cutter stock, pays a processing fee, pays trucking freight, with a resultant total annual expenditure of over $200,000 for disposing of styrene tar. Gulf has never used any other disposal source.

Both Cos-Mar and Gulf Oil have very clean plants. There are no styrene tar odors except minor local odors near the styrene tar loading spout. Both have superior loading pumps to the one at Foster Grant. Loading time is greatly reduced.

LOWE CHEMICAL COMPANY

I visited the Lowe Chemical Company near Clear Lake, Texas on Wednesday, August 16, 1972 to inspect the styrene tar reclaiming facility. Mr. Ralph Lowe had invited Mr. Trygg or one of his representatives to inspect the plant. Mr. Monroe Sharp conducted a thorough tour of the facility.

Lowe Chemical is the styrene tar reclaiming operation for all styrene monomer plants in Texas and two of the three previously mentioned plants in Louisiana. Mr. Lowe "repossessed" the plant from Phoenix Chemical which went bankrupt in April, 1972. Mr. Lowe has spent $200,000 in cleaning up the plant and modernizing trucking equipment and repairing processing equipment. Mr. Lowe had previously sold the plant to Phoenix Chemical in 1970. Mr. Lowe had been processing styrene tar since 1963.

Styrene tar is received by tank truck and is either pumped to a holding tank for processing or stored in disposal pits with a water cap. The tar is preheated and fed to four boilers where it is heated to 335°C and is thermally cracked. This is a batch operation which takes approximately 40 hours. The distillate (60% of input) is called crude oil and is further processed by distillation into light ends and aromatic oil. The aromatic oil is recycled for use as cutter stock. The light ends are further distilled into toluene, ethyl benzene and cumene which are sold for gasoline blending. Some of the by-product oil is sold as fuel. The bottoms (40% of input) consist of an asphaltic compound which is used to coat rail ties.

During the thermal cracking process hydrogen sulfide is liberated. The H_2S is collected in a vent system and piped to a spent caustic (8% NaOH) scrubber. Residual H_2S not scrubbed is vented to a flare with a John Zink burner and burned to SO_2. According to Mr. Lowe the company is going to improve the scrubbing system by using 50% caustic to blend with the 8% caustic to get a higher scrubbing efficiency. This is supposed to enable Lowe Chemical to meet Texas Air Control Regulations. The 50% caustic is to be furnished by the styrene tar producers.

The by-product from reacting caustic and H_2S is sodium sulfide which is a salable product to the paper industry.

The cold styrene tar from the disposal pits is pumped by means of Roper gear pumps. The pump is at the end of a 22' shaft which is angled to near the bottom of the 12' deep pit. Capacity of the pump varies from 20-35 gpm. The tar is pumped to a nearby petrochem heater and then pumped several hundred feet by insulated line to the plant. The water cap is maintained above 8 inches. Water is supplied from two water wells with a combined capacity of 600 gpm.

Present plant capacity is 500,000 gallons per month of styrene tar. With the use of a stronger caustic solution the plant will be able to process 1,000,000 gallons per month.

During our discussion Mr. Lowe stated that Dow Chemical is presently using a non-sulfur inhibitor and Foster Grant advised they were close to using one. In addition all other styrene producers are investigating non-sulfur inhibitors which confirms what I learned at Gulf Oil and Cos-Mar. Mr. Lowe stated that all producers had to explore this option because of the uncertainties which arose as a result of the bankruptcy of Phoenix Chemical Company. Mr. Lowe advised that he is notifying all styrene producers that he was going to lower his processing fee to one cent per gallon to help reduce costs to the producer.

"TYPICAL" STYRENE TAR ANALYSIS

12 - 20%	styrene monomer
15 - 16%	sulfur (Solid Sulfur, dissolved sulfur, sulfur compounds)
8 - 10%	C_9 Aromatics
25 - 30%	styrene monomer
Traces	Ethyltoluene, vinyl toluene
Remainder	Polystyrene and high boilers

cc: Mr. John E. Trygg
Mr. Henry Ledet, S. E. Regional Office
Mr. Russell Gautreaux, Ascension Parish Health Unit
Director, Ascension Parish Health Unit

27

Texas Department of Water Resources

INTEROFFICE MEMORANDUM

TO : George Green, Technical Review Unit, Field Support Section

DATE July 17, 1978

THRU :

FROM : Clarence E. Johnson, District 7 Representative

SUBJECT: Southern Pacific Transportation Company, Creosote Plant, 4910 Liberty Road, Houston, Mr. M.A. Lane, Plant Manager, 713/223-6582

Introduction:

Southern Pacific has had a creosote plant to treat their ties at 4910 Liberty Road since 1899.

Inspection was made on 6/29/78 with Mr. Art Lane, Plant Manager, and Mr. Frank Bozeman, Superintendent Water and Fuel Supply.

Findings:

1. Southern Pacific has been using styrene tars (70%) as a creosote (30%) extender for 15 years. Lowe Chemical Company has been the supplier of the styrene tars for this time period. Ralph Lowe holds the current contract since he foreclosed on JOC Oil Aromatics. He now operates under the name of Dixie Oil Processing Company.

2. This year, Southern Pacific signed a contract with Dominguez-Zapp to purchase some styrene tars contaminated with chlorinated solvents from Motco Pit in Galveston County.

3. When he foreclosed on JOC Oil Aromatics (formerly Lowe Chemical Company), Mr. Ralph Lowe acquired some 300,000 gallons of chlorinated solvents stored in three metal tanks. He expressed the desire to blend the chlorinated solvents into the styrene tars that he sells to Southern Pacific. He would reduce the price to Southern Pacific.

4. Southern Pacific has corrosion problems with the Motco Pit styrene tars, but the low price paid for the wastes adequately compensates them for it.

5. Southern Pacific has determined that the air emissions from using the Motco Pit wastes are within the OHSA rules.

6. The styrene tars are brought in by truck and unloaded into one of two unloading spots; thence pumped to storage tanks; thence to working tank; thence to cylinder full of ties; thence back to working tank. It is a closed system except for unloading spots and cylinder. The unloading spots had some small spills of styrene tars due to hose drainage from breaking connections.

7. The tank farm at Southern Pacific is all diked except for a 9,000 gallon caustic tank, which is outside the dike. The caustic is used to pretreat tie drying process wastewater which is sent to City of Houston sanitary sewer.

8. Last week, the TACB notified Southern Pacific that they would need a permit from them in order to use the styrene tars contaminated with chlorinated solvents from the Motco Pit. Southern Pacific has decided to quit using the Motco Pit wastes so they won't have to get a permit from TACB. They have informed Ralph Lowe that they don't want any of his chlorinated solvents.

Recommendations:

1. I verbally advised Southern Pacific that the chlorinated solvents which Ralph Lowe has are highly corrosive and contain several chemicals which could cause air emissions.

2. I verbally advised Southern Pacific to install drip pans at the styrene tar unloading spots and to dike the caustic tank.

Narration:

Please see attached data on the chlorinated solvents Ralph Lowe has and of the styrene tar wastes in the Motco Pit.

CEJ:tmr
Enclosures

Signed: [signature]

Approved: Billy H. Boggs

28, 32, 112

COPY

NO. 84-75865, 84-75865-A

JOSEPH EDWARD POWELL, ET AL.	)	IN THE DISTRICT COURT OF
VS.	)	HARRIS COUNTY, T E X A S
PULTE HOME CORPORATION, ET AL	)	125TH JUDICIAL DISTRICT

NO. 85-17210, 85-17210-A

KEVIN JONES, ET AL.	)	IN THE DISTRICT COURT OF
VS.	)	HARRIS COUNTY, T E X A S
FARM & HOME SAVINGS ASSOCIATION, ET AL.	)	189TH JUDICIAL DISTRICT

DEPOSITION OF RALPH LAWRENCE LOWE

VOLUME II

May 20, 1986

United Reporting, Inc.

REGISTERED PROFESSIONAL REPORTERS

3110 CAROLINE HOUSTON, TEXAS 77004

526-2900

RC01470

I N D E X - VOLUME II

INDEX OF EXHIBITS

R001471

Continuation of the deposition of RALPH LAWRENCE LOWE, taken on the 20th of May, 1986, in the offices of Watt, White, Gill & Craig, 1600 Smith, Suite 3700, Houston, Texas, before A. D. FARRACK, Certified Shorthand Reporter and Notary Public in and for the State of Texas, pursuant to agreement of counsel for the respective parties that:

The deposition of the witness named in the caption hereto may be taken at this time and place before the herein named Notary Public of the State of Texas; and that the said deposition or any part thereof, when so taken, may be used on the trial of this cause with the same force and effect as if the witness were present in court and testifying in person.

Formal notification of filing is required.

The necessity for preserving objections at the time of taking is waived, and that any and all legal objections to this deposition, or any part thereof, may be urged at the time same is sought to be offered in evidence on the trial of this cause; except, however, that objections to the form of the questions and/or the responsiveness of the answers must be made at the time of taking, or else such objections are specifically waived.

The original transcript of this deposition shall

R001472

be forwarded to the attorney for the witness who shall obtain the signature of the witness. The witness shall read and sign this deposition within 20 days from date of receipt and return same to the Court Reporter for filing with the Clerk of the Court. Failing that, a copy of this deposition can be used at the time of trial with the same validity as if it were the original.

R001473

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R001474

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R001475

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R001476

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ALSO PRESENT:

Mr. R. E. Guilliams

RC01477

RALPH LAWRENCE LOWE,

recalled as a witness, having been previously duly sworn, was examined and further testified upon his oath as follows:

EXAMINATION

BY MR. LACEY:

Q. Mr. Lowe, when we stopped yesterday, I think we had just established that prior to your becoming involved with the chemical processing facility in the vicinity of Beamer and Choate Road, the then existing facilities with all located to the south side of Choate Road and there was nothing on the north side; is that correct?
A. You are saying prior to my get involved?
Q. As a part owner in the Hard-Lowe Chemical Company?
A. Before I got involved with it, that all the facilities were on the south side?
Q. Right.
A. Okay.
Q. Is that correct?
A. Yes.
Q. And prior to the time that you got involved, was

R001478

association with Hard-Lowe Chemical and Lowe Chemical, none of the chlorinated materials which those companies received from Monsanto Company were placed anywhere within tract F?

A. Not to my knowledge.

MS. SHOEBOTHAM: Thank you, sir.

EXAMINATION

BY MS. GALLAGHER:

Q. Mr. Lowe, my name is Carole Gallagher and I represent Southern Pacific Transportation Company. You have testified that Dixie Oil Processors sold certain products to Southern Pacific; is that correct?

A. Creosote extenders.

Q. Creosote extenders. Do you recall whether Hard-Lowe or Lowe Chemical sold any products to Southern Pacific?

A. No, ma'am.

Q. You don't recall?

A. No, ma'am. I recall Lowe Chemical did. I can't recall the sales of Hard-Lowe.

Q. Okay. Do you remember what those products would have been that they sold to Southern Pacific?

A. They were material made up of the streams of the bottoms of -- they were composites of a number of different streams. That composite was tailored to fit the creosote extender for the needs of Southern Pacific. It would be difficult for me to give you an analysis on it. Part of it was a base of styrene tars and part of it was phenolic tars.

Q. Do you recall whether Southern Pacific ever supplied any materials to Dixie Oil Processors that they used in their processes?

A. No, I don't believe they ever did.

Q. How about did Southern Pacific supply any materials to Hard-Lowe that you recall?

A. No, I don't believe they ever did.

Q. How about did Southern Pacific supply any materials to Lowe Chemical Company that Lowe Chemical Company used in their processes?

A. I don't believe they did.

MS. GALLAGHER: Thank you, sir.

MR. HENNIG: I've got a question.

(Discussion off the record.)

29, 113

KG COH003941

E-UNIT

Product: Creosote Extender Oil

Customer: Southern Pacific

Contact: For scheduling and day to day business, John Balu at the yard, 222-1121.
For planning and public relation work, Art Laine at the yard, John Balu's boss, 222-1121.
For money matters, price increase etc., Mr. M. T. Money, Southern-Pacific, San Francisco.

Procedure: Scheduling is done on Monday for deliveries Tuesday and Wednesdays about 20 loads per week.

Status: Purchase Order. SP purchases by the pound at our request last year. The pound price is carried to 5 decimals. Last price increase was 1/1/77.

Understanding: John Balu likes JOC and tries hard to keep complaints between him and Ken. Lately SP experienced difficulties with our material which may be due to SP experimenting with other potential suppliers. Art Laine is worried that JOC will fold and is pushing for another supplier. What has kept him from doing so is that our price is lower than the competition by $1.00 or $2.00/BBL. Also the competition is not too willing to deliver per SP schedule.

Future: Unless we fail to supply their needs, I believe JCA can maintain them as customers. With present blend and blending facilities, JOA will run into trouble when the cold weather will hit. JOC will need to have a heated blending tank to at least 160°F otherwise the present blend will not flow. Better plan for this now. When Platt's fuel oil prices start to move, I believe SP price can be increased to $0.02145/BBL which would be $11.00/BBL at 10 API. The relationship pound/BBL should be pointed out to Money, otherwise he will think the price increase excessive.

Note: Product is all the cutter stocks, phenolic tars and styrene tars, we can get blended in BT-21. All planning and scheduling is done by S & D (Ken and I) production is not involved.

040231

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EXHIBIT
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BRIO-99-015770

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1977

JANUARY THRU DECEMBER

Company	Loads	LB's	Gallons	Total $
MONSANTO	734	36353018	4039224	241127.01
OXIRANE (WWA)	681	34222020	4011960	280837.21
Mobil I	63	2573136	352484	6795.50
OXIRANE (Glycol)	172	8161828	877616	17200.00
Southern Pacific (W Water)	134	6474000	780000	
OXIRANE (CAUSTIC WATER)	1	16560	1656	198.22
AMOCO	1	54380	5000	
Mobil II	6	194060	12805	256.12
Rohm & Haas (waste oil)	57	2608460	326020	10521.82
Rohm & Haas (BMA)	12	519200	59832	4188.24
TOTAL	1723	91176362	10466597	$561124.12

C[illegible]y	Loads	LB's	Gallons	[illegible]
Durawood		[illegible]	411 [illegible]	[illegible]
Southern Pacific		114[illegible]	2497754	64[illegible]
Pen Ray oil		4346210	350649	43[illegible]
Sunco (vinyl chloride)		292370	82416	13[illegible]
ColFax		329118	455125	42983 [illegible]
				{393671 [illegible]
Torque Petro (consolidated)		291122	2093074	{395903 [illegible]
				{8[illegible]
Petro Max		[illegible]	555835	[illegible]
McKenney & T James		342[illegible]	47754	[illegible]
Bernuth lembcke				10[illegible]
Gulf Chem & Metallurgical [illegible]		[illegible]	209457	[illegible]
Gulf Chem & Metallurgical [illegible]		[illegible]	777[illegible]	18[illegible]
Chemical Exchange ([illegible]		612[illegible]	430[illegible]	[illegible]
Brown & Root		58[illegible]	[illegible]016	18[illegible] 98
Parag[illegible]		[illegible]	[illegible]	1[illegible] 96
Owe[illegible]		[illegible]	[illegible]	78[illegible] 03
Torque [illegible] (Sunco)		[illegible]	354[illegible]	[illegible]30 63
Koch Int'L		[illegible]	36[illegible]	49559 99
				16874.47
Oxirane (moly BTms)		[illegible]	62975	21342 79
M E Group		115700	12[illegible]57	28249 66
M-K Fuel		394[illegible]	7161809	290465 19
				316,056 18

© WILSON JONES COMPANY G7504 GREEN 7504 BUFF PAT. APPL. FOR G7504C COVERLESS MADE [illegible]

KG COH003945

P-0063

1979

January — December

Company	Loads	LB's	Gallons	Total $
East Texas Asphalt	3	149000	17663	7595.23
Lamar Petro	11	586555	68932	25433.57
Dixie	1485	77612058	9148981	2,031,034.70
Sunco	157	7921901	867808	115,967.86
Ending Inventory	81	3299863	435278	108844.50
	1723	89233822	10452067	2255847.06

1-1-79
1-31-79

Outgoing	Loads	LB's	Gallons	$
Durawood ✓	5	238240	27829	7189.85
Southern Pacific ✓	54	3171470	370498	86105.41
Pen Roy ✓	6	304700	36205	4734.00
Sunco Vinyl Chloride ✓	18	892370	82416	<13186.56>

0015201

[illegible] Oil Processors, Inc.

COMPANY: Southern Pacific | Product: Creosote

DATE	WEIGHT	GALLONS
1-3-79	50500	5899
1-3-79	62480	7299
1-3-79	62120	7257
1-3-79	61860	7224
1-3-79	61580	7193
1-3-79	50620	5913
1-4-79	62080	7252
1-4-79	62820	7338
1-4-79	60680	7088
1-5-79	60720	7093
1-5-79	59260	6923
1-5-79	60020	7012
1-9-79	60300	7044
1-9-79	59[illegible]	7044
1-9-79	61[illegible]	7231
1-9-79	61250	7155
1-9-79	63640	7434
1-10-79	58180	6796
1-10-79	57860	6759

AV-LD = GAL

AV-59561-6958

12 Loads 714,740 - 19405.19

AV - 60441 - 7060

7 Loads 423090 = 11486.89

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

(8.4)

Dixie Oil Processors, Inc.

COMPANY - SouThern Pacific | Product Creosote

DATE	WEIGHT	GALLONS
1-16-79	59460	6946
1-16-79	59620	6964
1-16-79	60020	7011
1-16-79	61440	7172
1-16-79	60200	7032
1-17-79	58580	6843
1-17-79	63480	7415
1-17-79	56660	6619
1-16-79	63120	7373
1-24-79	58620	6848
1-24-79	58060	6282
1-24-79	59680	6921
1-24-79	60[illegible]0	7100
1-24-79	5[illegible]	6876
1-24-79	59240	6920
1-23-79	58850	6825
1-23-79	49780	5815
1-23-79	58000	6775
1-23-79	50220	5866
1-23-79	58530	6837
1-23-79	59820	6988

AV-60286

9 Loads-542580 — 14731.05

AV-57536

12 Loads-18[illegible]85.45

690440.20

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote Ext.

DATE	WEIGHT	GALLONS
1-30-79	57800	6752
1-31-79	57480	6714
1-31-79	57460	6712
1-30-79	55840	6523
1-31-79	57600	6728
1-31-79	57020	6661
1-30-79	~~62~~ 420	7292
1-30-79	57920	6766
1-31-79	53560	6257
1-31-79	56480	6598
1-31-79	58360	6817
1-31-79	49760	5813
1-31-79	59140	6908
1-31-79	59 [illegible] 800	6983

AV - 5787

21736.83

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going

	ds	LB's	Gallons	$
Durawood	4	192 160	22447.00	5799.25
Southern Pacific	27	1518690	177 417	$41,232.42
Pen Roy	8	430680	58835	6655.87
Col Fax	5	243420	28435	7336.99
Peter Max	17	888 180	102645	15398.82
[redacted]	9	--0-	-0-	739.50
Gulf Chem (TC) Doll OH	3	132140	16853	3370.98
Gulf Chem FP moly BTm	5	250 340	30014	7204.83
				87736.98

0015202

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific   PRODUCT Creosote

DATE	WEIGHT	GALLONS			
2-14-79	55740	6511	13 Loads - 19207.54	AV - 54420	
	707460				
2-21-79	58470	6830	AV 57318		
2-21-79	55580	6492		9337.15	
2-21-79	57840	6757	6 Loads -		
2-21-79	56500	6600			
2-21-79	61900	7231			
2-21-79	53620	6264			
	343910	40,174.00			
		~~2~~7 Loads	1518690	17742	41232.43

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18. U.

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS
2-6-79	58500	6834
2-6-79	57300	6693
2-6-79	60440	7060
2-6-79	58040	6780
2-6-79	60860	7109
2-7-79	57280	6691
2-7-79	57160	6677
2-7-79	57740	6743
	467320	
2-13-79	58240	6803
2-13-79	57200	6682
2-13-79	49700	5806
2-13-79	52380	6119
2-13-79	61[illegible]	7175
2-13-79	50030	5844
2-13-79	54640	6383
2-14-79	57840	6757
2-14-79	56420	6591
2-14-79	55480	6481
2-14-79	49900	5829
2-14-79	48470	5662

AV-58415

8 Load - $10682.94

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R. 41

3-1-79
3-31-79

OutGoing

	Loads	LB's	Gallons	$
Durawood	2	100741	11426	2952.07
Southern Pacific	25	1425680	164818	38707.2
Pen Roy	12	599680	82040	9278.32
Col Fax	2	96800	11307	2921.34
Petro Max	80	4124030	453190	67,978.
~~Caf.~~ Chem (TC) Doll OH	4	188780	24078	~~4815.~~83
Gulf ~~Chem~~ FP ~~[illegible]~~y BTms	13	675800	81031	19447.48
				146,100.76

0015217

4-1-79
4-30-79

Outgoing

	Loads	LB's	Gallons	
Durawood ✓	6	281920	32903	850[illegible]
Southern Pacific ✓	67	3782770	437314	142,702[illegible]
Pen Roy ✓	6	309960	42460	4802[illegible]
Colfax ✓	4	193400	22522	5831.
Petro Max ✓	—	—	—	—
Gulf MeT (OH) ✓	13	615610	78521	15908[illegible]
Gulf MeT (BTMS) ✓	29	1492280	178930	48943.[illegible]
Chem Exchange (Gly) ✓	2	82300	9135	1370.25
Brown & Root ✓	1	58320	6806	1089.00
		6,532,560	808,641	
				182942.6[illegible]

Dixie Oil Processors, Inc.

Company - Southern Pacific | Product Creosote Ext

Date	Weight	Gallons		
4-3-79	60000-	6936	1629.00	
4-3-79	48980	5662	1329.81	
4-3-79	49720	5747	1349.90	
4-3-79	50000	5780	1352.50	
4-3-79	50460	5833	1369.99	
4-3-79	50640	5854	1374.88	
4-3-79	56340	6513	1529.67	
4-3-79	49940	5750	1350.64	12 Loads - 53365
4-3-79	57080	6598	1549.72	17386.32
4-3-79	61160	7070	1660.59	
4-3-79	49440	5715	1342.30	
4-3-79	56820	6568	1542.66	
	640380			
4-5-79	56300	6508	1528.55	
4-5-79	571[illegible]	6603	1550.81	
4-5-79	471[illegible]	5449	1279.85	6 load
4-5-79	58900	6809	1599.14	8865.03
4-5-79	48400	5595	1314.06	
4-5-79	58660	6781	1592.62	
4-10-79	60720	7019	1648.55	
4-10-79	55260	6388	1500.31	

BOX 356 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

18.4)

Dixie Oil Processors, Inc.

COMPANY: Southern Pacific | PRODUCT: Creosote

DATE	WEIGHT	GALLONS		
4-10-79	59960	6931	1627.91	
4-10-79	60120	6950	1632.26	
4-10-79	61380	7095	1666.47	9 loads AV. 59600
4-10-79	59440	6871	1613.80	
4-10-79	58960	6816	1600.76	$14563.26
4-10-79	60800	7028	1650.72	
4-10-79	59760	6908	1622.48	
		62011		
4-12-79	59620	6892	1618.68	
4-12-79	59200	6843	1607.28	
4-12-79	57100	6601	1550.27	
4-12-79	57120	6603	1550.81	6327.04
	233[illegible]	26441		
4-17-79	57220	6615	1553.52	
4-17-79	59520	6880	1615.97	
4-17-79	50600	5849	1373.79	
4-17-79	62100	7179	1686.02	
4-17-79	56640	8547	1537.98	
4-17-79	40860	7035	1652.35	
4-17-79	57490	6646	1560.85	

BOX 856 • FRIENDSWOOD, TEXAS 7754[illegible] • Telephone 713 331-6196

Dixie Oil Processors, Inc.

Company: Southern Pacific | Product: Creosote

Date	Weight	Gallons	
4-17-79	49920	5771	1355.33
4-17-79	59580	6887	1612.60
4-17-79	62380	7211	1693.62
4-17-79	57400	6635	1558.41
4-17-79	49920	5771	1355.33
4-17-79	62540	7230	1692.96
4-17-79	57360	6631	1552.32
4-18-79	303530 58540	6267	1589.31
4-18-79	59320	6857	1610.54
4-18-79	49680	5743	1348.81
4-18-79	52320	6048	1420.49
	1,023,390	118310	27785.54
4-25-79	49[illegible]20	5736	1347.18
4-25-79	61[illegible]	7107	1669.18
4-25-79	55[illegible]	6376	1497.59
4-25-79	58340	6744	1583.93
4-25-79	49320	5701	1339.04
4-25-79	57800	6682	1569.27
4-24-79	49440	5715	1342.30
4-24-79	60000	6936	1629.00
4-24-79	50080	5789	1359.67
4-24-79	59480	6876	1614.88

18 Load AV/56855

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Dixie Oil Processors, Inc.

COMPANY: Southern Pacific | PRODUCT Creosote

DATE	WEIGHT	GALLONS		
4-24-79	62730	7252	1703.12	
4-24-79	50900	5884	1381.94	
4-24-79	57980	6702	1574.16	
4-24-79	58840	6802	1592.51	56.835
4-24-79	62000	7167	1683.30	AV:
4-24-79	57900	6693	1571.99	27775.54
4-24-79	59640	6894	1619.23	$
4-24-79	62330	7205	1692.26	
	1023040	118270		
67 Loads	3,782,770	437314	102,702.21	

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5337.2

Outgoing		Loads	LB's	Gallons	A[illegible]
Paragon Paint	✓	1	45680	5331	1686.
Southern Pacific	✓	40	2309060	266943	62690.
Barnsith Lem	✓	2			1770.00
Owens ILL	✓	6	313550	36595	7868.03
Chem Exchange	✓	1	50420	5540	831.10
[illegible] Boy Oil	✓	6	309160	39260	4496.
Gulf Metal (Moly BTMS)	✓	13	709420	85056	18088.[illegible]
Gulf Metal (Doll Co)	✓	2	96540	12313	2462.75
Durawood	✓		336660	32288	10,150.75
Consolidated of WACO	✓	14	840000	96998	17459.57
Sunco Consolidated of WACO	✓	4	237780	26129	4703.40
					132,204.09

0015199

Dixie Oil Processors, Inc. 40 230060 264983

COMPANY - Southern Pacific			PRODUCT Creosote
DATE	WEIGHT	GALLONS	
5-16-79	58100	6716	1572.42
5-16-79	57760	6677	1568.18
5-16-79	60620	7008	1645.83
5-16-79	63000	7283	1710.45
5-16-79	57220	6615	1553.52
5-16-79	61820	7157	1679.50
5-16-79	56660	6550	1538.32
5-16-79	56700	6554	1539.41
5-16-79	61200	7025	1661.58
5-16-79	61960	7163	1682.21
5-17-79	58220	6730	1580.87
5-17-79	59140	6836	1605.45
5-17-79	57600	5965	1400.95
5-16-79	5[illegible]0	6645	1560.58
	82[illegible]	94968.79	
5-25-79	61640	7126	1673.53
5-25-79	60910	7041	1653.71
5-25-79	46680	5396	1267.36
5-25-79	61180	7072	1661.64
5-25-79	58260	6735	1581.76
5-25-79	57400	6635	~~1558.41~~
	346070	40008	

14 Load 22,303.18

6 Loads 9395.80

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Dixie Oil Processors, Inc.

Company: Southern Pacific | Product: Creosote Extender

Date	Weight	Gallons		
5-1-79	58560	6769	1589.90	
5-1-79	59360	6862	1611.82	
5-1-79	57760	6677	1568.18	
5-1-79	59020	6823	1602.39	6 loads
5-1-79	58920	6811	1599.68	9540.51
5-1-79	57780	6679	1568.73	
	351400	40624		
5-8-79	49240	5250	1350.[illegible]	
5-8-79	50020	5782	1358.04	
5-8-79	51900	6000	1409.[illegible]	
5-8-79	62300	7202	1691.45	
5-8-79	55880	6460	1517.14	
5-8-79	62260	7255	1703.93	
5-8-79	503[illegible]	5819	1366.73	14 loads
5-8-79	62[illegible]	7234	1699.05	21451.49
5-8-79	58560	6769	1589.90	
5-8-79	58400	6751	1585.56	
5-8-79	57500	6647	1561.43	
5-8-79	52480	6067	1424.83	
5-11-79	59220	6846	1607.82	
5-11-79	58430	6754	1586.37	
	790110	91342		

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6-1-79
6-30-79

OutGoing

	Loads	LB's	Gallons	$
Bernuth Lem ✓	2			1470.00
Gulf Metallurgical (OH) ✓	4	197570	25209	5041.80
Durawood ✓	10	484090	56499	14595.7[illegible]
Colfax ✓	3	144530	16868	4352.68
Gulf Metallurgical BTMS ✓	13	705380	84577	20298.4[illegible]
Southern Pacific ✓	30	1676740	195,692	46325.
Consolidated of F WACO ✓	37	~~2669661~~	237,917	42825.06
Consolidated of F WACO (SUNCO) ✓	7	404740	43528	2833.67
Chem Exchange (SUNCO) ✓	16	804660	86522	1[illegible]76.13

DIXIE 134111.75
SUNCO 22,109.80

0015198

KG COH003963

P-0081

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	
6-29-79	54300	2346	1476.42
6-29-79	51180	5973	1389.54
6-29-79	56180	6556	1525.29
6-29-79	55830	6516	1515.78
6-29-79	58020	6721	1575.24
6-29-79	46640	5443	1266.28
6-29-79	49800	5812	1352.07
6-29-79	52360	6111	1421.57
6-29-79	57980	6767	1574.16
6-29-79	46840	5466	1271.71
	529130		
30 Loads	167[illegible]0	195697	45523.49

wt 10 Loads 14368.04 Gallons

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KG COH003964

Dixie Oil Processors, Inc.

COMPANY: Southern Pacific PRODUCT: Creosote

DATE	WEIGHT	GALLONS		
6-1-79	58060	6712	1574.33	
6-1-79	57060	6596	1549.18	
6-8-79	42740	4941	1160.39	
6-8-79	57280	6621	1555.15	
6-8-79	52120	6025	1415.06	
6-8-79	55160	6376	1497.59	
6-8-79	57380	6633	1557.87	6 Loads 8766.19
6-8-79	58200	6728	1580.13	
6-15-79	60700	7084	1648.01	
6-15-79	58740	6790	1594.99	
6-15-79	58[illegible]	6800	1596.96	6 Load 9829.12
6-15-79	60[illegible]	6956	1633.62	
6-15-79	62[illegible]	7181	1686.56	
6-15-79	61480	7107	1669.18	
6-22-79	58020	6707	1575.24	
6-22-79	57280	6621	1555.15	
6-22-79	56220	6499	1526.37	6 Loads 9436.79
6-22-79	57780	6679	1568.73	
6-22-79	59200	6843	1607.28	
6-22-79	59080	6830	1604.02	

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Outgoing 7-1-79
7-31-79

	Loads	Lb's	Gallons	$
Berauth Lum ✓	2			960.00
Gulf Metallurgical OH ✓	3	166340	21216	3235.71 37
Gulf Metallurgical ✓	14	709660	85091	20426.87
Consolidated Dixie ✓	47	2637545	app	54576.12
Consolidated Sunco ✓	5	290540	31240	5623.35
Durawood ✓	9	439520	51227	13251.97
Colfax ✓	3	131828	15391	3926.20
Southern Pacific ✓	[illegible]	159570	143413	45157.37
Chemical Exchange	[illegible]	198200	21311	3196.77
Southern Pacific ✓	4		23500	400.00

0015197

Dixie Oil Processors, Inc.

COMPANY: Southern Pacific PRODUCT: Creosote

DATE	WEIGHT	GALLONS	
7-6-79	54800	6395	1482.82
7-6-79	55460	6472	1505.74
7-6-79	54040	6307	1467.19
7-6-79	56740	6622	1540.47
7-6-79	47760	5574	1296.68
7-6-79	58500	6827	1588.28
7-6-79	57940	6762	1573.07
7-6-79	58960	6881	1600.76
7-6-79	48480	5658	1316.23
7-11-79	57280	6685	1555.15
7-11-79	59960	6998	1627.91
7-11-79	48900	5707	1327.64
7-11-79	57[illegible]0	6683	1554.61
7-11-79	[illegible]	7077	1646.38
7-11-79	59140	6902	1605.65
7-11-79	56680	6615	1538.86
7-11-79	57720	6736	1562.10
7-11-79	57300	6637	1555.70

9 loads - 13376.20

9 loads - 14079.08

Dixie Oil Processors, Inc.

COMPANY: Southern Pacific | PRODUCT: Creosote

DATE	WEIGHT	GALLONS		
7-18-79	49180	5739	1335.24	
7-17-79	60360	7044	1638.77	8 loads 12841.40
7-17-79	62340	7275	1692.53	
7-17-79	57440	6704	1559.50	
7-17-79	61480	7175	1669.18	
7-17-79	58560	6834	1589.90	
7-17-79	63360	7394	1720.22	
7-17-79	60260	7033	1636.06	
7-20-79	58400	6816	1585.56	3 loads 4860.67
7-20-79	63050	7358	1711.81	
7-26-79	57580	6720	1563.30	
29 loads			45157.33	

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Dixie Oil Processors, Inc.

Company - Southern Pacific Water Product

Date	Weight	Gallons
7-2-79	5500	
7-2-79	5500	
7-3-79	5500	
7-3-79	7000	
4 Load	23500	

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...xie Oil Processors, Inc.

P.O. BOX 866
FRIENDSWOOD, TEXAS 77546
713-482-7578

MONTH: August '79

COMPANY	AMOUNT SOLD
...UTHERN PACIFIC	$ 56,391.07
...ULF CHEMICAL (...TTOMS)	$ 21,147.61
GULF CHEMICAL (TOPS)	1067.09
DURA-WOOD	$ 19,090.79
C...LFAX	$ 1616.62
C...NSOLIDATED OF WACO	$ 84,163.96
PEN ROY	$ 8672.03
UNOC	$ 56,856.06
Koch International	52,516.19
	$ 244,665.36
...ANE	$
...	$

Sold ... (80/65)

...ing		LB's	Gallons	8-1-79 8-31-79 $
Torque Petro ✓		3864318	442323	79618.
Southern Pacific ✓	37	2124540	242962	57681.
Pen Roy ✓	10	304730	69377	8672.11
Colfax ✓	3	142120	16585	4758.91
Durawood ✓	11	522610	60931	12471.77
Koch Int ✓	42	2,389,476	276,442	52523.98
~~Metallurgical~~ Metallurgical Atms ✓	14	734880	88115	~~[illegible].62~~
GulfMet Tops ✓				1067.09
Torque Petro SUNCO ✓	9	517021	65591	11806.38
Chem Exch SUNCO ✓		Glycol		45049.64

Dixie — 241,873.79

Sunco — 56856.06

Total 298,729.85

0015196

KG COH003971

P-0089

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote Extender

DATE	WEIGHT	GALLONS	
8-1-79	59380	6930	1612.17
8-1-79	55460	6472	1505.74
8-1-79	58540	6832	1589.36
8-2-79	58920	6876	1599.68
8-1-79	57100	6664	1550.27
8-1-79	59820	6981	1624.11
8-1-79	56180	6556	1525.29
8-1-79	54440	6353	1478.05
8-1-79	57740	6739	1567.64
8-2-79	58460	6823	1587.19
8-2-79	47520	5546	1290.17
8-2-79	59860	6986	1625.20
8-8-79	[illegible]0	6984	1624.66
8-8-79	[illegible]0	7296	1697.42
8-8-79	59440	6937	1613.80
8-8-79	56660	6636	1543.75
8-8-79	58680	6848	1593.16
8-8-79	61880	7222	1680.04
	1,042,440	121,681	28,307.70

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote Ext.

DATE	WEIGHT	GALLONS	
8-15-79	59780	6904	1623.03
8-15-79	59820	6909	1624.11
8-15-79	49380	5703	1340.67
8-21-79	51540	6015	1399.31
8-21-79	55360	6461	1503.02
8-21-79	53080	6195	1441.12
8-23-79	54360	6248	1475.87
8-23-79	54840	6334	1488.91
8-23-79	52440	6027	1423.75
8-23-79	54620	6278	1482.93
8-23-79	58900	6770	1599.14
8-23-79	5[illegible]80	6[illegible]52	1521.44
8-30-79	62600	7306	1699.59
8-30-79	57140	6669	1551.35
8-30-79	58600	6768	1590.99
8-30-79	58960	6881	1600.76
8-31-79	59440	6937	1613.80
8-31-79	60780	7020	1650.18
8-31-79	62580	7303	1699.05
	2124540	247962	57,681.26

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	[illegible]ds	LB's	Gallons	[illegible]
Torque Petro ✓	52	2,961,723	33[illegible]	609[illegible]
Southern Pacific ✓	14	827020	95059	$22453.57
Bernuth Lemb ✓	11			1185.60
Durawood ✓	9	446620	52126	14955.38
Colfax ✓	3	144900	16911	4852.45
Gulf Metallurgical Comms Freeport	5	276920	33203	796.[illegible]
[illegible]och Intl ✓	14	744570	85840	17015.[illegible]
Pen Roy ✓	1	20800		36[illegible]
Torque Petro Suned ✓	6	341480	38920	7014.60

0015195

Dixie Oil Processors, Inc.

Company: Southern Pacific   Product: Creosote

Date	Weight	Gallons	
9-6-79	59940	6995	1622.37
9-6-79	61020	7121	1656.69
9-6-79	60400	7049.41	1639.86
9-6-79	61560	7148	1671.35
9-12-79	58780	6860	1595.88
9-12-79	59140	6902	1605.65
9-12-79	60320	7040	1637.69
9-13-79	57540	6715	1562.21
9-13-79	62120	7250	1686.56
9-13-79	58360	6811	1584.47
9-21-79	[illegible]00	6384	1485.11
9-21-79	56080	6545	1522.57
9-27-79	58360	6740	1584.47
9-28-79	58700	6851	1593.77
14 Loads	827020		$22453.57

TEXAS 77546 • Telephone 713 331-6196

Dixie Oil Processors, Inc.

SEPTEMBER, 1979

COMPANY	AMOUNT SOLD
SOUTHERN PACIFIC	$ 22,453.56
GULF CHEMICAL	$ 7,678.26
GULF CHEMICAL (TOPS)	$ -0-
DURA-WOOD	$ 14,955.12
COLFAX	$ 4,851.92
TORQUE PETROLEUM	$ 59,711.94
PEN ROY	$ 366.08
SUNCO	$ 1350.00
TORQUE PETROLEUM (truck repairs & gas)	$ 5359.08
KOCH INTERANTIONAL	$ 17,013.86
BERNUTH-LEMBCKE	$ 1,185.00
SOUTHERN PACIFIC (waste water & truck	$ 1,407.44
TOTAL	$ 136,332.26
MONSANTO	$
OXIRANE	$

0015220

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

Dixie Oil Processors, Inc.

P.O. BOX 858
FRIENDSWOOD, TEXAS 77546
713-482-7578

MONTH: October

COMPANY	AMOUNT SOLD
SOUTHERN PACIFIC	$ 37,209.58
GULF CHEMICAL (BOTTOMS)	$ 28,195.08
GULF CHEMICAL (TOPS)	$ 3769.12
DURA-WOOD	$ 16,257.71
COLFAX	$ 2,987.79
CONSOLIDATED OF WACO	$ 51,280.74
PEN ROY	$ - 0 -
SUNCO	$ 1800.00
Oxirane	10,318.79
M-K Fuel	56,308.00
McKinney + James	2759.74
Bernath - Lemocke	1530.00
Consolidated (Truck Expense + Fuel)	3762.89
TOTAL	$ 216,179.44

OXIRANE	23,152.38
MONSANTO	23,743.35

0015224

10-31-79

OUT[illegible]NG

	Loads	LB's	Gallons	$
Oxirane Moly ETM ✓	6	273700	32817.	10,961.13
ColFax ✓	2	89230	10424	2973.58
Gulf MeTallurgical Doll ov ✓	4	194810	24848	4969.64
Gulf MeTallurgical Moly BTs ✓	18	932720	111836	26,840.86
MarkeTing Eng Group ✓	19	1,115,700	126659	28649.01
T[illegible]wood ✓	10	485520	56666	16257.98
Bernoth Lembcke ✓	12			1200.00
M-K Fuel ✓	16	977544	110632	27658.05
Orque ✓	43	2512060	284888	51279.84
SouThern Pacific ✓	24	1370520	159957	37207.62
Dixie ✓	142		918727	207999.76
Sonco ✓	20		135710	
	162		1054437	

Dixie $ 207999.76
Sonco 24427.80
$ 232,427.56

0015194

KG COH003978

P-0096

Dixie Oil Processors

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	$
10-5-79	55440	6403	1505.70
10-5-79	59060	6821	1603.48
10-5-79	58260	6729	1581.26
10-9-79	58060	6776	1576.33
10-9-79	57890	6601	1571.91
10-9-79	52720	5990	1431.35
10-11-79	52040	5913	1412.89
10-11-79	56400	6409	1534.26
(?) 10-11-79	55520	6309	1502.37
10-12-79	54860	6234	1489.45
10-12-79	55610	6319	1509.81
10-12-79	[illegible]	6222	1486.73
10-18-79	[illegible]60	6525	1570.[illegible]
10-18-79	[illegible]80	6634	1585.02
10-18-79	58020	6593	1575.24
10-24-79	58380	6634	1585.02
10-24-79	59020	6706	1602.39
10-24-79	58460	6643	1587.19
10-29-79	59120	6718	1605.11
~~10-29-79~~	~~58840~~	~~6686~~	~~1597.51~~
10-29-79	58620	6661	1591.53

KG COH003979

P-0097

Dixie Oil Processors, In[illegible]

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	
10-30-79	58480	6645	1587.78
10-30-79	57780	6565	1568.73
10-30-79	56940	6470	1545.92
24	1370520	159957	37209.62

11-1-79
11-30-79

OutGoing

	Loads	LB's	Gallons	$
Oxirane Moly BTms	✓ 6	259,380	31098	10,387.65
M-K Fuel	✓ 52	3039,800	347985	87002.27
~~[illegible]~~	✓ 3	142 840	16,670	6979.44
Pen Roy	✓ 1	34960	4724	708.65
McKenney & James	✓ 3	147820	17754	7456.96
Bernoth Lembcke	✓ 2			1190.00
Torque Petro	✓ 10	572820	65664	15,634.80
Southern Pacific	✓ 28	1608980	181376	46,114.19
Dixie	✓ 105	5,806,600	665271	175473.[illegible]
Sunco	✓ 2	120740	13732	3021.33
Total	107	5927340	679,003	178495.2

0015193

12-1-79
12-31-79

Outgoing

	Loads	LB's	Gallons	$
Southern Pacific	✓ 29	1,639,330	182136	56,412.8
M-K Fuel	✓ 105	5,977,132	703192	175,804.8
Torque Inc	✓ 14	747,720	87594	23,716.10
Torque Petro	✓ 28	1,585,285	186776	49,382.2
Pen Roy	✓ 2	122040	14298	3731.75
Bernuth Lem	✓ 6			2205.00
East Texas Asphalt	✓ 3	149100	17663	7595.2[illegible]
McKenney & James	✓ 5	195020	30,000	13187.5
Lamar Petro	✓ 11	586555	68932.65	25,433.
Total	203	11002182	1,290,541	357,473.6

KG COH003982

P-00100

Dixie Oil Processors, Inc.

0394

Company 18 Southern Pacific Product Phenolic Tar

Date	Weight	Gallons	
12-20-79	55980	6220	2205.61
12-27-79	60700	6744	2391.58
12-27-79	60580	6731	2386.85
12-27-79	47500	5277	1871.50
12-27-79	49880	5542	1965.27
12-29-79	59400	6600	2340.36
12-29-79	50380	5597	1984.97
12-29-79	55320	6146	2179.61
12-29-79	60500	6722	2383.70
12-31-79	53800	5977	2119.72
12-31-79	56800	6311	2232.92
	610,840	67,867	24,167.09
TOTAL	1,639,330	182,136	56,412.85

.0394

Dixie Oil Processors, Inc.

COMPANY - SouThern Pacific PRODUCT Phenolic Tar

DATE	WEIGHT	GALLONS	
12-1-79	60240	6693	1635.52
12-1-79	62560	6951	1698.50
12-6-79	48260	5362	1310.26
12-6-79	58920	6546	1599.68
12-6-79	60860	6762	1652.35
12-11-79	55420	6157	1504.65
12-11-79	53580	5953	1454.70
12-11-79	58160	6462	1579.04
12-11-79	50100	5566	1360.22
12-14-79	57230	6358	1554.00
12-14-79	55780	6197	1514.63
12-14-79	54560	6062	1481.30
12-18-79	56040	6226	2207.98
12-18-79	60280	6697	2375.03
12-18-79	61300	6811	2415.22
12-18-79	61380	6820	2418.37
12-20-79	51400	5711	2025.16
12-20-79	62420	6935	2459.75
	1,028,490	114,269	32,245.76

KG COH003984

P-00102

July 1980

OUTGOING

Loads	Company	WT	Gallons	BBL's		$
3	Bayou Petroleum	141240	16106^{73}	383^{48}	@ 8.00	3067.84
4	Durawood	170280	19593^{57}	466^{50}	@ 14.10	6577.63
34	Southern Pacific	1885160	210461^{63}	4987^{05}	@ 14.89	74278.20
3	McKenney & Jones	137219	16933^{61}	403^{19}	@ 18.69	7535.61
9	Torque Petro	415880	52372^{05}	1385^{14}	@ 16.00	21918.50
4	Colfax	187200	21595^{91}	514^{18}	@ 14.10	7249.93
18	Southern Pacific GULF/COAST	921300	111000	2642^{86}	@ 5.25	13875.00
69	M-K Fuels	3699861^{90}	430216^{50}	10243^{25}	@ 11.00	112675.75
144		7558140^{90}	878280^{00}	20911^{43}		247178.46

KG COH003985

P-00103

5-1-78
5-31-78

(OUT Going ~~Incomming~~)
MATERIAL

MATERIAL	Loads	LB's	Gallons	
Sodium SulFide (Joe)	9 Loads	456380	48040	$4000.00
SouThern PaciFic	42	2,337,880	273,117	$63,473
InTerConTinenTal Oil (Joe)	2	111060	15862	$2062.00
Durawood TreaTing	9	430052	50192	$12,966.51
ColFax CreosoTing	2	93780	10945	2,827.51
CapiTal Supply (Joe)	9			8,555.00

0015215

	Southern	Pacific
4-26-78	078	59810
4-26-78	079	59820
4-26-78	080	60200
4-26-78	081	52900
4-26-78	082	58900
4-26-78	083	61300
5-2-78	084	58930
5 2 78	085	59380
5-2 78	086	47140
5-2-78	087	60250
5-2-78	088	59660
5-2-78	089	48620
5-9-78	091	60460
5-9-78	092	60500
5-9-78	093	55480
5-16-78	090	57700
5-16-78	094	57740
5-16-78	095	57460
5-16-78	097	54040
5-16-78	100	55080
5-17-78	103	57800
5-17-78	101	51980
5-17-78	102	61220
5-17-78	104	60860

Southern Pacific

5-23-78	113	56630
5-23-78	114	56590
5-23-78	115	56860
5-23-78	116	47440
5-23-78	117	55900
5-23-78	119	49780
5-23-78	120	55880
5-23-78	121	54820
5-24-78	112	57300
5-24-78	122	58090
5-24-78	123	58050
5-24-78	124	56220
5-24-78	126	50500
5-24-78	125	49960
5-24-78	127	57860
5-24-78	128	50220
5-24-78	129	56720
5-24-78	130	58180
5-30-78	135	56230
5-31-78	136	56150
5-31-78	137	56240
5-31-78	138	50240
5-31-78	139	50120
5-31-78	140	57300

6-1-78
6-30-78

OutGoing

MATERIAL	Loads	LB's	Gallons	#
Durawood Treating	5	237380	27705.4	$7157.20
Southern Pacific	42	2,426,080	280,471	#65,868.07
Owen ILL	19	950,910	102248	JOC # 4800.00
Capital Supply	16		123582	JOC #. 12,160.00
ColFax Creosoting	2	92260.	10768	#2781.72
Bernuth Lembcke	5	GATX To Southern Pacific		#2737.00

Dixie oil # 78,543.99
JOC 16,960.00

0015209

.02715

Southern Pacific

6-20-78	176	56590	
6-20-78	177	57980	
6-20-78	178	58750.	
6-20-78	179	56820	
6-20-78	180	56300.	
6-20-78	181	56340	342780 = 9306.48 - 93
6-27-78	200	59000	
6-27-78	201	62720	
6-27-78	202	56940	
6-27-78	203	56960	
6-27-78	204	58520	
6-27-78	206	61600	
6-28-78	205	55200	
6-28-78	207	58660	
6-28-78	208	56190	
6-28-78	209	56210	
6-28-78	210	58760	
6-28-78	212	55780	

SouThern Pacific

6-6-78	149	56940		
6-6-78	150	60460		
6-6-78	151	49100		
6-6-78	152	38230		
6-6-78	154	56800		
6-6-78	156	59510		
6-7-78	157	60600		
6-7-78	158	59600		
6-7-78	132	59240		
6-7-78	159	56920		
6-7-78	160	59240		
6-7-78	161	58320		
6-13-78	164	59720		
6-13-78	165	51820		
6-13-78	166	54660		
6-13-78	167	60400		
6-13-78	168	54880		
6-13-78	169	56740		
6-14-78	170	58500		
6-14-78	171	54860		
6-14-78	172	57300		
6-14-78	173	60540		
6-14-78	174	61760	42 Loads	
6-14-78	175	60620	2,426,080 LB's	$65,868.07

7-1-78
7-31-78

OUT GOING

MATERIAL	Load	LB's	Gallons	$
Durawood Treating	4	184820	21572	$5572.1[illegible]
Southern Pacific	60	3,441,090	404834	$93,425.5
Owen Ill	4	245390	25561 JOC	$2400.0
Capital Supply	-0-		-0-	
Colfax Creosoting	1	50060	5843	$1508.13
[redacted]				
Sonco (VCM)	1	55800	5530	(829.50)
Beewith Lembeke	28 hrs			$700.00
Petro Max	14 Loads	702246	97895 JOC	$10728.7

Dixie
JOC

0015216

Southern Pacific

7-26-78	278	54700		
7-26-78	279	60520		
7-26-78	280	55440		
7-27-78	281	60870		
7-27-78	282	58680		
7-27-78	283	61170		
7-27-78	285	62140		
7-27-78	286	58040		
7-27-78	287	53140		
7-27-78	288	56530	1,053,870	= $28,612.57

60 Loads 3,441,090 = #93455.59

Southern Pacific

7-18-78	250	56660	
7-18-78	251	56440	
7-18-78	252	56260	
7-18-78	253	57340	
7-18-78	254	56400	
7-18-78	255	58170	
7-18-78	256	55780	
7-18-78	257	55260	
7-18-78	258	59780	
7-19-78	259	57530	
7-19-78	260	57920	
7-19-78	261	57960	
7-19-78	262	49640	
7-19-78	263	57420	
7-19-78	264	54400	
7-19-78	265	57520	
7-19-78	267	55300	
7-19-78	268	50620	1,010,400 · .02715 = #27432.36
7-26-78	270	58640	
7-26-78	271	40810	
7-26-78	272	60160	
7-26-78	273	60930	
7-26-78	274	57120	
7-26-78	275	59000	
7-26-78	276	57480	
7-26-78	277	58500	

SouThern PaciFic

7-5-78	223	57040	
7-5-78	224	59570	
7-5-78	225	56320	
7-5-78	226	55260	
7-5-78	227	59630	
7-6-78	228	59630	
7-6-78	229	60060	
7-6-78	230	50840	458,350 · .02715 = # 12,444.20

8

~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	
7-11-78	234	59400	
7-11-78	235	58080	
7-11-78	236	56840	58613
7-11-78	237	57520	
7-12-78	238	60550	
7-12-78	239	60220	
7-12-78	240	56920	
7-12-78	241	59380	468910 · .02715 = # 12,730.91

7-14-78	242	58620	
7-13-78	243	58320	AV Load 56195
7-13-78	244	56760	
7-14-78	245	46140	
7-13-78	246	61120	
7-13-78	247	55740	
7-14-78	248	55400	~~392100 · .02715 = # 10,645.5~~
7-14-78	249	57460	449560 · " # 12205.56

8-1-78
8-31-78

OUTGOING

	Loads	LB's	Gallons	$
Durawood Treating	4	187400	21872	$5648.56
Southern Pacific	68	3910170	454670	$104161.12
Owens Ill.	-0-			
Colfax Creosoting	1	45060	5259	$1356.25
Bernuth Lembcke	6			$1675.00
Petro Mar BT-3	8	413120	57506	6325.0
Petro Mar BT-10	-0-			
Paragon Paint	1	54300	6388	$2014.00
Sunco	6	313460	30502	(

0015213

KG COH003996

P-0039

Dixie Oil Processors, Inc.

COMPANY - SOUTHERN PACIFIC | PRODUCT CREOSOTE EXTENDER

DATE	WEIGHT	GALLONS	Shipping Order			
8-22-78	54480	6334	358			
8-22-78	61210	7117	343			
8-22-78	60240	7004	344			
8-22-78	60220	7002	345			
8-22-78	58660	6821	357			
8-22-78	62050	7215	359			
8-22-78	57100	6640	360			
8-22-78	55380	6440	361			
8-22-78	52000	6046	362			
8-22-78	57360	6739	363			
8-22-78	56000	6512	364			
8-22-78	57520	6688	365			
8-22-78	55540	6458	366			
8-23-78	59620	6932	367			
8-23-78	62000	7209	368			
8-23-78	51460	5983	369	16 Loads	921240 = 25,0	11.66
8-29-78	56360	6553	378			
8-29-78	62560	7274	379			
8-29-78	57820	6723	380			
8-29-78	63140	7341	381			
8-29-78	63060	7333	382			

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

Dixie Oil Processors, Inc.

COMPANY - SouThern PaciFic | ProducT CREOSOTE EXTENDER

DATE	WEIGHT	GALLONS		
8-9-78	50400	5929	330	
8-9-78	59680	7021	331	
8-9-78	56340	6628	332	
8-9-78	55240	6499	333	
8-9-78	57120	6720	334	Av. Load = 56426
8-9-78	55720	6555	335	
8-10-78	59180	6962	336	
8-10-78	60900	7165	337	
8-10-78	59860	7042	338	
8-10-78	55560	6536	339	
8-10-78	55220	6496	340	
8-10-78	56520	6649	341	
8-10-78	59040	6946	342	18 Loads - 1015470 = $27,575.44
8-15-78	58040	6828	346	
8-15-78	59240	6969	347	
8-15-78	57720	6791	348	Av. Load 59136
8-15-78	62040	7299	350	
8-15-78	55520	6536	351	
8-15-78	60260	7089	352	6 Loads: 354820 = $9633.36

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

Dixie Oil Processors, Inc.

Company - Southern Pacific | Product Creosote Extender

Date	Weight	Gallons			
8-1-78	58610	[illegible]895			
8-1-78	60330	7098			
8-1-78	61000	7176			
8-1-78	58240	6852			
8-1-78	55600	6541			
8-1-78	56660	6666			
8-1-78	56860	6689			
8-1-78	54220	637[illegible]			
8-1-78	50380	5927			
8-1-78	45860	5395			
8-1-78	55760	6560			
8-1-78	56140	6605			
8-2-78	53000	[illegible]			
8-2-78	60080	7068			
8-2-78	62620	7367			
8-2-78	56720	[illegible]	16 Loads	[illegible]	$2449.57
8-9-78	54060	6360	313		
8-9-78	59730	7027	324		
8-9-78	52280	6151	327		
8-9-78	53880	6339	328		
8-9-78	54940	6464	329		

14 loads 56380

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(.02715)

Dixie Oil Processors, Inc.

Company Southern Pacific | Product CREOSOTE Extende.

Date	Weight	Car No.	
8-29-78	59900	6965	383
8-29-78	64880	7544	384
8-29-78	60020	6979	385
8-29-78	62880	7312	386
8 29 78	59160	6879	387
8-30-78	47490	5521	388
8-30-78	59100	6872	389

12 load - 716360 - 19449.17

68 loads 3910,170 = 106161

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

Outgoing	Loads	LB's	Gallons	9-1-78 9-20-78 $
Durawood Treating	5	236580	27610	7136.81
Southern Pacific	56	3,019,170	352377	$81,920.47
Colfax Creosoting	2	95880	11199	2890.88
Bernuth Lembcke	4		-	1000.00
Petro Max BT-3	8	403500	56396	6203.56
Petro Max BT-10	8	403300	54442	8166.30
Sunco Vinyl Chloride	1	43940	4031	<644.96>

0015214

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific | PRODUCT Creosote Extender

DATE	WEIGHT	GALLONS				
9-5-78	60230	7036	393			
9-5-78	58420	6825	398			
9-5-78	49580	5792	399			
9-5-78	50960	5953	401			
9-5-78	42900	5012	402			
9-5-78	54140	6325	403			
9-6-78	63000	7360	404			
9-6-78	56200	6565	405			
9-7-78	62200	7266	406			
9-6-78	44960	5252	407			
9-6-78	55980	6540	408			
9-6-78	53660	6269	409			
9-6-78	58040	6780	412			
9-6-78	60300	7044	413			
9-8-78	52560	6140	415			
9-7-78	49340	5764	416			
9-8-78	58800	6869	418			
9-7-78	54640	6383	420	18 Loads	985910 · .02715 =	$26,76
9-12-78	56330	6580	427			
9-13-78	58730	6860	215			
9-13-78	61320	7163	216			

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Dixie Oil Processors, Inc.

Company Southern Pacific | Product Creosote Extender

Date	Weight	Gallons				
9-12-78	61800	7219	434			
9-12-78	58330	6814	435			
9-12-78	42800	5112	436			
9-12-78	52120	6673	437			
9-13-78	52920	6299	440			
9-13-78	52140	6675	444			
9-13-78	57100	6621	446			
9-12-78	62600	7325	453			
9-12-78	47500	5551	454			
[illegible]	60920	7113	455			
9-14-78	[illegible]620	6731	441			
9-12-78	[illegible]	6005	[illegible]			
[illegible]	[illegible]	5346	[illegible]6			
[illegible]	[illegible]300	5~~4~~09	[illegible]	17 Loads .	930710 =	25268.
9-21-78	51960	6920	428			
9-19-78	44500	5199	442			
9-19-78	52500	6133	443			
9-20-78	55980	6540	459			
9-20-78	58800	6869	460			
9-20-78	65640	7668	461			
9-21-78	55500	6484	462			

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Dixie Oil Processors, Inc.

COMPANY	SOUTHERN PACIFIC		PRODUCT	CREOSOTE EXTENDER		
DATE	WEIGHT	GALLONS				
9-20-78	58900	6881	463			
9-20-78	50900	5946	464			
9-20-78	60360	7051	465			
9-20-78	51020	5960	466			
9-20-78	51240	5986	467			
9-20-78	58700	6857	468			
9-21-78	56900	6647	469			
9-21-78	53240	6220	470			
9-21-78	59560	6958	471			
9-21-78	50980	5956	472			
9-21-78	51530	6020	478			
9-21-78	57860	6759	476			
9-21-78	56480	6598	473	20 Loads	1102550	= # 29 93[illegible]
56 Loads	3019,170	352377 ~~3019170~~	= # 81970.47			

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

10-1-78
10-31-78

Outgoing

	Loads	LB's	Gallons	$
Durawood Treating	5	250660	28109	$7263.64
Southern Pacific	69	3692500	434412	100251.38
Colfax Creosoting	—	—	—	—
Bernuth Lembcke	9			837.50
Sunco Vinyl Chl	15	779540	69724	11,225.31

0015208

Dixie Oil Processors, Inc.

Company - Southern Pacific | Product Creosote

Date	Weight	Gallons	#5/0			
10-3-78	60420	7051	474			
10-3-78	46210	5393	475			
10-3-78	55140	6435	477			
10-3-78	59880	6988	484			
10-3-78	54900	6407	485			
10-3-78	58600	6839	486			
10-3-78	55080	6428	487			
10-3-78	50680	5915	488			
10-3-78	49800	5812	489			
10-4-78	50000	5835	492			
10-4-78	51060	5959	493			
10-4-78	50260	5866	494			
10-4-78	53300	6220	495			
10-4-78	55600	6489	496			
10-4-78	55640	6493	497			
10-4-78	57420	6701	498			
10-4-78	57620	6725	499			
10-4-78	59520	6946	502			
10-4-78	51700	6034	501	20 Load Av = 54,598		
10-6-78	59120	6906	503	1091950 = # 29646.44		

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Dixie Oil Processors, Inc.

COMPANY Southern Pacific | PRODUCT Creosote Extender

DATE	WEIGHT	GALLONS	
10-10-78	49380	5768	490
10-10-78	50850	5940	491
10-10-78	57120	6672	505
10-10-78	57440	6710	506
10-10-78	55700	6507	507
~~10~~ 10-11-78	58160	6794	508
10-10-78	48320	5644	509
10-10-78	49500	5782	510
10-10-78	55400	6471	511
10-10-78	51900	6063	512
10-11-78	58020	6778	513
10-11-78	48620	5679	515
10-11-78	49380	5768	516
10-11-78	56260	6572	518
10-11-78	51380	6002	519
10-11-78	57300	6693	520
		99848	
10-17-78	57580	6726	514
10-17-78	50390	5887	523
10-17-78	57020	6661	524
10-17-78	57400	6706	525

16 Load 854700 = $23205.11

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Dixie Oil Processors, Inc.

Company Southern Pacific | Product Creosote Extender

Date	Weight	Gallons			
10-17-78	57260	6689	526		
10-17-78	52540	6138	527		
10-18-78	56980	6657	528		
10-18-78	57360	6701	529		
10-18-78	55980	6540	530		
10-18-78	49000	5724	531		
10-18-78	50200	5864	532		
10-18-78	47000	5491	533		
10-18-78	52900	6180	534		
10-18-78	49040	5729	535		
10-18-78	52400	6121	536	15 Loads	=21,802.81
	803050				
10-24-78	48740	5694	538		
10-24-78	50420	5890	539		
10-24-78	55020	6428	540		
10-24-78	47520	5551	541		
10-24-78	50620	5914	542		
10-24-78	53480	6248	543		
10-24-78	52000	6075	545		
10-24-78	50500	5900	546		
10-24-76	55700	6553	547		

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Dixie Oil Processors, Inc.

Company Southern Pacific | Product Creosote Extender

Date	Weight	Gallons	
10-25-78	58300	6859	548
10-25-78	58260	6853	549
10-24-78	48840	5706	550
10-25-78	48060	5654	551
10-25-78	53440	6287	552
10-25-78	52300	6624	553
10-25-78	48380	5692	554
10-25-78	56860	6684	556
10-25-78	50360	5925	555
	942800	110537	

18 Loads - [redacted] 25,597.02

11-1-78
11-30-78

OUTGOING

	Loads	LB's	Gallons	
Dorawood Treating	7	324700	38515	$4945.37
Southern Pacific	59	3201580	374016	$86922.89
Colfax Creosoting	4	186020	21729	$5613.79
Beenuth Lenbeke				
Sunco Vinyl Chl	11	586020	49030	7844.80
Pen Roy Oil	14	629480	86103	$9520.46

0015206

Dixie Oil Processors, Inc.

Company Southern Pacific | Product Creosote Ext

Date	Weight	Gallons		
11-1-78	55120	6485	566	
11-1-78	57960	6819	567	
11-1-78	55340	6511	568	
11-1-78	48380	5692	569	
11-1-78	49240	5793	570	
11-1-78	56640	6664	571	
11-1-78	49380	5809	573	
11-1-78	49240	5793	574	
11-1-78	49100	5776	575	
11-2-78	57500	6765	578	
11-2-78	56240	6616	579	
11-2-78	56020	6591	580	12 load 640160 = 17380.34
11-7-78	57330	6744	583	
11-7-78	58660	6852	584	
11-7-78	59130	6907	585	
11-7-78	55640	6500	586	
11-7-78	49320	5762	587	
11-7-78	49420	5773	589	
11-7-78	50420	5890	590	
11-7-78	56100	6554	591	
11-7-78	51700	6040	592	

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Dixie Oil Processors, Inc.

COMPANY	Southern Pacific		PRODUCT	Creosote Extender
DATE	WEIGHT	GALLONS		
11-7-78	57300	6694	593	
11-8-78	59180	6914	595	
11-8-78	56240	6570	597	AV-54505
11-8-78	49840	5822	598	
11-8-78	50750	5929	600	
11-8-78	56700	6624	601	
11-7-78	53960	6304	619	16 - 672090 = 23677.24
11-14-78	57180	6680	596	
11-14-78	59100	6904	606	AV-53468
11-14-78	53650	6268	607	
11-14-78	52280	6107	608	
11-14-78	49440	5776	609	
11-14-78	49160	5743	610	320810 = $8709.99
11-17-78	58840	6874	611	
11-17-78	58860	6876	612	
11-17-78	48980	5722	614	AV-53673
11-17-78	48260	5638	615	
11-17-78	58080	6785	616	322040 = $8743.39
11-17-78	49020	5727	618	

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Dixie Oil Processors, Inc.

COMPANY Southern Pacific | PRODUCT Creosote Extender

DATE	WEIGHT	GALLONS	
11-21-78	54620	6380	
11-21-78	58820	6871	
11-22-78	59240	6921	
11-21-78	49540	5787	
11-21-78	49220	5750	AV-54082
11-21-78	49120	5738	
11-21-78	49400	5771	
11-22-78	58220	6801	
11-22-78	58560	6841	486740 = 13214.99
11-29-78	51820	6053	
11-29-78	53500	6250	
11-29-78	58880	6878	
11-29-78	58640	6850	
11-29-78	57480	6714	
11-29-78	53040	6196	
12-1-78	58100	6787	
12-1-78	58640	6850	
12-1-78	54200	6331	
12-1-78	55440	6476	559740 = 15196.94
59 Loads	3201580	374016	86922.89

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86922.90

12-1-78
12-31-78

Out Going

	Loads	LB's	Gallon	$
Durawood	6	290700	33958	8773.28
Southern Pacific	44	2544580	297264	69085.35
Colfax	1	48720	5961	1470.28
Sunco Vinyl	6	336710	31061	<4969.84>
Pen°Roy	10	493740	67900	7679.81
PeTro Max	8	440260	53386	8008.11
Paragon Paint	1	21400	2500	824.35

0015180

Dixie Oil Processors, Inc.

BOX 858
FRIENDSWOOD, TEXAS 77546
Telephone 713 331-6196

INVOICE

SOLD TO
Southern Pacific
P.O. Box 3979
San Francisco, Calif. 94119

NO CREDIT ALLOWED ON GOODS RETURNED WITHOUT OUR PERMISSION

SHIP TO AND DESTINATION
Southern Pacific
Houston Wood Preserving
4900 Liberty Road
Houston, Texas

CUSTOMER'S ORDER NO.	INVOICE DATE	INVOICE NO.	
0088-0899286	Feb. 23, 1979	146	
DATE SHIPPED	**FROM**	**F.O.B.**	**PPD. / COL.**
2-21-79	Choate Road	Delivered	
HOW SHIPPED AND ROUTE	**TERMS**		
our truck	Net 10 days		

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL

WEIGHT	DATE	SHIP. ORDER
58470	2-21-79	1476
55580	2-21-79	1477
57840	2-21-79	1479
56500	2-21-79	1480
61900	2-21-79	1481
53620	2-21-79	1482

343910 x .02715 = 9337.15

AMOUNT DUE...........$9337.15

Removal of waste SAP water from Wood PReserving Works in Houston Texas to Gulf Coast Waste Disposal Authority Sewage Treatment Plant.

Invoice # 01813.......$2012.62

TOTAL AMOUNT DUE THIS INVOICE.....$11 349.77

Dixie Oil Processors, Inc.

COMPANY Southern Pacific | PRODUCT Creosote Extender

DATE	WEIGHT	GALLONS
12-5-78	56650	6617
12-5-78	50280	5873
12-5-78	58580	6843
12-5-78	57780	6750
12-8-78	50220	5866
12-8-78	49500	5782
12-8-78	57830	6755
12-8-78	59180	6913
12-8-78	56820	6637
12-8-78	65860	6525
	552700	
12-12-78	57980	6773
12-12-78	58840	6874
12-12-78	55[illegible]	6533
12-12-78	61[illegible]	7182
12-12-78	56[illegible]	6629
12-12-78	56700	6624
12-15-78	59460	6946
12-15-78	55940	6535
12-15-78	62180	7264
12-15-78	57040	6664
12-15-78	61520	7187
12-15-78	53100	6203

10 Loads

AV 55270

6456 Gallons

15005.81

12 Loads

58075

6784

18920.84

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696900

KG COH004016

P-0059

Dixie Oil Processors, Inc.

COMPANY Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS
12-19-78	58860	6876
12-19-78	59880	6995
12-19-78	59590	6961
12-19-78	58100	6787
12-19-78	58540	6838
12-19-78	61340	7165
~~12~~-22-78	58460	6829
12-22-78	57400	6705
12-22-78	61520	7186
	533690	
12-27-78	59840	6990
12-27-78	59950	7003
12-27-78	60800	7102
12-27-78	56[illegible]	6591
12-27-78	57[illegible]	6978
12-27-78	56920	6649
12-27-78	59500	6950
12-27-78	55560	6490
12-27-78	58920	6883
12-28-78	59740	6978
12-28-78	58420	6824

9 Loads 533690
Av 59298
14489.68

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Dixie Oil Processors, Inc.

Creosote Ext

COMPANY - SouThern Paci Fic | PRODUCT

DATE	WEIGHT	GALLONS	
12-27-78	59460	6946	AU - 58560
12-28-78	56020	6544	12 Loads 20669.02
	761290		
44 Loads	2574580	297264	$69085.35

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

Dixie Oil Processors, Inc.

0394

18

Company - Southern Pacific Product Phenolic Tar

Date	Weight	Gallons	
12-20-79	55980	6220	2205.61
12-27-79	60700	6744	2391.58
12-27-79	60580	6731	2386.85
12-27-79	47500	5277	1871.50
12-27-79	49880	5542	1965.27
12-29-79	59400	6600	2340.36
12-29-79	50380	5527	1984.97
12-29-79	55320	6146	2179.61
12-29-79	60500	6722	2383.70
12-31-79	53800	5977	2119.72
12-31-79	56800	6311	2237.92
	610,840	67,867	24,167.09
TOTAL	1,639,330	182136	56412.85

KG COH004020

Dixie Oil Processors, Inc.

.0394

Company - Southern Pacific | Product Phenolic Tar

Date	Weight	Gallons	
12-1-79	60240	6693	1635.52
12-1-79	62560	6951	1698.50
12-6-79	48260	5362	1310.26
12-6-79	58920	6546	1599.68
12-6-79	60860	6762	1652.35
12-11-79	55420	6157	1504.65
12-11-79	53580	5953	1454.70
12-11-79	58160	6462	1579.04
12-11-79	50100	5566	1360.22
12-14-79	57230	6358	1554.00
12-14-79	55780	6197	1514.43
12-14-79	54560	6062	1481.30
12-18-79	56040	6226	2207.98
12-18-79	60280	6697	2375.03
12-18-79	61300	6811	2415.22
12-18-79	61380	6820	2418.37
12-20-79	51400	5711	2025.16
12-20-79	62420	6935	2459.75
	1,028,490	114,269	32,245.76

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Phenolic Tar

DATE	WEIGHT	GALLONS	
11-26-79	50600	5560	1373.79
11-26-79	62060	6819	1684.93
11-26-79	57520	6320	1561.67
11-26-79	58400	6417	1585.56
11-26-79	53320	5859	1447.64
11-27-79	55520	6101	1507.37
11-27-79	48440	5323	1315.15
11-			
	385860	42,399	10,476.11
TOTAL	1,608,980	181,376	46,114.19

KG COH004022

Dixie Oil Processors, Inc.

.0314

COMPANY - SOUTHERN PACIFIC PRODUCT CREOSOTE

DATE	WEIGHT	GALLONS	
11-5-79	58740	6675	1844.44
11-5-79	60160	6836	1889.02
11-5-79	60420	6865	1892.19
11-6-79	59080	6713	1855.11
11-6-79	58340	6625	1831.88
11-6-79	58520	6650	1837.53
11-9-79	54880	6236	1723.23
11-9-79	57300	6511	1799.22
11-9-79	57300	6511	1799.22
11-9-79	57700	6556	1811.78
11-14-79	59660	6779	1619.77
11-14-79	58780	6679	1595.88
11-14-79	58880	6690	1598.57
11-16-79	52060	5915	1413.43
11-16-79	59040	6709.09	1602.94
11-16-79	63200	7181	1715.88
11-16-79	50020	5684.09	1358.04
11-21-79	60780	6906	1650.18
11-21-79	59820	6797	1624.11
11-21-79	58380	6634	1585.01
11-21-79	60060	6825	1630.63
	1,223,120	138,977	35,683.08

KG COH004023

Dixie Oil Processors, Inc.

COMPANY - SOUTHERN PACIFIC PRODUCT CREOSOTE

DATE	WEIGHT	GALLONS	
10-5-79	55440	6403	#1505.20
10-5-79	59060	6821	1603.48
10-5-79	58260	6729	1581.76
10-9-79	58060	6776	1576.33
10-9-79	57890	6601	1571.71
10-9-79	52720	5990	1431.35
10-11-79	52040	5913	1412.89
10-11-79	56400	6409	1534.26
(?) 10-11-79	55520	6309	1502.37
10-12-79	54860	6234	1489.45
10-12-79	55610	6319	1509.81
10-12-79	[illegible]	6222	1486.73
10-18-79	[illegible]	6575	1570.90
10-18-79	[illegible]	6634	1585.02
10-18-79	58020	6593	1575.24
10-24-79	58380	6634	1585.02
10-24-79	59020	6706	1602.39
10-24-79	58460	6643	1587.19
10-29-79	59120	6718	1605.11
10-29-79	~~58840~~	~~6686~~	~~1597.51~~
10-29-79	58620	6661	1591.53

KG COH004024

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	
10-30-79	58480	6645	1587.73
10-30-79	57780	6565	1568.73
10-30-79	56940	6470	1545.92
24	1370520	159957	37209.62

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	
9-6-79	59940	6995	1627.37
9-6-79	61020	7121	1656.69
9-6-79	60400	7049.47	1639.86
9-6-79	61560	7148	16[illegible].35
9-12-79	58780	6860	1595.88
9-12-79	59140	6902	1605.65
9-12-79	60320	7040	1637.69
9-13-79	57540	6715	1562.21
9-13-79	62120	7250	1686.56
9-13-79	58360	6811	1584.47
9-21-79	[illegible]00	6384	1485.11
9-21-79	56080	6545	1522.57
9-27-79	58360	6740	1584.47
9-28-79	58700	6851	1593.71
14 Loads	827020		$22453.59

KG COH004026

Dixie Oil Processors, Inc.

Company - Southern Pacific | Product Creosote Extender

Date	Weight	Gallons	
8-1-79	59380	6930	1612.17
8-1-79	55460	6472	1505.74
8-1-79	58540	6832	1589.36
8-2-79	58920	6876	1599.68
8-1-79	57100	6664	1550.27
8-1-79	59820	6981	1624.11
8-1-79	56180	6556	1525.29
8-1-79	54440	6353	1478.05
8-1-79	57740	6739	1567.64
8-2-79	58460	6823	1587.19
8-2-79	47520	5546	1290.17
8-2-79	59860	6986	1625.20
8-8-79	[illegible]	6984	1624.66
8-8-79	[illegible]	7296	1697.42
8-8-79	59440	6937	1613.80
8-8-79	56660	6636	1543.75
8-8-79	58680	6848	1593.16
8-8-79	61880	7222	1680.04
	1,042,440	121,681	28,307.70

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Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote Ext.

DATE	WEIGHT	GALLONS	
8-15-79	59780	6904	1623.03
8-15-79	59820	6909	1624.11
8-15-79	49380	5703	1340.67
8-21-79	51540	6015	1399.31
8-21-79	55360	6461	1503.02
8-21-79	53080	6195	1441.12
8-23-79	54360	6248	1475.87
8-23-79	54840	4334	1488.91
8-23-79	52440	6027	1423.75
8-23-79	54620	6278	1482.93
8-23-79	58900	6770	1599.14
8-23-79	57880	6652	1571.44
8-30-79	62600	7306	1699.59
8-30-79	57140	6669	1551.35
8-30-79	58600	6768	1590.99
8-30-79	58960	6881	1600.76
8-31-79	59440	6937	1613.80
8-31-79	60780	7020	1650.18
8-31-79	62580	7303	1699.05
	2124540	247962	57681.26

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KG COH004028

Dixie Oil Processors, Inc.

Company - Southern Pacific Water Product

Date	Weight	Gallons
7-2-79	5500	
7-2-79	5500	
7-3-79	5500	
7-3-79	7000	
4 Load	23500	

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KG COH004029

Dixie Oil Processors, Inc.

COMPANY: Southern Pacific PRODUCT: Creosote

DATE	WEIGHT	GALLONS	
7-6-79	54800	6395	1482.82
7-6-79	55460	6472	1505.74
7-6-79	54040	6307	1467.[illegible]
7-6-79	56740	6622	1540.47
7-6-79	47760	5574	1296.68
7-6-79	58500	6827	1588.28
7-6-79	57940	6762	1573.07
7-6-79	58960	6881	1600.76
7-6-79	48480	5658	1316.23
7-11-79	57280	6685	1555.15
7-11-79	59960	6998	1627.91
7-11-79	48900	5707	1327.64
7-11-79	57[illegible]0	6683	1554.61
7-11-79	6[illegible]40	7077	1646.38
7-11-79	59140	6902	1605.65
7-11-79	56680	6615	1538.86
7-11-79	57720	6736	1567.10
7-11-79	57300	6637	1555.70

9 loads – 13326.20

9 loads / 14079.08

KG COH004030

Dixie Oil Processors, Inc.

T-1
7-31

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	
7-18-79	49180	5739	1335.24
7-17-79	60360	7044	1638.77
7-17-79	62340	7275	1692.53
7-17-79	57440	6704	1559.50
7-17-79	61480	7175	1669.18
7-17-79	58560	6834	1589.90
7-17-79	63360	7394	1720.22
7-17-79	60260	7033	1636.06
7-20-79	58400	6816	1585.56
7-20-79	63050	7358	1711.81
7-26-79	57580	6720	1563.30
29 Loads			45157.33

8 Loads 12841.40

3 Loads 4860.67

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Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	
6-29-79	54300	2346	1476.42
6-29-79	51180	5973	1389.54
6-29-79	56180	6556	1525.29
6-29-79	55830	6516	1515.78
6-29-79	58020	6771	1575.24
6-29-79	46640	5443	1266.28
6-29-79	49800	5812	1352.07
6-29-79	52360	6111	1421.57
6-29-79	57980	6767	1574.16
6-29-79	46840	5466	1271.71
	529130		
30 Loads	1676[illegible]0	195697	45523.49

wt 10 Load Gallons - 14368.06

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Dixie Oil Processors, Inc.

COMPANY Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS	
6-1-79	58060	6712	1574.33
6-1-79	57060	6596	1549.18
6-8-79	42740	4941	1160.39
6-8-79	57280	6621	1555.15
6-8-79	52120	6025	1415.06
6-8-79	55160	6376	1497.59
6-8-79	57380	6633	1552.87
6-8-79	58200	6728	1580.13
6-15-79	60700	7084	1648.01
6-15-79	58740	6790	1594.79
6-15-79	58[illegible]0	6800	1596.96
6-15-79	60[illegible]	6956	1633.62
6-15-79	62[illegible]0	7181	1686.56
6-15-79	61480	7107	1669.18
6-22-79	58020	6707	1575.24
6-22-79	57280	6621	1555.15
6-22-79	56220	6499	1526.37
6-22-79	57780	6679	1568.73
6-22-79	59200	6843	1607.28
6-22-79	59080	6830	1604.02

6 Loads 8766.19

6 Load 9829.12

6 Loads 9436.79

Loads Wt Gal
40 2309060 264943

Dixie Oil Processors, Inc.

Company Southern Pacific Product Creosote

Date	Weight	Gallons		
5-16-79	58100	6716	1572.42	
5-16-79	57760	6677	1568.18	
5-16-79	60620	7008	1645.83	
5-16-79	63000	7283	1710.45	
5-16-79	57220	6615	1553.52	
5-16-79	61820	7157	1679.50	
5-16-79	56660	6550	1538.32	
5-16-79	56700	6554	1539.41	
5-16-79	61200	7025	1661.58	
5-16-79	61960	7163	1682.21	
5-17-79	58220	6730	1580.87	14 Load 22,303.18
5-17-79	59140	6836	1605.65	
5-17-79	57600	5965	1400.95	
5-16-79	5[illegible]0	6645	1560.58	
	82[illegible]	~~94468.79~~		
5-25-79	61640	7126	1673.53	
5-25-79	60910	7041	1653.71	
5-25-79	46680	5396	1267.36	
5-25-79	61180	7072	1661.04	6 Loads 9395.80
5-25-79	58260	6735	1581.76	
5-25-79	57400	6635	1558.41	
	346070	40008		

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote Extender

DATE	WEIGHT	GALLONS	
5-1-79	58560	6769	1589.90
5-1-79	59360	6862	1611.82
5-1-79	57760	6677	1568.12
5-1-79	59020	6823	1602.39
5-1-79	58920	6811	1599.68
5-1-79	57780	6679	1568.73
	351400	40624	
5-8-79	49240	5250	1350.44
5-8-79	50020	5782	1358.04
5-8-79	51900	6000	1409.[illegible]
5-8-79	62300	7202	1691.45
5-8-79	55880	6460	1517.14
5-8-79	62760	7255	1703.93
5-8-79	503[illegible]	5819	1366.73
5-8-79	62[illegible]	7234	1699.05
5-8-79	58560	6769	1589.90
5-8-79	58400	6251	1585.56
5-8-79	57500	6647	1561.43
5-8-79	52480	6067	1424.83
5-11-79	59220	6846	1607.82
5-11-79	58430	6754	1586.37
	790110	91342	

6 Loads 9540.51

14 Loads 21,451.49

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Dixie Oil Processors, Inc.

COMPANY - SouThern PAciFic | ProducT CReosoTe ExT

DATE	WEIGHT	GAllons	
4-3-79	60000	6936	1629.00
4-3-79	48980	5662	1329.81
4-3-79	49720	5747	1349.90
4-3-79	50000	5780	1352.50
4-3-79	50460	5833	1367.99
4-3-79	50640	5854	1374.88
4-3-79	56340	6513	1529.67
4-3-79	49940	5750	1350.64
4-3-79	57080	6598	1549.72
4-3-79	61160	7070	1660.49
4-3-79	49440	5715	1342.30
4-3-79	56820	6568	1542.66
	640380		
4-5-79	56300	6508	1528.55
4-5-79	5712[illegible]	6603	1550.81
4-5-79	4714[illegible]	5449	1279.85
4-5-79	58900	6809	1599.14
4-5-79	48400	5595	1314.06
4-5-79	58660	6781	1592.62
4-10-79	60720	7019	1648.55
4-10-79	55260	6388	1500.31

12 Loads - 53365
17386.32

6 - load
8865.03

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(R.4)

KG COH004036

Dixie Oil Processors, Inc.

COMPANY · Southern Pacific | PRODUCT Creosote

DATE	WEIGHT	GALLONS		
4-10-79	59960	6931	1622.91	
4-10-79	60120	6950	1632.26	9 loads AV. 59600
4-10-79	61380	7095	1666.47	
4-10-79	59440	6871	1613.80	$14563.26
4-10-79	58960	6816	1600.76	
4-10-79	60800	7028	1650.72	
4-10-79	59760	6908	1622.48	
		62011		
4-12-79	59620	6892	1618.68	
4-12-79	59200	6843	1607.28	
4-12-79	57100	6601	1550.27	
4-12-79	57120	6603	1550.81	6327.04
	233[illegible]	26941		
4-17-79	57220	6615	1553.52	
4-17-79	59520	6880	1615.97	
4-17-79	50600	5849	1373.79	
4-17-79	62100	7179	1686.02	
4-17-79	56640	6547	1537.98	
4-17-79	60860	7035	1652.35	
4-17-79	57490	6646	1560.85	

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Dixie Oil Processors, Inc.

COMPANY: Southern Pacific | PRODUCT Creosote

DATE	WEIGHT	GALLONS	
4-17-79	49920	5771	1355.33
4-17-79	59580	6887	1617.60
4-17-79	62380	7211	1693.62
4-17-79	57400	6635	1558.41
4-17-79	49920	5771	1355.33
4-17-79	62540	7230	1692.96
4-17-79	57360	6631	1552.32
	803530		
4-18-79	58540	6267	1589.31
4-18-79	59320	6857	1610.54
4-18-79	49680	5743	1348.81
4-18-79	52320	6048	1420.49
	1,023,390	118310	27785.54
4-25-79	49620	5736	1347.18
4-25-79	61[illegible]	7107	1669.18
4-25-79	55[illegible]	6376	1497.59
4-25-79	58340	6744	1583.93
4-25-79	49320	5701	1339.04
4-25-79	57800	6682	1569.27
4-24-79	49440	5715	1342.30
4-24-79	60000	6936	1629.00
4-24-79	50080	5789	1359.67
4-24-79	59480	6876	1614.88

18 Load AV 56855

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KG COH004038

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific | PRODUCT Creosote

DATE	WEIGHT	GALLONS	
4-24-79	62730	7252	1703.12
4-24-79	50900	5884	1381.94
4-24-79	57980	6702	1574.16
4-24-79	58840	6802	1592.51
4-24-79	62000	7167	1683.30
4-24-79	57900	6693	1571.99
4-24-79	59640	6894	1619.23
4-24-79	62330	7205	1692.26
	1023040	118270	
67 Loads	3,782,770	437314	102,702.21

AV 568.35

$27775.54

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Dixie Oil Processors, Inc.

COMPANY - Southern Pacific PRODUCT Creosote

DATE	WEIGHT	GALLONS		
2-14-79	55740	6511	13 Loads - 19207.54	AV - 54420
	707460			
2-21-79	58470	6830	AV 57318	
2-21-79	55580	6492		
2-21-79	57840	6757	6 Loads - 9337.15	
2-21-79	56500	6600		
2-21-79	61900	7231		
2-21-79	53620	6264		
	343910	40,174.00		

27 Loads 1518690 177427 41232.43

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18. 41

KG COH004040

Dixie Oil Processors, Inc.

COMPANY - Southern Pacific | PRODUCT Creosote

DATE	WEIGHT	GALLONS	
2-6-79	58500	6834	
2-6-79	57300	6693	AV-58416
2-6-79	60440	7060	
2-6-79	58040	6780	
2-6-79	60860	7109	8 Load - $12687.74
2-7-79	57280	6691	
2-7-79	57160	6677	
2-7-79	57740	6743	
	467320		
2-13-79	58240	6803	
2-13-79	57200	6682	
2-13-79	49700	5806	
2-13-79	52380	6119	
2-13-79	61[illegible]	7175	
2-13-79	50030	5844	
2-13-79	54640	6383	
2-14-79	57840	6757	
2-14-79	56420	6591	
2-14-79	55480	6481	
2-14-79	49900	5829	
2-14-79	48470	5662	

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(R. 4)

Dixie Oil Processors, Inc.

COMPANY - SouThern PacFic PRoducT CReoSoTe

DATE	WEIGHT	GAllONS
1-3-79	50500	5899
1-3-79	62480	7299
1-3-79	62120	7257
1-3-79	61860	7226
1-3-79	61580	7193
1-3-79	50620	5913
1-4-79	62080	7252
1-4-79	62820	7338
1-4-79	60680	7088
1-5-79	60720	7093
1-5-79	59260	6923
1-5-79	60020	7012
1-9-79	60300	7044
1-9-79	59[illegible]	7044
1-9-79	61[illegible]	7231
1-9-79	61250	7155
1-9-79	63640	7434
1-10-79	58180	6796
1-10-79	57860	6759

AV-LB-GAL
AV-59561-6958

12 Loads 714,740 - 19405.19

AV-60441-7060

7 Loads 423090 = 11486.89

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(3.4)

KG COH004042

Dixie Oil Processors, Inc.

Company - Southern Pacific | Product Creosote

Date	Weight	Gallons
1-16-79	59460	6946
1-16-79	59620	6964
1-16-79	60020	7011
1-16-79	61440	7177
1-16-79	60200	7032
1-17-79	58580	6843
1-17-79	63480	7415
1-17-79	56660	6619
1-16-79	63120	7373
1-24-79	58620	6848
1-24-79	58060	6282
1-24-79	59680	6971
1-24-79	60780	7100.
1-24-79	58[illegible]	6876.
1-24-79	59240	6920
1-23-79	58850	6875
1-23-79	49780	5815
1-23-79	58000	6775
1-23-79	50220	5866
1-23-79	58530	6837
1-23-79	59820	6988

AV-60786

9 loads-542580- 14731.05

AV-57536

12 loads-18795.45

690440 lb

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Dixie Oil Processors, Inc.

Company - Southern Pacific Product Creosote Ext.

Date	Weight	Gallons
1-30-79	57800	6752
1-31-79	57480	6714
1-31-79	57460	6712
1-30-79	55840	6523
1-31-79	57600	6728
1-31-79	57020	6661
1-30-79	62420	7292
1-30-79	57920	6766
1-31-79	53560	6257
1-31-79	56480	6598
1-31-79	58360	6817
1-31-79	49760	5813
1-31-79	59140	6908
1-31-79	59[illegible]	6983
	800	

AV - 5787

21736.83

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(Incoming Material) 1979

JANUARY THRU DECEMBER

Company	Loads	LB's	Gallons	Total $
Monsanto	734	36353018	4039224	241127.01
Oxirane (LWA)	681	34222020	4011960	280887.21
Mobil I	63	2573136	352484	6795.50
Oxirane (Glycol)	172	8161828	877616	17200.00
Southern Pacific (W Water)	134	6474000	780000	
Oxirane (Caustic Water)	1	16560	1656	198.22
Amoco	1	54380	5000	
Mobil II	6	194060	12805	256.12
Rohm & Haas (waste oil)	57	2608160	326020	10521.82
Rohm & Haas (BMA)	12	519200	59832	4188.24
Total	1723	91176362	10466597	$561124.12

KG COH004045

Dixie Oil Processors, Inc.

COMPANY Southern Pacific PRODUCT Creasote Extender

DATE	WEIGHT	GALLONS
12-5-78	56650	6617
12-5-78	50280	5873
12-5-78	58580	6843
12-5-78	57780	6750
12-8-78	50220	5866
12-8-78	49500	5782
12-8-78	57830	6755
12-8-78	59180	6913
12-8-78	56820	6637
12-8-78	55860	6525
	552700	
12-12-78	57980	6773
12-12-78	58840	6874
12-12-78	55[illegible]	6533
12-12-78	61[illegible]	7182
12-12-78	567[illegible]	6629
12-12-78	56700	6624
12-15-78	59460	6946
12-15-78	55940	6535
12-15-78	62180	7264
12-15-78	57040	6664
12-15-78	61520	7187
12-15-78	53100	6203
	696900	

AV 55270 6456 Gallons

10 Loads

15005.81

58075 6784

12 Loads

18920.84

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KG COH004046

Dixie Oil Processors, Inc.

COMPANY SOUTHERN PACIFIC PRODUCT CREOSOTE

DATE	WEIGHT	GALLONS
12-19-78	58860	6876
12-19-78	59880	6995
12-19-78	59590	6961
12-19-78	58100	6787
12-19-78	58540	6838
12-19-78	61340	7165
12-22-78	58460	6829
12-22-78	57400	6705
12-22-78	61520	7186
	533690	
12-27-78	59840	6990
12-27-78	59950	7003
12-27-78	60800	7102
12-27-78	56[illegible]0	6591
12-27-78	5[illegible]	6978
12-27-78	56920	6649
12-27-78	59500	6950
12-27-78	55560	6490
12-27-78	58920	6883
12-28-78	59740	6978
12-28-78	58420	6824

9 Loads 533690

AV. 59298

14489.68

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Dixie Oil Processors, Inc.

Creosote Ext

Company - Southern Pacific | Product

Date	Weight	Gallons	
12-27-78	59460	6946	AU - 58560
12-28-78	56020	6544	13 Loads 20669.02
	761290		
44 Loads	2544580	297264	$69085.35

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Dixie Oil Processors, Inc.

Company Southern Pacific | Product Creosote Ext.

Date	Weight	Gallons	
11-1-78	55120	6485	566
11-1-78	57960	6819	567
11-1-78	55340	6511	568
11-1-78	48380	5692	569
11-1-78	49240	5793	570
11-1-78	56640	6664	571
11-1-78	49380	5809	573
11-1-78	49240	5793	574
11-1-78	49100	5776	575
11-2-78	57500	6765	578
11-2-78	56240	6616	579
11-2-78	56020	6591	580

12 load 640160 = 17380.34

11-7-78	57730	6744	583
11-7-78	58660	6852	584
11-7-78	59130	6907	585
11-7-78	55640	6500	586
11-7-78	49320	5762	587
11-7-78	49420	5773	589
11-7-78	50420	5890	590
11-7-78	56100	6554	591
11-7-78	51700	6040	592

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Dixie Oil Processors, Inc.

COMPANY Southern Pacific | PRODUCT Creosote Extender

DATE	WEIGHT	GALLONS		
11-7-78	57300	6694	593	
11-8-78	59180	6914	595	
11-8-78	56240	6570	592	AV-54505
11-8-78	49840	5822	598	
11-8-78	50750	5929	600	
11-8-78	56700	6624	601	
11-7-78	53960	6304	619	16-872090 = 23677.24
11-14-78	57180	6680	596	
11-14-78	59100	6904	606	AV-53468
11-14-78	53650	6268	607	
11-14-78	52280	6107	608	
11-14-78	49440	5776	609	
11-14-78	49160	5743	610	320810 = $8709.99
11-17-78	58840	6874	611	
11-17-78	58860	6876	612	AV-53673
11-17-78	48980	5722	614	
11-17-78	48260	5638	615	$8743.39
11-17-78	58080	6785	616	322040 =
11-17-78	49020	5727	618	

Dixie Oil Processors, Inc.

COMPANY Southern Pacific | PRODUCT Creosote Extender

[illegible]	WEIGHT	[illegible]	
11-21-78	54620	6380	
11-21-78	58820	6871	
11-22-78	59240	6921	
11-21-78	49540	5787	
11-21-78	49220	5750	AV-54082
11-21-78	49120	5738	
11-21-78	49400	5771	
11-22-78	58220	6801	
11-22-78	58560	6841	486740 = 13214.99
11-29-78	51820	6053	
11-29-78	53500	6250	
11-29-78	58880	6878	
11-29-78	58640	6850	
11-29-78	57480	6714	
11-29-78	53040	6196	
12-1-78	58100	6787	
12-1-78	58640	6850	
12-1-78	54200	6331	
12-1-78	55440	6476	559740 = 15196.94
59 Loads	3201580	374016	86922.89

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86922.90

KG COH004051

Dixie Oil Processors, Inc.

Company - Southern Pacific | Product Creosote

Date	Weight	Gallons	#5/0	
10-3-78	60420	7051	474	
10-3-78	46210	5393	475	
10-3-78	55140	6435	477	
10-3-78	59880	6988	484	
10-3-78	54900	6407	485	
10-3-78	58600	6839	486	
10-3-78	55080	6428	487	
10-3-78	50680	5915	488	
10-3-78	49800	5812	489	
10-4-78	50000	5835	492	
10-4-78	51060	5959	493	
10-4-78	50260	5866	494	
10-4-78	53300	6220	495	
10-4-78	55600	6489	496	
10-4-78	55640	6493	497	
10-4-78	57420	6701	498	
10-4-78	57620	6725	499	
10-4-78	59520	6946	502	
10-4-78	51700	6034	501	20 Load AV = 54,598
10-6-78	59120	6906	503	1091950 = # 29646.44

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

KG COH004052

Dixie Oil Processors, Inc.

Company Southern Pacific | Product Creosote Extender

Date	Weight	Cars No	
10-10-78	49380	5768	490
10-10-78	50850	5940	491
10-10-78	57120	6672	505
10-10-78	57440	6710	506
10-10-78	55700	6507	507
10-11-78	58160	6794	508
10-10-78	48320	5644	509
10-10-78	49500	5782	510
10-10-78	55400	6471	511
10-10-78	51900	6063	512
10-11-78	58020	6778	513
10-11-78	48620	5679	515
10-11-78	49380	5768	516
10-11-78	56260	6572	518
10-11-78	51380	6002	519
10-11-78	57300	6693	520
		99848	
10-17-78	57580	6726	514
10-17-78	50390	5887	523
10-17-78	57020	6661	524
10-17-78	57400	6706	525

16 Load 854700 = $23205.11

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Company Southern Pacific | Product Creosote Extender

Date	Weight	Gallons	
10-17-78	57260	6689	526
10-17-78	52540	6138	527
10-18-78	56980	6657	528
10-18-78	57360	6701	529
10-18-78	55980	6540	530
10-18-78	49000	5724	531
10-18-78	50200	5864	532
10-18-78	47000	5491	533
10-18-78	52900	6180	534
10-18-78	49040	5729	535
10-18-78	52400	6121	536 15 Loads = 21,802.81
	803050		
10-24-78	48740	5694	538
10-24-78	50420	5890	539
10-24-78	55020	6428	540
10-24-78	47520	5551	541
10-24-78	50620	5914	542
10-24-78	53480	6248	543
10-24-78	52000	6075	545
10-24-78	50500	5900	546
10-24-78	55700	6553	547

Dixie Oil Processors, Inc.

COMPANY SOUTHERN PACIFIC | PRODUCT CREOSOTE EXTENDER

DATE	WEIGHT	GALLONS			
10-25-78	58300	6859	548		
10-25-78	58260	6853	549		
10-24-78	48840	5706	550		
10-25-78	48060	5654	551		
10-25-78	53440	6287	552		
10-25-78	52300	6624	553		
10-25-78	48380	5692	554		
10-25-78	56860	6684	556		
10-25-78	50360	5925	555	18 Loads	25,597.02
	942800	110537			

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

11-1-78

11-30-78

OUTGOING

	Loads	LB's	Gallons	
Durawood Treating	7	329700	38515	$ 9945.37
Southern Pacific	59	3201580	374016	$ 86922.89
Colfax Creosoting	4	186020	21729	$ 5613.29
~~Beenuth Lenbeck~~				
Suneo Vinyl Chl	11	586020	49030	7844.80
Pen Roy Oil	14	629480	86103	$ 9520.46

0015206

Dixie Oil Processors, Inc.

Company - Southern Pacific			Product	Creosote Extender		
Date	Weight	Gallons				
9-5-78	60230	7036	393			
9-5-78	58420	6825	398			
9-5-78	49580	5792	399			
9-5-78	50960	5953	401			
9-5-78	42900	5012	402			
9-5-78	54140	6325	403			
9-6-78	63000	7360	404			
9-6-78	56200	6565	405			
9-7-78	62200	7266	406			
9-6-78	44960	5252	407			
9-6-78	55980	6540	408			
9-6-78	53660	6269	409			
9-6-78	58040	6786	412			
9-6-78	60300	7044	413			
9-8-78	52560	6140	415			
9-7-78	49340	5764	416			
9-8-78	58800	6869	418			
9-7-78	54640	6383	420	18 Loads	985910 · .02715 =	$26,767
9-12-78	56330	6580	427			
9-13-78	58730	6860	215			
9-13-78	61320	7163	216			

Dixie Oil Processors, Inc.

COMPANY Southern Pacific			PRODUCT Creosote Extender	
DATE	WEIGHT	GALLONS		
9-12-78	61800	7219	424	
9-12-78	58330	6814	425	
9-12-78	43800	5112	426	
9-[illegible]-78	57130	6673	4[illegible]	
9-[illegible]-78	[illegible]920	6299	[illegible]	
9-[illegible]-78	5[illegible]140	6675	444	
9-[illegible]-78	57100	6671	446	
9-12-78	62600	7325	453	
9-[illegible]-78	47500	5551	454	
[illegible]	60920	7113	455	
9-14-78	[illegible]620	6731	441	
9-12-78	5[illegible]00	6005	44[illegible]	
[illegible]	[illegible]760	5346	[illegible]6	
[illegible]	[illegible]300	5409	45[illegible]	17 Loads 930710 = # 25268.[illegible]
9-21-78	51960	6020	428	
9-19-78	44500	5199	442	
9-19-78	52500	6133	443	
9-20-78	55980	6540	459	
9-20-78	58800	6869	460	
9-20-78	65640	7668	461	
9-21-78	55500	6484	462	

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KG COH004058

Dixie Oil Processors, Inc.

COMPANY	SOUTHERN PACIFIC		PRODUCT	CREOSOTE EXTENDER		
DATE	WEIGHT	GALLONS				
9-20-78	58900	6881	463			
9-20-78	50900	5946	464			
9-20-78	60360	7051	465			
9-20-78	51020	5960	466			
9-20-78	51240	5986	467			
9-20-78	58700	6857	468			
9-21-78	56900	6647	469			
9-21-78	53240	6220	470			
9-21-78	59560	6958	471			
9-21-78	50980	5956	472			
9-21-78	51530	6020	478			
9-21-78	57860	6759	476			
9-21-78	56480	6598	473	20 Loads	102550	$29 934.
56 Loads	3019,170	352377 ~~3019170~~	= $81970.47			

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

Dixie Oil Processors, Inc.

Company - Southern Pacific | Product Creosote Extender

Date	Weight	Gallons	Shipping Order			
8-22-78	54480	6334	358			
8-22-78	61210	7117	343			
8-22-78	60240	7004	344			
8-22-78	60220	7002	345			
8-22-78	58660	6821	357			
8-22-78	62050	7215	359			
8-22-78	57100	6640	360			
8-22-78	55380	6440	361			
8-22-78	52000	6046	362			
8-22-78	57360	6739	363			
8-22-78	56000	6512	364			
8-22-78	57520	6688	365			
8-22-78	55540	6458	366			
8-23-78	59620	6932	367			
8-23-78	62000	7209	368			
8-23-78	51460	5983	369	16 Loads 921240 = 25,011.66		
8-29-78	56360	6553	378			
8-29-78	62560	7274	379			
8-29-78	57820	6723	380			
8-29-78	63140	7341	381			
8-29-78	63060	7333	382			

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Dixie Oil Processors, Inc.

COMPANY:- SouThern PaciFic | PRODUCT CREOSOTE EXTENDER

DATE	WEIGHT	GALLONS			
8-9-78	50400	5929	330		
8-9-78	59680	7021	331		
8-9-78	56340	8628	332		
8-9-78	55240	6499	333		
8-9-78	57120	6720	334		
8-9-78	55720	6555	335	Av. Load = 56426	
8-10-78	59180	6962	336		
8-10-78	60900	7165	337		
8-10-78	59860	7042	338		
8-10-78	55560	6536	339		
8-10-78	55220	6496	340		
8-10-78	56520	6649	341		
8-10-78	59040	6946	342	18 Loads - 1015470	= $27,575.44
8-15-78	58040	6828	346		
8-15-78	59240	6969	347		
8-15-78	57720	6791	348	Av. Load 59136	
8-15-78	62040	7299	350		
8-15-78	57520	6536	351		
8-15-78	60260	7089	352	6 Loads: 354820	= $9633.36

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Dixie Oil Processors, Inc.

COMPANY - SOUTHERN PACIFIC | PRODUCT CREOSOTE EXTENDER

DATE	WEIGHT	GALLONS			
8-1-78	58610	6895			
8-1-78	60330	7098			
8-1-78	61000	7176			
8-1-78	58240	6852			
8-1-78	55600	6541			
8-1-78	56660	6666			
8-1-78	56860	6689			
8-1-78	54220	6379			
8-1-78	52380	5727			
8-1-78	45860	5395			
8-1-78	55760	6560			
8-1-78	56140	6605			
8-[illegible]-78	53000	6235			
[illegible]	60080	7068			
[illegible]	62620	7367			
8-[illegible]-78	56720	[illegible]	16 Loads	[illegible]	$244[illegible]
8-9-78	54060	6360	313		
8-9-78	59730	7027	324		
8-9-78	52280	6151	327		
8-9-78	53880	6339	328		
8-9-78	54940	6464	329		

+4 Loads 56350

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(,02715)

KG COH004062

Dixie Oil Processors, Inc.

Company Southern Pacific | Product CREOSOTE Extender

Date	Weight	Gallons	
8-29-78	59900	6965	383
8-29-78	64880	7544	384
8-29-78	60020	6979	385
8-29-78	62880	7312	386
8 29 78	59160	6879	387
8-30-78	47490	5521	388
8-30-78	59100	6872	389

12 load - 716360 - 19449.17

68 loads 3910170 = 106161

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

12-1-78
12-31-78

Out Going

	Loads	LB's	Gallon	#
Durawood	6	290700	33958	8723.26
Southern Pacific	44	2544580	297264	69085.35
ColFax	1	48720	5961	1470.28
Sunco Vinyl	6	336710	31041	<4969.84>
Pen°Roy	10	493740	67900	7679.81
PeTro Max	8	440260	53386	8008.11
Paragon Paint	1	21400	2500	824.35

0015180

11-1-78
11-30-78

OutGoing

	Loads	LB's	Gallons	
Dorawood Treating	7	324700	38515	$4945.32
Southern Pacific.	59	3201580	374016	$86922.89
Colfax Creosoting	4.	186020	21729	$5613.29
~~Beenuth Lenbecke~~				
Sweco Vinyl Chl	11	586020	49030	7844.80
Pen Roy Oil	14	629480	86103	$9520.46

0015206

10-1-78
10-31-78

Outgoing

	Loads	LB's	Gallons	$
Durawood Treating	5	250660	28109	$7263.64
Southern Pacific	69	3692500	434412	100251.38
Colfax Creosoting	—	—	—	—
Bernuth Lembcke	9			837.50
Sunco Vinyl Chl	15	779540	69724	11,225.31

9-1-78
9-20-78

Outgoing

	Loads	LB's	Gallons	$
Durawood Treating	5	236580	27610	7134.81
Southern Pacific	56	3019120	352377	81,920.47
Col Fax Creosoting	2	95880	11199	2890.88
Bernuth Lembcke	4			1000.00
PeTro Max BT-3	8	403500	56396	6203.56
PeTro Max BT-10	8	403300	54442	8166.30
Sun co Vinyl Chloride	1	43940	4031	〈644.96〉

0015214

115

81-78
8-31-78

OUTGOING

	Loads	LB's	Gallons	$
Durawood Treating	4	187400	21872.	$5648.56
Southern Pacific	68	3910170	454670	$104161.12
Owens Ill.	-0-			
Colfax Creosoting	1	45060	5257	$1356.25
Bernuth Lenbeke	6			$1675.00
Petro Mar BT-3	8	413120	57506	6325.06
~~Petro Mar~~ BT-10	-0-			
Paragon Paint	1	54300	6388	$2014.00
Sunco	6	313460	30502	( )

7-1-28
7-31-28

OUT GOING

MATERIAL	LOAD	LB's		GALLONS	$
Durawood Treating	4	184820		21572	$ 5572.12
Southern Pacific	60	3,441,090		404834	$ 93,425.53
Owen Ill	4	245390		25561	JOC $2400.00
Capital Supply	-0-			-0-	
Colfax Creosoting	1	50060		5843	$ 1508.15
[redacted]					
Sunco (VCM)	1	55800		5530	⟨829.50⟩
Beenith Lembeke	28 hrs				$ 700.00
Petro Max	14 Loads	702246		97895	JOC $10728.74

DIXIE
JOC

0015216

KG COH004070

6-1-78
6-30-78

OutGoing

MATERIAL	Loads	LB's	Gallons	#
Durawood Treating	5	237380	27705.4	$7157.20
Southern Pacific	42	2,426,080	280,471	#65,868.07
Owen Ill	19	950,910	102248	JOC # 4800.00
Capital Supply	16		123582	JOC # 12,160.00
Colfax Creosoting	2	92260	10768	#2781.72
Bernuth Lembcke	5	Goto To Southern Pacific		#2737.00

Dixie oil # 78,543.99
JOC 16,960.00

(OUT Going ~~INCOMMING~~ MATERIAL)

5-1-78
5-31-78

MATERIAL	Loads	LB's	Gallons	
Sodium SulFide (Joe)	9 Loads	456380	48040	$4000.00
SouThern PaciFic	42	2,337,880	273,117	$63,473
InTerConTinenTal Oil (Joe)	2	111060	15862	$2062.00
Durawood TreaTing	9	430052	50192	$12,966.51
ColFax CreosoTing	2	93780	10945	2,827.51
CapiTal Supply (Joe)	9			8,555.00

0015215

Company	Loads	LB's	Gallons	[illegible]
Durawood		3528881	411 [illegible]	[illegible]
Southern Pacific	✓	[illegible]114872	2497754	[illegible]
Pen Ray oil	✓	434710	350649	[illegible]
Sunco (vinyl chloride)		892970	82416	13[illegible]
ColFax	✓	1329118	155125	43885
				393671
Torque Petro (consolidated)		[illegible]291[illegible]	2093074	395[illegible]
				81[illegible]
Petro Max		[illegible]012010	555835	[illegible]
McKenney & T James		342[illegible]	47254	[illegible]
Bernuth Lembcke				14[illegible]
Gulf Chem & Metallurgical [illegible]		[illegible]27790	209157	[illegible]
Gulf Chem & Metallurgical [illegible]		[illegible]	777866	[illegible]
Chemical Exchange ([illegible])		[illegible]12881	430[illegible]	[illegible]
Brown & [illegible]		58[illegible]	[illegible]	1[illegible] 98
[illegible]		[illegible]	[illegible]	1[illegible] 94
Oxi[illegible]		[illegible]	[illegible]	7[illegible] 02
Torque [illegible] (Sunco)		[illegible]	354[illegible]	[illegible]430 63
Koch Int'l		[illegible]	342[illegible]	6[illegible] 99
				16,874.87
Oxirane (moly Btms)		[illegible]	63915	21[illegible] 78
M E Group		115100	12[illegible]57	28447 66
M-K Fuel		[illegible]94[illegible]	11 61809	29046 5 19
				316,056.18

WILSON JONES COMPANY 07504 GREEN 7504 BUFF PAT. APPL. FOR. G7504C COVERLESS MADE [illegible]

[illegible] Material

1979

January — December

Company	Loads	LB's	Gallons	Total $
East Texas Asphalt	✓ 3	149000	17663	7595.23
Lamar Petro	✓ 11	586555	68932	25433.51
Dixie	1485	77612058	9148981	2,031,034.70
Sunco	157	7921901	867808	115967.86
Ending Inventory	81	3699863	435278	108844.50
	1723	89233822	10452067	2255847.06

WILSON JONES COMPANY G7504 GREEN 7504 BUFF PAT. APPL. FOR. 37504C COVERLESS MADE IN U.S.A.

KG COH004074

July 1980

OUTGOING

Loads	Company	WT	Gallons	BBL's		$
3	Bayou Petroleum	141240	16106.73	383.48	@ 8.00	3067.84
4	Durrwood	170280	19593.57	466.50	@ 14.10	6577.63
34	Southern Pacific	1885160	210461.63	4987.05	@ 14.89	74278.20
3	McKenney & James	137219	16933.61	403.19	@ 18.69	7535.61
9	Torque Petro	415880	52372.05	1385.14	@ 16.00	21918.50
4	Colfax	187200	21595.91	514.18	@ 14.10	7249.93
18	Southern Pacific Gulf/Coast	921300	111000	2642.86	@ 5.25	13875.00
69	M-K Fuels	3699861.90	430216.50	10243.25	@ 11.00	112675.76
144		7558140.90	878280.00	20911.43		247178.46

KG COH004075

35

AVERY

KG COH004077

0812/071-02 (HO)

November 16, 1978

NOV 20 1978
R. L. T.

Mr. D. K. Rose
Purchasing Department

SUBJECT: Creosote Extender Requirements, Wood Preserving Works, Houston, TX.

Pursuant to discussions between Mr. W. Money of Purchasing Department and Messrs. R. Kilpatrick and R. Thayer of M. of W. and Engr. Dept. concerning the subject creosote extender, attached are twelve copies of "Creosote Extender Diluent Material Specification Requirements."

We recommend that these requirements be included as part of any future purchase agreement for creosote extender of unknown composition.

H. B. BERKSHIRE

H. B. BERKSHIRE
Per J.B.V.

Attachments
RLT/3a

W. C. L.
NOV 16 1978

SF 508205

KG COH004078

UP0000148
Abraham, et al. vs. UPRR

12 copies

CREOSOTE EXTENDER DILUENT MATERIAL SPECIFICATION REQUIREMENTS:

1. Supplier shall furnish and deliver creosote extender diluent material (to be used as creosote extender in wood preserving process) and shall dispose of excess treating process wastewater in accordance with the following conditions.

2. Diluent material (a) shall be compatible with the treatment process, process equipment, and high flash solvent currently used in the vapor drying process, and shall be compatible and miscible with AWPA Grade 1 Creosote; (b) shall be uniform throughout, shall not contain foreign matter, nor more than 1.00% sulphur, nor more than 0.50% basic sludge and water; (c) shall not be significantly more corrosive to process equipment than creosote, as determined by Railroad; and (d) shall not change chemical characteristics as delivered when subjected to a temperature of 190°F and a pressure of 190 psig for the treatment period.

3. Desired treatment results are required, in a cost effective manner, as determined by Railroad. Emission into the environment of vinyl chloride monomer or of any other substance in objectionable quantities, determined by appropriate government authority, is not acceptable.

4. Should the chemical characteristics of Supplier's diluent material change, Supplier shall secure Railroad's written approval before delivery of any of the different material.

5. Supplier shall submit to Railroad a report of laborabory analysis as follows:

(a) Showing the concentration (in mg/l) in the diluent material of each substance included in the following list:

Arsenic	Lead	Silver
Barium	Manganese	Zinc
Boron	Mercury	Phenols
Cadmium	Nickel	Sulphides
Copper	Selenium	Cyanide or cyanogen compounds

Analytical procedures used shall be specified in such report and shall be approved by Railroad prior to any commitment by Railroad.

(b) Showing quantity of gaseous vinyl chloride emitted from a representative sample of diluent material; test procedure shall be specified by Railroad.

6. Supplier shall furnish Railroad any information concerning diluent material deemed necessary by Railroad.

7. Should the material furnished by Supplier or its use be incompatible with the desired treatment results or be detrimental to the treatment process or equipment or be hazardous to the health or safety of personnel, as determined by Railroad, or result in non-compliance with any environmental, health, pollution, or other applicable law or with any government directive or with any condition of this agreement; the Railroad may, at Railroad's discretion, immediately terminate this agreement, with written notice to Supplier; without incurring any penalty or further obligation to Supplier notwithstanding any other condition of this agreement.

8. Supplier shall remove from Wood Preserving Works (WPW) property excess treating process wastewater generated there and shall transport and dispose of such wastewater in compliance with applicable local, State and Federal regulations. Each delivery vehicle shall remove an equal quantity of wastewater as that of diluent material delivered by that vehicle.

RLT:pm

36, 37

WJL | ? PK
3 AW/2429

American Wood-Preservers' Association

President
Mike Dilbeck
Timber Products Inspection, Inc.
P.O. Box 919
1641 Sigman Road
Conyers, Georgia 30012
Telephone: 770-922-8000
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website: www.awpa.com

June 19, 2001

Richard P. Kinnan, Esq.
Engstrom, Lipscomb & Lack
10100 Santa Monica Boulevard, 16th Floor
Los Angeles, California 90067-4107

Dear Mr. Kinnan:

In response to your letter of May 17, 2001:

The American Wood-Preservers' Association does not have any videotapes of any sort.

The earliest P-Standards in our files are from the last loose-leaf edition of AWPA's *Book of Standards* in 1982. Subsequent editions were bound and are in our files. Available P-Standards meeting your requirements (1950 to 1985) are:

P1-78	P1-78 (Revised)	
P2-68	P2-85	
P3-67		
P4-70		
P5-81	P5-83	P5-85
P7-72	P7-85	
P8-77		
P9-77	P9-84	
P11-70		
P12-68	P12-85	
P13-65	P13-85	

We can provide photocopies of these AWPA Standards for $40.00. Send your request and check in that amount to AWPA, P.O. Box 5690, Granbury, Texas 76049.

Sincerely,

John F. Hall

KG COH004082

P1–78

STANDARD FOR COAL TAR CREOSOTE FOR LAND AND FRESH WATER USE

1. The creosote shall be a distillate derived entirely from tar produced by the carbonization of bituminous coal.

2. The new creosote and the creosote in use in treating operations shall conform to the following detailed requirements:

	New Creosote		Creosote in Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Water, percent by Volume	------	1.5	------	3.0
2.2 Matter Insoluble in Benzene, percent by Wt.	------	0.5	------	1.5
2.3 Specific Gravity at 38°C compared with water at 15.5°C				
2.31 Whole Creosote	1.050	----	1.050	----
2.32 Fraction 235–315°C	1.027	----	1.027	----
2.33 Fraction 315–355°C	1.095	----	1.095	----
2.4 Distillation: The distillate, percent by wt. on a water-free basis, shall be within the following limits:				
Up to 210°C	------	2.0	------	2.0
Up to 235°C	------	12.0	------	12.0
Up to 270°C	------	10.0	------	35.0
Up to 315°C	------	40.0	------	65.0
Up to 355°C	------	60.0	------	77.0

3. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A1).

Proceedings: 1917, 1921, 1923, 1924, 1933, 1935, 1936, 1947, 1950, 1951, 1952, 1953, 1954, 1965, 1978.

—	2.0
—	12.0
10.0	35.0
40.0	65.0
60 0	77.0

Same fig for new + used

KG COH004083

P1–78 (Revised)

STANDARD FOR COAL TAR CREOSOTE FOR LAND AND FRESH WATER USE

1. The creosote shall be a distillate derived entirely from tar produced by the carbonization of bituminous coal.

2. The new creosote and the creosote in use in treating operations shall conform to the following detailed requirements:

	New Creosote		Creosote in Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Water, percent by Volume	------	1.5	------	3.0
2.2 Matter Insoluble in Xylene, percent by Wt.	------	0.5	------	1.5
2.3 Specific Gravity at 38°C compared with water at 15.5°C				
2.31 Whole Creosote	1.050	----	1.050	----
2.32 Fraction 235–315°C	1.027	----	1.027	----
2.33 Fraction 315–355°C	1.095	----	1.095	----

	New Creosote		Creosote in Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than
2.4 Distillation: The distillate, percent by wt. on a water-free basis, shall be within the following limits:				
Up to 210°C	------	2.0	------	2.0
Up to 235°C	------	12.0	------	12.0
Up to 270°C	10.0	35.0	10.0	35.0
Up to 315°C	40.0	65.0	40.0	65.0
Up to 355°C	60.0	77.0	60.0	77.0

3. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A1).

Proceedings: 1917, 1921, 1923, 1924, 1933, 1935, 1936, 1947, 1950, 1951, 1952, 1953, 1954, 1965, **1978.**

KG COH004084

AMERICAN WOOD-PRESERVERS' ASSOCIATION STANDARD

P2–68 (75)

STANDARD FOR CREOSOTE-~~COAL TAR~~ SOLUTIONS

1. The material shall be a pure coal tar product, derived entirely from tar produced by the carbonization of bituminous coal. It may be either a coal tar distillate or a solution of coal tar in coal tar distillate.

2. The material shall conform to the following detailed requirements:

GRADE	A				B			
	New Material		Material In Use		New Material		Material In Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Composition: Coal tar distillate percent by volume	80		80		70		70	
2.2 Water: percent by volume		3.0		3.0		3.0		3.0
2.3 Material Insoluble in Benzol: percent by weight		2.0		3.0		3.0		4.0
2.4 Coke Residue: percent by weight		5.0		6.0		7.0		8.0
2.5 Specific Gravity at 38°C Compared with water at 15.5°C								
2.51 Whole material	1.06	1.11	1.06	1.11	1.07	1.12	1.07	1.12
2.52 Fraction 235/315°C	1.025		1.025		1.025		1.025	
2.53 Fraction 315/355°C	1.085		1.085		1.085		1.085	
2.6 Distillation: the distillate percent by weight on a water free basis shall be within the following limits:								
2.61 Up to 210°C		5		5		5		5
2.62 Up to 235°C		25		25		25		25
2.63 Up to 315°C	36		36		34		34	
2.64 Up to 355°C	60		60		56		56	

GRADE	C				D			
	New Material		Material In Use		New Material		Material In Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Composition: Coal tar distillate percent by volume	60		60		50		50	
2.2 Water: percent by volume		3.0		3.0		3.0		3.0
2.3 Material Insoluble in Benzol: percent by weight		3.5		4.5		4.0		5.0
2.4 Coke Residue: percent by weight		9.0		10.0		11.0		12.0
2.5 Specific Gravity at 38°C Compared with water at 15.5°C								
2.51 Whole material	1.08	1.13	1.08	1.13	1.09	1.14	1.09	1.14
2.52 Fraction 235/315°C	1.025		1.025		1.025		1.025	
2.53 Fraction 315/355°C	1.085		1.085		1.085		1.085	
2.6 Distillation: the distillate percent by weight on a water free basis shall be within the following limits:								
2.61 Up to 210°C		5		5		5		5
2.62 Up to 235°C		25		25		25		25
2.63 Up to 315°C	32		32		30		30	
2.64 Up to 355°C	52		52		48		48	

3.0 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (see Standard A1)

Proceedings: 1917, 1918, 1921, 1923, 1933, 1935, 1936, 1941, 1942, 1947, 1953, 1954, 1957, 1958, 1968

AMERICAN WOOD-PRESERVERS' ASSOCIATION
STANDARD

(This Standard is under the jurisdiction of AWPA Committee P-2)

P2–85

STANDARD FOR CREOSOTE AND CREOSOTE SOLUTIONS

1. The material shall be a pure coal tar product, derived entirely from tar produced by the carbonization of bituminous coal. It may be either a coal tar distillate or a solution of coal tar in coal tar distillate.

2. The material shall conform to the following detailed requirements:

GRADE	A				B			
	New Material		Material In Use		New Material		Material In Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Composition: Coal tar distillate percent by volume	80		80		70		70	
2.2 Water: percent by volume		3.0		3.0		3.0		3.0
2.3 Material Insoluble in Xylene: percent by weight		2.0		3.0		3.0		4.0
2.4 Coke Residue: percent by weight		5.0		6.0		7.0		8.0
2.5 Specific Gravity at 38°C Compared with water at 15.5°C								
2.51 Whole material	1.06	1.11	1.06	1.11	1.07	1.12	1.07	1.12
2.52 Fraction 235/315°C	1.025		1.025		1.025		1.025	
2.53 Fraction 315/355°C	1.085		1.085		1.085		1.085	
2.6 Distillation: the distillate percent by weight on a water free basis shall be within the following limits:								
2.61 Up to 210°C		5		5		5		5
2.62 Up to 235°C		25		25		25		25
2.63 Up to 315°C	36		36		34		34	
2.64 Up to 355°C	60		60		56		56	

GRADE	C				D			
	New Material		Material In Use		New Material		Material In Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Composition: Coal tar distillate percent by volume	60		60		50		50	
2.2 Water: percent by volume		3.0		3.0		3.0		3.0
2.3 Material Insoluble in Xylene: percent by weight		3.5		4.5		4.0		5.0
2.4 Coke Residue: percent by weight		9.0		10.0		11.0		12.0
2.5 Specific Gravity at 38°C Compared with water at 15.5°C								
2.51 Whole material	1.08	1.13	1.08	1.13	1.09	1.14	1.09	1.14
2.52 Fraction 235/315°C	1.025		1.025		1.025		1.025	
2.53 Fraction 315/355°C	1.085		1.085		1.085		1.085	
2.6 Distillation: the distillate percent by weight on a water free basis shall be within the following limits:								
2.61 Up to 210°C		5		5		5		5
2.62 Up to 235°C		25		25		25		25
2.63 Up to 315°C	32		32		30		30	
2.64 Up to 355°C	52		52		48		48	

3.0 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (see Standard A1)

Proceedings: 1917, 1918, 1921, 1923, 1933, 1935, 1936, 1941, 1942, 1947, 1953, 1954, 1957, 1958, 1968, 1985.

P3–67

STANDARD FOR CREOSOTE-PETROLEUM OIL SOLUTION

Creosote-petroleum oil solution shall consist solely of specified proportions of coal tar creosote which meets A.W.P.A. Standard P1 and of petroleum oil which meets A.W.P.A. Standard P4. No creosote-petroleum oil solution shall contain less than 50 percent by volume of such creosote or more than 50 percent by volume of such petroleum oil.*

* Owing to the lack of suitable methods of analysis, it is not possible to determine the relative amounts of either component once these materials have been blended. The purchaser may, therefore, wish to consider obtaining the materials separately and having them blended under his supervision.

P4–70

STANDARD FOR PETROLEUM OIL FOR BLENDING WITH CREOSOTE

Petroleum oil for blending with creosote (Standard P1) shall conform to the following requirements:

1. Specific gravity.*—Specific gravity at 60° F./60° F. not less than 0.96† (not greater than 15.9°, A.P.I.) A.S.T.M. Standard D 287.

2. Water and Sediment.—Water and sediment (B.S. & W.) not more than 1 percent. A.S.T.M. Standard D 96.

3. Flash Point.—Flash point not less than 175 deg., F., as determined by the Pensky–Martens closed tester. A.S.T.M. Standard D 93.

4. Viscosity.—The viscosity shall be expressed as Kinematic vis. cSt at 210° F. by ASTM D 445. It shall not be less than 4.2; nor more than 10.2. Oils of higher viscosity may be used, provided the penetration requirements are met. The purchaser may specify the viscosity best suited to his requirements, allowing the supplier a tolerance of plus or minus 10 percent of the value specified (Equivalent vis. SUS at 210° F. shall be 40 min. to 60 max. by ASTM D 88).

5. Each of the foregoing determinations shall be made in accordance with the A.S.T.M. method currently in effect. The A.S.T.M. Standards referred to herein may be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

* To convert the specific gravity of Group 0 petroleum oils at 60° F./60° F. to specific gravity at 38° C./15.5° C. subtract 0.0140. For Group 1 oils subtract 0.0162. Group 0 oils are those whose specific gravities at 60° F./60° F. are not less than 0.9665. Group 1 oils are those whose specific gravities at 60° F./60° F. are not less than 0.8504 and not over 0.9664.

† Petroleum oil of lower specific gravity may be used provided experience or test shows that it may be blended with creosote without the formation of excessive sludge.

Proceedings: 1939, 1941, 1942, 1943, 1947, 1948, 1955, 1956, 1967, 1970.

KG COH004093

P5–81

STANDARDS FOR WATER-BORNE PRESERVATIVES

Note: Standard P5–81 consists of three pages dated as follows: Pgs. 1–2, 1981; Pg. 3, 1977.

1. ACID COPPER CHROMATE (ACC)[a]

1.1 Acid copper chromate shall have the following composition:

Copper, as CuO	31.8%
Hexavalent chromium, as CrO_3	68.2%

subject to the following tolerances:

1.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min.[b]
Copper, as CuO	28.0%
Hexavalent chromium, as CrO_3	63.3%

1.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Bivalent copper—e.g., copper sulfate
Hexavalent chromium—e.g., sodium or potassium dichromate, chromium trioxide

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

1.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association.[c] (See Standard A2.)

2. AMMONIACAL COPPER ARSENATE (ACA)[a]

2.1 Ammoniacal copper arsenate shall have the following composition:

Copper, as CuO	49.8%
Arsenic, as As_2O_5	50.2%

subject to the tolerances listed in paragraph 2.2.

The above shall be dissolved in a solution of ammonia (NH_3) in water. The weight of ammonia contained in a treating solution shall be a minimum of 1.5 times the weight of copper expressed on the oxide basis. To aid in solution, not over 1.7 percent of glacial acetic acid may be added.

2.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min.[b]
Copper, as CuO	47.7%
Arsenic, as As_2O_5	47.6%

2.3 The treating solution shall contain bivalent copper and pentavalent arsenic derived from compounds in excess of 95 percent purity on an anhydrous basis.

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

2.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

2.5 The valency state of the arsenic component of ACA treating solutions shall be determined in accordance with Section 13 of AWPA Standard A2, to ensure that the arsenic is in the pentavalent form.

CHROMATED COPPER ARSENATE

3. TYPE A[a]

3.1 Chromated copper arsenate, Type A, shall have the following composition:

Hexavalent chromium, as CrO_3	65.5%
Copper, as CuO	18.1%
Arsenic, as As_2O_5	16.4%

subject to the following tolerances:

3.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	59.4	69.3
Copper, as CuO	16.0	20.9
Arsenic, as As_2O_5	14.7	19.7

3.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid. sodium arsenate or pyroarsenate

[a] A list of trade names for water-borne preservatives is shown in Standard M9.

[b] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

[c] Acetic acid may be used if desired to adjust pH of treating solution to conform to paragraph 1.4.

KG COH004094

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

3.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

4. TYPE B[a]

4.1 Chromated copper arsenate, Type B, shall have the following composition:

Hexavalent chromium, as CrO_3	35.3%
Copper, as CuO	19.6%
Arsenic, as As_2O_5	45.1%

subject to the following tolerances:

4.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	33.0	38.0
Copper, as CuO	18.0	22.0
Arsenic, as As_2O_5	42.0	48.0

4.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

4.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

5. TYPE C[a]

5.1 The active ingredients in chromated copper arsenate shall have the following composition:

Hexavalent chromium, as CrO_3	47.5%
Copper, as CuO	18.5%
Arsenic, as As_2O_5	34.0%

5.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	44.5	50.5
Copper, as CuO	17.0	21.0
Arsenic, as As_2O_5	30.0	38.0

5.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

5.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

6. CHROMATED ZINC CHLORIDE (CZC)[a]

6.1 Chromated zinc chloride shall have the following composition:

Hexavalent chromium, as CrO_3	20%
Zinc, as ZnO	80%

subject to the following tolerances:

6.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %[b]
Hexavalent chromium, as CrO_3	19
Zinc, as ZnO	76

6.3 Samples of chromated zinc chloride treating solution taken from a working tank or treating cylinder may show changes in composition as a result of treating operations. Such changes shall not serve to cause rejection of the preservative if they do not raise the ratio of zinc oxide to chromium trioxide to more than 7 to 1, and if it can be shown that the original fresh preservative was of the specified composition.

6.4 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., sodium dichromate, chromium trioxide
Zinc—e.g., zinc chloride

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

[a] A list of trade names for water-borne preservatives is shown in Standard M9.

[b] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

6.5 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

7. FLUOR CHROME ARSENATE PHENOL (FCAP)[a]

7.1 The active ingredients in fluor chrome arsenate phenol preservative shall have the following composition:

Fluoride, as F	22%
Hexavalent chromium, as CrO_3	37%
Arsenic, as As_2O_5	25%
Dinitrophenol[b]	16%

7.2 The analytical composition of the active ingredients in the solid preservative or treating solution shall be between the following limits:

	Min., %	Max., %[c]
Fluoride, as F	20	24
Hexavalent chromium, as CrO_3	33	41
Arsenic, as As_2O_5	22	28
Dinitrophenol	14	18

7.3 The solid preservative or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Fluorides—e.g., sodium or potassium fluoride
Hexavalent chromium—e.g., sodium or potassium chromate or dichromate
Pentavalent arsenic—e.g., sodium arsenate
Dinitrophenol—dinitrophenol

Sodium or potassium hydroxide may be used to adjust the pH, and a solution of the preservative shall be essentially free of insoluble matter. The commercial preservative shall be labaled as to its total content of active ingredients listed in the first paragraph.

7.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

8. pH OF TREATING SOLUTIONS

8.1 The pH of water-borne preservative solutions shall be within the following limits:

Preservative	*pH Limits*
ACA	Not applicable
ACC	2.0–3.9
CCA-Type A	1.6–3.2
CCA-Type B	1.6–3.0
CCA-Type C	1.6–3.0
CZC	2.8–4.0
FCAP	5.5–7.8

8.2 These pH values are preferably measured at an oxide concentration in the treating solution of 15–22 g./l. and at a temperature of 20–30°C. If a treating solution has a pH outside the stated limits, and it can be shown that it can be made conforming by adjustment of concentration to within the recommended limits, the solution shall be considered conforming to the standard.

[a] A list of trade names for water-borne preservatives is shown in Standard M9.

[b] An equal amount of sodium pentachlorophenate may be used in place of dinitrophenol provided the pH of the treating solution is in excess of 7.0.

[c] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

Proceedings: 1942, 1943, 1944, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1960, 1964, 1965, 1966, 1967, 1969, 1971, 1972, 1974, 1975.

P5–83

STANDARDS FOR WATERBORNE PRESERVATIVES

Note: Standard P5–83 consists of four pages dated as follows: Pgs. 1–4, 1983.

Scope

These standards cover waterborne preservative formulations expressed on the oxide basis and prescribe maximum and minimum values of acceptability in either solid, paste, or solution formulations for use in the preservative treatment of wood.

1. ACID COPPER CHROMATE (ACC)[a]

1.1 Acid copper chromate shall have the following composition:

Copper, as CuO	31.8%
Hexavalent chromium, as CrO_3	68.2%

subject to the following tolerances:

1.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min.[b]
Copper, as CuO	28.0%
Hexavalent chromium, as CrO_3	63.3%

1.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Bivalent copper—e.g., copper sulfate
Hexavalent chromium—e.g., sodium or potassium dichromate, chromium trioxide

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

1.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association.[c] (See Standard A2.)

[a] A list of trade names for water-borne preservatives is shown in Standard M9.

[b] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

[c] Acetic acid may be used if desired to adjust pH of treating solution to conform to paragraph 1.4.

2. AMMONIACAL COPPER ARSENATE (ACA)[a]

2.1 Ammoniacal copper arsenate shall have the following composition:

Copper, as CuO	49.8%
Arsenic, as As_2O_5	50.2%

subject to the tolerances listed in paragraph 2.2.

The above shall be dissolved in a solution of ammonia (NH_3) in water. The weight of ammonia contained in a treating solution shall be a minimum of 1.5 times the weight of copper expressed on the oxide basis. To aid in solution, not over 1.7 percent of glacial acetic acid may be added.

2.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min.[b]
Copper, as CuO	47.7%
Arsenic, as As_2O_5	47.6%

2.3 The treating solution shall contain bivalent copper and pentavalent arsenic derived from compounds in excess of 95 percent purity on an anhydrous basis.

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

2.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

2.5 The valency state of the arsenic component of ACA treating solutions shall be determined in accordance with Section 13 of AWPA Standard A2, to ensure that the arsenic is in the pentavalent form.

3. AMMONIACAL COPPER ZINC ARSENATE (ACZA)[a].

3.1 Ammoniacal Copper Zinc Arsenate shall have the following composition:

Copper as CuO	50.0%
Zinc as ZnO	25.0%
Arsenic as As_2O_5	25.0%

Subject to the tolerances listed in Paragraph 3.2.

The above shall be dissolved in a solution of ammonia (NH_3) in water. The weight of ammonia contained in a treating solution and obtained from ammonium hydroxide, shall be at least 1.38 times the weight of copper oxide. To aid in solution, it is also necessary that the treating solution contain ammonium bicarbonate (NH_4HCO_3) at least equal to 0.92 times the weight of copper oxide.

3.2 The composition of the preservative present in a treating solution may vary within the following limits:

	Max. %[b]	Min. %[b]
Copper as CuO	45.0	55.0
Zinc as ZnO	22.5	27.5
Arsenic as As_2O_5	22.5	27.5

3.3 The treating solution shall contain bivalent copper, bivalent zinc and pentavalent arsenic derived from compounds in excess of 95 percent purity on an anhydrous basis.

The commercial preservative shall be labeled as to its total content of active ingredients listed in Paragraph 3.1.

3.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association.

3.5 The valency state of the arsenic component of ACZA treating solutions shall be determined in accordance with Section 13 of AWPA Standard A2, to ensure that the arsenic is in the pentavalent form.

CHROMATED COPPER ARSENATE

4. TYPE A[a]

4.1 Chromated copper arsenate, Type A, shall have the following composition:

Hexavalent chromium, as CrO_3	65.5%
Copper, as CuO	18.1%
Arsenic, as As_2O_5	16.4%

subject to the following tolerances:

4.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	59.4	69.3
Copper, as CuO	16.0	20.9
Arsenic, as As_2O_5	14.7	19.7

[a] A list of trade names for waterborne preservatives is shown in Standard M9.

[b] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

4.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

4.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

5. TYPE B[a]

5.1 Chromated copper arsenate, Type B, shall have the following composition:

Hexavalent chromium, as CrO_3	35.3%
Copper, as CuO	19.6%
Arsenic, as As_2O_5	45.1%

subject to the following tolerances:

5.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	33.0	38.0
Copper, as CuO	18.0	22.0
Arsenic, as As_2O_5	42.0	48.0

5.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

5.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

6. TYPE C[a]

6.1 The active ingredients in chromated copper arsenate shall have the following composition:

Hexavalent chromium, as CrO_3	47.5%
Copper, as CuO	18.5%
Arsenic, as As_2O_5	34.0%

6.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	44.5	50.5
Copper, as CuO	17.0	21.0
Arsenic, as As_2O_5	30.0	38.0

6.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

6.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

7. CHROMATED ZINC CHLORIDE (CZC)[a]

7.1 Chromated zinc chloride shall have the following composition:

Hexavalent chromium, as CrO_3	20%
Zinc, as ZnO	80%

subject to the following tolerances:

7.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %[b]
Hexavalent chromium, as CrO_3	19
Zinc, as ZnO	76

7.3 Samples of chromated zinc chloride treating solution taken from a working tank or treating cylinder may show changes in composition as a result of treating operations. Such changes shall not serve to cause rejection of the preservative if they do not raise the ratio of zinc oxide to chromium trioxide to more than 7 to 1, and if it can be shown that the original fresh preservative was of the specified composition.

7.4 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., sodium dichromate, chromium trioxide
Zinc—e.g., zinc chloride

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

7.5 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

8. FLUOR CHROME ARSENATE PHENOL (FCAP)[a]

8.1 The active ingredients in fluor chrome arsenate phenol preservative shall have the following composition:

Fluoride, as F	22%
Hexavalent chromium, as CrO_3	37%
Arsenic, as As_2O_5	25%
Dinitrophenol[c]	16%

8.2 The analytical composition of the active ingredients in the solid preservative or treating solution shall be between the following limits:

	Min., %	Max., %[b]
Fluoride, as F	20	24
Hexavalent chromium, as CrO_3	33	41
Arsenic, as As_2O_5	22	28
Dinitrophenol	14	18

8.3 The solid preservative or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Fluorides—e.g., sodium or potassium fluoride
Hexavalent chromium—e.g., sodium or potassium chromate or dichromate
Pentavalent arsenic—e.g., sodium arsenate
Dinitrophenol—dinitrophenol

[a] A list of trade names for water-borne preservatives is shown in Standard M9.

[b] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

[c] An equal amount of sodium pentachlorophenate may be used in place of dinitrophenol provided the pH of the treating solution is in excess of 7.0.

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Sodium or potassium hydroxide may be used to adjust the pH, and a solution of the preservative shall be essentially free of insoluble matter. The commercial preservative shall be labaled as to its total content of active ingredients listed in the first paragraph.

8.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

9. PENTACHLOROPHENOL-AMMONIACAL/SOLVENT SYSTEM (PAS)

9.1 Pentachlorophenol-Ammoniacal/Solvent Systems shall have a composition subject to the following tolerances:

	Min. %	Max. %
Pentachlorophenol (Standard P8)	1.0	10.0
Ammonia (NH_3)	1.0	5.0
Alcohols (Aliphatic, C_1-C_6)	0.5	13.0

The above ingredients shall be dissolved in water by adding a pentachlorophenol-alcoholic solution to a solution of ammonia (NH_3) in water.

Other inert ingredients such as coupling agents and stabilizers may be added in amounts not exceeding 0.25 times the weight of pentachlorophenol in the treating solution.

Note—Alcohols may be straight or branch chained aliphatic alcohols of one to six carbon length.

9.2 Requirements of the treating solution.

9.2.1 The treating solution shall show no signs of penta precipitation when subjected to the test method of the Appendix shown below.

9.2.2 The treating solution shall not be greater than 10 percent more corrosive on 1020 carbon steel when tested by NACE Standard TM-02-70 (AWPA Standard M14) than is exhibited by conventional 5 percent pentachlorophenol in AWPA Standard P9 Solvent Type A.

9.3 Requirements of wood treated with the Pentachlorophenol-Ammoniacal/Solvent Systems.

9.3.1 Treated wood shall not show a leached threshold limit in excess of 0.25 pcf when tested by AWPA Standard M10 using Gloeophyllum trabeum (ATCC No. 11539) as the test fungus.

9.3.2 "Blooming," as defined in paragraph 3.2.2 of AWPA Standard P9 Type C, shall not occur on the surface of treated wood.

APPENDIX to Paragraph 9.2.1

High Temperature Test Method for Precipitation

Add 100 ml of treating solution to a 250 ml Erlenmeyer flask. Add four 6d finishing nails (mild steel) to the solution. With a hot plate heat the solution to 140 degrees F. and maintain this temperature for 6 hours. If the solution remains stable (no precipitation) retest the formulation of the treating solution under pressure at 100 p.s.i.g. and 140 degrees F. in a lab pressure vessel for a period of 16 hours. In this test the solution shall have samples of wood, mild steel, and copper screening in the solution. The sample of copper screening is a catalyst and is approximately 3 inches in diameter with ¼ inch mesh. No precipitation shall occur.

10. pH OF TREATING SOLUTIONS

10.1 The pH of waterborne preservative solutions shall be within the following limits:

Preservative	*pH Limits*
ACA	Not applicable
ACC	2.0–3.9
ACZA	Not applicable
CCA-Type A	1.6–3.2
CCA-Type B	1.6–3.0
CCA-Type C	1.6–3.0
CZC	2.8–4.0
FCAP	5.5–7.8

10.2 These pH values are preferably measured at an oxide concentration in the treating solution of 15–22 g./l. and at a temperature of 20–30°C. If a treating solution has a pH outside the stated limits, and it can be shown that it can be made conforming by adjustment of concentration to within the recommended limits, the solution shall be considered conforming to the standard.

AMERICAN WOOD-PRESERVERS' ASSOCIATION STANDARD

(This Standard is under the jurisdiction of AWPA Committee P-4)

P5–85

STANDARDS FOR WATERBORNE PRESERVATIVES

Note: Standard P5–85 consists of four pages dated as follows: Pgs. 1–3, 1985; pg. 4, 1983

Scope

These standards cover waterborne preservative formulations expressed on the oxide basis and prescribe maximum and minimum values of acceptability in either solid, paste, or solution formulations for use in the preservative treatment of wood.

1. ACID COPPER CHROMATE (ACC)

1.1 Acid copper chromate shall have the following composition:

Copper, as CuO	31.8%
Hexavalent chromium, as CrO_3	68.2%

subject to the following tolerances:

1.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min.[a]
Copper, as CuO	28.0%
Hexavalent chromium, as CrO_3	63.3%

1.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Bivalent copper—e.g., copper sulfate
Hexavalent chromium—e.g., sodium or potassium dichromate, chromium trioxide

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

1.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association.[c] (See Standard A2.)

[a] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

[c] Acetic acid may be used if desired to adjust pH of treating solution to conform to paragraph 1.4.

2. AMMONIACAL COPPER ARSENATE (ACA)

2.1 Ammoniacal copper arsenate shall have the following composition:

Copper, as CuO	49.8%
Arsenic, as As_2O_5	50.2%

subject to the tolerances listed in paragraph 2.2.

The above shall be dissolved in a solution of ammonia (NH_3) in water. The weight of ammonia contained in a treating solution shall be a minimum of 1.5 times the weight of copper expressed on the oxide basis. To aid in solution, not over 1.7 percent of glacial acetic acid may be added.

2.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min.[a]
Copper, as CuO	47.7%
Arsenic, as As_2O_5	47.6%

2.3 The treating solution shall contain bivalent copper and pentavalent arsenic derived from compounds in excess of 95 percent purity on an anhydrous basis.

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

2.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

2.5 The valency state of the arsenic component of ACA treating solutions shall be determined in accordance with Section 13 of AWPA Standard A2, to ensure that the arsenic is in the pentavalent form.

3. AMMONIACAL COPPER ZINC ARSENATE (ACZA) .

3.1 Ammoniacal Copper Zinc Arsenate shall have the following composition:

Copper as CuO	50.0%
Zinc as ZnO	25.0%
Arsenic as As_2O_5	25.0%

Subject to the tolerances listed in Paragraph 3.2.

The above shall be dissolved in a solution of ammonia (NH_3) in water. The weight of ammonia

6.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[a]
Hexavalent chromium, as CrO_3	44.5	50.5
Copper, as CuO	17.0	21.0
Arsenic, as As_2O_5	30.0	38.0

6.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

6.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

7. CHROMATED ZINC CHLORIDE (CZC)

7.1 Chromated zinc chloride shall have the following composition:

Hexavalent chromium, as CrO_3	20%
Zinc, as ZnO	80%

subject to the following tolerances:

7.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %[a]
Hexavalent chromium, as CrO_3	19
Zinc, as ZnO	76

7.3 Samples of chromated zinc chloride treating solution taken from a working tank or treating cylinder may show changes in composition as a result of treating operations. Such changes shall not serve to cause rejection of the preservative if they do not raise the ratio of zinc oxide to chromium trioxide to more than 7 to 1, and if it can be shown that the original fresh preservative was of the specified composition.

7.4 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., sodium dichromate, chromium trioxide
Zinc—e.g., zinc chloride

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

7.5 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

8. FLUOR CHROME ARSENATE PHENOL (FCAP)

8.1 The active ingredients in fluor chrome arsenate phenol preservative shall have the following composition:

Fluoride, as F	22%
Hexavalent chromium, as CrO_3	37%
Arsenic, as As_2O_5	25%
Dinitrophenol[c]	16%

8.2 The analytical composition of the active ingredients in the solid preservative or treating solution shall be between the following limits:

	Min., %	Max., %[b]
Fluoride, as F	20	24
Hexavalent chromium, as CrO_3	33	41
Arsenic, as As_2O_5	22	28
Dinitrophenol	14	18

8.3 The solid preservative or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Fluorides—e.g., sodium or potassium fluoride
Hexavalent chromium—e.g., sodium or potassium chromate or dichromate
Pentavalent arsenic—e.g., sodium arsenate
Dinitrophenol—dinitrophenol

[a] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

[c] An equal amount of sodium pentachlorophenate may be used in place of dinitrophenol provided the pH of the treating solution is in excess of 7.0.

contained in a treating solution and obtained from ammonium hydroxide, shall be at least 1.38 times the weight of copper oxide. To aid in solution, it is also necessary that the treating solution contain ammonium bicarbonate (NH_4HCO_3) at least equal to 0.92 times the weight of copper oxide.

3.2 The composition of the preservative present in a treating solution may vary within the following limits:

	Min. %[b]	Max. %[b]
Copper as CuO	45.0	55.0
Zinc as ZnO	22.5	27.5
Arsenic as As_2O_5	22.5	27.5

3.3 The treating solution shall contain bivalent copper, bivalent zinc and pentavalent arsenic derived from compounds in excess of 95 percent purity on an anhydrous basis.

The commercial preservative shall be labeled as to its total content of active ingredients listed in Paragraph 3.1.

3.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association.

3.5 The valency state of the arsenic component of ACZA treating solutions shall be determined in accordance with Section 13 of AWPA Standard A2, to ensure that the arsenic is in the pentavalent form.

CHROMATED COPPER ARSENATE

4. TYPE A

4.1 Chromated copper arsenate, Type A, shall have the following composition:

Hexavalent chromium, as CrO_3	65.5%
Copper, as CuO	18.1%
Arsenic, as As_2O_5	16.4%

subject to the following tolerances:

4.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	59.4	69.3
Copper, as CuO	16.0	20.9
Arsenic, as As_2O_5	14.7	19.7

[b] The composition of treating solutions in use may deviate outside the limits specified in paragraphs 1.2, 2.2, 3.2, 4.2, 5.2, 6.2 and 7.2 provided: a. The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the Table of para. 3.1 in Standard C1. b. Immediate action is taken to adjust the composition of the treating solution.

4.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

4.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

5. TYPE B

5.1 Chromated copper arsenate, Type B, shall have the following composition:

Hexavalent chromium, as CrO_3	35.3%
Copper, as CuO	19.6%
Arsenic, as As_2O_5	45.1%

subject to the following tolerances:

5.2 The analytical composition of the solid, paste, liquid concentrate or treating solution forms of the preservative may vary within the following limits:

	Min., %	Max., %[b]
Hexavalent chromium, as CrO_3	33.0	38.0
Copper, as CuO	18.0	22.0
Arsenic, as As_2O_5	42.0	48.0

5.3 The solid, paste, liquid concentrate or treating solution shall be made up of water soluble compounds selected from the following groups each in excess of 95 percent purity on an anhydrous basis:

Hexavalent chromium—e.g., potassium or sodium dichromate, chromium trioxide
Bivalent copper—e.g., copper sulfate, basic copper carbonate, cupric oxide or hydroxide
Pentavalent arsenic—e.g., arsenic pentoxide, arsenic acid, sodium arsenate or pyroarsenate

The commercial preservative shall be labeled as to its total content of active ingredients listed in the first paragraph.

5.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

6. TYPE C

6.1 The active ingredients in chromated copper arsenate shall have the following composition:

Hexavalent chromium, as CrO_3	47.5%
Copper, as CuO	18.5%
Arsenic, as As_2O_5	34.0%

Sodium or potassium hydroxide may be used to adjust the pH, and a solution of the preservative shall be essentially free of insoluble matter. The commercial preservative shall be labaled as to its total content of active ingredients listed in the first paragraph.

8.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A2.)

9. PENTACHLOROPHENOL-AMMONIACAL/SOLVENT SYSTEM (PAS)

9.1 Pentachlorophenol-Ammoniacal/Solvent Systems shall have a composition subject to the following tolerances:

	Min. %	Max. %
Pentachlorophenol (Standard P8)	1.0	10.0
Ammonia (NH_3)	1.0	5.0
Alcohols (Aliphatic, C_1-C_6)	0.5	13.0

The above ingredients shall be dissolved in water by adding a pentachlorophenol-alcoholic solution to a solution of ammonia (NH_3) in water.

Other inert ingredients such as coupling agents and stabilizers may be added in amounts not exceeding 0.25 times the weight of pentachlorophenol in the treating solution.

Note—Alcohols may be straight or branch chained aliphatic alcohols of one to six carbon length.

9.2 Requirements of the treating solution.

9.2.1 The treating solution shall show no signs of penta precipitation when subjected to the test method of the Appendix shown below.

9.2.2 The treating solution shall not be greater than 10 percent more corrosive on 1020 carbon steel when tested by NACE Standard TM-02-70 (AWPA Standard M14) than is exhibited by conventional 5 percent pentachlorophenol in AWPA Standard P9 Solvent Type A.

9.3 Requirements of wood treated with the Pentachlorophenol-Ammoniacal/Solvent Systems.

9.3.1 Treated wood shall not show a leached threshold limit in excess of 0.25 pcf when tested by AWPA Standard M10 using Gloeophyllum trabeum (ATCC No. 11539) as the test fungus.

9.3.2 "Blooming," as defined in paragraph 3.2.2 of AWPA Standard P9 Type C, shall not occur on the surface of treated wood.

APPENDIX to Paragraph 9.2.1

High Temperature Test Method for Precipitation

Add 100 ml of treating solution to a 250 ml Erlenmeyer flask. Add four 6d finishing nails (mild steel) to the solution. With a hot plate heat the solution to 140 degrees F. and maintain this temperature for 6 hours. If the solution remains stable (no precipitation) retest the formulation of the treating solution under pressure at 100 p.s.i.g. and 140 degrees F. in a lab pressure vessel for a period of 16 hours. In this test the solution shall have samples of wood, mild steel, and copper screening in the solution. The sample of copper screening is a catalyst and is approximately 3 inches in diameter with ¼ inch mesh. No precipitation shall occur.

10. pH OF TREATING SOLUTIONS

10.1 The pH of waterborne preservative solutions shall be within the following limits:

Preservative	*pH Limits*
ACA	Not applicable
ACC	2.0–3.9
ACZA	Not applicable
CCA-Type A	1.6–3.2
CCA-Type B	1.6–3.0
CCA-Type C	1.6–3.0
CZC	2.8–4.0
FCAP	5.5–7.8

10.2 These pH values are preferably measured at an oxide concentration in the treating solution of 15–22 g./l. and at a temperature of 20–30°C. If a treating solution has a pH outside the stated limits, and it can be shown that it can be made conforming by adjustment of concentration to within the recommended limits, the solution shall be considered conforming to the standard.

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P7–72

STANDARD FOR CREOSOTE FOR BRUSH OR SPRAY TREATMENT FOR FIELD CUTS

1. The creosote shall be a distillate derived entirely from tar produced by the carbonization of bituminous coal.

2. The creosote shall conform to the following detailed requirements:

	Not Less Than	Not More Than
2.1 Moisture percent by volume		1.0
2.2 Specific gravity at 38° C compared to water at 15.5° C	1.06	
2.3 Matter Insoluble in Benzene percent by wt.		0.5
2.4 Distillation, the distillate percent by wt. on a moisture-free basis shall have the following limits:		
Up to 210° C % by wt.		1.0
Up to 235° C % by wt.		10.0
Up to 355° C % by wt.	65.0	
2.5 The creosote shall be fluid and remain crystal-free after 3 hours at 5° C.		

3. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A1).

Proceedings: 1971, 1972.

AMERICAN WOOD-PRESERVERS' ASSOCIATION
STANDARD

(This Standard is under the jurisdiction of AWPA Committee P-2)

P7-85

STANDARD FOR CREOSOTE FOR BRUSH OR SPRAY TREATMENT FOR FIELD CUTS

1. The creosote shall be a distillate derived entirely from tar produced by the carbonization of bituminous coal.

2. The creosote shall conform to the following detailed requirements:

	Not Less Than	Not More Than
2.1 Moisture percent by volume		1.0
2.2 Specific gravity at 38° C compared to water at 15.5° C	1.06	
2.3 Material Insoluble in Xylene percent by wt.		0.5
2.4 Distillation, the distillate percent by wt. on a moisture-free basis shall have the following limits:		
Up to 210° C % by wt.		1.0
Up to 235° C % by wt.		10.0
Up to 355° C % by wt.	65.0	
2.5 The creosote shall be fluid and remain crystal-free after 3 hours at 5° C.		

3. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A1).

Proceedings: 1971, 1972, 1985.

KG COH004110

KG COH004111

P8–77

STANDARDS FOR OIL-BORNE PRESERVATIVES

1. PENTACHLOROPHENOL

1.1 Pentachlorophenol shall contain not less than 95 percent of chlorinated phenols as determined by titration of hydroxyl and calculated as pentachlorophenol.

1.2 It shall contain not more than 1 percent of matter insoluble in N/1 aqueous sodium hydroxide solution.

1.3 It shall have a freezing point of not less than 174°C.

1.4 The foregoing tests shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A5).

1.5 Solvents used to prepare solutions of pentachlorophenol shall comply with the standards of the American Wood-Preservers' Association (See Standard P9)

2. COPPER NAPHTHENATE

2.1 The naphthenic acid used in the manufacture of copper naphthenate shall be of the group of cyclopentane carboxylic acids occurring in petroleum and shall have an acid number of not less than 180, on an oil-free basis.

2.2 The copper naphthenate concentrate used to prepare wood-preserving solutions shall contain not less than 6 percent nor more than 8 percent copper in the form of copper naphthenate.

2.3 All of the copper present in the concentrate shall be combined as copper naphthenate.

2.4 The copper naphthenate concentrate shall not contain more than 0.5 percent water.

2.5 The foregoing tests shall be made in accordance with the standard methods of the American Wood-Preservers' Association.[1] (See Standard A5)

[1] Methods are being prepared for determining conformity with pars. 2.1 and 2.3.

2.6 Solvents used to prepare solutions of copper naphthenate shall comply with the standards of the American Wood-Preservers' Association. (See Standard P9)

3. SOLUBILIZED COPPER-8-QUINOLINOLATE

3.1 Solubilized Copper-8-Quinolinolate shall have the following composition:

Copper-8-quinolinolate, wt., min.	10.0%
Nickel-2-ethylhexoate, wt., min.	10.0%
Inert ingredients (hydrocarbon solvents), wt., min.	80.0%
	100.0%
Physical Properties	
Copper as metal, wt., min.	1.80%
Nickel as metal, wt., min.	1.80%
pH	5.5–6.5
Specific gravity at 77°F.	0.935–0.975

Solubility—Completely soluble in aliphatic and aromatic solvents which comply with the standards of the American Wood-Preservers' Association.

3.2 Solubilized copper-8-quinolinolate should be free of amines, phosphoric acid, or naphthenic acid and its derivatives.

4. BIS(TRI-N-BUTYLTIN) OXIDE

4. Bis(tri-n-butyltin) oxide, commonly called TBTO[2], shall have the following composition:

4.1 TBTO shall have the following composition: Bis (tri-n-butyltin) oxide, wt. min.—95%; Tin as metal, wt. min.—38.2%; wt. max.—40.1%.

4.2 TBTO shall be a colorless to slightly yellow liquid.

4.3 The solvent employed in formulating the preservation solution shall meet the requirements of Hydrocarbon Solvent Type C, Standard P9, Par. 3.1.

[2] Trademark M&T Chemical Co.

KG COH004112

P9–77

STANDARD FOR SOLVENTS FOR ORGANIC PRESERVATIVE SYSTEMS

Note: The ASTM Standards referred to herein may be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia, Pa. 19103.

1. Hydrocarbon Solvent, Type A for preparing solutions of oil-borne preservatives such as pentachlorophenol and copper naphthenate shall be composed of petroleum distillates, or a blend of petroleum distillates and co-solvents provided that the blended solvent meets the following requirements:

Penta

1.1 Distillation, ASTM Standard D-86, total volume of fractions:

1.1.1 50% volume distilling point—490° F. minimum.

1.1.2 90% volume distilling point—585° F. minimum.

1.2 Viscosity of the oil fraction undistilled above 500° F. from a 100 ml ASTM Standard D-86 distillation—Kinematic viscosity, cSt @ 100° F., ASTM Standard D-445—3.46 min. (equivalent SSU viscosity @ 100° F.—37.5 min., ASTM Standard D-88).

1.3 Flash Point, PMCC, ASTM Standard D-93 —150° F. minimum.

1.4 Solvency, grams of pentachlorophenol soluble at 75 degrees F. (see Standard A5, Sect. 4)

1.4.1 In 90 grams of whole oil—10 grams minimum.

1.4.2 In the oil fraction undistilled above 500°F from a 100 ml ASTM Standard D-86 distillation—6 grams minimum.

1.5 Water and Sediment, percent, B.S.&W., ASTM Standard D-96—0.5 maximum.

Note 1: If any co-solvents used are chlorinated solvents, they should not be distilled in a copper distillation apparatus, and the Lime Ignition method should not be used for boring assay.

Note 2: Any co-solvents used shall meet the following requirements on water solubility:

A. The co-solvent shall not be completely water soluble.

B. The co-solvent shall be permitted to have solubility in water to the extent that upon saturation, the solubility of pentachlorophenol in the total preservative blend shall not be affected and that emulsions do not result that would preclude its use.

C. The co-solvent shall not induce leaching of pentachlorophenol from the total preservative blend as determined by the method in Standard A5, Paragraph 8. The amount of pentachlorophenol found in the test sample shall not be less than that found in the control.

Note 3: When hydrocarbon solvent Type A is used to treat species that require steam conditioning (such as southern pine), it is recommended that the solvent have a maximum specific gravity of 0.910 at 60 degrees F. (minimum API gravity 24), ASTM Standard D-287. This will help avoid the formation of oil–water emulsions.

2. Hydrocarbon Solvent, Type B (Volatile Petroleum Solvent—LPG) for preparing solutions of pentachlorophenol, copper naphthenate and Copper-8-Quinolinolate, shall conform to the following requirements:

Cellon

2.1 Vapor pressure @ 100 degrees F., ASTM Standard D-1287—200 psig maximum.

2.2 Distillation, ASTM Standard D-1837.

2.2.1 95 percent volume distilling point—36° F. maximum.

2.3 Auxiliary Solvent.

2.3.1 The auxiliary solvent not to exceed five percent of the total volume of the combined solvent and which will not increase the 95 percent boiling point of the liquefied petroleum gas above 36 degrees F., may be used providing its dry point shall be not more than 160 degrees F. by test method ASTM Standard D-1078.

Note: In using pentachlorophenol dissolved in the type of solvent described above, the usual requirement for solution concentration does not apply. The wood is treated using a full cell process and the retention is controlled by adjusting solution concentration. Results of treatment, with respect to retention, are determined either by assaying the treated wood or by inventorying the preservative in solution before and after a charge.

3. Hydrocarbon Solvent, Type C (Light Hydrocarbon Solvent with Auxiliary Solvent).

Petroleum solvent for preparing solutions of pentachlorophenol shall be composed of the following solvents conforming to the respective indicated requirements:

LST

3.1	Light Petroleum Solvent[1]	
3.11	Gravity, °API at 60° F (D-287)	40.9 min.
3.12	Gravity, Spec. at 60° F (by conversion)	0.820 max.
3.13	Color (D-1500)	1 max.

3.14	Flash TCC, °F (D-56)	80 min.
3.15	Distillation, °F (D-86)	
	IBP	360 max.
	EP	415 max.
3.16	Doctor Test (D-484)	Negative

3.2 Auxiliary Solvent

3.21 An auxiliary or co-solvent shall be used with the Light Petroleum Solvent and pentachlorophenol but shall not exceed 10% of the total volume of the combined solvents. The combination of the auxiliary solvent and Light Petroleum Solvent shall have the following properties:

(a) Viscosity: Kin. vis. cSt. at 100° F. (D 445) ---- 5.8 max. (Equiv. SUS vis. at 100° F. = 45 max. by ASTM D-88.)

(b) Flash, TCC °F (D-56) ---- 80 min.

3.22 Anti-Blooming. The auxiliary solvent shall have such properties and shall be used at such concentrations to prevent "blooming". Blooming is defined as formation of visible penta crystals on any surface of the treated wood within a period of two days after completion of treatment.

3.23 Water Solubility of Auxiliary Solvent. (Standard A5, Par. 9)—Interface not less than 49.5 ml; not more than 50.5 ml.

[1] For treatment of lumber, the distillation E.P. shall be 375° F. max.

3.3 For Solubilized Copper-8-Quinolinolate and Copper Naphthenate solutions the auxiliary solvent need not be used.

4. Hydrocarbon Solvent, Type D (Chlorinated Hydrocarbon Solvent-Inhibited Grade of Methylene Chloride) for preparing solutions of pentachlorophenol, shall conform to the following requirements:

4.1	Distillation Range, °C @ 760 mm Hg ASTM D 1078-49T	39 min. 40 max.
4.2	Specific Gravity, 25/25°C ASTM D 2111B-71	1.314 min. 1.319 max.
4.3	Color, APHA ASTM D 2108–64	15 max.
4.4	Water Content, ppm ASTM D 1364–64	100 max.
4.5	Nonvolatile Matter, ppm ASTM D 2109–71	10 max.
4.6	Acidity as HCl, percent ASTM D 1613–66	0.001 max.
4.7	Acid Acceptance, percent ASTM D 2107–68	0.03 min.

Now - more like 1.5:1

Proceedings: 1949, 1950, 1951, 1952, 1958, 1961, 1963. 1964, 1965, 1966, 1967, 1969, 1970, 1971, 1972, 1973, 1974, 1975.

KG COH004115

P9–84

STANDARDS FOR SOLVENTS AND FORMULATIONS FOR ORGANIC PRESERVATIVE SYSTEMS

Note: Standard P9-84 consists of three pages dated as follows: Pgs. 1–3, 1984

Note: The ASTM Standards referred to herein may be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia, Pa. 19103.

1. Hydrocarbon Solvent, Type A for preparing solutions of oil-borne preservatives such as pentachlorophenol and copper naphthenate shall be composed of petroleum distillates, or a blend of petroleum distillates and co-solvents provided that the blended solvent meets the following requirements:

1.1 Distillation, ASTM Standard D-86, total volume of fractions:

1.1.1 50% volume distilling point—490° F. minimum.

1.1.2 90% volume distilling point—585° F. minimum.

1.2 Viscosity of the oil fraction undistilled above 500° F. from a 100 ml ASTM Standard D-86 distillation—Kinematic viscosity, cSt @ 100° F., ASTM Standard D-445—3.46 min. (equivalent SSU viscosity @ 100° F.—37.5 min., ASTM Standard D-88).

1.3 Flash Point, PMCC, ASTM Standard D-93—150° F. minimum.

1.4 Solvency, grams of pentachlorophenol soluble at 75 degrees F. (see Standard A5, Sect. 4)

1.4.1 In 90 grams of whole oil—10 grams minimum.

1.4.2 In the oil fraction undistilled above 500°F from a 100 ml ASTM Standard D-86 distillation—6 grams minimum.

1.5 Water and Sediment, percent, B.S.&W., ASTM Standard D-96—0.5 maximum.

Note 1: If any co-solvents used are chlorinated solvents, they should not be distilled in a copper distillation apparatus, and the Lime Ignition method should not be used for boring assay.

Note 2: Any co-solvents used shall meet the following requirements on water solubility:

A. The co-solvent shall not be completely water soluble.
B. The co-solvent shall be permitted to have solubility in water to the extent that upon saturation, the solubility of pentachlorophenol in the total preservative blend shall not be affected and that emulsions do not result that would preclude its use.
C. The co-solvent shall not induce leaching of pentachlorophenol from the total preservative blend as determined by the method in Standard A5, Paragraph 8. The amount of pentachlorophenol found in the test sample shall not be less than that found in the control.

Note 3: When hydrocarbon solvent Type A is used to treat species that require steam conditioning (such as southern pine), it is recommended that the solvent have a maximum specific gravity of 0.910 at 60 degrees F. (minimum API gravity 24), ASTM Standard D-287. This will help avoid the formation of oil-water emulsions.

2. Hydrocarbon Solvent, Type B (Volatile Petroleum Solvent—LPG) for preparing solutions of pentachlorophenol, copper naphthenate and Copper-8-Quinolinolate, shall conform to the following requirements:

2.1 Vapor pressure @ 100 degrees F., ASTM Standard D-1287—200 psig maximum.

2.2 Distillation, ASTM Standard D-1837.

2.2.1 95 percent volume distilling point—36° F. maximum.

2.3 Auxiliary Solvent.

2.3.1 The auxiliary solvent not to exceed five percent of the total volume of the combined solvent and which will not increase the 95 percent boiling point of the liquefied petroleum gas above 36 degrees F., may be used providing its dry point shall be not more than 160 degrees F. by test method ASTM Standard D-1078.

Note: In using pentachlorophenol dissolved in the type of solvent described above, the usual requirement for solution concentration does not apply. The wood is treated using a full cell process and the retention is controlled by adjusting solution concentration. Results of treatment, with respect to retention, are determined either by assaying the treated wood or by inventorying the preservative in solution before and after a charge.

3. Hydrocarbon Solvent, Type C (Light Hydrocarbon Solvent with Auxiliary Solvent).

Petroleum solvent for preparing solutions of pentachlorophenol shall be composed of the following solvents conforming to the respective indicated requirements:

3.1	Light Petroleum Solvent[1]	
3.11	Gravity, °API at 60° F (D-287)	40.9 min.
3.12	Gravity, Spec. at 60° F (by conversion)	0.820 max.
3.13	Color (D-1500)	1 max.
3.14	Flash TCC, °F (D-56)	80 min.
3.15	Distillation, °F (D-86)	
	IBP	360 max.
	EP	415 max.
3.16	Doctor Test (D-484)	Negative

3.2 Auxiliary Solvent

3.21 An auxiliary or co-solvent shall be used with the Light Petroleum Solvent and pentachlorophenol but shall not exceed 10% of the total volume of the combined solvents. The combination of the auxiliary solvent and Light Petroleum Solvent shall have the following properties:

(a) Viscosity: Kin. vis. cSt. at 100° F. (D 445) — 5.8 max. (Equiv. SUS vis. at 100° F. = 45 max. by ASTM D-88.)

(b) Flash, TCC °F (D-56) — 80 min.

3.22 Anti-Blooming. The auxiliary solvent shall have such properties and shall be used at such concentrations to prevent "blooming". Blooming is defined as formation of visible penta crystals on any surface of the treated wood within a period of two days after completion of treatment.

3.23 Water Solubility of Auxiliary Solvent. (Standard A5, Par. 9)—Interface not less than 49.5 ml; not more than 50.5 ml.

3.3 For Solubilized Copper-8-Quinolinolate and Copper Naphthenate solutions the auxiliary solvent need not be used.

4. Hydrocarbon Solvent, Type D (Chlorinated Hydrocarbon Solvent-Inhibited Grade of Methylene Chloride) for preparing solutions of pentachlorophenol, shall conform to the following requirements:

4.1	Distillation Range, °C @ 760 mm Hg ASTM D 1078-49T	39 min. 40 max.
4.2	Specific Gravity, 25/25°C ASTM D 2111B-71	1.314 min. 1.319 max.
4.3	Color, APHA ASTM D 2108–64	15 max.
4.4	Water Content, ppm ASTM D 1364–64	100 max.
4.5	Nonvolatile Matter, ppm ASTM D 2109–71	10 max.
4.6	Acidity as HCl, percent ASTM D 1613–66	0.001 max.
4.7	Acid Acceptance, percent ASTM D 2107–68	0.03 min.

5. System Type E for Preparation of Solutions of Pentachlorophenol and Dispersions of these in Water.

5.1 Definitions

5.1.1 The "organic solvent" is defined as the solvent for the pentachlorophenol as defined in paragraph 5.3.

[1] For treatment of lumber, the distillation E.P. shall be 375° F. max.

5.1.2 "Penta concentrate" is defined as a solution of pentachlorophenol in the "organic solvent".

5.1.3 The "dispersing agent" is defined as the substance that, when mixed with the "penta concentrate" causes that "penta concentrate" to disperse easily when mixed into water.

5.1.4 The "dispersible concentrate" is the "penta concentrate" mixed with the "dispersing agent" in the proper proportions for use.

5.1.5 The "treating mixture" is the resulting liquid after the "dispersible concentrate" has been mixed with water and the system is ready for use.

5.2 Specifications of Pentachlorophenol

Pentachlorophenol used in the water dispersible system shall meet the requirements of AWPA Standard P8.

5.3 Specifications of the "Organic Solvent"

5.3.1 The solvent for preparing the solutions of pentachlorophenol shall be composed of petroleum distillates, or a blend of petroleum distillates and co-solvents provided that the blended solvent meets the following requirements:

5.3.1.1 Distillation, ASTM Standard D-86, total volume of fractions:

5.3.1.1.1 50% volume distilling point — 490°F minimum.

5.3.1.1.2 90% volume distilling point — 585°F minimum.

5.3.1.2 Viscosity of the solvent fraction undistilled above 500°F from a 100 ml ASTM Standard D-86 distillation—Kinematic viscosity, cSt @ 100°F, ASTM Standard D-445—3.46 min. (equivalent SSU viscosity @ 100°F—37.5 min., ASTM Standard D-88).

5.3.1.3 Flash Point, PMCC, ASTM Standard D-93—150°F minimum.

5.3.1.4 Solvency, grams of pentachlorophenol soluble at 75°F. (See Standard A5, Sect. 4) In the solvent fraction undistilled above 500°F from 100 ml ASTM Standard D-86 distillation—6 grams minimum.

5.3.1.5 Water and Sediment, percent, B.S. & W., ASTM Standard D-96—0.5 maximum.

Note 1: If any co-solvents used are chlorinated solvents, they should not be distilled in a copper distillation apparatus, and the Lime Ignition method should not be used for boring assay.

Note 2: Any co-solvents used shall meet the following requirements on water solubility:

A. The co-solvent shall not be completely water soluble.

B. The co-solvent shall not include leaching of pentachlorophenol from the total preservative blend as determined by the method in Standard A5, Paragraph 8. The amount of pentachlorophenol found in the test sample shall not be less than that found in the control.

KG COH004118

5.4 Specifications of the "Dispersing Agent"

The "dispersing agent" shall be composed on alkyl aryl sulfonates containing C-8 to C-16 alkyl chains with at least 90% in the C-10 to C-14 range. Co-surfactants shall not exceed 30% by weight of the total active sulfonates.

5.5 Requirements of the "Dispersible Concentrate"

5.5.1 The "dispersible concentrate" shall show no signs of penta crystallization while standing at 40°F (test method shown in Appendix A).

5.5.2 The "dispersible concentrate" shall blend easily with water. (Mixing test method shown in Appendix B).

5.6 Requirements of the "Treating Mixture"

5.6.1 The "treating mixture" shall show no signs of penta crystallization at 40°F (test method shown in Appendix A).

5.6.2 The "treating mixture" shall be stable when tested by the method in Appendix C (Mixing test in Appendix B can be used to form mixture for stability test).

5.6.3 The pH of the treating mixture shall not exceed 7.5.

5.6.4 The treating mixture shall not produce blooming on treated wood.

APPENDIX A
TEST METHOD FOR CRYSTALLIZATION

A 100 ml sample to be tested is poured into a stopper-type 100 ml graduated cylinder. A seed crystal of pentachlorophenol is added to the sample. The stopper is then placed on the graduate and the graduate is placed in a conventional refrigerator compartment (normally maintained at 40°F). The sample is allowed to rest undisturbed for four hours. After the four hour chilling cycle is complete, the test sample is removed from the refrigerator and allowed to warm up to room temperature (75°F to 78°F) for at least two hours. After the sample has set undisturbed for this warmup period, it is visually examined to see if any additional crystals are present. If any additional penta crystals are present, the sample fails. If not, the chill warm cycles are repeated four more times. No signs of additional penta crystals after five complete cycles indicates satisfactory results.

APPENDIX B
MIXING TEST

1. Put 85 ml of water to be used in preparing the treating mixture into a stopper-type 100 ml graduated cylinder.

2. Adjust the temperature of the water in the graduate and the sample of dispersible concentrate to be tested to between 65°F and 95°F.

3. Slowly pour 15 ml of dispersible concentrate into the water without allowing the dispersible concentrate to contact the sides of the graduate. Dispersion formation should occur immediately as the dispersible concentrate contacts the water.

4. Place the stopper on the graduate and invert the cylinder 3 times shaking slightly with each inversion.

5. The treating mixture in the cylinder should now be homogeneous in appearance and ready for use.

Note: This procedure can be used to form the treating mixture for the stability test.

APPENDIX C
STABILITY TEST FOR TREATING MIXTURES

1. To test a treating mixture freshly prepared from the dispersible concentrate, prepare a treating mixture as in the Mixing Test (Appendix B). Allow the sample to sit undisturbed for 12 hrs. Maintain the temperature between 65 and 95°F.

2. For used treating mixtures, obtain a 100 ml sample in a stoppered 100 ml graduate cylinder. Shake the cylinder 10 times to obtain a homogeneous liquid. Allow the sample to sit undisturbed for twice the length of time required for the pressure period of the treating cycle.

3. After the settling period, obtain a sample from the top 5 ml of the undisturbed dispersion.

4. Shake the cylinder vigorously for 60 sec., and immediately obtain a sample of the shaken dispersion.

5. Analyze both samples for pentachlorophenol. The penta concentration of the settled sample should be within 10 percent of the penta concentration of the shaken sample.

P11–70

STANDARD FOR CREOSOTE-PENTACHLOROPHENOL WOOD PRESERVATIVE SOLUTION

1. Creosote-pentachlorophenol solution shall be made up of:

(a) Coal tar creosote meeting the requirements of AWPA Standard P1, "Standard for Creosote" and

(b) A minimum of 2 percent of pentachlorophenol meeting the requirements of AWPA Standard P8, "Standard for Oil-Borne Preservatives—1. Pentachlorophenol."

2. The requirements of Standard P1 also apply after addition of the pentachlorophenol to the creosote.

3. The methods for analyses shall be in accordance with AWPA Standards A1, "Standard Methods for Analysis of Creosote and Oil-Type Preservatives" and A5, "Standard Methods for Analysis of Oil-Borne Preservatives." The addition of 2% pentachlorophenol to creosote affects the results of physical tests, as follows:

Test	Change	Amount
Sp. gravity whole oil	Increase	0.010–0.015
Sp. gravity 235–315 C fraction	Increase	0.010–0.015
Sp. gravity 315–355 C fraction	Increase	0.002–0.004
Amount distilling to 355 C	Decrease	1%–3%
Distillation residue	Increase	1%–3%
Benzol insoluble	Increase	0.1%–0.6%

Proceedings: 1960, 1968, 1970.

P12–68

STANDARD FOR CREOSOTE-COAL TAR SOLUTION TO BE USED IN THE TREATMENT OF MARINE (COASTAL WATERS) PILES AND TIMBERS

1. The material shall be a pure coal-tar product derived entirely from tar produced by the carbonization of bituminous coal.

2. Composition: The material shall be a solution of coal tar in coal-tar creosote.

3. It shall conform to the following detailed requirements:

	Not Less Than	Not More Than
4. Water—percent by volume	------	3.0
5. Material Insoluble in Benzol[1], percent	1.0	3.0
6. Coke Residue[1], percent	4.0	7.0
7. Specific Gravity at 38° C, compared to water at 15.5° C	1.090	----
8. Distillation[1]: The distillate percent, on a water-free basis, shall be within the following limits:		
Up to 210° C	------	5.0
Up to 235° C	------	15.0
Up to 270° C	20.0	35.0
Up to 315° C	35.0	50.0
Up to 355° C	55.0	70.0
9. Specific Gravity of Fractions at 38° C. compared to water at 15.5° C.:		
Fraction 235° C.–315° C	1.030	----
Fraction 315° C.–355° C	1.105	----
10. Specific Gravity of Distillation Residue above 355° C. at 38° C. compared to water at 15.5° C	1.185	----

11. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A1).

[1] Due to treating operations, samples of used solution may show an increase in material insoluble in benzol and in coke residue, and decreases in percentages of distillate up to 235° C. A used solution shall be considered as conforming if it can be shown that the original solution was of specified quality and the used solution conforms to the standard requirements within the following limits:

Benzol Insoluble, maximum percent	4.0
Coke Residue, maximum percent	8.0
Distillate up to 235° C., minimum percent	2.0

Proceedings: 1963, 1965, 1968.

KG COH004124

(This Standard is under the jurisdiction of AWPA Committee P-2)

P12–85

STANDARD FOR CREOSOTE-COAL TAR SOLUTION TO BE USED IN THE TREATMENT OF MARINE (COASTAL WATERS) PILES AND TIMBERS

1. The material shall be a pure coal-tar product derived entirely from tar produced by the carbonization of bituminous coal.

2. Composition: The material shall be a solution of coal tar in coal-tar creosote.

3. It shall conform to the following detailed requirements:

	Not Less Than	Not More Than
4. Water—percent by volume	------	3.0
5. Material Insoluble in Xylene[1], percent	1.0	3.0
6. Coke Residue[1], percent	4.0	7.0
7. Specific Gravity at 38° C, compared to water at 15.5° C	1.090	----
8. Distillation[1]: The distillate percent, on a water-free basis, shall be within the following limits:		
Up to 210° C	------	5.0
Up to 235° C	------	15.0
Up to 270° C	20.0	35.0
Up to 315° C	35.0	50.0
Up to 355° C	55.0	70.0
9. Specific Gravity of Fractions at 38° C. compared to water at 15.5° C.:		
Fraction 235° C.–315° C	1.030	----
Fraction 315° C.–355° C	1.105	----
10. Specific Gravity of Distillation Residue above 355° C. at 38° C. compared to water at 15.5° C	1.185	----

11. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association. (See Standard A1).

[1] Due to treating operations, samples of used solution may show an increase in material insoluble in Xylene and in coke residue, and decreases in percentages of distillate up to 235° C. A used solution shall be considered as conforming if it can be shown that the original solution was of specified quality and the used solution conforms to the standard requirements within the following limits:

Xylene Insoluble, maximum percent	4.0
Coke Residue, maximum percent	8.0
Distillate up to 235° C., minimum percent	2.0

Proceedings: 1963, 1965, 1968, 1985.

KG COH004125

KG COH004126

P13–65

STANDARD FOR COAL TAR CREOSOTE TO BE USED IN THE TREATMENT OF MARINE (COASTAL WATERS) PILES AND TIMBERS

1. The creosote shall be a distillate derived entirely from tar produced by the carbonization of bituminous coal.

2. The new creosote and the creosote in use in treating operations shall conform to the following detailed requirements:

	New Creosote		Creosote in Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Water, percent by Volume	-----	1.5	-----	3.0
2.2 Matter Insoluble in Benzene, percent by Wt.	-----	0.5	-----	1.5
2.3 Specific Gravity at 38°C compared with water at 15.5°C				
2.31 Whole Creosote	1.080	----	1.080	----
2.32 Fraction 235–315°C	1.030	----	1.030	----
2.33 Fraction 315–355°C	1.105	----	1.105	----
2.34 Residue above 355°C	1.160	----	1.160	----
2.4 Distillation: The distillate, percent by wt. on a water-free basis, shall be within the following limits:				
Up to 210°C	-----	2.0	-----	2.0
Up to 235°C	-----	12.0	-----	12.0
Up to 270°C	20.0	40.0	20.0	40.0
Up to 315°C	45.0	65.0	45.0	65.0
Up to 355°C	65.0	75.0	65.0	75.0

3. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association (see Standard A1).

KG COH004128

AMERICAN WOOD-PRESERVERS' ASSOCIATION
STANDARD

(This Standard is under the jurisdiction of AWPA Committee P-2)

P13–85

STANDARD FOR COAL TAR CREOSOTE TO BE USED IN THE TREATMENT OF MARINE (COASTAL WATERS) PILES AND TIMBERS

1. The creosote shall be a distillate derived entirely from tar produced by the carbonization of bituminous coal.

2. The new creosote and the creosote in use in treating operations shall conform to the following detailed requirements:

	New Creosote		Creosote in Use	
	Not Less Than	Not More Than	Not Less Than	Not More Than
2.1 Water, percent by Volume	-----	1.5	-----	3.0
2.2 Matter Insoluble in Xylene, percent by Wt.	-----	0.5	-----	1.5
2.3 Specific Gravity at 38°C compared with water at 15.5°C				
2.31 Whole Creosote	1.080	----	1.080	----
2.32 Fraction 235–315°C	1.030	----	1.030	----
2.33 Fraction 315–355°C	1.105	----	1.105	----
2.34 Residue above 355°C	1.160	----	1.160	----
2.4 Distillation: The distillate, percent by wt. on a water-free basis, shall be within the following limits:				
Up to 210°C	-----	2.0	-----	2.0
Up to 235°C	-----	12.0	-----	12.0
Up to 270°C	20.0	40.0	20.0	40.0
Up to 315°C	45.0	65.0	45.0	65.0
Up to 355°C	65.0	75.0	65.0	75.0

3. Tests to establish conformance with the foregoing requirements shall be made in accordance with the standard methods of the American Wood-Preservers' Association (see Standard A1).

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AMERICAN WOOD-PRESERVERS' ASSOCIATION

STANDARDS 1997

AMERICAN WOOD-PRESERVERS' ASSOCIATION
STANDARD

(This Standard is under the Jurisdiction of AWPA Subcommittee P-5, and P-2)

A1—97

STANDARD METHODS FOR ANALYSIS OF CREOSOTE AND OIL-TYPE PRESERVATIVES

Note: Standard A1-97 consists of nineteen pages dated as follows: Pgs. 1-3, 1997, Pg. 4, 1974; Pg. 5, 1989: Pgs. 6-11, 1997; Pg. 12, 1973; Pgs. 13-14, 1997; Pg. 15, 1981; Pg. 16, 1976; Pg. 17, 1997; Pgs. 18-19, 1980.

Note: The ASTM Standards referred to herein may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103-1180.

1. STANDARD METHOD FOR THE DETERMINATION OF COKE RESIDUE

Notice: This Method has been recommended for removal from this Standard in 1998 without prejudice due to lack of use.

Scope

This method of test covers the determination of the coke residue (fixed carbon) of creosote and creosote solutions. As coal tars vary in their coke residue values, the method is, therefore, not a quantitative index of the percentage of coal tar in creosote solutions. However, by specifying a maximum amount of coke residue as done in AWPA Standard P2, the method does serve to limit the amount of coal tar in such solutions. Formerly the test was also used as a check on the cleanliness of AWPA P1/P13 creosote (absence of coal tar).

Outline of Method

After subjecting the creosote solution (oil) under test to the distillation method (Standard A1, Section 2), the weighed residue at 355°C in the distillation flask is thoroughly mixed and a one gram sample transferred to a special platinum crucible with vented cover. The crucible is then placed in a furnace maintained at 950° ± 20°C for exactly seven minutes. A final weighing gives the amount of coke of the distillation residue. The coke residue of the creosote solution under test is calculated from (a) the percentage of distillation residue at 355°C, (b) the weight of the sample of distillation residue transferred to the platinum crucible, and (c) the weight of coke remaining in the platinum crucible after the coking operation.

Apparatus

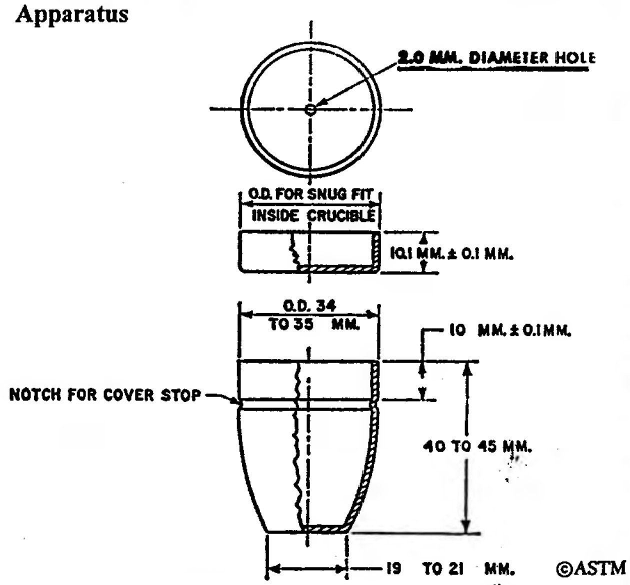

FIGURE 1.—**Platinum Crucible for Use in Determining Coke Residue.**

1. Crucible and Cover—Platinum crucible and cover with dimensions as shown in Figure 1. The cover shall be tightly fitting, shall have a depth of between 10.0 and 10.2 mm, and shall have a hole 2.0 mm in diameter at its center. The crucible without cover shall have a capacity of 25 to 30 ml. It shall have an outside diameter at the top of 34.0 to 35.0 mm, and outside diameter at the bottom of 19 to 21 mm, and a height of 40 to 45 mm. The weight of crucible with cover shall be 25 to 35 g.

2. Crucible Holder—The crucible holder shall be made from No. 20 nichrome wire and a brass ring as shown in Figure 2. The holder serves as a support for the platinum crucible during the coking operation.

3. Furnace—A vertical electric tube furnace having a heating chamber 1-1/2 in. (38 mm) in diameter, by 6 in. (150 mm) in depth. The power input shall be 300 to 400 watts at 115 volts The furnace shall be equipped with a suitable rheostat or variable transformer and pyrometer, for control at 950° ± 20°C. A thermocouple shall be installed through a central hole in the bottom of the furnace, and sealed in place so that its junction is located 2 to 5 mm below the eventual position of the bottom of the platinum crucible.

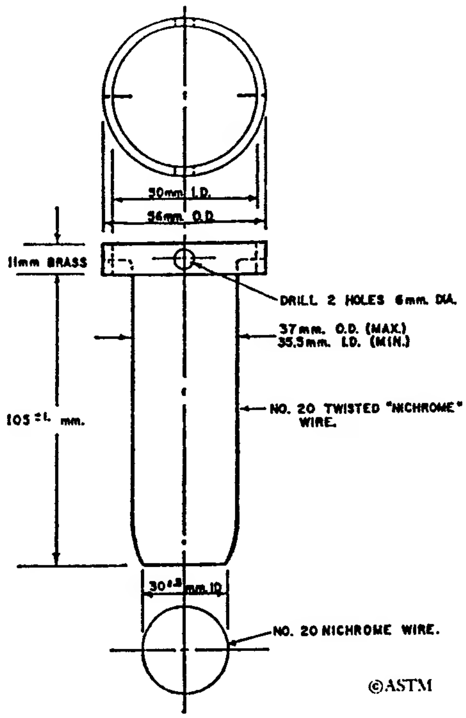

FIGURE 2.—Crucible Holder.

Note: This is the Fieldner-type furnace designed for the determination of volatile matter in coal (Bureau of Mines Bulletin 85). The Hoskins Type FA-120 electric furnace has proven satisfactory.

Procedure

Heat and adjust the temperature of the uncovered. empty furnace to 950° ± 20°C.

Clean the platinum crucible and cover, place them in the crucible holder, and suspend them in the temperature-adjusted furnace for at least five minutes. Remove the holder with contents from the furnace and cool the crucible and cover to about 150°C, being careful not to contaminate the bottom of the crucible. Then place the crucible with cover in a desiccator until they have cooled to room temperature and weigh (P). Record all weighings to the nearest mg.

If the coke residue determination is made shortly after completion of the distillation test (AWPA Standard A1, Section 2) transfer a 1 ± 0.1 g portion of the well-stirred distillation residue at 355°C directly from the distillation flask to the tared platinum crucible. Since the tare weight (P) includes the weight of the platinum cover, the cover must also be on the balance pan during this operation.

If the residue is in a storage container, carefully heat the container and contents in a water bath or on a steam bath until sufficiently liquid for pouring. Then transfer a 1 ± 0.1 g portion to the platinum crucible as directed in the preceding paragraph.

After the desired amount of distillation residue has been transferred to the platinum crucible insert its cover firmly and weigh (Q). Weight of sample of distillation residue taken for coking: Q–P = W.

Place the covered crucible with sample in the crucible holder and suspend in the furnace at 950 ± 20°C for exactly seven minutes. At the end of this period immediately remove the crucible holder from the furnace, cool the crucible and contents to about 150°C as before, transfer to a desiccator. When at room temperature, weigh (R). Weight of coke in sample of distillation residue: R — P = A.

Calculations

Calculate the percentage of coke residue on the basis of original oil (creosote solution) as follows:

$$Coke\ Residue = \frac{A\ x\ B}{W}$$

where:
W = Weight of sample of distillation residue taken for coking
A = Weight of coke in sample of distillation residue
B = Percentage of distillation residue at 355°C of original oil (creosote solution))
Example–W = 1.100 g; A = 0.308 ; B = 29.0%

$$Coke\ Residue = \frac{29.0\ x\ 0.308}{1.100} - 8.1\%$$

Report

Report the calculated amount of coke residue to the nearest 0.1%.

Precision

Coke Residue, 0-2.5% Range

Repeatability: Duplicate values by the same operator should not be considered suspect unless they differ by more

A

than 0.3 percent absolute.

Reproducibility: The values reported by each of two laboratories should not be considered suspect unless they differ by more than 0.5 percent absolute.

NOTE: The estimated standard deviation of repeatability is 0.12 percent absolute at 16 D.F. The estimated standard deviation of reproducibility is 0.18 percent absolute at 14 D.F.

Coke Residue, 2.5—12% Range

Repeatability: Duplicate values by the same operator should not be considered suspect unless they differ by more than 12 percent relative.

Reproducibility: The values reported by each of two laboratories should not be considered suspect unless they differ by more than 14 percent relative.

NOTE: The estimated standard deviation of repeatability is 4.1 percent relative at 24 D.F. The estimated standard deviation of reproducibility is 4.9 percent relative at 21 D.F.

2. STANDARD METHOD OF DISTILLATION

Scope

This method of test is suitable for the distillation of creosote and creosote solution.

Sampling

Thoroughly stir or otherwise mix the sample immediately before removing the portion for testing, to ensure that such portion will be representative of the sample. If crystallized solids are present, warm the sample to dissolve the crystals, taking care to avoid loss of volatile material.

Apparatus

1. Flask.—A side-neck distillation flask, as shown in Fig. 3, having the following dimensions:

Diameter of bulb, outside	86.1 ± 1.5 mm.
Diameter of neck, inside	22.0 ± 1.0 mm.
Diameter of tubulature, inside	10.0 ± 0.5 mm.
Height of flask, outside	131.0 ± 1.5 mm.
Vertical distance bottom of bulb, outside to horizontal tangent at tubulature, in-side	93.0 ± 1.5 mm.
Length of tubulature	220.0 ± 5.0 mm.
Angle of tubulature	75.0 ± 2 deg.
Thickness of tubulature wall	1.0 to 1.5 mm.

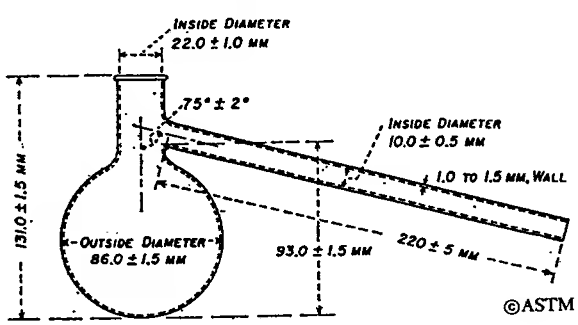

FIGURE 3.—Distillation flask

2. Condenser Tube.—A tapered glass condenser, as shown in Figs. 4 and 5, having the following dimensions:

Diameter of small end, outside	12.5 ± 1.5 mm.
Diameter of large end, outside	28.5 ± 3.0 mm.
Length	360.0 ± 4 mm.
Length of tapered part	100.0 ± 5 mm.

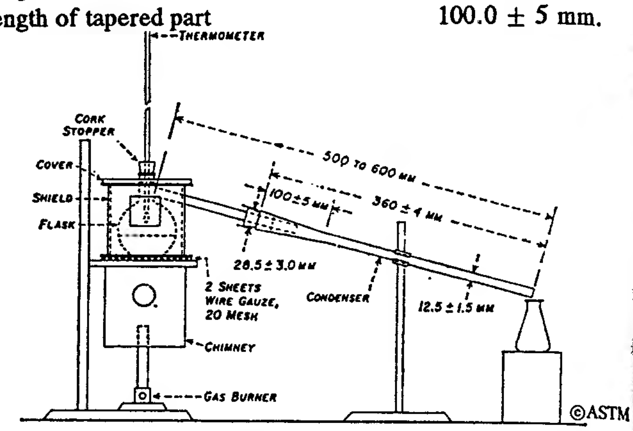

FIGURE 4.—Apparatus assembly for flame distillation.

3. Source of Heat

(a) *Flame.*—Bunsen or Meker type burner, or

(b) *Electric Heater*—.Output variable to 600 or to 750

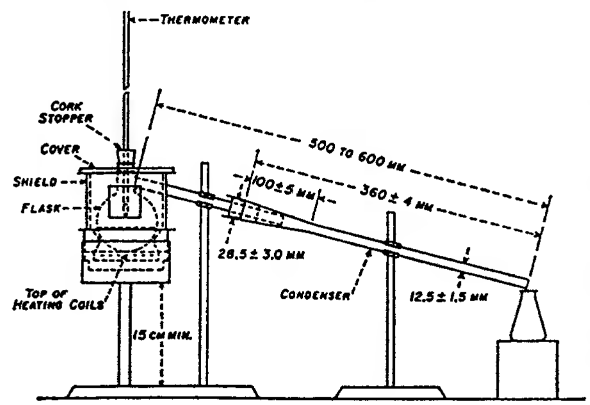

FIGURE 5.— Apparatus assembly for electric heater distillation.

watts with removable upper and lower refractories, as illustrated in Fig. 6, provided with variable transformer or rheostat suitable for the voltage used[1] and fitted with clamp for mounting on vertical support rod.

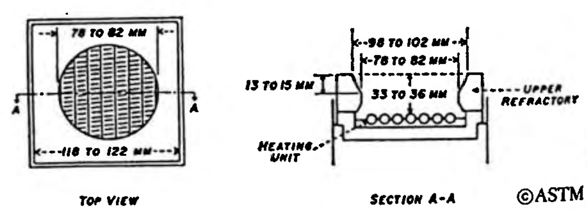

FIGURE 6.—Upper part of electric heater.

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4. Shield and Cover

(a) *For Flame Distillation.*—A metal shield, fitted with mica windows, and lined with 1/8-in. asbestos, of the form and dimensions shown in Fig. 7; with two-part cover made from 1/4-in. "Transite" board, also shown in Fig. 7.

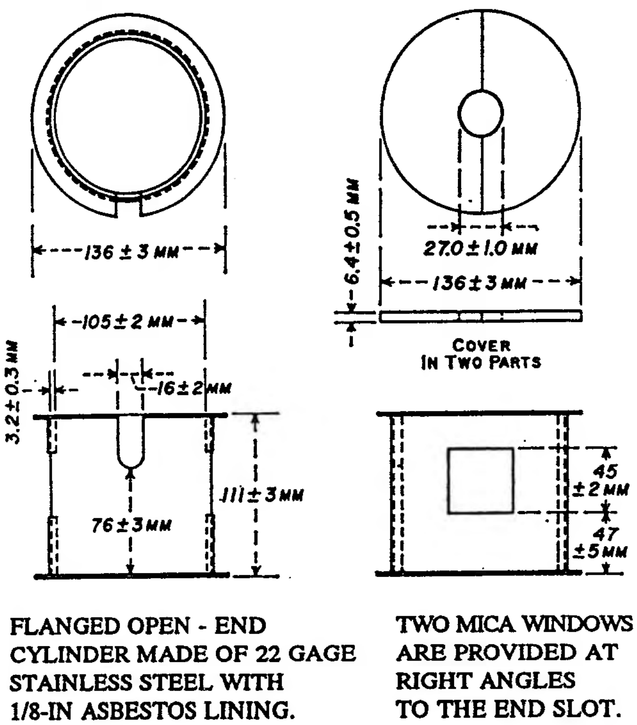


FIGURE 7.—Shield and cover for flame distillation.

(b) *For Electric Heater Distillation.*—A metal shield, fitted with mica windows, and cover of the same construction and dimensions as those used for flame distillation (4(a)), except for the height of the shield. See Fig. 8.

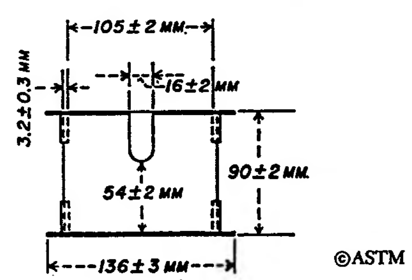


FIGURE 8.—Shield for use with electric heater.

5. Burner Chimney for Flame Distillation.— A cylindrical metal chimney approximately 100 mm. high, 95 to 105 mm. in diameter, and having a peephole 25 mm. in diameter centered about 32 mm. below the ring support, used to protect the flame from air currents. The top of the shield shall be flanged to permit its being suspended from the ring support. See Fig. 9.

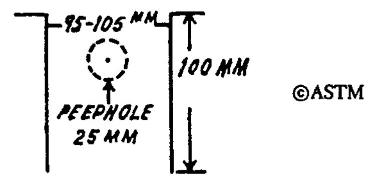


FIGURE 9.—Burner chimney for flame distillation.

6. Gauzes for Flame Distillation.—Two 6 inch by 6 inch sheets of 16 mesh nichrome wire gauze made of 0.02 inch diameter wire.

7. Receivers.—Erlenmeyer flasks or beakers having a capacity of 50 to 125 ml. tared to the nearest 0.05 g.

8. Balance and Weights.—A balance and weights accurate to 0.05 g.

9. Thermometer.—An ASTM High Distillation thermometer having a range of -2° to 400° C. and conforming to the requirements for Thermometer 8°C as prescribed in the Specifications for ASTM Thermometers (ASTM Designation: E 1).

10. Some chemical supply houses do not stock all of the above apparatus. Burrell Company, W. H. Curtin & Co., and Scientific Glass Apparatus Co. usually carry complete stocks.

Apparatus Assembly

(a) *For Flame Distillation.*—Suspend the burner chimney by its flange from a support ring, place the specified two sheets of wire gauze on the burner chimney, and set the flask shield on the upper sheet of gauze.

Insert the thermometer through a regular-length, tightly-fitting cork, rolled prior to use, in the neck of the distillation flask so that the bottom of the cork is from 23 to 28 mm. above the lowest point of the juncture between the tubulature and the neck of the flask, and the bottom of the bulb is 12 to 13 mm. from the surface of the liquid in the flask. The exact location of the thermometer bulb may be determined by calculating the number of divisions on the thermometer which are equal to 12 to 13 mm., lowering the thermometer through the cork until the tip of its bulb touches the surface of 100 g. of sample in the flask, and then raising the thermometer the calculated number of degrees to give the correct distance from the surface of the liquid. Align the stem on the axis of the bulb through the neck of the flask.

Place the distillation flask in the flask shield with its bulb resting on the gauze and connect the condenser tube to the tubulature of the flask with a tight cork joint, having the tubulature project 30 to 50 mm. through the cork. The distance from the neck of the flask to the outlet end of the condenser tube shall be not more than 600 nor less than 500 mm. Support the condenser tube in a position such that it is in alignment with the tubulature of the flask, and the thermometer is vertical. Place the shield cover on the flask shield around the neck of the flask.

(b) *For Electric Heater Distillation.*—Attach the electric heater to a vertical support so that, at the end of the distillation, it can be lowered for a distance of at least six inches (15 cm.). Place the upper refractory on the heater with its larger opening facing upwards. Set the flask shield on the upper refractory.

Position the thermometer in the distillation flask as described in the second paragraph of (a).

Connect the condenser tube to the tubulature of the distillation flask with a tight cork joint, having the tubulature project 30 to 50 mm. through the cork. The distance from the neck of the flask to the outlet end of the condenser tube shall be not more than 600 nor less than 500 mm. Place the distillation flask in the flask shield and support the assembly so that the bottom of the flask is between 4 and 7 mm. above the heating coils, the condenser tube is in alignment with the tubulature of the flask, and the thermometer is vertical. Place the shield cover on the flask shield around the neck of the flask.

Procedure

1. Dehydration.—If not more than 3.0 percent of water is present, the sample may be tested without previous dehydration. If the water content exceeds 3.0 percent, dehydrate a representative portion of the sample before distillation in accordance with the "Standard Method for the Dehydration of Oil-Type Preservatives", Section 7. In case of dispute the determination shall be carried out on a dehydrated sample.

2. Distillation Test.—Weigh the distillation flask to the nearest 0.05 g. and then weigh 100.0 ± 0.1 g. of the sample into it. Assemble the apparatus as described under Apparatus, Item 10.

Apply heat to the flask so that, 45 seconds after the first drop of distillate falls from the end of the condenser, the distillation rate is 80 to 100 drops per minute.[2] Maintain this rate throughout the distillation. If the sample contains over 1% of water, heat the flask and contents slowly until the vapor temperature reaches 170° C. to distill over water before continuing the distillation as described above. Warm the condenser tube whenever necessary to prevent accumulation of solid distillates in the tube.

Collect the distillate fractions in tared receivers at the points designated by the specifications, changing receivers as the thermometer indicates the maximum temperature, corrected as described in the following paragraph, for each fraction. The following fractions are specified:

Up to 210° C.
210° to 235° C
235° to 270° C
270° to 315° C.
315° to 355° C.

Do not change the position of the thermometer during the distillation. Make no correction for emergent steam of the thermometer, but if the laboratory's altitude is over 250 feet above sea level, adjust (but do not report) the temperatures in accordance with the text table.

When the maximum temperature specified for the test—corrected for altitude—is indicated by the thermometer, immediately remove the flame and the flask shield cover; or when the electric heater is used, immediately remove the flask shield cover and drop the electric heater a distance of at least six inches. Allow the apparatus to cool for at least 5 min., or until no vapors are visible. Drain any material remaining in the condenser tube into the receiver containing the last fraction. Weigh the receivers containing the distillate fractions to the nearest 0.05 g. Remove the cork and thermometer and weigh the flask and residue to the nearest 0.05 g.

Should the fraction to 210° C. contain water, determine the water volume[3] and calculate the net weight of oil distillate, assuming that 1 ml. of water weighs 1 g.

If tests of the residue are required, replace the cork and thermometer in the flask and lower the thermometer until its bulb is in the liquid residue. If the residue is not completely fluid, heat it carefully to a temperature not exceeding 150° C. by holding the bulb of the flask over a wire gauze heated by a gas burner or by immersion in a suitable bath whose temperature does not exceed 150° C. Incline the flask and rotate it so that the fluid residue will flow around the side, and collect any oils that have condensed on the upper surfaces of the flask. Mix the contents of the flask until the are homogeneous. Allow the residue to cool to a temperature at which it can be readily poured from the flask without loss of volatile material and then pour it into the desired testing equipment or into a suitable receptacle. Cover the receptacle.

Calculations

1. If the laboratory's altitude is more than 250 feet above sea level, change the temperature listed in (2) under Procedure, above, to the temperatures in the following table: "Adjustment of Distillation Test Temperatures for Altitude."

Adjustment of Distillation Test Temperatures for Altitude to the Nearest One Degree (C)*

Altitude vs. Temperature of Cut

Ft. Above SeaLevel	Temperature Degree C 210	235	270	315	355
500	209	234	269	314	354
1000	208	233	268	313	353
1500	208	232	267	312	352
2000	207	232	266	311	351
2500	206	231	265	310	350
3000	205	230	264	309	349
3500	204	229	263	308	347
4000	203	228	263	307	346
4500	203	227	262	306	345
5000	202	226	261	305	344
5500	201	225	260	304	343
6000	200	225	259	303	342
6500	199	224	258	302	341
7000	198	223	257	301	340

*Average barometer assumed

2. Convert the distillation results to the water-free basis by means of the following formulas:

I. Fraction to 210° C.:

Percentage (water-free basis)

$$\textit{Percentage (water free basis)} = (\textit{Wt. of fraction} - W) \times \frac{100}{100 - W}$$

II. Second and subsequent fractions including residue:

$$\textit{Percentage (water-free basis)} = \textit{Wt. of fraction} \times \frac{100}{100 - W}$$

where W = ml. water, expressed as grams, in fraction distilling to 210° C.

3. Add the percentages (water-free basis) of the fractions to obtain cumulative percentages to the specified temperatures.

Report

Report the cumulative percentages to the specified temperatures and distillation residue, on a water-free basis, to the nearest 0.1 percent.

Precision

The following criteria should be used for judging the acceptability of results at the 95 percent probability level:

Repeatability

Duplicate values by the same operator should not be considered suspect unless they differ by more than 1.1 percent absolute.

Reproducibility

The values reported by each of two laboratories should not be considered suspect unless the values differ by more than 2.9 percent absolute.

Note

The estimated standard deviation of repeatability is 0.41 percent absolute at 272 degrees of freedom. The estimated standard deviation of reproducibility is 1.05 percent absolute at 352 degrees of freedom.

Notes

[1]The "Precision" Ful-Kontrol,750-watt heater with built-in variable transformer control has been found satisfactory. This heater is available for 115 volts, 50/60 cycles only.

[2]If an electric metronome is not available to measure the distillation rate, not less than 20 drops nor more than 25 drops of distillate shall fall from the end of the condenser in the time interval 45 to 60 seconds after the first drop or in any given 15-second time interval thereafter.

[3]The amount of water contained in this fraction may be determined by either of the following methods:

(a) Transfer the fraction, after weighing, to a tube or cylinder graduated in 0.1 ml. Rinse the receiver several times with benzene, adding the rinsings to the tube or cylinder containing the fraction or,

(b) Collect the fraction to 210° C. in a tared 5-ml graduated cylinder having a flared top. After weighing, add benzene which will result in a clear separation of the water and oil distillate.

3. STANDARD METHOD FOR THE DETERMINATION OF THE AMOUNT OF MATERIAL INSOLUBLE IN XYLENE (*Reaffirmed with amendments 1997*)

Scope

This method covers the determination of the Xylene insoluble matter in creosote and creosote solution. Since this method is empirical, strict adherence to all details of the procedure is necessary for close agreement of results among laboratories.

Apparatus and Reagents

1. Filtering crucibles, porcelain with fine-porosity bottom 40 ml. capacity, high form, maximum pore diameter, 7 microns (Selas Grade 01, Size FC 40, or equivalent:)

2. Filter apparatus, filter flask and tube with crucible adapter, and means for producing a vacuum.

3. Balance and weights accurate to 0.001 g.

4. Xylene—5-degree distillation range, conforming to ASTM Standard D-845.

5. Acetone, boiling at a pressure of 760 mm. Hg. within a range of 1.0° C., which shall include the temperature of 56.1° C

6. Colite Analytical Filter Aid (CAFA), dry to constant weight at 105° C. and store in tightly stoppered container. (Do not use any other grade of filtering medium, because porosities differ.)

Safety Precautions

1. Use fresh, clean, moisture free xylene for each

determination.

2. Xylene is toxic and extremely flammable, all operations with xylene must be carried out under an efficient hood.

Procedure

1. Make and record all weighings to the nearest 0.001 g.

2. Clean a crucible, if used for less than six determinations as follows: Remove the mat, wash the crucible with distilled water, dry and ignite in a muffle furnace for one hour at about 800° C. Cool the crucible slowly to prevent cracking and place it in a desiccator while still warm.

After a crucible has been used for six determinations, remove any residual ash from pores in the filtering area by boiling in 1:1 hydrochloric acid. Then boil the crucible in distilled water, thoroughly back wash with distilled water, dry, and ignite as above.

3. Transfer 0.45 to 0.55 g of Celite to a clean, filtering crucible. Distribute the Celite evenly over the bottom. Dry in an oven at 105 to 110° C. for 30 minutes. Cool in a desiccator and weigh. Record the weight of crucible plus Celite.

4. Take the original, undehydrated sample, and if necessary, heat and stir until any crystalline material is in solution and the sample is homogeneous. Determine the percentage of water in accordance with the "Standard Method for the Determination of Water in Oil-Type Preservatives."

5. Weigh the following size sample, into a 100 ml beaker:

New Creosote
10 ± 1 g
Used Creosote
5.0 ± 0.5 g
Creosote Solution 2.0 ± 0.1 g

Calculate and record the weight of the sample.

6. Warm 50 ml. of xylene to a temperature of 50° to 60° C., and immediately add it to the sample while stirring thoroughly. Continue stirring until the sample is dispersed and the bottom of the beaker is clean. Bring the beaker or flask containing the solution to boiling on a hot plate.

7. Insert the filter tube with adapter in the filter flask and place the previously prepared and tared crucible in the adapter. Fill the crucible halfway with boiling xylene, and with the suction turned on, slowly pour the mixture containing the sample into the crucible before the xylene has been drawn entirely through the Celite. Take care that the Celite is never free from liquid, either during the addition of the solution containing the sample, or during the subsequent washing with xylene.

8. Wash the beaker thermometer, or stirring rod, and crucible with hot xylene. Pass all washes through the filter. Use a suitable policeman to sweep the insoluble particles into the crucible. Wash the crucible and contents with hot xylene, allowing each wash to pass almost through the filter before the next is added, until the washings are colorless.

9. Reduce the suction and wash the contents with acetone until the washings are colorless. Four additions of 5 ml. each are usually sufficient. Remove the crucible, and wipe the outside clean with a tissue moistened with xylene

Place the filtering crucible in the drying oven at 105° ± 5° C. and dry to constant weight (±0.001 g.). Record the weight of the filtering crucible and its contents.

Calculations

Calculate the xylene insoluble content as follows:

$$xylene\ insoluble,\ \% = 100 \times \frac{A - B}{C} \times \frac{100}{100 - D}$$

Where A = Total weight of filtering crucible, Celite plus matter insoluble in xylene.
B = Initial weight of filtering crucible containing dried Celite.
C = Weight of sample taken for determination.
D = Percentage water in the sample.

Precision

The following criteria should be used for judging the acceptability of results:

Repeatability

Duplicate values by the same operator should not be considered suspect unless they differ by more than 0.2.

Reproducibility

The values reported by each of two laboratories should not be considered suspect unless the values differ by more than 0.5.

3A. ALTERNATE METHOD FOR THE DETERMINATION OF THE AMOUNT OF MATERIAL INSOLUBLE IN XYLENE (*Reaffirmed 1997*)

Scope

This method is intended as an alternate procedure from that specified in the previous section. In case of a dispute, the referred method shall be Standard Al, Section 3.

Apparatus and Reagents

1. Refer to reagent specifications outlined in Al, Section 3.

2. Scale or balance accurate to three decimal places

3. Filtering crucibles, porcelain with 40 ml capacity (top diameter 1-5/8", bottom 1") and bottom perforations 1/32" (0.6 mm) diameter.

4. Glass microfiber filter pads with 1.2 um nominal pore retention and 2.4 cm in diameter.

5. 500 ml side-arm vacuum filtering flask, tapered rubber crucible holder with flared glass collection stem and a means of producing a vacuum.

Safety Precautions as Outlined in Al, Section 3

Procedures

1. Place a glass microfiber filter into a clean filtering crucible. Dry in oven for 1/2 hour at 105°C, then remove and cool in desiccator.

2. Weigh and record tare weights of crucible with glass

filter and a clean 100 ml beaker.

3. Pour a well mixed, crystal free sample (10 g new oil, 5 g used oil) into the tared 100 ml beaker and record actual weight. A 2 g sample may be used for creosote solutions.

4. Heat 250-300 ml of xylene to 50-60°C and add 40-50 ml of this warm xylene to the sample in the beaker. Stir to dissolve the sample completely and heat to boiling (leave stir rod or thermometer in beaker).

5. Place crucible in holder on the vacuum flask and be sure filter pad is correctly positioned in the bottom.

6. Fill crucible one-half full with warm xylene and simultaneously turn on suction, then begin to pour sample mixture before crucible is empty (use only a partial vacuum if warm xylene empties too quickly from the crucible). Add sample to crucible, not letting the crucible be free of liquid. Care must be taken to be sure the filter mat does not float free from the bottom of the crucible.

7. Rinse beaker and stir rod with warm xylene and pass all washes through the crucible until washings are colorless.

8. Reduce or turn off suction and wash the contents with acetone until all washings are colorless. Four additions of 5 ml each are usually sufficient. Again avoid dislodging filter pad from its position.

9. Turn off vacuum and remove crucible from holder. Wipe outside of crucible with a clean tissue and place in oven at 105°C and dry to a constant weight (1/2 hour).

10. Cool crucible in a desiccator, then weigh and return to oven for 1/2 hour, cool and reweigh. Repeat until a constant weight is obtained.

11. Calculate xylene insoluble content:

$$\% \; x \; XI = \frac{Weight \; of \; residue}{Weight \; of \; sample} \; x \; 100\%$$

12. Dispose of glass fibre filter and rinse crucible with solvent and wipe clean.

13. After several tests, carbon deposits may appear inside the crucible. These can be cleaned by firing over a bunsen flame.

Precision

The following criteria should be used to judge the acceptability of results at the 95 percent probability level:

Xylene Insoluble, 0 — 0.2% range

Repeatability — Duplicate values by the same operator should not be considered suspect unless they differ by more than ± 0.07.

Reproducibility — The values reported by each of two laboratories should not be considered suspect unless they differ by more than ± 0.07.

Xylene Insoluble, 0.2 — 3.5% range

Repeatability — Duplicate values by the same operator should not be considered suspect unless they differ by more than ± 0.34.

Reproducibility — The values reported by each of two laboratories should not be considered suspect unless they differ by more than ± 0.38.

4. STANDARD METHOD FOR THE DETERMINATION OF THE SPECIFIC GRAVITY OF OIL-TYPE PRESERVATIVES (*Reaffirmed 1997*)

Scope

This method is suitable for the determination of the specific gravity of oil-type preservatives. To determine the specific gravities of distillation fractions, see Section 5.

Apparatus

1. A set of three hydrometers covering the range of 1.00 to 1.150 and conforming to the requirements for hydrometers 125H (range 1.000 to 1.050), 126H (range 1.050 to 1.100), and 127H (range 1.100 to 1.150) as prescribed in the specifications for ASTM Hydrometers (ASTM Designation: E 100).

If not available, hydrometers (60°/60° F.) in the range 1 .000 to 1.1 50 of similar accuracy and having a scale length not less than 9.5 mm. per 0.010 units of specific gravity may be used.

2. Hydrometer cylinder of glass having the following approximate dimensions:

Length: Approximately 300 mm.

Diameter: Not less than 32 mm.

3. ASTM Low Softening Point Thermometer having a range of 2° to 80° C. (30° to 180° F.) conforming to the requirements for Thermometer 15 C (15 F) as described in the Specifications for ASTM Thermometers (ASTM Designation: E 1); or other thermometer of suitable range and precision.

Procedure

Place the oil in the cylinder to a depth sufficient to float the hydrometer and, with thorough stirring to ensure uniformity, adjust the temperature to 38° C. (100° F.) or, if not entirely liquid at that temperature, to the lowest temperature at which the oil is completely liquid.[1] Insert the hydrometer and allow the instrument to settle until it is in floating equilibrium. Then read the height of the meniscus on the stem of the hydrometer and the temperature to the nearest 0.1° C. (0.2° F.). Add to the hydrometer reading an increment of specific gravity equivalent to 1 mm. on the scale. Then correct this observed specific gravity at the observed temperature to the specific gravity at 38°/15.5° C. using Table II of Standard F1, entitled "Factors to be used for determining the Specific Gravity at 100° F. When Observed at Temperatures Ranging from 60° to 220° F."

Report

Report the specific gravity at 38°/15.5° C. to the nearest one thousandth unit of specific gravity.

Precision

The following criteria should be used to judge the acceptability of results at the 95 percent probability level:

Repeatability

Duplicate values by the same operator should not be considered suspect unless they differ by more than 0.002.

Reproducibility

The values reported by each of two laboratories should not be considered suspect unless the values differ by more than 0.004.

Note

The estimated standard deviation of repeatability is 0.0003 at 14 degrees of freedom. The estimated standard deviation of reproducibility is 0.0014 at 22 degrees of freedom.

Note

[1]It is advantageous to have the cylinder immersed in a bath maintained at the temperature of test.

5. STANDARD METHOD FOR THE DETERMINATION OF THE SPECIFIC GRAVITY OF DISTILLATION FRACTIONS AND RESIDUE *(Reaffirmed with amendments 1997)*

Scope

This method of test is suitable for the determination of the specific gravities of the distillation fractions and residue of Creosote and Creosote Solution. It is also suitable for determining the specific gravity of quantities of oil-type preservatives too small to be determined by the hydrometer method. Section 4.

Apparatus

1. Pycnometers:
   (a) Gay-Lussac type, 10 ml. and 25 ml. capacity.
   (b) Hubbard-Carmick type, 25 ml. capacity.
2. Water bath maintained at 38.0° ± 0.1° C.
3. Balance and weights accurate to 0.001 g.
4. ASTM Low Softening Point Thermometer having a range of 2° to 80° C. and conforming to the requirements for Thermometer 15° C as prescribed in the specifications for ASTM Thermometers (ASTM Designation: E 1).

Calibration of Pycnometers

Before calibration, grind the stopper into the neck of the pycnometer by partially filling the pycnometer with water, inserting the stopper into the neck, and rotating the stopper by hand with very light pressure. During this operation, keep the ground surfaces wet and occasionally flush with water. When the wet stopper can be rotated freely with no tendency for the ground surfaces to stick together, using no more pressure than the weight of the stopper, the pycnometer is in condition for calibration.

Thoroughly clean the pycnometer with hot chromic acid cleaning solution. Empty the acid from the pycnometer, flush thoroughly with distilled water, dry in an oven at about 110° C., cool in a desiccator for 15 to 30 minutes, and weigh to the nearest 0.001 g. Designate this weight P.

Fill the pycnometer with freshly boiled distilled water at room temperature. (A pipette or drawn-out medicine dropper facilitates this operation.) Insert the stopper with a rotary motion to secure a firm seat, making sure that no air is entrapped, then completely immerse the pycnometer in the water bath at 38.0° C. for 30 minutes.

While still in the water bath, raise the pycnometer so the top of the stopper is slightly above the water level in the bath and wipe off the water on the flat top surface of the stopper with soft absorbent paper, taking precautions not to remove water from the capillary tube. Remove the pycnometer from the water bath, immerse its lower half momentarily in cold water, dry its surface and weigh it to the nearest 0.001 g. Then remove the stopper, add distilled water and reinsert the stopper as described above. Return the pycnometer to the water bath for 30 minutes, remove, and weigh as before. (It is advisable to have the previously determined weights on the balance pan to expedite the reweighing). Repeat this operation until three successive weighings check within 0.010 g; if this proves impossible, regrind the stopper and repeat the calibration until three weighings agree within 0.010 g. Designate this weight W_1. Remove the water and thoroughly dry the pycnometer in an oven at about 110° C.

Procedure

1. Fractions Entirely Liquid Below 38° C.— Carefully heat the fraction to a temperature below 38° C. in a water bath or by direct heat with an asbestos board under the container until the distillation fraction is entirely liquid. Fill the dry Gay-Lussac pycnometer by means of a warm pipette or warm drawn-out medicine dropper until the neck is about one-half full, avoiding the inclusion of air bubbles. Insert the stopper with a rotary motion to secure a firm seat, making sure no air is entrapped. Place the filled pycnometer in the water bath at 38.0° C. so that the top of the stopper is slightly above the water level, and allow to remain for at least 30 minutes. All this time the capillary tube should be completely filled with oil. Carefully wipe off with soft absorbent paper any oil from the top flat surface of the stopper while the pycnometer is still in the water bath. Remove the pycnometer from the water bath, immerse its lower half momentarily in cold water, dry its surface and weigh it to the nearest 0.001 g. Remove the stopper, refill the pycnometer with liquid fraction, and repeat the determination as described above until two successive weighings agree within 0.010 g. Designate this weight W_2.

2. Fractions Containing Solids at 38° C— Carefully heat the fraction in a water bath or by direct heat with an fire proof board under the container until the distillation fraction is entirely liquid. By means of a warm pipette or warm drawn-out medicine dropper, transfer a sufficient amount of the fraction to the dry Gay-Lussac or Hubbard-Carmick pycnometer until it is approximately one-half full, avoiding the inclusion of air bubbles and contact of the oil with the ground glass surface of the neck of the pycnometer. (Permitting the stream of liquid to impinge on the side of the pycnometer below the ultimate liquid level aids in preventing inclusion of air bubbles.) Cool the pycnometer to room temperature and weigh with the stopper. Designate this weight W_3.

Add freshly boiled distilled water to the partially filled pycnometer until it is about three-quarters full. Partially immerse the pycnometer without the stopper in a small water bath, maintained at 90° to 95° C., and allow to remain until the fraction is liquid and free of air bubbles. (Any entrapped air bubbles can be removed with a heated fine wire loop.)

Cool the pycnometer and contents to a temperature of about 25° C. and then add cool freshly boiled distilled water until the neck is about one-half full. Insert the stopper with a rotary motion to secure a firm seat, making sure that all air is excluded. Completely immerse the pycnometer in the water bath at 38.0° C. and allow sufficient time for an equilibrium crystal state to be established. One hour is usually sufficient. While still in the water bath, raise the pycnometer until the top of the stopper is above the water level and wipe off the water on the flat surface of the stopper with soft absorbent paper, taking precautions not to remove water from the capillary tube. Remove the pycnometer from the water bath, immerse its lower half momentarily in cold water, dry its surface and weigh it to the nearest 0.001 g. Remove the stopper, add freshly distilled water, reinsert the stopper, and return the pycnometer to the water bath at 38.0° C. After 30 minutes, remove and weigh the pycnometer as described above. Repeat these operations until two successive weighings agree within 0.010 g. Designate this weight W_4.

3. Distillation Residue.—Melt the distillation residue as described in the Standard Method of Distillation (see Section 2, last paragraph of Procedure 2). Carry out the determination as described in Procedure 2 above, using the Hubbard-Carmick pycnometer, but omitting the liquefaction step in the second paragraph of that procedure.

Calculations

1. Fractions Entirely Liquid Below 38° C.

$$\text{Specific Gravity at } 38.0/15.5°\text{C} = \frac{W_2 - P}{W_1 - P} \times 0.99393$$

2. Fractions Containing Solids at 38° C. and distillation residue

Specific Gravity at 38.0°/15.5° C =

$$\frac{W_2 - P}{(W_1 - P) - (W_4 - W_3)} \times 0.99393$$

Where, P = Weight of empty pycnometer
W_1 = Weight of pycnometer full of water
W_2 = Weight of pycnometer full of liquid fraction
W_3 = Weight of pycnometer partially filled with solid fraction or distillation residue
W_4 = Weight of pycnometer full of solid fraction or residue and water

0.99393 the ratio of the density of water at 38.0° C. to the density of water at 15.5° C., i.e.,

$$\frac{0.99299}{0.99905}$$

Report the specific gravity at 38.0°/15.5° C. to the nearest one thousandth unit of specific gravity.

Precision

The following criteria should be used to judge the acceptability of results at the 95 perçent probability level:

Repeatability

Duplicate values by the same operator should not be considered suspect unless they differ by more than 0.005.

Reproducibility

The values reported by each of two laboratories should not be considered suspect unless the values differ by more than 0.010.

Note

The estimated standard deviation of repeatability is 0.0018 at 54 degrees of freedom. The estimated standard deviation of reproducibility is 0.0036 at 27 degrees of freedom.

Note

[1]Calibration of the pycnometer is not necessary prior to making each determination. Dependent on usage, re calibration should be done at sufficient time intervals to insure that the calibration is accurate. In case of dispute calibration is mandatory.

6. STANDARD METHOD FOR THE DETERMINATION OF WATER IN OIL-TYPE PRESERVATIVES

(Reaffirmed with amendmentd 1997)

Scope

This method is suitable for determining water in oil-type preservatives. The sample is distilled with a volatile solvent, therefore the dehydrated material cannot be used for other required tests. (See Section 7 for dehydration procedure).

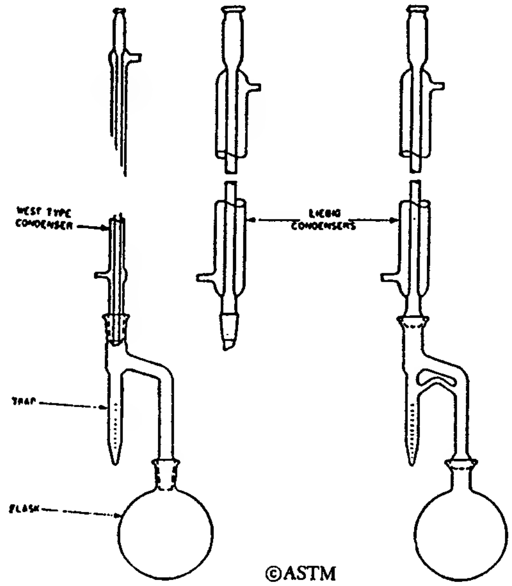
Apparatus

The apparatus comprises a glass or metal still, a heater, a reflux condenser, and a graduated glass trap. The still, trap, and condenser may be connected by any suitable method for producing a leak-proof joint. Preferred connections are ground joints for glass to glass and O-rings for metal to glass. Typical assemblies are illustrated in Figures 10 and 11 reproduced from ASTM Standard D95.

1. Still.—A glass or metal vessel having a nominal capacity of 500 to 1000 ml. and a short neck accommodating the reflux tube of the trap.

2. Heater.—Any suitable gas burner or electric heater may be used with the glass flask. A gas ring burner with ports on the inside circumference shall be used with the metal still.

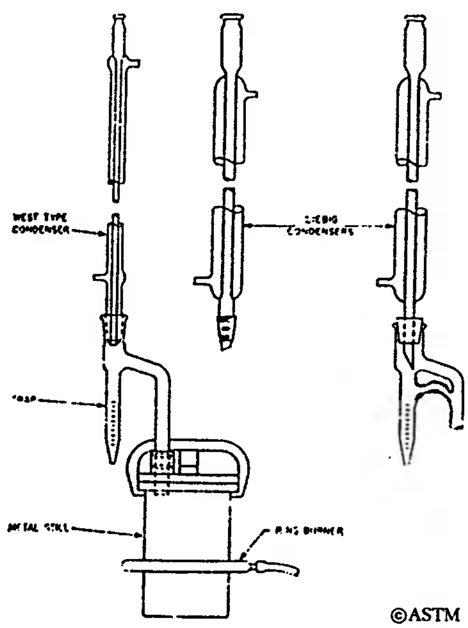
3. Condenser.—A straight tube condenser, having a jacket at least 400 mm. long and an inner tube whose outside diameter is 9.5 to 12.7 mm.



Note: Trap shall be 15 to 16 mm. inside diameter.

FIGURE 10.—Typical assemblies with glass flask.

4. Trap.— A glass trap of 10- or 25-ml. capacity. The traps shall be graduated in 0.1 ml divisions with a ± 0.05 ml. maximum error below 1 ml. and in 0.2 ml. divisions with a ± 0.1 ml. maximum error above 1 ml.



Note: Trap shall be 15 to 16 mm. inside diameter.

FIGURE 11.—Typical assemblies with metal still.

Reagents

For general use an aromatic solvent is preferred since it has high solvency and dispersing power for most bituminous materials. Xylene, toluene, or a blend of these solvents is recommended.

Sample

The portion of the sample used for the test must be thoroughly representative of the total sample. If the material is liquid, thoroughly stir the sample as received, warming if necessary to ensure uniformity, and take a representative sample for analysis. When there is doubt as to the uniformity of the material, run a number of samples and average the data.

Base the size of the test portion on the estimated water content of the sample, such that the water yield does not exceed the capacity of the trap.

Procedure

1. Transfer 100 ml. of sample, measured with an accuracy of ± 1 percent, to the still. Measure ordinary liquid samples in a graduated cylinder of appropriate size. Rinse the material adhering to the cylinder into the still with one 50-ml. and two 25-ml. portions of the solvent. Drain the cylinder thoroughly after the sample transfer and each rinsing. When the sample to be tested contains more than 10 percent of water, the volume of material used shall be decreased to that which will yield somewhat less than 10 ml. of water.

2. Assemble the components of the apparatus as illustrated in Figures 10 and 11, making all connections vapor—and liquid-tight. If a metal still with removable cover is used, insert a gasket of heavy paper, moistened with solvent, between the still body and cover. The condenser tube and trap must be chemically clean to assure free drainage of water into the bottom of the trap. Insert a loose cotton plug in the top of the condenser to prevent condensation of atmospheric moisture inside it. Circulate cold water through the jacket of the condenser.

3. Apply heat to the still, adjusting the rate of boiling so that condensed distillate discharges from the condenser at the rate of 2 to 5 drops per second. If the metal still is used, start heating with the ring burner about 3 in. above the bottom of the still and gradually lower the burner as the distillation proceeds. Continue distillation until no water is visible in any part of the apparatus except in the trap. If there is a persistent ring of water in the condenser tube, increase the rate of distillation or cut off the condenser water for a few minutes.

4. When the evolution of water is completed, allow the trap and contents to cool to room temperature. Dislodge any drops of water adhering to the sides of the trap with a glass or polytetrafluorethylene rod or other suitable means and transfer them to the water layer. Read the volume of the water in the trap to the nearest scale division.

Calculation

Calculate the water in the sample as percent by volume as follows:

KG COH004142

$$Water,\ percent = \frac{vol.\ of\ water\ in\ trap}{100\ vol.\ of\ sample} \times 100$$

Report

Report the determined percentage of water to the nearest 0.1 percent.

Precision

The following criteria should be used for judging the acceptability of results:

Repeatability

Duplicate values by the same operator should not be considered suspect unless they differ by more than 0.2 percent absolute.

Reproducibility

The values reported by each of two laboratories should not be considered suspect unless the values differ by more than 0.4 percent absolute.

Variations: The type of apparatus joint, method of heating the still, solvent used, trap size and type of still within the limits given in the section on apparatus do not affect this precision statement.

7. STANDARD METHOD FOR THE DEHYDRATION FOR OIL-TYPE PRESERVATIVES

Scope

This method is suitable for the dehydration of oil-type preservatives prior to a distillation test.

Sampling

The portion of sample removed for dehydration must be representative of the total sample. Thoroughly stir the sample as received, warming if necessary to ensure liquidity and uniformity, and remove a representative portion for dehydration.

Apparatus

1. **Still.**—A vertical, cylindrical copper still, with removable flanged top and yoke, of the form and approximate dimensions shown in Figs. 12 and 13.

2. **Thermometer.**—A thermometer conforming to the specification given in "Standard Method of Distillation" (see Section 2).

3. **Condenser.**—Copper trough condenser with straight-walled glass tube, having approximately the form and dimensions shown in Fig. 12.

4. **Separatory Funnel.**—A separatory funnel of the form shown in Fig. 12 having a total capacity of 120 ml. with outlet graduated in fifths of a milliliter, or a separatory funnel of the Squibb type having a capacity of about 100 ml.

5. **Assembling Apparatus.**—Assemble the apparatus as shown in Fig. 12.

Procedure

Transfer 200 to 300 ml. of the portion of the sample removed for dehydration to the copper still.[1] Clamp the lid on, using a paper gasket slightly wet with the oil under test around the flange of the still. Apply heat by means of the ring burner, which shall be placed just above the level of the oil in the still at the beginning of the dehydration and gradually lowered when most of the water has distilled over. Continue the distillation until the vapor temperature reaches 205 ° C., as indicated by the thermometer with the bulb opposite the off-take of the connecting tube. Collect the distillate in the separatory funnel. When the distillation is completed, and a clear separation of water and oil in the funnel has taken place,[2] return any light oil distilled over with the water to the oil in the still and mix thoroughly before further testing.

---

[1] When free water is present in the portion of the sample removed for dehydration, separate, if possible, before the transfer.

[2] Separation of water and oil in the separatory funnel may be more readily accomplished by the addition of concentrated solution of sodium chloride and slight heating.

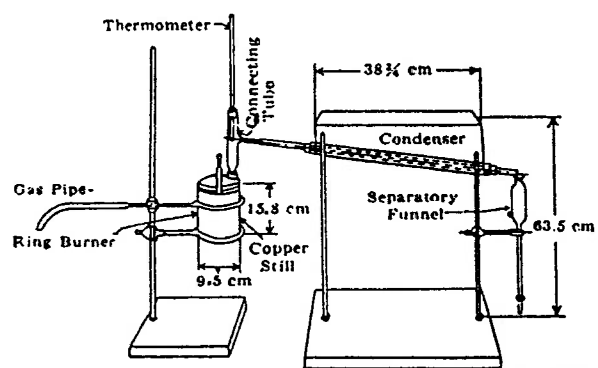


FIGURE 12.

8. STANDARD METHOD FOR DETECTING THE PRESENCE OF SMALL AMOUNTS OF PETROLEUM OIL IN COAL TAR CREOSOTE

Notice: This Method has been recommended for deletion from this Standard in 1998, without prejudice, due to lack of use.

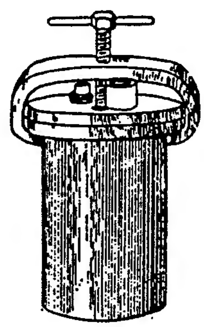


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FIGURE 13.

Scope

This method of test is suitable for showing the presence of two percent or more "paraffinic" petroleum oil or three percent or more "aromatic" petroleum oil in coal tar creosote. The results obtained are qualitative, not quantitative.

Outline of Method

The sample of creosote is dehydrated, after which 25 ml. is distilled to coke. A 4.0 ml. portion of the total distillate is shaken with 6.0 ml. of a mixture of triethyleneglycol (95 percent by volume) and furfural (5 percent by volume) in a 15-ml centrifuge tube. After centrifuging the tube and contents, the volume of insoluble material in the top layer is read and the amount of insoluble calculated.

Apparatus

1. Distillation Flask.—As used in AWPA Al, Section 2.

2. Distillation Flask.—50-ml. capacity with side tube 77 mm. below mouth at 75° angle. A. H. Thomas Co. 5397. *Use only once.*

3. Condenser Tube.—As used in AWPA Al, Section 2.

4. Centrifuge Tubes.—15 ml. capacity and graduated in 0.1. ml. Length 120 mm., outside diameter 17 mm. A. H. Thomas Co. 2994-H10.

5. Centrifuge.—Motor driven, to hold 15-ml centrifuge tubes. "Precision" Centricone, Clinical Model, which costs less than $100, is satisfactory.

6. Burner.—Bunsen type.

7. Magnifier.—Pocket type, low power.

Reagents

1. Triethyleneglycol (TEG); Matheson, Coleman & Bell #5809. Must be stored over Drierite or other suitable desiccant.

2. Furfural (F); purified and free of water (Baker & Adamson Code 1796). Redistill if discolored discarding first 10% by volume and using the next 50% by volume distilled.

3. Mixture of 95 percent by volume of TEG and 5 percent by volume of F; store over suitable desiccant such as Drierite.

Procedure

I. Dehydration.—Heat the creosote sample to complete liquidity at a temperature not exceeding 75°C. Pour about 100 ml. of the limpid sample into the AWPA distillation flask, stopper the flask with a rolled cork stopper, and attach the condenser by means of another cork stopper.

Heat the sample to boiling by means of a 20-cm long flame, holding the burner by hand and intermittently heating the top of the unprotected flask and the side tube to vaporize condensed water. Boil the sample for a few minutes. If more than 5 ml of distillate is collected, separate the water that has co-distilled, using salt if necessary to effect separation (see Al, Section 7). Return the dry distillate to the cool dehydrated sample.

2. Distillation to Coke.—Transfer 25 ml of the dehydrated sample to a 50-ml distillation flask. Stopper the flask with a rolled cork and connect the condenser by means of another cork. Suspend the assembly so that the bottom of the bulb is 7 to 8 cm above the top of the gas burner.

Heat the sample to boiling by means of a small (6 cm) flame, holding the burner by hand and occasionally heating the top of the unprotected flask. When boiling starts, place the burner on the table and adjust the flame so that the rate of distillation is maintained at between 100 and 120 drops per minute. Collect the distillate in a small Erlenmyer flask suspended from the end of the condenser. Towards the end of the distillation maximum gas input must be used, with the tip of the inner cone directly under the bottom of the flask. Remove the flame the moment the flask is dry. Gently heat the condenser tube and drain its contents into the receiver. Mix the distillate thoroughly and use within 6 hours for solubility testing.

3. Solubility Test.—Transfer 4.0 ml (4.3 g) of the cooled total distillate to a centrifuge tube. Centrifuge the tube and contents for a few minutes. Then clamp the tube in a vertical position before a strong light source and read the sample volume to the nearest 0.05 ml at the top of the clearly defined vertical light streaks in the oil, using a small magnifier to facilitate the reading. If the volume is outside the range 3.90 to 4.10 ml, adjust by adding or removing distillate sample. Then add 5.8 to 6.2 ml of solvent solution and stopper the tube with a rolled cork that must not enter more than 8 mm into the tube. Shake the tube and contents vigorously for 30 seconds, remove the cork stopper, and wipe its bottom on the top of the tube. Fill another centrifuge tube partly with water to counterbalance the tube with sample and solvent, then place the tubes in the centrifuge. Run the latter for 30 minutes or longer, until the difference between meniscus levels no longer changes. Again clamp the tube in a vertical position before a strong light source and read and record the volume sample plus solvent at the highest horizontal meniscus line to the nearest 0.05 ml. If an interface between two layers is visible, read and record its position to the nearest 0.05 ml. In case crystals deposit near the liquid surface, heat this location momentarily with a small flame and slightly shake the vertically held tube in a horizontal motion before making the readings.

Calibrations

$$\text{Insoluble matter, \% volume} = \frac{a - b - 0.35^*}{4.0} \times 100$$

Where:

a = Reading at horizontal line at top of the meniscus, ml.

b = Reading at interface between layers, ml.

---

*A factor to correct the reading at the top of the meniscus to the true volume of sample plus solvent.

Traces of insoluble matter appear as tiny globules and should be so reported. Absence of such traces and of a light-colored top layer indicates complete miscibility of the total distillate in the solvent.

9. METHOD FOR DETERMINING CONFORMANCE OF DISTILLATION FRACTIONS OF CREOSOTE OR CREOSOTE SOLUTION TO SPECIFIC GRAVITY REQUIREMENTS (*Reaffirmed 1997*)

Scope

This method is suitable for determining whether or not the specific gravity of a distillate fraction or the distillation residue of creosote or creosote solution is greater than a given specific gravity. In cases of dispute, the pycnometer method shall be used.

General

This proposed method employs the principle of sink or float of a droplet of the distillation fraction in a salt solution of predetermined specific gravity and temperature set as a minimum requirement for the fraction under test.

Apparatus and Equipment

1. **Constant temperature bath**—Controlled bath for maintaining temperature at 38° C. ± 0.2° C.
2. **Volumetric flasks**—glass stoppered.
   1-500 ml.
   2-200 ml.
3. Beakers 100 ml.
4. Two glass-stoppered bottles 500 ml.
5. Test tubes (125x15 mm.).
6. Rack or clamps for holding test tubes in the bath.
7. Medicine droppers drawn out to moderately fine point.
8. Thermometers of suitable range, i.e., 38° C
9. Polyethylene squeeze bottle—500 ml.

Chemicals and Reagents

1. Potassium chloride (CP).
2. Detergent Aerosol AY.
3. Reagent water meeting the requirements of ASTM Standard D 1193 for nonreferee reagent water.

Preparation of Stock Solutions

1. Solution A to 500 ml. of distilled water, add 0.5 grams of Aerosol AY and mix thoroughly.

2. Solution B, transfer about 125 ml. of Solution A to a 200 ml. volumetric flask and place in bath at 38° C. Weigh 10.4 grams of potassium chloride in a tared 100 ml. beaker. Add 40 to 50 ml. of Solution A and dissolve the salt by warning to about 38° C. Add the salt solution to the volumetric flask in the bath and rinse the beaker and thermometer with Solution A from a squeeze bottle. Stopper flask and mix. Bring flask and contentss to equilibrium temperature in the bath. Add Solution A to the mark and mix again. Store in a clean, glass-stoppered bottle. This bottle should be labeled "For Specific Gravity of 235° to 315° C. Fraction—1.027."

3. Solution C, repeat as in 2 above, except that 33.3 grams of potassium chloride are used. Label the stock bottle "For Specific Gravity of 315° to 355° C. Fraction—1.095."

4. Stock solutions should be checked by pycnometer comparing distilled water with stock solutions at 38° C

Test Procedure

1. Fraction 235° to 315° C., fill a test tube with Solution B. Hold the tube by means of a clamp or rack in the bath at 38° C. Warm a clean, dry medicine dropper and partially fill with the liquefied fraction. Insert the tip about one to two inches below surface of Solution B and force out a drop of the oil. If droplet clings to dropper, gently jar it loose. Let stand for five minutes; if drop sinks, the requirement is met.

2. Fraction 315° to 355° C. Repeat "Procedure 1" with Solution C and the Fraction 315° to 355° C. after liquefying. Use a clean, fresh dropper. Again, if the drop sinks after five minutes, the requirement is met.

10. STANDARD 5-BALL COLUMN METHOD OF DISTILLATION OF CREOSOTE, CREOSOTE SOLUTION AND CREOSOTE PETROLEUM SOLUTION

Notice: This Merthod has been recommended for removal from this Standard in 1998, without prejudice, due to obselence.

Scope

This method of test is suitable for the distillation of creosote, creosote solution, creosote-petroleum solution—either new or working oils—or the extracted preservative residuals from treated materials. It is a method for use in characterization of these preservatives or preservative residuals by their distillation properties when such characteristics are important in connection with laboratory or field evaluation tests. The distillation pattern obtained by the method correlates closely with those obtainable by fractional distillation and by gas liquid chromatography.

Apparatus

1. Distillation Flask. Round bottom, outside diameter 86.0 ± 1.0 mm., with 35/25 outer semi-ball connection in short neck; 300 ml. capacity.

2. Fractionating Column. Snyder 5-ball, 25 mm. outside diameter with 35/25 inner semi-ball connection at lower end; shown in Figure 1.

3. Condenser Tube. Tapered, conforming to the following dimensions:

Outside diameter of small end: 12.5 ± 1.5 mm
Outside diameter of large end: 28.5 ± 3.0 mm
Length: 360 ± 4.0 mm
Length of tapered part: 100 ± 5.0 mm

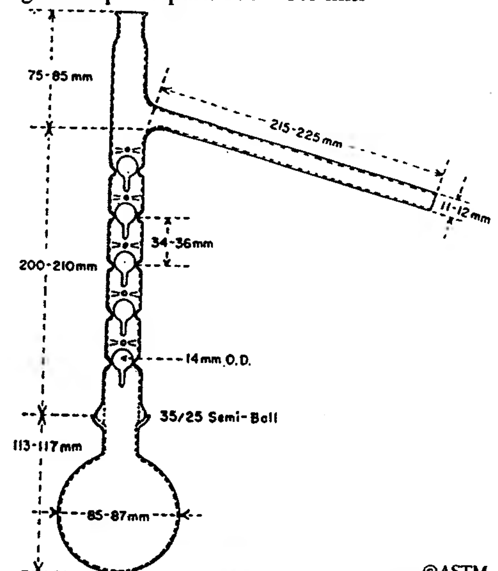


FIGURE 1.—5-Ball distillation column and flask.

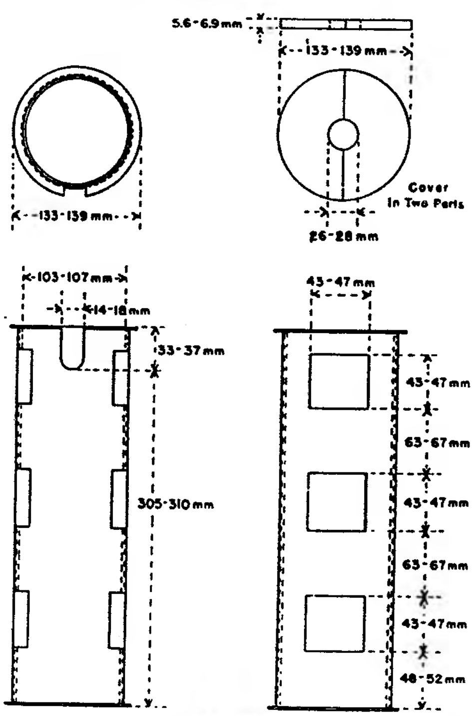


Figure 1.—5-Ball distillation column and flask

4. Flask and Column Shield. A cylindrical metal shield lined with 3.2 mm. (1/8 in.) asbestos, riveted to the metal; provided with a cover comprising two pieces of 6.4 mm. (1/4-in.) asbestos cement board; and fitted with transparent windows as shown in Figure 2.

5. Source of Heat

(a) Flame. Bunsen or Meker type burner, or

(b) Electric Heater. Output variable to 600 or 750 watts with removable upper and lower refractories, as illustrated in Fig. 3, provided with variable transformer or rheostat suitable for the voltage used (Note 1) and fitted with clamp for mounting on vertical support rod.

6. Burner Shield for Flame Distillation. A cylindrical metal shield, 95 to 105 mm. in diameter, and having a

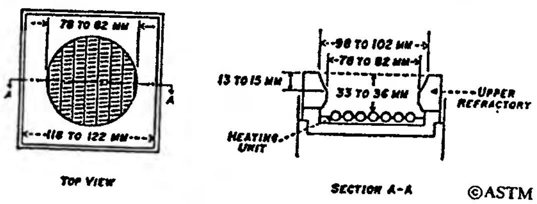


Figure 3.—Upper part of electric heater.

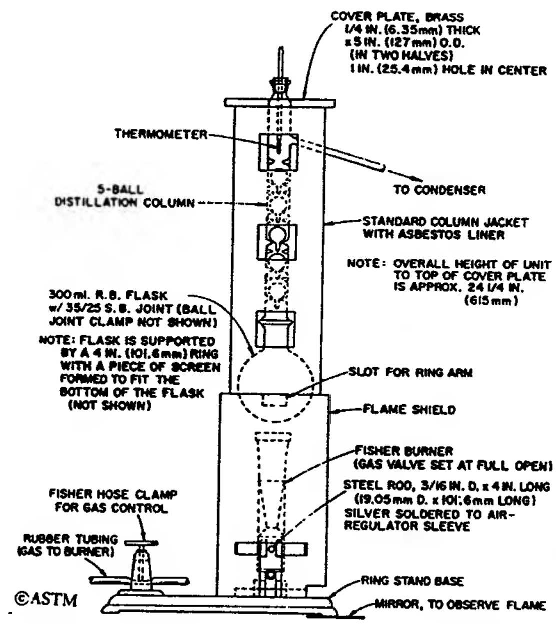


Figure 4.—Burner shield for flame distillation

peephole 25 mm. in diameter centered about 32 mm. below the ring support. The top of the shield shall be flanged to permit its being suspended from the ring support. The height of the burner shield shall be appropriate for the type of burner used. See Fig. 4.

7. Gauzes for Flame Distillation. Two sheets of 20-mesh wire gauze made of No. 26 B and S gauge nichrome wire, and 125 to 150 mm. in diameter or square.

8. Shield for Electric Heater Distillation. A metal shield

fitted with mica windows, and cover of the same construction and dimensions as those used for flame distillation (Section 6) except for the height of the shield. See Fig. 5.

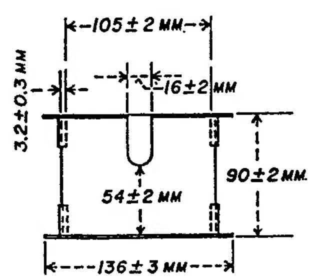
9. Receivers. Erlenmeyer flasks or beakers having a capacity of 50 to 125 ml. tared to the nearest 0.05 g.

10. Balance and Weights. A balance and weights accurate to 0.05 grams.

11. Thermometer. An ASTM High Distillation thermometer having a range of – 2 to 400°C. and conforming to the requirements for Thermometer 8 C as prescribed in the Specifications for ASTM Thermometers (ASTM Designation: E1).

12. Some chemical supply houses do not stock all of the above apparatus. The Scientific Glass Apparatus Co., Bloomfield, N. J. usually carries complete stocks.

13. Usual laboratory apparatus as required.



©ASTM

FIGURE 5.—Shield for use with electric heater

14. Apparatus Assembly

(a) For Flame Distillation. Suspend the burner shield by its flange from the support ring. Place the flask and column shield on the upper sheet of gauze. Insert the thermometer through a cork in the top of the 5-ball column so that the top of the thermometer bulb is level with the lowest point of juncture between the tubulature and the column, inside, and the stem is aligned on the axis of the column. Connect the 5-ball column to the charged distilling flask by means of a semi-ball clamp, using a heavy silicone grease to lubricate the semi-ball connections. Place the assembled column and flask in the flask and column shield with the bottom of the flask resting on the gauze. Place the pieces of the cover on the flask shield around the neck of the column. Connect the condenser tube to the tubulature of the column with a tight cork joint, having the tubulature project 30 to 50 mm. through the cork. The distance from the neck of the flask to the outlet end of the condenser tube shall be not more than 600 nor less than 500 mm. Support the condenser tube in a position such that it is in alignment with the tubulature of the column and the thermometer is vertical.

(b) For Electric Heater Distillation. Attach the electric heater to a vertical support so that, at the end of the distillation, it can be lowered for a distance of at least 15 cm. (6 in.). Place the upper refractory on the heater with its large opening facing upwards. Set the flask and column shield on the upper refractory. Place the distillation flask in the flask and column shield and support the assembly so that the bottom of the flask is between 4 and 7 mm. above the heating coils. Connect the condenser tube as in (a) above.

Procedure

1. Preparation of the Sample

(a) Thoroughly stir or otherwise mix the sample immediately before removing the portion for testing, warming if necessary to insure a solution free from crystallized solids. Take care to avoid loss of volatile material.

(b) If the sample contains more than 1.0 percent of water, dehydrate a representative sample before distillation in accordance with AWPA Standard Method for the Dehydration of Oil-type Preservatives (A1, Section 7).

2. Distillation Test. Weigh the distilling flask, and also the condenser tube, to the nearest 0.1 gram. Weigh 100.0±0.1 grams of the sample into it. If insufficient material is available for a 100-gram charge, the test may be carried out with not less than 60 grams weighed to the nearest 0.05 gram. If the distillation residue of the creosote is known to be 15 percent or less, carry out the test with not less than 150 grams nor more than 200 grams, weighed to the nearest 0.1 gram. Assemble the apparatus as described in Section 14 under Apparatus.

Apply heat to the flask by means of flame or electric heater. When the condensate forms at the bottom of the column reduce the heat so that the ring of condensate continues to rise slowly at a uniform rate. Adjust the rate of distillation, (Note 2) and subsequently maintain that rate, so that from 35 to 45 drops per minute fall from the end of the take-off and condenser tubes. Warm the condenser tube whenever necessary to prevent accumulation of solid distillates in the tube.

Calculations

1. Collect the distillate fractions in tared receivers, changing receivers as the thermometer indicates the maximum temperature for each specified fraction. The following fractions shall be collected:

Up to 200°C
200 to 210°C
210 to 235°C
235 to 270°C
270 to 315°C
315 to 355°C

Do not correct for emergent stem of the thermometer, but if the barometric pressure is not within the range 756 to 765 mm. of mercury adjust the temperature according to the table.

Adjustment of Distillation Test Temperatures for Barometric Pressure

Fractionation Temperature for Barometric Pressure

Various Barometric Pressure mm of Mercury	Ranges, deg. Cent.				
786 to 795	212	237	272	317	357
776 to 785	211	236	271	316	356
766 to 775	211	236	271	316	356
756 to 765	210	235	270	315	355
746 to 755	209	234	269	314	354
736 to 745	209	234	269	314	354
726 to 735	208	233	268	313	353
716 to 725	208	233	267	312	352
706 to 715	207	232	267	312	351
696 to 705	207	231	266	311	351
686 to 695	206	231	265	310	350
676 to 685	205	230	265	309	349
666 to 675	205	230	264	309	348
656 to 665	204	229	264	308	348
646 to 655	204	228	263	307	347
636 to 645	203	228	262	307	346
626 to 635	202	227	262	306	345
616 to 625	202	226	261	305	345
606 to 615	201	226	260	305	344
596 to 605	201	225	260	304	343

When the maximum temperature of 355°C is indicated by the thermometer, immediately remove the heat source and the flask-shield cover.

Drain any oil remaining in the condenser tube into the receiver containing the last fraction. Weigh the condenser tube to the nearest 0.1 gram and add the positive difference, if any, between the before and after weights to the last fraction. Weigh the receivers containing the distillate fractions to the nearest 0.05 gram and record the weight of each fraction.

2. Convert the distillation results to the water-free basis by means of the following formulas:

I. Fraction to 210° C:

$$\textit{Percentage (water-free) basis} = (\textit{Wt. of fraction} - W) \times \frac{100}{100 - W}$$

II. Second and subsequent fractions including residue:

$$\textit{Percentage (water-free basis)} = \textit{Wt. of fraction} \times \frac{100}{100 - W}$$

Where:

W = ml. water, expressed as grams, in fraction distilling to 210° C.

3. Add the percentages (water-free basis) of the fractions to obtain cumulative percentages to the specified temperatures.

Report

Report the cumulative percentages to the specified temperatures and distillation residue, on a water-free basis, to the nearest 0.1 percent. Report the residue by difference.

Precision

The following criteria should be used for judging the acceptability of results at the 95 percent probability level: (Note 3)

Repeatability

Duplicate values by the same operator should not be considered suspect unless they differ by more than 1.1 percent absolute.

Reproducibility

The values reported by each of two laboratories should not be considered suspect unless the values differ by more than 2.9 percent absolute.

Notes

1. The "Precision" Ful Kontrol 750-watt heater with built-in variable transformer control has been found satisfactory. This heater is available for 115 volts, 50/60 cycles only.

2. An electric metronome is preferred.

3. The figures given below are the same as those for standard Al flask distillation. More precise figures are not currently available for the 5-ball column method or for relating precision to degrees of freedom.

11. STANDARD METHOD OF DETERMINING LIQUIDITY OF CREOSOTE AND CREOSOTE SOLUTIONS

Notice: This Method has been recommended for removal from this Standard in 1998, without prejudice, due to lack of use.

1.0 Application of Test

1.1 The determination of liquidity by this method is applicable to creosote oils, creosote-coal tar solutions, and similar tar oils at specified temperatures between the range of 5°C and 38°C.

1.2 This method is also applicable for determining the percent dry salts in such oils at the specified temperature.

2. Apparatus

2.1 The apparatus shall consist of the following:

Erlenmeyer flasks, 200 ml, 100 ml, 50 ml capacity. Dewar flask, approximately 4300 ml capacity, A.H.T. Co. No.5385-K or equivalent. Asbestos or corrugated paper board cover for the Dewar flask, with an opening for a thermometer.

Wire screen approximately 4 inches square. Copper or other metal wire, approximately 12 gauge, 4 pieces approximately 10 inches in length each, suitable for use as hooks in hanging the wire screen as a platform in the Dewar flask.

Crucible, monel metal, Gooch type, approximately 4.4 cm width at top, tapering to 3.6 cm at bottom, and covered with 200 mesh wire cloth at the bottom, Newark Wire Cloth Co., Newark, N.J.

Filtering flask with crucible holder for filtering under vacuum. Water bath maintained at the specified temperature ± 0.2°C.

Balance, accurate to 0.1 gm, Thermometer, —2 to 80°C, ASTM Low Softening Point.

Laboratory press or other suitable means for pressing wet salts. Absorbent filter paper.

3. Preparation of Sample

3.1 The sample shall be truly representative of the oil to be tested.

3.2 Heat the sample carefully until completely liquid, without loss of volatile components by overheating, and mix thoroughly until completely uniform.

4. Preparation of the Dewar Flask

4.1 Trim the corners of the wire screen with tin snips, or bend them over so that the screen will freely fit into the Dewar flask to form a shelf or platform.

4.2 Loop the pieces of 12 gauge wire into a hook at one end and fasten one length of wire at each of the four rounded corners of the wire screen, and hang in the Dewar flask by bending the free ends of the wire hooks over the top rim of the flask so that the screen forms a level shelf or platform approximately 7.5 inches from the top.

4.3 Fill the Dewar flask with water at 10°C below the temperature specified for the liquidity test, to a point approximately one-half inch below the level of the screen platform before adjusting the screen in place.

5. Procedure

5.1 Determination of percent liquidity

5.1.1 Weigh 100 grams ±0.1 (Note 9.1) of the well-mixed, completely liquid sample into a 200 ml Erlenmeyer flask, and adjust temperature to 30°C above the temperature specified for the liquidity test.

5.1.2 Place the Erlenmeyer flask in the previously prepared Dewar flask by resting it on the screen platform. Adjust the asbestos or corrugated board cover over the Dewar flask, with the thermometer in place in the oil and extending out through the hole provided for it in the cover.

5.1.3 Allow the oil to cool slowly by stirring 15 seconds with the thermometer at 15 minute intervals. When the oil reaches the temperature specified for the liquidity test in 1 hour ± 10 minutes, immediately transfer the Erlenmeyer flask to the water bath maintained at the specified test temperature ± 0.2°C. Stir the contents of the Erlenmeyer flask 15 seconds at 15 minute intervals for a period of 3 hours in the water bath maintained at the proper temperature.

5.1.4 Tare the monel metal crucible to the nearest 0.1 gm and set up for vacuum filtration. Remove the Erlenmeyer flask from the water bath at the end of the l-hour period and immediately filter its contents, using a partial vacuum at the start, and increasing the suction as the filter cake forms, to a full suction within one minute. Maintain the portion of oil remaining in the Erlenmeyer flask at the specified temperature during filtration, swirling the flask prior to each addition to the crucible until the entire test portion has been filtered. Remove any salts that may adhere to the flask by rinsing with a portion of the filtrate maintained at the specified temperature.

5.1.5 Maintain full suction on the crucible for 5 minutes after filtration has been completed. Remove the crucible and weigh to the nearest 0.1 gm.

5.2 Determination of percent dry salts.

5.2.1 Remove a 4 to 5 gram portion of wet salts from the filter cake obtained in Section 5.1.5, weigh to the nearest 0.1 gm, and transfer to a large sheet of absorbent filter paper. Fold into a square approximately 4 by 4 inches, place in a press, and press out oil. Renew the filter paper, and repeat the pressing operation until the salts are substantially free of oil. This is indicated when only a trace of oil appears as a stain on fresh filter paper. Weigh the dry salts recovered to the nearest 0.1 gm.

6. Calculations and Report

6.1 Calculations.

6.1.1 Calculate liquidity as follows:

$$\%\ Liquidity = \frac{Weight\ of\ Sample\ -\ Weight\ of\ Wet\ Salts}{Weight\ of\ Sample} \times 100$$

6.1.2 Calculate dry salts content as follows:

$$\%\ Dry\ Salts = \frac{a\ (100\ -\ c)}{b}$$

Where

a = Weight of dry salts recovered.

b = Weight of portion of wet salts used in the test.

c = Percent Liquidity of the sample.

6.2 Report the test results as follows:

Liquidity, 3 hours @ °C = %

Dry Salts, 3 hours @ °C = %

7. Reproducibility

7.1 The determination should be reproducible to 0.1+ 0.05 x (percent wet salts) expressed in terms of the percent liquidity.

8. Precautions

8.1 Make sure that the temperature of the oil does not drop below the specified test temperature during the preliminary cooling in the Dewar flask, and that the oil and water bath do not vary by more than ± 0.2°C from the specified temperature during the test period.

8.2 Make sure that the filtration is as rapid as possible once it is started, and the unfiltered portion of the oil in the Erlenmeyer is maintained at the specified temperature until filtration is complete.

9. Notes

9.1 If the liquidity is known or estimated to be less than 80 percent, use a 50 gram portion in a 125 ml. Erlenmeyer flask; if the liquidity is less than 70 percent, use a 25 gram portion in a 50 ml. Erlenmeyer flask.

39

[illegible]
VICE PRESIDENT-PURCHASING
G. [illegible]RN
ASST. VICE PRESIDENT-PURCHASING
H. [illegible]AMILTON
ASST. TO VICE PRESIDENT-PURCHASING

SOU[illegible]ERN PACIFIC TRANSPORTATION COM[illegible]Y
Roo[illegible] 577 One Market Street, San Francisco, Calif. 9[illegible]05

FORM 5-2004

ORIGINAL ORDER

Date APRIL 26,1972 Bid No. 9873-05 Order No. 0088-08-99286

SHOW THIS NUMBER ON ALL PAPERS & PACKAGES

FOR FURTHER DETAILS PHONE (415) 362-1212, EXT. 22363

LOWE CHEMICAL CO.
216 WINKLER DRIVE
HOUSTON, TEXAS 77017

SEND ORIGINAL INVOICE WITH BILL OF LADING OR RECEIPT TO P. O. BOX 3979, SAN FRANCISCO, CALIF. 94119.

PLEASE SHOW OUR CODE NUMBERS ON INVOICES, PACKING LISTS, ETC.

SHIP TO SOUTHERN PACIFIC TRANSPORTATION COMPANY,
% SUPT. WOOD PRESERVING WORKS, 4910 LIBERTY RD. HOUSTON, TEXAS

SHIP VIA YOUR DELIVERY SERVICE

SHIP AS REQ. BY SUPVR. WOOD PRESERVING WORKS

TERMS NET

TAX CODES STATE 00 LOCAL 00

F.O.B. DELVD. HOUSTON, TEXAS

OUR CODE NO.	DESCRIPTION	QUANTITY	PRICE
	SUCH ALKYLATED BENZINE BOTTOMS (RESIDUAL PETROLEUM OIL) FOR BLENDING WITH CREOSOTE OIL SIMILAR TO RESIDUAL OIL PER AWPA SPEC. P-4-56, AS REQUIRED FOR WOOD TREATING OPERATION		2.40 BBL
	TO BE DELIVERED IN YOUR 6000 GALLON TRANSPORT TRUCKS AT 125 DEG. FARENHEIT AND PRODUCT MUST FLOW FREELY AT DESTINATION. QUANTITY DELIVERED TO BE CORRECTED TO 60 DEG. F FOR BILLING PURPOSES		
	MATERIAL TO BE THE SAME AS FURNISHED BY PHOENIX CHEMICAL CO. DURING 1971 AND MUST PERFORM SATISFACTORILY IN OUR EQUIPMENT AND IN WOOD TREATED IN WHICH IT IS USED; FAILURE TO DO SO SHALL RESULT IN SUSPENSION OF DELIVERIES.		
	PRICE 2.40 PER BARREL OF 42 GALLONS. FIRM UNTIL DEC. 31, 1972		
	TERM OF THIS ORDER SHALL BE FROM MAY 1, 1972 to DEC. 31,1972, SUBJECT TO CONTINUATION THEREAFTER BY MUTUAL AGREEMENT ARRIVED AT ON OR BEFORE NOVEMBER 1, 1972.		
	EXEMPT FROM TEXAS SALES AND USE TAX PER CONDITION 18 ON REVERSE SIDE	"Seller certifies the prices for the product(s) being purchased under this order are in strict compliance with executive order 11627 and the Phase Two regulations and interpretations issued hereunder providing for stabilization of prices, rents, wages and salaries."	

Separate invoices must be rendered for each phone or written release against this order.
Complete 11 digit release number to be shown on each invoice
Releases bearing identical 11 digit numbers may be recapped on a monthly or semi-monthly basis.
All invoices are to be supported by signed (for this Co.) receipts whenever possible.
It is understood that we shall be protected so as to receive the benefit of any price reduction.
All shipments to be unit packaged.
Subject to termination by written notice

040225

The Equal Employment Opportunity clauses contained in Section 202 of Executive Order № 246, as amended, and implementing rules and regulations are incorporated herein by specific reference.

A. D. DeMoss
VICE PRESIDENT-PURCHASING

BY [signature]

SEE REVERSE SIDE FOR CONDITIONS AND INSTRUCTIONS

J000513

KG COH004152

UP0000802
Abraham, et al. vs. UPRR

A. D. C. MOSS
VICE PRESIDENT-PURCHASING
V. H. HAMILTON
ASST. VICE PRESIDENT-PURCHASING

SOUTHERN PACIFIC TRANSPORTATION COMPANY
Room 7 One Market Street, San Francisco, Calif. 9

FORM S-2904

ORIGINAL ORDER

Date OCTOBER 9, 1975 Bid No 9873-05 Order No. 0082-08-99286

SHOW THIS NUMBER ON ALL PAPERS & PACKAGES

LOWE CHEMICAL CO.
P. O. BOX 12426
HOUSTON, TEXAS 77017

FOR FURTHER DETAILS PHONE (415) 362-1212, EXT. 22363

W. P. W.

OCT 23 1975

M. A. L.

SEND ORIGINAL INVOICE WITH BILL OF LADING OR RECEIPT TO P. O. BOX 3979, SAN FRANCISCO, CALIF. 94119.

PLEASE SHOW OUR CODE NUMBERS ON INVOICES, PACKING LISTS, ETC.

SHIP TO SOUTHERN PACIFIC TRANSPORTATION COMPANY,
% SUPT. WOOD PRESERVING WORKS, 4910 LIBERTY RD.
HOUSTON, TEXAS

SHIP AS REQ. BY SUPVR. WOOD PRESERVING WORKS

SHIP VIA YOUR DELIVERY SERVICE

TERMS NET

TAX CODES STATE 00 LOCAL 00

F.O.B. DELVD. HOUSTON, TEXAS

OUR CODE NO	DESCRIPTION	QUANTITY	PRICE
	SUCH ALKYLATED BENZINE BOTTOMS (RESIDUAL PETROLEUM OIL) FOR BLENDING WITH CREOSOTE OIL SIMILAR TO RESIDUAL OIL PER AWPA SPEC. P-4-56, AS REQUIRED FOR WOOD TREATING OPERATION.		8.50 BBL
	TO BE DELIVERED IN YOUR 6000 GALLON TRANSPORT TRUCKS AT 125 DEG. FAHRENHEIT AND PRODUCT MUST FLOW FREELY AT DESTINATION. QUANTITY DELIVERED TO BE CORRECTED TO 60 DEG. F FOR BILLING PURPOSES.		
	MATERIAL TO BE THE SAME AS CURRENTLY BEING FURNISHED.		
	EXEMPT FROM TEXAS SALES AND USE TAX PER CONDITION 17 ON REVERSE SIDE		
	SUPERSEDES ORDER 0082-08-99286 DATED APRIL 26, 1972		

Separate invoices must be rendered for each phone or written release against this order.
Complete 11 digit release number to be shown on each invoice.
Releases bearing identical 11 digit numbers may be recapped on a monthly or semi-monthly basis.
All invoices are to be supported by signed (for this Co.) receipts whenever possible.
It is understood that we shall be protected so as to receive the benefit of any price reduction.
All shipments to be unit packaged.
Subject to termination by written notice

PURCHASING MANAGER

SOUTHERN PACIFIC TRANSPORTATION COMPANY
Southern Pacific Building • One Market
Room 977, San Francisco, CA 94105

FORM 5-2004

ORIGINAL ORDER

MAY 5, 1977

Bid No. 9873-05

Order No. 0088-08-99286

SHOW THIS NUMBER ON ALL PAPERS & PACKAGES

J.O.C. OIL AROMATICS, INC.
BOX 138
FRIENDSWOOD, TX 77546

FOR FURTHER DETAILS PHONE (415) 362-1212, EXT. 22363

SEND ORIGINAL INVOICE WITH BILL OF LADING OR RECEIPT TO P. O. BOX 3979, SAN FRANCISCO, CALIF. 94119.

PLEASE SHOW OUR CODE NUMBERS ON INVOICES, PACKING LISTS, ETC.

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SUPT. WOOD PRESERVING WORKS, 4910 LIBERTY RD.
HOUSTON, TX

SHIP AS REQ. BY SUPVR. WOOD PRESERVING WORKS

SHIP VIA YOUR DELIVERY SERVICE

TERMS NET

TAX CODES STATE 00 LOCAL 00

F.O.B. DELVD. HOUSTON, TX

OUR CODE No.	DESCRIPTION	QUANTITY	PRICE
	SUCH ALKYLATED BENZINE BOTTOMS (RESIDUAL PETROLEUM OIL) FOR BLENDING WITH CREOSOTE OIL SIMILAR TO RESIDUAL OIL PER AWPA SPEC. P-4-56 AS REQUIRED FOR WOOD TREATING OPERATION.		.02715 LB SUBJECT TO CHANGE ON WRITTEN NOTICE AND MUTUAL AGREEMENT
	TO BE DELIVERED IN YOUR 6000 GALLON TRANSPORT TRUCKS AT 125 DEG. FARENHEIT AND PRODUCT MUST FLOW FREELY AT DESTINATION. QUANTITY DELIVERED TO BE CORRECTED TO 60 DEG. F FOR BILLING PURPOSES.		
	MATERIAL TO BE THE SAME AS CURRENTLY BEING FURNISHED.		
	EXEMPT FROM TEXAS SALES AND USE TAX PER CONDITION 17 ON REVERSE SIDE.		
	SUPERSEDES ORDER 0088-08-99286 DATED OCTOBER 9, 1975.		

KG COH004154

Tomoff
1-415-433-1…
5:30 …

Southern Pacific Transportation Company

Room 977 | One Market Street • San Francisco, California 94105

A. D. DEMOSS
VICE PRESIDENT—PURCHASING
G. C. FREEBORN
ASST. VICE PRESIDENT—PURCHASING
H. H. HAMILTON
ASST. TO VICE PRESIDENT—PURCHASING

PURCHASING AGENTS
W. C. DUNN
J. F. GRIFFIN
T. E. KEYWOOD
W. T. MONEY
D. E. ROSE

REFERENCE NUMBER
0088-08-99286
TELEPHONE (415) 362-1212
EXTENSION 22363

January 8, 1973

Lowe Chemical Company
216 Windler Drive
Houston, Texas 77017

Gentlemen:

Referring to our Order 0088-08-99286 dated April 26th covering such benzine bottoms for blending with creosote oil as required for our wood treating operation and confirming telephone conversation with Mr. Sharp.

Will appreciate your arranging to extend this purchase order to cover period ending December 31st, 1973 with all other terms and conditions to remain the same and subject to further continuation by mutual agreement arrived at on or before December 1st, 1973.

Yours truly,

A D DeMoss

RECEIVED JAN 17 1973

Rob talked to Bill Money 11/12/73
(6¢ per barrel
(Nov. + Dec 1973)
Phone 1-415-362-1212
… 2.50 per …
… $2.50 per barrel
Barbara Bryant

Sharp
1-17-73

040247

J000535

KG COH004155

41

KG COH004156

Wood Preserving Works, Houston
December 5, 1980

Mr. H. B. Berkshire
Asst. Vice-President, Engineering
Attn: Mr. J. B. Vernon

Reference is made to our conversation today concerning the phenolic material we are currently receiving from Dixie Oil Company that is mixed with creosote to treat our cross ties.

As was explained, the phenolic material formerly received from Monsanto is now largely unavailable as Dixie is furnishing various "junk streams" to make up the required amount of dilulent. These "junk streams" are completely untested and are causing numerous problems throughout our treating system.

Mr. R. S. Kilpatrick has informed me that his comparison study of #6 fuel and phenolic resin has been completed, and he will present it to you at your convenience.

Until such time as we can decide when we will use #6 fuel as a dilulent, we are going to be forced to use creosote to treat with in order that our system can continue to operate.

M. A. Lane
M. A. Lane
Superintendent

MAL:heb

cc: Messrs. W. T. Money
R. S. Kilpatrick

UP0000107
Abraham, et al. vs. UPRR

SF 506360

KG COH004157

RSK –

In order for me to request Ross to purchase No. 6 fuel oil, I'll need a good argument based on money. Need to come up with best estimate of cost associated with using the present material that will disappear when we go to No. 6. Some of these I know; such as down time and cost of cleaning the cylinder each year.

Will you detail out the other for me please.

SF 506381

J. B. V.

OCT 27 1980

Rec'd 11-6-80
Thayer

UP0000106
Abraham, et al. vs. UPRR

KG COH004158

44

Wood Preserving Works, Houston
March 30, 1978

Mr. G. F. Bozeman:

Attached for your handling is violation notice received at Wood Preserving Works dated March 28, 1978.

Odor in Sap Water Pits No. 1 and No. 2 will be controlled by placing cover over pits.

Covers have been installed, per M.A. Lane.

M. A. Lane

G.F.B.
APR 3 - 1978

C.C. A.H. Nagel
R. S. K.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC HEALTH
AIR POLLUTION CONTROL PROGRAM

VIOLATION NOTICE

Date Issued March 24 1978 Time Issued 3:50 pm

Date of Violation [illegible] Time of Violation [illegible]

Place of Violation Southern Pacific Wood Preserving Works
Samp pt #1 and Samp pt #2

Issued to:

Name H. J. Gulbenu

Title Operating Engineer

Company Name Southern Pacific Wood Preserving Works

Address [illegible] Houston, Texas

Violation of (Law or Ordinance): [illegible]

[illegible]

Violation Noted: general rules
Rule 5 nuisance from the odor
of samp pt #1 and samp pt #2

Recommendation:
abate violation

Issued by: [illegible]

Acknowledged by:

COPY FOR RESPONSIBLE MANAGEMENT OFFICIAL

Please fill in reverse side of this copy of Violation Notice and retu[rn]
by April 7th 1978 as evidence that you have taken action in this matte[r]

Director
Pollution Control Division

To: City of Houston
Department of Public Health
Pollution Control Division
Air Pollution Control Program
1115 N. MacGregor, Room 310
Houston, Texas 77030

Attention:
Director
Pollution Control Division

Gentlemen:

The Undersigned being the owner, manager, or responsible official in charge of the premises offers the following report of action taken pursuant to the inspector's recommendations and or any other steps necessary to eliminate the cause of Air Pollution Violations from said premises.

Report of Action Taken:

Odor in Sap Water Pits No. 1 and No. 2 has been controlled by installing covers over pits.

Corrective measures will be completed on (state date)

Remarks:

Signature ORIGINAL SIGNED:

Title Manager, Environmental and Mechanical

Date of Investigation April 3, 1978

cc: Mr. R. S. Kilpatrick, San Francisco
Mr. A. H. Meyers, Houston

KG COH004162

UP0000047
Abraham, et al. vs. UPRR

SF 50825

45, 139

CAUSE NO. 2000-38068

CLARENCE ABRAHAM, ET AL.	§	IN THE DISTRICT COURT
	§	
VS.	§	295th JUDICIAL DISTRICT
	§	
UNION PACIFIC RAILROAD	§	
COMPANY	§	HARRIS COUNTY, TEXAS

ORAL DEPOSITION OF:

M. A. LANE – VOLUME 1

JANUARY 17, 2002

COMPRESSED COPY

NO. 2000-38068

CLARENCE ABRAHAM, ET AL	*	IN THE DISTRICT COURT OF
	*	
VS.	*	HARRIS COUNTY, T E X A S
	*	
UNION PACIFIC RAILROAD	*	
COMPANY	*	295TH JUDICIAL DISTRICT

****

ORAL DEPOSITION OF

M.A. LANE - VOLUME I

JANUARY 17, 2002

****

ORAL DEPOSITION OF M.A. LANE, produced as a witness at the instance of the Plaintiffs, and duly sworn, was taken in the above-styled and numbered cause on the 17th day of January, 2002, from 9:26 a.m. to 4:01 p.m., before IRENE VALDES, CSR in and for the State of Texas, reported by machine shorthand at the offices of Phelps Dunbar, L.L.P., 3040 Post Oak Boulevard, Suite 900, Houston, Texas, pursuant to the Texas Rules of Civil Procedure and the provisions stated on the record or attached hereto.

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EXHIBITS

APPEARANCES

FOR THE PLAINTIFFS:
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FOR THE DEFENDANT:
MS. DEBORAH A. NEWMAN
MR. CLINT E. McGUIRE
Phelps Dunbar, L.L.P.
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MS. NEWMAN: He'll sign it. By the Rules.

M.A. LANE,
having been first duly sworn testified as follows:

EXAMINATION
BY MR. KINNAN:
Q. Morning, sir.
A. Hi.
Q. Could you state and spell your full name for the record?
A. Marion A. Lane. M-a-r-i-o-n, A period, L-a-n-e.
Q. Is your middle name Art?
A. Arthur.
Q. Arthur. And at the creosote plant you were known by?
A. Generally as Art.
Q. As Art. Okay. What's your date of birth?
A. 5/9/30.
Q. Have you ever had your deposition taken before?
A. Yes, sir.
Q. On how many occasions?

A. Oh, I couldn't tell you that.
Q. Can you give me your best estimate?
A. Four or five.
Q. When was the last time you had your deposition taken?
A. 25 years ago.
Q. Okay. Let's go over some of the ground rules. The woman to my right is an officer of the court. She put you under oath and that's the same oath you'd take in a court of law. Do you understand that?
A. Yes, sir.
Q. Do you understand your testimony is being taken under penalty of perjury?
A. Yes, sir.
Q. Is there anything of a physical or mental nature which would prevent you from giving your best testimony today?
A. No, sir.
Q. You need to give me audible responses to my questions so the court reporter can hear you and take down your audible response. I understand a shake of the head, but we need audible responses. Will you do that for me?
A. Yes, sir.
Q. Most importantly, throughout the course of

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the deposition please wait for me to finish my entire question before you give me your response so that the court reporter can get my entire question out and then your answer as opposed to an interruption. And we're going to step on each other's lines from time to time. It's inevitable, but let's do our best to wait for each other. I'll wait for you as well, okay?
A. Yes, sir.
Q. If you answer my question, I will assume as will everybody who reads the deposition transcript that you understood the question. So if there's anything about my question you don't understand, please ask me to clarify or rephrase. Do you understand that?
A. Yes, sir.
Q. In preparation for this deposition did you speak with any other Southern Pacific, Union Pacific employees or supervisors outside the presence of Counsel?
A. No, sir.
Q. In preparation for this deposition did you review any documents?
A. No, sir.
Q. Do you still work for Union Pacific?
A. I never worked for Southern Pacific.
Q. You never worked for Union Pacific?

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A. I'm sorry. Yes. Yes. I get Southern Pacific and Union Pacific mixed up.
Q. So do I, but I know there was a change. All right. So you started your employment with Southern Pacific on October 1, 1961; is that right?
A. Yes, sir.
Q. And on October 1, 1961 you were hired in what capacity by Southern Pacific?
A. Superintendent wood preserving works.
Q. Was that the Liberty Road facility?
A. Yes, sir.
Q. And you worked as the superintendent wood preserving works on Liberty Road from 1961 until when?
A. The last Friday in August of 1986.
Q. Okay. Let's mark as Exhibit Number 1 to this deposition a copy of a document. It's a three-page document. It's dated August 3, 1972. Take a look at it and tell me what that is, please?
(Exhibit Number 1 marked.)
A. This was a document that I was required to produce by the chief engineer for Southern Pacific to outline the duties and responsibilities as I saw the job requirements of superintendent of wood preserving works in Houston, Texas.
Q. (BY MR. KINNAN) Okay. So this is a document

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you put together about your job responsibilities as the superintendent of the wood preserving works on Liberty Road; is that correct?
A. Yes, sir.
Q. Okay. And you prepared it on or about or in 1972?
A. The date?
Q. On the first page there's a 1972 up at the top. Very first page?
A. Yes, sir.
Q. Okay. And we'll go through this in a minute, but let me ask you does this job description accurately reflect what your duties were for Southern Pacific from 1961 through 1986?
A. Yes, sir.
Q. Okay. Even though it was prepared roughly in the middle of that time period, it covers the whole period?
A. Yes, sir.
Q. All right. Who was the chief safety engineer that asked you to produce this?
A. Let's see, I just can't remember.
Q. Okay. Let me ask you this question. Who were your bosses over the years?
A. That's the problem. Initially my boss was

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L.A. Loggins. He was chief engineer of T & L lines of the Southern Pacific.
Q. If I may interrupt, was he your immediate supervisor?
A. Yes, sir.
Q. Okay. Go ahead.
A. His office was in Houston. After Mr. Loggins they changed the title to district engineer and the district engineer was Jeff Lynch.
Q. Say it again?
A. J.F. Lynch, L-y-n-c-h. After that change my immediate supervisor was John B. Vernon, J.B. Vernon.
Q. His title? District engineer?
A. No. He was -- his title was engineer track I believe.
Q. And does that take us through 1986, Loggins, Lynch and Vernon?
A. No. Yes, yes.
Q. And then who did you have working directly under you to help you manage the creosote plant on Liberty Road during this period of time, 25 years or so?
A. I had a general foreman. His name was Searcy, S-e-a-r-c-y, Walkinshaw.
Q. Do you have any idea how to spell that?

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We'll go C --
A. It's S.
Q. S.
A. W-a-l-k-i-n-s-h-a-w.
Q. Okay. He was your general foreman?
A. Yes, sir.
Q. For what period of time?
A. From --
Q. While you're thinking, let me say one thing about the procedures that I failed to mention at the outset. That is, the law entitles me to your best estimate. We don't want you to guess. Just tell us it's an estimate. Right now you're going to tell me approximately when he was your general foreman. Tell me it's not an exact time period, it's your best estimate and we'll move on, okay?
A. My best estimate is 1967 or '8.
Q. '61 to '67 or '8. And then who?
A. My next general foreman was T.B. T period, B period Brannon.
Q. Tommy Brannon?
A. Yes, sir.
Q. From when to when? And that's B-r-a-n-n-o-n?
A. Yes, sir.
A. My best estimate would be '81 or '82.

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Q. And then who was your general foreman up through the time the plant closed in May of 1984?
A. Well, the next general foreman was William Flock.
Q. F-l-o-c-k?
A. Yes, sir. And he was the general foreman probably till '78. I'm sorry. '88.
Q. And by that time you had left?
A. Herman Jackson.
Q. Okay. I missed something. We had Walkinshaw, Tommy Brannon through '82 and then after Tommy Brannon was Flock?
A. Flock.
Q. And he went through what year?
A. '80 -- or '78 or '79.
Q. How long was Tommy Brannon your general foreman?
A. About five years.
Q. Okay. So he went through the early '70s?
A. Yes, sir.
Q. Okay. Then did he continue to work there, Tommy Brannon?
A. No, sir.
Q. Did he die?
A. No.

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Q. He just left the company?
A. Yes, sir.
Q. All right. So while you were working there you've given me the names of the general foremen?
A. Yes, sir.
Q. And that's Walkinshaw, Brannon and Flock?
A. Herman Jackson. Herman Jackson was there until I left.
Q. And Herman Jackson was from when to when?
A. From the period of Bill Flock until I left in '86.
Q. What was Flock's tenure? I'm sorry. I missed it.
A. Bill Flock's tenure was short. Probably three or four years at the most.
Q. In the late '70s?
A. Yes, sir.
Q. All right. And while you were the superintendent of the creosote yard in Houston, where was your office?
A. Immediately inside the gate, front gate to the property.
Q. And the property was at 4910 Liberty?
A. Liberty Road, yes, sir.
Q. And so you officed at 4910 Liberty Road for

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the entire 25 years?
A. Yes, sir.
Q. Is it fair to say that you were the person mainly responsible for the operation of the plant for those 25 years? You were the superintendent?
A. Yes, sir.
Q. How often would your bosses came out to the plant to visit? Was there a regular schedule once a week, once a month or just as needed?
A. Very seldom.
Q. Very seldom. Okay. And the department that you were working in was called what?
A. Wood preserving works.
Q. Okay. What's this department engineer of M of W department? If you'll look on the second page of Exhibit 1? Just the second page of Exhibit 1. You're looking at the third page.
A. Oh, sorry.
Q. It says position superindendent of wood preserving work and then it says department. What is that?
A. Engineering of maintenance of way department was the title of the overall engineering activities on the railroad. We were just one department in the the engineering department under the maintenance, in the

maintenance of way group, which --
Q. As the plant manager, one of your responsibilities was to ensure that the workers at the plant had a safe place to work; is that right?
A. Yes, sir.
Q. And as the plant manager of the creosote plant, one of your responsibilities was to ensure that the workers were advised of any health risks that may be posed by the materials they were working with; is that right?
A. Yes, sir.
Q. And as the plant manager, one of your responsibilities was to understand what chemicals were being used at the wood preserving works; is that correct?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) Let me rephrase that so that we're clear. As the manager of the creosote plant, one of your responsibilities was to be informed as to what chemicals were being used at the plant; is that correct?
A. Yes, sir.
Q. And as the plant manager, one of your responsibilities was to educate yourself as to the toxicity of the chemicals that were being used at the

creosote plant?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) Is that correct?
A. No, sir.
Q. As the plant manager, did you have the responsibility to understand what health risks were posed by the chemicals that were being used to treat the wood?
MS. NEWMAN: Objection; form.
A. Could you run that by me again?
MR. KINNAN: Could you read the question, please?
(Last question read back.)
Q. (BY MR. KINNAN) Let me ask the question again, make sure it's clear. As the plant manager, did you have the responsibility to educate yourself as to the health risks posed by the treatment materials used at the plant?
A. Yes.
Q. And did you have the responsibility to advise the workers at the creosote plant of all the health risks posed by the chemicals used in treating the wood?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) Did someone at Southern

Pacific have the responsibility to advise the workers of the health risks posed by the chemicals they were using to treat the wood?
A. That would -- that would come under the information -- it would probably come from the safety department.
Q. It's your testimony that you did not have the responsibility to warn the workers at the creosote plant of the health risks posed by the materials they were using to treat the wood?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) Is that correct?
MS. NEWMAN: Objection; form?
A. I don't know of any health risk that was evident out there.
MR. KINNAN: Can I have the question and answer read, please?
(Last question and answer read back.)
Q. (BY MR. KINNAN) Okay. I think I understand your answer; but as a general proposition, in your position as superintendent, was it your responsibility to inform the workers of any health risks that might be posed by the materials that they were using?
A. I didn't think there was any health risk out there.

Q. Let's have the court reporter read the question back and see if I can get a yes or no answer to my question and then you can explain your answer if you'd like?
A. Okay.
(Last question read back.)
A. No.
Q. (BY MR. KINNAN) Did anybody at Southern Pacific have that responsibility to warn or advise the workers of any health risks that might be posed by chemicals that were used in the treatment process?
A. I think -- I still believe that would be under the responsibility of the safety department.
Q. As the plant manager was it your responsibility to ensure that the workers had the necessary safety equipment to protect them from exposure to the materials used in the treatment process?
A. Yes, sir, yes.
Q. One of your responsibilities was to understand what chemicals were being used in the treatment process?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) Let me strike that because I understand the objection. I want to make sure I'm

clear. Was it one of your responsibilities as the plant manager to know what chemicals were being used in the treatment process?
A. Yes, sir.
Q. That would include the chemical makeup of the extender that was being used was your responsibility to know what composition of chemicals that consisted of; is that correct?
A. There were no chemicals used out there that we weren't aware of.
Q. So as the plant manager, you informed yourself of exactly what chemicals were being used at the plant; is that correct?
A. The chemicals that we were using out there were chemicals that were furnished by the purchasing department.
Q. And what I'm asking you was as the plant manager for overall supervision of the plant, was it your responsibility to know what chemicals were being furnished in the treatment process?
A. Yes.
Q. Just so I'm clear, as the plant manager, was one of your responsibilities to understand and to learn -- strike that.
As the plant manager, was one of your

responsibilities to know if there was any health risks posed to the workers by the various chemicals used in the treatment operation?
A. Run that by me again.
MR. KINNAN: Read the question, please.
(Last question read back.)
MS. NEWMAN: Objection; form.
A. The chemicals we used in our treating process down through the years were not, as far -- as far as I know, not hazardous to the health of the employees.
Q. (BY MR. KINNAN) And I think you have indirectly answered my question. Let me ask it again because you have said that to your knowledge the chemicals were not hazardous to the employees and I understand that. Was it your responsibility to determine in the first instance whether the chemicals that you were using might pose a hazard to the health of the employees?
A. No.
Q. Whose responsibility was that at Southern Pacific?
A. It was the responsibility --
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) Do you know whose responsibility that was?

A. That would have been the responsibility of the purchasing department to ensure that they were furnishing us the material that was proper to be properly used.
Q. When you say "to be properly used," you mean chemicals that could be used safely by the workers?
A. All chemicals we used safely.
Q. Was it the responsibility to your knowledge of the purchasing department to purchase chemicals which would not pose health risks to the workers?
A. Yes, sir.
Q. Did you have any input into the purchasing department's decisions in what chemicals to purchase for use in treating the wood?
A. From the standpoint of purchasing, we had to levy a requirement on the purchasing department to receive the material we needed.
Q. Was that a quantitative requirement?
A. Yes, sir.
Q. Was it a qualitative requirement?
A. Yes, sir.
Q. So you were dictating both the quantity that you needed to the purchasing department and -- strike that.
You told the purchasing department how much

you needed to treat the wood?
A. Yes, sir, that's it.
Q. Did you tell the purchasing department what type of materials you wanted them to purchase?
A. Only by name and use.
Q. And what did you tell the purchasing department that you needed?
A. Creosote, coal tar and diluent, Number 6 fuel oil or equal.
Q. And how did you know what chemicals you needed to treat the wood at the creosote plant?
A. Down through the years wood in the United States has been treated by creosote and creosote mixtures.
Q. When you started with Southern Pacific in 1961, did someone train you as to what chemicals were needed in what quantities to treat the wood?
A. I came to Southern Pacific from the Santa Fe.
Q. Santa Fe Railroad?
A. Yes, sir.
Q. Okay. All right. You graduated from Oklahoma State University in Stillwater in 1953; is that correct?
A. Yes, sir.
Q. So you had about seven or eight years to work

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thereafter. Did you work for that seven or eight years before going to Southern Pacific?
A. Yes, sir.
Q. What was your first job out of college?
A. I was an inspector, track inspector.
Q. For whom?
A. Santa Fe.
Q. Where were you stationed?
A. Topeka, Kansas.
Q. How long did you hold that job?
A. Actually until I came to work for Southern Pacific.
Q. Very good. Were you a track inspector the whole time?
A. Yes, sir.
Q. What is a track inspector?
A. An individual that is given a section of track and it's his responsibility to make sure that section of track is capable of handling the traffic and loads safely.
Q. Did you have to repair track?
A. No, sir.
Q. Did you have to treat the track with --
A. No, sir.
MS. NEWMAN: Wait for the question.

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Q. (BY MR. KINNAN) No. We're doing good. It was my fault. I should have hurried along with my question. Let me get my question out. Did you as a track inspector have to apply treatment material to the wood ties out in the field?
A. No, sir.
Q. Did you have anybody doing that for you?
A. No, sir.
Q. You were just inspecting; and if you saw a problem, you would issue an order for someone else to do that?
A. Report it.
Q. Report it. Okay. And just out of curiosity, did you drive around in a train?
A. No, sir. I walked.
Q. You walked?
A. My first job was from Galveston to Clovis, New Mexico.
Q. So you walked from Galveston to --
A. That's right.
Q. Did you really?
A. Yes, sir.
Q. Well, that's good. Okay. So you did that for seven years and then you went to work for Southern Pacific?

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A. No, sir.
Q. No, you didn't?
A. During that period I was located in two treating plants.
Q. As a track inspector for Santa Fe you worked for -- I'm sorry. I didn't understand your answer.
A. I was located at two Santa Fe treating plants.
Q. Between 1953 and 1961?
A. Yes, sir.
Q. But your job was always track inspector?
A. That was my title.
Q. Did you do anything at the wood treatment plants?
A. Yes, sir.
Q. What did you do?
A. At the Summerville plant I was designated the alternate chemist and at the Albuquerque plant I was designated the -- what did they call me, construction foreman.
Q. Do you have a chemistry background?
A. No, sir.
Q. What did you do as the alternate chemist at the Santa Fe wood treatment plant in Summerville?
A. I was -- I learned the duties of a treating

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plant chemist.
Q. What were the duties of a treating plant chemist?
A. Primarily to keep track of the treating solutions.
Q. So when you keep track of the treating solutions --
A. Count them.
Q. What are you doing? The volume?
A. Yes, sir.
Q. What about the chemical makeup of those treating solutions?
A. Yes, sir.
Q. Yes?
A. Yes, sir.
Q. What was the chemical makeup of the treating solutions at the Summerville wood treatment plant?
A. 30 percent creosote, 70 percent Seguro fuel oil.
Q. So in addition to inspecting the track, you managed the inventory of treating material for the Summerville plant; is that correct?
A. Yes, sir.
Q. And what was the construction foreman -- what were you doing as a construction foreman at the other

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treatment plant in Albuquerque?
A. I was installing a cylinder, an additional cylinder for treating crossties, supervising.
Q. So while you were at Santa Fe, you came to learn what chemicals were used in treating crossties and you also learned about the machinery needed to treat the ties; is that correct?
A. Yes, sir.
Q. All right. What was the residual fuel oil called that you used at Santa Fe?
A. Seguro petroleum.
Q. Would you spell Seguro?
A. S-e-g-u-r-o.
Q. So it was called Seguro petroleum?
A. Yes, sir.
Q. Was that the name of an extender?
A. Yes, sir.
Q. Where did you get that material?
A. I don't know.
Q. Did the American Wood Preservers Association have standards for treating wood ties?
A. Yes, sir.
Q. And did you study those standards?
A. Yes, sir.
Q. Do you know the number of the standards that

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were applicable to the wood treatment at Southern Pacific?
A. The standards are designated by letters and numbers and I can't remember what they are.
Q. Okay. P standards?
A. Petroleum standards.
Q. And do you recall what the standard was for treatment material that applied to the treatment process at Southern Pacific while you were there?
A. No, sir, I can't.
Q. You recall generally what it said?
A. No, sir.
Q. Not just the number, but what it required you to do or advised you to do?
A. No.
Q. Was there a standard for the extender?
A. Yes, sir.
Q. And what did that standard advise you by way of the extender to be used?
A. The extender had to conform to a certain specific gravity and had to conform to certain -- the gravity of certain components and it had a standard of sediment.
Q. On what?
A. Sediment.

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Q. And what is the gravity aspect of this standard?
A. The gravity is a comparison of the material at any given temperature to water.
Q. What about the chemical makeup of the extender, was there a standard for that?
A. No.
Q. Did each individual wood treatment plant determine what the appropriate makeup of the extender would be?
A. I don't know how the other plants handled that.
Q. How did Southern Pacific handle the specifications for the extender they used?
A. We used a gravity requirement and a sediment requirement and a compatibility requirement.
Q. What's the compatibility requirement?
A. The extender should be completely compatible with the creosote.
Q. What does it mean to be completely compatible?
A. It mixes.
Q. It mixes?
A. (Witness nods head.)
Q. Was there a toxicity requirement for the

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extender that you purchased?
A. No, sir.
Q. Now, you said that the requirement to the -- your requirement to the purchasing department was that you needed Number 6 fuel oil or equal as the extender; is that correct?
A. Yes, sir.
Q. What is Number 6 fuel oil?
A. Number 6 fuel oil is the lowest cut in the catalytic cracking of a barrel of oil. It's the last -- it's the last cut that comes off when all of the lighter ends are taken off.
Q. And you said Number 6 fuel oil or equal. What equals Number 6 fuel oil? What other type of extender? Can you give me some examples?
A. No.
Q. Say it again?
A. No.
Q. Well, what did it mean to request Number 6 fuel oil or equal?
A. We can take Bunker C which is even a lower cut, but it had to be heated.
Q. What is Bunker C?
A. It's another cut from the distillation of petroleum.

Q. Is it higher or lower than Number 6 fuel oil?
A. Lower.
Q. It's a lower cut?
A. Yes, sir.
Q. In any event, the Number 6 fuel oil and Bunker C are petroleum products?
A. Yes, sir.
Q. How you doing? You want to take a break? One of the things --
MS. NEWMAN: Let's take a few minutes.
Q. (BY MR. KINNAN) What I forgot to mention is if you want to take a break at anytime, feel free to do so. It's not a marathon test here, okay?
A. Yes, sir.
MS. NEWMAN: Take a little short bathroom break.
(Break.)
MR. KINNAN: Let's go back on the record.
Q. (BY MR. KINNAN) You understand you're still under oath?
A. Yes, sir.
Q. All right. Let me use your vast knowledge of the plant to get oriented. Let's mark as the next number in order a photograph from Mr. Bozeman's file

and I'll ask you to identify the -- what's in this photograph. What we're going to do is we only have the original. The court reporter will take the original, make color copies for everybody, attach that to the deposition and send the original back to Counsel for defendant. Is that okay?
A. That's right.
(Exhibit Number 2 marked.)
MR. KINNAN: Let's go back on the record.
Q. (BY MR. KINNAN) That's Exhibit 2. What does Exhibit 2 show us?
A. Exhibit 2 shows cylinder number 1 closed. Treating cylinder number 2 open. I'm sorry. That's not number 2 because we have the fifth cylinder on there. Treating cylinder number 2 is closed. Treating cylinder number 3 is open. Treating cylinder number 4 is open and treating cylinder number 5 is open.
Q. And does the picture show some smoke or vapor or fumes in front of the ones that are open?
A. Steam.
Q. Steam. Okay. It's steam pressured inside --
A. No. When the cylinder is open, it's very hot, between 190 to 225 degrees. And if there's any moisture in there at all, it's in the steam phase and

it's going to came out.
Q. Okay. So there are some I guess railroad tracks that go right into those cylinders; is that --
A. There's not railroad tracks. They're rail. They're lines of a rail. That's the bridge. So you can get the ties from the yard into the cylinders and then those bridges are picked up and laid beside the cylinder while the cylinder is under pressure or is being used for treating.
Q. So Exhibit 2 shows the treatment cylinders?
A. The treating cylinders, right. It shows four of them.
Q. Let's mark as Exhibit Number 3 a series of aerial photographs that I obtained from various companies and they're labeled on the back and dates and I'll just ask you to identify -- we'll take a look at these.
(Exhibit Number 3 marked.)
Q. (BY MR. KINNAN) I was provided with very similar photographs from your office last week. I have those here too; so feel free. If you'll take a look at that, sir, and I will represent to you that I obtained these from aerial photograph companies and if you'll look at the back of each page or otherwise provided, it gives us the date of the photograph. So we're looking

at the first one, first page of Exhibit 3 and it says that this picture was taken in January of 1985. Do you see that?
A. Right here.
Q. Okay. So let's use 1985 as the date that this picture supposedly was taken. Now look at the picture, will you please? Does it show the creosote yard where you worked?
A. Yes, sir.
Q. And can you give us some directions on this? At the top of the page, what direction is that?
A. That's primarily east. North --
Q. Let's make sure we have the photograph.
MS. NEWMAN: You want it vertical or horizontal?
A. This has to be north because Englewood yard is down here.
Q. (BY MR. KINNAN) I'm sorry. But we'll get through this. The treatment vessels are shown in this photograph, aren't they?
A. Yes, sir.
Q. It looks like one, two, three, four long ones and one short one are shown; is that correct?
A. Yes, sir.
Q. Is that the east end of the yard?

A. It's really the north end. It's -- Englewood yard is north -- the way Houston is laid out, Englewood yard is north. Downtown is south. This is east. This is west.
Q. Okay. It's skewed just a bit then?
A. Yes, it's skewed, yes, sir.
Q. So in the northeast portion of the creosote yard, what are the tanks that we see to the northeast of the treatment vessels?
A. They're working tanks and storage tanks.
Q. Okay. To the best of your ability, can you tell me what was stored in the tanks?
A. Okay. You want to start from the --
Q. Furthest north?
A. Furthest north, okay. That tank that's horizontal to the rest of the tanks is a caustic tank. We put the -- you just want to know what it is? It's a caustic tank.
Q. And what was the caustic used for? What is caustic?
A. Caustic is a -- material you use to reduce the PH of acidic solutions.
Q. And is that mixed with the creosote and extender?
A. No, sir.

Q. That's mixed with the water?
A. Water, yes, sir.
Q. Okay. So there's a caustic tank. It's a vertical caustic tank and then --
A. No, it's horizontal. This is a horizontal tank on legs.
Q. What are the other tanks?
A. The three large tanks, the tank next to the caustic tank was what we call our slop tank. We pumped material into there to get it out of the system and hold it until such time as we can evaporate it and recover material.
MR. KINNAN: Mr. Lane, this is Mr. Dutton.
MR. DUTTON: Mr. Lane, how are you?
THE WITNESS: Hi.
A. The next two tanks are storage tanks and we can have either creosote or extender oil in one or the other.
Q. (BY MR. KINNAN) Okay. So in those storage tanks one would hold creosote, one would hold extender?
A. Right.
Q. They would not be mixed in those tanks?
A. No, sir.
Q. And the slop tank --

A. That there was a tank that we collected the material so it wouldn't be on the yard.
Q. How did you get the material into the slop tank?
A. This building down here with the five cylinders sticking out of it --
Q. Yes.
A. -- it had what we call a -- it was called a -- it was a series of valves and teeth and we could pump through any tank to the cylinders, from the cylinders to any tank, and from tank to tank.
Q. All right. So at the end of a treatment operation the residue would be pumped back into the slop tank?
A. No, no, no. The only time we put material in the slop tank was when we -- like we'd have a big rain and the water would run in the sump. We'd pump from the slump to this slop tank because it's water and its got creosote and stuff like that.
Q. Where you had accumulation of waste material somewhere on the plant?
A. Not on the plant, just inside the tank farm.
Q. And the tank farm is to the northeast of the cylinder building?
A. The tank farm is that area behind the

building down to the caustic tank which is inside -- we had a four and a half foot concrete retaining wall around the whole thing. If there was a tank -- should there be a tank run-over, we would have taken that stuff and put it in the slop tank.
Q. Understood. Okay. And then you said that material would be evaporated?
A. Yes, sir. We pump it from the slop tank to the cylinder -- if we have the cylinder time. Understand, if we have the cylinder time, we put that material in the cylinder, put the heat on it, put a vacuum on it, get rid of the water and collect all the other stuff, oil, anything that -- anything that would not evaporate at the normal air pressure that the cylinder was on.
Q. And then from -- that material would go where after the water evaporated?
A. It would be very hot, very hot. We'd drop a working tank on top of it to cool it down and then we'd pump it to the oil tank working tank.
Q. Pump it to a working tank, whether it would be creosote or extender?
A. 99 percent of it is 30/70 anyway.
Q. Okay. So I understand it, we've got the caustic horizontal, the slop tank, then we have a

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creosote --
A. Two storage tanks.
Q. Two storage tanks. Were they covered tanks?
A. Oh, yes, sir. All of our tanks were covered.
Q. And could the material -- were they closed covered?
A. Yes, sir. Well, except for a -- except for a raised stove pipe kind of thing that would --
Q. Vent?
A. Vent, right.
Q. All right. Okay. So we have the storage tanks, the slop tanks, the caustic. This is to the north of the building. What are the other tanks?
A. We have seven working tanks. Three in line and one off to the left. And then we have three dry agent tanks.
Q. Let me stop you right there. The working tanks, did they contain the 70/30 mix of the treating material?
A. All of them except two. Two we had creosote in and one -- one we had creosote in. One we had residual fuel oil, extender.
Q. So you had four of the working tanks with the mixture and two --
A. Five.

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Q. Five with the mixture, that's right, and then two that held either strictly creosote or strictly extender?
A. It was our backup material if we needed it.
Q. Okay. And were those closed tanks?
A. Yes, sir.
Q. Except for a vent?
A. Yes, sir.
Q. And to your knowledge were there any emissions, vapors released from the tanks through the vent or any other source?
A. Very little.
Q. And how do you know that or how did you know that?
A. Well, anytime you pump hot treating solution into a tank, it's giving off vapors and they have to go somewhere.
Q. Was the material in these treatment working tanks heated?
A. Yes, sir.
Q. At all times?
A. Yes, sir.
Q. What about in storage tanks?
A. Storage tanks were heated, too. Everything was heated except the slop tank and the caustic tank.

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Q. Okay.
A. And the drying agent tanks.
Q. Okay. So now at the northeastern and you've identified the working tanks and storage tanks, the caustic tank. Anything else out there?
A. You see the three little white dots?
Q. To the left --
A. Left.
Q. -- of the working tanks?
A. Right.
Q. Yes.
A. Those are drying agent tanks.
Q. Say it again?
A. Drying agent tanks.
Q. Naphtha?
A. Naphtha, yes, sir.
Q. You used naphtha for what purpose?
A. To dry the wood.
Q. How did that process operate?
A. Well, wood in its normal state comes off the stump at anywhere from 60 to 95 moisture. You cannot treat wet wood. You have -- you have a choice of either pulling the moisture down or you put it on the yard and air dry it. We chose to air -- to use the vapor drying process. Vapor drying process amounted to

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an artificial -- it was an artificial process. Put a train of ties in the cylinder. After you determine the moisture content of the train, you know how much water you've got to take out of that train. Close the door. You fill the cylinder with a drying agent above the coils, turn the heat on and the drying agent starts coating the wood. The heat in the cylinder would gradually build up and the drying agent will -- has an affinity for moisture. As the process keeps turning, your cylinder is going to fill up with moisture and drying agent. It comes off the top of the cylinder. It goes into a separator. The separator separates one side water and the other side drying agent. The drying agent goes to the drying agent tanks. The water goes to the -- well, it goes to a concrete -- or it was going to a concrete box.
Q. Okay. We'll get into that. The naphtha that was used, did you -- do you know what the chemical constituents were of the naphtha?
A. We knew it had to be from an aromatic petroleum and it had to vaporize at not -- at not less than 190 degrees. Now, the ties were treated as much as 260 degrees, but naphtha has to be -- it has to be able to vaporize at a lower temperature. Every degree that it takes to get the naphtha into the vapor phase

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is costing you money.
Q. Did you come to learn that the -- that naphtha vapors were toxic?
A. No, sir.
Q. If you breathed them?
A. No, sir.
Q. What about the material itself, did you come to learn that the material was toxic in any way?
A. I'm not sure naphtha is toxic.
Q. Did you make an effort to learn the toxicity of the naphtha either in vapor form or liquid form?
A. No.
Q. Was that, as you said earlier, the responsibility of the safety department?
A. Well, no. It was never discussed.
Q. Okay. Were there various types of naphtha that you could purchase?
A. Yes, sir. You can buy naphtha from any petroleum company in the United States.
Q. Did the type of naphtha that you purchased vary in price?
A. The alphatic naphtha, which we couldn't use, were always cheaper than the aromatic naphthas.
Q. But with the aromatic naphthas, were they different price?

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A. There was a lot of different prices, yes, sir.
Q. And who determined which aromatic naphtha to purchase?
A. Well, from my standpoint, the most efficient naphtha should be the one we should use.
Q. Did Southern Pacific use the most efficient naphtha?
A. As long as it was available.
Q. Were there times when it was not available?
A. Yes, sir.
Q. And over the -- I'm just going to say 25 years that you were there, what percentage of the time was the most efficient naphtha available or not available? What's the breakdown?
A. The first ten years.
Q. First ten years it was available?
A. Yes, sir.
Q. And then after that the most efficient naphtha was not available?
A. It was taken -- for some reason they quit producing it.
Q. So after 1971 there was a change in the type naphtha used given the market?
A. Yes, sir.

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Q. And could you describe for me what that change was from most efficient to not so efficient? What was the difference?
A. The big difference was the lesser naphthas would -- you would use more naphtha per cubic foot than the material that I favored.
Q. And why would you have to use more? What was it lacking in terms of chemical component?
MS. NEWMAN: Objection; form.
A. I don't know.
Q. (BY MR. KINNAN) You don't know?
A. I don't know.
Q. Okay. All right. So we used the naphtha to dry the wood?
A. Right.
Q. And then you returned as much naphtha as possible back to the naphtha holding; is that correct?
A. Right. Well, during the drying period -- after the drying period you return it -- it was automatically returned back to the holding tank, but at the same time there was naphtha coming out of the holding tank and going back into the cylinder because you had to maintain level the naphtha over the coils. Otherwise the process would stop.
Q. Okay. I understand.

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A. Okay. We would lose -- let me go into hot vacuum first. The next item is we put the cylinder under a hot vacuum to pull naphtha and water vapor out of the wood as much as we can. Primarily to open the pores up and recover as much naphtha as we could. After the hot vapor or hot vacuum, we would break the vacuum by turning on the pumps and filling up the cylinder with oil as fast as we could. It's also the safest way.
Q. Was this water waste stream called sap water?
A. Yes, sir.
Q. All right. And the sap water for many years was discharged along the what? What border would that be?
A. There was a concrete box between -- if you look between -- this is a railcar -- this is the main line out here.
Q. Let me ask you when we're describing what's on this picture to describe it so the record can pick it up. So you were -- there is a white building with the cylinders coming out of it. Do you see that building?
A. Yes, sir.
Q. All right. Now, where in relation to that building is the sap water discharged?

A. The sap water discharge is just in between the first working tank behind the building on the right and the railcar on the track.
Q. Okay.
A. We were dumping the sap water into this box which had three loopers and it was going into the City sewer.
Q. Wasn't there a ditch along the southern --
A. Had nothing to do with this.
Q. Okay. So what you did was you extracted the sap water from the ties, put it into this concrete tank behind the building and then into the sewer; is that correct?
A. Yes, sir.
Q. All right. And that sap water you came to learn had a phenolic content to it?
A. Yes, sir.
Q. Is that correct?
A. Yes, sir.
Q. Did you always know that that sap water had a phenol content to it?
A. No, sir.
Q. And the phenol came from where?
A. The wood.
Q. From the wood itself?

A. (Witness nods head.)
Q. Okay. Was there phenol in the creosote?
A. No.
Q. Was there phenol in the creosote extender?
A. Not that I know of.
Q. While the drying process was in operation, were the cylinders releasing naphtha vapor into the air through vents or something?
A. Not naphtha, steam.
Q. Steam?
A. Except when they were under hot vacuum. Then the cylinder was -- it was a closed system.
Q. So it's your testimony that none of the naphtha in vapor form escaped the cylinders during the drying process; is that correct?
A. Yes, sir.
Q. Okay. All right. Have you described for us all of the structures to the east, the northeast section of the plant behind the -- what do we call that building?
A. The treating building.
Q. The treating building. To the northeast of that treating building, have you described all those structures up there?
A. Well, just to the left of the treating

building is our package boilers.
Q. Your what?
A. Package boilers. Actually they were steam generators.
Q. Can we see those in this picture?
A. You can see a red -- I'm sorry. A light square configuration immediately to the left of the fifth cylinder.
Q. And that's a boiler?
A. That's a boiler, steam generator.
Q. Okay.
A. And immediately behind it was our water softening equipment.
Q. And then you have the cylinders?
A. The cylinders.
Q. This is a 1985 picture; so we show five cylinders, correct?
A. Yes, sir.
Q. How long were the cylinders?
A. 108 feet by 145 feet.
Q. Eight feet in diameter by 145 feet?
A. In length and 85 feet in the short zone.
Q. And still eight foot diameter?
A. Eight foot diameter.
Q. And we identified in Exhibit Number 2 the

treatment vessels we're talking about; is that correct?
A. Cylinders, yes, sir.
Q. We'll call them cylinders. Also called retorts?
A. Retorts.
Q. All right. How many wood ties would you treat at a time in the long cylinders?
A. Crossties are not always exactly seven by nine by nine. They're exactly nine, but they're not seven by nine. They can be quarter to a half-inch in either direction; and that could determine how many actual ties you've got on a tram, which would determine the actual number of ties you put in a cylinder for treatment.
Q. The typical wood tie is how long?
A. Eight foot eleven and three-quarter inches.
Q. By?
A. Seven inches by nine inches.
Q. Okay. So on the average how many did you treat at a time?
A. About 100 ties to the cylinder. It can be more than that.
Q. And was the wood treatment operation a 24/7 operation?
A. No, sir. Only when it was required.

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Q. What was the standard operating time?
A. Five days, eight hours.
Q. And was there a particular time during the day when the treatment operation was ongoing?
A. 24 hours a day.
Q. That's what I meant. Were you treating the wood 24 hours a day?
A. Well, the normal treating time for a stump green train would be maximum 22 hours.
Q. Okay. What I want to know is how often you were using the cylinders to treat the wood? I know it takes 24 hours or 22 hours to go through the treatment process. How often were you doing that?
A. Every time we could change a cylinder.
Q. Okay. So everyday most of the day there would be treatment going on in these cylinders; is that correct?
A. Yes, sir.
Q. 24 hours a day?
A. (Witness nods head.)
Q. Yes?
A. Yes, sir.
Q. And during the treatment operation did the cylinders emit smoke, vapor, any other substances?
A. Only when the door's open.

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Q. So it's your testimony that during the treatment operation there was no emission from the treatment cylinder?
A. No, sir.
Q. You couldn't see any smoke coming out?
A. No, sir.
Q. See any vapor coming out?
A. No, sir. It's a closed system.
Q. Closed system. And that was always the case?
A. Yes, sir.
Q. And at the end of the treatment operation then you would open the cylinder door --
A. Yes, sir.
Q. -- as shown in Exhibit 2, correct?
A. Yes, sir.
Q. And at that point then you would have a release of vapor and smoke and steam?
A. It was controlled. It could be controlled by the laborer that opened the door. The door's not just swung open. The door's opened, cracked and it's -- the reason for that is after every treatment there's 30/70 solution still in the cylinder in the bottom of the cylinder and you let that 30/70 solution run out of the cylinder. Now, there's vapors coming out of the top of the cylinder and that's primarily where the vapors --

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that's the only effluent there is of any volume coming out of the top of the cylinder because that cylinder has been up to 195, 200 degrees and there's water vapor in there and its got -- it's going to go somewhere.
Q. During the treatment operation does the -- do the vapors go out the top?
A. Yes, sir.
Q. Through a vent?
A. No, sir. Through the front door. Through the front of the door.
Q. Only when it's opened?
A. Only when it's opened.
Q. Understood. Okay. So you'd have a worker at the end of every cycle open these doors; is that correct?
A. We have a lead on every eight hours and when the cylinder comes down, we pull that cylinder and then we recharge that cylinder.
Q. I'm just talking about opening the doors. There would be a worker who opened the doors; is that correct?
A. Yes, sir.
Q. All right. Was it just one worker per cylinder or one worker for all the cylinders?
A. One worker for eight hours. His shift. Now,

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very seldom did all five cylinders come down during one shift. That could be -- I wouldn't bet on it.
Q. Well, during the course of an eight-hour shift, on the average how many of these cylinder doors would be open?
A. Two, possibly three.
Q. Okay. And it's true though when you open the cylinder door at the end of a treatment operation, vapors and smoke and steam come billowing out of the cylinder, correct?
A. Mostly steam. Some vapors. Mostly steam.
Q. There is a number 30/70 creosote vapor that's released; is that correct?
A. Yes, sir.
Q. And it smells; is that correct?
A. Yes, sir.
Q. Is it -- was it or would it irritate the eyes when you opened the cylinders?
A. No, because you're -- we didn't have any laborers that were that tall. Now, I thought the air was pretty nice, pretty good.
Q. Say that again?
A. I liked the odor myself.
Q. The odor of the creosote and creosote extender?

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A. Right.
Q. Did you provide these workers who opened these doors any respirators?
A. We had respirators. We had air packs and we had the small dust masks.
Q. Okay. Respirators?
A. Had four respirators.
Q. Air packs. What's an air pack?
A. An air pack is the thing that you have two tanks that you had to fill up with air and you get your oxygen out by turning on the tanks to the face mask.
Q. And then you had dust masks?
A. (Witness nods head.)
Q. And is it your testimony that from -- during your tenure 1961 to 1984 --
A. '6.
Q. I know, but I had to say '84 because they shut the plant in '84?
A. That's right.
Q. So is it your testimony from 1961 to 1984 Southern Pacific provided its workers with respirators, air packs and dust masks --
A. Gloves.
Q. -- dust masks for use in the treatment operation?

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A. Yes, sir.
Q. Did you personally see the employees wearing the respirators that were provided when they opened these doors?
A. They were using them when I was around.
Q. Do you know whether they were using them at all times?
A. Yes, they weren't. They were not.
Q. And how do you know that?
A. Well, I walked up on them and they weren't using them.
Q. And as we said earlier, you understood one of your responsibilities to be to make the working place safe for the workers while they were there; is that correct?
A. Yes, sir.
Q. And as part of your responsibility you provided appropriate respirators, things of that nature to prevent them from breathing in the vapors from the creosote cylinders; is that correct?
A. Not only the creosote cylinders but any other area where they might be working where there was fumes.
Q. Okay. You felt it necessary for the safety of the workers that they wear respirators when they're around these fumes that consisted of the creosote and

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creosote extender; is that correct?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) For the workers' safety, for the workers' safety you required them to wear respirators when they were breathing or in an area where they would breathe these fumes?
MS. NEWMAN: Objection; form.
A. Yes, sir.
Q. (BY MR. KINNAN) Yes?
A. Yes.
Q. And that safety rule that you had related to all employees?
MS. NEWMAN: Objection; form.
A. No, sir.
Q. (BY MR. KINNAN) It wasn't a very good question. Did you feel it necessary that for the workers' safety they wear a respirator when they opened these cylinders?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) Did you allow the workers to open these cylinders without using a respirator or an air tank?
A. Yes, sir.

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Q. Is that because you believed that the treatment materials were not toxic or hazardous to health?
A. Yes, sir.
Q. And if you had known that the treatment materials were toxic, would you have required them to wear the appropriate respirator?
MS. NEWMAN: Objection; form.
A. I don't think we had any toxic chemicals out there.
Q. (BY MR. KINNAN) Okay. I understand that. We'll get into that, but assume for a minute that you were told that the treatment materials were toxic to breathe. They posed hazards to the health of the employees if breathed. Would you have required them to wear the appropriate respirator or air device, breathing device?
MS. NEWMAN: Objection; form.
A. That was not covered in our safety manual.
Q. (BY MR. KINNAN) What was not covered?
A. If there was toxic material out there. I maintain that there was no toxic material out there.
Q. How did you go about educating yourself as to the toxicity or non-toxicity of the chemicals being used in the treatment process?

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MS. NEWMAN: Objection; form.
A. If I had a problem with a material, I would have it tested.
Q. (BY MR. KINNAN) What do you mean "a problem with a material"?
A. Well, if somebody told me it was toxic, I'm not an expert on toxicity and I'm not a chemist; so I'd have to have somebody that is, has that particular level of expertise.
Q. Well, under your responsibilities to ensure that the workers have a safe place to work, didn't you take it upon yourself to learn whether any of the chemicals were toxic?
A. No.
Q. No?
A. No.
Q. Do you know whether anybody else at Southern Pacific undertook the responsibility to determine whether the treatment materials were toxic to the workers?
A. No, sir.
Q. Do you know that they did not?
A. I don't know if there was anybody doing it.
Q. And this is for the entire tenure, 25-year tenure you were there, 26-year tenure?

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A. I don't know. I don't know.
Q. As the superintendent of this plant, you would have been one of the people responsible for determining whether the chemicals were toxic to your workers; is that correct?
A. I think we'd have to -- I think we'd have to know ahead of time that there was a toxicity problem, and I was not aware of that.
Q. You have testified that to your knowledge these chemicals were not toxic; is that correct?
A. Yes, sir.
Q. All right. How did you come to that understanding that these chemicals were not toxic?
A. We've had a lot of work done by laboratories during that time and I'm sure that if we had given those people a toxic material that was toxic, they would let us know.
Q. What work were those laboratories doing for you?
A. Primarily compatibility tests, gravity tests, flash tests.
Q. Did you ever ask these laboratories to do a toxicity test on the materials that were being used in the treatment operation?
A. No, sir.

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Q. Do you know if anybody at Southern Pacific did that?
A. No, sir.
Q. It was Southern Pacific's position that the materials were not toxic because they were never told they were toxic?
MS. NEWMAN: Objection; form.
A. We had -- Southern Pacific, when we bought a product, the product that we bought was certified to be non-toxic. No matter who we bought the product from, it was certified to be non-toxic.
Q. (BY MR. KINNAN) And you took part in ensuring naphtha certification of non-toxicity was received with respect to each chemical?
A. Yes, sir.
Q. That would include the extender?
A. Yes, sir.
Q. And the creosote materials?
A. Yes, sir.
Q. All right. And did the certification of non-toxicity present itself in writing or just verbal?
A. No, it was written. It was written.
Q. What was the document called?
A. It was an attachment to our purchase order.
Q. Can you describe it any more?

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A. I'm sure there's a copy of it around here somewhere.
Q. What was the title of it?
A. Like I say, it was an attachment to the purchase order.
Q. And it said something to the effect that we, the seller, certify that these chemicals are non-toxic?
A. Yeah.
Q. Is that right?
A. Yes, sir.
Q. And in each instance you received that certification?
A. We received -- we received the certification upon the initiation of shipment.
Q. And you purchased extender from Dixie Oil Process, Ralph Lowe; is that correct?
A. Yes, sir.
Q. Did you receive a certification of non-toxicity from his companies?
A. Yes.
Q. Yes?
A. Yes, sir.
Q. Did you ever receive any certification of non-toxicity from the EPA, for example, of the materials you were using?

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A. I can't remember any.
Q. As part of your responsibility to ensure that the workers had a safe place to work and were not working with toxic chemicals, did you consult the EPA with respect to the chemicals being used?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) Did you ever consult the EPA to determine the chemical components of the materials you were using at your plant?
A. No, sir.
Q. As the manager of the creosote plant for Southern Pacific, did you ever apply for a hazardous waste permit?
A. Those hazardous waste permits were applied for by the environmental people.
Q. Did they consult with you?
A. Sometimes yes, sometimes no.
Q. What hazardous waste did you have out there at the creosote site?
A. I really don't know if we had any.
Q. As part of your responsibilities as a plant manager, you provided the workers with the appropriate safety equipment to limit their exposure to the chemicals being used in the treatment operation; is

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that correct?
A. Yes, sir.
Q. And one of the things you provided them with was respirators; is that correct?
A. Only to the -- only to the employees that were working in the treating area.
Q. All right. And you provided those respirators to those workers to ensure that they weren't harmed by the fumes coming out of the treatment vessels; is that correct?
A. No, not really.
Q. Why did you provide them with respirators?
A. The safety department suggested that we have respirators out there.
Q. Did the safety department suggest that you require the employees to wear them while they were working around the treatment area?
A. When they were needed. When the employees needed it.
Q. Was it your rule as the plant manager that they wear the respirators when they were going to these treatment vessels opening them up and taking out the --
A. Yes.
Q. And did you enforce that rule?
A. When I was around, yes, sir.

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Q. Did you request your foremen to enforce that rule?
A. Yes.
Q. Did your foremen ever tell you that your rule was not being followed?
A. Yes.
Q. Did you ever sit in any meetings with the safety department?
A. Once a month, yes, sir. Once a month, yes, sir.
Q. And where were the safety meetings held?
A. Various locations.
Q. All right. As the plant manager, was one of your responsibilities to warn the workers at the plant of any health risks posed by the treatment materials used to treat the wood?
A. I never considered we had any materials out there that would pose a health risk.
Q. But as the plant manager, if you knew of any health risks associated with exposure to the treatment materials, was it your responsibility to warn the workers of those hazards?
MS. NEWMAN: Objection; form.
A. I still say that I didn't consider there were any health hazards out there to tell those people

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about.
Q. (BY MR. KINNAN) If there were hazards, would you have been the one to warn the employees about those hazards?
MS. NEWMAN: Objection; form.
A. I don't know. I don't know. Seems to me that would be from the medical department.
Q. (BY MR. KINNAN) Who headed up the safety department while you were there?
A. I can't remember. I really can't remember.
Q. Do you know if anybody from the safety department warned the workers of health risks associated with exposure to the treatment materials?
A. No, sir. No, sir.
Q. Do you know that they did not?
A. No, I don't know that they did not. I don't know whether they did or not.
Q. As you sit here today, you have no idea?
A. That's right.
Q. As you sit here today, do you know whether chronic exposure to breathing the creosote fumes causes any health effects?
A. I've been breathing them since I was 15 years old and I don't know of anything that's causing any chronic effects on me.

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Q. Do you know whether chronic exposure to creosote and creosote extender fumes causes any health effects?
A. No, sir.
Q. Adverse health effects?
A. No.
Q. You don't know?
A. No.
Q. Is it your opinion it does not?
A. No.
Q. What about dermal exposure to the creosote treatment materials, do you know whether that causes any adverse health effects?
A. I know that creosote may cause a tingling feeling.
Q. Temporary burning sensation?
A. No -- maybe. I don't know.
Q. Okay. Do you know whether chronic dermal exposure to the creosote materials that were used at Southern Pacific would cause any adverse health effects?
MS. NEWMAN: Objection; form.
A. I can't remember anybody telling me that.
Q. (BY MR. KINNAN) So as you sit here today, it's your belief that chronic dermal exposure to this

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creosote treatment materials that were used at Southern Pacific would not cause any adverse health effects?
A. I don't know that.
Q. You don't know one way or the other?
A. No, sir.
Q. Did you ever investigate that?
A. No, sir.
Q. What about drinking water contaminated with the creosote materials, would that cause any adverse health effects?
MS. NEWMAN: Objection; form.
A. That would have to be decided by the medical department I would think.
Q. (BY MR. KINNAN) To protect your workers did you issue them any other safety equipment other than the respirators?
A. Yes, sir. Furnished gloves. They are required to buy hard toe shoes. They were given a hard helmet, and we emphasized that they should wear long sleeve shirts and wash their clothing regularly.
Q. Why did you issue them gloves as safety equipment?
A. Well, the gloves afford some kind of protection for a lot of things.
Q. Did you issue them gloves to protect them

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from getting the creosote material on their skin?
A. Could be said that, yes, sir.
Q. What was your reason for issuing the gloves?
A. My reason for issuing the gloves was it's easier to handle the equipment, the tools with gloves than it is to use your bare hands.
Q. So your reasons for issuing the gloves didn't have anything to do with protecting them from exposure to the chemicals; is that correct?
MS. NEWMAN: Objection; form.
A. Yes, sir.
Q. (BY MR. KINNAN) Is that correct?
MS. NEWMAN: Objection; form.
A. Yes, sir.
Q. (BY MR. KINNAN) And because you believed that dermal exposure to the creosote materials didn't cause any adverse health effects, you were not concerned whether your workers got the creosote material on their skin or not; is that correct?
MS. NEWMAN: Objection; form.
A. No, sir. My policy was to preach keep the creosote off your clothes and change your clothes very often.
Q. (BY MR. KINNAN) And why did you advise your employees to do that?

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A. It just seemed the right thing to do.
Q. Did you do it to protect them from adverse health effects from exposure to these creosote materials?
MS. NEWMAN: Objection; form.
A. Not really.
MR. KINNAN: Let's take a five-minute break.
MS. NEWMAN: Sure.
(Break.)
MR. KINNAN: Okay. Let's go back on the record.
Q. (BY MR. KINNAN) You understand you're still under oath?
A. Yes, sir.
Q. I want to talk a little bit about the safety department. You say you can't recall who operated the safety department?
A. I fellow name Pilcher.
Q. Spell it?
A. But he was in San Francisco.
Q. Pilcher?
A. Pilcher. The people in the safety department somehow or other changed chairs real often.
Q. Often?

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A. Yes, sir. I don't know any better answer that I can give than that right now.
Q. Did the safety department issue any documents to you as the manager of the creosote plant?
A. I have a document somewhere around here that I posted all over the plant and get every employee on the plant a copy and I required that they sign for it.
Q. And when was that?
A. Well, actually it started in probably the middle '70s.
Q. What document are you referring to?
A. I don't know -- it's a document that -- my feelings about what the employees should do at the wood preserving works.
Q. And when did you issue that to the -- first issue that to the employees?
A. Somewhere in the middle '70s.
Q. And what did it say?
A. It's a two-page document that had a lot.
Q. What's the essence of what you were trying to get across?
A. That people should wear their protective equipment. They should wash, take a bath everyday. They should wear long sleeve shirts. They should wear their hardhat. They should -- it's difficult to

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remember what all was on that document. It was a --
Q. What prompted you in the mid '70s having worked there as a manager since 1961 to issue this document?
A. On my many travels I saw a similar document at Copper Company in Texarkana, Kerr-McGee Company in Mosier City and I plagiarized a little bit. It was -- it was excellent work.
Q. Okay. I think we have a copy of that document and we'll get to it. You say there were safety meetings once a month?
A. We had a safety meeting at the plant once a month. The last day of the month.
Q. And who attended these meetings?
A. Everybody on the yard.
Q. All employees?
A. All employees.
Q. All managers?
A. Well, yes, supervisors and foremen.
Q. And superintendent?
A. I was the one that called the meeting.
Q. Each meeting you attended?
A. Yes, sir.
Q. And did you discuss the issue of how employees could limit their exposure to these treatment

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materials?
A. The primary thrust of the meetings was actually what had happened the previous month. Now, we normally had an excellent safety record. We had very few people that got hurt; but if something should have happened, it was discussed during that safety meeting.
Q. You recall ever discussing the use of respirators?
A. Yes, sir.
Q. What was discussed in that respect?
A. That was when we were cleaning out a cylinder and I was very insistent on using the -- not the -- the respirators when we were cleaning out the cylinder. We cleaned out -- in fact we cleaned out all the cylinders.
Q. How often were the cylinders cleaned?
A. I can only remember cleaning them one time.
Q. In the 26 years?
A. Yes, sir.
Q. Were there other times when employees had to go into the cylinder to get something or to do something?
A. Yes, sir.
Q. What sort of instances would require that?
A. If you -- if the laborer was pulling a charge

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and the cable would break on the charge that's in the cylinder, the laborer would have to put on his -- we used the air pack so he could go in the cylinder and pull the trams out one at a time until he could get to the broken cable.
Q. And there would be creosote fumes in there at that time?
A. Yes, sir.
Q. It would be hot?
A. It would be hot.
Q. Hence the need for the air pack?
A. That was the air pack, right.
Q. Were the respirators and air pack available for the entire 24 years that you were operating that plant?
A. Yes, sir. Yes, sir. That equipment was in the plant before I got there.
Q. And were all employees notified that they had the opportunity to get an air pack whenever they went into these cylinders?
A. Yes, sir.
Q. You're certain of that?
A. (Witness nods head.)
Q. Yes?
A. Yes, sir.

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Q. Did you ever discuss at these meetings how employees could limit their exposure to the treatment materials other than the respirator we just talked about?
A. You automatically limit exposure if you've got your helmet on, your shirt on, your pants, your high-top boots.
Q. You were out there most everyday or every week?
A. No. That was another problem. I averaged about two and a half days a week on other jobs. I was not in the plant, but the people that operated the plant were completely competent and that did not -- that did not pose a problem.
Q. How many days a week did you work? Five?
A. Well, six normally.
Q. Okay. We'll get to the other jobs that you were doing. All right. So you were out there for 24 years while the operation was ongoing and you observed the workers, didn't you?
A. Yes, sir.
Q. And isn't it true that you often saw the workers with the creosote material on their skin and hands and face and clothes?
A. Not their hands. They were -- they were --

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they used gloves.
Q. So other than -- did you ever see the workers, what I'll say, covered in this creosote material after a day's work?
A. Yes, sir, and I've seen them wear the same pair of pants and shirts for two weeks.
Q. And did you ever tell them that may cause --
A. Yes, sir.
Q. -- a health problem if they continued?
MS. NEWMAN: Wait for him to finish.
Q. (BY MR. KINNAN) Strike that. Did you ever tell the workers that wearing their pants over and over again may cause health effects if they don't change their clothes out everyday?
A. No, sir.
Q. And that's because you didn't believe any of these chemicals caused any adverse health effects; is that correct?
A. Yes, sir.
Q. Now, what about the medical department, you say there was a medical department?
A. Yes, sir.
Q. And who ran the medical department?
A. A Dr. Hyder.
Q. Spell the last name?

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A. H-y-d-e-r.
Q. And what was his tenure for Southern Pacific?
A. He died in -- I think it was somewhere in the '80s.
Q. So did he start with you in 1961?
A. Oh, no, sir.
Q. When did he first come aboard?
A. I don't remember.
Q. Was it before 1961 or after 1961?
A. Oh, it was after '61.
Q. Was it in the '60s?
A. I think it was in the '70s.
Q. Okay. Was there another doctor in the '60s?
A. There was another doctor in the '60s, and I can't remember his name.
Q. And where were they stationed?
A. They had an office in the SP building downtown.
Q. Did these doctors ever came out to the creosote plant?
A. Yes, sir.
Q. What was the reason for that?
A. Just a general visit. We also had a meeting once a month with the mechanical, representatives of the mechanical department, purchasing department, the

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creosote works. It was held in an office in the mechanical department area.
Q. The medical was invited to that meeting?
A. The medical department. Supervisors primarily.
Q. Did anybody from the medical department, doctors, supervisors ever tell you that your workers' exposure to the treatment materials may cause certain adverse health effects?
A. No, sir.
Q. Did you ever ask them whether the stuff caused any health effects?
A. No.
Q. Do you know whether they ever studied the health effects caused by creosote and creosote extender?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) The medical department?
A. I don't know.
Q. What was the medical department doing for you as the manager of the creosote plant?
A. He had an open door all the time if you needed to talk to him.
Q. How were you using the medical department for the benefit of your employees?

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MS. NEWMAN: Objection; form.
A. I can't give you an answer.
Q. (BY MR. KINNAN) Is there something called a medical van that Southern Pacific had?
A. I'm not familiar with it.
Q. Okay. Did any of your workers ever complain to you about adverse health effects they were suffering from the creosote material?
A. I can't remember.
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) From any source do you know whether creosote causes skin cancer?
A. No, sir.
Q. You don't know one way or the other?
A. No, sir.
Q. Anybody from Southern Pacific ever provide you with any documentation concerning potential adverse health effects from the creosote material used at your plant?
A. No, sir.
Q. Now, at one point you discovered that there was vinyl chloride in the air at the plant; is that correct?
A. Yes, sir.
Q. And you understood that vinyl chloride --

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A. I --
Q. Go ahead.
A. I was told -- we received some information from Ralph Lowe. We were not aware of it -- I was not aware of it myself.
Q. Okay. What did Ralph Lowe tell you?
A. He said we were getting some product with vinyl chloride in it.
Q. His product?
A. No.
Q. What product was he referring to?
A. Some -- I'm not sure.
Q. Dominguez & Sapp sound familiar?
A. Yes.
Q. And while we're on the subject of Ralph Lowe, he was a provider of creosote extender to Southern Pacific, was he?
A. Yes, sir.
Q. And when you started in 1961 was Ralph Lowe providing you with creosote extender?
A. No.
Q. When did Mr. Lowe and his companies first start providing Southern Pacific the creosote extender?
A. I'd say the early '70s.
Q. And how long did Ralph Lowe and his companies

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provide you with creosote extender?
A. Until we shutdown.
Q. In May of 1984?
A. (Witness nods head.)
Q. Yes?
A. Yes, I suppose.
Q. Okay. How many conversations did you have with Ralph Lowe over the years?
A. As few as possible.
Q. Why is that?
A. I just didn't have much to say to him.
Q. And you understood that Ralph Lowe operated a number of companies that purchased industrial waste and then sold it as extender and other materials; is that correct?
MS. NEWMAN: Objection; form.
A. Not personally.
Q. (BY MR. KINNAN) Did you come to learn that you were getting your creosote extender from an industrial waste site operated by Ralph Lowe?
MS. NEWMAN: Objection; form.
A. No, no.
Q. (BY MR. KINNAN) Do you know as you sit here right now whether Southern Pacific got its creosote extender from an industrial waste site?

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A. Ralph Lowe -- according to the shipping documents that we received, his material was coming from the same material that Number 6 was coming from. There was no waste disposal material that I'm aware of.
MS. NEWMAN: You want to break for lunch? The food is out there.
MR. KINNAN: Okay. Let me just follow-up.
MS. NEWMAN: Sure.
Q. (BY MR. KINNAN) Did you know what type of operation Mr. Lowe was running that provided you the creosote extender?
A. I was aware of part of the operation that concerned the material we were receiving.
Q. What did you understand that operation to be?
A. He was -- all of our material was in a separate tank.
Q. Did you ever go out to the --
A. Yes, sir.
Q. -- Brio site?
A. Yes, sir.
Q. In the '70s?
A. Yes, sir.
Q. And did you see the waste ponds throughout the facility?

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A. Yes, sir.
Q. Yes?
A. Yes, sir.
Q. Did he show you which waste ponds your material came from?
A. Our stuff, our material didn't come from waste ponds.
Q. Did he explain to you what was in the various waste ponds on his site?
A. No.
Q. Did you ask him?
A. No.
Q. Did you ask him what type of operation he was running there?
A. I asked him how he was producing our product.
Q. How many times did you go out to the Ralph Lowe site?
A. Probably three or four.
Q. And why did you go out there on those three or four occasions?
A. He invited me.
Q. Did he tell you that he was purchasing industrial waste from various companies?
A. Yes.
Q. Did he tell you what type of waste he was

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purchasing?
A. Since we weren't receiving any waste, we were -- I wasn't concerned with it. The material that we were receiving was approximately -- was a product that was equal to Number 6 fuel oil.
Q. Your understanding was that the product he sold you was a part of this petroleum --
A. Right.
Q. -- breakdown that we talked about earlier?
A. Yes, sir.
Q. And did you know he was purchasing styrene tar bottom from Monsano?
A. I don't think it had ever come up.
Q. Do you know that he was selling as creosote extender to Southern Pacific a styrene tar bottom?
A. According to the receipt documents that's not what we were receiving.
Q. And if you had learned you were getting styrene tar bottoms, would that have been unacceptable to you as the plant manager?
A. I don't know.
Q. Did you ever have tests conducted on the material received from Mr. Lowe to determine its toxicity?
A. Not the toxicity but the general requirements

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of gravity and admissibility and something similar to Number 6 fuel oil, same thing.
Q. And how did you assure yourself that you were getting a product that was similar to Number 6 fuel oil from Ralph Lowe?
A. The information that we received from the testing we asked for indicated that it was a possible product equal to Number 6 fuel oil.
Q. Okay. Do you know whether you received any phenolic bottom tars from Mr. Lowe for your extender?
A. I can't say that I did.
Q. And if you did, would that have been unacceptable to you as the plant manager?
A. I don't know.
Q. But as part of your responsibilities as the plant manager, you wanted to know what chemicals were going into your operation; is that correct?
A. Yes, sir.
Q. And you wanted to know that, for among other reasons, to make sure that you weren't using some chemical that could be toxic; is that correct?
MS. NEWMAN: Objection; form.
A. Yes, sir.
Q. (BY MR. KINNAN) Do you know whether any material received by Southern Pacific from Ralph Low

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contained vinyl chloride?
A. No, sir.
Q. Was the material received by Ralph Lowe by Southern Pacific ever tested for vinyl chloride?
A. Not that I'm aware of.
Q. And you had the power to order such a test?
A. Oh, yes, sir.
Q. So you went out there on three or four occasions to Ralph Lowe's operation; is that correct?
A. Yes, sir.
Q. And how much time did you spend out there?
A. Couple of hours.
Q. Each occasion?
A. Yes, sir.
Q. What did you guys talk about?
A. What he was doing here and what he was doing -- his cracking operation, what stream he was putting in here and what stream he was putting in there and as long as our stream was not in his mainstream, I wasn't -- I was not particularly worried about our product.
Q. Could you tell me the first date that you went out and talked to him about these streams and the last date? I want to get a time frame.
A. I would say the first time I went out to

Lowe's place was early '70s, and the last time I went out there was probably middle or late '70s.
Q. Do you know what an alkylated benzene bottom is?
A. No.
Q. Did you get those from Ralph Lowe?
A. If we did, I didn't know about it.
Q. Do you know whether the product sold to Southern Pacific as extender by Ralph Lowe contained any benzene?
A. The benzene was supposed to have been cooked off. That was in the specifications.
Q. When did you first give specifications to Ralph Lowe for the extender?
MS. NEWMAN: Objection; form.
A. The specification had to come from the purchasing department.
Q. (BY MR. KINNAN) Did you see those specifications?
A. I furnished some of the requirements in the specifications.
Q. So you had input into what was being specified?
A. Yes.
Q. All right. Did you ever test the extender

you got from Mr. Lowe to see whether it contained any benzene?
A. We tested -- we tested Ralph Lowe's product pretty often, but we never did ask if there was any benzene in it because the specifications that he was selling under dictated that there would be no benzene.
Q. Okay. And you never tested his product for vinyl chloride; is that correct?
A. No.
Q. You knew though from your visit going out there that he had a holding tank for waste stream chloride that he was purchasing from Monsanto?
MS. NEWMAN: Could you repeat that? I'm sorry.
Q. (BY MR. KINNAN) Let me ask the question over. You knew from your meetings with Mr. Lowe that he had a vinyl chloride waste stream at his site?
A. No, I did not. The only -- well --
MR. KINNAN: Okay. Let's take our lunch break.
(Break.)
MR. KINNAN: Let's go back on the record.
Q. (BY MR. KINNAN) You understand you're still under oath?

A. Yes, sir.
Q. All right. And you've understood my questions so far?
A. Yes, sir.
Q. All right. We were talking about your receipt of extender from Ralph Lowe and you said that you got that from the early '70s until the plant closed; is that right?
A. Yeah.
Q. Yes?
A. Yes. I'm sorry.
Q. And during that period of time, other than Dominguez & Sapp supplying extender, did you get your extender for the creosote plant exclusively from Ralph Lowe and his companies?
A. Yes.
Q. Okay.
A. I can't think of anybody else.
Q. All right. I have here documents we'll mark next in order. These are some invoices from Lowe to Southern Pacific and they say on the cover '72 to '74 and they are bates stamp P-761 consecutive to 900.
(Exhibit Number 4 marked.)
Q. (BY MR. KINNAN) I'd like you to just look at these. I'm obviously not going to go through too much

detail; but you see, for example, on 761, P-761, it says Lowe Chemical Company. Are you with me?
A. Oh, okay.
Q. All right. At the bottom, 761, Lowe Chemical Company sold to Southern Pacific Transportation Corporation creosote cutter stock and it says 137,000 gallons for --
A. Let's see. Okay.
Q. You with me?
A. Okay.
Q. And that looks like it was sold over the 25th, 26th, and 28th if you look at the ship dates? Do you see that?
A. Uh-huh, yeah.
Q. Does that seem about right? Let's see what the date of this document is. This is 1974, November '74 --
A. You have to understand that --
MS. NEWMAN: Wait a minute. Let him finish asking you a question, okay.
Q. (BY MR. KINNAN) What I'm getting at here is 137,000 gallons were shipped in three or actually in a number of shipments to Southern Pacific over three days. Does that sound about right in terms of quantity?

A. (Witness nods head.)
Q. Yes?
A. Yes, yes, sir.
Q. Okay.
A. Let me -- well, never mind.
Q. Okay. And what did you understand this creosote cutter stock to be?
A. Another cut off of petroleum -- the residual material of petroleum cutter stock.
Q. Is styrene tar bottoms a petroleum cutter stock?
A. No.
Q. All right. Is phenol bottoms --
A. It has some phenol in it.
Q. Is a phenol tar bottom a petroleum cutter stock?
A. No.
Q. All right. And so did you ever see these invoices? They look familiar to you?
A. This is not what we received. When he brought the material out to the plant, it was a different -- here we go. It was -- this is what we received here.
Q. What page are you looking at?
A. P-00769.

Q. 769?
A. We received a copy of this.
Q. Okay. So if we look at 769, it's dated July 5, 1972 and on that date it shows the delivery all on one day for a total of 60,959 gallons of this creosote cutter stock; is that right?
A. Yeah.
Q. And is that about right in terms of one day delivery?
A. Well, 60,000 gallons of this material right here, that there is the 70 percent part of the product, and when you're getting -- when you're treating 4,000 ties in 24 hours, this is not going to treat them.
Q. So you need a lot of this material?
A. We need a lot, yes, sir.
Q. Okay.
A. And during this period that we're talking about here, we were working five cylinders 24 hours a day and we were working two crews on the time.
Q. So you were ordering as much as you needed for that operation at the time, right?
A. Right.
Q. And they were able to supply you with that?
A. (Witness nods head.)
Q. Ralph Lowe was?

A. Yes, sir.
Q. Okay. And they delivered it in trucks, did they?
A. In trucks.
Q. And then what would happen when this truck got to the site?
A. We'd unload it.
Q. Somebody, a worker --
A. Well, let me explain it to you.
Q. Okay. Explain the process. I have a question. Explain the process by which the load material was transferred to Southern Pacific's plant?
A. Look at your --
Q. You're referring to Exhibit 3?
A. Uh-huh.
Q. The first page, which is an overhead map, 1985 and you're up in the northeast corner by the storage tanks, right?
A. Right. Okay. Now, initially when this plant was opened, they sent the cutter stock in by tank car and that was all right. We can handle it all right, but we had to have -- we had to have a switch every 24 hours. If we didn't get a switch, we'd run out of oil. So over a period of time I changed it over to all loads coming in will be in trucks.

Q. All right.
A. Now, we have three spots in front of our sump, our unloading sump. That means we can unload three trucks at a time. We have a sump that will hold 30,000 gallons.
Q. Let me ask you. You're talking about a sump. Earlier today when we described this area, I don't think I heard about a sump?
A. That's right. I didn't say anything about it.
Q. Where is the sump?
A. You see the -- it's hard to distinguish on this map. Maybe if -- okay.
Q. If we go to the next page --
A. Next page.
Q. -- of Exhibit 3 which is a 1984 photograph, overhead photograph --
A. You see the truck? There's a truck right adjacent to the firewall just at the end of the fourth drainage tank.
Q. It is a white truck?
A. White truck.
Q. Yes.
A. Just inside the firewall there's a sump. A sump is a holding ground.

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Q. Concrete?
A. Concrete-lined. It has an overhead on it and it has sides on it.
Q. Is it a complete enclosure?
A. Yes, sir.
Q. Okay.
A. We can position three of those trucks on the track next to that concrete barrier and open the spigots and run the oil directly into the sump. Now, we can either do two things. We can either pick the oil up and go to the sump and to a working tank or we can mix in the sump. Now, the normal thing is for us to mix a sump load because we're probably getting low on oil. We had a steel stob on one side of the sump that had two notches on it. The first notch was oil. The second notch was creosote.
Q. So you'd fill it up to the first notch with oil and then --
A. Dump creosote in on top of it if we were needing 30/70. And then we had some large plate coils. We turned the heat on the plate coils and that would heat up the oil. Then we had an air pipe in there. We turned the air on and that would turn the oil over and creosote over. That would mix it and then we would go directly to a working tank.

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Q. Did Southern Pacific employees participate in this process?
A. The laborer did that work.
Q. What would the trucker do?
A. Stand there and look at it.
Q. Okay. Stand there and look at it. All right. And how often would the sump be full or not full but be containing the material?
A. There's no material in the sump if there's nothing being unloaded.
Q. So every time a load comes in, it goes through this sump?
A. That's right.
Q. All right. So how many workers would be responsible for this sump area?
A. One man that's on every eight hours.
Q. Okay. For eight hours?
A. We can unload material 24 hours a day. We didn't normally do that.
Q. Did the guy working the sump, did he have occasion to get creosote material on him as part of the process?
A. We had three laborers that never got a drop on them. We had three laborers that got it all over them.

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Q. So it's just hard to tell, right?
A. We --
Q. Now --
MS. NEWMAN: Let him finish. I know you're not trying to cut him off.
Q. (BY MR. KINNAN) Go ahead.
A. Everybody can do a job. Some people have a better way of doing a job and it's just that simple.
Q. Did this holding sump, when it was heated, emit fumes from the creosote?
A. That's right.
Q. Did the workers up there have to wear a respirator?
A. No. We had a fan that was enclosed, a suck fan that would blow the stuff out of the sump through a pipe down toward the caustic tank that we applied a scented product that killed the smell of the stuff coming out of the sump.
Q. Did you ever take any air tests at the sump to determine whether there were any toxic fumes in that area?
A. No.
Q. Any tests --
A. This was -- this project took place because it helped us with the people that were calling in and

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saying there was an odor that they didn't like. As long as we had that fan running, that stuff was running out the other end. We had apple blossom and we had two or three different odors that we would use.
Q. At the end of the pipe to filter the odor?
A. Right.
Q. Did you ever test at the end of that pipe whether there were any toxic emissions coming out after it has been filtered?
A. The only thing coming out would be the fumes that had been bathed in this --
Q. Deodorized?
A. Right, deodorized.
Q. Okay.
A. And it kept down telephone calls.
Q. Okay. So 60,000 gallons a day is not -- this is accurate, so to speak?
A. You figure in your mind a train of ties is going to take 3,000 cubic feet at nine pounds to the cubic foot. That's 27,000 pounds divided by a little over eight. That's 3,000 gallons of preservative. And you hit that for five cylinders plus there's a chance that you're going to get another turnover on your cylinder that's going to double the amount of oil you need, oil and creosote.

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Q. So during your tenure how much creosote and creosote extender did you use per month or per year? Just your best estimate. We have it here in some answers to interrogatories.
A. We do have it here somewhere. It was a pretty good lot.
Q. Would you say that Southern Pacific used between 1962 and 1972 as much as 1,170,000 gallons of creosote per year?
MS. NEWMAN: Objection; form.
A. I'd have to look at some -- I'd have to look at some figures. I mean, I'd hate to take that right out of the air.
Q. (BY MR. KINNAN) I just took that right out of Southern Pacific's answers to interrogatories which I can show you.
MS. NEWMAN: Nevertheless --
Q. (BY MR. KINNAN) Okay. I understand. Let me just do it my way then. Do you have an estimate for how much creosote for the ten-year period between '62 and '72 Southern Pacific used per year in gallons?
A. We treated about a million and a half ties a year, and each one of those ties would have nine pounds of material. That would be between -- 28 million. And a third of that would be creosote and two-thirds would

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be -- two-thirds plus would be treating solution or oil.
Q. So 5 million gallons of creosote a year?
A. Five --
Q. And 15 million gallons of extender? I think you said 20 million?
A. Its been a long time.
Q. Okay.
A. I could work it out pretty fast.
MS. NEWMAN: They have it. Don't worry about it.
Q. (BY MR. KINNAN) Did you assist Southern Pacific's or Union Pacific's lawyers in coming up with the amount of creosote used each year over the years you were there?
A. No, I did it myself.
Q. But did you share that information with the lawyers?
A. Oh, yes, yes.
Q. Okay. All right. So we'll get into that. In any event, did there come a time when more creosote and more creosote was needed at your plant?
A. You hit a plateau when you hit the maximum amount of material you can put through your cylinders.
Q. Didn't you add a cylinder?

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A. Well, that -- we added, but -- that's what I'm talking about, the five cylinders. You can only treat so many ties in five cylinders in one cycle.
Q. Okay. All right. We'll get --
A. And it was normally -- it was about a million and a half ties per year out of all five cylinders. About 150,000 ties a month.
Q. And you don't have an estimate as you sit here right now as to how much creosote per year was needed to treat those million and a half ties a year?
MS. NEWMAN: Objection; form.
A. I'm reluctant to come up with an amount.
Q. (BY MR. KINNAN) Okay. And the numbers I quoted you don't help you with an amount?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) I have here 2,044,800 gallons of creosote a year between '73 and '84 and I'll represent to you that's straight out of their answers to interrogatories as to how much they used per year. Does that --
A. Yes.
MS. NEWMAN: Let him ask a question.
Q. (BY MR. KINNAN) Does that sound about right?
MS. NEWMAN: Objection; form.
A. Yes.

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Q. (BY MR. KINNAN) And then would you then add 70 percent to that amount --
A. You can double the creosote amount plus. 30 percent and then 60 percent.
Q. What is the remaining 10 percent?
A. Well, it's oil, but that's just a quick way to figure it.
Q. Okay. Double and add a little bit?
A. Right.
Q. Okay. Very good. All right. We were talking about also -- so we're done with the invoices. We'll just attach that as an Exhibit.
MS. NEWMAN: You going to number these as you go along?
MR. KINNAN: That's Exhibit Number 1.
MS. NEWMAN: Okay.
Q. (BY MR. KINNAN) Did you ever order testing of the air in and around the creosote plant to determine whether there were any toxic fumes in the air?
MS. NEWMAN: Objection; form.
A. Not that I can remember.
Q. (BY MR. KINNAN) Okay. Did someone else do that to your knowledge?
MS. NEWMAN: Objection; form.

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A. I can't remember.
Q. (BY MR. KINNAN) There came a time when you learned that there was vinyl chloride in the air space within the plant; is that correct?
MS. NEWMAN: Objection; form.
A. Yes.
Q. (BY MR. KINNAN) And do you remember the date of that?
A. No.
Q. Do you know how long vinyl chloride had been in the air within the plant?
A. Well, that would require me knowing when they knew about it. That would require me knowing when we knew about it and I'm not real sure when we knew about it.
Q. At some point you learned that air testing showed vinyl chloride in the air at the creosote plant; is that correct?
A. Yes.
Q. Did you investigate that issue?
A. No.
Q. Did you know that vinyl chloride in the air could be harmful to the workers?
A. I wasn't real sure what vinyl chloride was.
Q. Did someone tell you that was a

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cancer-causing chemical?
A. No.
Q. Did someone tell you it was harmful to the health of the workers?
A. No.
Q. As you sit here right now, do you know whether it's harmful to workers, vinyl chloride?
A. Vinyl chloride is a bad actor. It's not a good -- it's not a good chemical.
Q. So if you learned that it was in the air, you would attempt to discontinue its use at the plant so there wouldn't be any vinyl chloride in the air; is that correct?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) Did you ever determine where the vinyl chloride was coming from that they found in the air at the plant?
A. Yes.
Q. Where was it coming from?
A. Some junk we got from Dominguez & Sapp.
Q. And when you say "junk," define that?
A. It was junk, trash.
Q. Waste?
A. Had we known that the material was coming in,

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we would have done something about it. We were surprised when the stuff showed up.
Q. In the air tests?
A. In the treating solution.
Q. Well, how long had you been using Dominguez & Sapp treating solution before you learned that there was vinyl chloride in the air at the plant?
MS. NEWMAN: Objection; form.
A. Couldn't have been very long.
Q. (BY MR. KINNAN) You're saying Mr. Lowe called you and told you there was vinyl chloride in the Dominguez & Sapp material?
A. He came out to the plant and told me.
Q. How long had you been using Dominguez & Sapp material when he came out to the plant and told you that?
A. I have no idea.
Q. Did you test the Dominguez & Sapp material for any toxicity prior to using it?
A. No.
Q. Did you get a certification of non-toxicity from Dominguez & Sapp when they gave you that material?
A. No.
Q. And it was your responsibility to ensure that the chemicals that were being used at the plant were

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non-toxic to the workers; is that correct?
MS. NEWMAN: Could you repeat that or read it back?
(Last question read back.)
MS. NEWMAN: Objection; form.
A. Up till the time we found out, we were not aware that there was any toxic chemical material out there.
Q. (BY MR. KINNAN) But part of your job was to ensure that the workers were not working in an area where there was toxic vapors or materials; is that correct?
MS. NEWMAN: Objection; form.
A. We never were -- we never were aware of the fact that we had any up till that time that we had any toxic material on the plant.
Q. (BY MR. KINNAN) But as the manager of the plant, one of the things you wanted to see happen was that the workers had a safe place to work; is that correct?
MS. NEWMAN: Objection; form.
A. Yes.
Q. (BY MR. KINNAN) And part of that responsibility included knowing what the chemicals were that were being used in the treatment operation; is

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that correct?
MS. NEWMAN: Objection; form.
A. The chemicals that we used in our treating operation were shipped to us by the purchasing department. We had every reason to believe that the material that the purchasing department was furnishing us was material that was non-toxic.
Q. (BY MR. KINNAN) Were you ever told that the materials you received were non-toxic?
A. What was that question?
(Last question read back.)
A. No.
Q. (BY MR. KINNAN) Did you ever tell the employees that the materials they were working with were non-toxic?
A. No.
Q. Did any employee ever ask you whether the materials they were working with were non-toxic?
A. Not that I can remember.
Q. Or were hazardous to their health? Did they ever ask that question? Strike that. Did any employee ever ask you whether the materials they were working with were hazardous to their health?
A. Not that I can remember.
Q. Did you ever ask the medical department

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whether the materials that the workers were using were adverse to the workers' health?
A. No.
Q. When you discovered that there was vinyl chloride in the Dominguez & Sapp extender which was found in the air at the plant, did you tell the workers about that?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) Why didn't you tell the workers?
A. I had to make sure that it was there.
Q. Okay. And when you found out that it was there, did Southern Pacific immediately discontinue the use of the Dominguez & Sapp material?
A. No. We -- when I found out that the stuff was on the property, I got hold of the purchasing department and I told them that we had a problem and they better get it cleaned up. And I wrote my boss a letter.
Q. Mr. Vernon?
A. No, Mr. Berkshire.
Q. Berkshire?
A. He was the chief engineer.
Q. Okay. What did the letter say? What did

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your letter say to Mr. Berkshire?
A. It should be around here somewhere. I don't remember exactly how I put it, but I told him that we had a problem we needed to cleanup.
Q. What was his response?
A. I got a letter later on from -- that he wrote to Mr. Rose and that letter should be around here somewhere. And it was finally resolved down to the point where we would take the material, the loaded material and then it would be cutoff.
Q. Okay. So you took more shipments after discovering the vinyl chloride --
A. Only the shipments that were under load.
Q. Only what?
A. Only the shipments that were under load.
Q. What's under load?
A. Already loaded on the trucks.
Q. Do you know how many shipments that was?
A. There's another document around here that gives the truck load and the truck number.
Q. Do you know how many gallons that was?
A. No.
Q. Best estimate?
A. No.
Q. In any event, you used the extender with the

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vinyl chloride for a period of time after you discovered it was in the air?
A. Yes.
Q. You just don't remember the time?
A. Yes.
Q. Okay. Did you consult with the medical department to determine what health effects might have been caused during the time that this material had been used?
A. No.
Q. Did anybody do that at Southern Pacific?
MS. NEWMAN: Objection; form.
A. I'm not going to -- I'm not going to try to guess that because I don't know.
Q. (BY MR. KINNAN) Do you know whether any of your employees were sent to the doctor?
A. No, sir. None of the employees were ever sent to the doctor.
Q. Say that again?
A. There were no employees that requested to be sent to the doctor. There were no 2611s made out.
Q. Was the vinyl chloride hazardous to the neighboring community to your knowledge?
MS. NEWMAN: Objection; form.
A. No.

Q. (BY MR. KINNAN) You don't know one way or the other?
A. I feel that the vinyl chloride odor in the atmosphere was diluted to the point that it couldn't be hazardous to anybody.
Q. That it couldn't be?
A. Yes, sir.
Q. What's your basis for making that statement?
MS. NEWMAN: You asked him. He's not an expert. We'll stipulate to that.
A. I just couldn't see where it was -- I just couldn't see where the concentration -- the concentration of the vinyl chloride odor was being -- it was being -- it drifted off.
Q. (BY MR. KINNAN) After that you stopped using Dominguez & Sapp material, correct?
A. Yes, sir.
Q. And at the time you were using Dominguez & Sapp were you also still using Lowe material, extender?
A. Lowe, yes, sir.
Q. Ralph Lowe. Did you test Ralph Lowe's material for vinyl chloride after discovering that you got a junk stream from Dominguez & Sapp?
A. No, sir.
Q. Weren't you concerned that it might also

contain vinyl chloride?
A. No, sir. In my opinion Ralph Lowe was still shipping his -- the regular material that we'd been receiving for years.
Q. And if I understand your testimony correctly, naphtha material that you had been receiving for years from Ralph Lowe had never been tested for vinyl chloride or any other toxins; is that correct?
MS. NEWMAN: Objection; form.
A. I don't know of any testing that was done.
Q. (BY MR. KINNAN) So you personally don't know the chemical composition of the extender you're getting from Ralph Lowe; is that correct?
A. Not other than a notation on his shipping documents indicating that it is Number 6 fuel oil or equal.
Q. Do you know of anybody at Southern Pacific who knew the chemical composition of the Lowe extender?
A. No.
Q. Did Southern Pacific receive a citation as a result of the vinyl chloride emissions at the plant?
A. I don't remember. I don't really remember.
Q. Did Southern Pacific have to register the types of materials they were using at the plant?
A. I don't know.

Q. Did they have to get a permit for the materials they were using at the plant?
A. I just don't know.
Q. An air permit, do you know?
A. No.
Q. Say it again?
A. No.
Q. You don't know?
A. I don't know, right.
Q. Okay. Let's continue on with our look at these overheads. Do you like the second one better than the first one because it's clearer? Let's go with the second one, page two of Exhibit Number 3.
A. Okay.
Q. Okay. And this is represented to be 1984. Does it look like the plant in 1984?
A. Yes.
Q. All right. We've talked about everything behind the treatment building, correct?
A. Right.
Q. To the northeast. We've talked about the treatment cylinders; is that correct?
A. Correct, sir.
Q. Talked about the boilers to the west. Is that to the west of the cylinders?

A. (Witness nods head.)
Q. Yes?
A. Yes. I'm sorry.
Q. Okay. Could you describe what else is on this plant?
A. Going south from the boiler you -- we have a small metal building that -- where -- that's located where our fire pump is located.
Q. In case there's a fire?
A. In case there's a fire.
Q. All right.
A. We had our own fire control system at the wood preserving works.
Q. Okay.
A. I think -- I don't know, but I believe those things behind the fire pump are automobiles.
Q. What I'm asking you is just to explain the various features. We can't go through every single dot on this map. The various features that were used?
A. The next building is the building we used to have our repair work done. We had two mechanics and they kept our operating equipment going.
Q. Okay.
A. Just behind it is a diesel tank and a gasoline facility.

Q. Where were the breathing apparatus safety equipment kept on the site?
A. In the powerhouse.
Q. The treating house?
A. Treatment building, yeah.
Q. Okay.
A. And all of these geometric lines actually are treated material that's -- during this period of time they were -- this material is being set out for use by anybody that needed it. This was already after the plant was shutdown. They were in the throws of --
Q. This says February of '84?
A. Okay.
Q. Just before?
A. We were still treating then, but all we were treating was material on hand. We weren't receiving any material.
Q. Okay. Did you store treated ties at the creosote plant?
A. Yes, sir.
Q. So up to how many were stored there at any given time?
A. Well, the purchasing department wouldn't allow more than 30, 40,000 at one time. If it exceeded -- see, every month we had to send out an

inventory to the chief engineer and one to the purchasing agent. And this inventory told both of them the number of treated ties and untreated ties. The purchasing agent will not buy ties if we have untreated ties on the ground, in excess. The chief engineer likes lots of treated ties and he also likes to have treated ties in stock, but we're not allowed to have treated ties in stock.
Q. Why not?
A. Money. Treated ties standing on the ground is money that's tied up. Now, the chief engineer is prone to want as many of those as he can get. The purchasing agent is -- doesn't want any at all.
Q. So on the average, the 25 years you were there, how many treated ties were stored there at any given time?
A. 20, 25,000.
Q. Do you know whether those treated ties emitted any fumes while they were sitting there?
A. No. You can stick your nose right up next to them and not smell a thing.
Q. Wouldn't smell a thing?
A. That's right, yes, sir.
Q. Did you ever take any air tests near the treated ties to see if they were emitting any vapors?

A. No.
Q. Any toxic vapors?
A. No, sir.
Q. Did you ever give your employees any warnings to stay away from the stacks of treated ties?
A. I had no reason to tell them that.
MS. NEWMAN: At the next time you can break, I'd appreciate it real quick.
MR. KINNAN: sure. Hold on just a moment.
MS. NEWMAN: Okay.
Q. (BY MR. KINNAN) How many ties were stored up at the Englewood yard?
A. None.
Q. I thought there came a point when there was a number -- thousands upon thousands of ties stored up at the Englewood yard, treated ties?
A. I don't ever remember any treated ties at the Englewood yard.
Q. Okay.
A. Had they been treated at the Englewood yard, they probably wouldn't have been at our account anyway.
Q. But there was no treating facility up at the Englewood yard, right?
A. No, sir.

Q. You don't recall them ever transferring a large number of treated ties up to Englewood?
A. Well, the ties would have to have been picked up at our yard and moved to Englewood and we would have made out a shipping order or something because we were going to take them out of our accounts. I can't remember ever having any ties, treated ties stocked at Englewood.
Q. Okay. If we look at this, my understanding it that the Southern Pacific employees built track and rail and panels on this site. Where did they do that?
A. Okay. That's down here in this area.
Q. All right. We have a record we have to protect here.
A. I'm sorry.
Q. You're looking at the second page of Exhibit 3, which is a 1984 aerial photograph of the site and you're where?
A. We are in the southeast -- southwest corner of the -- southeast -- southwest corner.
Q. Southwest?
MS. NEWMAN: Bottom left.
Q. (BY MR. KINNAN) Bottom left?
A. Bottom left.
Q. I gotcha. Southwest.

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A. The area -- this area is normally covered with switch panels. This is where we build the switch panels and we have a -- sometimes we have a job plating crossties and then bundling the crossties, but all that work was handled in this area here.
Q. And those were workers working with the treated ties down there to make the panels and so on?
A. Uh-huh.
Q. Yes?
A. Yes, sir.
Q. Okay.
A. The switch ties were immediately to the north of that where you see the rows of ties that stick out 90 degrees to the road.
Q. Oh, I see. What is that area? That's in the middle of --
A. It's storage area for switch ties.
Q. Okay.
A. We don't carry or we didn't carry anymore switch material to this area than it took to perform the current job requirements.
MR. KINNAN: Okay. I think Counsel wanted to take a break; so we'll take a short break.
MS. NEWMAN: Just a couple of seconds.
(Break.)

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Q. (BY MR. KINNAN) Were going to go back on the record. You understand you're still under oath?
A. Yes, sir.
Q. We were talking about the plant. I'd like to get through this. I'm getting it from someone who really knows here. So we talked about the panel. What do you call that, the switch?
A. Panel plant.
Q. Switch panel?
A. Switch panel plant.
Q. Where are the green ties stored? Do you see them there?
A. This is in a time when we're going down to nothing. If there's any green material on there that's being treated, it's to get it out of the way.
Q. Okay. Let's look at the 1982 aerial photograph which is page four of Exhibit Number 3. You see --
A. Number 4?
Q. Page four from the top.
A. Okay.
Q. And on the back it tells you that it's 1982.
A. All right.
Q. That looks like the creosote plant that you managed, right?

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A. That's right.
Q. See any green ties there?
A. The green ties are the stacks. You see the parallel stacks?
Q. Lighter in color?
A. Whiter in color and the reason they're stacked there, these ties here -- I can't give you a reason why their stacked there.
Q. That's all right. What are the other buildings?
A. Okay. Going down and little bit farther --
Q. What is -- where are you? We know the top of the page --
A. You're moving to the right across the yard.
Q. Which is to the east?
A. There's a large pile of untreated ties.
Q. To the east?
A. Right. Uh-huh. Okay. You see a small building.
Q. All right.
A. Sticking out there. Right here. That there is a fire station.
Q. Okay.
A. Fire plug and a hose.
Q. All right.

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MS. NEWMAN: Point that out to me.
A. Right here.
MS. NEWMAN: That one?
A. Right.
Q. (BY MR. KINNAN) It's running north and south and there's a building south of it running east and west, right?
A. Right.
Q. What's the building running east and west?
A. That east and west is the benzene and boring machine. That's where every green tie on the yard shows up to be cut to a certain length and have the holes bored to fit.
Q. Did the workers ever cut treated ties?
A. It had to be a real special occurrence.
Q. Okay.
A. You never cut a piece of treated material because it would bleed.
Q. Okay. What's the other building there to the east?
A. To the right was a tie inspection machine that I promoted.
Q. What is a tie inspection machine?
A. When we bought crossties in the field, that's what the -- the biggest part of my time was looking at

crossties in the field to make sure that the ties they are sending -- they were cutting in the field were cut to our specifications. And we would mark those ties in such a way that we can determine that those were our ties and they were marked our ties before they arrived at the plant. See --
Q. I understand. So these are green ties in that building?
A. That's right. It's not a building. It's a track and it has seven stations.
Q. Okay.
A. And we have a -- we had an inspector in there and he would classify every tie according to its specification, size.
Q. Okay. And then what's in the lower right portion of the plant, which would be the southeast?
A. Down here?
Q. Yes. What's in all that?
A. That there is -- that's the area where we put our bridge material.
Q. Treated bridge material?
A. Treated and untreated.
Q. Did you treat the bridge material with anything other than creosote and creosote extender?
A. No, 30/70.

Q. Did you ever use pentachlorophenol on this site?
A. Yes.
Q. Did you ever treat the ties with pentachlorophenol?
A. No.
Q. You treated the bridge?
A. Bridge material and lumber.
Q. With pentachlorophenol?
A. Penta.
Q. We'll call it penta.
A. Penta.
Q. How long did you treat the bridge material with penta?
A. I got there in '61 and I decided that -- there was very little utilization of the fourth cylinder, and I decided for a number of reasons that we should put that cylinder in service for crossties. And I dumped the penta and worked it off as 30/70. Then everything that was treated 30/70 and it didn't matter where we put it, whether it was switch ties, crossties material, anything. See, our production at the plant was something like 96, 97 percent crossties. The rest of the production was so small it didn't make a blip on the cost sheet, but we

still had -- we still had to treat that material.
Q. Okay. Pentachlorophenol was used at the plant during what period of time?
A. From December '61 till probably January, February, '62. Two or three months.
Q. Two or three months? That's it?
A. That's it.
Q. Was there an order from someone at Southern Pacific to stop using the pentachlorophenol?
A. No. I did it on my own. I never have been an advocate of pentachlorophenol.
Q. Did you ever learn whether penta was toxic?
A. I was aware that it was toxic.
Q. Cancer-causing?
MS. NEWMAN: Objection; form.
A. I don't know about that.
Q. (BY MR. KINNAN) How did you become aware that the penta was toxic?
A. Through reading.
Q. What sorts of things did you read?
A. Trade magazines.
Q. Information from the American Association of Railroads?
A. Could be.
Q. Information from the American Wood Preservers

Association?
A. No, the AWPA would never make that -- they would never make -- they may have by now, but they would never make that one of their attendants.
Q. Never make what one of their attendants? That something was toxic?
A. Right. There's still people in the United States using pentachlorophenol.
Q. As the manager of the creosote plant, did you feel you had a responsibility to learn as much as possible about the materials you were using out at the site?
A. Yes.
Q. Including its toxicity or lack thereof; is that correct?
A. The information that I can remember that I read was not so much toxicity oriented as it was handling and how it's utilized and cost, parameters like that.
Q. Were you aware that there was literature available concerning the toxicity of the chemicals used at the plant you were managing?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) Do you know whether the

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American Wood Preservers Association published any literature concerning the toxicity of creosote, for example?
A. A lot.
Q. Did you ever read those articles?
A. Yes.
Q. Did you come to learn that certain of these papers took a position that creosote was toxic in one way or another?
A. No.
Q. That it caused any health effects?
A. No.
Q. So all the literature you have read as to the toxicity or lack thereof, creosote, told you it was not toxic or harmful to health?
A. Yes.
Q. Yes?
A. Yes.
Q. How much such material did you read?
A. Anything that came out.
Q. Okay. So you did make it a point to read those articles?
A. Yes.
Q. And you made it a point to determine what material was available from the American Wood

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Preservers Association on the toxicity of creosote or extender; is that correct?
MS. NEWMAN: Objection; form.
A. I never read anything that the AWPA put out that ever indicated that creosote was a toxic agent.
Q. (BY MR. KINNAN) Did you ask that association for all the material, all the materials it had on the toxicity of creosote?
A. No.
Q. How did you get that information?
A. What information is that?
Q. The literature on the toxicity of creosote?
A. Every month we received a magazine from AWPA
Q. You were a member?
A. I was a member, yes, sir.
Q. Did you attend their meetings?
A. Yes, sir.
Q. Did they give you an opportunity to review indices of literature that they had available?
A. Everything, everything that anyone -- anything that was written by an AWPA member, there was a compendium at the end of the magazine and you can order anything you wanted to read; but from my standpoint, reading the magazine was really all I thought I needed.

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Q. Okay. Is the same true for the American Association of Railroads, did they have a magazine or literature available?
A. That's right, but I was never a member of AAR.
Q. Okay. Now, as I understand it, you had working cylinders behind the treatment house and --
A. No, in front of it.
Q. To the east, northeast, correct? I said cylinders. I meant storage tanks. What did you call those?
A. Working tanks.
Q. Working tanks. And those working tanks then would pump material --
A. They would hold the material.
Q. Okay. Could you describe briefly the operation for treatment of these wood ties?
A. After the drying process and hot vacuum, the engineer would line up a cylinder with a working tank. The engineer -- at the time the engineer cut off his hot vacuum, he would cut on one of our pumps and hit the cylinder with the maximum load of 30/70 going directly into the cylinder to break the vacuum. When the cylinder was full --
Q. Let me stop you. Do you mean full? It's

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eight foot in diameter. You mean it was completely full?
A. It has to be full or you don't get any oil in the wood.
Q. So in an eight foot diameter cylinder 145 feet long was full of 30/70, 30 percent creosote, 70 percent extender?
A. Yes.
Q. And there were how many ties in there at the time?
A. Anywhere from 950 to 1,000.
Q. All right.
A. The space around the ties and the ends, it took around 35,000 gallons to fill the cylinder; but you have to pump out of the tank to get that next gallon to go into the wood. Your cylinder has to be full and under pressure all the time to move a gallon of oil from the tank to a gallon of oil in the crossties. The engineer has a clipboard that is -- that has every item of information about that charge from the minute it went in the cylinder till the minute it goes out of the cylinder. He has the information of -- he knows what the moisture content of the wood is and he's been furnished with the number of gallons of water that has to came out of that wood to reach 45

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percent. We always shot for 45 percent. Now, that doesn't --
Q. 45 percent?
A. Moisture content. See, the wood -- normally the hardwoods out of East Texas --
Q. Okay. I hate to interrupt you, but are you now in the drying process?
A. No, we finished that a long time ago.
Q. Okay. My fault.
A. Okay.
Q. But the drying process took all the water out as I understood?
A. That's right. That's right.
Q. All right.
A. That's right. The ties are now at 45 percent average moisture content. Now, that means -- and a lot of people don't understand this --
Q. Obviously.
A. -- that the moisture content of that tie is probably 90 percent, 80 percent in the center; but in the outer inch, it's something like 4 or 5 percent. And the deeper it goes, the higher the moisture gradient is. What you're wanting to do is put the oil in the outside of the tie because when you put that tie in the track, it's going to -- the moisture content is

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going to fall and level. It will assume the moisture content of whatever is around it in the track.
When the engineer -- let me go back to the tank. The tank -- we had automatic gauges on the tank and we had an automatic gauge on the control panel. And that automatic -- he knows that he has to take so many inches, so many feet and so many inches out of that tank if he's to achieve nine pounds retention, okay. He sets his controller for 15 hours, 14 hours, whatever. He can always increase that if he wants to, but he knows that he's already taken out X gallons of water because we've already taken it out of the thing and we've metered it -- maybe I ought to go back.
Behind each cylinder is a large tank, probably a five, 600-gallon tank and immediately on either side of that are two smaller tanks, maybe 100-gallon tanks with sight glasses over them. And the tank has a mercury switch. When that tank fills up, it goes through a flow meter and it counts the number of gallons that's leaving and it counts the number of gallons that's going back to the dry unit tank. And as the drying agent comes out of the tank, we have to put new drying agents into the tank to keep the process going. If the level of the drying agent falls below the level of the coils for some reason, and nobody's

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been able to tell me why, the process stops. It just sits there and boils.
Q. Let me stop you right there. So you treat these for roughly 22 to 24 hours; is that right?
A. Depending on the moisture content.
Q. And during this time is any chemical escaping the treatment vessels?
A. No.
Q. Okay.
A. It's a closed system. The water -- well, the water initially would go to this concrete ditch that we had and the drying agent -- there's only two components in there when you're drying, and there's only one component in there when you're treating with creosote petroleum. We get through the drying agent, the drying cycle, your drying agent is back in the -- in the drying agent tank and the water has gone down this concrete box.
Q. To the sewer?
A. To the sewer. Then we go into the treating cycle. The only place the oil can go is either into the wood or the wood is going to -- the wood is not going to take it and when your pump -- when the pressure gauge on your pump starts going up, you know the wood's not taking anymore material.

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Q. Okay. So at the end of the process these workers --
A. One worker.
Q. One worker opens the cylinder; is that correct?
A. Well, no. You've got a vacuum period of an hour to pull the excess oil off of the ties, let it drop into the bottom of the cylinder and it goes back into the working tank, too. Then when the engineer -- he lets it sit there for ten minutes. And that, they call that a drip period. It drops into the bottom of the cylinder, then the powerhouse laborer will break the seal on the door, but he won't open the door. He'll hold the door and let the 30/70 run out into the sump because invariably you've got lots of oil left in that cylinder.
Q. So when he opens the cylinder door, some runs out into the sump in front of the cylinder; is that correct?
A. Yes, sir.
Q. I understand. So if we look at any of these pictures on Exhibit 3, you see the cylinders looking at page four still, can you see that sump where the material runs out at the end of the --
A. Let me show you.

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Q. Okay. I'm now going to hand you Exhibit Number 2 which is the photograph of the cylinders.
A. All right. Now, these cylinders would be the next -- he might be breaking the door that much.
Q. An inch. Understood.
A. Until all the excess oil goes out.
Q. And it goes out to where?
A. There's a sump -- just below the lip of the cylinder on every cylinder there is a sump.
Q. Concrete sump?
A. Concrete sump. And it has a steel grating over it. The oil drops into the sump and it goes into what we call a sap truck under the cylinder. This is more oil. Next time he starts a charge, he puts air on the cylinder and blows that oil back. There's not that much oil, but it doesn't go anywhere.
Q. Did you ever see the workers who are opening these cylinder doors have this material run out and get on their pants and their feet and their legs?
A. They would only do it once.
Q. Because it was hot?
A. It was hot, yeah.
Q. How hot?
A. I've never -- well, when your cylinder goes down, you're treating at 190 degrees fahrenheit and I

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can't remember one instance where somebody opened the door too much and got hit with 100 -- I mean, you'd get burned after 190 degrees.
Q. Understood. And then is it completely -- are the workers exposed to this creosote that comes out the front of the cylinders in the sump? Do they stand on the sump?
A. No, they're on a steel grating that's on the bottom arc of the cylinder.
Q. Were there occasions where that sump drain would plug and the workers had to go in and clear it out?
A. No.
Q. You never heard of that?
A. We never had that problem.
Q. Okay. And then at this point fumes are being released from the front of the cylinder I gather?
A. No. The fumes are going out the top of the cylinder. Until he opens the door, there's no fumes going to be coming out lower than maybe three inches of the top of the cylinder.
Q. But in any event, at the door end is where all the fumes come out when you open the door of the cylinder?
A. At the door end of the top. That stuff runs

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right along the top of the cylinder and then goes up.
Q. Isn't it true that there's a visible cloud of vapor and steam and material that comes out when you open those doors?
MS. NEWMAN: Objection; form.
A. The -- when you open the door, the only thing you're going to see is oil coming out the bottom. And the laborer is going to be holding that door to see it doesn't open anymore. He's not going to let that door open much more than that.
MS. NEWMAN: Indicating about a couple of inches. For the record about how far, how many inches?
A. Two, three inches.
Q. (BY MR. KINNAN) All I'm asking you, at that point isn't there a visible cloud of smoke or vapor or steam that comes out that front door no matter how much you open it?
A. The door's still shut in a practical way of looking at it. The door doesn't open until the amount of oil that's coming over the lip of that cylinder is nothing.
Q. Okay.
A. And then you open the door and you hook it in place and if you want to look up there, you'll see --

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you're going to see some blue smoke. That's all you're going to see.
Q. Blue smoke from the treatment operation?
A. Right. Well, from the heat primarily that's coming off of the cylinder.
Q. Did you ever test the blue smoke to see whether it contained any toxic --
A. No.
Q. -- constituents?
A. No, sir.
Q. Do you know if anybody at Southern Pacific did?
A. No, sir.
Q. And it was your recommendation that the workers wear a respirator when they open these doors?
A. Yes, sir.
Q. That was to protect their health I gather?
MS. NEWMAN: Objection; form.
A. Some people don't like the smell of creosote. And if you didn't like the smell of creosote, it would be better for you to wear a respirator.
Q. (BY MR. KINNAN) So it's your position that breathing the vapor that comes out of the cylinder right after the door's open after a treatment operation is not harmful?

MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) It just smells bad?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) Just yes or no?
MS. NEWMAN: He can't answer it yes or no, plus you've asked it a bunch of times.
A. I don't think so.
Q. (BY MR. KINNAN) Okay. Did the ties ever get stuck back in the cylinder?
A. No. The only problem in the cylinder, when your ties are loaded on a tram, each one of these trams are made like a basket; only there's no end. There's no end. It's just a thing with four wheels on it. You load the ties in this thing. The ties are not tied to anything. They're tied together. And if you're not careful, you can dump a tram and that causes a problem.
Q. Workers have to go in there and get it out?
A. That's right.
Q. And really get covered with the creosote?
MS. NEWMAN: Objection; form.
A. Not necessarily. If you know how to do it, all you're going to do is get in a real hot cylinder. I've been in there.
Q. (BY MR. KINNAN) Did you require your workers to go into those hot cylinders and get those ties?

A. We let them cool down.
Q. Did you ever require them to go in while they're still hot?
A. No.
Q. You ever seen any workers with wet rags over their face doing the work?
A. I've seen them do that any number of times and I've criticized them for it.
Q. And why?
A. That's just not -- the rags are not -- they don't do what they think they do. If they need a rag, it's easier to put on a respirator.
Q. Okay. So where -- some of the material that was used to treat the ties goes into the ties. Some of the material goes back by vacuum into the storage tanks?
A. No. It's pumped back.
Q. Pumped back and some comes out into the sump, correct?
A. Yeah.
Q. When it gets into the sump, where does it go?
A. It goes to the sap drum that's under the cylinder and the next time you treat a train of ties, you blow that sap drum back into the working tank.
Q. Okay.

A. There's not that much oil in there to begin with.
Q. Now, there's a ditch along the east end of the property, correct?
A. Yeah.
Q. Is that correct?
A. Yes, sir.
Q. It's a wood ditch of some sort; is that correct?
A. It's a U shaped wood ditch, yes, sir.
Q. And --
A. Running right along here.
Q. It runs along the east border of the plant; is that correct?
A. Yes, sir.
Q. All the way down to the end of the plant?
A. All the way down here, right.
Q. And what went into that ditch?
A. Runoff, rainwater runoff.
Q. Rainwater runoff?
A. Yes, sir.
Q. Well, wasn't there ever creosote in that ditch?
A. If there was loose globs of creosote, conceivably you'd get some creosote; but normally the

only thing you're going to get in there after a heavy rain is water.
Q. Okay. Well, isn't it true that --
A. Now, we had -- let me say this. We had boards nailed to the bottom of that to make a kind of a flume effect. The water would have to go over the boards, but the creosote wouldn't. It would be caught.
Q. Okay. And did you see that there was an accumulation of creosote in that ditch every so often?
A. Yes, sir.
Q. Okay. And then the workers would actually scoop that out and put it in a trash container?
A. No, sir. That belonged to the Houston division when the water got out there in that ditch. That was not our responsibility.
Q. So your workers did not --
A. No, sir.
Q. -- clean that ditch out?
A. No, sir.
Q. Is the Houston division, did that include Englewood?
A. Yes, sir. The division engineer is the man responsible for the Houston division. Now, the division engineer has no responsibility inside the gate -- the fence of the wood preserving works.

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Q. Okay. The Houston division people would come over and build tracks on your property, your plant, wouldn't they?
A. That -- yes, yes, sir.
Q. And isn't it true that there was an accumulation of water and creosote on the adjoining property to your plant?
A. Well, the joining property that you're concerned with I think is this property down here at the bottom.
Q. Okay. How much property are we talking about?
A. Acre maybe.
Q. And wasn't there an accumulation of water and creosote there on a regular basis?
A. Only when there was a heavy rain.
Q. Well, didn't there come a time when there was a fire down there where the creosote caught fire?
A. Yes, sir.
Q. Okay. Let me mark as the next Exhibit in order a document. I think I've already given it to you. This is Number 5.
(Exhibit Number 5 marked.)
Q. (BY MR. KINNAN) Is this a report that you prepared on or about May 15, 1979?

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A. Yes, sir.
Q. And this is April 29, 1979. A large fire was reported on the property immediately adjacent to the west boundary of the wood preserving works; is that correct?
A. Yes, sir.
Q. This was creosote that had accumulated on the neighboring property over the years as a result of flowing down this ditch that we've talked about?
A. Yes. Creosote and dead weeds and brush and grass.
Q. And you say that "for the past 30 or 35 years we have enjoyed the privilege of allowing runoff from our wood preserving works to accumulate on this property." That's true, isn't it?
A. Yes, sir.
Q. And that accumulation would be of water and creosote, correct?
A. Yes, sir.
Q. Because the next sentence says it's a mixture of water and what are you saying, volatile? What is that?
A. What?
Q. You're saying "a mixture of water and volatile inflammable petroleum products." Is that the

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creosote you're referring to?
A. Volatile. Yes, sir, uh-huh.
Q. And that's waste from your treating plant?
A. And yard runoff, yes, sir.
Q. Okay. And did you know the Reese family?
A. No.
Q. Did you ever meet them?
A. No, sir.
Q. Even after this event did you ever meet them?
A. No.
Q. Did Southern Pacific buy their property?
A. I suggested it, but they never did.
Q. Why did you suggest Southern Pacific buy their property?
A. Because we could use it for piling storage. Perfect. It's right down where we needed it.
Q. And you accumulated waste on their property?
A. Well, should we have bought the property, we would have raised the property.
Q. Over the years did you accumulate waste on their property?
A. Yes.
Q. And that would be the creosote material and water?
A. (Witness nods head.)

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Q. Yes?
A. Yes.
Q. And the area was about -- or exceeded one acre?
A. It's about an acre.
Q. After the fire incident did you do something to prevent the accumulation of waste on the neighboring property?
A. The Houston division people came out to the plant and had some people get in this area along the right-of-way and dig the ditch deeper so we can move on down toward town.
Q. What was the fix?
A. Do what?
Q. Just tell me what the fix was? What did they do?
A. They dug out the ditch so that the water and whatever would flow -- initially it was a natural ditch and over the years it had got -- it had been filled up with dirt and junk and everything you see along a railroad right-of-way. And it filled up to the extent that the water was not being trapped in the ditch, but it would move out over this property.
Q. Over the railroad's property?
A. Well, the railroad's property and then when

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you had a good rain, it would get over on this private property.
Q. How did you prevent that after this incident?
A. The Houston division sent some division laborers out there and they dug a deep ditch along the line of the former ditch.
Q. Were you concerned that you had been contaminating the neighbor's property?
A. They never did ask about it or say anything about it.
Q. Let's look at the last paragraph of your letter for a minute. It says "we will be happy to assist you in any way to handle this extremely poor situation but suggest we do some, quote, "spade work", close quote, with these people in the near future to let them know we are aware of this poor condition that we have allowed to exist on their property." Do you see that?
A. Yes, sir.
Q. What did you mean by "spade work"?
A. Find out if they'd sell it.
Q. Why did you put it in quotes?
A. It's an old East Texas colloquialism.
Q. Is it a derogatory statement?
A. No, no. It's not derogatory at all.

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Q. Did you know whether the people that owned this property were Black?
A. No.
Q. Had you ever met them?
A. No. The people that owned this property were not living in the house.
Q. Was there anybody occupying this house?
A. Every so often.
Q. Did you ever talk to them?
A. It wasn't occupied all the time. That's the reason -- that's one of the reasons we couldn't buy it because we couldn't find an owner.
Q. In any event, you regretted accumulating waste on their property?
A. Yes, sir.
Q. How come you hadn't done anything earlier about it?
A. Nobody had said anything or done anything.
Q. Do you know whether the City considered the accumulation of that creosote to be a hazardous condition?
A. Well, I don't think so because I don't believe creosote is a hazardous condition.
Q. Did the City ultimately designate the soil that was removed from that property as hazardous?

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A. No, this had nothing to do with the soil that was put into a --
Q. Impoundment?
A. -- impoundment on our -- on SP's property.
Q. Didn't they dig up the soil on the adjoining property --
A. That's right.
Q. -- with creosote and put it in the impoundment?
A. No. The material that was put in the impoundment was the material that was developed when the working tank exploded when the contractor was working on the working tank. This had nothing to do with the impoundment. The impoundment -- the impoundment was the soil that was generated that -- the soil that was saturated with oil was picked up down here in front or behind the treating area. That's where the impoundment came in.
Q. I just want to understand your sensitivity to the neighbors. Have you ever heard of the word spade referred to as a derogatory comment toward a black person?
A. No. Spade work is getting to know somebody.
Q. Okay. All right. Let's carry on. So we've got the ditch. We've got the adjoining property which

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became contaminated and then --
A. The Houston division came out and straightened it out.
Q. Okay. You don't know whether you ever bought that adjacent property or not?
A. No. I thought it would be a great idea.
Q. If you could flip through real quick the remainder of Exhibit Number 3 and just see if it represents, accurately depicts the site over the years? Just generally. I don't want you to get specific.
A. You want me to lead you along? You can see on this 1/18/81 we have a lot of green ties but no black ties. Do you see that?
Q. What page are you on? What year?
A. 1/18/81.
MS. NEWMAN: Look at the back.
A. Oh, I'm sorry. It's on the front.
MS. NEWMAN: It is on the front. I'm sorry.
A. The flying date is 1/18/81. All you can see is treated ties on trams and untreated ties on yard.
Q. (BY MR. KINNAN) Okay.
A. Now, the treated ties on trams ultimately are going through the tie loading machine and the empty trams are going to come back here and going through to

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the tie machine.
Q. What is directly across this track from your plant?
A. That's the intermodal.
Q. Say it again.
A. TOFC Intermodal.
Q. Is it the railroad property?
A. Right.
Q. What is it?
A. The TOFC, trucking subsidiary of Southern Pacific. You know, the boxes that -- boxes they load on ships.
Q. Okay. Mr. Vernon was your boss, was he?
A. He was my point of contact.
Q. Out of San Francisco?
A. Yes, sir.
Q. All right.
A. He -- if Mr. Berkshire wanted to talk to me, he didn't go through John Vernon.
Q. And Mr. Berkshire was Mr. Vernon's boss?
A. Yes.
Q. Chief engineer?
A. Yes, sir.
Q. Let's mark as the next number in order, I guess it's Number 6 , memo from Mr. Kilpatrick to

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Mr. Vernon dated March 16, 1981. We marked it yesterday as an Exhibit.
(Exhibit Number 6 marked.)
Q. (BY MR. KINNAN) You recognize this document?
MS. NEWMAN: Go ahead and read the whole document. Take your time. While he's reading that, do you mind if he takes over a little bit?
MR. KINNAN: That's fine.
Q. (BY MR. KINNAN) Okay. Have you had an opportunity to look at the document?
A. Yes, sir.
Q. Okay. You recognize Mr. Kilpatrick's signature there at the second page?
A. Yes, sir, uh-huh.
Q. Yes?
A. Yes, sir.
Q. Whose handwriting is on the last page? Is that Mr. Vernon's?
A. That's John Vernon's.
Q. All right. And the note -- let's go through this document, okay. Mr. Vernon was -- what was his title?
A. He was engineer track.
Q. Okay.
A. I believe was his title.

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Q. And Berkshire's stamp is on this document showing he received a copy, right?
A. He was chief engineer.
Q. His stamp is shown indicating he received a copy of this document?
A. Yes.
Q. And the subject is process emissions into atmosphere, wood preserving works Houston, Texas, right?
A. Yes, sir.
Q. Now, apparently there was a discussion with you in reviewing some correspondence and some investigation indicated some things; is that correct?
A. Yes, sir. Yes, sir.
Q. All right. So the wood preserving works was issued a couple of citations for the drying agent smell; is that correct?
MR. McGUIRE: I think it says spill.
Q. (BY MR. KINNAN) Spill. I'm sorry. That's what it says, right?
A. Right.
Q. Was there a drying agent spill at some time?
A. We had a drying agent spill anytime we had the -- the engineer may have put the drying agent in the wrong tank. You put hot drying agent in a cold

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tank, it's going to expand real quick where it goes up and runs down the side of the tank.
Q. Looking at the first page of Exhibit Number 3, where would those spills have occurred?
A. You see that first tank -- I don't know which tank they were working out of. We don't work out of the same tank all the time because you have to let the drying agent cool down.
Q. So not only that one horizontal tank for the naphtha. There were other tanks?
A. No, not horizontal tanks. Vertical tanks. All the naphtha tanks are vertical. The horizontal tank was caustic.
Q. That's right. That's right. Okay. So back there to the northwest I guess behind the treatment cylinders there would be spills; is that correct?
A. Yes, sir.
Q. Okay. And do you know whether these spills resulted in any emissions to the air that might have been harmful to the workers?
A. I don't think they can even smell them.
Q. Did the workers have to cleanup this spill?
A. We washed it off with a hose.
Q. It spilled onto cement or to --
A. Ground. The ground. See, number 11 is the

second drying agent tank.
Q. Okay.
A. 10, 11 and 12. And evidently 11 was a cold tank and it may have had too much drying agent in it.
Q. Okay. And then it goes on -- I am trying to cut you off only because you're giving me more information than I need unless Counsel --
MR. McGUIRE: No, that's perfectly fine.
Q. (BY MR. KINNAN) Because you're so intimately familiar with this operation, you've given me some really good detail, but almost too much for the time that we have.
MR. McGUIRE: Just let him ask the question and answer the question.
Q. (BY MR. KINNAN) It also says in paragraph one that there was a citation for odor for the number 2 cylinder door open. Do you see that?
A. Yes, sir.
Q. And that was the blue smoke that would come out at the end of the process; is that correct?
A. Yes, sir.
Q. Did you get complaints from the neighbors often about the odor?
A. No.
Q. How often were you cited by the City of

Houston?
A. Very seldom. Very seldom. It's hard to give you a number.
Q. Are you familiar with the ACORN, the Association of Community Organization for Reform Now?
A. Yes, sir.
Q. Did you have meetings with them?
A. No, sir.
Q. Did you get information, communication from them?
A. They were always calling me on the phone.
Q. What were they saying? What were they complaining about?
MR. McGUIRE: Objection; form.
A. The odor.
Q. (BY MR. KINNAN) Odor?
A. (Witness nods head.)
Q. Yes?
A. Odor, yes, sir.
Q. How often would they call you?
A. I remember three telephone calls.
Q. Okay. What years?
A. Total? I want to say that it was getting close to the time when we were getting ready to shut the plant down.

Q. Late '70s, '80s?
MR. McGUIRE: Objection; form.
A. Well, the '80s.
Q. (BY MR. KINNAN) Was there a gas explosion as referenced in paragraph two at the plant?
A. It was not a gas explosion.
Q. What happened?
A. The engineer, when he was through with a cylinder, was pumping drying agent back to -- he put it in the wrong tank. He put it in a cold tank. He was working out of number 10 probably, and he put it in number 11 and --
Q. Okay. Understood. Now, we go to paragraph four. It says "ACORN group expressed concern with possible emissions from WPW of naphthalene (alleged toxic substance) and anthracene (alleged carcinogenic substance) and indicated that these substances are constituents of creosote." You see that?
A. I see it, yes, sir.
Q. Have you seen this document before?
A. I barely remember the document when I talked to John Vernon about it.
Q. Okay. When were you first aware that creosote contained naphthalene and anthracene, which were toxic substances?

MR. McGUIRE Objection; form.
A. I really wasn't aware of either one of them.
Q. (BY MR. KINNAN) Okay. Was the wood preserving works plant ever shutdown --
A. No, no, sir.
Q. -- by the City?
A. No, sir, never.
Q. And in paragraph six it says "current creosote drying agent suppliers confirmed that naphthalene and anthracene are present in their product as follows." And then it gives some percentages. Do you see that?
A. Yes, sir.
Q. All right. And you see there in paragraph seven it says "these substances," referring to substances below, "are controlled as follows, creosote, EPA hazardous substance or hazardous waste" and it says "yes." Do you see that?
A. Yes, sir.
Q. And OSHA also had some kind of allowable exposure limit; is that correct?
MR. McGUIRE: Objection; form.
Q. (BY MR. KINNAN) Is that what this says?
A. I don't know.
Q. Okay. You see that the document says OSHA

had an eight-hour work shift allowable exposure for creosote; is that correct?
A. What's written on the paper is correct, but I don't know whether that's correct or not.
Q. Okay. So did you ever consult with any OSHA representative or anybody that knew about the OSHA regulations to see exposure levels that were recommended by OSHA --
A. No.
Q. -- for creosote?
A. No.
Q. Did you ever discuss with the EPA the fact that creosote was on their hazardous waste list?
MR. McGUIRE: Objection; form.
A. No.
Q. (BY MR. KINNAN) And it says naphthalene was also considered by the EPA to be a hazardous waste. Do you see that?
A. Yes.
Q. And OSHA had a parts per minute for exposure. Do you see that?
A. Yes, sir.
Q. Did you know that while you were working there?
A. No, sir.

Q. About the EPA and OSHA regulations with respect to this material?
A. No, sir.
Q. And the same for anthracene as listed there?
A. No.
Q. Did you discuss any of the contents of this letter with Mr. Vernon or Mr. Kilpatrick?
A. I don't remember any of this letter other than taking to John Vernon about the boil-over of the tank, the -- of course he knew about the cylinders emitting odor and -- I believe that's about it.
Q. And if we look at paragraph eight, it says by Mr. Kilpatrick -- and by the way, what's Mr. Kilpatrick's title again?
A. He was the environmental -- he was chief of the environmental section in the headquarters of Southern Pacific in San Francisco.
Q. And you recognize his signature down there?
A. Yes, sir.
Q. So on paragraph eight it says by Mr. Kilpatrick "both anthracene and naphthalene should be considered to be carcinogenic substances." Do you see that?
A. Yes, sir.
Q. Do you have any reason to disagree with

Mr. Kilpatrick's assessment of those chemicals?
MS. NEWMAN: Objection; form.
A. Yes, I do.
Q. (BY MR. KINNAN) What's the basis for that disagreement?
A. I've never heard about it before.
Q. You've never heard that the component parts of creosote, certain component parts of creosote were cancer-causing?
A. No.
Q. The next sentence says "some substances containing anthracene or naphthalene structure are listed either as OSHA carcinogenic substances or are on the suspected list." Do you see that?
A. Yes, sir.
Q. Do you know whether OSHA considered these to be carcinogenic substances?
A. I've never received anything from OSHA telling me that.
Q. Did you know that anthracene and naphthalene were component parts of creosote while you worked there?
A. I would -- I don't believe I ever gave it any thought.
Q. Did you ever order any testing for the

presence of anthracene or naphthalene at the site?
A. No, sir.
Q. And you see in paragraph nine it says "WPW situation is vulnerable to litigation concerning alleged adverse health effects (both internal and external) to employees and nearby residents due to uncontrolled emissions into atmosphere of unknown quantities of suspected carcinogenic substances." You see that?
A. Yes, sir.
Q. Did you ever discuss with Mr. Kilpatrick or Mr. Vernon or anybody else the wood preserving works' vulnerability to litigation by the employees or neighbors?
A. No, sir.
Q. Now, the last paragraph on page two here over the signature says "we can wait for possible Air Board action or proceed with testing to obtain information concerning possible air pollution or plant's future may be another consideration." Do you see that?
A. Yes, sir.
Q. In or around March of 1981 did Southern Pacific begin testing the air at the plant to see whether it contained any toxic substances such as naphthalene, anthracene?

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A. Not that I can remember.
Q. Did they discuss possibly taking air tests or soil tests in and around '81, the people in San Francisco?
A. Not that I remember.
Q. When did you first become involved in discussions about closing the plant and moving it somewhere else?
MS. NEWMAN: Objection; form.
A. I was -- I was never in that, any discussions.
Q. (BY MR. KINNAN) Were you ever told that Southern Pacific was considering shutting down the plant?
A. No, not directly.
Q. Well, indirectly?
A. I was never told directly.
Q. By your bosses or --
A. Anybody.
Q. -- anybody?
A. Anybody.
Q. Well, you were still working for Southern Pacific when it was shut down?
A. Yes, sir. Yes, sir.
Q. So at some point they told you it was being

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shutdown, did they?
A. You could tell what was going on.
Q. How could you tell what was going on?
A. If the materials -- if the materials deliveries stopped, if the orders stopped, you can assume that you're pretty well on the short end.
Q. And so that's what was happening, you were not getting shipments?
A. That's right.
Q. And so you had to guess that you were closing the plant?
A. That's right.
Q. Did anybody ever tell you why the plant was shutdown?
A. No.
Q. Do you have any idea why the plant was shutdown?
A. I imagine it was a corporate decision.
Q. For what reason?
A. I have no idea.
Q. You've never seen any document as to why they shut it down?
A. No, no.
Q. Do you know if it had anything to do with air pollution at the plant around the adjoining

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neighborhood?
A. I don't know.
Q. Water pollution below the plant, anything to do with that?
A. I don't know.
Q. Okay. If we look at the last page of this Exhibit Number 6 you previously identified that as Mr. Vernon's handwriting. Do you see that?
A. No, G.L. Murdock. Oh, that's right. That's John V. Vernon's.
Q. Handwriting?
A. (Witness nods head.)
Q. You see that?
A. Yes, sir.
Q. You recognize that from other notes you received from him?
A. Yes, sir.
Q. Okay. And what does the note say?
A. "Please note one more thorn in our side."
Q. Do you know what he was referring to as a thorn in the side?
MS. NEWMAN: Objection; form.
A. No.
Q. (BY MR. KINNAN) Did you ever discuss this note with Mr. Vernon?

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A. No.
Q. Did you ever discuss air pollution at the site with Mr. Vernon?
A. He didn't want to discuss anything like that.
Q. Did you ever discuss that with Mr. Kilpatrick?
A. He was dead.
Q. When did he die?
A. I think it was sometime before they shut the plant down.
Q. Do you know what he died from?
A. No, I have no idea.
Q. Was he ever at the site?
A. At the creosote worksite?
Q. Yes.
A. Yes, sir.
Q. How often?
A. Not that often really. He would show up in the morning and spend a couple or three hours walking around the plant and go somewhere else.
Q. And what was he doing when he was walking around the plant, if you know? What was his purpose for being there?
A. You really couldn't -- you really couldn't know because he didn't talk. He was a funny

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individual. He'd say things that you really couldn't understand what he was getting at. He was never really -- at the plant he was never real specific about anything.
Q. Did he ever discuss with you safety procedures for the workers?
A. No, never.
Q. Emission controls, anything like that?
A. I can remember him saying one thing positive. We're going to have to start getting some samples of air, air samples around the periphery of the plant.
Q. When did he say that?
A. About the last time he was down there.
Q. In the '80s or '70s?
A. '80s, '80s.
Q. Do you know why he said we're going to have to start getting some air samples around the plant, perimeter of the plant?
A. No, but he never did do anything about it.
Q. Why do you say that was a positive statement by him?
A. Usually he never made positive statements.
Q. Oh, okay. I understand.
A. He was a -- there's nothing wrong with him. He's just -- he was from California.

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MR. KINNAN: Let's take a break.
(Break.)
MR. KINNAN: Okay. Let's go back on the record.
Q. (BY MR. KINNAN) You understand you're still under oath?
A. Yes, sir.
Q. At anytime while you were the manager of the plant in Houston were you aware that the EPA considered creosote to be a cancer-causing agent?
A. No.
Q. Okay. From no source that you can remember?
A. No source.
MR. KINNAN: Let me mark as the next Exhibit in order a document.
(Exhibit Number 7 marked.)
Q. (BY MR. KINNAN) It's Exhibit Number 7 and for the record while you're reading it, it looks like a little memo from M.A. Lane to Mr. Berkshire dated March 24, 1981 and there's an attachment to it. Okay. You remember this memo?
A. Not really but --
Q. That's your signature?
A. Yes, sir, sure is.
Q. And the article, if we turn to the second

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page, it's a document bates stamped UP-233 and it says "EPA threatens to ban wood preservatives." Were you aware of the movement by the EPA to ban creosote as a wood preservative?
A. Yes, sir, but --
Q. Yes?
A. Sorry.
Q. Yes?
A. Yes, I'm aware of the movement.
Q. Okay. And you see in the first paragraph it says "the three major woods preservatives used in Texas, creosote, pentachlorophenol and arsenic --"
A. Base treatments.
Q. "-- base treatments are threats to public health and should be banned unless the wood preserving industry cleans up it's act, the U.S. Environmental Protection Agency says." Do you see that?
A. Yes.
Q. And you read this at the time of this note to Mr. Berkshire, didn't you?
A. Uh-huh.
Q. Yes?
A. Yes, yes, sir.
Q. And the next paragraph says "EPA officials say they will refuse registration of the three major

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preservatives unless the wood treatment industry can rebut findings that the chemicals cause cancer, birth defects, reproductive disorders, miscarriages and mutations." Do you see that?
A. Yes, sir.
Q. Okay. So you had information that certain entities considered the creosote material to be harmful to human health; is that right?
MS. NEWMAN: Objection; form.
A. The EPA never did include creosote.
Q. (BY MR. KINNAN) In what?
A. This plan to --
Q. They never banned creosote?
A. No, they never did.
Q. Do you know whether the EPA considers creosote to be a cancer-causing material?
MS. NEWMAN: Objection; form.
A. I don't think so.
Q. (BY MR. KINNAN) And how do you know -- what do you base your position on?
A. Readings.
Q. Did you make an effort to read material to determine whether the EPA considered creosote to be a cancer-causing agent back in the '60s, '70s and '80s?
A. No.

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Q. No?
A. No.
Q. And you didn't think that was part of your responsibility as plant manager?
MS. NEWMAN: Objection; form. Asked and answered.
A. I don't think anybody back in those days did -- had any reason to believe that creosote was carcinogenic.
Q. (BY MR. KINNAN) In the early '80s --
A. Okay.
Q. -- Southern Pacific was of the mind that certain components of creosote could cause cancer; is that correct?
MS. NEWMAN: Objection; form.
A. I know. I know.
MS. NEWMAN: You want to hear the question again?
A. Yeah. Read the question, please. Thank you.
(Last question read back.)
A. Yes.
Q. (BY MR. KINNAN) Did Southern Pacific advise the creosote plant workers of the fact that creosote might cause cancer?
A. No.

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Q. Did they advise you of their position?
A. Only insofar as that document.
Q. The document from Mr. --
A. Kilpatrick.
Q. -- Kilpatrick which referenced their concern that creosote might cause cancer?
A. Might cause cancer.
Q. And Mr. Kilpatrick suggested to you that it might be time to take air measurements to see what type of chemicals were in the air at the plant?
A. It wasn't directed to me.
Q. No, I didn't mean you. Strike that. Mr. Kilpatrick said Southern Pacific should start taking air measurements to determine the chemicals in the air at the plant?
MS. NEWMAN: Objection; form.
A. And he immediately forgot about it. Nothing was ever done.
Q. (BY MR. KINNAN) But he did make the suggestion or the statement that Southern Pacific should test the air at the plant to determine whether there were contaminants in the air; is that correct?
MS. NEWMAN: Objection; form.
A. Yes.
Q. (BY MR. KINNAN) And then your recollection

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is that nothing was done about that?
A. Nothing that I can remember.
Q. A few years later the plant closed?
A. (Witness nods head.)
Q. Is that correct?
A. Yes, sir.
MR. KINNAN: Okay. Let's mark as the next Exhibit in order a document entitled Creosote Extender Diluent Material Specification Requirements P-913 through P-914. Can we go off the record just a minute?
(Exhibit Number 8 marked.)
(Break.)
Q. (BY MR. KINNAN) Have you had an opportunity to review Exhibit Number 8, Mr. Lane?
A. Yes, sir.
Q. All right. What is this document and when was it created?
A. This document was -- this document was information that I worked up for Don Rose. He was wondering what he should look for in a diluent that could be used for extender. This actually is what you'd look -- this actually is what you'd find in Number 6 fuel oil.
Q. When was this prepared?

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A. I wish I could tell you. I suspect when -- are we --
Q. I'm sorry. Go ahead.
MR. McGUIRE: Do you want to know what the date is? I can give you the date.
MR. KINNAN: Yes.
MR. McGUIRE: It's August of '78.
Q. (BY MR. KINNAN) August of '78. Does that sound about right?
MR. McGUIRE: July or August, one of those months.
Q. (BY MR. KINNAN) Does that sound about right?
A. Pretty close. Has to be.
Q. What was the reason for producing this document?
A. I knew that we were going to be running out of Number 6 fuel oil because of world requirements. This was in the period when the Japanese were beating us down and the Arabs were beating us down and I kind of suspected we were going to be needing something other than the Number 6 fuel oil. And I can't remember whether he was talking to Lowe or not, but my thought was -- my thought is that he was; and if we bought anything from Lowe, he should at least be held accountable for this.

Q. Prior to this document being created by yourself in the late '70s had there been a specification document on file before?
A. All we had was a P something 57 for Number 6 fuel oil.
Q. Okay. Paragraph three of this document says "desired treatment results are required in a cost effective manner as determined by railroad. Emission into the environment of vinyl chloride monomer or any other substance in objectionable quantities determined by appropriate government authority is not acceptable." Do you see that?
A. Yes, sir.
Q. Was Southern Pacific willing to accept creosote extender with a certain amount of vinyl chloride in it?
A. No.
Q. This seems to suggest that these materials needed to be at a level other than in an objectionable quantity?
MS. NEWMAN: Objection; form if that's a question. I'm not sure.
Q. (BY MR. KINNAN) What was your intention by writing this paragraph? What was your reason for putting that in there?

A. Number three?
Q. Yes.
A. I didn't want any vinyl chloride.
Q. Say it again?
A. I didn't want any vinyl chloride.
Q. So this was immediately after the incident with Dominguez & Sapp, the junk stream?
A. It could have been.
Q. It was probably as a result of that?
A. It may have been.
Q. And how was Southern Pacific going to determine whether the extender they got contained vinyl chloride or any other substances --
A. When you buy product from anyone, you give the producer a set of specifications; and if he can't fulfill the specifications, you should not buy the product.
Q. All right. We've already been through the fact that in any event Southern Pacific never tested the extender that it got from Lowe. It just assumed that he followed your specifications; is that correct?
MS. NEWMAN: Objection; form.
A. We didn't have it analyzed as far as I know.
Q. (BY MR. KINNAN) Okay.
A. But it says here "supplier shall furnish

railroad with any information concerning about any material deemed necessary by railroad." And that was -- I guess that's what Don Rose accepted when he was buying the product as Number 6 or equal.
Q. Did your creosote extender supplier ever supply to you or submit to you a report of a laboratory analysis as called for in paragraph five of this specification?
A. I can't remember for sure.
Q. Because paragraph 5-B says "showing quantity of gaseous vinyl chloride emitted from a representative sample." I take it you wanted to make sure that the extender you were getting didn't contain anymore vinyl chloride?
A. It didn't contain any vinyl chloride.
Q. That it didn't contain any?
A. Yes, sir.
Q. Right. So do you know whether Mr. Lowe ever provided you with --
A. He always assured me and he always furnished a disclaimer with his purchase orders that he was furnishing a product equal to -- Number 6 or equal to Number 6 .
(Discussion off the record.)
MR. KINNAN: Okay. Let's mark as next

in order Exhibit Number 9.
(Exhibit Number 9 marked.)
Q. (BY MR. KINNAN) Okay. What I represent this to be are all of the contracts or purchase orders by Southern Pacific for creosote extender from Lowe Chemical, J.O.C. Oil, Ralph Lowe's series of companies. Do you recognize these documents?
A. Oh, yes, sir. Yes, sir.
Q. Great. Let's look at page one, April 26, 1972. It's a Southern Pacific Transportation Company original order?
A. Right.
Q. Do you know if prior to that date Southern Pacific was getting extender from Mr. Lowe's companies?
A. I'm going to believe we don't.
Q. Say it again?
A. I don't believe we were not.
Q. Okay. I understand. So you think sometime prior to April '72 you began your relationship with Lowe in terms of getting the extender?
A. Lowe's relationship with the Southern Pacific --
Q. Let me strike my question and just ask in this context. Looking at these contracts when did you first start purchasing extender from Mr. Lowe and his

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companies, to the best of your recollection?
A. It had to be in this time frame.
Q. In the early '70s?
A. Uh-huh.
Q. Yes?
A. Yes.
Q. That's what you said earlier today. I understand that. I failed to ask you earlier however prior to Mr. Lowe, who was providing you with the extender?
A. Number 6 fuel.
Q. Who?
A. Well --
Q. Or did I ask you this?
A. We were buying Number 6 fuel oil out of a tank yard in Galena Park. And all we had to do was call a phone number and tell them we wanted a tank car or two tank cars or three tank cars of Number 6 fuel.
Q. And you moved over to Mr. Lowe because his extender was cheaper?
MS. NEWMAN: Objection; form.
Q. (BY MR. KINNAN) Is that correct?
A. No, no, that's not correct.
Q. Isn't it true that Mr. Lowe's extender was much cheaper than the Number 6 fuel oil?

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A. Yes, but the main reason we couldn't get -- the main reason we got tied up with Mr. Lowe is because we couldn't get Number 6 . Number 6 was tight as Dick's hat band.
Q. So it was the -- your testimony is it was the unavailability of Number 6 that led you to Mr. Lowe?
A. The unavailability we could see in the future, I could see in the future because Number 6 was even hard to come by at that time.
Q. Number 6 became hard to come by when?
A. During this time period.
Q. Early '70s?
A. (Witness nods head.)
Q. Yes?
A. Yes, sir. Now --
Q. What were the sources for Number 6 fuel oil back in the '60 and '70s?
A. That's what I'm telling you. This Galena Park tank farm, all the major oil companies had tanks out there. Now, we didn't know who we were getting the oil from, but the purchasing department had setup in the past a purchase order and we could draw any amount against that purchase order. All we had to do was pickup the phone and say we need 30,000 gallons of Number 6 fuel oil or whatever; but at the same time it

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was being shipped out in tank cars, which wasn't a good situation.
Q. You mean on the railroad track?
A. Right.
Q. As we discussed earlier?
A. Uh-huh.
Q. Okay. All right. Well, did the supply of Number 6 fuel oil make a comeback sometime after the early '70s?
A. I don't really know.
Q. Did you ever look into going back to Galena Park and getting Number 6 fuel oil?
A. We didn't have a purchase order.
Q. Southern Pacific didn't authorize you to do that?
A. No.
Q. All right. Do you know whether Southern Pacific stayed with Mr. Lowe because his material was less expensive?
MS. NEWMAN: Objection; form.
A. I imagine it was a consideration.
Q. (BY MR. KINNAN) Were you part of any of those discussions?
A. No.
Q. Part of any analysis on behalf of the

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company?
A. No, other than if we're going to buy oil from somebody, they have to meet these specifications, whatever they are.
Q. Okay. One of our exhibits, Exhibit Number 8 -- Okay. So let's look at Exhibit Number 9 and you recognize this as a purchase order from Southern Pacific to Lowe Chemical April 26, 1972. Do you see that?
A. Uh-huh.
Q. Yes?
A. Yes, yes, sir.
Q. And it says shipped to I guess superintendent wood preserving works, 4910 Liberty Road, correct?
A. Yes, sir.
Q. And then the description of what is being delivered is described as such alkylated benzene, spelled wrong but b-e-n-z-i-n-e?
A. No, that's the benzene that comes out of aromatic oil.
Q. It's a different type of benzene?
A. Right.
Q. How are you aware of that?
A. I just know it.
Q. Do you know whether that benzene poses risks,

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health risks in either dermal contact or inhalation, ingestion?
A. I can't tell you, no.
Q. Okay. So "such alkylated benzene bottoms, paren, (residual petroleum oil), close paren, for blending the creosote oil similar to residual oil per AWPA spec P-4-56 as required for wood treating operation." Do you see that?
A. Yes, sir.
Q. Okay. Now, if Mr. Lowe shipped you styrene tar bottoms, would that comport with this purchase order?
A. As long as it -- as long as it was shipped under speck P-4-56, which is Number 6 fuel oil.
Q. Do you know whether styrene tar bottoms complied with P-4-56 specification?
A. Yes, sir.
Q. They did?
A. They did.
Q. How do you know that?
A. We had testing done insofar as the components of acidic gravity, admissibility, sulfur. Let's see, there was a couple other components.
Q. Okay. Did the AWPA specification P-4-56 address the toxicity of the compound?

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A. We did not -- we did not ask for a toxicity or I'm not aware that we asked for a toxicity test.
Q. Okay. So we have this first page is UP-802, which is a '72 contract. Was it an evergreen contract? In other words, once it was in place, until it was canceled, it was renewed each year?
A. Normally our contracts are good for six months.
Q. This one says "the term of this order shall be from May 1, '72 to December 1, '72 subject to consideration thereafter as we spoke." Okay. And as far as you recall, all of the contracts with Mr. Lowe and his companies were for this alkylated benzene bottom, et cetera. Is that --
A. Which was the same as Number 6 .
Q. Which was to be --
A. Was used as Number 6 , yes, sir.
Q. Now, where on these purchase orders is Mr. Lowe's certification of non-toxicity of his chemicals?
A. He didn't put it on all purchase orders. I know there's one floating around here that I seen.
Q. Is it on any of these which we've marked as Exhibit 9, do you know?
A. Not on mine.

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Q. Okay. And tell me again what it says?
A. In essence says that this material is to be delivered for use by Southern Pacific for use as Number 6 fuel oil or the same as Number 6 fuel oil.
Q. And that to you is a statement that is non-toxic?
A. Yes, sir.
Q. Okay.
A. If this stuff, if this stuff right here was bought under this specification, it can't be toxic. This stuff down here is what produces the toxicity.
Q. You're referring to what Exhibit?
A. P-913.
Q. Exhibit 8. Okay. And you were referring to what chemicals that cause the toxicity?
A. These are the elements that cause toxicity.
Q. At the bottom of the page?
A. Yes, sir.
Q. Three columns?
A. Huh?
Q. Three columns?
A. Yes, sir.
Q. Did Mr. Lowe ever provide you with phenolic resin as an extender?
A. Not that I know of.

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Q. Do you know whether phenolic resin comports with the Number 6 fuel oil requirement?
A. I don't know that we've ever used Number 6 phenolic resin.
Q. Is there such a thing as Number 6 phenolic resin?
A. I don't know.
Q. You said earlier that styrene tar would comply with the requirement that it be similar to Number 6 fuel oil?
A. If it met these requirements.
Q. Referring to Exhibit 8?
A. Right.
MR. KINNAN: I have a document I'd like to mark as an Exhibit. I don't know that I have copies though.
MR. McGUIRE: I can make copies.
(Break.)
MR. KINNAN: We're back on the record. We're marking the next Exhibit in order, which I believe is Number 10.
(Exhibit Number 10 marked.)
Q. (BY MR. KINNAN) Do you recognize this document, sir?
A. No, sir, I don't think so.

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Q. It's a comparison cost phenol versus Number 6. Do you recall if anybody at Southern Pacific ever made such a comparison cost analysis?
A. We make cost comparisons all the time or we used to.
Q. The difference between Dixie Oil extender and Number 6 fuel oil was about twice as expensive, Number 6 fuel oil?
MS. NEWMAN: I'm going to object to the form. He doesn't know anything about this document.
A. I've never seen this before.
Q. (BY MR. KINNAN) Okay. I'll represent to you we got it out of Southern Pacific's files. At the bottom it's supposed to be SF. It's not properly -- I guess we'll have to, you know, authenticate it through some other means.
MR. McGUIRE: We produced it. I mean, you can authenticate it all you want to.
MR. BOZE: We have to authenticate it. He hasn't seen it?
MS. NEWMAN: No, he can't.
MR. BOZE: It's a business record.
Q. (BY MR. KINNAN) What I'm asking you is just without looking at this document was Number 6 fuel oil about twice as expensive per gallon as the Dixie Oil

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extender?
A. Roughly.
MS. NEWMAN: I'm going to object to the form. Can you specify when, if you have personal knowledge?
Q. (BY MR. KINNAN) Roughly?
A. Yes, sir.
Q. And this is based upon your personal knowledge of purchasing both Dixie Oil and Number 6 fuel oil?
A. Yes, sir.
Q. Were there certain additional processes that were imposed upon the creosote plant as a result of the use of the Dixie Oil extender versus the use of Number 6 fuel oil?
A. Yes, sir.
Q. Could you explain those to us?
A. Well, the Dixie Oil was -- read the question again.
MR. KINNAN: Could you read the question?
(Last question read back.)
A. No.
Q. (BY MR. KINNAN) No?
A. No.

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Q. Was there a necessity to clean out the retorts more often with the number -- with Dixie Oil as opposed to Number 6 fuel oil?
A. We didn't, no, sir.
Q. Was there additional sap water as a result of using the Dixie Oil process?
A. No, sir.
Q. Was there more sludge in the Dixie Oil extender as opposed to Number 6 fuel oil?
A. No.
MR. KINNAN: Okay. I'd like to mark as next in order a document out of some documents produced by Southern Pacific. We'll mark this next in order, Number 11.
(Exhibit Number 11 marked.)
Q. (BY MR. KINNAN) It's a document memo from Art Lane or letter from Art Lane to Mr. Berkshire attention Mr. Vernon dated December 3, 1979 with an SF-506792 bates stamp on the first page. Let me ask you first do you know what that bates stamp is, SP-506792?
A. I have no idea.
Q. Do you know of any other litigation arising out of the wood treatment plant?
A. No, sir.

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Q. All right. So have you had an opportunity to look at this document briefly? Take a look at it. I don't necessarily want you to read the whole thing, but take whatever time you need to look at it.
A. (Witness complies.)
Q. All right. Is that your signature on the first page?
A. Yes, sir.
Q. This is a letter from you to Berkshire and Vernon?
A. Right.
Q. December 3, 1979?
A. Yes, sir.
Q. The second paragraph says that there was an employee who complained of respiratory problems allegedly caused by odors in treating room. You see that?
A. Yes, sir.
Q. Who was that employee and what was the problem?
A. Well, the problem was the treating room was full of water.
Q. What is the treating room?
A. It's -- the treating room is this building right here. Half of the room.

Q. The building you're pointing to is a big white building that looks like it's attached to the cylinders?
A. The cylinders are attached to it.
Q. Right.
A. This half of the treating room is where the rear end of the cylinders are. This part over here is where the piping and controls are located. In this section over here the treating room was level at the location of the cylinders out to a point where it dropped down about six foot. And then it moves over about 10 or 12 feet and it's back up again and this area over here is where the treating engineers monitor the five cylinders at the -- during the period of treating. And I wasn't aware of this until the next day, but somebody got in the treating room and stepped off the edge of the ledge and dropped down -- I can't remember --
Q. Dropped down into what?
A. Six foot of water. And I can't remember the name of the individual. I wish I could, but he was the only individual of the employees of the creosote works that had a problem after this fire. Now, he was supposed to have been an -- one of the members of the electrical crew. Of course, the electrical people, we

were out there because everything in that building was electrical. It was electronically activated.
Q. Okay. In any event, one employee said that the odors were causing him to have some respiratory problems; is that correct?
A. I didn't hear about it until the next day.
Q. Okay. But the reason for writing this letter was some complaints about odor?
A. Yes, sir. Right. Yes, sir.
Q. That was the odors emitted from the treatment operations, correct?
A. Well, the odors emanated from creosote on the water, drying agent on the water, lubricating oil on the water. Anything in that treating building got washed over into -- it's a pit. It's a pit and it's about six foot deep and it's the entire length of the building.
Q. And it got contaminated with bits of creosote and treating solution and --
A. Yeah.
Q. -- phenol from maybe from the sap water?
A. Right.
Q. Things of that nature?
A. Yes, sir.
Q. And this employee who was working in there,

the electrician complained of some odor problems and respiratory problems; is that correct?
A. The problem that I couldn't understand was what he was doing in there in the first place. Everybody else was way out next to the highway, the street.
Q. Okay. Was that water there on a daily basis in that treating room?
A. No, no. The water -- we had three people using hoses hosing down the tanks to keep them cool to keep them from blowing up. We had some fire in two tanks, and these two tanks were furnishing heat against the other tanks and this water from the hoses to keep the tanks cool came back, came back into the powerhouse.
Q. I understand. Okay. So to get off track just a little bit, there was a fire in the tanks?
A. It wasn't a fire. It was an explosion.
Q. Explosion. Did one or two employees die?
A. Not employees. The contractor that was doing the work, one of his employees died.
Q. Okay. And he had a welding tool of some sort that sparked an explosion?
A. This employee of Blumenthal Metal was a steel cutter and we were replacing a head -- the head on -- I

don't know what you'd call it.
Q. Cap?
A. Huh?
Q. The cap?
A. Cap on a working tank and to do that we had to cut a template to tie it to the top of the tank. My power supervisor told him to leave the cutting torch on the floor, go up the side of the tank and mark the holes where he's got to cut and then come back down on the floor and take the cutting torch and cut out the template. Well, he didn't do that.
Q. Okay.
A. He climbed up the side of the tank and that particular tank happened to be the last tank that was used to fill a cylinder and the oil is hot. That gave the --
Q. And the oil was a mixture?
A. 30/70.
Q. 30/70. Okay. And did it catch fire?
A. No. He stuck that torch down in the top of the tank and that tank is full of fumes and the fumes exploded. There was really no fire in that tank until the tank ripped open and got out on the ground.
Q. Okay. And then did this burn for a period of time?

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A. For a little while, yeah.
Q. How long did it burn?
A. Well, we had three holes in it. Maybe half hour.
Q. Okay. All right.
A. The Houston fire department put the fire out. Our people -- I kept our people back.
Q. Was there a lot of smoke?
A. Oh, man, yeah.
Q. Okay. And I guess everybody was breathing it for a while?
A. Well, the smoke --
MS. NEWMAN: Objection; form.
A. No, the smoke was in a different direction than where the men were. The smoke was blowing across Liberty Road.
Q. (BY MR. KINNAN) In any event, as part of all that, one employee complained of getting respiratory problems from these odors?
A. That's right.
Q. In the treating room, right?
A. That's right, but there were a lot of special conditions present for him to get what he got in the treating room.
Q. Understood. But the odors were from the

Page 195

chemicals that he'd been using in the plant?
A. That's right.
Q. So this was brought to your attention --
A. The next day.
Q. You got together with Mr. Dewey of the safety department?
A. Dewey, right.
Q. And the two of you decided that it might be time to contact "Southwest Research Institute to perform certain testing procedures to ensure that we are furnishing our employees with a safe environment in which to work"?
A. Yes, sir.
Q. I'm reading from the letter. All right. And so you had Southwest Research Institute prepare a proposal for you?
A. Right, yes, sir.
Q. And that proposal was submitted to you on November 19, 1979 or thereabouts and it was addressed to Southern Pacific Transportation Company attention Mr. Lane, subject, survey of plant operations for exposure of plant personnel to hazardous substances including carcinogens that may be present in process chemicals used in the preservation of railroad ties, right?

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A. That's what the paragraph says.
Q. Okay. And then it goes on to explain this company would take air samples and do all kinds of testing to determine what contaminants might be in the air at the plant; is that correct?
A. Yes, sir.
Q. Okay. And so you got this proposal from Southwest Research Institute. You attached it to a memo to your boss and your boss' boss, Berkshire and Vernon, and say, hey, you might want to have this company do some testing to determine whether the plant personnel are being subjected to hazardous substances while they do their work, correct?
A. Yeah.
Q. Yes?
A. Yes, sir.
Q. And so you sent it off I gather to Mr. Berkshire and Mr. Vernon. Did you get a response?
A. Their response is on there. They approved for $19,000.
Q. Okay. Where am I -- where's the response?
A. Well --
Q. Where's the approval?
A. I've seen it.
Q. Okay. So they did approve this?

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A. (Witness nods head.)
Q. And did Southwest Research Institute do the testing?
A. I've never seen the results.
Q. Did you ever see Southwest Research Institute out there doing their air testing and all that kind of business?
A. Yes, sir.
Q. Did you talk to them?
A. No.
Q. Did you show them around?
A. If they asked questions, I answered their questions.
Q. How long did they -- were they out there doing their testing?
A. I can't really tell you.
Q. Were you ever told of the results of the testing?
A. No.
Q. Do you know whether Southwest Research Institute was paid?
A. Yes, sir.
Q. And they did the testing and did you tell me how long they were out there?
A. No, sir.

Q. You don't remember?
A. I don't remember.
Q. Did you ever come to learn there was a report generated?
A. Well, this right here is the --
Q. There's one right in front of you.
A. The $19,000 is the money spent to put this -- to take care of the cost of cleaning up that mess.
Q. Cleaning up what mess?
A. The fire.
Q. Okay. But this says that this study -- you say in your letter in Exhibit 11, "this study by Southwest Research Institute is in three separate studies and costs $19,400." And the study was to survey the plant operations for exposure of plant personnel to hazardous substances?
A. Uh-huh.
Q. Right?
A. Right.
Q. What does that have to do with cleaning up the fire --
A. I guess that there's another -- I guess that's another --
Q. That was another expenditure?
A Right.

Q. Okay. Understood. But in any event, you're certain that they approved this $19,000. Southwest came out, did some testing, might have talked to you?
A. I don't remember.
Q. Did they let you know if they talked to any employees?
A. I don't remember.
Q. Talked to your foreman?
A. I just can't tell you.
Q. Do you know where they did the testing?
A. No.
Q. Did anybody tell you anything about the results of that test?
A. No.
Q. Then you sent a copy of this to Mr. Dewey in the safety department and Mr. Kilpatrick, right?
A. Yes, sir.
Q. Did you talk to those two about the study?
A. No.
Q. Whose handwriting is in the top right if you have it in front of you there?
A. Environmental matters. I don't know.
Q. Do you know whether as a result of this study Southern Pacific made a decision to close the plant?
A. No.

Q. The proposal says "the survey will include the chemical analysis of process chemicals with emphasis on identifying hazardous and/or carcinogenic compounds, ambient air sampling, personnel exposure monitoring and an evaluation of materials handling operations at the plant." Is that what you wanted to see done?
A. Yes, sir.
Q. And as far as you know, they did all that?
A. No, I don't.
Q. Okay. You don't know. This it 1979?
A. Right.
Q. Do you believe it would have been prudent for you to have questioned this many years before 1979?
MS. NEWMAN: Objection; form.
A. I don't know.
MR. KINNAN: Okay. It's 4:00 o'clock, 4:01. We're going to continue this deposition tomorrow at 9:00 o'clock.
A. Very good.
(Proceedings recessed at 4:01 p.m.)

CHANGES AND SIGNATURE

PAGE	LINE	CHANGE	REASON

I, M.A. LANE, have read the foregoing deposition and hereby affix my signature that same is true and correct, except as noted herein.

____
M.A. LANE

THE STATE OF TEXAS *
COUNTY OF HARRIS *

Before me ______________ on this day personally appeared M.A. LANE, known to me or proved to me under oath or through ______________ to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that they executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office this ______ day of ______________, 2002.

____
NOTARY PUBLIC IN AND FOR THE
STATE OF TEXAS

My commission expires: ______________________

NO. 2000-38068

CLARENCE ABRAHAM, ET AL * IN THE DISTRICT COURT OF
*
VS. * HARRIS COUNTY, T E X A S
*
UNION PACIFIC RAILROAD *
COMPANY * 295TH JUDICIAL DISTRICT

REPORTER'S CERTIFICATION
DEPOSITION OF M.A. LANE - VOLUME I
JANUARY 17, 2002

I, IRENE VALDES, Certified Shorthand Reporter in and for the State of Texas, hereby certify to the following:

That the witness, M.A. LANE, was duly sworn by the officer and that the transcript of the oral deposition is a true record of the testimony given by the witness;

That the deposition transcript was submitted on ______________, 2002 to the witness or to the attorney for the witness for examination, signature and return to me by ______________, 2002.

That the amount of time used by each party at the deposition is as follows:
Mr. Richard P. Kinnan - 5 hours; 18 minutes
Ms. Deborah A. Newman - 0 hours; 0 minutes

That pursuant to information given to the deposition officer at the time said testimony was taken, the following includes all parties of record:
Mr. Richard P. Kinnan, Attorney for Plaintiffs;
Ms. Deborah A. Newman, Attorney for Defendant.

I further certify that I am neither counsel for, related to, nor employed by any of the parties or attorneys in the action in which this proceeding was taken, and further that I am not financially or otherwise interested in the outcome of the action.

Further certification requirements pursuant to

Rules 203 of TRCP will be certified to after they have occurred.

Certified to by me this _____ day of ___________, 2002.

IRENE VALDES, TEXAS CSR 1939
Expiration Date: 12/31/2002
Compex Legal Services
7155 Old Katy Road, Suite 200
Houston, Texas 77024
713-861-3900

CERTIFICATION UNDER RULE 203

The original deposition was/was not returned to the deposition officer on ____________________;

If returned, the attached Changes and Signature page contains any changes and the reasons therefor;

If returned, the original deposition was delivered to ____________________, Custodial Attorney;

That $______ is the deposition officer's charges to the Plaintiffs for preparing the original deposition transcript and any copies of exhibits;

That the deposition was delivered in accordance with Rule 203.3, and that a copy of this certificate was served on all parties shown herein on and filed with the Clerk.

Certified to by me this ____ day of __________, 2002.

IRENE VALDES, TEXAS CSR 1939
Expiration Date: 12/31/2002
Compex Legal Services
7155 Old Katy Road, Suite 200
Houston, Texas 77024
713-861-3900

A

KG COH004218

KG COH004220

KG COH004222

KG COH004224

KG COH004227

KG COH004228

S

KG COH004231

KG COH004234

Investigator's Comments
Southern Pacific Transportation
Houston, Harris County

116-840-1
7/11/78
Page 2

On Tuesday, July 11, 1978, Paul Henry and I visited Southern Pacific Wood Preservation Works (SP) to discuss (1) their vinyl chloride emissions, and (2) whether a permit was required for the change of feeds in their reactor vessels.

We met with David LaFargue from the City of Houston and three SP employees: Frank Bozeman, Supt. Water and Fuel Supply; M.A. Lane, Plant Supt.; and R.S. Kilpatrick, Environmental Engineer.

SP had contracted with Dominguez and Sapp Enterprise, a minority service company, to purchase styrene tar to use as a diluent for their creosote process. The styrene tar obtained from Dominguez and Sapp's open tar pits has been reported to be contaminated with vinyl chloride. SP has utilized this styrene tar since January of 1978.

SP presented us with a report of an ambient air survey for vinyl chloride monomer, conducted by Southwest Research Institute (SRI). SRI determined a property line value for vinyl chloride at 0.016 PPM, averaged over 8 hrs. TACB's sampling results showed 0.4 PPM vinyl chloride at the SP property line, averaged over 15 minutes.

Since the EPA and OSHA limits for vinyl chloride is 1.0 PPM, SP felt that their levels of vinyl chloride were safe. They asked if the sampling results would be acceptable to the TACB. Paul Henry explained that the Texas Clean Air Act does not specifically regulate the monomer. He proceeded to explain Rule 131.08.00.001 of Regulation VI, which requires a person to apply for a permit upon modification of an existing facility which may emit air contaminants to the air.

In this case SP was violating Rule 131.08.00.001, due to their vinyl chloride emissions upon utilization of the Dominguez product. Henry stated that he would mail a notice of this violation to SP.

At the conclusion of our meeting the three SP employees decided to cease using Dominguez and Sapp's styrene tar; thus, eliminating the vinyl chloride problem.

The SP employees gave us a tour of their creosote operation at the end of our discussion.

My purpose in visiting SP was to familiarize myself with their creosote process, as I will later report the toxicological impact of the materials handled at SP.

Cindy Blackburn
Cindy Blackburn

KG COH004235

P-00491

47

KG COH004236

SIP

Southern Pacific Wood Preservation Works
4910 Liberty Rd
Houston, Texas

Account #HG-0672-H

September 11, 1981

Clifford F. Goff

A review of the files showed two notices issued to this company for 1981. Both were Rule 101.4 - Nuisance by Odor.

Southern Pacific was represented by M.A. Lane, Plant Superintendent and the City of Houston Bureau of Air Quality Control by Clifford F. Goff, Environmental Technician I.

This company treats approximately 4,400 railroad ties a day and operates 24 hours, 7 days a week. The ties are cut in lengths of 8' and 9'. Southern Pacific handles approximately 400,000 gallons of creosote and oil a month. Solution consists of 30% creosote and 70% naptha oil to treat the wood. Each treatment takes approximately 24 hours. The solution is pumped into a sump by truck and then into holding tanks. It is then introduced into the cylinders to treat the wood. Each of the five (5) cyclinders can hold between 900-1300 ties. Four cylinders are 8' x 145' and one is 8' x 85'. The oil and creosote are s sprayed on the ties and pressured into the wood. Two steam generators produce 250 lbs/in^2. Each steam generator is independent of the other. The sap from the ties is vaporized and then transferred to a tank truck after it is condensed. It is then transported to waste wells. The sap is a dilute acetic acid. The ties are pulled out of the cylinders at 190°F to complete the process. The ties are stored on the property until shipment to other Southern Pacific depots.

Mr. Lane stated the major odor source would be cylinder doors opening after each treatment. During the visit, this was confirmed as there is a very strong creosote odor present when the doors are opened. The odor remained in the work area only. Depending on wind direction, there will be a light odor detected on Liberty Rd. adjacent the most immediate neighborhood. Mr. Lane said any odor complaints from the neighborhood are in the spring when the people open their windows.

Rules and Regulations reviewed.

General Rules

101.4	-	nuisance by odor - explained
101.6	-	notification of upset - explained

Regulation I

111.1	-	no outdoor burning
111.11	-	no incinerator
111.21	-	visible emissions from stationary flue - N/A - only steam
111.23	-	excessive emissions from buildings or enclosed facility - only steam
111.42	-	unpaved roadway

Regulation II	-	Sulpher Compounds
Regulation III - V	-	Not Applicable
Regulation VI	-	Permits
Regulation VII	-	Nitrogen Compound Steam Generating Units - 33,000 lbs/hr
Regulation VIII	-	Episodes

Based upon this inspection and with no complaints being recieved by this office since March 1981, this company is judged to be in compliance with the Texas Clean Air Act.

Clifford F. Goff

Clifford F. Goff
Tech I - District 4
Enforcement Section
Bureau of Air Quality Control

CFG:jr

48

KG COH004239

ISW # 31547

HW #_ _ _ _ _ - _ _ _

REPORTS

PRE - 1985

1

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8

4

BEGINNING OF REPORT

Rollins Environmental Services (FS) Inc.

FINAL REPORT ON CLOSURE PLAN

OF RCRA FACILITY #31547

Prepared For: Southern Pacific Transportation Company
By: Rollins Environmental Services (FS) Inc.
April, 1984

34523-1003

TABLE OF CONTENTS

I. INTRODUCTION

In March of 1981 RES (FS) submitted a proposal to Southern Pacific for the excavation, transportation and disposal of creosote waste in a surface impoundment at 4910 Liberty Road. The pricing was revised January, 1982. In November, 1983 a formal contract was signed to cover specifics concerning the excavation, transportation and disposal of the creosote waste.

RES (FS) completed a formal Closure Plan for the surface impoundment (RCRA Facility #31547) that was submitted by Southern Pacific to the Texas Department of Water Resources. The Closure Plan was officially approved by letter dated February 28, 1984.

Southern Pacific had a public notice announcing the closure published in the Houston Chronicle on January 13, 1984. On-site operations to carry-out the closure plan began on March 15, 1984. The on-site work was inspected and certified by an independent registered engineer. There were four major phases to the closure on-site work:

1. Waste Removal
2. Sampling Program
3. Clay Backfill
4. Groundwater Monitoring Well Installation

Pertinent documents and letters are included as Appendix A. A Project Calendar of on-site work is provided on the following page. Appendix B is a series of photographs pertaining to project phases.

3415721050035

PROJECT CALENDAR OF ON-SITE WORK

DATES

March 15-16	Dewater Surface of Waste Impoundment
17	Heavy Equipment Move-On
18	Dewater Remaining Water On Top of Waste
19	6 Loads of Waste to Landfill
20	36 Loads of Waste to Landfill
21	41 Loads of Waste to Landfill
22	43 Loads of Waste to Landfill
23	2 Loads of Waste to Landfill
24	Dewatering
25	Dewatering
26	22 Loads of Waste to Landfill
27	53 Loads of Waste to Landfill, East Bank Clay Fill 32
28	17 Loads of Waste to Landfill, East Bank Clay Fill 184
29	Samples procurred
30-31	Sample Analysis
April 1	Sample Analysis
2	Rainout, All area clean except for Section C-1
3	Dewater
4	Dewater, Sample Procurred for Section C-1, Several Yards of Waste to Landfill
5-6	Dewater

7	1826 Truck Yards of Clayfill Emplaced
8	242 Truck Yards of Clayfill Emplaced
9	2622 Truck Yards of Clayfill Emplaced
10	1402 Truck Yards of Clayfill Emplaced
11	1230 Truck Yards of Clayfill Emplaced
12	Final Dressing
17-18	Well Installation

3457210508

II. WASTE REMOVAL PHASE

Vacuum trucks were used to pump water off the surface of the impoundment. The water was then transported to a local deepwell. Dewatering continued from March 15 through March 18.

On Monday, March 19, the first loads of waste were transported to the Rollins Deer Park Landfill. All trucks were lined with visquine, tarped and placarded. The waste was loaded with a large backhoe. A small bulldozer was used to push material to the backhoe. From March 19 through March 28, a total of 220 loads of waste were transported to landfill.

Fourteen samples of waste were taken to determine an average weight per cubic yard. The weight per cubic yard varied from a low of 1345 pounds to a high of 2746 pounds. The average weight of 2177 pounds per cubic yard was agreed upon as representative of the waste.

The total waste poundage taken to landfill as of March 28, was 10,962,642 pounds moved by 220 loads. This amounted to 5,036 cubic yards.

The basic challenge during the waste removal phase was water control. Overnight approximately four to five inches of water would build up in the bottom of the impoundment. This waste had to be pumped off by vacuum trucks each morning. During the latter stages of the waste removal the dozer could not operate on the wet bottom soil and a small backhoe had to be placed in the impoundment to move waste to the larger backhoe used for truck loading.

III. SAMPLING PHASE

On March 29, six samples were obtained according to the random sampling program outlined in the formal Closure Plan (see Appendix A). Henry Koster, Field Supervisor RES (FS), Dan Bridge, Project Manager RES (FS), and Karen Freibus of the T.D.W.R. were all present during the sample procurement. Samples were immediately taken to M.B.A. Labs for analysis. The results of the sample analyses are in Appendix A.

Concentrations of the six samples were compared against concentrations of two background samples obtained from clay about six feet deep 10 feet north of the north side of the impoundment area. All of the samples contained lower concentrations than background, except for the sample taken from area C-1 of the sample grid. The sample grid is on the last page of the Closure Plan in Appendix A. Sample analyses are also provided in Appendix A.

On April 4, 63,820 pounds of waste (29.32 cubic yards) were removed from Section C-1 and taken to landfill. A composite sample of the section was procurred and taken to M.B.A. Labs for analysis. On Friday, April 6, the lab analysis confirmed that the concentrations of contaminants were lower than those of the background samples. The analytical results are attached in Appendix A. At 4 p.m., Friday, April 6, Mr. Tom Kearns, Head of the Solid Waste Department of the T.D.W.R., District 7 Office, confirmed that the waste had been removed and gave approval to begin the clay backfill phase.

Originally, according to the approved Closure Plan, the samples were to be analyzed for conentrations of contaminants associated with the waste K001. These contaminants were principally phenols. However, the actual sample analyses revealed poly-nuclear aromatics (PNA's) to be the primary contaminants in the waste. All samples were analyzed for both phenols and PNA's and both families of contaminants were used as criteria for determining acceptable limits.

IV. CLAY BACKFILL PHASE

Red Beaumont Clay from the local area was unloaded and compacted into the impoundment from April 7 through April 11. A total of 7,538 truck yards were brought to the project site. A compaction factor of 40% was used to estimate a total of 4,523 cubic yards of clay compacted inplace.

The completed clay surface was graded to provide water runoff. A drainage trench, lined with clay, was excavated along the railroad tracks running parallel to the east side of the backfilled area.

V. GROUNDWATER MONITORING WELL INSTALLATION

Four groundwater monitoring wells were installed -- One upstream on the south side of the backfill area and three downstream on the north side of the backfilled area. The exact locations are depicted on the last page of the Closure Plan in Appendix A.

A dry soil core revealed clay down to approximately 13 feet on the north side of the backfilled area, followed by 3 feet of a clayey sand and then clay beyond 16 feet. Drilling on the south side of the backfilled area revealed the same strata; however, the 3 feet thick clayey sand was found at 15 feet. PVC casing was installed with bottom screen extending 10' from the bottom clay strata, up through the clayey sand. All four wells were producing groundwater from the clayey sand strata. All wells were cased with sand surrounding the screen, then bentonite, and then grouted to the ground surface. All wells were developed and metal casing was installed to enable the use of pad locks. A concrete mound was built around each well to prevent surface water from ponding around the well pipe. A complete documentation of well borings and installation is included in Appendix A.

VI. SUMMARY

On-site operations for carrying out the Closure Plan began with the dewatering of surface water on March 15 and ended with monitoring well installation on April 17. The remaining work will be monitoring well sampling and analysis .

A total of 5064.98 cubic yards (11,026,462 pounds) of waste were removed, transported and disposed.

A random sampling program was carried out and sample results were compared to two background samples. The one section where sample results were higher than background was scraped and resampled. The analysis of the composite sample showed that concentrations were lower than background levels.

A total of 7,538 truck yards of clay were backfilled and compacted to total 4,523 cubic yards implace (based on a compaction factor of 40%).

Four groundwater monitoring wells, one upstream and three downstream, were installed.

An official "Closure of Facilities" letter signed by an independent engineer is included in Appendix A. Appendix B includes a series of photographs pertaining to the project phases.

APPENDIX A

PERTINENT DOCUMENTS IN

CHRONOLOGICAL ORDER

1. Revised pricing and original proposal.

2. Contract between Rollins and Southern Pacific

3. Closure Plan

4. Executive Director (T.D.W.R.) Approval of Closure Plan

5. Public Notice of final facility closure.

6. Bulk Density Values

7. MBA Laboratories Analyses

8. Letter of Certification of Closure by independent Professional Engineer.

1. Proposal and Updates

3453210018

Rollins Environmental Services (TX) Inc.
P. O. Box ... Texas 77...

Rollins

June 14, 1983

Mr. G. F. (Frank) Bozeman
Senior Manager, E & M
Southern Pacific Railroad
Engineering Department
P. O. Box 1314
Houston, TX 77001

Dear Mr. Bozeman:

Our latest correspondence, dated January 15, 1982, is attached. In that correspondence I quoted a final 'turn-key" price of $48.55 per cubic yard for excavation, transportation and disposal of approximately 1800 cubic yards of creosote sludge.

Clay backfill was quoted at $10.00 per yard.

These prices are still in effect. The contents of the attached proposal will remain the same except for the changes in pricing indicated in this letter. I might add that we do plan to use polyethylene liners in the dump trucks to insure against leakage of wetter materials. The truck beds will possess chained tailgates as a security measure against waste spillage on the highway. The contents of the original proposal dated March 23, 1981, will remain the same except for the price change indicated in this letter.

Please contact me if you desire further information.

Sincerely,

Dan Bridge

Dan Bridge, Ph.D.
Field Services Group

DB/vs
Attachment

Rollins Environmental Services (TX) Inc.
P. O. Box 609 Deer Park, Texas 77536 (713) 479-6001

Rollins

January 15, 1982

Mr. G. F. (Frank) Bozeman
Senior Manager, E & M
Southern Pacific Railroad
Engineering Department
P. O. Box 1314
Houston, Texas 77001

Dear Mr. Bozeman:

In March 1981 I sent the attached proposal for clean-out and backfill of the creosote sludge lagoon at the Liberty Plant in Houston.

Several developments have occurred since March 1981, that have allowed us to reduce our pricing in excavation and transportation. Our corporate headquarters has given us considerable leeway in our pricing policy and we find that excavation rental equipment and trucking have become more competitive, reducing our costs in these areas as well.

Our new price per yard is $48.55, which is $7.02 less per yard than the March 1981 price of $55.57 per yard. Price breakdown is below:

Excavation	$14,290
Transportation	$7,700
Disposal	$64,663
TOTAL	$86,653

or $48.55 per cubic yard.

Clay backfill remains at $10.00 per yard and it is our understanding that Empak is currently deep-welling the standing water.

The contents of the attached proposal will remain the same, except for the changes in pricing indicated in this letter.

We look forward to visiting with Bob Kilpatrick and yourself. If you require any further information, please call.

Sincerely,

ROLLINS ENVIRONMENTAL SERVICES (TX) INC.

Dan Bridge

Dan Bridge, Ph. D.
Field Services Group

DB:csw

Rollins Environmental Services (TX) Inc.
P O Box 609, Deer Park, Texas 77536 (713) 479 6001

Rollins

PROJECT PROPOSAL

LIBERTY PLANT, HOUSTON

Prepared For

Southern Pacific Transportation Company
1 Market Plaza
San Francisco, CA. 94105

By

ROLLINS ENVIRONMENTAL SERVICES

March 23, 1981

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3 4 5 7 2 1 0 5 0 2 5

Attention: Mr. K. S. Kilpatrick - Room 1100
Southern Pacific Transportation Company
1 Market Plaza
San Francisco, CA. 94105

Dear Mr. Kilpatrick:

This proposal contains strategies and pricing schedules for excavation, transport, and disposal of waste sludge from a waste storage pond at the 4910 Liberty Road site. Pricing is also included for backfilling the excavated area with clay material. The proposal rational is founded on data gathered by our sampling team and results of independent laboratory chemical analysis. A diagram of the waste pond and the independent laboratory analysis are attached. For internal record keeping purposes at Rollins, the waste sludge will be designated as #HO-6242.

I. Site and Material Description

The clay-lined sludge pond is four-sided: 106' x 180' x 72' x 177'. The sludge is approximately 3' thick, with a volume of 1562 cubic yards. The levees or berms account for an additional 223 cubic yards. Total waste volume is 1785 cubic yards. The sludge bulk density is 2392 pounds per square yard. The solids content is 71%.

Chemical analyses of samples of water and sludge taken from the pond show relatively high concentrations of phenols (11 p.p.m. and 120 p.p.m., respectively) and other chemicals. Copies of the analyses are attached.

II. Plan of Action

Initially, a wide-track dozer will be used to flatten the berms to facilitate access for a backhoe. The dozer and backhoe will work in conjunction to provide surface drainage trenches for the accumulation and removal of surface water. The water will be pumped into vacuum trucks and deep-welled at EMPAK, Inc. We anticipate 2 to 3 truckloads of waste liquid, or roughly 7,000 to 10,000 gallons.

After the surface water has been removed, the backhoe will load the sludge directly into tandem dump trucks. The sludge will be transported to Rollins Chemically Secure Landfill in Deer Park. The waste will be solidified with flue dust prior to landfilling. Approximately 128 truck loads will be transported.

After the sludge and contaminated berm material have been removed, the pond will be backfilled with clay material.

The entire project will require a minimum of 3 days.

III. Access Problems and Costs

No access problem is anticipated concerning the site ground conditions. However, it is requested that the railroad tracks near the waste pond be clear of rail cars so as not to impede the movement of heavy equipment. If road stabilization did become necessary due to heavy rains, flue dust can be used at a cost of $3.00 per running foot 20 feet wide.

IV. General Considerations

A Rollins' supervisor will be continuously at the job site. Rollins' employees will perform excavation. Rollins may use subcontractors for transport. Rollins assumes responsibility for its subcontractors and for all operations contractually under its control.

Rollins indemnifies and holds Southern Pacific harmless from liability or claims arising out of the operations caused by Rollins or its subcontractors.

Rollins plans to work a 10 hour day, seven day week unless otherwise directed by Southern Pacific. Certain circumstances, beyond Rollins control, such as mechanical failure, transport traffic problems and excessive rainfall may necessitate a longer period for completion

V. Customer Provisions

A. It is requested that Southern Pacific provide a representative available during working hours with authority to make operation decisions.

B. It is requested that Southern Pacific provide access so as not to impede normal plant traffic and maintain freedom from unnecessary protocol.

C. It is requested that Southern Pacific notify Rollin of any hidden pipes, cables, or obstructions.

VI. Paperwork

Rollins will provide copies of Bills of Lading, weigh tickets, and summary sheets. The summary sheet will list information pertinent to each truck load--a sample copy is attached. Rollins will also provide the Texas Department of Water Resources (T.D.W.R.) Manifests.

VII. Pricing Schedule

Prices below are subject to change within 90 days of this proposal. Pricing will be done on a volume basis (i.e., per cubic yard, per gallon). Material transported in bulk will be weighed and net weights will be divided by bulk densities (pounds per cubic yard) to convert to cubic yards.

Waste Pond - - Sludge and Berm Material

	Price/Yd	Estimated Volume (YD^3)	Estimated Total Price
Excavation	$ 14.32	1785	$ 25,563
Transportation	5.02	1785	8,960
Disposal	36.23	1785	64,663
TOTAL	$ 55.57	1785	$ 99,186

Waste Pond - - Liquid Waste

	Price/Gal	Estimated Volume (Gal)	Estimated Total Price
Excavation	-	10,300	-
Transportation	$0.0277	10,300	$ 286
Disposal	0.1428	10,300	1,471
TOTAL	$0.17	10,300	$ 1,757

Waste Pond - - Clay Fill

	Price/Yd	Estimated Volume (YD^3)	Estimated Total Price
Clay Delivered, Placed, and Compacted	$ 10.00	1,562	$ 15,620

We appreciate the opportunity to quote this project. If you need clarification on any matter above, please contact me.

Sincerely,

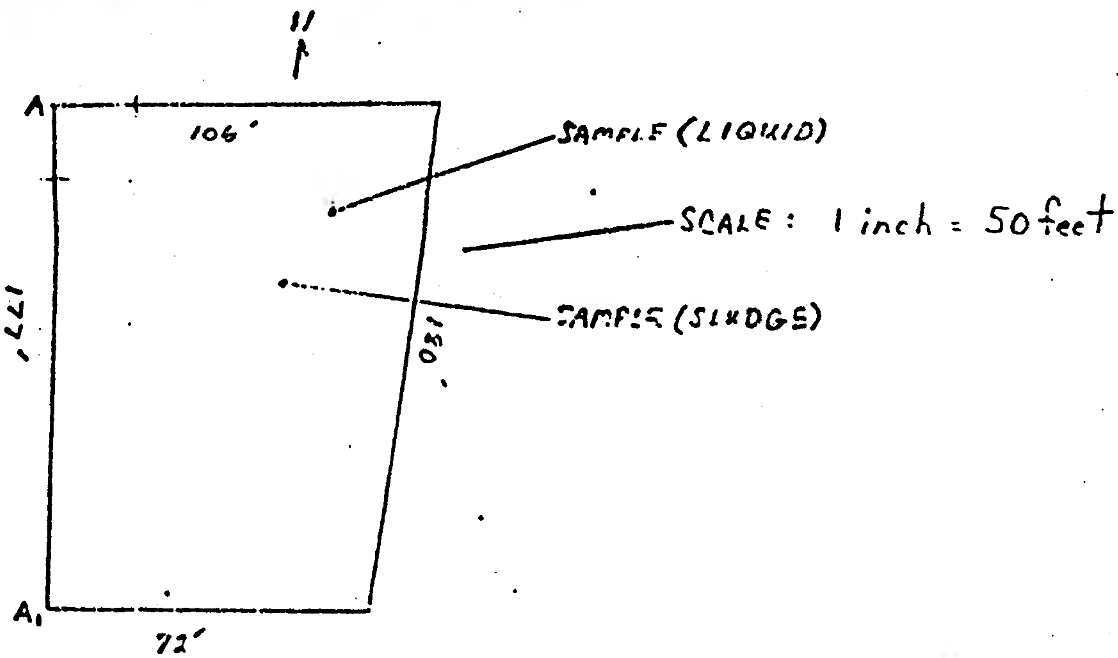
ROLLINS ENVIRONMENTAL SERVICES (TX) INC.

Daniel W. Bridge

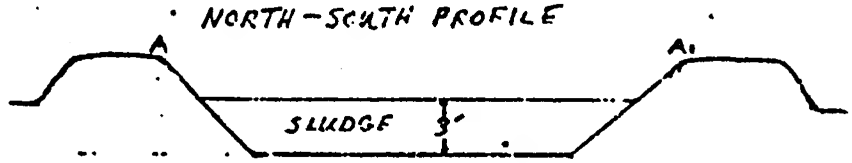
Daniel W. Bridge
Project Manager
Field Service Group

DWB/pag

Attachments



NORTH-SOUTH PROFILE



VERTICAL SCALE: 1 inch = 10 feet

SLUDGE VOLUME : 1562 cubic yards

BERM VOLUME : 223 cubic yards

Exhibit A

COMPANY ____________ LOCATION ____________ DATE ____________

Date	Truck No.	B/L No.	TDWR No.	Gross wt.	Light wt.	Net wt.	Bulk Dens.	Cubic Yards

NUS CORPORATION

ANALYTICAL SERVICES LABORATORY
SOUTH CENTRAL OPERATIONS
900 GEMINI AVENUE • HOUSTON TEXAS 77058
713 488 1810

Rollins Environmental Services, Inc.
P.O. Box 609
Deer Park, TX 77536

Attn: E. Hillier

WATER ANALYSIS

Q

Client No 3-3-81
Date Sampled 3-3-81
Date Received 4-3-81
Date Reported

NUS Sample No 21030030

Sample Source Liberty St. Water

Client Sample No P.O.# 81-2208-I

Test Results reported in mg/liter unless otherwise noted

DETERMINATION*	DATE	NUS	
Acidity Free ($CaCO_3$)			
Acidity Total ($CaCO_3$)			
Alkalinity M.O. ($CaCO_3$)			
Alkalinity Pht. ($CaCO_3$)			
Aluminum (Al)			
Ammonia ( )			
Antimony (Sb)			
Arsenic (As)		0.03	
Barium (Ba)			
Beryllium (Be)			
Bicarbonate (HCO_3)			
Bio. Oxygen Demand (O_2)			
Boron (B)			
Cadmium (Cd)			
Calcium (Ca)			
Carbon Inorganic (C)			
Carbon Organic (C)		1100	
Carbon Total (C)			
Carbonate (CO_3)			
Chem. Oxygen Dem. (O_2)			
Chloride (Cl)			
Chromate (CrO_4)			
Chromium (Cr^{+6})			
Chromium (Cr^{+3})			
Chromium Total (Cr)		0.10	
Color (APHA)			
Copper (Cu)		0.08	
Cyanide Free (CN)			
Cyanide Total (CN)		<0.01	
Fluoride (F)			
Hardness ($CaCO_3$)			
Hydroxide (OH)			
Iron ( ) (Fe)			
Iron Total (Fe)			
Lead (Pb)			
Magnesium (Mg)			
Manganese (Mn)			

DETERMINATION*	DATE	NUS	
Mercury (Hg), µg/l		<0.2	
Molybdenum (Mo)			
Nickel (Ni)			
Nitrate ( )			
Nitrite ( )			
Nitrogen, Kjeldahl (N)			
Odor, Method			
pH			
Phenolic Cpds (Phenol)		11	
Phosphorus Ortho ( )			
Phosphorus Total ( )			
Potassium (K)			
Selenium (Se)			
Silica Soluble ( )			
Silica Total ( )			
Silver (Ag)			
Sodium (Na)			
Solids Dissolved			
Solids Suspended			
Solids Total			
Solids Non-Settleable			
Solids Settleable			
Solids Volatile			
Solvent Extract (Oil) Method.		68	
Sp Cond, 25°C µmhos			
Sulfate ( )			
Sulfide (S)			
Surfactants (MBAS)			
Thallium (Tl)			
Tin (Sn)			
Turbidity (NTU)			
Vanadium (V)			
Zinc (Zn)			

Special Instructions (Methods, Etc.)

Project Manager [illegible signature]

NUS CORPORATION

ANALYTICAL SERVICES LABORATORY
SOUTH CENTRAL OPERATIONS
900 GEMINI AVENUE • HOUSTON TEXAS 77058
713-488 1610

Rollins Environmental Services, Inc.
P.O. Box 609
Deer Park, TX 77536

Attn: E. Hillier

Client No. 0
Date Sampled 3-3-81
Date Received 3-3-81
Date Reported 4-3-81

Liberty St. Water P.O.# 81-2208-I

NUS Sample No.	
21030030	Total PCB <1 ug/l

Special Instructions

Test results reported in mg/liter unless otherwise noted

KG COH004271

NUS CORPORATION

ANALYTICAL SERVICES LABORATORY
SOUTH CENTRAL OPERATIONS
900 GEMINI AVENUE • HOUSTON TEXAS 77058
713 488 1810

Rollins Environmental Services, Inc.
P.O. Box 609
Deer Park, TX 77536

Attn: E. Hillier

WATER ANALYSIS

Client No Q
Date Sampled 3-3-81
Date Received 3-3-81
Date Reported 4-3-81

Sample Source Liberty St. Sludge
NUS Sample No. 21030031
Client Sample No.

Test Results reported in mg/liter unless otherwise noted

DETERMINATION*	DATE	NUS	
Acidity Free ($CaCO_3$)			
Acidity Total ($CaCO_3$)			
Alkalinity M.O. ($CaCO_3$)			
Alkalinity Pht. ($CaCO_3$)			
Aluminum (Al)			
Ammonia ( )			
Antimony (Sb)			
Arsenic (As)		<2 mg/kg	
Barium (Ba)			
Beryllium (Be)			
Bicarbonate (HCO_3)			
Bio Oxygen Demand (O_2)			
Boron (B)			
Cadmium (Cd)			
Calcium (Ca)			
Carbon Inorganic (C)			
Carbon Organic (C)		100,000 mg/kg	
Carbon Total (C)			
Carbonate (CO_3)			
Chem. Oxygen Dem. (O_2)			
Chloride (Cl)			
Chromate (CrO_4)			
Chromium (Cr^{+6})			
Chromium (Cr+3)			
Chromium Total (Cr)		12 mg/kg	
Color (APHA)			
Copper (Cu)		16 mg/kg	
Cyanide Free (CN)			
Cyanide Total (CN)		<1 mg/kg	
Fluoride (F)			
Hardness ($CaCO_3$)			
Hydroxide (OH)			
Iron ( ) (Fe)			
Iron Total (Fe)			
Lead (Pb)			
Magnesium (Mg)			
Manganese (Mn)			

DETERMINATION*	DATE	NUS	
Mercury (Hg) ~~XXX~~ mg/kg		<0.2	
Molybdenum (Mo)			
Nickel (Ni)			
Nitrate ( )			
Nitrite ( )			
Nitrogen, Kjeldahl (N)			
Odor, Method			
pH			
Phenolic Cpds. (Phenol)		120 mg/kg	
Phosphorus Ortho ( )			
Phosphorus Total ( )			
Potassium (K)			
Selenium (Se)			
Silica Soluble ( )			
Silica Total ( )			
Silver (Ag)			
Sodium (Na)			
Solids Dissolved			
Solids Suspended			
Solids Total			
Solids Non-Settleable			
Solids Settleable			
Solids Volatile			
Solvent Extract (Oil) Method:		43,000 mg/kg	
Sp. Cond., 25°C μmhos			
Sulfate ( )			
Sulfide (S)			
Surfactants (MBAS)			
Thallium (Tl)			
Tin (Sn)			
Turbidity (NTU)			
Vanadium (V)			
Zinc (Zn)			

Special Instructions (Methods, Etc.) Analysis performed on an "as received" sample.

Jerry Bright

KG COH004272

NUS CORPORATION

ANALYTICAL SERVICES LABORATORY
SOUTH CENTRAL OPERATIONS
900 GEMINI AVENUE • HOUSTON, TEXAS 77058
713 488 1810

Rollins Environmental Services, Inc.
P.O. Box 609
Deer Park, TX 77536

Attn: E Hillier

Client No. Q
Date Sampled 3-3-81
Date Received 3-3-81
Date Reported 4-3-81

Liberty St. Sludge P.O.# 81-2208-I

NUS Sample No.	
21030031	Total PCB (Soxhlet) <1 mg/kg

Special Instructions

Jerry Bright/g

Test results reported in mg/liter unless otherwise noted

KG COH004273

2. Contract

3 4 5 1 2 1 0 5 0 3 4

Southern Pacific
Transportation Company

Southern Pacific Building • One Market Plaza • San Francisco, California 94105

H. B. BERKSHIRE
ASST. VICE PRESIDENT-MAINTENANCE OF WAY AND ENGINEERING

M. J. KARLOVIC
ENGINEER OF STANDARDS
J. F. LYNCH
ENGINEER, DESIGN AND CONSTRUCTION

G. L. MURDOCK
ENGINEER, MAINTENANCE OF WAY
G. D. WILSON
ENGINEER OF SIGNALS

November 30, 1983

IN REPLY PLEASE REFER TO

0812/071-02(HO)-C

Rollins Environmental Services, Inc.
P. O. Box 609
Deer Park, Texas 77536

Gentlemen:

Pursuant to our letter of August 26, 1983, attached for your records is a fully executed counterpart of our agreement with you, dated November 29, 1983, covering the following work:

> Remove hazardous waste, clean up clay lining in pond and backfill with clean material at the Wood Preserving Works Hazardous Waste Storage, Houston, Texas.

Please submit statement of charges on this project, making reference to Billing Order No. H800-94-48121, GMO 65769 directly to:

> Mr. L. W. Pepple, Engineer,
> Environmental & Utilities
> Southern Pacific Transportation Company
> One Market Plaza
> Southern Pacific Building - Room 1007
> San Francisco, California 94105

Very truly yours,

JFLynch

Attach.

3 4 5 7 2 1 0 5 0 3 5

NOV 7 1983

3 4 5 7 2 1-0 5-0 3 6

S 7300
SHEET 1 of 4

Approved as to form by General Counsel.
January 1979

This Agreement, made and entered into this 29th day of November, 1983 by and between SOUTHERN PACIFIC TRANSPORTATION COMPANY, hereinafter called "RAILROAD," and ROLLINS ENVIRONMENTAL SERVICES, INC., P. O. Box 609 Deer Park, Texas 77536,

hereinafter called "CONTRACTOR,"

Witnesseth:

(1) WORK TO BE PERFORMED:

CONTRACTOR agrees to specifically perform at or near Houston, County of Harris, State of Texas, the work of removing hazardous waste, cleaning up clay lining in pond and back-filling with clean material at the Wood Preserving Works Hazardous Waste Storage,

and as provided for herein, in strict conformance with the plans and/or specifications hereto attached and made a part of this agreement. (Exhibit "A")

CONTRACTOR, in performing the work provided for in this agreement, shall be an independent contractor, it being specifically agreed that CONTRACTOR, any subcontractor, or the employes of the CONTRACTOR or subcontractor, in performing said work shall not be in any way employes or agents of the RAILROAD.

(2) MATERIALS TO BE FURNISHED BY CONTRACTOR:

CONTRACTOR agrees to furnish at the location where said work is to be performed, with no extra charge, all labor, tools, implements and materials necessary for the complete performance of this agreement, unless otherwise provided for herein.

(3) PERMITS, MUNICIPAL FEES AND DEPOSITS:

CONTRACTOR agrees to secure all necessary permits in connection with the performance of said work and to pay all engineer's, municipal and other fees in connection therewith, and agrees to make any and all cash or other deposits, and furnish at its expense all bonds required by law or required by any lawful body having the right to make demand therefor.

(4) PLANS AND SPECIFICATIONS:

CONTRACTOR agrees to fully perform this agreement to the entire satisfaction of RAILROAD and in strict conformance with the plans and/or specifications attached hereto, and also in conformance with any plans and/or specifications in effect at the date of this agreement, required by any lawful body having the right to demand that said work should be performed in the manner specified by such body.

(5) COMMENCEMENT AND COMPLETION OF WORK:

CONTRACTOR agrees to begin said work ~~within~~ upon execution of this ~~days after the date of this~~ agreement and to proceed diligently with said work to completion and fully complete same two (2) weeks ~~days~~ from the date work is commenced. Time is of the essence of this agreement.

(6) INVESTIGATION OF FACTS BY CONTRACTOR:

It is distinctly understood and declared by the CONTRACTOR that this agreement is made for the consideration herein named and that the CONTRACTOR has, by careful examination, satisfied CONTRACTOR as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this agreement. No verbal agreement or conversation with any officer, agent or employe of the RAILROAD, either before or after the execution of this agreement, shall affect or modify any of the terms or obligations herein contained.

(7) DELAYS AND EXTENSIONS:

The time during which CONTRACTOR is delayed in said work by the acts of omission or commission of RAILROAD, or the employes or agents of RAILROAD, or by the acts of God or the elements, which CONTRACTOR ... reasonably foresee and provide against, or other causes beyond CONTRACTOR'S

ROAD, and ROLLINS ENVIRONMENTAL SERVICES, INC., ...
Deer Park, Texas 77536,

hereinafter called "CONTRACTOR,"

Witnesseth:

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and as provided for herein, in strict conformance with the plans and/or specifications hereto attached and made a part of this agreement. (Exhibit "A")

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(7) DELAYS AND EXTENSIONS:

The time during which CONTRACTOR is delayed in said work by the acts of omission or commission of RAILROAD, or the employes or agents of RAILROAD, or by the acts of God or the elements, which CONTRACTOR could not reasonably foresee and provide against, or other causes beyond CONTRACTOR'S control including strikes, boycotts, or like obstructive action by employes or labor organizations, or lockouts or other defensive action by other employers, whether general or individual, or by organizations of other employes, shall be added to the aforesaid time of completion of said work.

CONTRACTOR shall not be entitled to and hereby waives any and all damages which it may suffer by reason of RAILROAD hindering or delaying CONTRACTOR in the progress of said work, or any portion thereof or from any cause whatsoever.

(8) EXTRA WORK:

CONTRACTOR shall not be entitled to any payment for extra work performed in connection with the work provided for herein, unless such work shall have been previously authorized in writing by RAILROAD.

(9) DEVIATION FROM PLANS AND SPECIFICATIONS:

CONTRACTOR expressly agrees that RAILROAD may make any alterations RAILROAD deems proper by adding to, omitting or deviating from the aforesaid plans and/or specifications, and in all such cases RAILROAD and CONTRACTOR shall value or appraise such alterations in a fair and reasonable manner, and add to or deduct from the amount herein agreed to be paid to CONTRACTOR at pro rata rates, but in no case shall such alteration be made unless notice in writing is given to CONTRACTOR by RAILROAD.

(10) ADDITIONAL DRAWINGS:

RAILROAD will furnish to CONTRACTOR such further drawings and explanations as may be necessary to illustrate the work to be done, and CONTRACTOR agrees to conform to such drawings and explanations.

(11) INSPECTION:

CONTRACTOR agrees that RAILROAD, or any person appointed by RAILROAD, will be permitted to visit and inspect said work, or any part thereof, at all times and places during the progress of the work, and CONTRACTOR agrees to provide sufficient, safe and proper facilities for such inspection.

(12) PERFORMANCE OF WORK:

CONTRACTOR agrees to proceed with said work, and each and every part and detail thereof, in a prompt and diligent manner, and agrees to do the several parts thereof at such time and in such order as RAILROAD may designate, and agrees to finish such work in strict conformance to said plans and/or specifications, or any modifications or amplifications thereof made by RAILROAD.

(13) CONDEMNATION OF WORK:

CONTRACTOR agrees, within twenty-four (24) hours after receiving written notice from RAILROAD, to proceed to remove from the above mentioned premises all materials condemned by RAILROAD, whether worked or unworked, and to remove all portions of said work which RAILROAD shall, by like written notice, condemn as unsound or defective, or as in any way failing to conform with said plans and/or specifications, or any modifications or amplifications thereof made by RAILROAD.

(14) SUPERINTENDENCE:

CONTRACTOR agrees to keep a competent man in the immediate vicinity of the premises above described at all times during working hours with whom RAILROAD may communicate, and to supervise said work.

(15) TAKING OVER OR STOPPING OF WORK:

Should CONTRACTOR at any time during the progress of the work fail, or refuse or neglect to supply a sufficiency of material, tools, labor or properly skilled workmen to complete same with reasonable diligence and dispatch, except when due to circumstances which CONTRACTOR cannot be reasonably expected to control, and should such failure, neglect or refusal continue for five (5) days after written notice shall have been served by RAILROAD on CONTRACTOR, RAILROAD is hereby given the right to take over the said work and complete it. The cost to RAILROAD of doing such work shall be deducted from any moneys due CONTRACTOR under this agreement and if such cost exceeds any such moneys due CONTRACTOR, CONTRACTOR agrees to reimburse RAILROAD for all costs in excess of any moneys due CONTRACTOR hereunder.

RAILROAD hereby reserves the right to stop at any time the said work, it being understood, however, that in any such event, except as provided in the next preceding paragraph of this Section 15, RAILROAD shall pay CONTRACTOR for all work done in conformity with said plans and/or specifications plus a [illegible] such event sustain through money expended or [illegible] inhibition to complete the work contemplated. In the event of such stoppage of work or termination of agreement the consideration provided in this paragraph shall be paid days after such stoppage of work or termination of agreement, except where work is performed in the State of California or Nevada. Where work is performed in the State of California or Nevada, said consideration shall be paid [illegible] has been recorded in the Office of the County Recorder

(9) DEVIATION FROM PLANS AND SPECIFICATIONS

CONTRACTOR expressly agrees that RAILROAD may make any alterations RAILROAD deems proper by adding to, omitting or deviating from the aforesaid plans and/or specifications, and in all such cases RAILROAD and CONTRACTOR shall value or appraise such alterations in a fair and reasonable manner, and add to or deduct from the amount herein agreed to be paid to CONTRACTOR at pro rata rates, but in no case shall such alteration be made unless notice in writing is given to CONTRACTOR by RAILROAD.

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RAILROAD will furnish to CONTRACTOR such further drawings and explanations as may be necessary to illustrate the work to be done, and CONTRACTOR agrees to conform to such drawings and explanations.

(11) INSPECTION:

CONTRACTOR agrees that RAILROAD, or any person appointed by RAILROAD, will be permitted to visit and inspect said work, or any part thereof, at all times and places during the progress of the work, and CONTRACTOR agrees to provide sufficient, safe and proper facilities for such inspection.

(12) PERFORMANCE OF WORK:

CONTRACTOR agrees to proceed with said work, and each and every part and detail thereof, in a prompt and diligent manner, and agrees to do the several parts thereof at such time and in such order as RAILROAD may designate, and agrees to finish such work in strict conformance to said plans and/or specifications, or any modifications or amplifications thereof made by RAILROAD.

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(14) SUPERINTENDENCE:

CONTRACTOR agrees to keep a competent man in the immediate vicinity of the premises above described at all times during working hours with whom RAILROAD may communicate, and to supervise said work.

(15) TAKING OVER OR STOPPING OF WORK:

Should CONTRACTOR at any time during the progress of the work fail, or refuse or neglect to supply a sufficiency of material, tools, labor or properly skilled workmen to complete same with reasonable diligence and dispatch, except when due to circumstances which CONTRACTOR cannot be reasonably expected to control, and should such failure, neglect or refusal continue for five (5) days after written notice shall have been served by RAILROAD on CONTRACTOR, RAILROAD is hereby given the right to take over the said work and complete it. The cost to RAILROAD of doing such work shall be deducted from any moneys due CONTRACTOR under this agreement and if such cost exceeds any such moneys due CONTRACTOR, CONTRACTOR agrees to reimburse RAILROAD for all costs in excess of any moneys due CONTRACTOR hereunder.

RAILROAD hereby reserves the right to stop at any time the said work, it being understood, however, that in any such event, except as provided in the next preceding paragraph of this Section 15, RAILROAD shall pay CONTRACTOR for all work done in conformity with said plans and/or specifications, plus a reasonable amount, if any, to be determined by RAILROAD, representing loss CONTRACTOR would in such event sustain through money expended or necessary to be expended by CONTRACTOR through inhibition to complete the work contemplated. In the event of such stoppage of work or termination of agreement the consideration provided in this paragraph shall be paid   days after such stoppage of work or termination of agreement, except where work is performed in the State of California or Nevada. Where work is performed in the State of California or Nevada, said consideration shall be paid thirty-five (35) days after notice of cessation of labor has been recorded in the Office of the County Recorder in the county in which said work is performed, as provided by law, such notice to be recorded within ten (10) days after there has been a cessation of labor thereon for a period of thirty (30) days; provided, however, in any event, final payment shall not be made until no liens remain undischarged of record or stop notices or attachments remain unsatisfied in connection with the work provided for herein.

(16) COMPENSATION:

RAILROAD agrees to pay CONTRACTOR for the entire work in conformance with said plans and/or specifications as follows:

> Not to exceed the sum of One Hundred Five Thousand Dollars ($105,000.00) without RAILROAD'S prior written approval.

(17) TERMS OF PAYMENT:

RAILROAD, at the close of each month, through duly authorized representatives, shall estimate value of work done and materials furnished by CONTRACTOR during such month and RAILROAD shall pay to CONTRACTOR, in accordance with RAILROAD'S usual practice of vouchering accounts, -90- per cent of the amount estimated to be due CONTRACTOR for that month, the remaining -10- per cent of such amount shall be paid CONTRACTOR by RAILROAD (provided no liens remain undischarged of record, or stop notices or attachments remain unsatisified in connection with the work provided for herein), ninety (90) days after the completion and final acceptance of said work; except where work is performed in the State of California or Nevada, in which event, final payment shall be made CONTRACTOR by RAILROAD (provided no liens remain undischarged of record or stop notices or attachments remain unsatisfied) thirty-five (35) days after the recording by RAILROAD of Notice of Completion in the Office of the County Recorder of the county in which such work is performed, as provided by law, such notice to be recorded within ten (10) days after the completion of said work.

All estimates herein provided for shall be made by RAILROAD'S engineer, whose measurements and calculations as to the quantities and amounts of work performed shall be final, conclusive and binding upon the parties hereto.

(18) ACCEPTANCE OF WORK:

It is mutually agreed that no payment made under this agreement, except the final payment, shall be evidence of the performance of this agreement, either wholly or in part, and that no payment shall be construed to be an acceptance of defective work or improper materials.

(19) PATENT RIGHTS:

It is mutually agreed that CONTRACTOR shall pay all claims growing out of any patent rights covering work under this agreement, or any part thereof, or any tools, implements or appliances used on or in connection with said work, and CONTRACTOR agrees to fully reimburse RAILROAD for any royalties, damages or other payments that RAILROAD shall be called upon or be obligated to pay by virtue of any patent rights, originating or growing out of said work or any part thereof, or any tools, implements or appliances used on or in connection therewith.

(20) BOND: WAIVED

~~CONTRACTOR agrees to furnish RAILROAD with a good and sufficient bond from a surety company satisfactory to RAILROAD, in full amount of the contract price at the time of award before beginning work hereunder, to insure CONTRACTOR to carry out this agreement.~~

(21) LIABILITY:

CONTRACTOR expressly agrees to indemnify and save RAILROAD harmless from and against any and all claims, loss, damage, injury and liability, however caused, resulting from, arising out of or in any way connected with the work to be performed under this agreement, whether or not caused or contributed to by the operation of trains on RAILROAD'S adjacent track or by any negligence or alleged negligence on the part of any of RAILROAD'S agents or employees, except that the provisions of this Paragraph 21 shall not apply to loss or liability caused by the ~~[illegible]~~ negligence of RAILROAD.

(22) LIENS:

CONTRACTOR expressly agrees to discharge at once all liens which may be filed in connection with said work and hold RAILROAD and the owner of the premises upon which the work is to be performed harmless therefrom.

(23) CONTRACTOR TO REMOVE DEBRIS AND MATERIAL:

Upon termination or completion of said work, CONTRACTOR shall remove all debris and waste material and leave the premises in a neat and clean condition, all to the satisfaction of RAILROAD.

(24) ASSIGNMENT:

... sublet or transferred in whole or in part by CONTRACTOR.

written approval.

(17) TERMS OF PAYMENT:

RAILROAD, at the close of each month, through duly authorized representatives, shall estimate value of work done and materials furnished by CONTRACTOR during such month and RAILROAD shall pay to CONTRACTOR, in accordance with RAILROAD'S usual practice of vouchering accounts, -90- per cent of the amount estimated to be due CONTRACTOR for that month, the remaining -10- per cent of such amount shall be paid CONTRACTOR by RAILROAD (provided no liens remain undischarged of record, or stop notices or attachments remain unsatisfied in connection with the work provided for herein), ninety (90) days after the completion and final acceptance of said work; except where work is performed in the State of California or Nevada, in which event, final payment shall be made CONTRACTOR by RAILROAD (provided no liens remain undischarged of record or stop notices or attachments remain unsatisfied) thirty-five (35) days after the recording by RAILROAD of Notice of Completion in the Office of the County Recorder of the county in which such work is performed, as provided by law, such notice to be recorded within ten (10) days after the completion of said work.

All estimates herein provided for shall be made by RAILROAD'S engineer, whose measurements and calculations as to the quantities and amounts of work performed shall be final, conclusive and binding upon the parties hereto.

(18) ACCEPTANCE OF WORK:

It is mutually agreed that no payment made under this agreement, except the final payment, shall be evidence of the performance of this agreement, either wholly or in part, and that no payment shall be construed to be an acceptance of defective work or improper materials.

(19) PATENT RIGHTS:

It is mutually agreed that CONTRACTOR shall pay all claims growing out of any patent rights covering work under this agreement, or any part thereof, or any tools, implements or appliances used on or in connection with said work, and CONTRACTOR agrees to fully reimburse RAILROAD for any royalties, damages or other payments that RAILROAD shall be called upon or be obligated to pay by virtue of any patent rights, originating or growing out of said work or any part thereof, or any tools, implements or appliances used on or in connection therewith.

(20) BOND WAIVED

~~CONTRACTOR agrees to furnish RAILROAD with a good and sufficient bond from a surety company satisfactory to RAILROAD in full amount of the contract price at the time of award hereof [illegible] hereunder [illegible] CONTRACTOR to carry out this agreement.~~

(21) LIABILITY:

CONTRACTOR expressly agrees to indemnify and save RAILROAD harmless from and against any and all claims, loss, damage, injury and liability, however caused, resulting from, arising out of or in any way connected with the work to be performed under this agreement, whether or not caused or contributed to by the operation of trains on RAILROAD'S adjacent track or by any negligence or alleged negligence on the part of any of RAILROAD'S agents or employees, except that the provisions of this Paragraph 21 shall not apply to loss or liability caused by the ~~[illegible]~~ negligence of RAILROAD.

(22) LIENS:

CONTRACTOR expressly agrees to discharge at once all liens which may be filed in connection with said work and hold RAILROAD and the owner of the premises upon which the work is to be performed harmless therefrom.

(23) CONTRACTOR TO REMOVE DEBRIS AND MATERIAL:

Upon termination or completion of said work, CONTRACTOR shall remove all debris and waste material and leave the premises in a neat and clean condition, all to the satisfaction of RAILROAD.

(24) ASSIGNMENT:

This agreement shall not be assigned, sublet or transferred in whole or in part by CONTRACTOR, except with the previous written consent of RAILROAD.

In case said work consists of the construction, alteration, repair or improvement of any structure, CONTRACTOR will, at the expense of CONTRACTOR, place and maintain Builder's Fire Insurance on any such structure jointly in the names of RAILROAD and CONTRACTOR, payable as the several interests of RAILROAD and CONTRACTOR may appear, such insurance at all times to be of sufficient amount to fully cover all loss or damage to the work under this agreement, resulting from fire; such fire insurance policy shall be delivered to and held by RAILROAD.

(26) ATTORNEY'S FEES:

In case RAILROAD shall bring suit to compel performance of or to recover for breach of any covenant, agreement or condition herein written, CONTRACTOR shall and will pay to RAILROAD reasonable attorney fees in addition to the amount of judgment and costs.

(27) EMPLOYERS' LIABILITY, WORKMEN'S COMPENSATION AND INSURANCE:

The CONTRACTOR shall perform the work herein specified in strict conformance with the provisions of all applicable Federal and State enactments with reference to Employers' Liability, Workmen's Compensation, and Workmen's Insurance, and shall indemnify and hold harmless the RAILROAD* from and against any and all liability, damages, claims, demands, costs and expenses of whatsoever nature, resulting from such enactments, or from any claim of subrogation provided in such enactments, or otherwise.

(28) CONTRACTOR warrants that CONTRACTOR has not employed any officer or employee of RAILROAD or of any subsidiary of RAILROAD or any member of their immediate families or near relatives to solicit or secure this contract under any agreement for a commission, percentage, brokerage, or compensation of any nature. Breach of this warranty shall give RAILROAD the right to cancel this contract and/or recover from CONTRACTOR amount of commission, percentage, brokerage, or other compensation without waiver of any legal right which RAILROAD may have under applicable statutes.

(29) CONTRACTOR agrees to provide insurance coverage as set forth in the attached insert captioned "Insurance".

(30) In the event of any conflict between the said Exhibit "A" and specifications and this agreement, the terms of this agreement shall govern.

*(except for the negligence of RAILROAD)

IN WITNESS WHEREOF, the parties hereto have executed these presents the day and year first above written.

WITNESSED BY:

SUPERVISOR OF CONTRACTS

SOUTHERN PACIFIC TRANSPORTATION COMPANY

By

(Title) Engr., Design & Constr.

WITNESSED BY:

ROLLINS ENVIRONMENTAL SERVICES, INC.,

(See Note) Contractor.

By

(Title) Sr. Vice President

Form Approved:

~~General~~ Attorney

11-23-83

NOTE: — If an incorporated company, agreement should be executed by an authorized officer thereof and his title indicated; otherwise signature should be witness by an employe of Railroad if practicable, if not, by a disinterested party.

KG COH004282

EXHIBIT "A"

COST BREAKDOWN

1. Excavate, Transport & Dispose of Slude:

   Approximately 1,800 cu yds @ $48.55/cu yd.

2. Backfill:

   Approximately 1,600 cu yds @ $10.00/cu yd.

3. Soil Analyses:

   Not to exceed Lump Sum of $1,000.00

4. Road Stabilization:

   Stabilize 20 ft. wide roadway @ $3.00/run. ft.

3 4 3 7 2 1 0 0 0 4 0

GENERAL CONDITIONS

Article 1 - PROJECT DESCRIPTION:

These specifications provide for the removal and disposal of waste from a waste storage pond and to finally backfill the pond located on Southern Pacific Transportation Company property at 4910 Liberty Road, Houston, Texas. The pond contains waste constituents generated by the adjacent wood preserving works.

Article 2 - DEFINITION OF TERMS:

a. Railroad - The Southern Pacific Transportation Co.

b. Engineer - Person acting through properly authorized representative of the Railroad to supervise within the scope of the particular duties delegated to him.

c. Contractor - Rollins Environmental Services (TX) Inc.

Article 3 - DRAWINGS

CE Drawing No. 39180, Sheet 1 of 1 is annexed to and made a part of these specifications. The area included in this project is outlined in red.

Article 4 - SUBCONTRACTORS:

The Contractor agrees that he is fully responsible to the Railroad for the acts and omissions of his subcontractor and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him. Nothing contained in the Contract Documents shall create any contractual obligation to any subcontractor from the Railroad.

SPECIAL PROVISIONS

ECTION 1-01 - SCOPE

Furnish labor and material to complete the following work:

1. Excavate approximately 1800 cu.yds. of Pond Sludge.
2. Transport and dispose of all excavated waste material at an off site disposal facility approved by State Agencies to receive such waste.
3. Backfill excavated area with clean clay fill (approximately 1500 cu.yd.
4. Sample and test underlying soil to determine that all waste material has been removed.
5. Following sludge removal, assist Railroad in negotiating with the State Agencies to have the pond area declared clean.

SECTION 1-02 - WATER REMOVAL

The Railroad will make necessary arrangements and pay for removing ponded water prior to excavation work by the Contractor. Contractor will at his expense ditch and otherwise direct standing water to a depressed area for convenient removal.

SECTION 1-03 - EXCAVATION

Contractor shall remove all sludge from the pond and shall include underlying clay liner or other soil as necessary to comply with State and Federal regulations.

SECTION 1-04 - TRANSPORT AND DISPOSE

Contractor shall transport all sludge to an approved dump site and shall prepare manifest for each load as required by law. Contractor shall be responsible for all charges associated with the transportation and disposal of material.

SECTION 1-05 - BACKFILL

Contractor shall furnish and place clean clay fill material. The entire pond area shall be filled and graded to slope away from the Railroad's tracks. Fill shall be leveled and wheel rolled as necessary to provide a firm level finish surface.

Prior to backfillings contractor shall take at least two surface samples of remaining soil in the pond area and analyze for the waste constituents that were found in the removed sludge. Certified Laboratories shall be used to analyze soil and shall furnish the Railroad with copies of the laboratory report. Additional sampling and analyses shall be performed if it is determined necessary to find the limits of contamination.

SECTION 1.07 - NEGOTIATIONS

Contractor shall coordinate his work with the appropriate agencies to assure their cc currence before proceeding with work. The Contractor shall assist the Railroad in acquiring a statement from the Texas Department of Water Resources (TDWR) that the pond contaminates have been satisfactorily removed and that any contaminates remaining in the soil are below the hazardous limits.

SECTION 1.08 - ADDITIONAL WORK

In the event more material than provided for in this contract must be removed to meet regulations, the contractor shall submit an estimate of cost and shall not proceed without written approval from the Railroad.

SECTION 1.09 - WORK CONDITIONS & SUPERVISION

Railroad will coordinate yard traffic to minimize interference with Contractor's work. The Engineer will be available each day and will make every effort to keep clear access between the work site and Liberty Road. The Contractor will comply with yard traffic regulations. The Contractor will have a supervisor on the job any time he is progressing work. Unfinished work or exposed hazards shall be protected while work is not in progress with barricades, lights, etc. as necessary to avoid injury to Railroad's employees and the public.

SECTION 1.10 - ROAD STABILIZATION

If the yard roadway becomes unstable due to heavy rains the Contractor will furnish and place flue dust as necessary to carry the weight of the transport trucks. This work will be kept at an absolute minimum and will be done only after alternate routes or other solutions have been eliminated.

COMPREHENSIVE GENERAL AND AUTOMOBILE LIABILITY ENDORSEMENT

Attached to certificate of insurance for and hereby certified to be part of the following policy or policies having the following expiration dates:

Policy No.	Company Providing Policy	Expiration Date

The scope of the insurance afforded by the policy(ies) designated in the attached certificate is not less than that which is afforded by the Insurance Service Organizations or other "Standard Provisions" forms in use by the insurance company in the territory in which coverage is afforded.

Such Policy(ies) provide for or are hereby amended to provide for the following

1. The named insured is ______________________________

2. ______________________________ ("Railroad")* is included as an additional insured with respect to liability arising out of the hazards or operations under ALL AGREEMENTS entered into between the named insured and Railroad, whether or not liability is attributable to negligence of the named insured or Railroad. In the event it is intended that this endorsement is applicable to only one agreement, the agreement is described as follows:

The insurance provided hereunder applies as though separate policies are in effect for both the named insured and Railroad.

3. The limits of liability under the policy(ies) are not less than those shown on the certificate to which this endorsement is attached.

4. Cancellation or material reduction of this coverage will not be effective until thirty (30) days following written notice to

Address

By registered or certified mail

5. Contractual liability coverage for liability assumed by this insured under said agreement or agreements with Railroad.

6. This insurance is primary and insurer is not entitled to any contribution from insurance in effect for Railroad

7. All policy or endorsement limitations relating specifically to operations on or near railroad property are eliminated.

8. Broad Form Property Damage endorsement.

9. So-called X, C and U (or similar) limitations are not effective as respects operations by or for the named insured on or adjacent to Railroad's property.

10. In the event of reduction or exhaustion of the applicable aggregate limit or limits of liability under the primary policy or policies referred to in the attached certificate of insurance solely by reason of losses paid thereunder on account of occurrences during the policy period, the excess policy, if any, referred to herein shall (i) in the event of reduction, apply as excess of the reduced limit of liability thereunder; and (ii) in the event of exhaustion, continue in force as though it were primary insurance.

The term "Railroad" includes successors, assigns and affiliated companies of Railroad and affiliates thereof, and other railroad company operating upon or over Railroad's tracks with Railroad's permission, and the officers, employees and agents of any of the foregoing.

____
Insurance Company

Date:______________________________, 19____ By______________________________
Signature of Authorized Representative

KG COH004287

INSURANCE

(1) CONTRACTOR agrees to carry and/or furnish the following at CONTRACTOR'S sole cost and expense:

(a) Workmen's Compensation and Employer's Liability Insurance covering all employees of CONTRACTOR and any subcontractors wherever they may be in the United States so long as they are engaged in the work covered by this contract. The policy or policies shall cover the entire liability of CONTRACTOR and any subcontractors as determined by the compensation laws of the state or states under which such liability arises, and shall contain, so far as it is lawful to obtain the same, a waiver of insurer's right of subrogation against RAILROAD for payments made to or on behalf of employees of CONTRACTOR or subcontractors.

(b) Contractor's Public Liability Insurance (Bodily Injury and Property Damage) which shall provide a combined single limit of not less than $2,000,000 for bodily injury and/or property damage resulting from any one occurrence. They will protect CONTRACTOR and any subcontractors from liability arising out of the contract work for: (a) bodily injury, sickness or disease, including death at any time resulting therefrom, sustained by any person, and (b) damage to or destruction of property, including loss of use thereof.

(c) Insurance referred to in item (b) above shall include RAILROAD and any person or entity requiring RAILROAD to provide insurance in connection with the work to be performed hereunder as an additional insured and shall contain a so-called "cross liability" endorsement (the effect of which shall be to cause the insurance to apply as though separate policies were written for both CONTRACTOR and RAILROAD). The insurance shall protect RAILROAD from liability arising out of the contract work, whether caused or contributed to by any act or omission, negligent or otherwise, of RAILROAD, its agents or employees.

(2) In case CONTRACTOR and/or subcontractors, in carrying on the contract operations, should use and operate automobiles or other vehicles elsewhere than upon the contract premises, they shall carry, at their expense, Automobile Liability Insurance (Bodily Injury and Property Damage) with a combined single limit of not less than $ 2,000,000.

(3) CONTRACTOR further agrees to furnish RAILROAD with a certificate or certificates of insurance to which will be attached an endorsement in the form attached and made a part hereof, or certified copy of insurance policy or policies.

3. Closure Plan

Rollins Environmental Services (TX) Inc.
P. O. Box 609, Deer Park, Texas 77536 (713) 479 6001

Rollins

December 15, 1983

Mr. L. W. Pepple
Southern Pacific Transportation Company
One Market Plaza, Room 1007
San Francisco, California 94105

Dear Mr. Pepple:

Mr. Jeff Webb of T.D.W.R. has requested that a sampling program be added to the closure document to validate the complete removal of contaminants from your facility. We have, therefore, revised the closure plan to reflect Mr. Webb's comments regarding the sampling program and its analytical requirements.

The cost associated with implementing this sampling program will be billed as labor, materials, and analytical costs plus 15 per cent.

Please review the revised closure document and send it to Mr. Webb with a cover letter stating that, per your consultant, a sampling program section and more specific information concerning the analytical requirements for the sampling program have been added.

Please call me if you have any questions.

Sincerely yours,

ROLLINS ENVIRONMENTAL SERVICES (TX) INC.

Dan Bridge

Dan Bridge, Ph. D.
Project Manager
Field Services Group

DB/jml

Attachments

3459215047

KG COH004290

CLOSURE PLAN FOR SOUTHERN PACIFIC TRANSPORTATION COMPANY HOUSTON, TEXAS

INTRODUCTION

Southern Pacific Transportation Company will close a creosote tank bottom surface impoundment (RCRA Facility #31547) on their 4910 Liberty Road site in Houston, Texas in accordance with the following plan. This closure plan will comply with the provisions of Texas Administrative Code Sections 335.211-335.220, 335.1-335.15 and 335.281-335.288 and will minimize the post closure escape of hazardous constituents to the environment.

Facility Description

The impoundment, originally constructed in 1979 to contain creosote tank bottoms (K001), is located on the west side of the Liberty Road site; It is a rectangular shaped facility with the following dimensions: 106' x 180' x 72' x 177'. The impoundment which contains approximately 3' of creosote sludge has a total surface area of 18,762 ft.2 and an approximate volume of 1600 cubic yards. Earthen berms surrounding the impoundment are two to three feet above ground level and account for an additional 200 cubic yards of soil. The maximum waste inventory is estimated at approximately 1800 cubic yards. (335.213,(a),(2))

During the life of this impoundment, rainwater collecting on the surface of the creosote sludge has been repeatedly pumped into vacuum trucks and taken to a nearby Class I Disposal site.

CLOSURE PLAN

This closure plan involves 3 phases:

Phase 1. - Excavation of the creosote sludge and all contaminated portions of the walls and bottom. The material will be transported to Rollins Class I Landfill in Deer Park, where it will be solidified with flue dust prior to compaction in place. Site background samples will be analyzed for benzene, benz(a)anthracene, benzo(a)pyrene, chrysene, 4-nitrophenol, toluene, naphthalene phenol, 2-chlorophenol, 2,4-dimethylphenol, 2,4,6-trichlorophenol, pentachlorophenol, 4,6-dinitro-o-cresol and tetrachlorophenol. The contaminated zones will be considered sufficiently cleaned when the concentration of remaining materials is statistically equal to a "clean" background level (within the 95% confidence interval). See attached sampling plan.

All equipment will be decontaminated (335.213(a)(3) and 335.215) over a water collection pad. Decontamination will be accomplished with a mild detergent and hot water sprayed from a portable high pressure sprayer. The residue will be collected and disposed at a Class I disposal site.

Phase 2. - The excavated area will be backfilled with clay soil and the soil will be compacted with heavy equipment to accommodate further site expansion. No continued maintainance (with the exception of the ground-water study) will be required on the facility, since the waste material will be removed. (335.212(1))

Phase 3. - A ground-water monitoring system will be installed within the compliance zone to demonstrate the containment integrity of the facility. Four ground-water monitoring wells (4) will be constructed according to TAC 335.192 specifications. This system will be monitored for 1 year for the same chemical components listed in Phase 1 for soil contamination. If it is determined, after 1 year, that the active facility has no impact on the subsurface/ground water the monitoring program will be discontinued.

ESTIMATED CLOSURE SCHEDULE

Southern Pacific will implement this closure plan within 1 month after its approval by TDWR(335.214(a)), with an anticipated final closure date of 'anuary,1984.(335.212(a)(4))

7 working days: Excavation, transportation, disposal of all contaminated material.

3 working days: Backfill, compaction.

5 working days: Ground water monitoring well installation, surveying and initial sampling.

Weather permitting, the entire closure plan will be accomplished within 12 working days, allowing for sampling and sample analysis.

POST CLOSURE CARE

Being that this closure plan follows TAC 335.286(b) to remove all waste residues and contaminated subsoils, post closure care is not required.

CERTIFICATION OF CLOSURE

A registered professional engineer will inspect the closure project and, if the facility has been closed in accordance with the closure plan, the engineer will endorse a letter stating this fact to TDWR.

ESTIMATED CLOSURE COST

Excavation, Transportation, Disposal of Waste at $48.55/yd x 1800 yds	$87,390.00
Clay backfill and compaction at $10/yd x 1800 yds	$18,000.00
Ground-water Monitoring System	$10,000.00
Certification by Registered Professional	- 0 -
TOTAL	$115,390.00

Addendum to Closure Plan for Southern Pacific

RCRA Facility #31547

SAMPLING PROGRAM

A sampling program will be incorporated into the closure procedure to insure complete removal of the hazardous material. The program, based on a non-bias grid selection method, will minimize the analytical burden without jeopardizing the reliability of the sampling program.

Specifically, the visual hazardous material and apparent contaminated soil will be removed from the facility. Prior to sampling, an additional 3" of material below the visual endpoint will be removed as an added insurance buffer.

As shown in Figure 1., the facility will be surveyed and divided into 50' grids, which will be randomly selected and sampled. Within each grid 10 to 15 grab samples will be combined, homogenized and subsampled as representative samples of that particular grid area. The individual grab samples will not exceed 6" in depth from the excavated surface.

These samples will be analyzed for: benzene, benz(a)anthracene, benzo(a)pyrene, chrysene, 4-nitrophenol, toluene, napthalene phenol, 2 chlorophenol, 2-4, dimethylphenol, 2,4,6-trichlorophenol, pentachlorophenol, 4,6-dinitro-o-cresol and tetrachlorophenol. (K001 listed waste parameters, Appendix VII - Basis for Listing Hazardous Waste, CFR Part 261).

Analysis will include the volatile, base-neutral and acid fraction extractions.

The ground-water monitoring wells (Closure Plan - Phase 3) will also be analyzed for the same parameters on a quarterly basis for the first year. An evaluation will take place at the end of the first year to determine which, if any, parameters to continue monitoring and for what length of time to sample.

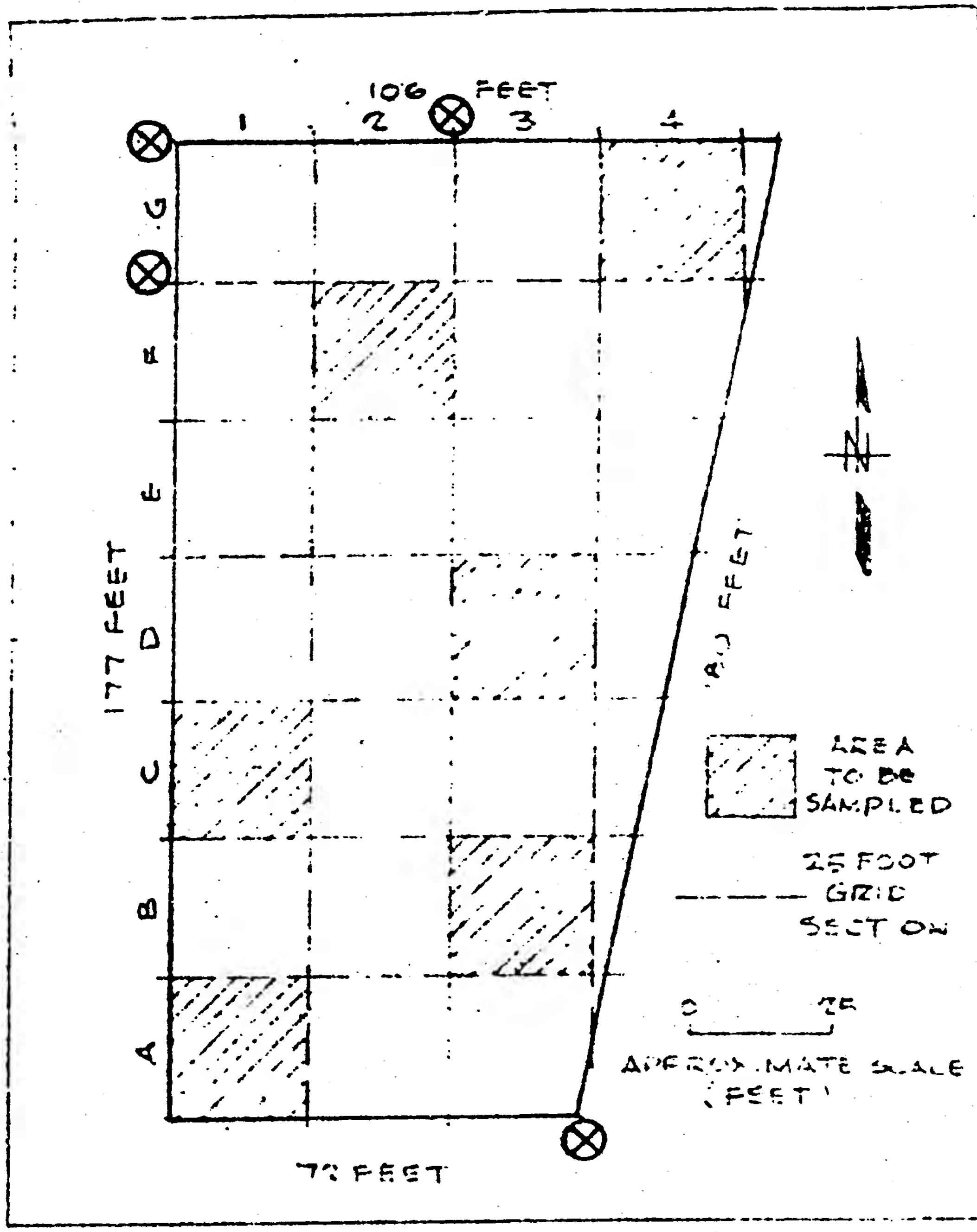


FIGURE 1
CREOSOTE IMPOUNDMENT AT
SOUTHERN PACIFIC TRANSPORTATION CO
HOUSTON, TEXAS

⊗ - MONITORING WELLS

KG COH004298

4. T.D.W.R. Approval of Closure Plan

TEXAS DEPARTMENT OF WATER RESOURCES
1700 N. Congress Avenue
Austin, Texas

Charles E. Nemir
Executive Director

February 28, 1984

Mr. H. B. Berkshire
Southern Pacific Transportation Company
Southern Pacific Building
One Market Plaza
San Francisco, CA 94105

Dear Mr. Berkshire:

Re: Industrial Solid Waste Registration No. 31547
Closure of On-Site Hazardous Waste Landfill
Harris County, Texas

We have completed a review of the closure plan, submitted by your letter of November 29, 1983 and as amended by your letter of December 23, 1983. This closure represents full facility closure and was accordingly reviewed under 31 Texas Administrative Code (TAC) Sections 335.212-.216 and 31 TAC Section 335.286(b).

This letter constitutes approval by the Executive Director of the closure plan contained in the referenced letters, provided that all analytical results shall be submitted to the Central Office and the District 7 Office of the Department within 15 days of receipt by the company.

Upon completion of the closure, certification shall be submitted by the owner or operator of the subject facility and by an independent Registered Professional Engineer that the facility has been closed in accordance with the approved closure plan. Also, an Affidavit of Exclusion (see enclosed form) indicating that this facility meets the "Accumulation Time" requirements of 31 TAC Section 335.69 should be submitted along with the closure certification, if applicable.

If you have any questions, please contact our Solid Waste Section at AC512/475-2041.

Sincerely,

Charles E. Nemir
Executive Director

Enclosure
cc: TDWR District 7 Office - Deer Park
Frank Bozeman, Southern Pacific Transportation Company
Dr. Daniel W. Bridge, Rollins Environmental Services (TX) Inc.

1836-1986

KG COH004300

5. Public Notification of Closure

3 4 5 9 2 1 0 5 0 5 3

Southern Pacific
Transportation Company
913 Franklin Ave., P. O. Box 1319, Houston, Texas 77251
MAINTENANCE OF WAY

E. F. REILLY
Asst. Engineer MofW
Eastern Lines

January 30, 1984

File 071.1

Mr. Dan Bridge, Ph.D.
Rollings Environmental Services, Ltd.
P. O. Box 609
Deer Park, TX 77536

Dear Mr. Bridge:

Reference to previous correspondence concerning disposal of creosote contaminated soil at Wood Preserving Works, Houston.

Enclosed for your information is copy of notice published in the Houston Chronicle concerning final facility closure, along with copy of Publisher's Affidavit and copy of letter of transmittal to the Texas Department of Water Resources.

Yours truly,

G. F. Bozeman

G. F. Bozeman
E&M Manager

cc: Mr. L. W. Pepple - with
copies of enclosures

GFB/css

Encls.

Southern Pacific
Transportation Company
813 Franklin Ave., P. O. Box 1319, Houston, Texas 77251

MAINTENANCE OF WAY

E. P. REILLY
Asst. Engineer MofW
Eastern Lines

January 27, 1984

071.1

Mr. Jeff Webb
Texas Department of Water Resources
1700 N. Congress Avenue
Austin, TX

Dear Sir:

Reference Mr. Messenger's letter of December 12, 1983, subject: Southern Pacific Transportation Company, Industrial Solid Waste Registration No. 31547, Publication of Notice of the Receipt of Closure Plan concerning Hazardous Waste Management Facilities.

Enclosed is the original sworn affidavit from the Houston Chronicle, showing notice published on January 13, 1984. Also enclosed is copy of said notice.

Yours truly,

G. F. Bozeman

G. F. Bozeman
E&M Manager

Enclosure

GFB/css

KG COH004303

PUBLISHER'S AFFIDAVIT

STATE OF TEXAS

COUNTY OF -Harris

Before me on this day personally appeared Lee Benton, the Supervisor-Accts Rec of the Houston Chronicle, a newspaper which is regularly published or circulated in Harris County, Texas, who being by me duly sworn deposes and says:

That the foregoing notice was published in said newspaper on January 13, 1984

Lee Benton

Lee Benton

Subscribed and sworn to before me this the 26th day of January ~~1983~~ 1984

Carol Hanson

Notary Public in and for Harris County, Texas

CAROL HANSON
Notary Public State of Texas
My Commission Expires November 25, 1985
Bonded by L. Alexander Lovell, Lawyers Surety Corp.

Notice of Final Facility Closure

[illegible] to 31 Texas Administrative Code (TAC) Section 335.211(d), [illegible] Executive Director of the Texas Department of Water Resources [illegible] notice of the receipt on December 2, 1983 of a closure plan [illegible] hazardous waste management facility associated with Southern [illegible] Transportation Company located at 6910 Liberty Road, Houston, [illegible] County. Pursuant to the closure plan submitted, Southern Pacific Transportation Company intends to close a 0.13-acre surface impoundment used to receive wastewater treatment sludge from [illegible] operations.

[illegible] of this notice is to give members of the public the opportunity [illegible] written comments on the closure plan and request [illegible] of the plan. Any comments must be submitted within 30 [illegible] date of publication of this notice to Allen Messenger, Solid [illegible] Section, Texas Department of Water Resources, P.O. Box 13087, [illegible] Station, Austin, Texas 78711. Pursuant to 31 TAC Section 335.211(d), the Executive Director is required to approve, modify, or [illegible] the plan within 90 days of receipt. Copies of the closure plan [illegible] public inspection at the central office of the Texas Department [illegible] Water Resources, 1700 North Congress Avenue, Austin, Texas [illegible] of the Department's District 7 Office, 4301 Center Street, [illegible] Texas 77536.

[illegible] Pursuant to 31 TAC Section 335.212(d), the Executive Director [illegible], in response to a request or at his own discretion, hold a public [illegible] on the closure plan whenever such a hearing might clarify one [illegible] concerning the plan. Any request for a public hearing [illegible] submitted within 30 days of the date of publication of this [illegible] Messenger, Solid Waste Section, Texas Department of Water Resources, P.O. Box 13087, Capitol Station, Austin, Texas 78711 [illegible] 512-475-2041.

[illegible] Austin, Texas on December 19, 1983.

[illegible]
Assistant Executive Director

3459210|0502

6. Bulk Density Values, Sampling Analyses

Rollins Environmental Services (FS) Inc.
2027 Battleground Road, P.O. Box 6?9 De[illegible] Pa[illegible] Te[illegible] ?75?[illegible]
(713) 479-6001

Rollins

March 30, 1984

TO WHOM IT MAY CONCERN:

Bulk Density Values for Waste From 4910 Liberty Rd.

1. 1345
2. 1821.2
3. 2181.3
4. 1885.2
5. 2337.6
6. 1835.3
7. 1973.1
8. 1650.1
9. 2760.9
10. 2647.1
11. 2746.4
12. 2370
13. 2709.2
14. 2215.9

30478.3 ÷ 14 = 2177 <u>Pounds</u> <u>Per</u> <u>Cubic</u> <u>Yard</u>

Sincerely,

ROLLINS ENVIRONMENTAL SERVICES INC.

Dan Bridge

Dan Bridge, Ph. D.
Project Manager

DB/jml

MBA LABORATORIES
P.O. Box 9461 340 S. 66th St.
Houston, Texas 77261
(713) 928-2701

LABORATORY REPORT #: H-6914

SAMPLE SUBMITTED BY: ROLLINS

DATE RECEIVED: 4-4-84

DATE COMPLETED: 4-4-84

SAMPLE IDENTIFICATION: ONE SOIL SAMPLE

THE SAMPLE WAS ANALYZED BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY, USING A HEWLETT-PACKARD MODEL #5985 GC/MS SYSTEM.

SAMPLE PREPARATION

1. BASE NEUTRALS, ACID EXTRACTABLES
   50 GMS OF SAMPLE WAS PLACED INTO A STAINLESS STEEL BLENDER ALONG WITH 50 GMS. OF SODIUM SULFATE. 150 MLS. OF METHYLENE CHLORIDE WAS ADDED, AND THE SAMPLE WAS BLENDED FOR 5 MINUTES AT HIGH SPEED. THE EXTRACT WAS FILTERED THROUGH GLASS WOOL INTO A KJDERNA-DANISH CONCENTRATOR. TWO MORE EXTRACTIONS WERE MADE USING 50 MLS. OF MECL2, AND THESE WERE ADDED TO THE ORIGINAL EXTRACT. THE SAMPLE EXTRACT WAS THEN CONCENTRATED TO 0.25 MLS. FOR GC/MS ANALYSIS. NEXT, THE SOIL WAS ACIDIFIED, AND AGAIN 3 EXTRACTIONS WERE PERFORMED JUST LIKE THE NEUTRAL FRACTION. THIS EXTRACT WAS ALSO CONCENTRATED TO 0.25 MLS., AND THIS WAS COMBINED WITH THE NEUTRAL EXTRACT AND ANALYZED.
2. BENZENE AND TOLUENE
   2 GMS OF SOIL WAS PLACED INTO A VIAL ALONG WITH 5 MLS. OF MECL2. THIS WAS SONICATED FOR 10 MINUTES, AND SHAKEN FOR 1 HOUR ON A SHAKER TABLE. THIS EXTRACT WAS THEN INJECTED DIRECTLY INTO THE GC/MS.

THE SAMPLE WAS ANALYZED FOR THE FOLLOWING SUBSTANCES:

SPECIFIC ORGANICS

Joe Kreso

THE GC/MS .ARAMETERS WERE AS FOLLOWS:

COLUMN - 30 METER FUSED SILICA CAPILLARY COATED WITH SPB-5
CARRIER GAS - HELIUM @ 30 CM/SEC (0.9 ML/MIN)
INJECTOR TEMP - 260 DEGREES
COLUMN TEMP - 3 MIN @ 50 DEGREES, THEN 8 DEGREES PER
MINUTE TO 280 DEGREES, HOLD @ 280 DEGREES
INJECTION MODE - SPLIT
SPLIT RATIO - 15:1

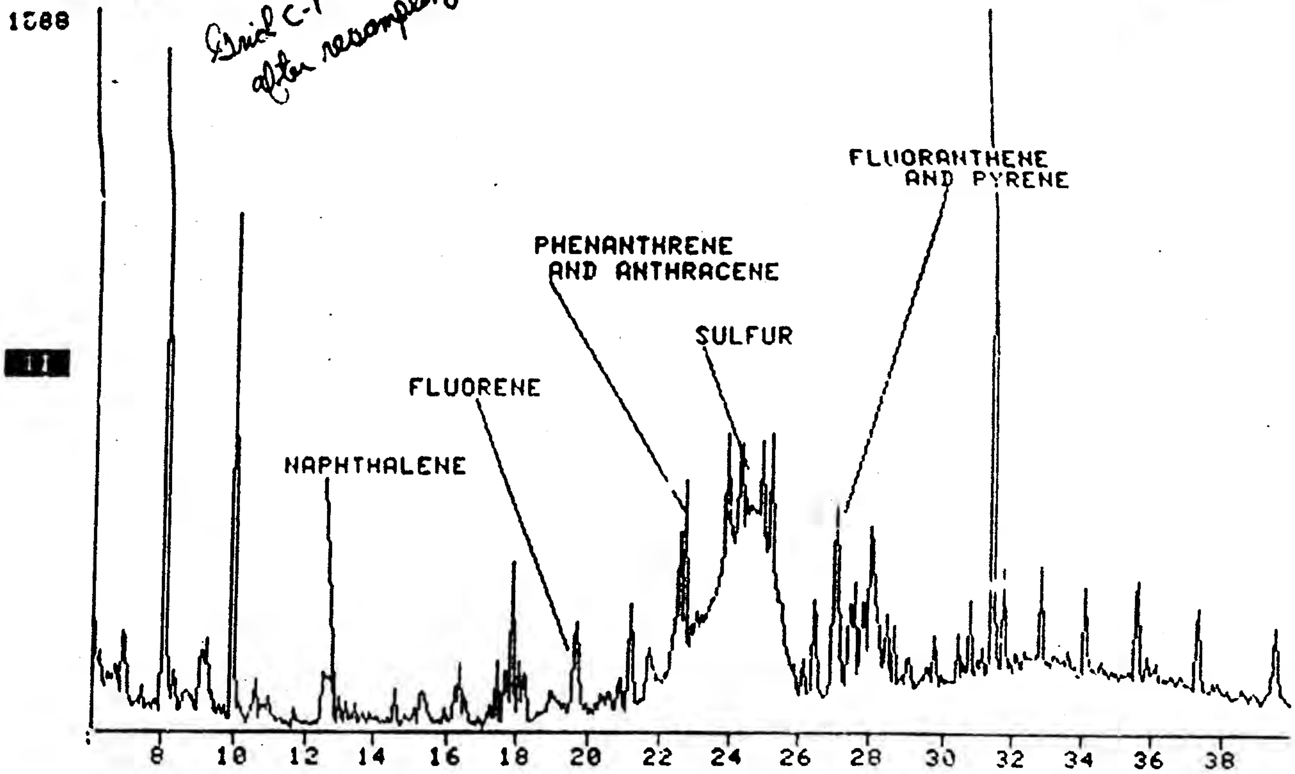
GC/MS INTERFACE - DIRECT
IONIZATION MODE - ELECTRON IMPACT
ELECTRON ENERGY - 70 V
MASS RANGE SCANNED - 40 TO 360 AMU
SCAN TIME - 0.4 SEC

COPIES OF THE TOTAL ION CHROMATOGRAMS ARE INCLUDED WITH THIS REPORT. ALL GC/MS DATA IS PERMANENTLY STORED AT MBA LABORATORIES ON MAGNETIC TAPE.

34532105055

[redacted] H-6914,60 GMS10.6 ML MECL2,6 ULS,15:1 SPLIT [redacted] 11805
[redacted] 4-4-84,JK

Grid C-1 after resampling



COMPOUNDS FOUND

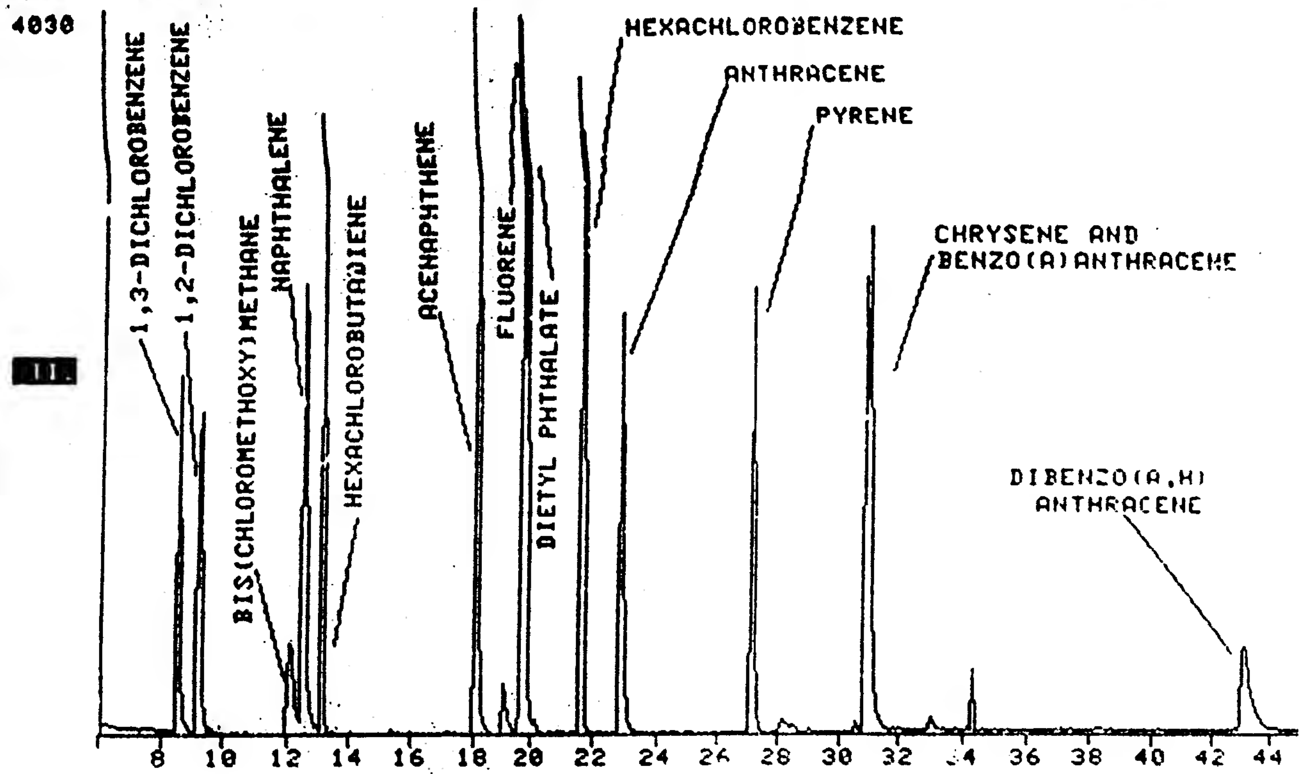
NAME	*RETENTION TIME (MINUTES)*	*CONCENTRATION*
Naphthalene	*12.6*	*4.0 ugs/kg*
Fluorene	*19.7*	*2.4 ugs/kg*
Phenanthrone	*22.7*	*31.8 ug/kg*
Anthracene	*22.8*	*5.3 ug/kg*
Fluoranthene	*26.5*	*13.00 ug/kg*
Pyrene	*27.1*	*2.2 ug/kg*
Chrysene	*31.0*	*9.1 ug/kg*

COMPOUNDS NOT FOUND

NAME	*CONCENTRATION*
Benzene	*<100 ug/kg*
Toluene	*<100 ug/kg*
Phenol	*< 2.4 ug/kg*
4-Nitrophenol	*< 18.0 ug/kg*
2-Chlorophenol	*< 3.6 ug/kg*
2,4-dimethyl phenol	*< 3.6 ug/kg*
2,4,6-trichlorophenol	*< 5.4 ug/ig*
pentachlorophenol	*< 13.8 ug/kg*
2-methyl, 4,6-dinitrophenol	*< 24.0 ug/kg*
tetrachlorophenol	*< 9.6 ug/kg*
benzo(a)anthracene	*< 1.0 ug/kg*
benzo(a)pyrene	*< 1.0 ug/kg*

[redacted] BN#2 STD,1,10,20 PPM EA.,6 ULS,15:1 SPLIT
4-4-84,JK

[redacted] 11806



MBA LABORATORIES
P.O. Box 9461 340 S. 66th St.
Houston, Texas 77261
(713)928-2701

LABORATORY REPORT #: H-6870

SAMPLE SUBMITTED BY: POLLINI

DATE RECEIVED: 3-29-84

DATE COMPLETED: 4-2-84

SAMPLE IDENTIFICATION: SIX SOIL SAMPLES

THE SAMPLE WAS ANALYZED BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY, USING A HEWLETT-PACKARD MODEL #5985 GC/MS SYSTEM.

SAMPLE PREPARATION

1. BASE NEUTRALS, ACID EXTRACTABLES
50 GMS OF SAMPLE WAS PLACED INTO A STAINLESS STEEL BLENDER ALONG WITH 50 GMS OF SODIUM SULFATE. 150 MLS OF METHYLENE CHLORIDE WAS ADDED, AND THE SAMPLE WAS BLENDED FOR 5 MINUTES AT HIGH SPEED. THE EXTRACT WAS FILTERED THROUGH GLASS WOOL INTO A KJERNA-DANISH CONCENTRATOR. TWO MORE EXTRACTIONS WERE MADE, USING 50 MLS. OF METHYLENE CHLORIDE, AND THESE WERE ADDED TO THE ORIGINAL EXTRACT. THE SAMPLE EXTRACT WAS THEN CONCENTRATED TO 0.25 MLS. FOR GC/MS ANALYSIS. NEXT, THE SOIL WAS ACIDIFIED, AND AGAIN 3 EXTRACTIONS WERE PERFORMED JUST LIKE THE NEUTRAL FRACTION. THIS EXTRACT WAS ALSO CONCENTRATED TO 0.25 MLS, AND THIS WAS COMBINED WITH THE NEUTRAL EXTRACT AND ANALYZED.
2. BENZENE AND TOLUENE
2 GMS OF SOIL WAS PLACED INTO A VIAL ALONG WITH 5 MLS. OF METHYLENE CHLORIDE. THESE WERE SONICATED FOR 10 MINUTES, AND SHAKEN FOR 1 HOUR ON A SHAKER TABLE. THIS EXTRACT WAS THEN INJECTED DIRECTLY INTO THE GC/MS FOR ANALYSIS.
3. SOIL SAMPLES HEAVILY CONTAMINATED
TWO OF THE SAMPLES WERE OBVIOUSLY OILY. 1 GM. OF EACH WAS PLACED INTO A VIAL, THE SOIL WAS ACIDIFIED, AND 10 MLS. OF METHYLENE CHLORIDE WAS ADDED. THE SAMPLES WERE SONICATED FOR 10 MINUTES, AND SHAKEN FOR 1 HOUR ON A SHAKER TABLE.

THE SAMPLE WAS ANALYZED FOR THE FOLLOWING SUBSTANCES: SPECIFIC ORGANICS

Joe Kresl

THE GC/MS PARAMETERS WERE AS FOLLOWS:

COLUMN - 30 METER FUSED SILICA CAPILLARY COATED WITH SPB-5
CARRIER GAS - HELIUM @ 30 CM/SEC (0.9 ML/MIN)
INJECTOR TEMP - 260 DEGREES
COLUMN TEMP - 3 MIN @ 50 DEGREES, THEN 8 DEGREES PER MINUTE TO 280 DEGREES, HOLD @ 280 DEGREES
INJECTION MODE - SPLIT
SPLIT RATIO - 15:1

GC/MS INTERFACE - DIRECT
IONIZATION MODE - ELECTRON IMPACT
ELECTRON ENERGY - 70 V
MASS RANGE SCANNED - 33 TO 360 AMU
SCAN TIME - 0.4 SEC

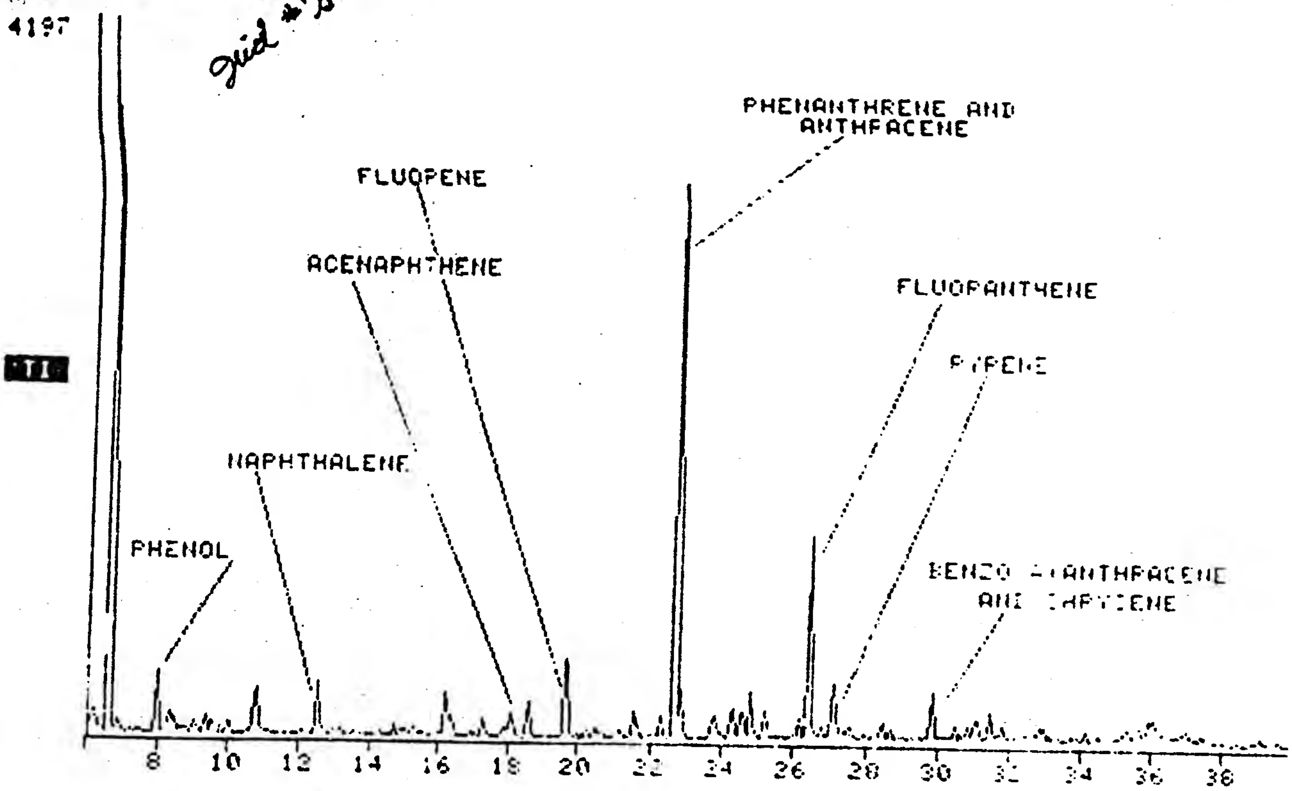
COPIES OF THE TOTAL ION CHROMATOGRAMS ARE INCLUDED WITH THIS REPORT. ALL GC/MS DATA IS PERMANENTLY STORED AT MBA LABORATORIES ON MAGNETIC TAPE.

Joe Kresse

NAME H-6870, A-1, 100 GMS; 0.5 ML, 6 UL; 3, 15:1 SPLIT
MISC ~-29-8~ ~K

11614

Grid #1 A



3452100070

COMPOUNDS FOUND

NAME	RETENTION TIME (minutes)	CONCENTRATION
Phenol	8.7	4.5 ugs/kg
Naphthalene	12.5	23.(ug/kg
Acenaphtene	18.1	6.0 ug/kg
Fluorene	19.7	25.(ug/kg
Phenanthreen	22.7	206.(ug/kg
Anthracene	22.8	19.(ug/k
Fluoranthene	26.5	89.(ug/kg
Pyrene	27.1	27.(ug/kg
Benzo(a)anthracene	30.9	11.(ug/kg
Chrysene	31.1	15.3 ug/kg

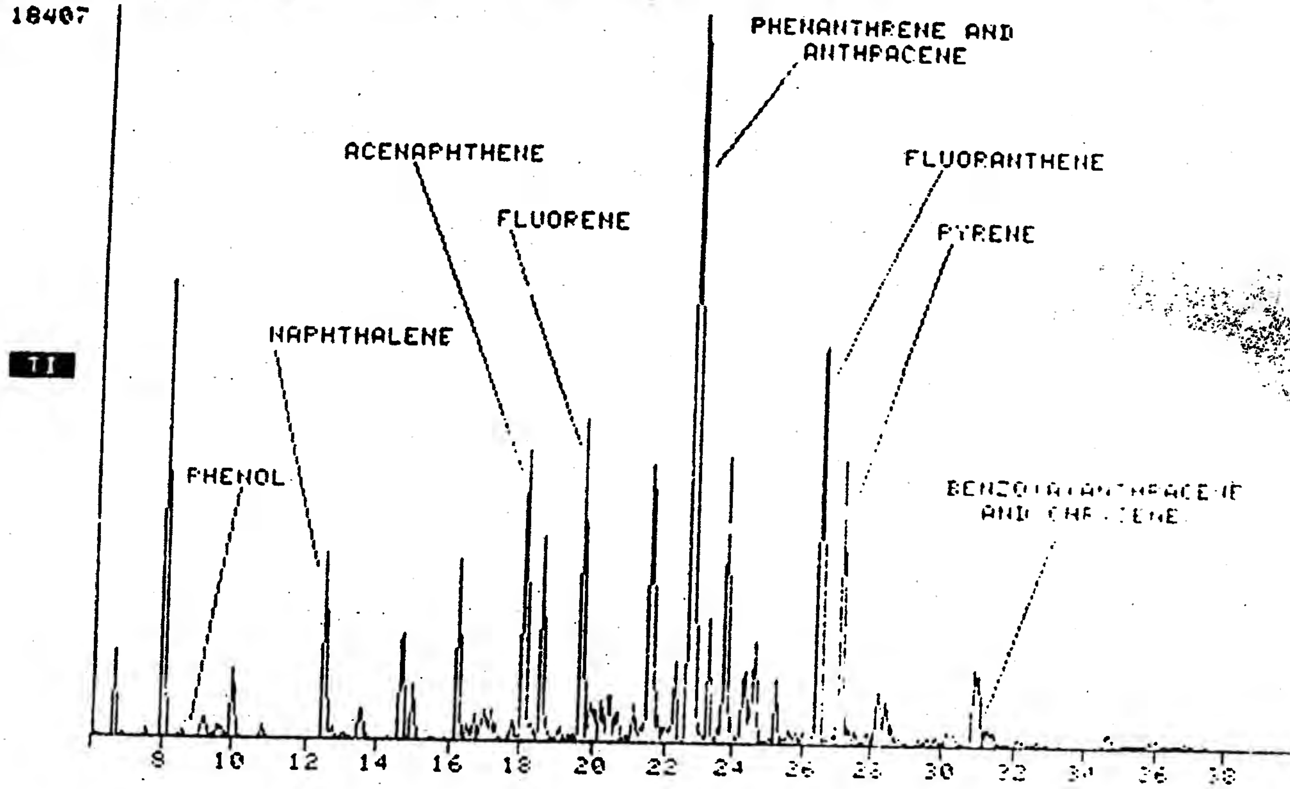
COMPOUNDS NOT FOUND

NAME		DETECTION LIMIT
Benzene	<	100.0 ug/kg
Toluene	<	100.0 ug/kg
Benzo(a)pyrene	<	0.4 ug/kg
4-Nitrophenol	<	.6.0 ug/kg
2-Chlorophenol	<	1.2 ug/kg
2,4-dimethyl phenol	<	1.2 ug/kg
2,4,6-trichlorophenol	<	1.8 ug/kg
Pentachlorophenol	<	4.6 ug/kg
2-methyl,4,6,-dinitrophenol	<	8.0 ug/kg
tetrachlorophenol	<	3.2 ug/kg

Joe Kresse

KG COH004313

3-29-84,JK 11615



COMPOUNDS FOUND

NAME	RETENTION TIME (minutes)	CONCENTRATION
Pehnol	8.6	28 ug/kg
Naphthalene	12.5	135 ug/kg
Acenaphtene	18.1	121 ug/kg
Fluorene	19.7	180 ug/kg
Phenanthrene	22.7	749 ug/kg
Anthracene	22.8	119 ug/kg
Fluoranthene	26.5	381 ug/kg
Pyrene	27.1	225 ug/kg
Benzo(a)anthracene	30.[illegible]	70 ug/kg
Chrysene	31.0	49 ug/kg
Benzo(a)pyrene	36.1	12 ug/kg

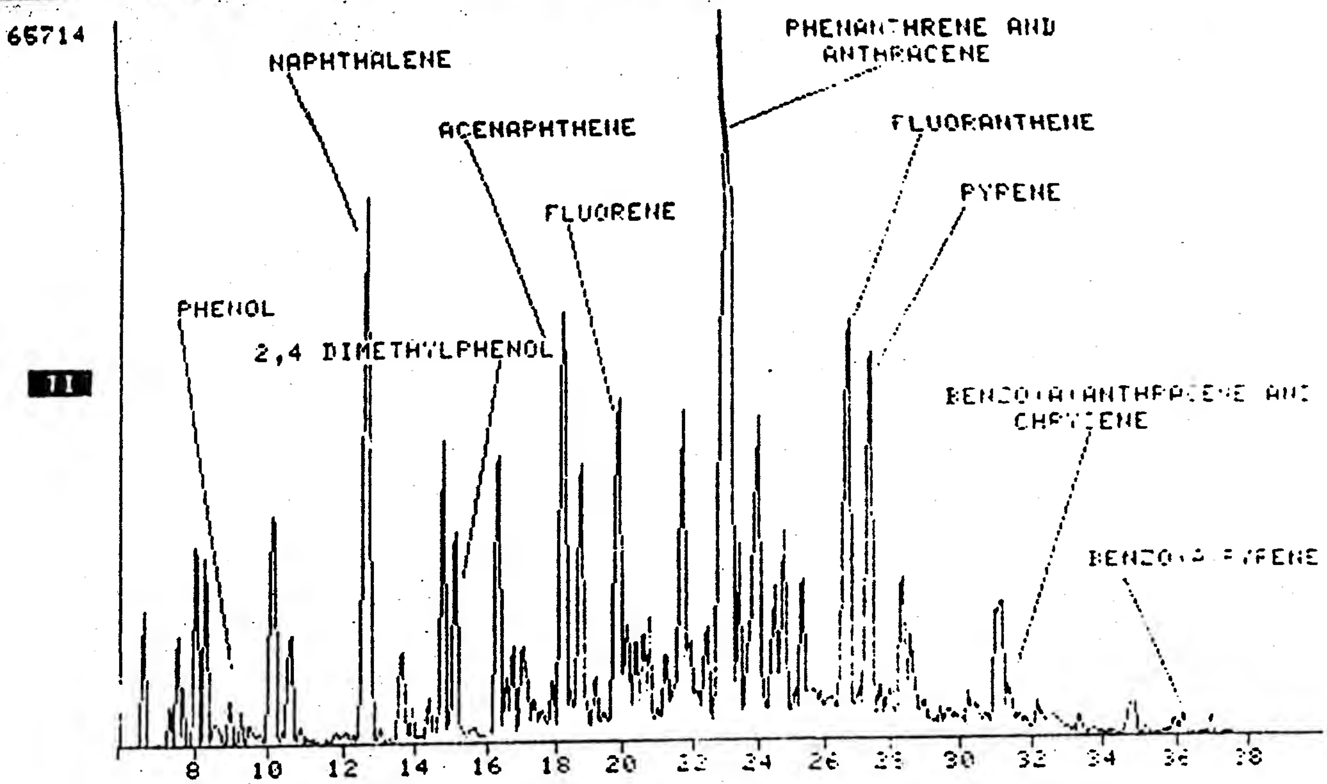
COMPOUNDS NOT FOUND

NAME	DETECTION LIMIT
Benzene	< 100 ug/kg
Toluene	< 100 ug/kg
2-chlorophenol	< 0 ug/kg
4-nitrophenol	< 3 ug/kg
2,4-dimethylphenol	< 0.6 ug/kg
2,4,6-trichlorophenol	< 0.9 ug/kg
Pentachlorophenol	< 2.3 ug/kg
2-methyl,4,6-dinitrophenol	< 0.9 ug/kg
tetrachlorophenol	< 1.6 ug/kg

Joe Kresl

KG COH004314

H-6870,(C-1),100 GMS:0.5 ML,1 UL,15:1 SPLIT
3-29-84



COMPOUNDS FOUND

NAME	RETENTION TIME	CONCENTRATION
Phenol	8.6	4.07 mg/kg
2,4,-Dimethylphenol	12.0	0.387 mg/kg
Naphthalene	12.6	29.840 mg/kg
Fluorene	19.8	11.1 mg/kg
Phenanthrene	22.9	44.9 mg/kg
Anthracene	23.2	5.4 mg/kg
Fluoranthene	26.6	20.5 mg/kg
Pyrene	27.2	12.1 mg/kg
Benzo(a)anthracene	31.0	3.1 mg/kg
Chrysene	31.1	2.0 mg/kg
Benzo)a)pyrene	36.1	0.6 mg/kg

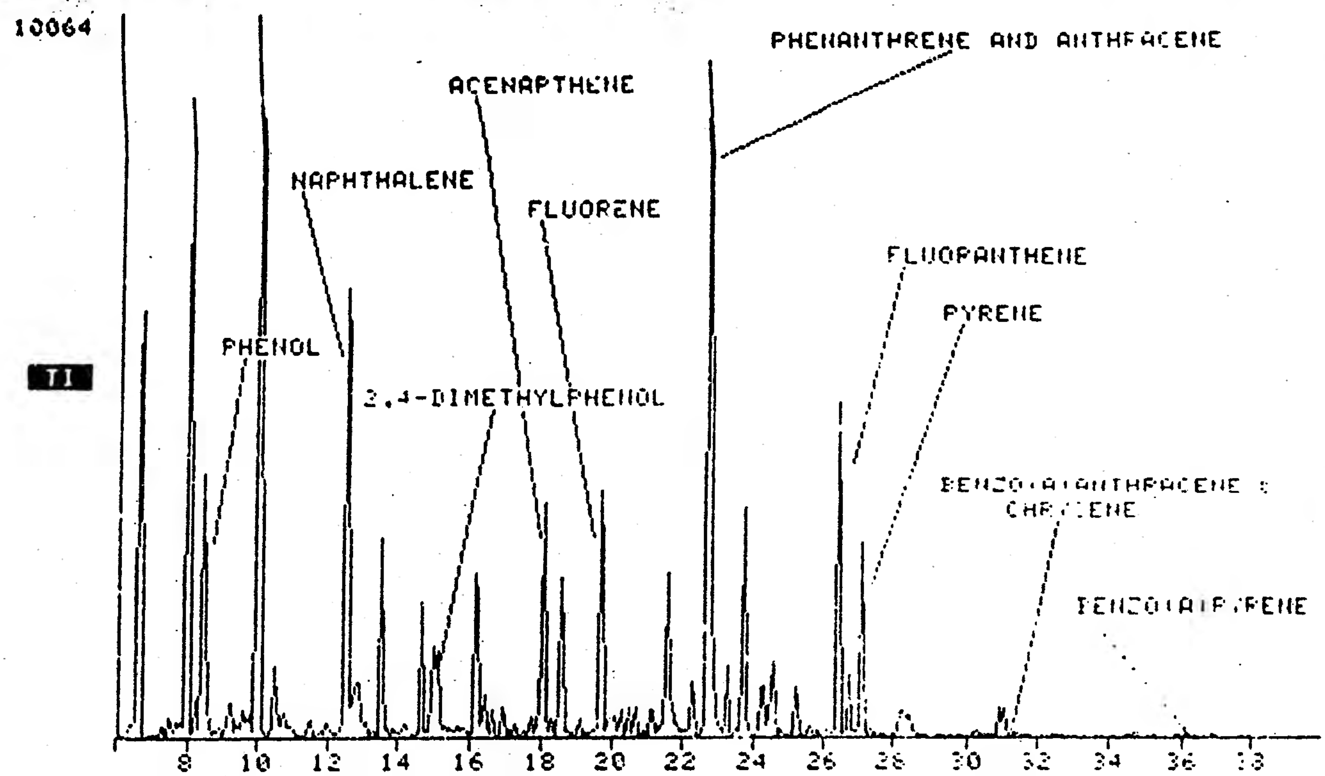
COMPOUNDS NOT FOUND

NAME	DETECTION LIMIT
Benzene	< 100.0 ug/kg ppb
Toluene	< 100.0 ug/kg
4-Nitrophenol	< 18.0 ug/kg
2-Chlorophenol	< 3.6 ug/kg
2,4,6-trichlorophenol	< 5.4 ug/kg
Pentachlorophenol	< 14.0 ug/kg
2-methyl,4,6-dinitrophenol	< 24.0 ug/kg
tetrachlorophenol	< 9.9 ug/kg

Joe Kress

KG COH004315

NAME H-6870,D-3,100 GMS10.5 ML,1 ULS,15:1 SPLIT S/N 11702
MISC 3-29-84,JK



COMPOUNDS FOUND

NAME	RETENTION TIME (minutes)	CONCENTRATION
Phenol	8.5	3.0 mg/kg
2,4-dimethylphenol	15.0	0.3 mg/kg
Naphthalene	12.5	1.1 mg/kg
Acenaphthene	18.0	0.3 mg/kg
Fluorene	19.7	0.4 mg/kg
Phenanthrene	22.7	1.8 mg/kg
Anthracene	22.8	0.3 mg/kg
Fluoranthene	26.4	0.8 mg/kg
Pyrene	27.1	0.5 mg/kg
Benzo(a)anthracene	30.9	0.1 mg/kg
Chrysene	31.0	0.1 mg/kg
Benzo(a)pyrene	36.1	0.02 mg/kg

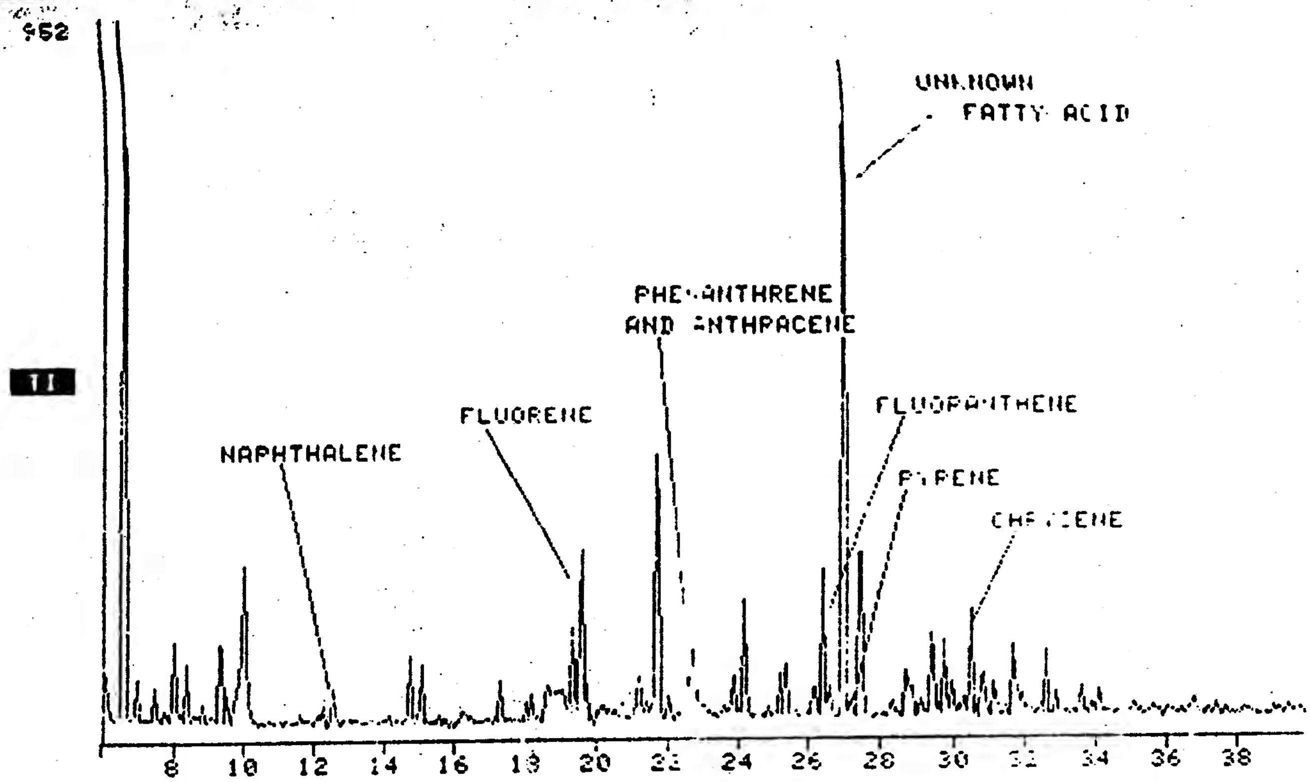
COMPOUNDS NOT FOUND

NAME	DETECTION LIMIT
Benzene	< 100.0 ug/kg ppb
Toluene	< 100.0 ug/kg ppb
4-Nitrophenol	< 3.0 ug/kg ppb
2-chlorophenol	< 0.6 ug/kg ppb
2,46-trichlorophenol	< 0.9 ug/kg ppb
Pentachlorophenol	< 2.3 ug/kg ppb
2-methyl,4,6-dinitrophenol	< 4.0 ug/kg ppb
tetrachlorophenol	< 1.6 ug/kg ppb

Joe Kreso

KG COH004316

NAME H-6870,F-2,100 GMS,0.5 ML,3 ULS,1:1 SPLIT 11-03
DATE 3-29-84,JK



COMPOUNDS FOUND

NAME	RETENTION TIME (minutes)	CONCENTRATION
Naphthalene	12.5	12 ug/kg
Fluorene	19.7	1.1 ug/kg
Phenanthrene	22.7	14.6 ug/kg
Anthracene	22.9	2.2 ug/kg
Fluoranthene	26.5	4.8 ug/kg
Pyrene	27.1	2.5 ug/kg

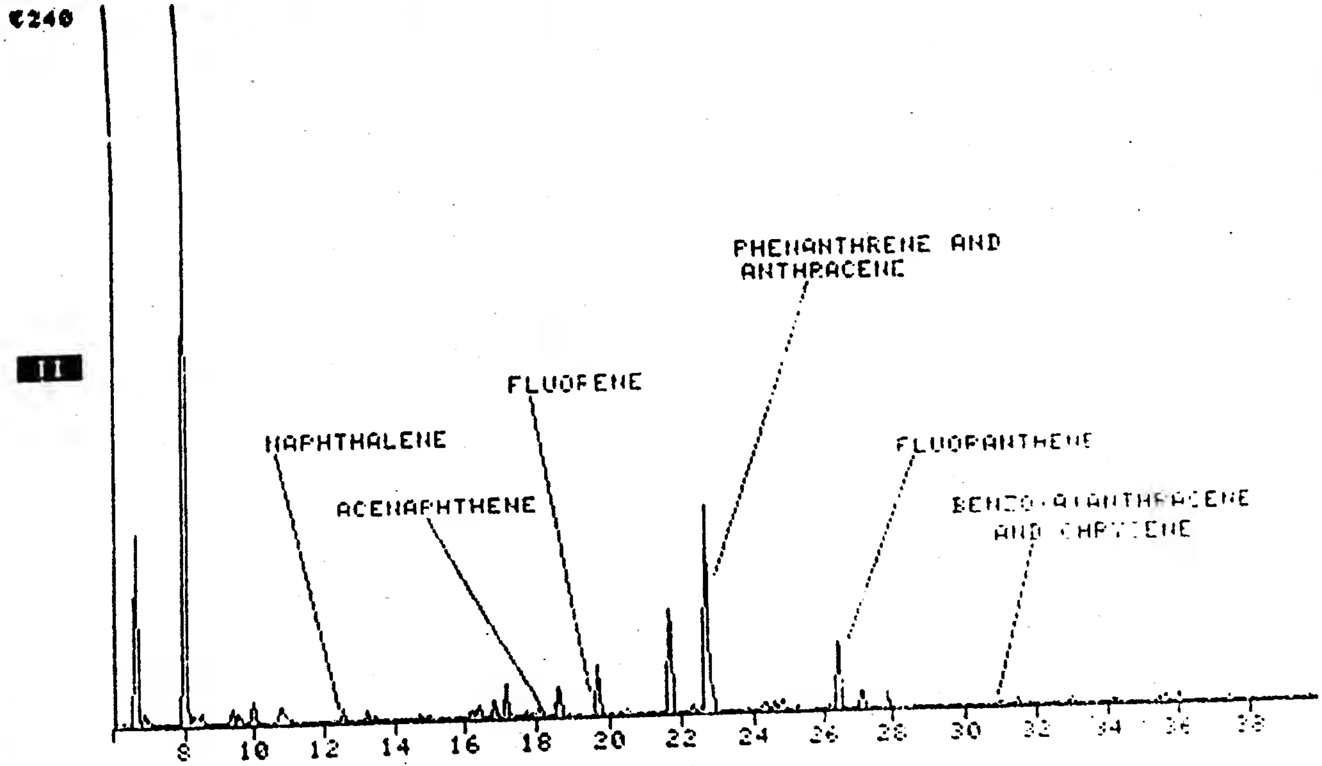
COMPOUNDS NOT FOUND

NAME	DETECTION LIMIT
Benzene	< 100.0 ug/kg ppb
Toluene	< 100.0 ug/kg ppb
Benzo(a)pyrene	< 0.2 ug/kg ppb
4-Nitrophenol	< 3.0 ug/kg ppb
Phenol	< 0.4 ug/kg ppb
2-chlorophenol	< 0.6 ug/kg ppb
2,4-dimethylphenol	< 0.6 ug/kg ppb
2,4,6-trichlorophenol	< 0.9 ug/kg ppb
Pentachlorophenol	< 2.3 ug/kg ppb
2-methyl,4,6-dinitrophenol	< 0.9 ug/kg ppb
tetrachlorophenol	< 1.6 ug/kg ppb

Joe Kreso

FRN 11704

H-6870 G-4,100 GMS:0.5 ML,6 ULS,1E11 SPLIT
3-29-84, JK



COMPOUNDS FOUND

NAME	RETENTION TIME (minutes)	CONCENTRATION
Naphthalene	12.5	4.0 ug/kg
Acenaphthene	18.1	2.4 ug/kg
Fluorene	19.7	9.2 ug/kg
Phenanthrene	22.7	49.0 ug/kg
An.hracene	22.8	9.8 ug/kg
Fluoranthene	26.5	19.2 ug/kg
Pyrene	27.1	6.4 ug/kg
Benzo(a)Anthracene	30.9	3.0 ug/kg
Chrysene	31.1	3.5 ug/kg

COMPOUNDS NOT FOUND

NAME	DETECTION LIMIT
Benzene	< 100.0 ug/kg ppb
Benzo(a)pyrene	< .0.2 ug/kg ppb
Toluene	< 100.0 ug/kg ppb
4-Nitrophenol	< 3.0 ug/kg ppb
Phenol	< 0.4 ug/kg ppb
2-chlorophenol	< 0.6 ug/kg ppb
2,4-dimethylphenol	< 0.6 ug/kg ppb
2,4,6-trichlorophenol	< 0.9 ug/kg ppb
Pentachlorophenol	< 2.3 ug/kg ppb
2-methyl,4,6-dinitrophenol	< 4.0 ug/kg ppb
Tetrachlorophenol	< 1.6 ug/kg ppb

Joe Kreso

KG COH004318

MBA LABORATORIES
P.O. Box 9461 340 S. 66th St.
Houston, Texas 77261
(713)928-2701

LABORATORY REPORT #: H-6855

SAMPLE SUBMITTED BY: ROLLINS

DATE RECEIVED: 3-28-84

DATE COMPLETED: 4-2-84

SAMPLE IDENTIFICATION: FIVE SOIL SAMPLES

THE SAMPLE WAS ANALYZED BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY, USING A HEWLETT-PACKARD MODEL #5985 GC/MS SYSTEM.

SAMPLE PREPARATION

1. BASE NEUTRALS, ACID EXTRACTABLES
   50 GMS OF SAMPLE WAS PLACED INTO A STAINLESS STEEL BLENDER ALONG WITH 50 GMS OF SODIUM SULFATE. 150 MLS OF METHYLENE CHLORIDE WAS ADDED, AND THE SAMPLE WAS BLENDED FOR 5 MINUTES AT HIGH SPEED. THE EXTRACT WAS FILTERED THROUGH GLASS WOOL INTO A KJERNA-DANISH CONCENTRATOR. TWO MORE EXTRACTIONS WERE MADE, USING 50 MLS. OF METHYLENE CHLORIDE, AND THESE WERE ADDED TO THE ORIGINAL EXTRACT. THE SAMPLE EXTRACT WAS THEN CONCENTRATED TO 0.25 MLS. FOR GC/MS ANALYSIS. NEXT, THE SOIL WAS ACIDFIED, AND AGAIN 3 EXTRACTIONS WERE PERFORMED JUST LIKE THE NEUTRAL FRACTION. THIS EXTRACT WAS ALSO CONCENTRATED TO 0.25 MLS. AND THIS WAS COMBINED WITH THE NEUTRAL EXTRACT AND ANALYZED.
2. BENZENE AND TOLUENE
   2 GMS OF SOIL WAS PLACED INTO A VIAL ALONG WITH 5 MLS. OF METHYLENE CHLORIDE. THESE WERE SONICATED FOR 10 MINUTES, AND SHAKEN FOR 1 HOUR ON A SHAKER TABLE. THIS EXTRACT WAS THEN INJECTED DIRECTLY INTO THE GC/MS FOR ANALYSIS.
3. SOIL SAMPLES HEAVILY CONTAMINATED
   TWO OF THE SAMPLES WERE OBVIOUSLY OILY. 1 GM. OF EACH WAS PLACED INTO A VIAL, THE SOIL WAS ACIDIFIED, AND 10 MLS. OF METHYLENE CHLORIDE WAS ADDED. THE SAMPLES WERE SONICATED FOR 10 MINUTES, AND SHAKEN FOR 1 HOUR ON A SHAKER TABLE.

THE SAMPLE WAS ANALYZED FOR THE FOLLOWING SUBSTANCES: *SPECIFIC ORGANICS*

Joe Kreme

3 4 5 2 1 0 3 7 9

KG COH004319

THE GC/MS PARAMETERS WERE AS FOLLOWS:

COLUMN - 30 METER FUSED SILICA CAPILLARY COATED WITH SPB-5
CARRIER GAS - HELIUM @ 30 CM/SEC (0.9 ML/MIN)
INJECTOR TEMP - 260 DEGREES
COLUMN TEMP - 3 MIN @ 50 DEGREES, THEN 8 DEGREES PER
MINUTE TO 280 DEGREES, HOLD @ 280 DEGREES
INJECTION MODE - SPLIT
SPLIT RATIO - 15:1

GC/MS INTERFACE - DIRECT
IONIZATION MODE - ELECTRON IMPACT
ELECTRON ENERGY - 70 V
MASS RANGE SCANNED - 33 TO 360 AMU
SCAN TIME - 0.4 SEC

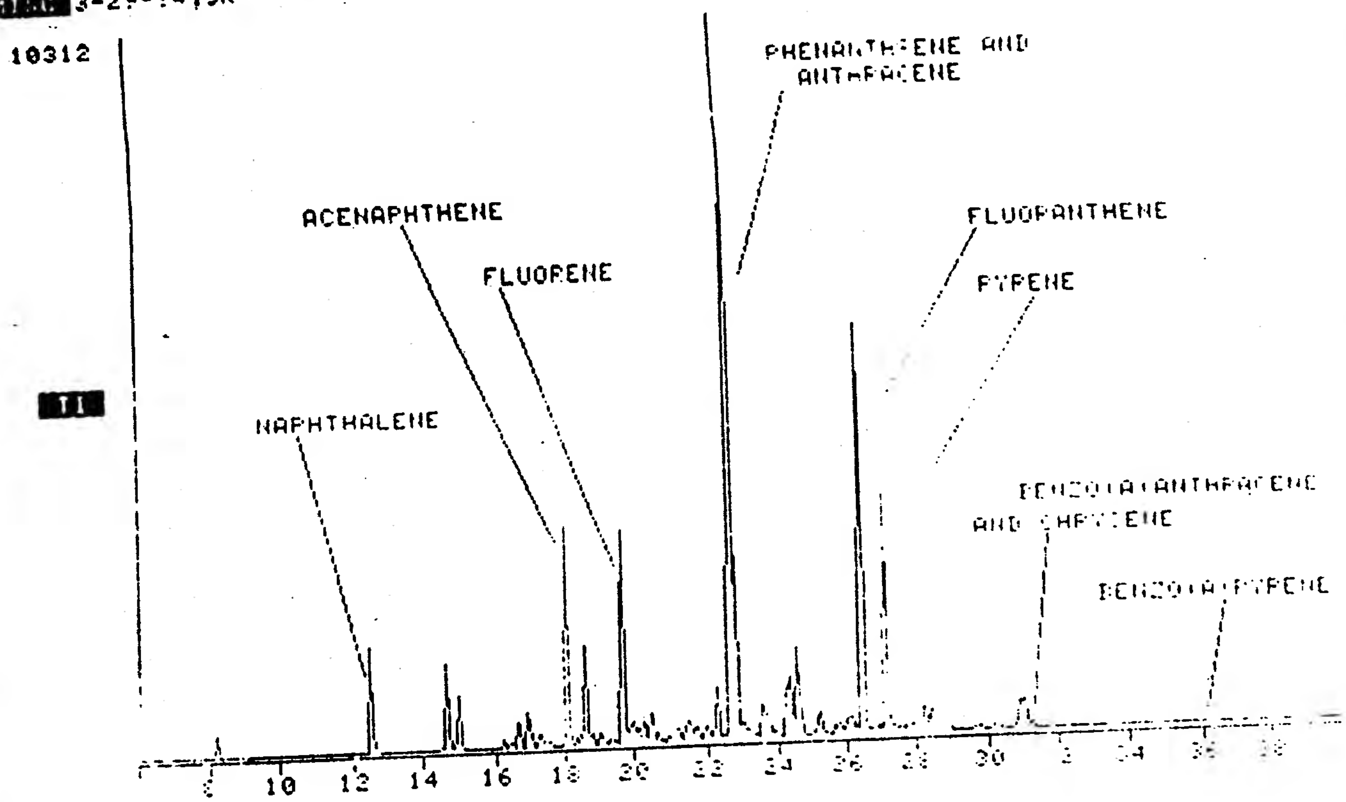
COPIES OF THE TOTAL ION CHROMATOGRAMS ARE INCLUDED WITH THIS REPORT. ALL GC/MS DATA IS PERMANENTLY STORED AT MBA LABORATORIES ON MAGNETIC TAPE.

Joe Kresse

3 4 5 3 2 1 0 0 0 7 7

SAMPL H-695?.HIGH CONC..1GM:10ML.MECL2,1 UL,15:1 SPLIT
MISC 3-29-84,JK

FRN 11609



COMPOUNDS FOUND

NAME	RETENTION TIME(minutes)		CONCENTRATION(mg/kg,ppm)		
1. Benzo(a)anthracene	30.9	mins.	280	mg/kg	(ppm)
2. Chrysene	31.1	"	231	"	"
3. Benzo(a)pyrene	36.1	"	231	"	"
4. Phenanthrene	22.7	"	3329	"	"
5. Fluoranthene	26.5	"	2438	"	"
6. Anthracene	22.8	"	697	"	"
7. Pyrene	27.1	"	1497	"	"
8. Benzo(a)anthracene	30.8	"	280	"	"
9. Chrysene	31.1	"	231	"	"
10. Benzo(a)Pyrene	36.1	"	60	"	"

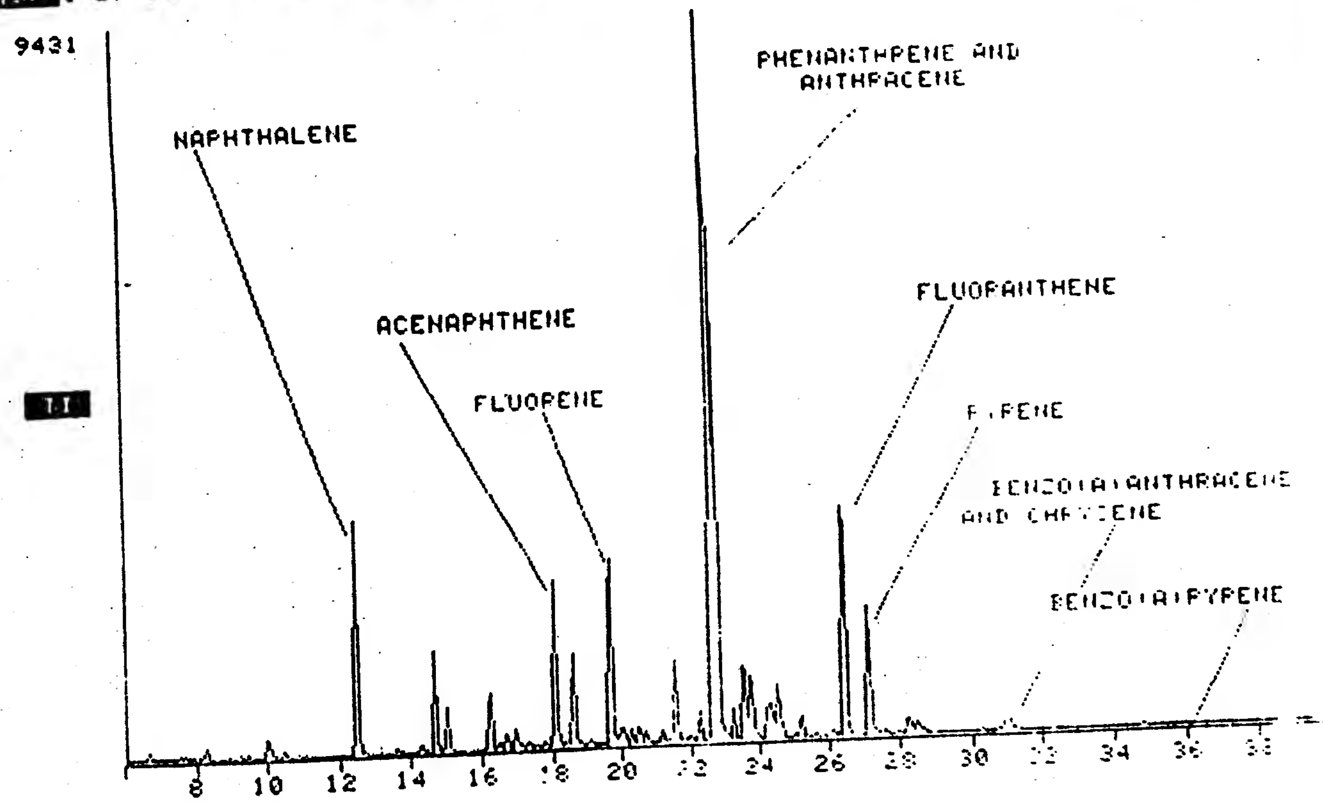
COMPOUNDS NOT FOUND

NAME	DETECTION LIMIT
1. Benzene	< 0.10 mg/kg
2. Toluene	< 0.10 mg/kg
3. Phenol	< 0.4 mg/kg
4. 4-Nitrophenol	< 3.4 mg/kg
5. 2-Chlorophenol	< 0.6 mg/kg
6. 2,4 - dimethylphenol	< 0.6 mg/kg
7. 2,4,6,-trichlorophenol	< 1.1 mg/kg
8. Pentachlorophenol	< 2.7 mg/kg
9. 2-methyl, 4,6 - dinitrophenol	<24.0 mg/kg
10. Tetrachlorophenol	< 1.6 mg/kg

Joe Kresse

H-4666, INTERMEDIATE, 10M:10 ML, 2 ULS, 15:1 SPLIT 11:10

3-29-84, JK.



COMPOUNDS FOUND

	NAME	RETENTION TIME (minutes)	CONCENTRATION (mg/kg, ppm)
1.	Naphthalene	12.5 minutes	620 mg/kg (ppm)
2.	Acenaphthene	18.1 minutes	228 mg/kg (ppm)
3.	Fluorene	19.7 minutes	328 mg/kg (ppm)
4.	Phenanthrene	22.7 minutes	1350 mg/kg (ppm)
5.	Anthracene	22.8 minutes	951 mg/kg (ppm)
6.	Fluoranthene	26.4 minutes	636 mg/kg (ppm)
7.	Pyrene	27.1 minutes	383 mg/kg (ppm)
8.	Benzo(a) Anthracene	30.9 minutes	58 mg/kg (ppm)
9.	Chrysene	31.1 minutes	69.2 mg/kg (ppm)
10.	Benzo(a)pyrene	36.2 minutes	11 mg/kg (ppm)

Joe Kresse

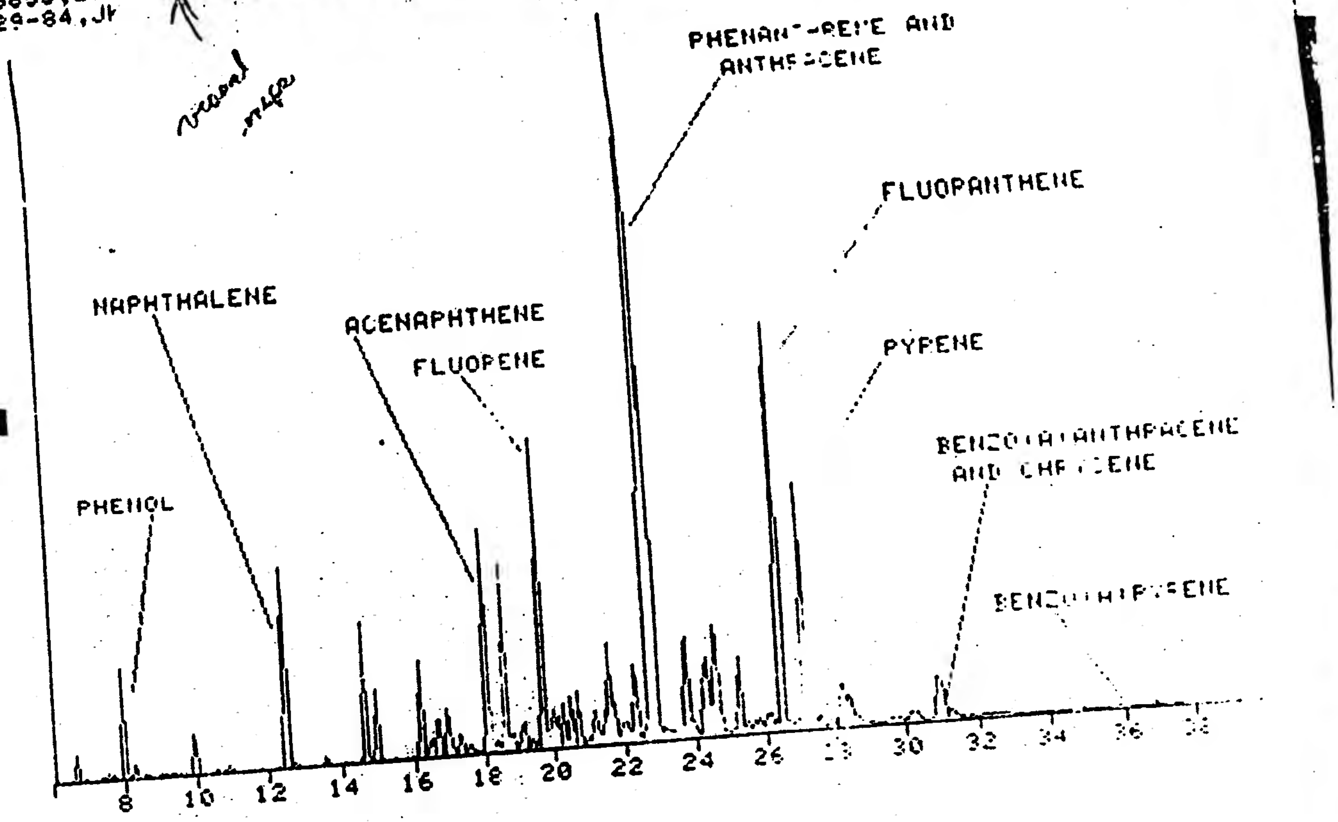
COMPOUNDS NOT FOUND

NAME		DETECTION LIMIT
1).	Benzene	< 0.10 mg/kg
2).	Toluene	< 0.10 mg/kg
3).	Phenol	< 0.2 mg/kg
4).	4-Nitrophenol	< 1.7 mg/kg
5).	2-Chlorophenol	< 0.3 mg/kg
6).	2,4 - dimethyl phenol	< 0.3 mg/kg
7).	2,4,6 - trichlorophenol	< 0.5 mg/kg
8).	Pentachlorophenol	< 1.4 mg/kg
9).	2-methyl, 4,6 - dinitrophenol	<12.0 mg/kg
10).	Tetrachlorophenol	< 0.8 mg/kg

Joe Kresse

34532105030

H-6855,LOW CONC,100 CM:0.5 ML,1 UL,15:1 SPLIT
3-29-84,JK



COMPOUNDS FOUND

	NAME	RETENTION TIME (minutes)	CONCENTRATION
1).	Phenol	8.6	0.203 mg/kg
2).	Naphthalene	12.5	1.05 mg/kg
3).	Acenaphthene	18.1	0.630 mg/kg
4).	Fluorone	19.7	1.159 mg/kg
5).	Phenanthrene	22.7	10.3 mg/kg
6).	Anthracene	22.8	3.4 mg/kg
7).	Pyrene	27.1	2.7 mg/kg
8).	Fluoranthene	26.4	5.0 mg/kg
9).	Pyrene	27.1	2.7 mg/kg
10).	Fluoranthene	26.4	5.0 mg/kg
11).	Benzo(a)anthracene	30.9	0.6 mg/kg
12).	Chrysene	31.1	0.5 mg/kg
13).	Benzo(a)pyrene	36.2	0.1 mg/kg

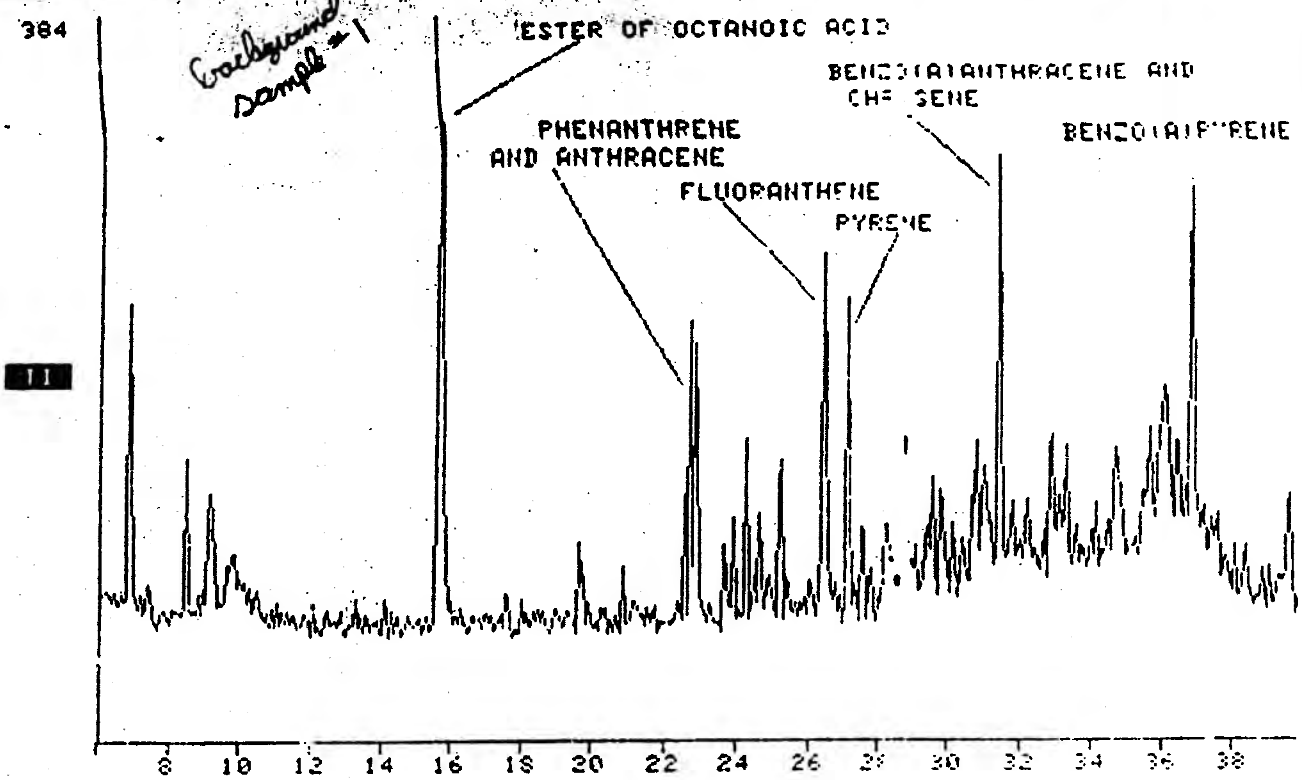
COMPOUNDS NOT FOUND

	NAME	DETECTION LIMIT
1).	Benzene	< 0.100 mg/kg
2).	Toluene	< 0.100 mg/kg
3).	4-Nitrophenol	< 0.018 mg/kg
4).	2-Chlorophenol	< 0.004 mg/kg
5).	2,4-dimethylphenol	< 0.004 mg/kg
6).	2,4,6-Trichlorophenol	< 0.005 mg/kg
7).	Pentachlorophenol	< 0.014 mg/kg
8).	Tetrachlorophenol	< 0.096 mg/kg
9).	2-methyl,4,6-deinitrophenol	< 0.024 mg/kg

Joe Kresse

NAME H-6855,BACK GD-1,100 GMS:0.5 ML,1 UL,15:1 SPLIT
DATE 3-29-84,JK

FRN 11612



3 4 5 9 2 1 0 1 0 3 2

COMPOUNDS FOUND

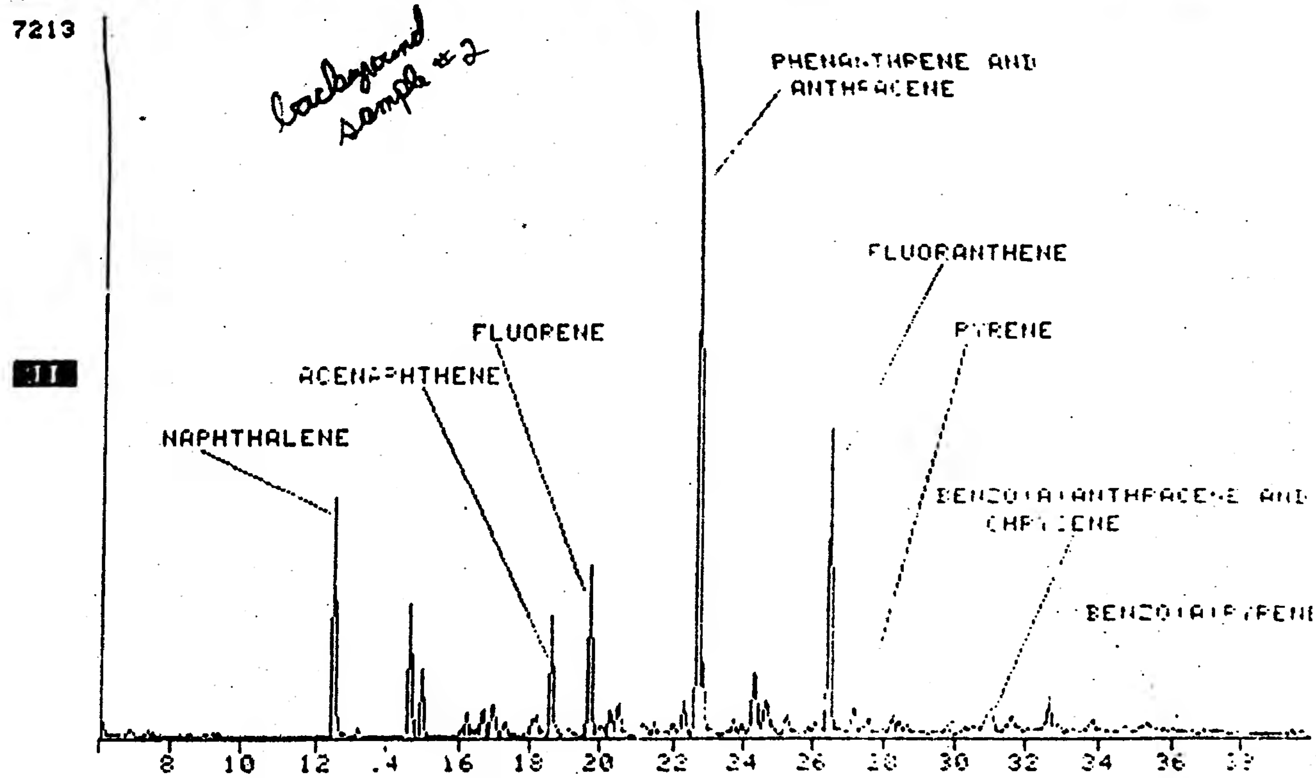
NAME	*RETENTION TIME (minutes)*	*CONCENTRATION*
Fluorene	*19.7*	*5.0 ug/kg=ppb*
Phenanthrene	*22.7*	*41.0 ug/kg=ppb*
Anthracene	*22.9*	*56.0 ug/kg=ppb*
Fluoranthene	*26.5*	*55.0 ug/kg=ppb*
Pyrene	*27.2*	*47.0 ug/kg=ppb*
Benzo(a)antracene	*30.9*	*22.0 ug/kg=ppb*
Chrysene	*31.0*	*22.0 ug/kg=ppb*
Benzo(a)pyrene	*36.1*	*14.0 ug/kg=ppb*

COMPOUNDS NOT FOUND

NAME	*DETECTION LIMIT*
Benzene	< *100.0 ug/kg*
Toluene	< *100.0 ug/kg*
4-Nitrophenol	< *18.0 ug/kg*
Phenol	< *2.4 ug/kg*
2-Chlorophenol	< *3.6 ug/kg*
2,4-dimethylphenol	< *3.6 ug/kg*
2,4,6-trichlorophenol	< *5.4 ug/kg*
Pentachlorophenol	< *13.8 ug/kg*
2-methyl, 4,6-dinitrophenol	< *24.0 ug/kg*
Tetrachlorophenol	< *9.6 ug/kg*

Joe Krend

H-6856,CD-2,BACK,100 GMS:0.5 ML,2 ULS,15:1 SPLIT :1613
3-29-84,JK



COMPOUNDS FOUND

NAME	RETENTION TIME	CONCENTRACTION
Naphthalene	12.5	240.0 ug/kg=ppb
Acenapthene	18.1	5.0 ug/kg=ppm
Fluorene	19.7	119.0 ug/kg=ppm
Phenanthrene	22.7	627.0 ug/kg=ppm
Anthracene	22.8	62.0 ug/kg=ppm
Fluoranthene	26.5	203.0 ug/kg=ppm
Pyrene	27.1	13.0 ug/kg=ppm
Benzo(a)antracene	30.9	36.0 ug/kg=ppm
Chrysene	31.1	37.0 ug/kg=ppm
Benzo(a)pyrene	35.9	5.0 ug/kg=ppm

COMPOUNDS NOT FOUND

NAME	DETECTION LIMIT
Benzene	< 100.0 ug/kg
Toluene	< 100.0 ug/kg
4-Nitrophenol	< 9.0 ug/kg
Phenol	< 1.2 ug/kg
2-chlorophenol	< 1.8 ug/kg
2,4-dimethylphenol	< 1.8 ug/kg
2,4,6-trichlorophenol	< 2.7 ug/kg
Pentachlorophenol	< 6.9 ug/kg
2-methyl,4,6-dinitrophenol	< 12.0 ug/kg
Tetrachlorophenol	< 4.8 ug/kg

Joe Kraus

7. Monitoring Well Installation Report

psi
Professional Service Industries, Inc.
National Soil Services Division

Report No. 286-45062
April 25, 1984

Rollins Environmental Services, Inc.
P. O. Box 609
Deer Park, Texas 77536

Attention: Mr. Daniel W. Bridge
Project Manager

MONITOR WELL INSTALLATIONS
CREOSOTE FACILITY
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

Gentlemen:

Submitted here is our report relative to the installation of monitor wells at the above referenced facility. This work was verbally authorized during the latter part of March, 1984.

Monitor wells were installed at locations staked by Rollins and as shown on the plan, Plate 1. Descriptions of the soils encountered, together with installation details for the wells, are shown on the logs of borings, Plates 2 through 6.

Drilling was done with a truck mounted rotary rig. The initial location, SP-1, was wash bored to a completion depth of 50 feet and the cuttings were visually classified by a geotechnician, in order to determine the soils stratigraphy. Boring SP-2, located within five feet of SP-1, was dry augered into the sand stratum at a depth of 14 feet and water level measurements were made to verify the presence of groundwater. The borehole was then advanced to completion depth by the rotary wash method. The screen and pipe were inserted in the borehole and sand, bentonite pellets and grout were placed in the annulus. A well protector, consisting of a section of four inch steel pipe with a locking cap, was grouted in place at the surface. Boreholes at locations SP-3 through SP-5 were made using the rotary wash method, and the wells were installed as at SP-2. On completion of the installations, an air compressor was used to surge and pump each well.

We appreciate the opportunity to perform this work for you. Should you have any questions or need additional information, please feel free to call.

Very truly yours,

NATIONAL SOIL SERVICES DIVISION

Darryl E. Carlson

Darryl E. Carlson,
Chief Geologist

DEC:ig
Copies submitted: 3

3 4 7 7 2 1 0 5 3 3 5

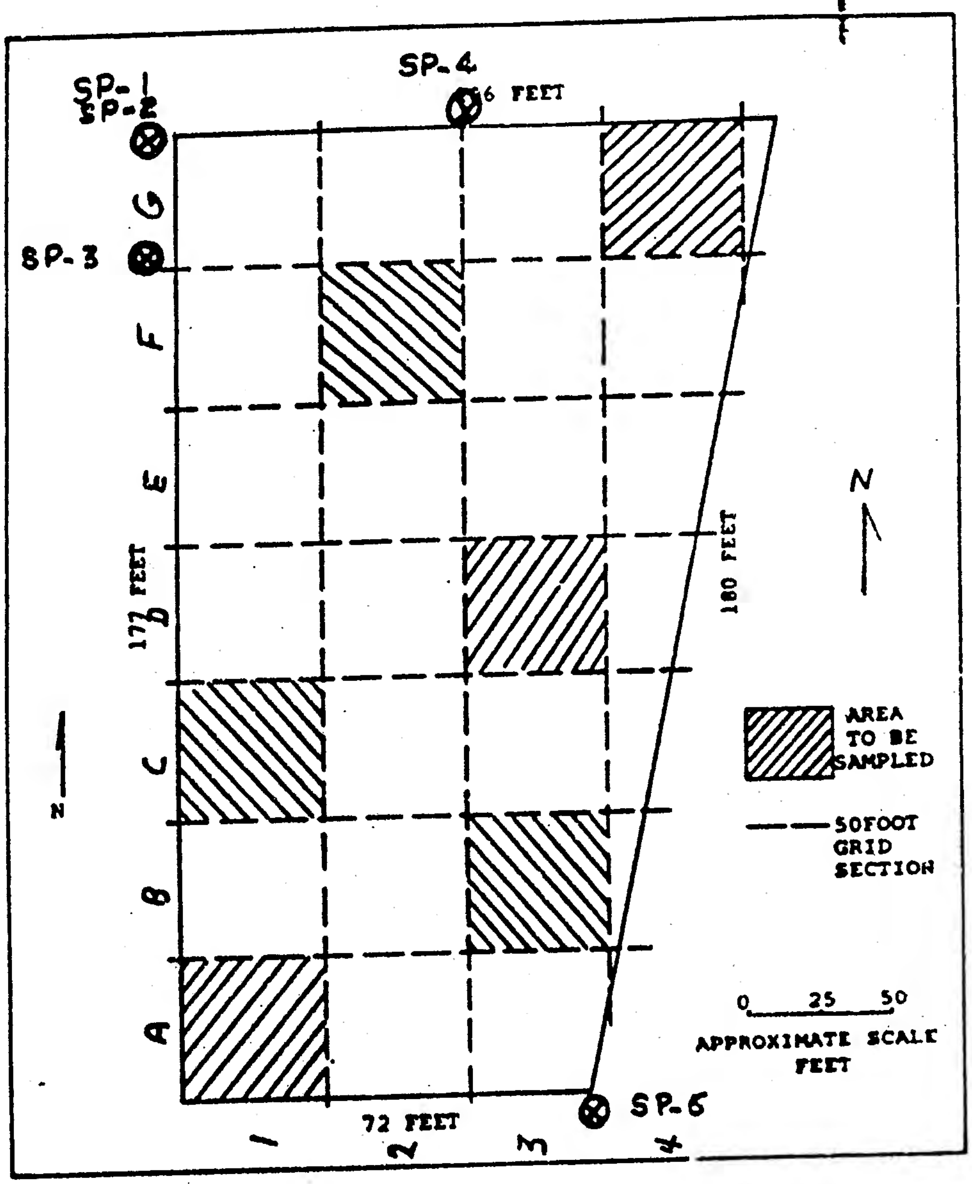


Figure 1.
Creosote facility at
Southern Pacific Transportation Company
Houston, Texas

⊗ MONITORING WELLS

JOB No. 286-45062

LOG OF BORING No. SP-1

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION SUR. ELEV.	MONITOR WELL INSTALLATION
0–13			Black sandy clay - tan and light gray below 3' - light gray and tan below 5' - tan and light gray below 12'	NOTE: This boring was made to determine soil stratigraphy, and therefore a well was not installed. A well was installed in SP-2, located within five feet of SP-1.
13–17			Tan sand	
17–29			Tan and light gray clay	
29–37			Tan and light gray clay w/sand seams	
37–40			Red clay	
40–50			Tan and light gray clay w/sand seams Note: Backfilled with cuttings on completion.	

COMPLETION DEPTH: 50'
DATE: April 17, 1984

DEPTH TO WATER:
DATE:

PLATE 2

NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

KG COH004331

JOB No. 286-45062

LOG OF BORING No. SP-2

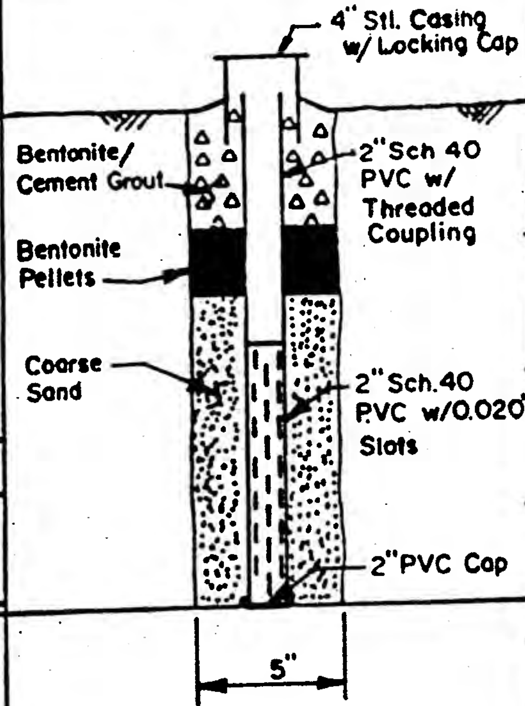
MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Auger & Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION SUR. ELEV.:
0			Dark gray clay - light gray and tan w/calcareous nodules below 7' - tan and light gray w/silt pockets 10' - 11'
12			Light gray silty clay
14			Tan and light gray sand w/chemical odor - free water at 14'
18			Light gray clay

MONITOR WELL INSTALLATION



COMPLETION DEPTH: 18.5'
DATE: April 17, 1984

DEPTH TO WATER:
DATE:

PLATE 3

JOB No. 286-45062

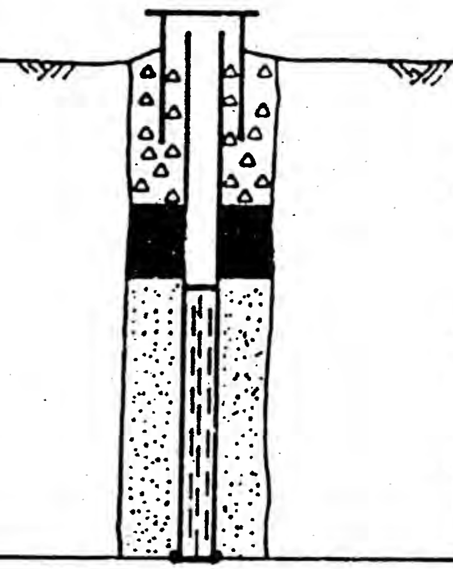
LOG OF BORING No. SP-3

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION	MONITOR WELL INSTALLATION
			SUR. ELEV.:	
0			Black sandy clay	
			- tan and light gray below 3'	
5				
			- light gray and tan below 7'	
			- tan and light gray w/sand seams below 9'	
10				
			Tan and light gray sand	
15				
20				
25				
30				
35				
40				
45				



Note:
For Description Of Material Used, See Plate 3.

COMPLETION DEPTH: 18.5'
DATE: April 17, 1984

DEPTH TO WATER:
DATE:

NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 4

KG COH004333

JOB No. 206-45060

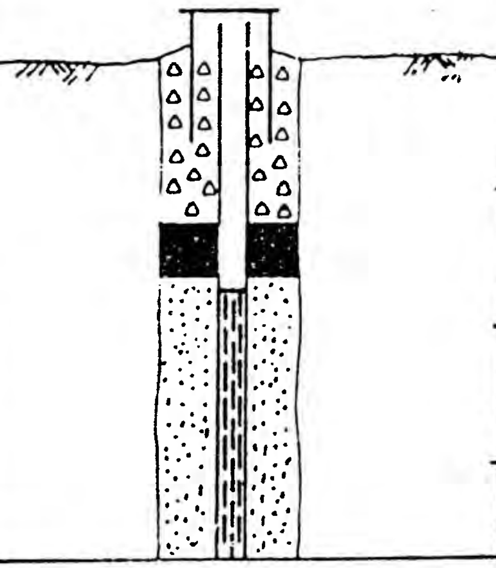
LOG OF BORING No. SP-4

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION	MONITOR WELL INSTALLATION
			SUR. ELEV.:	
0			Red clay - black below 3'	
5			Light gray and tan sandy clay - tan and light gray below 9'	
10				
15			Light gray and tan sand	
20				Note: For Description Of Material Used, See Plate 3.
25				
30				
35				
40				
45				



COMPLETION DEPTH: 18.5'
DATE: April 17, 1984

DEPTH TO WATER:
DATE:

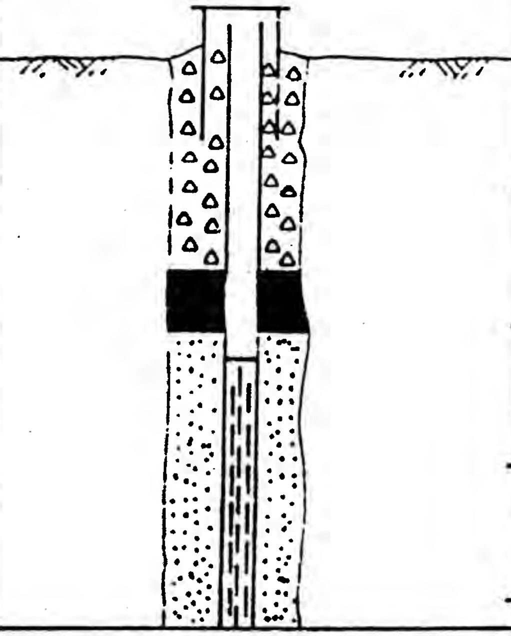
NSI / NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 5

JOB No. 286-45062

LOG OF BORING No. SP-5

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION SUR. ELEV.:	MONITOR WELL INSTALLATION
0			Tan and dark gray sandy clay - dark gray below 3' - light gray and tan below 7' - tan and light gray w/calcareous nodules below 12'	
15			Light gray sand	
21				Note: For Description Of Material Used, See Plate 3.

COMPLETION DEPTH: 21'
DATE: April 18, 1984

DEPTH TO WATER:
DATE:

PLATE 6

8. "Closure of Facilities" Letter by
Independent Registered Engineer

3452210503

ETC ENGINEERS, INC.
Engineering Technical Construction Services For Industry
610 COLLEGE SO. HOUSTON, TEXAS 77587 713/941-8420

April 18, 1984

Texas Department of Water Resources
P.O. Box 13087, Capitol Station
Austin, Texas 78711

CLOSURE OF FACILITIES

This is a statement of the closure of a creosote tank bottom surface impoundment (RCRA Facility #31547) at the Southern Pacific Transportation Company facility, 4910 Liberty Road, Houston, Texas.

The owner has removed all the impoundment materials in accordance with Texas Administrative Code Section 335.286a. The excavated area has been backfilled and compacted with clay soil. Four ground-water monitoring wells have been constructed. This system will be monitored for one year. If after one year it is determined that there is no affect on the ground-water, there is sufficient proof that the impoundment is clear of any contamination.

I hereby certify that I have examined the facility and being familiar with the provisions of the Texas Administrative Code Subchapter N, Surface Impoundment Sections 335.281-335.288 attest that this closure has been conducted in accordance with good engineering practices.

Henry T. Gramann
Printed Name
of

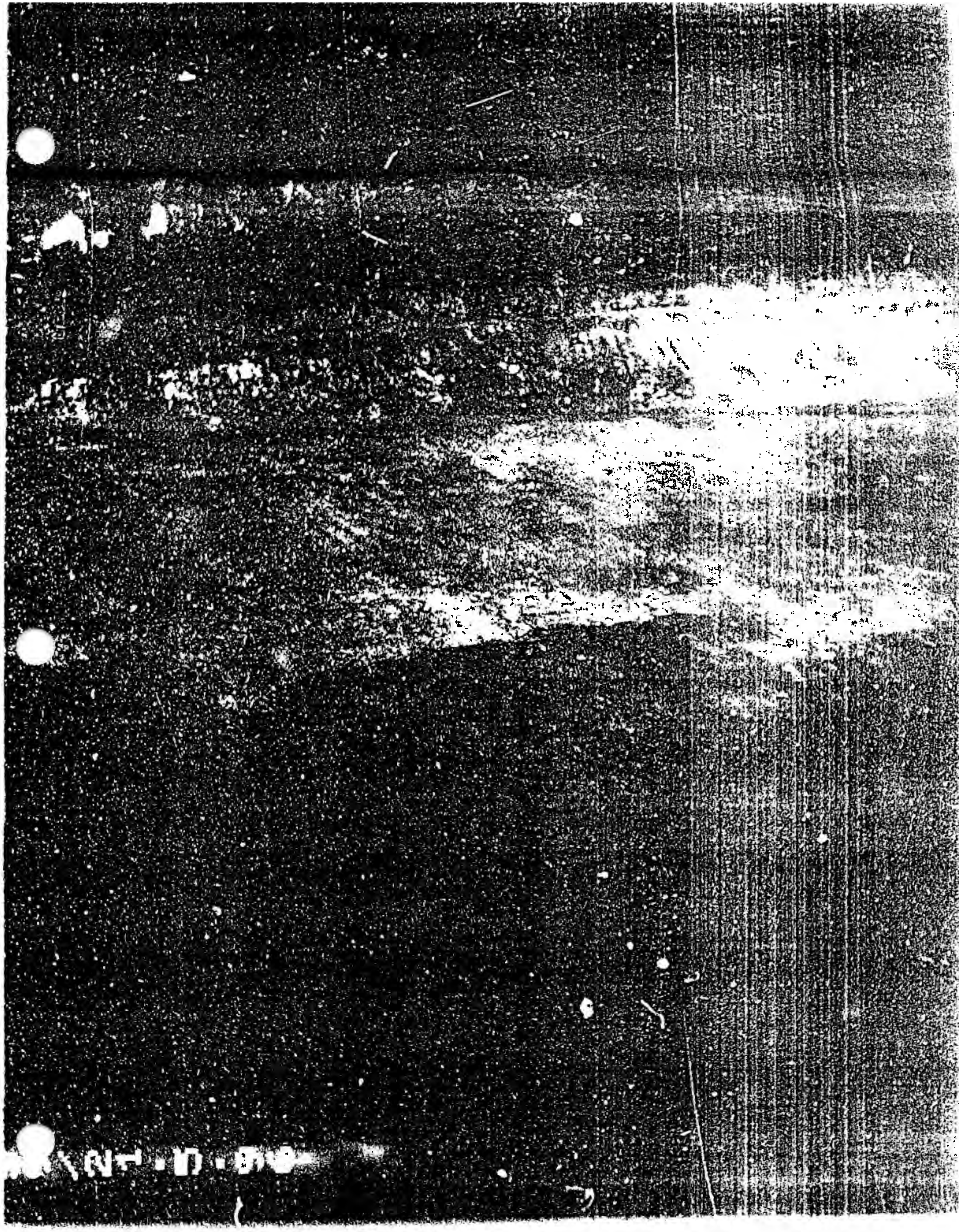
Henry T. Gramann
Signature of
Registered Professional Engineer
Regis. No. 28163 State Texas

Date April 18, 1984

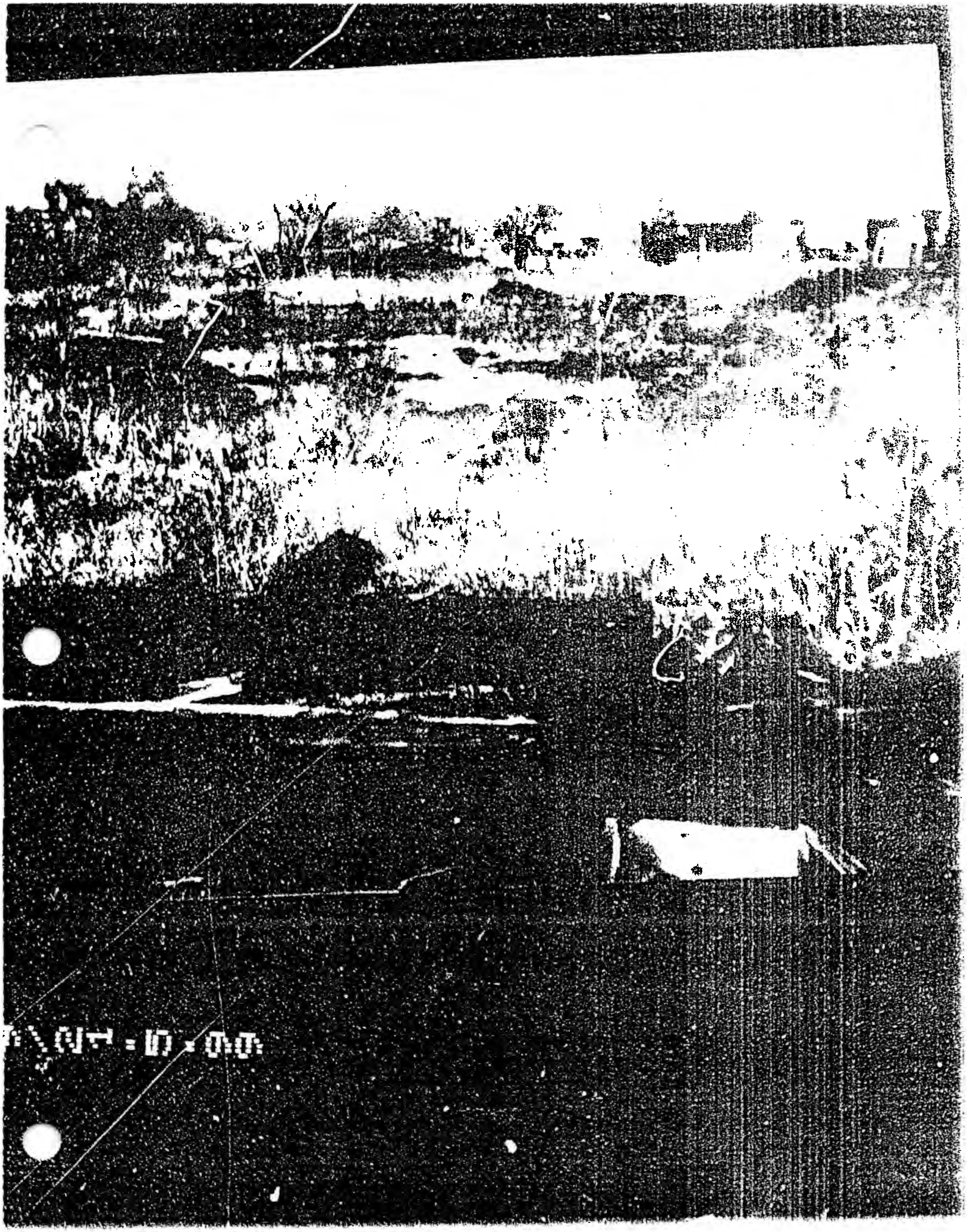
9 1 1 7 2 1 0 5 0 9 4

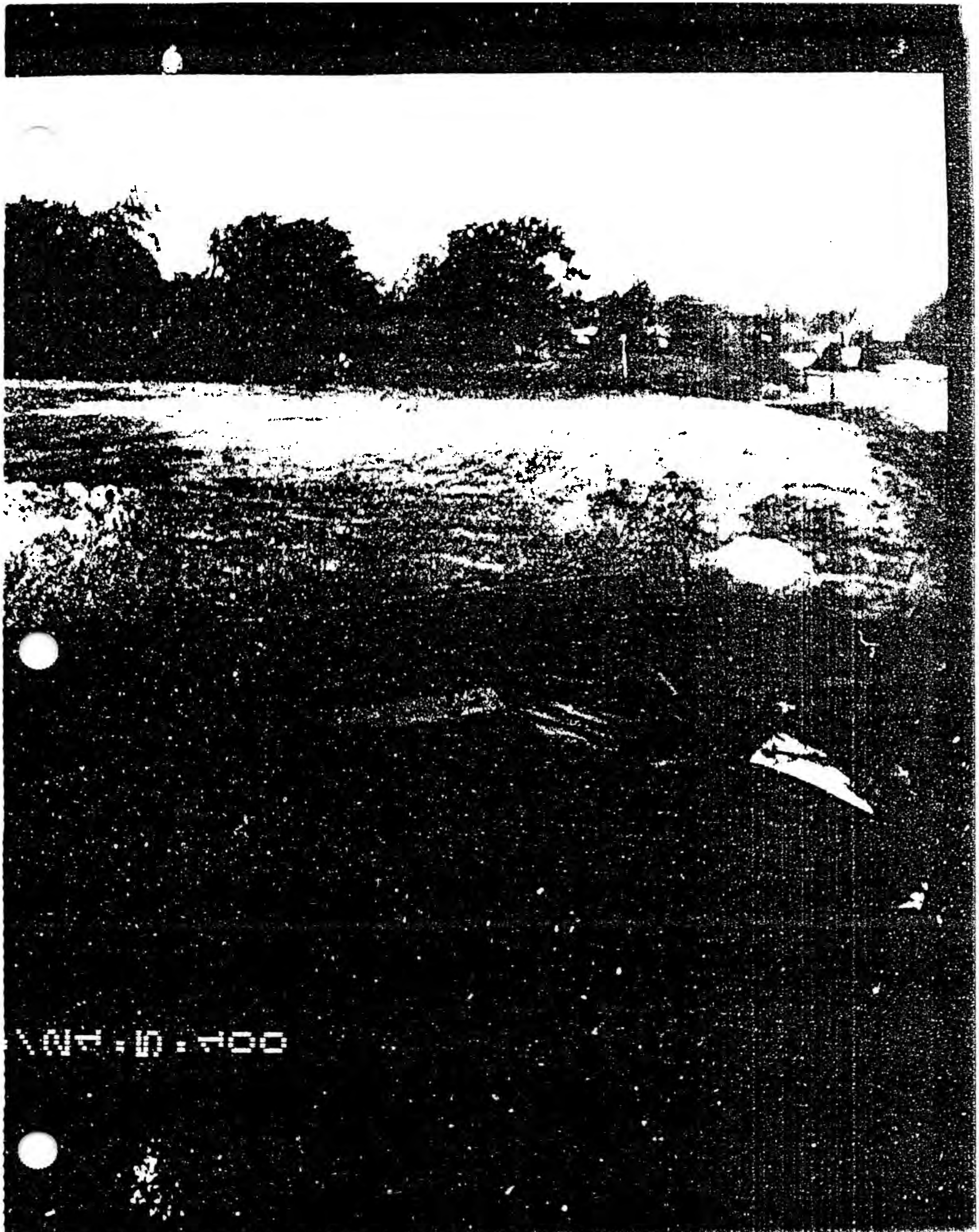
APPENDIX B

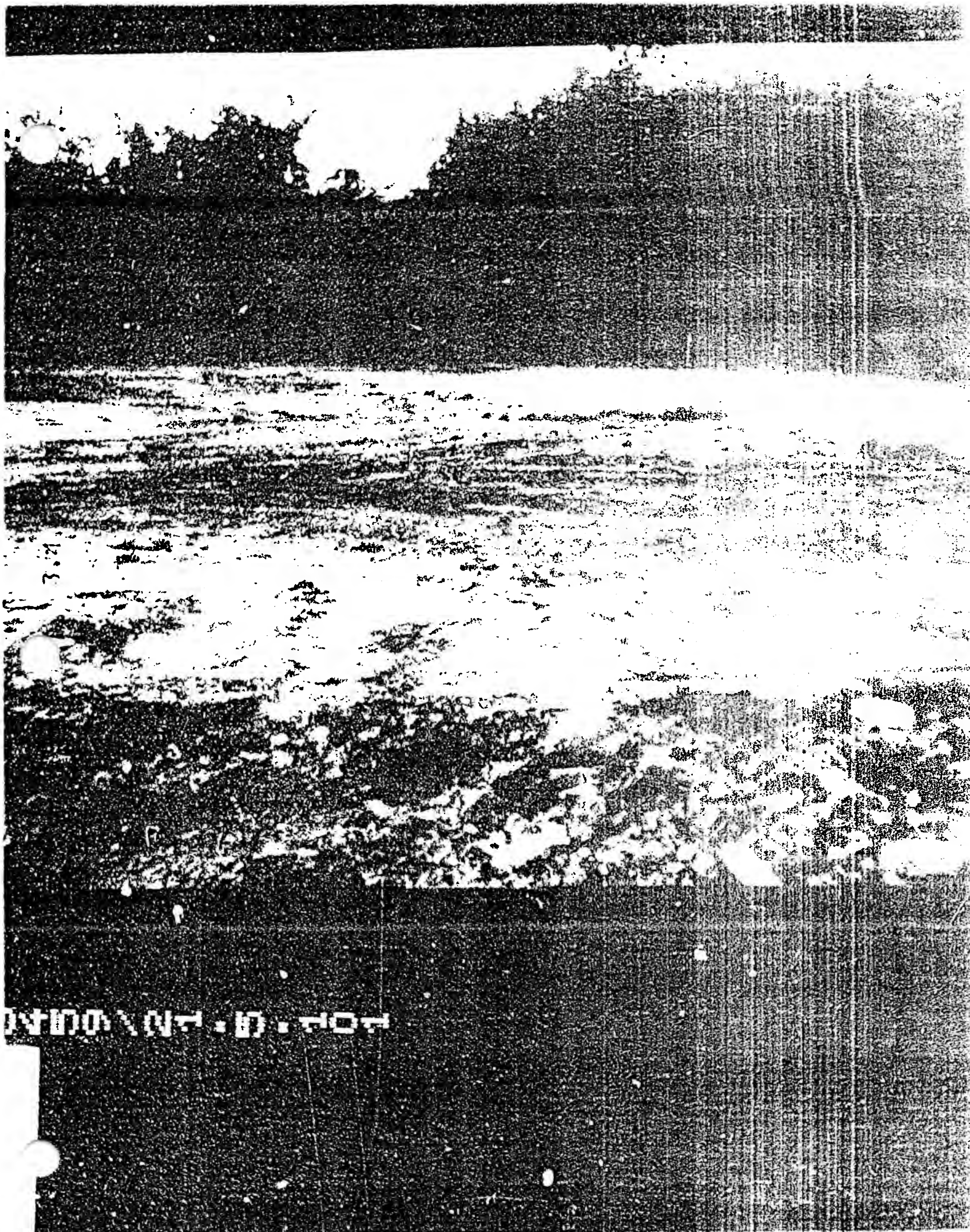
PROJECT PHOTOGRAPHS



KG COH004341







KG COH004344

END OF REPORT

49, 54, 55, 56, 58, 59,
64, 66, 115, 116, 117

KG COH004346

PUBLIC HEALTH ASSESSMENT

BRIO REFINING, INC.
AND
DIXIE OIL PROCESSOR, INC.

SUMMARY

The Brio Refining, Inc. (Brio) and Dixie Oil Processors (DOP) NPL Sites are located approximately 20 miles southeast of Houston, Texas. The shallow groundwaters of both sites are heavily contaminated with volatile organic chemicals (VOCs). The documents reviewed did not indicate that there was any known use of contaminated groundwater from the shallow aquifer (Numerous Sand Channel Zone [NSCZ] and Fifty-Foot Sand zones) near the site for human consumption. There are approximately 28 water wells (both potable and non-potable) within a one-mile radius of the sites which were completed in the deeper aquifers (>400 feet deep). The deeper aquifers are separated from the upper aquifers by a 100 foot thick clay aquitard. The deeper aquifers are not known to be contaminated at this time. No surface drinking water intakes were identified n the surrounding area. Former on-site pits are heavily contaminated with VOCs, polyaromatic hydrocarbons (PAHs), metals, and semi-volatile compounds. On-site remedial or construction activities could expose workers to air, soil, and groundwater contamination, and could lead to the off-site migration of contaminants if appropriate precautions are not implemented. Human contact with sediment from Mud Gully south of Dixie Farm Road would not be expected to pose a Significant Health Risk. Analyses of air ad soil samples form Southbend Subdivision did not reveal significant contamination with site-related chemicals. Based on the available information, the Brio/DOP Sites are of public health concern, but currently pose no significant risk to public health under the assumptions that contaminated groundwater is not used for human consumption and the site conditions and migration pathways remain unchanged.

BACKGROUND

A. SITE DESCRIPTION

The Brio/DOP sites are located in Harris County approximately 20 miles Southeast of Houston, Texas (see Appendix, Figure 1). The sites are about 1.5 miles southwest of Interstate 45 at the Ellington Field Exit. About one to two miles further south is the community of Friendswood. The Brio/DOP sites are located north and south of Dixie Farm Road. For simplicity, the sites will be referred to as Brio north, Brio south, DOP north and DOP south. The Brio orth and DOP north sites are separated by a flood control ditch called Mud Gully, which discharges to Clear Creek. Brio is bordered on the northwest (NW) by Southbend Subdivision and to the northeast (NE) by Beamer Road. DOP is bordered on the NW by open fields and an athletic field to the southwest (SW). Other areas surrounding both sites are open lands used for oil and gas production. The Brio and DOP sites are 58.1 and 26.6 acres respectively. Both sites north of Dixie Farm Road were used for storage purposes (impoundments and pits). The areas south of Dixie Farm Road were mainly used for processing activities. There are on-site water supply wells at both brio/DOP sites. These wells were intended for potable and non-potable use and were completed in the aquifer at a depth of approximately 475 feet.

Brio Site:

Approximately 23 unlined storage pits were constructed and closed on the Brio site during the period 1957 to 1982.

From 1957 to 1969, the major industrial operations included regeneration of cooper catalysts, recovery of petrochemicals from styrene tars and recovery of chemicals from vinyl chloride still bottoms. Reclamation of petrochemicals from various chemical feedstocks also occurred at Brio. Because of a lack of processing capacity, styrene tars were stored in large impoundments.

KG COH004347

Spent caustics were stored in tanks during 1969 to 1971. Hydrogen sulfide was blended with spent caustic to produce cresylic acid, sodium sulfide and sodium crystallite.

During the time period 1975 to 1978, styrene tar, diesel fuel that did not meet specifications, ethylbenzene, phenol bottom, cutter stock, caustic, crude oil, blend oil, polyethylbenzene bottoms, and crankcase oil were utilized as feedstock.

Styrene tars were stored in open pits on the site. Several pits were closed between 1957 to 1977.

The recovery plant was converted to a crude oil topping unit for jet fuel production in 1978. Different fuels were produced by distillation of crude oil. No cracking or reforming of feedstocks took place.

DOP Site:

?

Six unlined impoundments were used by DOP north for cooper catalyst recovery and hydrocarbon washing operations from 1969 to 1978. The impoundments were used to store the wastewater prior to cooper recovery and to treat the wastewater prior to discharge. Wastewater from the hydrocarbon washing operation was discharged into one of the impoundments. The impoundments were closed during the above period.

DOP south began operations in 1978. The operations were similar to DOP north. The site was used to regenerate copper chloride catalyst and hydrocarbon washing to produce ethylbenzene, toluene, aromatic solvents, styrene pitch, and for oil recovery. Feedstocks were residues from local chemical plants and refineries (phenolic tank bottom tars and glycol cutter stock).These were blended and distilled to produce various petroleum products, including fuel oil, creosote extender, and a molybdenum catalyst. Presently, both DOP north and DOP south use some of the storage tanks for an intermediate storage operation.

B. SITE VISIT

A site visit was made on January 25 to 27, 1988, with ATSDR Headquarters and Regional personnel, the EPA Remedial Project Manager, and members of the Brio Task Force. The site was fenced and appeared to be well secured. Site security personnel were present.

The area surrounding the site appears to have experienced a moderate population growth. Residences, businesses, a hospital, and a school were located within about one-half mile of the site. Much land is still used for cattle grazing and oil production.

The site terrain is level. Mud Bully Creek, which passes through the site, did not appear to be visibly polluted. The Brio/DOP north soils contained many small black objects that appeared to be tar residues. All process pits were backfilled and leveled to the surrounding terrain. Evidence of apparent plant toxicity was found at the northwestern area between DOP and Brio north near Mud Gully. A 10-20 foot by 100 foot long strip of land along the northern and western edges of Brio north contained a black granulated soil and was devoid of plant life. Analyses of soil samples from the bare areas reportedly did not detect significant concentrations of priority pollutants; therefore the cause of the phytotoxicity is unknown. Surface runoff from this area enters Mud Gully.

Next Section Table of Contents

PUBLIC HEALTH ASSESSMENT

BRIO REFINING, INC.
AND
DIXIE OIL PROCESSOR, INC.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. ON-SITE CONTAMINATION

1. GROUND CONTAMINATION (see Appendix, Tables 1,2)

2. PIT RESIDUALS - BRIO/DOP SITES (see Tables following).

3. MUD GULLY SEDIMENTS - BRIO/DOP SITES (see Tables following).

PIT RESIDUAL - BRIO/DOP SITE

Contamination	Min/Max	Concentration (mg/kg)
1,1,2-Trichloroethane	ND	166,000
1,2,-dichloroethane	ND	245,000
Vinyl chloride	ND	22,700
Methylene chloride	ND	909
Ethylbenzene	ND	2,190
Styrene	ND	518
Hexachlorobenzene	ND	674
Bis (2-chloroethyl)ether	ND	3,040
Phenanthrene	ND	6,670
Fluoranthene	ND	988
Chromium	ND	1,300
Copper	ND	182,000
Lead	ND	10,100

ND - Not Detected
mg/kg - milligrams per kilogram

MUD GULLY SEDIMENTS
BRIO NORTH AND BRIO SOUTH

Contaminants	Concentration (mg/kg) Geometric Mean Brio North
Copper	567
Chromium	23
Phenanthrene	5.1
Fluoranthene	70.3
Pyrene	17.7
Benzo(a)anthracene	4.3
Chrysene	133.5
Benzo(b)fluoranthene	3.8
Benzo(k)fluoranthene	25.8
Benzo(a)pyrene	--
Dibenzo(a,h)anthracene	10.7

MUD GULLY SEDIMENTS
DOP NORTH AND DOP SOUTH

Contaminants	DOP North	Concentration (mg/kg) Geometric Mean DOP South
Cooper	1,586	183
Chromium	28	26
Acenaphthene	9.8	---
Phenanthrene	0.6	2.0
Fluoranthene	0.86	8.86
Pyrene	---	4.07
Benzo(a)anthracene	---	0.8
Chrysene	---	12.73
Benzo(b)fluoranthene	4.28	---
Benzo(g,h,i)perylene	1.4	---
Indeno(1,2,3-cd)pyrene	---	2.6

(---) analyzed but not detected.

B. OFF-SITE CONTAMINATION:

Southbend Subdivision is outside the northern boundary of Brio north. There are five pits located along the Brio north northern boundary. Soil samples were taken from the pits (backfill) and subdivision properties to determine the lateral extent of contaminant migration. During the Remedial Investigation, soil samples were collected from multiple locations in Southbend Subdivision residential lots at depths of 0-1 foot and 9-10 feet. In June 1988, additional soil samples were collected from residential lots in the Southbend Subdivision at depths of 0-5 feet. These samples were analyzed for acid base/neutral compounds, VOCs, and one sample was analyzed for metals. Only a low level of phenanthrene (806 ug/kg) was detected. The migration of metals from Brio north did not appear to be addressed, although data indicated high levels of lead (7,800 mg/kg), copper (182,000 mg/kg), and chromium (1,000 mg/kg) in some pits on the Brio North northern boundary. However, metals migration should not be a problem since fill was used to raise the ground level of the subdivision along the boundary above the ground level of Brio north.

There may have been some limited, on-site lateral migration of copper from DOP pits AA and CC. Lead and chromium in the DOP north pit subsoils were analyzed for but not detected.

Off-site NSCZ monitoring wells in Southbend Subdivision indicated high concentrations of volatile organic compounds near the site boundary that rapidly diminished a few hundred feet beyond the site boundary. Since this area is served by a deep municipal well, minimal or no groundwater exposure is anticipated.

C. PHYSICAL HAZARDS

During a site visit on January 26, 1988, a physical survey revealed much debris, old process equipment, and storage tanks. The estimated quantity of waste liquids left in the storage tanks is approximately 200,000 gallons. Only two large lagoons remain which were used in the past for process wastewater treatment. The two lagoons trap stormwater; periodically, the stormwater is manually discharged. At Brio south, a large box weir was found filled with water. At DOP south, a large wastewater pump pit was also found filled with water. The storage tanks appear abandoned with holes in the sides of some of them. Many tanks still hold chemical residues that may present a future hazard due to tank corrosion. The lagoons and stump pits were at grade level, filled with water, and may represent a drowning hazard for trespassers.

DEMOGRAPHICS

The Brio/DOP sites are within two Standard Metropolitan Statistical Areas (SMSA) - Houston and Galveston-Texas City, Texas. The estimated population within a one-mile radius of the site is approximately 5,700. Census data indicate that the population in the site area is composed mostly of young families residing in recently-developed communities that constitute suburban Houston.

No residence were within one mile of the sites prior to 1972. Three homes were built between 1972 and 1976 within 1,000 feet of the sites. The Southbend subdivision was built adjacent to the northern boundary of the Brio site between 1980 and 1984. The subdivision is approximately 502 acres, of which approximately one-half is presently developed with single-family homes. Thirty-one residences are on the NW boundary of the site, and Weber Elementary School is located approximately 1,200 feet NW of the site.

The Southbend Municipal Utility District water well is located approximately 1.25 miles west and southwest of the site. The well is approximately 1,200 feet deep with a well casing diameter of 16 inches. The depth of the screen is not known. This well supplies water for the homes in Southbend Subdivision.

Northwest of Southbend is the Sageglen Subdivision.

Approximately one mile north is the Scarsdale Subdivision.

Memorial Southeast Hospital, with approximately 920 beds, is located approximately 3,200 feet NW of the site. The community of Friendswood is located one to two miles to the south and southwest of the site.

Outside of the residential areas, the land is used for grazing and oil and gas production. Approximately 26 oil and gas wells are located within a half-mile radius of the site.

An athletic field is located immediately adjacent to DOP north. The field is used as a public ball park (USA Ball Park). A well at the ball field was completed at a depth of greater than 250 feet and is reported by EPA to be used only for irrigation purposes.

Water is supplied by public or private utilities to almost all homes within a one-mile radius of the Brio/DOP site.

Population distribution by sex is comparable to the national average. The number of children (under 5 years of age) is three times the national average. The number of elderly persons (62 years and older) is one-fourth the national average. Median age is three years younger than the national average. Most employed persons (over 16 years of age) are in managerial, professional, technical, or administrative position. Seventy-five percent of the residences are owner-occupied, single-family dwellings.

KG COH004351

EVALUATION

A. SITE CHARACTERIZATION (DATA NEEDS AND EVALUATION)

1. Environmental Media:

The Final Summary Report, Final Endangerment Report and previous investigations conducted air, hydrologic and geologic evaluations. Sampling efforts were concentrated on groundwater, surface water, sediments of Mud Gully, soil sampling on site and off, and air.

2. Land Use and Demographics:

The nearest municipal well is over one mile from the site and is approximately 1,200 feet deep. Complete data does not appear to be available for a listing of domestic potable wells and the depths in which they are completed within one mile of the site. These wells, if any exist other than those listed in the Reference 2 well inventory, should not be affected because the site contamination only extends a few hundred feet beyond the northeast site boundary.

The Brio/DP sites are fenced to preclude trespassing. This health assessment is based on the sites being remediated or remaining undeveloped with proper maintenance of controlled access. If the sites are zoned for residential use in the future without proper remediation, his assessment would not be valid.

3. Quality Assurance/Quality Control (QA/QC):

This health assessment was based on compile data from the FINAL SUMMARY REPORT, BRIO REFINING, INC. AND DIXIE OIL PROCESSORS SITE, FRIENDWOOD, TEXAS, June 1987. Environmental samples collected during the investigations were analyzed by contract laboratories. The results were submitted to EPA Region VI for QA/QC analyses.

B. ENVIRONMENTAL PATHWAYS:

The site groundwater system is composed to two shallow confined groundwater flow zones overlying the Chicot aquifer system, a regional drinking water aquifer. The upper shallow groundwater has been labeled the Numerous Sand Channel Zone (NSZC). The NSC begins at 14 to 32 feet below the surface and is semi-confined by an overlying clay layer that varies from 5 to 32 feet thick. Potentiometric surface maps indicate that the water flow in the NSCZ is towards Mud Gully. A middle clay unit from 8 to 20 feet in thickness separates the NSCZ from the lower groundwater zone, the Fifty-Foot Sand Zone. The Fifty-Foot Sand Zone ranges from 35 to 45 feet in thickness. Underlying the Fifty-Foot Sand is clay unit approximately 100 feet thick that separates the shallower water bearing units from the major water producing lower aquifers (Chicot, Evangelize, and Jasper).

1. Groundwater discharge to Mud Gully: The NSCZ is heavily contaminated by numerous site chemicals. Groundwater flow in the NSCZ is toward Mud Gully at a rate of 3 to 70 feet per year. Since the water flow in the NSCZ is towards Mud Gully, contaminants in this zone may migrate horizontally to Mud Gully and be transported to off-site locations. Mud Gully is also used as a drainage channel for a wastewater treatment plant.

2. Groundwater pertaining to well drinking water supplies: The groundwater existing in the NSCZ under the site is contaminated (see Appendix, Tables 1 and 2). The NSCZ does not appear to be a major existing or potential drinking water source because of the poor yield of the aquifer.

The Fifty-Foot Sand zone has a small amount of contamination (see Appendix, Tables 1 and 2) from 1,1,2-trichloroethane (20 ug/l), 1,2-dichloroethane (55 ug/l), and methylene chloride (70 ug/l). Reference 1 concluded that there are no known uses of groundwater from the Fifty-Foot Sand zone. However, one well (5J) was reported in the Reference 2 well inventory and is screened at a depth of 87-97 feet. No sampling was performed on this well which is approximately one-half mile northwest of the site. Two

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other wells were also mentioned in the well inventory as being near the site (511 and A). The screened depths were listed as 260-282 feet and greater than 250 feet. No sampling has been performed on well 511. Well a (located at the athletic ball field 1,000 feet west of the DOP site) was tested and found not to be contaminated. These wells were reported as being located hydraulically upgradient of the site. The two wells 5J and 511 were not expected to show any contamination because the shallow groundwater contamination plume extends only a few hundred feet beyond the site boundaries and the deeper aquifers were not found to be contaminated.

No surface drinking water intakes exist in the surrounding area. Drinking water sources are mostly groundwater supplied by the Municipal Utility District and the City of Houston from wells greater than 500-600 feet deep. A clay aquitard approximately 100 to 120 feet thick exists between the Fifty-Foot Sand zone and the lower aquifers. It appears unlikely that contaminants could migrate vertically through the clay aquitard and reach the deep aquifers, except through an earth fault or a physical penetration of the clay layer (wells). It is possible for contaminated water in the NSCZ to migrate vertically along ungrouted well casing or corroded well casing of in-use or abandoned oil and water wells, either on-site or downgradient off-site. However, EPA noted that there were no off-site wells that intercept the contaminated NSCZ groundwater and hat on-site inactive oil wells have been plugged according to state procedures. Therefore, this contamination pathway was not considered further.

Other major wells that were evaluated and not found to be contaminated are: Southbend, Weber Elementary, Pearland, West University, Seabrook House, and the Athletic Field baseball well west of the DOP Site.

Faults: an on-site fault runs east-west of the DOP site. If the fault intersects groundwater or other subsurface materials, the clay aquitards could be affected. There may be ap potential for cross-contamination of the aquifers. If the upward hydraulic gradient on the site persists, there appears to be little potential for vertical contaminant migration to deeper aquifers. However, as will be discussed below, this may not be true.

Pipeline routes: A pipeline is located on the northeast side of the Brio north site. The pipeline is locate on the northeast side of the Brio north site. The pipeline was investigated to determine if there are a potential for a horizontal off-site pathway. Sample analyses of backfill indicate minima concentrations of four contaminants in the groundwater. Based on this data and the clay backfill material, he pipeline did not appear to be a significant pathway for contaminant migration.

3. vertical migration or flow from the NSCZ to the Fifty-Foot Sand: the potential exists for contaminants to more from the NSCZ to the Fifty-Foot Sand shallow aquifers. General information indicates that an upward hydraulic gradient exists between the two zones over most of the Brio/DOP north and south sites. There is a downward gradient at the northern corner of the sites. Based on the model presented in reference 2 an the upward hydraulic gradient on the most of the site, the conclusion was reached by the Final Summary Report that his was not a likely exposure pathway. However, the hydraulic gradient was calculated from potentiometric data gathered during the months of August, October, and March. The data set may not be adequate to describe the long-term potential for vertical migration of contaminants. Hydraulic gradients can reverse with seasonal recharge events an droughts. Monthly water level measurements over a one to two year period would provide would provide a better data set to determine variations in vertical flow and contaminant migration.

Also, some dense non-aqueous phase liquids (DNAPL) were found in the NSCZ (see Appendix, Table 3). These DNAPLs are denser than water. They may counteract the upward hydraulic gradient and migrate by gravity to the Fifty-Foot Sands or downward through an earth fault The ROD required removal of DNAPLs from Pits J and Q and should eliminate or minimize the migration of these contaminants by gravity.

4. Sediment runoff to Mud Gully: Mud Gully passes through the site. About 2,000 feet downstream, Mud Gully flows into Clear Creek. Clear Creek discharges into Clear Lake about 12 miles downstream. Elevated concentrations of PAHs were found in Mud Gully sediments (271 mg/kg) collected at a location between Brio north and DOP north. Chrysene, a suspected carcinogen, was detected in sediment

at a concentration of 149 mg/kg. Further downstream, PAH concentration in Mud Gully sediment samples were relatively low (21 mg/kg).

5. Surface Water: Mud Gully surface water data collected adjacent to Pit B was contaminated with 1,1,2-Trichloroethane (35.5 ug/1), 1,2-dichloroethane (26.1 ug/1), and chrysene (154 chemicals (VOCs, PAHs) may be absorbed through the skin during contact with contaminated soils and sludges.

Human exposure pathways that are consistent with the environmental pathways previously discussed are:

1. Ingestion of water: The contaminated NSCZ groundwater is unsuitable for human consumption without treatment. From references 2, off-site contamination by the site NSCZ groundwater appears to be limited to the northern boundary of Brio-north and extends about 200 feet into the Southbend Subdivision. The subdivision is on a municipal well that is 1,200 feet deep and has no known contamination.

Reports (Reference 1 and 2) indicate that NSCZ groundwater is not a major existing or potential drinking water source because of the poor yield of the aquifer. Public or private utilities provide drinking water within a one-mile radius of the site. Complete data for domestic wells near the site was not available (other than those listed in the well inventory in Reference 2). There does not appear to be any major potable use of the shallow contaminated aquifer.

There may be a potential for contaminants to enter the Fifty-Foot Sand zone from the NSCZ zone thorough earth faults, abandoned defective wells, or well casings. EPA reported that there are no off-site wells in the NSCZ contamination plume that may contaminate the lower aquifers and that on-site inactive oil wells have been plugged according to state procedures. Currently, gross contamination of the Fifty-Foot Sand does not seem to have occurred.

It will be assumed in this Health Assessment that there is no current major human consumption of contaminated ground water (not withstanding the two wells, 511 and 5J, which have not been sampled). It will also be assumed that the affected portions of the upper aquifers are not being used for agricultural irrigation or for livestock watering.

Mud Gully is reportedly not being used as a drinking water source. Therefore, significant human ingestion of water from Mud Gully is not likely. Inadvertent ingestion of surface water from Mud Gully may occur it children or other trespassers play in or contact the water that flows through the site. However, such exposure is expected to be infrequently because of fences and heavy underbrush that restrict access to Mud Gully.

2. Dermal contact and absorption of contaminants from surface water: Children or trespassers who come in contact with water that flows through Mud Gully may be exposed to water contaminants by skin contact and dermal absorption.

3. Inhalation of air and volatile emissions: The former storage pits at the sites are potential sources of air-bourn contaminants. Both on-site workers and off-site, down-wind residents could be exposed to VOCs through the inhalation route.

The initial air sampling for VOCs was conducted by the Texas Air Control Board (TACB) during January-March 1985 at the Brio and DOP sites. Vinyl chloride was not detected in excess of the detection limit of approximately 2 p[b, nor was tetrachloroethylene detected at concentration in excess of 1 and the highest hourly average value was 65 ppb. For toluene, the 10-day average air concentration was 16 ppb, and the highest hourly average value was 95 ppb.

Additional air sampling during warm ambient temperatures was conducted by Southwest Research Institute on July 10 and 11, 1985, and by the TACB on August 2, 1988. These studies also detected only low concentrations of air contaminants that were comparable to or less than the initial sampling results described above.

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VOCs were detected in Mud Gully surface water. Trespassers or children who play near the stream may inhale VOCs that volatilize from the water. However, a noted above, such exposures are expected to occur infrequently.

4. Soil ingestion and dermal exposure:

Off-site surface soils:

A residential neighborhood, the Southbend Subdivision, is located northwest of the Brio-north sites. Numerous waste pits (F,I,J,K,L) were located along the northern edge off the site. To test for possible lateral migration o contamination, soil samples were collected in the Southbend Subdivision at distances of 60-125 feet from the pits. Soil samples collected at a depth of 0-1 foot did not contain any site-related chemical contamination except for a low concentration of PAHs (3.255 mg/kg) detected in one sample.

In June 1988, an additional 11 soil samples were collected at depths of 0-5 feet from the Southbend residential area. An analysis of these samples did not detect the presence of any significant contamination. Therefore, contact with surface and subsurface oils from the Southbend Subdivision along the northern border of the Brio property line would not be expected to pose any known health risk.

On-site surface soils:

Human exposure to soil contaminants by ingestion and dermal absorption is possible for on-site remedial and construction workers or for trespassers. A wooden fence plus a chain-link fence topped with three strands of barbed wire separate the Brio site from the Southbend Subdivision. Therefore, t is not likely that neighborhood residents would come into contact with waste material at the Brio site.

Mud Gully sediments:

Mud Gully may receive groundwater discharge form the NSCZ in addition to receiving surface water and suspended sediment runoff from the Brio and DOP sites. Several carcinogenic and non-carcinogenic PAHs were detected in Mud Gully sediments from sampling points adjacent to the Brio/DOP sites. The total maximum concentration of carcinogenic PAHs ranged from 2-47 mg/kg. Two VOCs, 1,1,2-trichloroethane and 1,2-dichloroethane, were detected in Mud Gully surface water samples that were collected adjacent to Pit B.

Mud Gully sediment samples collected south of Dixie Farm Road contained PAHs at a geometric mean concentration of 31 mg/kg, as well as copper (125 mg/kg) and chromium (25.5 mg/kg). No data on concentrations of contaminants in Mud Gully stream water from south of Dixie Farm Road were available.

5. Ingestion of Biota:

The volume and quality of water in Mud Gully are inadequate to support game fishing. However, Mud Gully may be used as a water source by cattle. Humans may therefore be indirectly exposed to contaminants from the site that may have bioaccumulated in cattle.

PUBLIC HEALTH IMPLICATIONS

1. The former storage pits on the Brio site contain numerous chemicals and organic solvents. Among the chemicals that occurred most frequently and at the highest concentrations were chlorinated VOCs such as 1,2-dichloroethane, 1,1,2-trichloroethane, trans-1,2-dichloroethylene, and vinyl chloride. In general, these chemicals are toxic to the liver as the result of their metabolic conversion to highly-reactive chemical intermediates. Chronic exposure to high doses of these chemicals can lead to varying degrees of degeneration and fatty infiltration of the liver. Laboratory experiments have also indicated that some of these compounds may be capable of inducing liver tumors in certain strains of laboratory animals. In

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addition, epidemiological evidence has demonstrated that vinyl chloride can induce tumors of the liver (hemangiosarcoma) and other organs in exposed workers.

Contact with contaminated sludges, sediments, and soil could result in VOC exposures from direct ingestion or by dermal absorption. The Brio sites are not currently engaged in any chemical production operations, and the only current use of the DOP sites are as storage facilities. However, if industrial operations were to resume at the site, or if remedial activities were to be conducted, there would be a potential for worker contact with contaminated materials.

It is not possible to offer quantitative estimates of health risks for on-site workers because of the wide variation in VOC concentrations and because of the lack of information on worker contact with contaminated areas. However, under worst-case exposure assumptions, significant health risks could occur for unprotected on-site workers or for remedial workers.

Non-carcinogenic PAHs and lower concentrations of carcinogenic PAHs were identified in the storage pit areas. Skin exposure to PAHs, such as anthracene, acridine, or phenanthrene, followed by exposure to sunlight, can produce phototoxic effects such as erythema, urticaria, and burning and itching of skin. These dermal reactions will usually disappear when contact with the irritant or sensitizer is eliminated.

Exposure to PAHs is also of concern because of the carcinogenicity of some PAHs and PAH mixtures. In laboratory experiments, PAHs are potent inducers of skin cancer when applied dermally to mice and rats. In addition, PAHs are carcinogenic in animals when ingested, injected, or instilled intratracheal.

Studies of human exposure to PAHs have been conducted among coke plant workers and coal gas production workers. Epidemiological studies of these workers have revealed as association between occupational exposure to combustion products containing PAHs and cancer of the lung, pancreas, kidney, bladder, and skin. Interpretation of these studies is confounded by simultaneous exposure to other combustion products, as well as by additional chemical carcinogenic exposure from cigarette smoking.

PAHs can be absorbed through intact human skin. In addition, human skin is capable of activating PAHs to chemically-reactive intermediates that may be involved in chemical carcinogenesis. The quantity of PAHs absorbed would depend on the area and anatomical location of exposed skin, the contact time, the dermal permeability of individual PAHs, etc. Since these parameters are not known, it is not possible to quantify the risks associated with dermally-absorbed PAHs.

Copper is an essential element in man, and it has been estimated that 2.5-5 mg of copper are ingested daily from dietary sources. Acute exposures to high doses of copper can cause gastroenteritis in man. Chronic copper exposure in animals (especially when combined with zinc and iron deficiency) can cause liver damage.

Copper is not appreciable absorbed through intact skin, so dermal contact with copper-containing soils and sediments would not present a significant health risk. However, small qualities off copper-containing soil could be ingested by workers at the site. Although high concentrations of copper were detected at both the Brio and DOP sites, copper toxicity would not be expected to result from oral exposures. Under realistic conditions, only relatively small qualities o copper-containing soils would be ingested. In addition, homeostatic mechanisms in the human body regulate the gastrointestinal absorption of copper, and the liver has a large excretory capacity for excess cooper, ad the liver has a large excretory capacity for excess copper. However, individuals with chronic liver disease, as well as rare individuals with Wilson's Disease (1 in 100,000), may be at an increased risk for copper toxicity.

If remedial activities generate dust containing high concentrations of copper, workers should be protected against dust inhalation. Potential pulmonary manifestations of copper inhalation include "vineyard sprayer's lung" metal fume fever.

Elevated concentrations of lead were also found in some pit residual samples. The ingestion of lead can cause neurotoxicity, particularly in infants and young children. Chronic lead exposure can also have

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deleterious effects on hemoglobin synthesis, kidney function, and may contribute to hypertension. If the pit residues are exposed during remedial activities, precautions should be taken to prevent the ingestion of lead-contaminated materials.

2. Epidemiological studies have demonstrated that exposure to benzene can cause bone marrow toxicity. Occupational exposure to benzene in the rubber coating, leather working, rotogravure printing, and other industries has been correlated with an increased incidence of blood dyscrasia, aplastic anemia, and leukemia. High level exposures to benzene have also been associated with cytogenetic aberrations in bone marrow and peripheral blood cells.

At the Brio site in 1985, the 10-day average air concentration of benzene was 7 ppb (0.007 ppm), and the highest hourly average value was 65 ppb (0.065 ppm). By comparison, air monitoring in Harris County for 6 months in 1981 revealed the 6 month average air benzene concentration to be between 5 and 11 ppb, and the highest hourly average concentration was 586 ppb. Therefore, air benzene concentrations at the Brio site were comparable to those of Harrison County. The present OSHA standard for occupational exposure to benzene is 10 ppm a time-weighted average. The air benzene concentration at Brio in 1985 was more than 1,000-fold less than the OSHA standard and does not represent a significant public health threat as judged by this criterion.

Toluene as detected in air samples at Brio in 1985 at concentrations as high as 95 ppb (hourly average). Other air contaminants that were detected at Brio and DOP include mesitylene (17.3 ppb) and xylenes (10.8 ppb). The concentrations of these contaminants were several orders of magnitude less than National Institute of Occupational Safety and Health (NIOSH) and/or American Conference of Governmental Industrial Hygienists recommendations for occupational exposures and do not present a significant public health threat as judged by these criteria.

The studies conducted by the Texas Air Control Board and the Southwest Research Institute did not detect significant concentrations of air contaminants during either winter or summer monitoring. Therefore, inhalation of contaminants from the site would not be expected to pose a significant health risk. However, if buried contaminants are unearthed during construction or remedial activities, significant inhalation exposures could occur.

3. No surface or subsurface soil contamination was reported in the Southbend residential area north of the Brio property line. Furthermore, surface water flow at the northern edge of the Brio site parallels the property line before emptying into Mud Gully. No channeling of surface water runoff from Brio onto the residential areas as noted. Therefore, in the absence of any demonstrated, off-site soil contamination, there are no apparent health risks associated with contact with off-site soils.

4. Between the Brio north and DOP north property lines, contamination of sediment and/or surface water from Mud Gully with PAHs and VOCs was detected. Human contact with sediment and water in this portion of the stream could result in exposure to contaminants by ingestion, inhalation, or dermal absorption. However, access to this portion of Mud Billy is restricted by fences and by heavy underbrush on both sides of the stream. Because of the limited attraction and inaccessibility of this portion of Mud Gully, it is likely that human contact would be on an intermittent and infrequent basis.

Downstream from Dixie Farm Road, access to Mud Gully is more open. Since cattle pasture land abuts on the western edge on the stream, it is possible for cattle to drink from this portio of the stream.

No data were available on contaminant levels in water from Mud Gully south of Dixie Farm Road. Significant human ingestion of water from Mud Gully is unlikely to occur since Mud Gully and other surface streams in the area are not used for potable water supplies.

PAHs, at a geometric mean concentration of 31 mg/kg, were detected during sampling of Mud Bully sediment from south of Dixie Farm Road. PAHs are relatively insoluble in water and do not significantly concentrate in fish because they are metabolized to water soluble compounds and excreted. No bioaccumulation data for PAHs in cattle are available. However, it has been demonstrated in a wide variety of mammals that PAHs are readily metabolized and excreted. Therefore, it would not be expected that significant quantities of PAHs would accumulate in cattle drinking from Mud Gully.

In ruminants, dietary levels of trace elements, such as zinc, effect the absorption and toxicity of copper. There may be some accumulation of copper in the body, and the highest tissue concentration is found in liver. From the available information, it is not possible to determine whether toxicologically significant quantities of cooper wold accumulate in cattle that drank from Mud Gully ad grazed in the adjacent fields.

There may be occasional human contact with sediment in Mud Gully south of Dixie Farm Road. Contact with copper in the sediments does not present a significant health concern because of the low likelihood for ingestion and because of the low toxicity of copper in humans. Although PAHs were also detected in stream sediment, occasional human contact with the sediments would not be expected to result in a significant health risk.

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PUBLIC HEALTH ASSESSMENT

BRIO REFINING, INC.
AND
DIXIE OIL PROCESSOR, INC.

APPENDICES

Figure 1. Brio Refining Inc. and Dixie Oil Processors Sites.

TABLE 1.
NSCZ AND FIFTY-FOOT SAND GROUNDWATER
BRIO SITE

Contaminant	NSCZ (mg/l) Min/Max Conc	50 Foot Sand (mg/l) Min/Max Conc
1,1,2-trichloroethane	ND 1,810	ND 0.02
1,2-dichloroethane	ND 3,580	ND 0.055
Vinyl chloride	ND 650	ND ND
Methylene Chloride	ND 20.9	ND 0.07
Ethyl Benzene	ND 1.0	ND ND
Bis(2-chloroethyl)ether	ND 37.6	ND ND

ND- Not Detected
mg/l-milligrams per liter

TABLE 2
NSCZ AND FIFTY-FOOT SAND GROUNDWATER
DOP SITE

KG COH004359

Contaminant	NSCZ (mg/l) Min/Max Conc	50 Foot Sand (mg/l) Min/Max Conc
Volatile Organics		
Benzene	ND <0.01	No organic compounds were detected in the DOP 50 Foot Sand.
Chlorobenzene	ND 0.01	
Chloroform	ND 0.01	
1,1-dichloroethane	ND 0.10	
1,1-dichloroethylene	ND 3.49	
1,2-dichloroethane	ND 7.590	
Ethylbenzene	ND 0.20	
Tetrachloroethylene	ND 0.02	
Toluene	ND 0.05	
1,2-trans-dichloroethylene	ND 0.56	
1,2,2-trichloroethane	ND 9.39	
Trichloroethylene	ND 0.12	
Vinyl Chloride	ND 0.82	
Ethylene chloride	ND 0.037	
Base/Neutral Compounds		
Bis(2-chloroethyl)ether	ND 0.16	
1,2-dichlorobenzene	ND 0.01	
1,3-dichlorobenzene	ND 0.04	
1,4-dichlorobenzene	ND 0.01	
Naphthalene	ND <0.01	

TABLE 3
NON-AQUEOUS PHASE LIQUID (NAPL) FRACTION
GROUNDWATER-MAXIMUM VALUES IN MONITORING WELLS

KG COH004360

All values in mg/l

Contaminants	Max. Values
1,1,2-trichloroethane	48,700
1,2-dichloroethane	39,000
Vinyl Chloride	8,400
Methylene chloride	44
Ethyl benzene	4,750
Benzene	257
Carbon tetrachloride	171
Chlorobenzene	3,650
Chloroform	3,580
1,1-dichloroethane	3,380
1,1-dichloroethylene	8,820
1,1,2,2-tetrachloroethane	777
Tetrachloroethylene	1,580
Toluene	437
1,2-trans-dichloroethylene	7,740
1,1,1-trichloroethane	166
Trichloroethylene	2,760
Hexachloroethane	27
Fluoranthene	148
Fluorene	428
Bis(2-chloroethyl)ether	383,170
Anthracene	308
Bis(2-ethylhexyl)phthalate	293
Dichlorobenzene	182/742/235

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PUBLIC HEALTH ASSESSMENT

BRIO REFINING, INC.
AND
DIXIE OIL PROCESSOR, INC.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS:

This site is of potential health concern because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result n adverse health effects. As noted in the Human Exposure Pathways section above, human exposure to VOCs, PAHs, and metals may occur via ingestion, dermal absorption, and inhalation.

Public and private utilities provide drinking water to 99.9 percent of the homes within a one-mile radius of the Brio/DOP sites. The available information indicates that the shallow contaminated aquifers near the site are not normally used for potable purposes because of their low yield and the availability of municipal water in the area. There is currently no known use of contaminated groundwater for human consumption.

The available data for off-site contamination of air and surface soil from the Southbend Subdivision did not indicate that a significant health risk would be expected to result from contact with these environmental media. The contamination detected in sediment samples from Mud Gully south of Dixie Farm Road would not be expected to pose a health concern. No data on surface water contamination from this portion of the stream were available for assessment.

High concentrations of chemical wastes remain at the site. Inhalation, dermal contact, and ingestion of these wastes could pose a potential health risk to on-site workers.

RECOMMENDATIONS:

1. General information indicated that an upward hydraulic gradient existed over much of the site. ATSDR believes that the current water level data set (three months) is inadequate to rule out downward migration of contamination. Monthly water level measurements collected for a minimum of one year would better determine vertical flow direction. A better data set may help determine vertical flow direction. A better data set may help determine if the hydraulic gradient is reversed during seasonal or cyclic events such as recharge events and droughts.

2. We recommend testing of soil from the barren area in the northwest corner of the Brio north site that adjoins the Southbend Subdivision property line to determine the cause of the vegetative stress.

3. Worker contact with the contaminated on-site soils should be minimized. If remedial activities involve the excavation of contaminated soils, workers should be provided with protective clothing and respirators in accordance with applicable OSHA regulations and OSHA and Niosh guidelines and advisories.

Optimal dust control procedures should be implemented to prevent the off-site migration of fugitive dusts. Potential remedial worker exposure should be minimized by prohibiting eating and smoking in contaminated areas and washing after contact with contaminated materials.

In accordance with CERCLA as amended, the Brio Refining, Inc,/Dixie Oil Processors NPL Site, Houston, Texas have been evaluated for appropriate follow-up with respect to health effects studies. Inasmuch as there is no extant documentation or indication in the information and data reviewed for this Health Assessment that human exposure to on-site or off-site contaminants is currently occurring or has occurred in the past, this site is not being considered for follow-up health studies at this time. However, if data become available suggesting that human exposure to significant levels of hazardous substances is currently occurring or has occurred in the past, ATSDR will re-evaluate this site for any indicated follow-up.

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REFERENCES

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2. IT corporation, FINAL REPORT - ENDANGERMENT ASSESSMENT, RIO REFINING INC. AND DIXIE OIL PROCESSORS SITE, FRIENDSWOOD, TEXAS, IT PROJECT NO. 421167, (June 1987).

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EXHIBIT #10

AUGST
10
2-12-91
[illegible]

Monsanto

R. L. Stuart - Texas City

to Styrene

April 17, 1972

cc. P. E. Brubaker
J. W. Frizzell
R. G. McDonnell
A. C. MacFarlane
G. L. Stacy

TRIP REPORT ON VISIT TO PHOENIX CHEMICAL CO. APRIL 14, 1972

TO W. C. Fuller

Persons Involved: Don Blessing - Phoenix
Ralph Lowe
R. G. McDonnell - Monsanto
Rex Rawls - Petro Chem Industries, Consultants
Tom Roach - Phoenix
Bob Round - Phoenix
Monroe Sharp -
R. L. Stuart - Monsanto

The purpose of visit was to observe conditions in the plant and to hear Mr. Lowe describe his plans for restarting operations. The visit started with a plant tour hosted by Mr. Lowe (a basic flow diagram is attached) and completed with a discussion with Mr. Tom Roach and Mr. Bob Round, both of Phoenix.

Mr. Lowe explanied that Phoenix had been unable to meet paynnents to him. He feels that Phoenix operating philosophy allowed too much to be taken as profit and not enough returned to the plant to keep it maintained and operable. He felt there was no choice but to foreclose on Phoenix before the plant became completely inoperable. Mr. Lowe chose to make his point with a tour through the plant.

The plant was not operating. It was stated by Mr. Sharp that one of the six cracking reactors is not operable because of coke buildup, one is in urgent need of cleaning and three have partial coke plugs. Only one is considered in good operating condition. Two of the three distillation columns (EB and toluene) are partially plugged and need packing change out. The third column (topping) has a leaking main condenser. Column instrumentation is considered by Phoenix (Don Blessing) to be operational although preventative maintenance is needed.

Tanks within the plant are considered operable with exception of one that is corroded and one with its side collapsed. The collapsed tank was ruined late last year after only 2 months service.

EXHIBIT 9

R003563

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Mr. Lowe pointed out that when he sold to Phoenix there were eleven operable trucks and trailers. He stated now there is only one truck and three trailers. We observed the remains of the other ten trucks, which are still on the plant site.

The main power station serving the plant is in terrible condition. Breaker panels are off, terminal corrosion is severe and the wooden structure that houses the breakers is used for storage, such as tires, reinforcing wire, motor parts and litter. It is unsafe and both access ways were blocked.

The overall condition of the plant was worse than when last visited (summer, 1971). Housekeeping needs attention, and after a rain much of the plant becomes a mud hole. A large amount of insulation needs repairing. There were a few cases of exposed electrical wiring.

Mr. Lowe said he finds the plant in much need of repair and plans to bring the plant back to an acceptable level. His plan is to make his past associate, Mr. Monroe Sharp, operations manager and right hand man. He will retain most of the present hourly staff and has an agreement with the union to operate for 72 hours before signing a labor contract. He said there would probably be some changes in the supervision staff, althoug no plans are set to date. Mr. Lowe plans to obtain legal ownership on May 2 and plans to start up that same day. He stated there was approximately $50,000 in past due utility bills (natural gas primarily) that must be paid by that time also.

There is also a problem with sulfur emmission from the plant and an August 31 date has been set by the County to have it corrected. Mr. Lowe says he will meet this deadline. He also feels that the present condition of the equipment will allow processing all of Monsanto's tar. There will need to be downtime on several pieces of equipment soon for maintenance, however

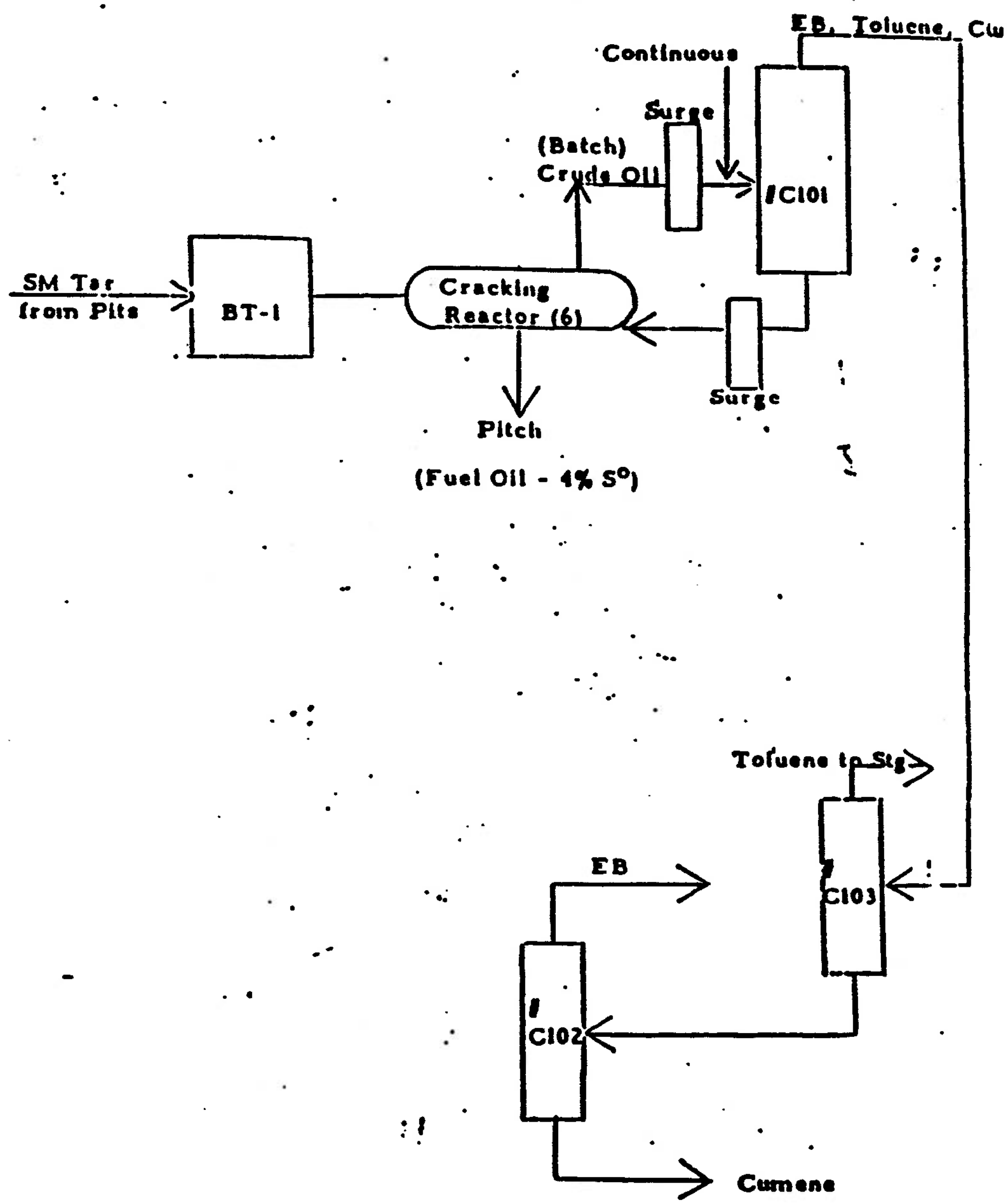
Mr. Lowe then suggested we discuss the present plant capability with Mr. Roach. Mr. Roach also felt the plant could be started up and easily handle all of Monsanto's tar. Mr. Roach also felt that the August 31 deadline on sulfur emmission could be met if work was started right away. He also seemed to verify Mr. Lowe's description of the condition of the plant equipment.

The tar pits were inspected as a last stop. The pit inventory is much lower than last summer and they have 60% of their capacity available.

R. L. Stuart

/cp

PHOENIX CHEMICAL CO.
BASIC FLOW DIAGRAM



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Texas Department of Water Resources

INTEROFFICE MEMORANDUM

TO : George Green, Chief, Field Support DATE: Sept. 19, 1977

THRU :

FROM : Clarence E. Johnson, District 7 Representative

SUBJECT: JOC Oil Aromatics, Inc., WCO #00951 Sw Reg # 31180

I. Introduction:

Inspection was made on 7/11/77, with Mr. Weldon Reeves, Operations Foreman, and Mr. Balfour Augst, Environmental Consultant.

Inspection was made on 9/8/77, with Mr. Max Fowler, General Manager, JOC Oil Aromatics, Mr. Augst, Mr. Gene Speller, TACB, Houston, and Mr. Ed Flickinger, US Fish and Wildlife Service, Victoria.

II. Findings:

1. PVC bottoms pit was closed on 6/7/77, some seven days later than called for in TACB injunction dated 1/18/77. The contents are stored in two 5,000 barrel storage tanks. It contains 25.5% organic chlorine in the waste.

2. On 7/11/77, the valve at the northeast corner of the diked plant area was blinded.

3. On 7/11/77, the seepage of styrene tars in the old tar pit #1 and #2 area, styrene tar disposal area, and last tar pit area was fairly extensive.

4. On 9/4/77, Mr. Ed Flickinger counted 232 birds, animals, and reptiles dead in styrene tar seepage at JOC Oil Aromatics, Inc.

5. On 9/8/77, Mr. Flickinger found additional animals had been caught by the tars.

SEP 22 '77

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JOC Oil Aromatics, Inc.
WCO #00951
Page 2

6. Styrene tar seepage was much worse on 9/8/77 than on 7/11/77; probably due to recent rains. Low level odors exist, also.

7. On 9/8/77, PVC bottoms pit had settled some but still had very little seepage.

8. JOC Oil Aromatics, on 9/8/77, had failed to submit an [illegible]

9. JOC Oil Aromatics has failed to meet the deed record requirements of Board Order 75-1125-1, Section 1.05; although requested to do so within 30 days by Mr. Yantis on 5/16/77.

10. JOC Oil Aromatics is up for sale at the present time.

III. Recommendations:

1. JOC Oil Aromatics has previously been recommended for appropriate enforcement action.

2. Stored organic chlorine contaminated waste from PVC bottoms pit should be disposed of by incineration.

IV. Narration:

On 7/11/77, the PVC bottoms pit was closed out with about four feet of clay fill above the dikes and the level was about eight to nine feet above natural ground. It appeared to be well covered with only one small seepage spot. It was finished on 6/7/77, about a week later than the 6/1/77 date called for in the TACB injunction.

Mr. Augst said that the pit was up to 16 feet deep so it required a lot of fill dirt to fill the pit in.

The 10,000 barrels of industrial wastes were placed in tanks #22A and #23A, which have a TACB permitted vent system. Disposal is uncertain at this time. Rollins Environmental Services and Sonics International (through Browning Ferris Industries) have been contacted regarding disposal. Rollins wants 56 cents per gallon for incineration and Browning Ferris Industries wanted 12 cents per gallon for deep well injection (plus 5 cents per gallon for transportation to Ranger).

The industrial waste from the PVC bottoms pit contains 50 PPM Copper, 25.5% organic chlorine, and has a heat value of 100,000 btu/gallon. Please see attached data sheet.

On 7/11/77, the valve at the northeast corner of the diked plant area was blinded so that no more wastewater discharges could be made easily.

The septic tank field line going outside the diked plant area has been dug up and rerouted to separator.

The tar seepage in the styrene tar disposal area was worse. The last styrene tar pit area was the worst spot. It has never been reworked despite ideal weather for about two months. It appears no efforts are being made to rebury styrene tar seepage.

On 8/22/77, the TACB investigated an odor complaint at JOC Oil Aromatics and found extensive styrene tar seepage with birds and animals stuck in the tars.

The TACB notified Texas Parks and Wildlife, who evidently notified US Fish and Wildlife Service.

On 9/4/77, Mr. Flickinger, US Fish and Wildlife Service, along with Mr. Tom McMickle of TACB counted 232 birds, small animals, and reptiles in the tar seepage.

On 9/8/77 inspection, Mr. Flickinger said several additional birds and animals were found. I saw ducks, hawk, squirrel, snakes, owl, etc. stuck in the styrene tar seepage.

The styrene tar seepage is on the former location of tar pits #1 and #2, last styrene tar pit, and in the styrene tar disposal area. The tars are only a few inches thick and cover partially three to four acres of ground. The summer temperatures make the tar tacky so it traps small animals and birds.

Mr. Max Fowler said that he has a contract with Mr. Arden Hill of Hills Sandpit to rebury the tar seeps, but it has rained so much that Mr. Hill hasn't been able to do the work. I contacted Mr. Arden Hill by telephone on 9/12/77. He said he recently was given a contract to do the work. He was not asked to rebury the styrene tar seeps in June when he was on-site closing the PVC Bottoms pit. It was dry then and could have easily been done.

On 9/8/77, the PVC bottoms pit had settled some and only had a small amount of seepage. Additional dirt fill was dumped ready to spread.

JOC Oil Aromatics has a small pit into which empty drums and other metal scrap is dumped.

JOC Oil Aromatics has failed to meet the deed record requirements of Board Order 75-1125-1, Section 1.05, despite request by Mr. Yantis dated 5/16/77. This is critical now that the plant is up for sale and residential areas are within one mile and rapidly growing closer.

JOC Oil Aromatics has never filed an industrial solid waste inventory form despite the fact they have many acres of Class I landfill and 10,000 barrels of chlorinated organics in two tanks.

JOC Oil Aromatics is now only processing 24,000 gpd of waste oils and no styrene tars. The plant is up for sale. Mr. Ralph Lowe of Friendswood holds the mortgage on the property.

CEJ:tmr

Attachments: Compliance Survey
Map
Letter, dated 5/16/77
Newspaper Clippings
Letter, dated 2/9/77
Letter, dated 9/7/77
Photos (12)

B. W. Boggs
Approved

Signed: Clarence E. Johnson

Date: September 19, 1977

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GAO/RCED-99-245: Texas Superfund Sites - Netscape 6

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http://www.gao.gov/RCED-99-245/TXfs.html

Home Search Bookmarks

- TEXARKANA WOOD PRESERVING Texarkana (TXD008056152)
- JASPER CREOSOTING CO., IN Jasper (TXD008096240)
- ALCOA (POINT COMFORT)/LAVACA BAY Point Comfort (TXD008123168)
- TEX TIN CORPORATION Texas City (TXD062113329)
- SHERIDAN DISPOSAL SERVICE Hempstead (TXD062132147)
- RSR CORP. Dallas (TXD079348397)
- State Marine of Port Arthur Port Arthur (TXD099801102)
- KOPPERS CO. INC (TEXARKAN Texarkana (TXD980623904)
- BRIO REFINING, INC Friendswood (TXD980625453)

Information from GAO Superfu

[Texas] BRIO REFINING, IN

Site ID: TXD98062

Site name and region	Location, county, and size of site	Date EPA added site to National Priorities List (NPL)	When added to NPL, buildings present at site	
Brio Refining, Incorporated Region=6	2501 Dixie Farm Road, Friendswood TX 77089 / Harris / 58 acres	Mar. 1989	abandoned commercial, public, or industrial buildings	n c i a i e n v

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From MONSANTO CH[illegible]ICAL COMPANY
At Texas City, Texas

CC S. M. Evans-St. Louis
H. K. Eckert
bcc: Alexander/Lovett/Kienker
Hunter/Jackson
Schatz/McDonald

Date October 9, 1957

To C. E. Caspari, Jr.
At St. Louis, Mo.

Reference
Subject Hard-Lowe Agreement (R10H4S57)

Dear Charlie:

The regeneration of spent acrylonitrile catalyst is a significant problem in Texas City operations. I think you are aware of the fact that a number of months ago Charles Hard and Ralph Lowe became interested in our problem and successfully developed a process for the regeneration of spent acrylonitrile catalyst. These two men, together with their wives, formed the Hard-Lowe Company and took their process from the laboratory stage, through the pilot plant stage and into actual commercial production. They built a plant about twenty miles from here near Ellington Airforce Base and for some time have been regenerating our catalyst on a commercial scale under short-term contracts. Their present short-term contract expires on February 1, 1958. It has always been somewhat of an unofficial understanding of both Hard-Lowe and Monsanto that satisfactory performance by Hard-Lowe under the short-term contracts would ultimately lead to a long-term contract.

Several months ago our Purchasing and Production people began talking in earnest with Hard-Lowe concerning a long-term contract for the regeneration of our spent catalyst. While we have done some research work on regenerating catalyst ourselves, economic studies indicate that there is little to be gained by regenerating our own catalyst. If someone else can do it as cheaply as we can, doing it ourselves would unnecessarily tie up capital. Therefore, a long-term contract with Hard-Lowe is definitely desirable.

In the discussions with Hard-Lowe, two problems were presented. One of these problems is concerned solely with price while the other is concerned with satisfying ourselves as to Hard-Lowe's ability to perform. This is a new type of business for these people and while they have satisfactorily performed during the past several months under short-term contracts, we wish to make certain that they can satisfactorily perform under a long-term contract. At high acrylonitrile capacity, we will have considerable quantities of spent catalyst solution to be regenerated and any breakdown in the regeneration process could cause serious problems here in the plant at Texas City. Guarantees by Hard-Lowe are meaningless. If they can't operate, a guarantee doesn't solve our problem. It was decided that the only way this problem could be solved was to be able to satisfy ourselves that Hard-Lowe could perform through knowledge of their process with the right to use their process under certain conditions. Production first established with Hard-Lowe a mutually satisfactory price for regenerated catalyst. I then got into the picture relative to the acquisition of the technical information and know-how possessed by Hard-Lowe and rights and obligations pertinent thereto. After a series of meetings with Hard-Lowe, we arrived at what we believed to be a workable arrangement which will fully protect Monsanto.

Attached is a draft of an agreement which I have prepared covering this long-term contract with Hard-Lowe. A copy of this agreement is also being forwarded to Sam Evans. I would appreciate having comments and criticisms from both of you concerning this agreement. It is of the utmost importance to the people here at Texas City that this catalyst regeneration problem be settled at the earliest possible time. I am sure that you can understand why. For this reason the people here at Texas City would be most appreciative of your comments at the earliest opportunity.

Subject to your approval the agreement first submitted to Hard-Lowe for their consideration will be in the form attached. I doubt very much, however, that the ultimate agreement will be in that form. I intend to try to negotiate some different terms relative to the know-how in view of some recent developments. There is the distinct possibility that we may have to furnish Mitsubishi with some know-how relative to catalyst regeneration. I intend to see if Hard-Lowe would consider selling us their know-how outright on the effective date of this agreement for a somewhat nominal sum with the right for us to convey that know-how to people who purchase acrylonitrile know-how from us. This point has not been brought up in that fashion with Hard-Lowe. It will have to be brought up casually in a manner which will not cause them to form an exaggerated idea of the value of their know-how. My approach to such an alternate arrangement will be through this agreement but I do not wish to use an agreement, even for that purpose, that does not have the approval of the Patent Department and Law Department in St. Louis.

I believe a few comments concerning the contents of this agreement are in order. Because of the starting date of the agreement, contract quarter-years were used throughout the agreement rather than calendar quarter-years. Production and Accounting are not certain as yet which will be the more convenient. This can easily be changed.

This is not a take or pay contract. All we agree to sell them is 500 gallons per day of spent catalyst if we are producing that much or our production of spent catalyst if it is less than 500 gallons per day. We are not obligated to sell Hard-Lowe more than 500 gallons per day of spent catalyst even though we may be making more than 500 gallons per day.

The agreement is based upon a single recipe for regenerated catalyst solution. Our people have not decided either that this recipe is correct or that they wish to limit it to one recipe. They may wish to specify several recipes with Monsanto electing the recipe desired for a particular quarter-year. This will be a simple change to make.

Hard-Lowe's token payment for the spent catalyst was put into the agreement merely to emphasize ownership of the spent catalyst. We want nothing to do with the spent catalyst once it is put into Hard-Lowe's trucks.

I selected the National Bank of Commerce as the escrow agent merely because this location does a considerable amount of banking with the National Bank of Commerce. I talked to the National Bank over the telephone and found that they would serve in this capacity. I have not reviewed the escrow agreement with them nor do I know how much they will charge for this service. Naturally, I would want them to review the escrow agreement prior to any agreement with Hard-Lowe. I do not believe National Bank need see the basic agreement.

We do not know precisely what process Hard-Lowe uses for regenerating spent catalyst. We do think it is very close to a process claimed in one of our own patents. Hard-Lowe maintains they do not infringe this patent. Paragraph 7.4 was put in to satisfy this point and at the same time clearly indicate that if they are infringing they have no license to regenerate anybody elses catalyst under our patent.

Hard-Lowe wanted to be able to terminate this agreement after three years if economics so indicated but if they felt that they could satisfactorily meet the price schedule set forth they wish to be able to continue on for at least five years. This is the reason for paragraphs 8.1 and 8.2.

Please note the way the Force Majeure clause is modified in paragraph 8.5. We believe this necessary for our protection.

I had no precedent at hand for the escrow agreement I prepared. My discussion with the escrow officer of the National Bank of Commerce leads me to believe that the escrow agreement would be satisfactory to the National Bank.

I believe the rest of the agreement is self-explanatory but if you have any questions concerning it, please do not hesitate to call me. I will be in El Dorado the rest of this week but will be back in Texas City on Monday. I will have a copy of the agreement with me in El Dorado and if you wish to discuss it by phone please call. As I mentioned earlier, the people here at Texas City would appreciate your prompt consideration of this agreement. It is to our advantage to execute an agreement with Hard-Lowe at the earliest possible time.

Best personal regards.

Original Signed By
RUSSELL H. SCHLATTMAN
Russell H. Schlattman
Patent Department

be

Enc.

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Doug Diehl Table

TABLE 1

Non-Styrene Related Materials Sent for Processing
from Companies Other than Monsanto

Brio Refining Site
Houston, Texas

Name	Location	Product	Date
American Cyanamid	Kenner, LA	Copper Catalyst	Pre-1960
American Petrofina	Port Arthur, TX	Ural Crude	1975
AMOCO	Texas City, TX	Caustic	1972-75
Archem International	Houston, TX	Caustic	1972-76
ARMCO Steel	Galena Park, TX	Slop Oil	1976-77
Ash Oil Service	Houston, TX	Slop Oil	1976
Bay Coast Industries	Houston, TX	Slop Oil	1976
Bethlehem Steel	Beaumont, TX	Oil	1977
Coastal States	Corpus Christi, TX	Slop Oil	1977
Diamond Alkali	Deer Park, TX	Chlorine Chlorinated Solvents	1962-64
Dixie Chemical	Houston, TX	Caustic Chlorine Anhydrous Ammonia Muriatic Acid	Pre-1970-75
Dow Chemical	Freeport, TX	Caustic Chlorinated Solvents	1962
Eastex	Evadale, TX	Caustic	1974-75
Eastman Chemical Products	Longview, TX	Heavy Caustic Oil	1976-77
Goodyear Tire & Rubber	LaPorte, LA	Alkie & Organic Heavies – Residual Fuel Oil	1974-77
Goodrich Chemical Co.	LaPorte, TX	Copper Catalyst	1964
Gulf	Cedar Bayou, TX	Spent Caustic	1975-76
Industrial Solvents (Gulf)	Cypress, TX	Caustic Cutter Oil Stock	1972-75
Jim Joste	Houston, TX	Slop Oil	1976
Kocide Chemical	Houston, TX	Cutter Stock Oil	1975
Lee Bankers & Co.	Houston, TX	Slop Oil	1977-78
Mobil Chemical	Baytown, TX	Slop Oil	1976-78
Port Drum	Port Arthur, TX	Slop Oil	1977
Pullman-Kellog	Houston, TX	Slop Oil	1977
Rhodia	Freeport, TX	Spent Caustic	1972
Rohm & Haas	Deer Park, TX	Cutter Stock Oil	1974-78
Rosebud Petroleum	Houston, TX	Slop Oil	1975
Shell Oil	Deer Park, TX	Spent Caustic Slop Oil	1975-77
South Coast Terminals	Houston, TX	Slop Oil	1976-77

TABLE 1 (cont'd)

Non-Styrene Related Materials Sent for Processing
from Companies Other than Monsanto

Brio Refining Site
Houston, Texas

Name	Location	Product	Date
South Hampton Co.	Silsbee, TX	Cutter Stock	1975
Southwest Oil Service	Houston, TX	Slop Oil	1976
Southwestern Barge	Highland, TX	Slop Oil	1976-77
Stauffer Chemical	St. Gabriel, LA	Caustic	1974
Texas City Refining	Texas City, TX	Spent Caustic	1975
Texas Petro-Gas Producing (Cosden)	Groves, TX	Spent Caustic	1975
Union Carbide	Seadrift, TX and Port Lavaca, TX	Caustic Slop Oil Cellulose Acetate Reactor Residue	1975-77
Union Texas Petroleum	Winnie, TX	Caustic	1975
United States Steel	Houston, TX	Slop Oil	1977
Warren Petroleum	Mont Belvieu, TX	Spent Caustic	1972
Paul Watson	Houston, TX	Slop Oil	1977
Whitehead Oil Petroleum	Buna, TX	Slop Oil	1976-77

TABLE 2

Shipment of Styrene Related Tars
to Lowe, Phoenix & JOC from Companies Other than Monsanto

Brio Refining Site
Houston, Texas

Name	Location	Product	Date
A-G Fuel Oil Co.	Geismar, LA	Styrene-Related Tars	1975
AMOCO	Texas City, TX	Styrene-Related Tars	1965-77
Borg-Warner	Baytown, TX	Styrene-Related Tars	1963-68
Browning-Ferris Ind.	Geismar, LA	Styrene-Related Tars	1975
Coastal Fuels		Styrene-Related Tars	1976
Cosmar/Cosden	Carville, LA	Styrene-Related Tars	1970-78
Dow	Freeport, TX	Styrene-Related Tars	1959, 1964
El Paso Products	Odessa, TX	Styrene-Related Tars	1976
Foster-Grant	Baton Rouge, LA	Styrene-Related Tars	1962, 1975-77
Gulf	Donaldsville, LA	Styrene-Related Tars	1971-77
Sinclair-Koppers	Houston, TX	Styrene-Related Tars	1961-77
Sun Oil	Corpus Christi, TX	Styrene-Related Tars	1976
Union Carbide	Seadrift, TX	Styrene-Related Tars	1964-78

TABLE 3

Documented Shipments to the DOP Site

DOP Site
Houston, Texas

Name	Product	Date
American-Chem Oil Co.	Waste Oil Lube Oil Alkylate Light Ends Mix Petroleum Oil Fuel Residue	1980
ArChem Co.	Olefins from Ethyl Corp. Caustic Soda Spent Caustic Slop Oil	1969-1974
Arco/Arco Chemical	LUWA Bottoms Refinery Still Bottoms Pyrolysis Gas Oil	1978, 1981-1982
B & I Metals	Aluminum Shavings	1969-1970
B.F. Goodrich	Hexane N-Hexane SN High Boils High Boils Waste Hexane	1972-1974
By-Product Chemical Processors	Cutter Stock Tetrapropylene Recycle Tetrapropylene Tetrapropylene/Blend Oil Light Oil	1980
C & H Service Co.	Chlorinated Solvents Styrene Tars Waste Chemicals	1974
Celco-Tex	Residual Fuel Oil	1988
Chemical Leaman Tank Lines, Inc.	Regular Caustic Soda Caustic Soda Solution	1972-1973
ChemLime Corp.	Chemlime Slurry	1975
The Cosmodyne Corp.	Caustic	1969-1970
Diamond Shamrock Chemical Co.	Muriatic Acid Anhydrous Ammonia	1971-1973
Dixie Chemical Co.	Muriatic Acid Anhydrous Ammonia Chlorine HTH Granula Soda Ash	1980-1983
Disposal Systems, Inc.	Solvent Waste	1983

TABLE 3 (cont'd)

Documented Shipments to the DOP Site

DOP Site
Houston, Texas

Name	Product	Date
Dow Chemical USA	Caustic Soda Solution Purifloc Polyglycerine Epichlorohydrin	1969, 1972-1973, 1980-1983
El Paso Products Co.	Styrene Tars	1978
Eltex Chemical & Supply Co.	Miscellaneous Liquid Residue for Disposal	1974-1975
Ethyl	Hydrocarbon Bottoms Blended Light Olefins Olefins-Paraffins Olefin-Alcohols Alcohol Bottoms Alcohol Fatty Alcohol Hydropolymer Oil Hexanol Solvent Column Bottoms	1968-1973, 1975-1977
Force, Inc.	Liquid Waste	1980
Foster Feed & Seed	Styrene Waste	1974
French, Ltd.	Skimmed Oil off Water Butadiene Furfural Polymer	1972, 1980
Friendswood Refining Corp.	Waste Oil Diesel	1980-1981
G & G Oil & Service Co.	Slop Oil	1980
Georgia Pacific	Fuel Oil	1980-1981
Goodyear Tire & Rubber Co.	Waste Hydrocarbon Liquid Still Bottoms Drums of Oil Stream IV Naphtha Stream IV Petroleum Residue	1968-1969, 1970, 1971-1972, 1980
Grupo	Styrene Monomer Propylene Glycol	1973-1974
Gulf Chemical & Metallurgical	Polyphenic Tars	1979-1982
Gulf Coast Waste Disposal Authority	Waste	1980-1981

TABLE 3 (cont'd)

Documented Shipments to the DOP Site

DOP Site
Houston, Texas

Name	Product	Date
Gulf Oil Chemicals	Styrene Residue/Waste Spent Caustic PEB Styrene Tar Styrene Waste	1971-1977
Gulf States Utilities	Fuel Blend #8	1973-1974, 1976
Hill Petroleum Co.	#2 Oil	1977-1978
JOC Oil Aromatics	Vinyl Chloride Waste	Date Unknown
Kile Petroleum	#2 Oil	1980
Koch	Triethanolamine	1972
Lone Star Cement Corp.	Regular Shell Concrete Sand	1970
Lone Star Industries	Preep Dust	1975
Lowe Chemical	Styrene Waste Ethylbenzene	1973-1974
L.R. McAllister	Fuel Oil #2 Oil Hydrocarbons Oil Waste Oil	1980-1981
MAC Enterprises	Water & Oil Waste	1981
MOP Inc.	Residual Fuel Oil	1980
McKesson Chemical	Borax Dust	1970-1971
Merichem	Cresylic Acid Tar RQ, Cresols, Tar	1980-1984
Mobil Chemical	Slop Oil/Waste Oil	1979
Occidental	Anhydrous Ammonia	1971-1972
Oil Chemical	Dibutyl Phthalate	1974
Oxirane	Refinery Still Bottoms Corrosive Containing Ethylene Glycol Diacetates Spent Caustic Waste Motor Oil Oil, Waste Water/Oily Waste Water By-Product Organics Containing Styrene Liquid Fuel Crude Acetone	1971, 1978-1980

TABLE 3 (cont'd)

Documented Shipments to the DOP Site

DOP Site
Houston, Texas

Name	Product	Date
Parlin Chemical	Liquid Caustic Soda Diethylene Triamine	1974-1975
Petro Chemical Transport	Petroleum Naphtha	1969
Petromax Chemical	Diesel Glycol Bottoms	1978
Petro-Tex	Butadiene Fufural Dimethylformanide DMF Butadiene Copolymers Fuel Oil Slop Fuel Oil Slop Oil Benzene	1973, 1980-1983
Phillips Petroleum	Anhydrous Ammonia	1972
Reagent Chemical	Hydrochloric Acid	1969
Renewable Energy	Glycol Bottoms	1980
Rohm & Haas	BMA Residue Waste Oil PNP 10% 21% S-134 Inhibitor Recovered Oil	1978, 1980-1981, 1983-1985
S.H. Bell Co.	Toluol Xylol	1972
Sentinel Energy, Inc.	#2 Diesel	1980-1981
Shell Chemical Co.	Phenol Heavy Ends	1978
Shipp Chemical	Muriatic Acid Chlorine Bleach	1983-1984
Sinclair-Koppers	Styrene	1973
Southlands Material Supply Corp.	Heating Oil	1979
Southwestern Barge Fleet Service	Waste Oil Glycol Waste	1979
Sunco	Styrene Tars Vinyl Chloride Waste	1978-1979
Sunset Fuel Co.	Calcine Coke	1975
Tobey Chemical	Cyclohexane	1974
Torque	#6 Oil Fuel Oil Fatty Alcohol	1980
Union Carbide	Styrene Tars	1969, 1975
Velsicol Chemical	Hexane Recycle Hexane	1973-1974

TABLE 4

Materials Sold to Commercial Users
Other than Monsanto

Brio Refining Site
Houston, Texas

Name	Location	Product	Date
Alpha Chemical	Collersville, TN	Ethylbenzene	1974
AMOCO	Texas City, TX	Toluene Ethylbenzene	1964-68
Anchortank	Texas City, TX	Naphtha	1972-74
Archem International	Houston, TX and c/o Calcasieu Paper Elizabeth, LA	Fuel Oil Sodium Sulfide	1973
B&R Oil	Houston, TX	Road Oil Tank Bottoms	1976
Bay Coast Industries	c/o Champion Chemicals Houston, TX	Heavy Aromatic Oils Sodium Sulfide	1972
Boise Southern	DeRidder, LA	Sodium Sulfide	1977
Brio Petroleum	Houston, TX	Cumene Blend Oil	1975-76
Calcasieu Paper	Elizabeth, LA	Fuel Oil	1976
Capital Supply	Hurst, TX	Fuel Oil	1977-78
Champion Paper	Pasadena, TX	Sodium Sulfide	1976
De Lo	Aransas Pass, TX	Fuel Oil	1976-77
Diamond Alkali	Deer Park, TX	Ethylene Dichloride Trichloroethane	1961-68
Durawood Treating	Alexandria, LA	Creosote Extender Oil	1976-77
Eastex	Evadale, TX	Sodium Sulfide Spent Caustic	1974-75
Energy Supply	c/o Georgia Pacific Zachary, LA	Aromatic Fuel Oil Phenolic Tar	1976-77
Firestone Synthetic Rubber & Latex	Orange, TX	Aromatic Fuel Oil	1976
Humble Oil	Baytown, TX	Carbon Black Feedstock	1962-67
Industrial Solvents (Gulf)	Cypress, TX	Toluene/Cumene No. 6 Fuel Oil	1972-75
Intercoastal Chemical	Houston, TX	Ethylbenzene Cutter Stock	1975-77
Lone Star Industries	Houston, TX	Cutter Stock Sodium Sulfide	1975

TABLE 4 (cont'd)

Materials Sold to Commercial Users
Other than Monsanto

Brio Refining Site
Houston, Texas

Name	Location	Product	Date
Lowenco	Friendswood, TX	Ethylbenzene	1974-75
Malone Trucking	Texas City, TX	Cumene	1975
Maysville Oil	Donaldsonville, LA c/o International Paper Natchez, MS	Fuel Oil	1976
Merichem	Houston, TX	Blend Oil Creosote Cutter Stock	1976-78
Paragon Paint	South Houston, TX	Aromatic Residue Fuel Oil	1972-75
Penn Oil & Chemical	Saginaw, TX	Fuel Oil	1976
Petroleum Industries	Euless, TX	Cumene	1976
Rohm & Haas	Deer Park, TX	Sodium Sulfide	1975-76
Sinclair Koppers	Houston, TX	Ethylbenzene	1974-76
Southern Pacific	Houston, TX	Fuel Oil Creosote Cutter Stock	1975-79
South Hampton	Silsbee, TX	Xylene Light Aromatic Naptha (Cumene Toluene)	1963-75
Southland Paper	Houston, TX	Sodium Hydrosulfide	1972-75
Sun Meadow Country Club	c/o Texas Petro Chemical Houston, TX	Fuel Oil	1973-77
Tauber Oil	Houston, TX	Fuel Oil	1975
Traweek Oil	Houston, TX	Fuel Oil	1972
United Petroleum Distributors	Houston, TX	Fuel Oil	1977
Van Waters & Rogers	Houston, TX	"Bunker C" Oil	1972
Varibus	Beaumont, TX	Fuel Oil	1974

NUMEROUS COMPANIES DID BUSINESS WITH LOWE CHEMICAL, PHOENIX AND JOC

Non-Styrene Related Materials Sent For Processing From Companies Other Than Monsanto

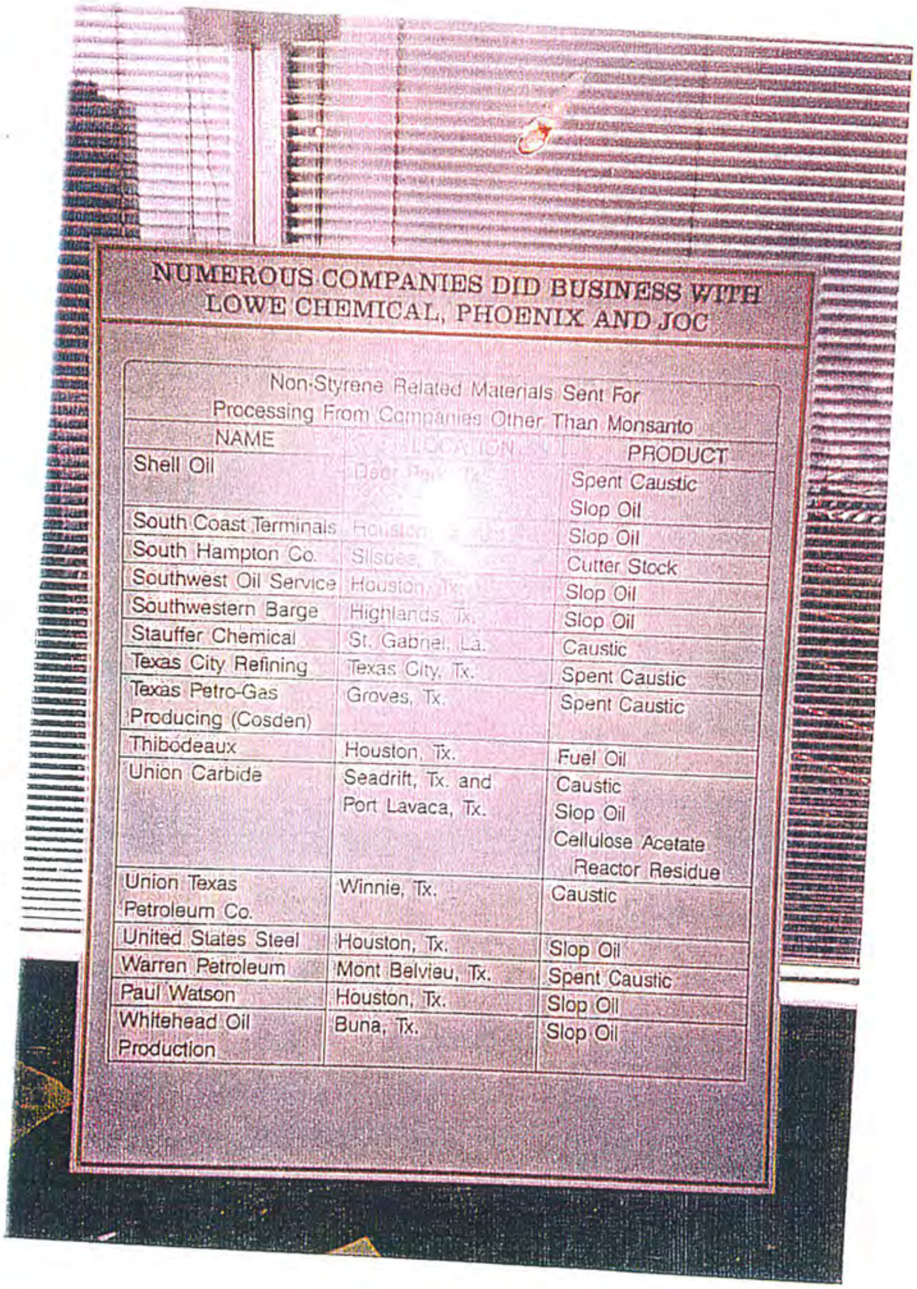
NAME	LOCATION	PRODUCT	DATE
American Cyanamid	Kenner, La.	Copper Catalyst	Pre-1960
American Petrofina	Port Arthur, Tx.	Ural Crude	1975
AMOCO	Texas City, Tx.	Caustic	1972-75
Archem International	Houston, Tx.	Caustic	1972-76
ARMCO Steel	Galena Park, TX.	Slop Oil	1976-77
Ash Oil Service	Houston, Tx.	Slop Oil	1976
Bay Coast Industries	Houston, Tx.	Slop Oil	1976
Bethlehem Steel	Beaumont, Tx.	Oil	1977
Coastal States	Corpus Christi, Tx.	Slop Oil	1977
Diamond Alkali	Deer Park, Tx.	Chlorine Chlorinated Solvents	1962-64
Dixie Chemical	Houston, Tx.	Caustic Chlorine Anhydrous Ammonia Muriatic Acid	Pre-1970/75
Dow Chemical	Freeport, Tx.	Caustic Chlorinated Solvents	1962
Eastex	Evadale, Tx.	Caustic	1974-75
Eastman Chemical Products	Longview, Tx.	Heavy Caustic Oil	1976-77
Goodyear Tire & Rubber	LaPorte, Tx.	Alkie & Organic Heavies - Residual Fuel Oil	1974-77
Goodrich Chemical Co.	LaPorte, Tx.	Copper Catalyst	1964
Gulf	Cedar Bayou, Tx.	Spent Caustic	1975-76
Industrial Solvents (Gulf)	Cypress, Tx.	Caustic Cutter Oil Stock	1972-75
Jim Joste	Houston, Tx.	Slop Oil	1976

NUMEROUS COMPANIES DID BUSINESS WITH LOWE CHEMICAL, PHOENIX AND JOC

Non-Styrene Related Materials Sent For Processing From Companies Other Than Monsanto

NAME	LOCATION	PRODUCT	DATE
Kocide Chemical	Houston, Tx.	Cutter Stock Oil	1975
Lee Bankers & Co.	Houston, Tx.	Slop Oil	1977-78
Mobil Chemical	Baytown, Tx.	Slop Oil	1976-78
Port Drum	Port Arthur, Tx.	Slop Oil	1977
Pullman-Kellog	Houston, Tx.	Slop Oil	1977
Rhodia	Freeport, Tx.	Spent Caustic	1972
Rohm & Haas	Deer Park, Tx.	Cutter Stock Oil	1974-78
Rosebud Petroleum	Houston, Tx.	Slop Oil	1975
Shell Oil	Deer Park, Tx.	Spent Caustic Slop Oil	1975-77
South Coast Terminals	Houston, Tx.	Slop Oil	1976-77
South Hampton Co.	Silsbee, Tx.	Cutter Stock	1975
Southwest Oil Service	Houston, Tx.	Slop Oil	1976
Southwestern Barge	Highland, Tx.	Slop Oil	1976-77
Stauffer Chemical	St. Gabriel, La.	Caustic	1974
Texas City Refining	Texas City, Tx.	Caustic	1975
Texas Petro-Gas Producing (Cosden)	Groves, Tx.	Caustic	1975
Union Carbide	Seadrift, Tx. and Port Lavaca, Tx.	C[illegible] [illegible] Oil Cellulose Acetate Reactor Residue	1975-77
Union Texas Petroleum	Winnie, Tx.	Caustic	1975
United States Steel	Houston, Tx.	Slop Oil	1977
Warren Petroleum	Mont Belvieu, Tx.	Spent Caustic	1972
Paul Watson	Houston, Tx.	Slop Oil	1977
Whitehead Oil Petroleum	Buna, Tx.	Slop Oil	1976-77

EXHIBIT
3544 B
PENGAD-Bayonne, N.J.



NUMEROUS COMPANIES DID BUSINESS WITH LOWE CHEMICAL, PHOENIX AND JOC

Non-Styrene Related Materials Sent For Processing From Companies Other Than Monsanto

NAME	LOCATION	PRODUCT
Shell Oil	Deer Park, Tx.	Spent Caustic Slop Oil
South Coast Terminals	Houston [illegible]	Slop Oil
South Hampton Co.	Silsbee, [illegible]	Cutter Stock
Southwest Oil Service	Houston, Tx.	Slop Oil
Southwestern Barge	Highlands, Tx.	Slop Oil
Stauffer Chemical	St. Gabriel, La.	Caustic
Texas City Refining	Texas City, Tx.	Spent Caustic
Texas Petro-Gas Producing (Cosden)	Groves, Tx.	Spent Caustic
Thibodeaux	Houston, Tx.	Fuel Oil
Union Carbide	Seadrift, Tx. and Port Lavaca, Tx.	Caustic Slop Oil Cellulose Acetate Reactor Residue
Union Texas Petroleum Co.	Winnie, Tx.	Caustic
United States Steel	Houston, Tx.	Slop Oil
Warren Petroleum	Mont Belvieu, Tx.	Spent Caustic
Paul Watson	Houston, Tx.	Slop Oil
Whitehead Oil Production	Buna, Tx.	Slop Oil

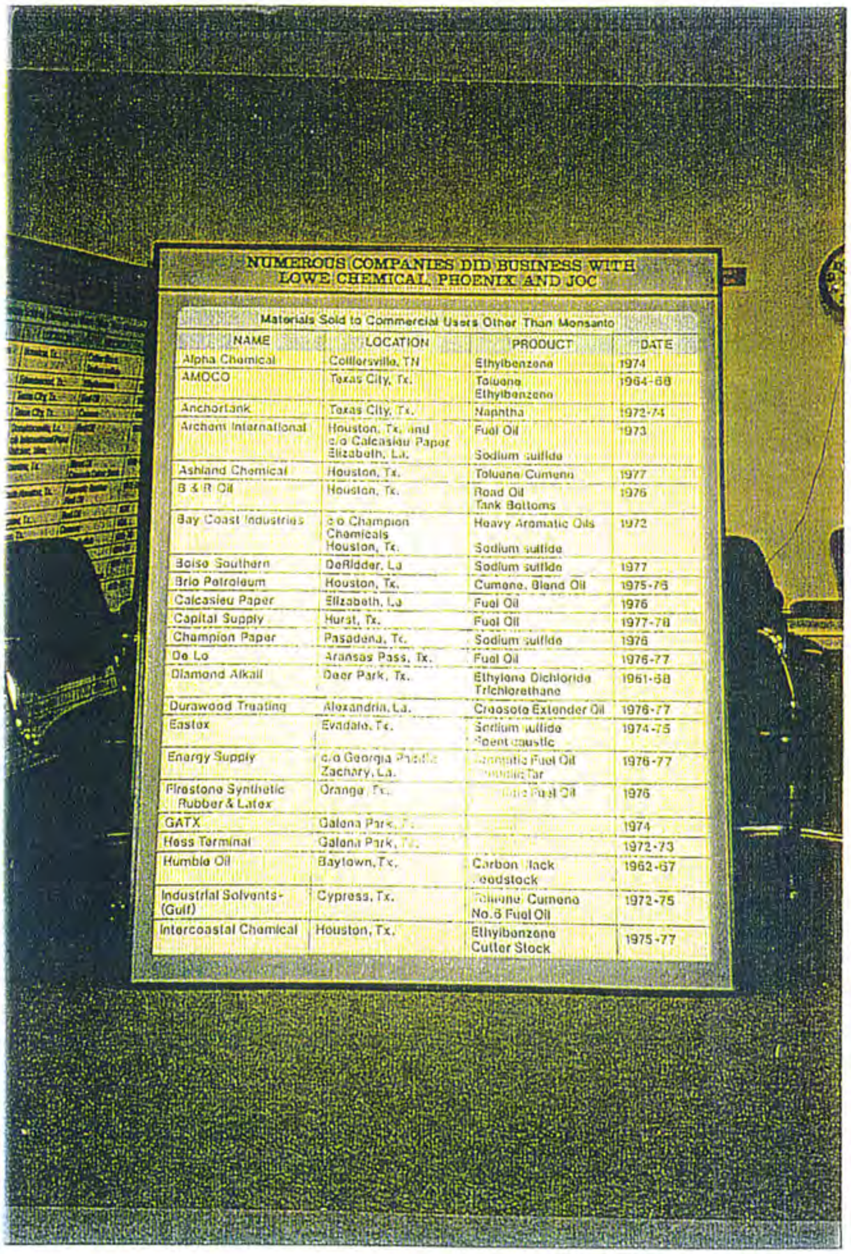


EXHIBIT
3545 A
PENGAD-Bayonne, N.J.

KG COH004396

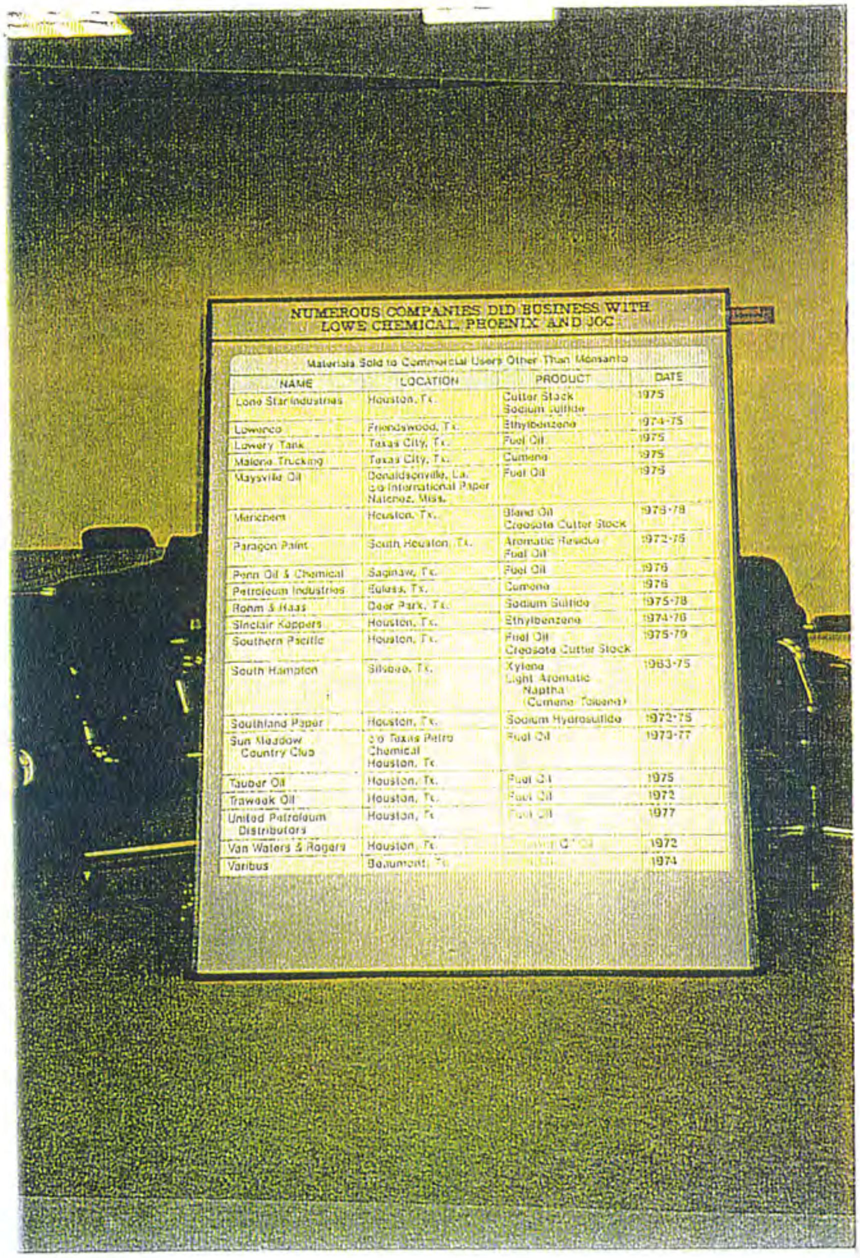
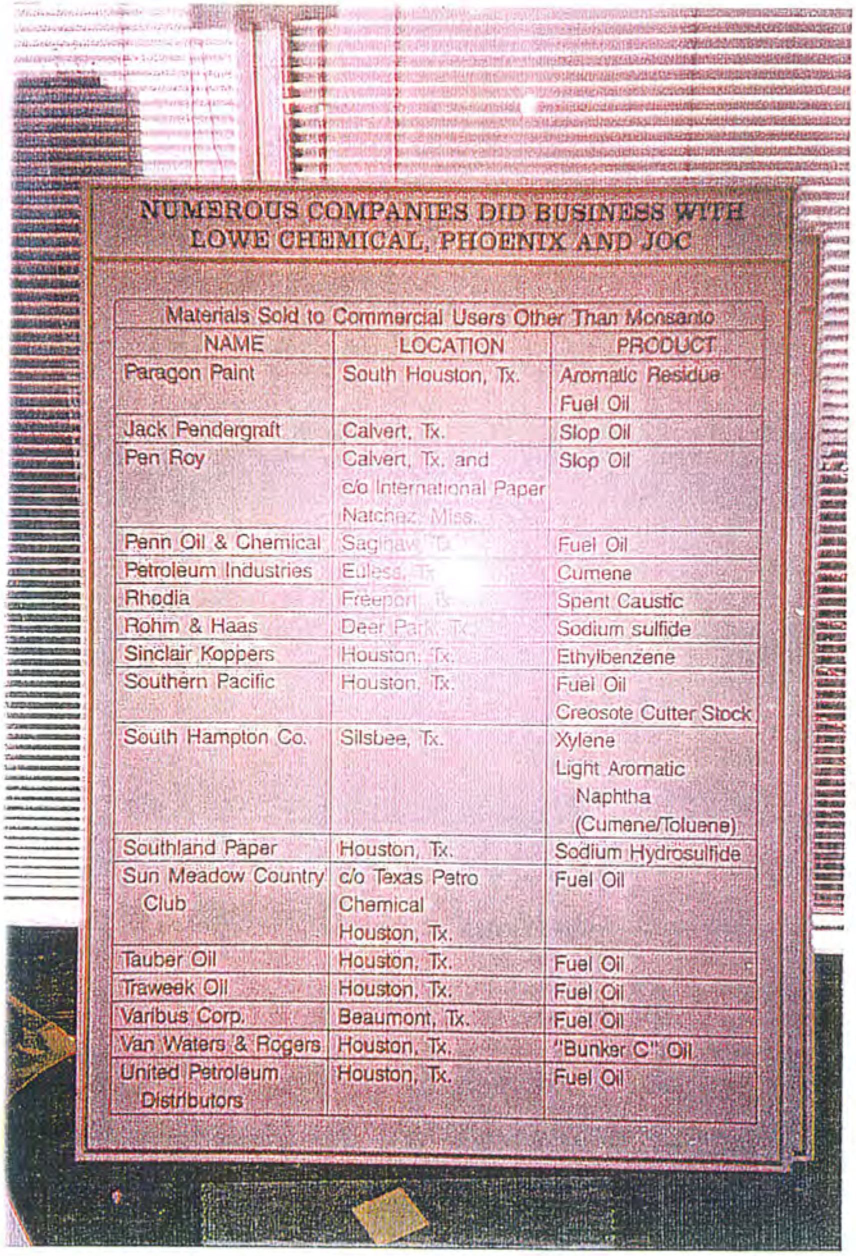


EXHIBIT
3545 B
PENGAD-Bayonne, N.J.



NUMEROUS COMPANIES DID BUSINESS WITH
LOWE CHEMICAL, PHOENIX AND JOC

Materials Sold to Commercial Users Other Than Monsanto		
NAME	LOCATION	PRODUCT
Paragon Paint	South Houston, Tx.	Aromatic Residue Fuel Oil
Jack Pendergraft	Calvert, Tx.	Slop Oil
Pen Roy	Calvert, Tx. and c/o International Paper Natchez, Miss.	Slop Oil
Penn Oil & Chemical	Saginaw, Tx.	Fuel Oil
Petroleum Industries	Euless, Tx.	Cumene
Rhodia	Freeport, Tx.	Spent Caustic
Rohm & Haas	Deer Park, Tx.	Sodium sulfide
Sinclair Koppers	Houston, Tx.	Ethylbenzene
Southern Pacific	Houston, Tx.	Fuel Oil Creosote Cutter Stock
South Hampton Co.	Silsbee, Tx.	Xylene Light Aromatic Naphtha (Cumene/Toluene)
Southland Paper	Houston, Tx.	Sodium Hydrosulfide
Sun Meadow Country Club	c/o Texas Petro Chemical Houston, Tx.	Fuel Oil
Tauber Oil	Houston, Tx.	Fuel Oil
Traweek Oil	Houston, Tx.	Fuel Oil
Varibus Corp.	Beaumont, Tx.	Fuel Oil
Van Waters & Rogers	Houston, Tx.	"Bunker C" Oil
United Petroleum Distributors	Houston, Tx.	Fuel Oil

PENGAD-Bayonne, N.J.
EXHIBIT
3545C

KG COH004398

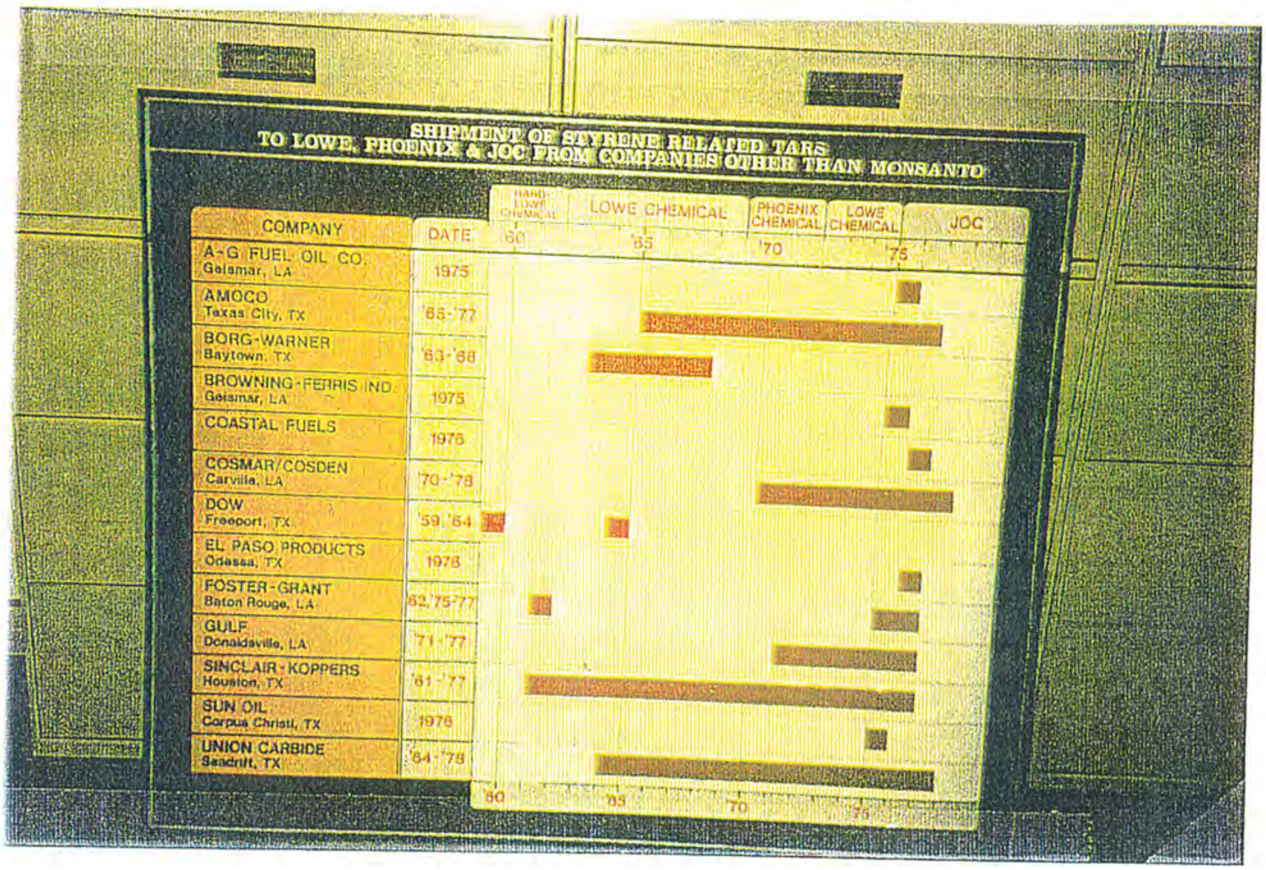


EXHIBIT
3546
PENGAD-Bayonne, N.J.

KG COH004399

PENGAD-Bayonne, N.J.
EXHIBIT
3547

61

KG COH004401

W. R. Nisbet - Previously rec'd cc of contracts
bcc: J. D. Flynn, St. Louis - Signed copies of contracts attached
J. V. Waggoner, St. Louis - CC of contract attached
R. O. Robson, Spfld - " " "
H. R. Lanser, T. C. - " " "
C. A. Peters, T. C. - " " "
W. H. Slager, T. C. - " " "

Contract file
① Styrene Tar CSI
② Vcm Tar CSO

October 6, 1961

Mr. C. G. Hard, President
Hard-Lowe Chemical Company
P. O. Box 12426
Houston 17, Texas

Dear Charlie:

Thank you for signing and returning to Rob Nisbet the two contracts for the purchase of our Styrene Tar Residue and Mixed Chlorinated Solvent By-Product Streams.

I have signed the contracts for Monsanto and your copies of these executed agreements are enclosed.

It is always a pleasure to do business with your good company. Please let me know if I can be of assistance in any way.

Sincerely,

J. N. Flanagan
Product Sales Manager
Monomers and Raw Materials

JNF:gh
Enclosures (2)

PLAINTIFF'S EXHIBIT 10B

2509102 1

0007251

KG COH004402

P-00562

62

KG COH004403

SM Tar ID17 /-65 14965

Monsanto

FROM (NAME & LOCATION) W. C. Fuller - Texas City

January 29, 1976

SUBJECT Joc Oil Agreement
Re: SM Tars

REFERENCE

TO : P. E. Brubaker

cc M. D. Burns
W. R. Johnson
R. McManamy
R. G. Roth
G. L. Stacy
C. Yoas/C. A. Peters

A meeting was held Wednesday, January 28, at the Joc Oil Aromatic offices in Friendswood. Joc Oil representatives were:

Mac Fowler	- Managing Director, Oil Division Joc Companies
Fred Jackson	- General Manager - Joc Oil Aromatic
Pierre Fairon	- Manager - Supply and Distribution

Monsanto representatives were:

R. G. Roth
W. C. Fuller

Agreement was reached that Joc Oil will pay Monsanto 17¢/gallon for SM tar (equal to 1.98¢/pound). Monsanto will pay Joc Oil 65% of the styrene price for EB, adjusted quarterly (present price is 65% of 21 = 13.65¢/pound).

Joc Oil will pick up SM tars and deliver EB to Monsanto in Joc Oil trucks.

Monsanto will continue to supply Joc Oil with caustic at Monsanto cost. The caustic will be picked up by Joc Oil trucks.

The agreement will be for one year starting February 1, 1976.

Contracts are being put together by Bob Roth.

The agreement for sale of SM tar was negotiated along with an agreement for sale of phenolic tar from Chocolate Bayou to Joc Oil.

W.C.F.
W. C. Fuller

WHP 0335783

[redacted]

CS10663

MONSANTO (Seller)

I b 1 6

File Raw Materials + Products

SM Tars

14868

800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
(314) 694-1000

SALES CONTRACT

SOLD TO JOC OIL LTD. (Buyer)

Crawford House

Hamilton, Bermuda

THE FOLLOWING GOODS, SUBJECT TO TERMS AS STATED BELOW AND ON THE REVERSE SIDE HEREOF.

PERIOD ~~January 1,~~ 1975, through ~~December~~ 31, 1976, and continuing year to year thereafter unless canceled as of December 31, 1976, or at the end of any year thereafter, upon ~~six~~ months prior written notice by either party.

GOODS Styrene (bottoms) Tars. (See Section 5 on reverse side.) No other materials shall be added without Buyer's approval.

QUANTITY Total production, up to 485,000 gallons per month.

PAYMENT TERMS Net cash thirty (30) days.

F.O.B. Seller's Texas City, Texas, Plant.

#0.17 per gallon

PACKING & PRICES Tank Trucks arranged by Buyer. Price to be ~~$0.00 for Goods containing sulphur (as inhibitor) and~~ for the entire calendar quarter during which Sulphur-Free Goods (as defined in Attachment 1) are first made available. For Sulphur-Free Goods the price will be equivalent to Monsanto's purchase price of fuel (natural gas BTU basis) for its Texas City, Texas, Plant and will be revised pursuant to Section 9 on reverse side.

REMARKS See Attachments No. 1, No. 2, and No. 3.

THIS CONTRACT WILL NOT BE BINDING ON SELLER EXCEPT AS PROVIDED IN ATTACHMENT 3.

~~This contract will not be binding on Seller unless accepted and returned by Buyer within ... days from date hereof.~~

ACCEPTED AS OF THE DATE HEREOF

JOC OIL LTD.

BY

TITLE

WHP 0335669 [redacted]

DATED January 1, 1975

MONSANTO COMPANY

BY

R. G. Roth

TITLE Director, Product Coordination & Planning, Petrochemical

CS10566

6-436 REV. 10/73

63

KG COH004406

RM&P Chlorinated Solvents

cc: Lillie Capps
V. DeWalt
J. N. Flanagan
H. M. Keating
J. W. Kongable
W. R. Nisbet
E. D. Paine
C. A. Peters, Jr.
W. E. Repschleger
R. W. Roten
J. J. Schroeder
N. N. Smith
C. W. Stephens
J. V. Waggoner
J. J. Walsch
F. Zivot
File (5)

Date: June 16,1960

Subject: Hard-Love Contracts - By-Products

To: Mr. B. W. Roman

Springfield, Mass.

Reference: Chlorinated Solvents Contract of 9/21/59
Styrene Residue Contract of 1/29/60 and Addendum of 4/7/60

Recently, two contracts have been signed with Hard-Love Company of South Houston, Texas to take, at minimum prices, two different by-product streams from operations at the Texas City plant.

Neither of these represents any great amount of money. However, for the record and so that everyone concerned will be familiar with the arrangements we have outlined below the essential points and arrangements for each contract.

Chlorinated Solvents By-Product Contract

Although this contract was executed on September 10, 1959, it provided for the start of operations and take of the Chlorinated By-Products on April 1, 1960. Actual operations started on May 1, 1960. The contract provides for Hard-Love to take all of the Texas City Plant production of the mixed chlorinated solvent by-product stream from the vinyl chloride monomer operations. The estimated production of this stream is five million to eight million pounds per year. Actual production in 1959 was 6.4 million pounds.

For 100 percent of this production, Hard-Love is to pay Monsanto the sum of $5,000 per year, payable in $1,000 increments on January 31, March 31, May 31, July 31 and September 30. The first payment was due and had been billed on May 31, 1960. Buyer is to supply tank trucks equipped with pumps and auxiliary lines or hoses for loading or suitable substitutes at Buyer's expense. Material is to be F.O.B. Seller's Plant, Texas City.

The Texas City Sales Department will arrange to bill Hard-Love for record purposes only and on memo for the quantity of chlorinated solvents taken each month by Hard-Love. Coding of this invoice will be 06-19-840.22-523-84196.

On or before the dates specified in the contract, the Texas City Sales Department will initiate a request for billing to Hard-Love for the $1000 payable on the next due date. The coding of these invoices will be to 6-19-840.22-523-84196. No weight is to be shown on these invoices.

EXHIBIT 88

2516911

MTC 0005714

EXHIBIT 5733

65, 135

Monsanto — Company

Texas City — Location

NOTE: Use lbs. as unit for amounts.

VCM Tars — Material

MO/YR	$\overline{m}$#/yr Amount/(lbs.)	Source/Stage Process	Process Capacity	Specific Gravity	Chemical Composition	Significant Events
1959	2.9 (1)	Tar from (4) the production of EDC and vinyl chloride monomer produced at an approximate rate of 2#/100# EDC & 5#/100# VCM	100%	8.5 lbs/gal	mixed (3) chlorinated solvents 30% EDC 60% TCE 10% Tar	(3)(4) 1.2 $\overline{m}$#/yr of VCM tars attributed to Motco and N80
1960	7.9					
1961	5.7 (2)					
1962	5.7					
1963	5.7				VCM Tar (4) 20% EDC 50% TCE 30% Tars may have traces of mercury	2.1 $\overline{m}$#/yr (5)
1964	5.7					
1965	5.7					
1966	5.7					
1967	5.7					
1968	5.7					
TOTAL	56.4					3.3 $\overline{m}$#/yr

Estimate of possible Amt to Brio: 53.1 $\overline{m}$#

ehEL212/94(3)

CMT 254064

KG COH004409

Monsanto Company — Tejas City Location

NOTE: Use lbs. as unit for amounts.

Material: Spent copper Catalyst

MO/YR	Amount/(lbs.) M#/yr	Source/Stage Process	Process Capacity	Specific Gravity	Chemical Composition	Significant Events
1956	1.26M (2)	Spent copper Catalyst from the production of acrylonitrile	Unknown	8.5 lbs/gal (1)	Cuperous Chloride Potassium Sodium	3.06M lbs to Motco (3); 3.12M lbs to Vaughn Chemical (4)
1957	1.26M					
1958	1.26M					
1959	1.26M					
1960	1.26M (5)					
1961	11.5M					
1962	11.5M					
1963	11.5M					
1964	11.5M (6)					
1965	24M					
1966	24M					

CMT 254065

(5) 1961-1964 amounts are an average of 1958, and 1965 estimates of spent copper catalyst to Hard-Lowe, Lowe.

(4) attributed to Vaughn Chemical during 1966 & 1967, according to Moto Waste allocati. and Monsanto correspondence with Vaughn.

ehEL212/94(3)

(1) Information obtained from Motco Allocation decision
(2) Information obtained from Monsanto IOM, Grissom, 10/15/58
(3) attributed to Motco by Decision on Volumetric waste allocation for the Motco site.

KG COH004410

Monsanto
Company

Texas City
Location

NOTE: Use lbs. as unit for amounts.

Spent Copper Catalyst
Material

MO/YR	MH/yr Amount/(lbs.)	Source/Stage Process	Process Capacity	Specific Gravity	Chemical Composition	Significant Events
1967	24					
1968	6					
Total	130.3					6.18

Total possible amt to Brio: 126.12*

CMT 254066

ehEL212/94(3)

* Monsanto EPA response indicates during July 1968 to July 1970 spent copper catalyst amounts recorded shipped to Brio, 52.0M lbs, for regeneration 52.8M lbs was returned to Monsanto as regenerated catalyst.

VCM Tars FooTnotes

(1) Information obtained from Monsanto Dept 22 VCM Plant Table entitled "Weight Recovery Yields."

(2) Information obtained from Monsanto memos (Grissom, Sept. 1959) and "Decision on Volumetric Waste Allocation for the Motco site", August 1985

(3) Information obtained from "Decision . . . Motco site"

(4) Monsanto undated memo entitled "Wastes to North 80."

(5) According to Texas State records mixed chlorinated solvents attributed to Monsanto's VCM process were disposed of off-site from Bris- (Sonics, Brazosport, Rollins)

CMT-254063

KG COH004412

67, 72, 77, 79, 81, 85,
86, 89, 91, 93, 94, 95
96, 97, 98, 99, 121

EXHIBIT 7049

August 21, 1985
1985

Re: Southbend/EPA Records

MEMORANDUM TO MR. BRADFORD AND MR. SPRAGUE:

File I of the EPA records contained correspondence between the EPA and 26 corporations. The EPA asked each of these corporations to provide with information regarding the Brio Refining, Inc. site in Friendswood, Texas. The EPA had reason to believe that each of these corporations may have generated a waste sent to the Brio Refining, Inc. site. Therefore, in order to determine which corporations were involved and to what extent, letters were sent giving a three week deadline within which to answer the questions to each of these corporations on October 30, 1984. In this letter, four basic questions were asked to each of these corporations:

1. Have you sent, or do you have knowledge of anyone who may have sent any waste to the Brio Refining company site? If so, please provide the names and addresses of any generators and transporters involved and indicate to which entity or entities the materials were sent.

2. In reference to Question No. 1, what was the chemical composition and volume of materials sent to the site and on what dates were such materials delivered to the site?

3. How and by whom were the above referenced wastes transported?

4. What was the ultimate disposition of the hazardous materials or substances sent to the site (ie landfill, recycled, etc.)?

The following are the responses provided by each of these corporations.

AMERICAN HOECHST CORPORATION

1. American Hoechst Corporation has never sent waste intended for disposal to the Brio Refining site. Company files indicate that from mid 1976 until approximately mid March, 1977, certain co-products, generally called styrene tars, produced in connection with the production of styrene monomer at American Baton Rouge, Louisiana plant, were sold as feed stocks to JOC Oil Aromatics and/or Lowe Chemical Company for their use in recovering certain aromatic hydrocarbons and other petro chemical products. File materials also indicate

F40012

KG COH004414

BRIO-99-012687

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that the following companies may have sold or delivered similar materials to these operators: Gulf Oil, Amoco Oil, American Oil, Alex Pit, El Paso Tar, Arco Polymer and Monsanto.

2. Analysis of the American Hoechst Corporation styrene tar feed stock sold in mid 1976 reveals that such materials as benzene, toluene, ethylbenzene, cumene, O-sylene, aliphatics, styrene, C_{10} alkybenzene were sold. Available sales records indicate that from February 2, 1977 through March 12, 1977 approximately 672,822 pounds of styrene tars were sold to JOC Oil Aromatics and/or Lowe Chemical Company. From other available records it also appears that from mid 1976 to the end of 1976 JOC Oil Aromatics and/or Lowe Chemical Company were delinquent in paying American Hoechst $58,879.71. Based on a contract price of 9¢ per gallon, and approximately 8.5 pounds of material per gallon, this may represent as much as 5,560,086 pounds of styrene tars purchased in accordance with the American Hoechst contract of sale. These records do not, however, indicate that these materials were ever taken to the Brio Refining site after they were picked up by JOC or Lowe at the Hoechst Company's Baton Rouge, Lousiana plant.

3. Sales were made pursuant to written contracts and were sold f.o.b. the American Hoechst Corporation Baton Rouge, Louisiana plant. Buyers took possession of the feed stocks at this location and transported them, using their own transportation, from Baton Rouge.

4. American Hoechst Corporation does not know what ultimate disposition may have been made of feed stock material sold to JOC and/or Lowe.

AMOCO CHEMICALS

1. Amoco Chemicals Corporation, Texas City plant did sell material to Lowe Chemical Company, Phoenix Chemical Company and JOC Oil Aromatics. Materials sold are described in the following answers. The material was sent to these companies for reclamation and recycling. In Amoco Chemicals' opinion, the material would, therefore, not be considered a solid waste under 40 CFR 261.2 or a CERCLA hazardous substance. The Malone Trucking Company, P. O. Box 709, Texas City, Texas 77590, transported this material for Amoco Chemicals.

F40013

2. An approximate range of chemical composition of the styrene residue sent to the site is less than 2% ethylbenzene, less than 3% diethylbenzene, 1% to 10% triethylbenzene, 2% to 8% styrene monomer, 10% to 20% styrene polymer, 25% to 35% diphenyl ethane, 20% to 30% ethyldiphenyl ethane, 20% to 30% other heavy hydrocarbons and 0% to 10% inhibitors. Amoco Chemicals was unable to find sufficient documentation which specifically established the volume of resi dues Amoco Chemicals had sent to the site. Sales of the byproduct styrene residues to the aforementioned companies began in early 1965 and continued until early 1977.

3. The styrene residues were hauled by tank truck. The Malone Trucking Company hauled the styrene residues for Amoco Chemicals, in some instances the buyer contracted for the transportaion of the styrene residues.

4. In Amoco Chemicals' opinion, the materials sold to the aforementioned companies which operated at the site was not a solid waste under RCRA or a CERCLA hazardous substance. The styrene residues were sold for reclamation and recycling. Amoco Chemicals believed that essentially all of the residues were, in fact, reclaimed, but some residual materials may have been generated from processing.

ATLANTIC RICHFIELD

1. Atlantic Richfield admits that certain materials were transported from facilities owned or operated by Atlantic Richfield or its predecessor companies to the site at 2501 Choate Road. Atlantic Richfield Company does not concede that any of the materials sent from its facilities to the site are hazardous, or wastes or are in any other way subject to the terms mentioned in this question.

2. Mostly high molecular weight tars from styrene distillation were viscous liquids with a flash point greater than 140° F, typically containing 1% to 2% styrene, 5% to 15% sulfur, styrene dimers, styrene trimmers, low molecular weight styrene polymers and unidentified tars. Petroleum sent was derived from crude oil and crude oil processing with some admixture of sand, dirt, rust and water.

3. Transporters were Lowe Chemical Company from 1964 through 1969; Phoenix Chemical Company from 1970 to 1972; Lowe Chemical Company from 1972 to 1974 and JOC Oil Company from 1976 to 1977.

4. The materials were sent to the site for processing, not disposal, and, to the best of Atlantic Richfield's knowledge, they were thus processed and the products were removed from the site.

BAY COAST INDUSTRIES

Bay Coast stated that it was not involved with any waste oil collection system as concerned JOC Oil Aromatic reclaiming operation. It attempted to set up such a transaction in 1975 and 1976, but it was never consummated.

COSDEN OIL AND CHEMICAL

1. Cosden Tech, Inc. denied that it has done business with Brio Refining, Inc. or any of its predecessors at any time. It was discovered that a sister company, Cosden Oil and Chemical Company, a petro gas plant, had done business with Lowenco, Lowe Chemical Company, and JOC Oil Aromatics. Records indicate that such dealings were limited to the year 1975.

2. No records of the composition of the materials shipped were available, but the spent caustic generated by the Cosden facility as a byproduct of LPG sweetening normally contains from 2% to 5% caustic and contains varying amounts of sulfur compounds which would be present in LPG.

3. Cosden Chemical Company was invoiced for transportation costs only. Invoices revealed that Lowenco, JOC Oil Aromatics or Lowe Chemical Company trucks were used for shipment.

4. From the available information, the only material involved was spent caustic which was picked up at the Cosden Oil and Chemical Company, petro gas plant in Port Arthur, Texas. This material was ostensibly removed for reclamation and according to the available document it was shipped to the Choate Road facility in Friendswood, Texas. Employees who were involved in loading this material will indicate that this spent caustic was actually shipped directly to the [illegible]

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KG COH004417

BRIO-99-012690

F4001

DIXIE CHEMICAL COMPANY

1. Dixie stated that the did not dispose nor arrange for disposal of any hazardous waste or substances at the Brio Refining site. Dixie has no knowledge of any other person sending hazardous wastes or substances to the Brio Refining, Inc. site.

Questions 2, 3 and 4 were not applicable. Dixie records did indicate that Lowe Chemical Company, JOC Oil Company and Lowe Chemical Company-JCC Oil Aromatics were customers of Dixie. These companies purchased from Dixie a variety of Dixie's products in a manner and at prices consistent with Dixie sales to its other customers. Caustic was and continues to be one of the many regular package products sold by Dixie to a variety of its customers. A list of Dixie Products was provided.

DOW CHEMICAL

1. Dow Chemical Company is a large, diverse company with many divisions throughout the country. The records search at the locations where the relevant records are kept has revealed no information regarding a transporation of waste to or disposal of waste at the Brio Refining, Inc. site. Although Dow Chemical had no knowledge of waste being transported to or disposed of at the site, conversations with Dow employees have indicated that Dow has sold some products to Ralph Lowe and/or Lowe Chemical.

2. Dow has neither transported waste to nor disposed of waste at the Brio Refining, Inc. site. Conversations with Dow employees have indicated that Dow sold approximately 130,000 gallons of Tarophen S-30, a styrene tar to Ralph Lowe during 1959. Dow also sold an unknown amount of ethyl benzen oil to Lowe Chemical—in 1964 to be used as a solvent for styrene tar recovery.

5007266

3. Dow has neither transported waste to nor arranged for the transportation of waste to the Brio Refining, Inc. site. At this time, Dow did not have sufficient information concerning the transportation of products sold to the former operators at the site.

4. The Tarophen S-30 sold to Ralph Lowe by Dow Chemical was to be refined, to strip it of sulfur, and the residual product was to be used as fuel. The ethyl

benzene oil was to be used as a diluent in Lowe Chemical's styrene tar refining process.

ETHYL CORPORATION

1. Ethyl Corporation, Houston plant records did not indicate that Ethyl Corporation's Houston plant dealt with Brio Refining, Inc., or with the two other entities that were listed as operators of the site (ie Lowe Chemical Company and JOC Oil Exploration Company, Inc.) or with the PRP listed as a transporter (ie Malone Trucking Company). Later discovery indicated that Ethyl Corporation had sold a quantity of "cutter stock" to JOC Oil Aromatics, Inc. Ethyl's investigation revealed only the sale of a quantity of fuel oil to JOC in a single sale on September 20, 1975. That sale represented the entire quantity of material listed as cutter stock and JOC Oil Aromatics, Inc. feed stock summary.

2. The fuel oil was not a hazardous substance and certainly was not a waste.

3. Ethyl Corporation was not at all certain if the fuel oil was ever transported to the Brio Refining, Inc. site. It may rather have been stored in remote tanks for other eventual user sale.

4. If the fuel oil was in fact used as "cutter stock" at the Brio Refining, Inc., it is Ethyl's understanding from Mr. Ralph Lowe that cutter stock was stored in tanks in the refinery area for blending with sellable products recovered during styrene recovery operations and was never introduced into any of its pits or any other ground units at the site.

GENERAL FOODS

1. To the best of General Foods Corporation's knowledge no hazardous substances or hazardous wastes were ever sent to or disposed of at the Brio Refining site. to the best of their knowledge they have acted in compliance with all local, state and federal regulations concerning all material disposal.

GOODYEAR TIRE AND RUBBER COMPANY

Records revealed that there were two Goodyear plants that were involved with Brio Refining or one of its predecessors.

1. The Bayport Chemical Plant, LaPorte, Texas did generate materials referred to as alky heavies and organic heavies. These materials were sold to Lowe Chemical from November, 1973 to May, 1975, to JOC Oil Aromatics, Inc. from September, 1975 to June, 1977.

2. The Bayport plant streams were of very low sulfur content and blended with materials they obtain from other sources having a high sulfur level. Specification No. 6 fuel oil was the final product.

3. All shipments were loaded in buyer owned vehicles.

4. It was Goodyear Bayport's understanding at times of shipment of these materials that they were being used as blending stock for fuel oil. (Also note that Beaumont Chemical Plant, Beaumont, Texas made one sale of surplus mobiletherm 600 to JOC Oil Aromatics, Inc. in 1976 and a 1980 sale to Dixie Oil Processors, Inc. of a waste hydrocarbon liquid.)

GULF COMPANIES

1. Gulf has not thus far uncovered any information which indicates that it sent any waste to the Brio Refining Company site. Furthermore, this preliminary search has not identified any other persons who may have sent waste to the Brio Refining Company site. This investigation is continuing. It has been determined that Gulf sold styrene and polyethyl benzen byproducts to Lowe Chemical Company, Phoenix Chemical and JOC Oil Aromatics. It is unknown at this time whether any of these products were transported to the Brio Refining Company site.

Questions 2, 3 and 4 were not applicable based on information reviewed to date.

KOCIDE CHEMICAL

1. Kocide Chemical had no records or knowledge of any materials being sent to the Brio Refining site. They have no information or knowledge about a material

known as "cutter stock". Kocide Chemical Corporation is a producer of copper based fungicides which are used on food crops. There is no waste generation or storage for disposal resulting from such operations.

Questions 2, 3 and 4 are not applicable.

LONE STAR INDUSTRIES

1. Lone Star attempts to explain its involvement as identified by JOC Oil Aromatics, Inc. in the disposition of 24,100 gallons of "cutter stock" on its feed stock summary for December, 1975. Lone Star denies any involvement with the sending of hazardous waste or substances to the Brio Refining Company, Inc. site. The EPA disagrees. A Lone Star subsidiary purchased a 30 acre tract adjacent to Lone Star's Houston cement plant from Signal Oil and Gas Company in late 1960's. On that track were very large crude oil storage tanks, one of which had contents which were the materials in question in this case. No action was taken on the contents of the tanks until the early 1970's when efforts were made to the hydrocarbons in the tanks sold and to have one or both of the tanks demolished. Lone Star entered into sales agreements with several individuals and companies for the right to remove the materials from the tanks. Pursuant to these agreements, materials were shipped from the tanks. One such agreement was with an individual named J. R. Burns in 1975. Under that agreement, Burns purchased the contents of the tanks and the steel structure of the tank for $2,500.00. Burns also agreed that after he removed his hydrocarbons from the tanks he would demolish the north tank and level that site and the surrounding levies. Before completing this demolition and cleaning work he would be paid $35,000.00. Subcontractors were retained, one of which was JOC. It is believed that the cutter stock listed on the JOC feed stock summary report was removed from the north tank by JOC and/or Burns in the fall of 1975.

Questions 2 and 3 were not answered.

4. Lone Star has no knowledge of what JOC did with the cutter stock/material recovered from the tank nor what process they employed.

LOWERY CORPORATION

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1. Lowery Corporation denies any involvement with Brio Refining, Inc. Lowery Corporation has never generated hazardous waste nor has ever sent such material anywhere.

BRIO-99-012694

MALONE TRUCKING

1. Malone Trucking Company did not, of its own discretion, send any waste to the Brio Refining Company site. Hard-Lowe Chemical Company hired Malone Trucking Company to transport materials, the exact nature of which is unknown at this time, from both Monsanto Chemical Company at Texas City, Texas and the Dow Chemical Company of Freeport, Texas to the Hard-Lowe Chemical Company which is now the Brio site referred by the EPA. None of these or any other trips which may have been made by Malone Trucking Company to the Hard-Lowe or Brio site involved any discretion on the part of Malone Trucking Company and Malone acted at all times as a non-discretionary hauler of material.

2. The material hauled from Monsanto Chemical Company was sometimes referred to as vinyl chloride monimer, styrene monimer and cuprous chloride. No [illegible] or other verification of this material was made by Malone Trucking Company and the information supplied in this answer is comprised solely of the representations made to Malone Trucking Company by its customer. Only materials referred to by the customer as styrene monimer were hauled from Dow Chemical Company to the Brio site. In both instances, the volume transported was not known and the material was delivered during the late 1950's and possibly the very early 1960's.

3. The material was transported by Malone Trucking Company owned by Malone Trucking Company.

4. It is believed that the material is recycled al though no first hand knowledge of the ultimate disposition of the material is known to Malone Trucking Company.

MARATHON OIL

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1. Marathon stated that any caustic which Marathon Petroleum Company may have shipped to the site would not be a "hazardous substance" under CERCLA, but instead was a product used as a detoxicant in a scrubber for removing H_2S from gases given off from tars being treated at the site.

Questions 2, 3 and 4 were not applicable.

BRIO-99-012695

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MONSANTO

1. Monsanto does not admit that any of its materials sold to companies alleged to have operated at the site is considered a hazardous substance or hazardous waste as defined by Section 101(14) of CERCLE or Section 1004(5) of RCRA. Based upon Monsanto's records, it was determined that copper catalyst was shipped to the Brio site and returned to Monsanto; two treatment chemicals may have been sold or provided to the alleged Brio site owners and/or operators; and styrene tars, vinyl chloride tars, and various fuels were sold to alleged Brio site owners and/or operators. Between the years 1956 and 1970, a depleted copper catalyst solution was regularly shipped to the Brio site for regeneration by adding copper. The regenerated copper catalyst slurry was returned direct to Monsanto for reuse in Monsanto's process. As part of the catalyst regeneration process at the Brio site, muratic acid was used as a treatment chemical. Between the years 1960 and 1977, styrene tars were sold to those companies allegedly operating at the Brio site. The material was sold for use as a feed stock for their process which recovered various products from this raw material. Additionally, this process utilized caustic soda as a treatment chemical and occasional shipments of this material were documented in records. During the period 1959 to 1968, vinyl chloride tars were sold to those companies allegedly operating at the Brio site. This material was also used as a feed stock for their process which recovered various products from this raw material. During the years 1967 through 1980, various fuels were sold to those companies allegedly operating at the Brio site. Those materials were sold for feed stocks, their fuels recovery and blending operations. The fuels were aromatic oil no. 1, aromatic oil no. 4 and phenolic tars. It is Monsanto's belief that the Brio site was not a disposal site. Monsanto did not have sufficient information to state whether or not any one sent hazardous waste or hazardous substances to the Brio site.

Questions 2 and 3 were not answered.

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4. Finally, Monsanto had no information relating to the disposition of hazardous waste or hazardous substances, if any were generated at the site.

[illegible], INC.

1. No.

Questions 2, 3 and 4 are not applicable.

ROHM & HAAS COMPANY

Rohm & Haas denied all involvement with the Brio site.

SHELL OIL

1. Shell Deer Park manufacturing complex did sell two tank trucks of sales grade, commercial product caustic soda to JOC Oil Aromatics, in 1975 for their use. Shell Deer Park manufacturing complex did send used oil to JOC Oil Aromatics in Friendswood, Texas in 1976. JOC Oil Aromatics arranged for transportation of this material to the Friendswood facility. Transporters used include JOC Oil Aromatics trucks and Lowe Chemical Trucks.

2. In 1975, Shell sold two tank trucks with sales grade caustic soda liquid to JOC Oil Aromatics for their use. In 1976 Shell DPMC sent material which was routinely treated in their refinery "slop" oil recovery system to JOC Oil Aromatics. This material was commonly called oilly sludge or slop oil from petroleum refining. Chemical composition is not available. Although the Shell purchase orders attached indicate this material was sent to JOC Oil Aromatics for disposal, Shell DPMC routinely processed this oil layer to produce fuel oil for other useful oils.

3. The materials were transported in tank trucks by the transporters indicated above (JOC Oil Aromatics and Lowe Chemical).

4. The caustic soda sold to JOC Oil Aromatics was probably used in their processing. In 1976, Shell DPMC sent material which was routinely treated in their refinery "slop" oil recovery system to JOC Oil Aromatics. This material was commonly called oilly sludge or slop oil from petroleum refining. The chemical composition analysis is not available. The material sent to JOC Oil Aromatics was upper layer oil from our oil recovery separator lagoons. Although the Shell purchase orders attached indi

F40022

cates this material was sent to JOC Oil Aromatics for disposal, Shell DPMC routinely processed this oil layer to produce fuel oil or other useful oils. It is likely that JOC Oil recovered useful oil from this material. Special notes on the receipts included from Shell Oil are these are the most incriminating with specific statements in the receipts referring to the hauling of oil, sludge, waste oil for disposal as far back as 1975.

INVOLVEMENT OF SOUTHERN PACIFIC TRANSPORTATION COMPANY

1. Investigation and interviews reveal that Southern Pacific had neither transported hazardous substances to the Brio Refining site nor had disposed of hazardous substances at the Brio Refining site.

Questions 2, 3 and 4 are not applicable.

TENNECO

Apparently the EPA had information linking Petro Tex to the Brio site. Somehow Petro Tex must be linked or associated with Tenneco Oil. Tenneco conducted an investigation with former Petro Tech employees concerning information possessed by the EPA. There had been allegations by a stockholder of Lowe Chemical Company, Ralph L. Lowe, that during some part of the periods 1962 through 1968 and 1972 through 1975, the Hard-Lowe Chemical Company reclaimed chemicals from, inter alia, chlorinated hydrocarbon material from Petro Tex's plant. After the follow up and interviews, there was no information which was revealed that showed any chlorinated hydrocarbon ever being delivered to Hard-Lowe Chemical Company or Brio Refining by Petro Tex. The Petro Tex employees recalled that this stream was sold to Dow Chemical Company for reclamation for several years. Thereafter, it was sent to Rowland's Disposal Services for incineration for a period of time, and then was split between Ploss Chemical, for reclamation, and Rowland's Disposal, for incineration. Therefore, the response to Question number 1 was the Petro Tex Chemical Corporation did not send any wastes to the Brio Refining, Inc. site.

TEXACO

1. Texaco's investigation so far has revealed no record of hazardous waste or hazardous substances, as those

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terms are respectively defined under the Resource Conservation and Recovery Act and the Comprehensive Environmental Response Compensation and Liability Act, having been sent to the Brio Refining, Inc. site. To the extent that EPA Question number 1 inquires about the activities of others, there is no legal authority which has been cited, nor is any known, for inquiring concerning activities of others.

Questions 2, 3 and 4 all say see answer to number 1. It was stated that Texaco was only tied to JOC Oil Aromatics, Inc. through a Texas Department of Water Resources record which showed that Texaco was on the Accounts Payable list of JOC for the sum of $648.11. There was no other explanation or reason for the Accounts Payable suggested in the document and Texaco's name was not included in the supplier of feed stock list for the last five months of 1975. Texaco, therefore, retained its contention that it in no way was related to the disposal or handling of any hazardous substances out at the Brio plant.

TEXAS CITY REFINING, I.C.

1. TCR admits involvement in deliveries to JOC Aromatics, Inc. They have no knowledge of any deliveries of any material from TCR to the Brio site, nor do they have any knowledge of any other person who may have sent materials to that site. TCR identified spent caustic as a byproduct of the refining process, wherein a propane-propylene stream is purified by scrubbing with a caustic solution to remove hydrogen sulfide. The H_2S is chemically bound into the liquid by reaction to sodium sulfide. The release of H_2S from the liquid occurs upon a reduction of the pH of the material. At the time that material was not dis carded, but rather was a marketable product. TCR sold the caustic for reclamation or use for other production purposes. TDWR did not require mani festing of the material as a waste. The principle use for the liquid in the mid '70's was by the paper industry. It is the belief of TCR that JOC "blended up" the caustic by adding sulfides and resold the mixture to the paper producing industries of the Houston area.

5007274

2. The mixture of "waste oil" sent to the site contained the following materials: water and sediment 80%, hydrocarbons 20%. The hydrocarbons, once separated

from the water and sediment, would be reclaimable, sellable oil. A number of manifest and delivery receipts are included in the TCR records. They concern spent caustic delivered by JOC from Texas City Refining.

3. The materials were transported apparently by JOC delivery. The chemical break down of the spent caustic which was sent by Texas City Refining is provided in the supplemental materials. A summary of the Industrial Waste Shipping Control tickets that involve the spent caustics which were delivered to JCC Oil Aromatics revealed that the only hazardous properties were high pH.

UNION CARBIDE

1. Union Carbide sold material to persons operating at the Brio site. As of March 12, 1985, Union Carbide had no information to indicate which companies, if any, may have sent waste to the Brio site. Although Union Carbide did admit that it sold material to companies operating at the site, Union Carbide did not admit that any of this material would be con sidered "hazardous waste" as defined by Section 101(14) of CERCLA.

2. Based upon Union Carbide's review of records to date, Union Carbide may have sold to persons operating at this site cellosolve acetate, ethyl benzene, poly ethyl benzene, or styrene tars. Union Carbide estimates that in 1975 and 1976, approximately 1,600,000 gallons of styrene tars were sold to Lowe Chemical or JOC Oil. In May, 1976, 5,000 gallons of cellosolve acetate was sold to JOC Oil. Union Carbide's records indicate that Union Carbide sold 28,000 gallons of ethyl benzene to Lowe Chemical in September and October of 1975.

3. Union Carbide's records indicate that Lowe Chemical and Sunco transported the styrene tar in 1975 and 1976 by vacuum truck. Union Carbide's records indicate that Kay Dee Resources transported the cello solve acetate.

BRIO-99-012700 | 5007275

4. Union Carbide understood that its materials were to be used as feed stocks in chemical processing operations. Union Carbide does not know the ultimate disposition of any material which ...

Carbide did not send any materials to this site for disposal.

UNION TEXAS PETROLEUM CORPORATION

1. Based upon a review of Union Texas Petroleum Corporation (UTPC) records, they found no evidence of and have no knowledge of any shipments by UTPC or any other parties of hazardous wastes or hazardous substances to the Brio Refining, Inc. site. A search has been made of UTPC payment records dating back to 1965. No records were found evidencing payments made by UTPC to any of the parties identified by the EPA as operators of the site. Similarily no evidence of payments by UTPC to parties identified by the EPA as transporters servicing the site have been found.

2. UTPC is unaware of the shipment of any hazardous wastes or substances to the site.

3. UTPC is unaware of the shipment of any hazardous wastes or substances to the site.

4. UTPC is unaware of the shipment to the site of any hazardous wastes or substances or of their ultimate disposition at the site.

Timothy R. Price

TRP:tal

5007276

89

Monsanto Company
[illegible] Post Oak Tower
5051 Westheimer
Houston, Texas 77027
Phone (713) 621-5555

June 1, 1973

Mr. Ralph Lowe
Lowe Chemical Company
P.O. Box 12426
Houston, Texas 77017

Dear Ralph:

Confirming our telephone conversation, we have agreed to lower the Phenolic Tar price from $0.0042 per pound to $0.0032 per pound effective May 1, 1973.

We hope this will enable you to move Phenolic Tars at a uniform rate once you are able to deinventory the styrene tars some.

Sincerely,

MONSANTO POLYMERS & PETROCHEMICALS CO.

T.L. Lopper
Sales Representative

TLL/nb

PLAINTIFF'S EXHIBIT 185

1800116

0007239

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KG COH004431

Form ... Rev. 3-72

MONSANTO

MONSANTO POLYMERS & PETROCHEMICALS CO.

INV.

Order Billing Copy

WP
OD 1-19/1/WP/ZZ020

SHIPPER'S NO.	DISTRICT	DATE ENTERED	CUSTOMER'S ORDER NO.	INVOICE DATE	INVOICE NUMBER
M460447-02		11-19-73	N/A	12-19-73	52-120632

TERMS: NET 30 DAYS

DATE SHIPPED:

CAR INITIALS AND NO.:

PREPAID OR COLLECT—ROUTING: COLLECT

S/P DUAL

DELIVERY F.O.B.: CHOC BAYOU TEXAS

S. S.	MODE	TERMS	TR.	O. C.	KIND	SHIP TO
06						

SHIPPED FROM	WHSE. CODE	BOOKED THRU	COPIES CODE
CHOC BAYOU TEXAS	0046	08-42 LOOPER	02500

SOLD TO:
LOWE CHEMICAL COMPANY 2809
P O BOX 12426
HOUSTON TEXAS 77017

BOX 3608
DALLAS TEXAS 75221

SHIP TO:
LOWE CHEMICAL COMPANY
C/O GATX-TANK 28
GALENA PARK TEXAS

9

KIND CODE	DESCRIPTION	QUANTITY	PRICE & UNIT	AMOUNT
6113	XX-TANKTRUCK 30 PHENOLIC TARS	60031 GALS 579300 LBS	.00332 LB	1923.28

These may have been mailed to Lowe Chem, I sent Check Copies 12/21/73

M-7066-000-91-046

SPECIAL INSTRUCTIONS:
TWO COPIES OF B/L TO SOLD TO ADDRESS. CALCULATE GALLONS BY DIVIDING WEIGHT BY 9.65.
EOT

M00041

KG COH004432

000041

70, 71, 73

AtlanticRichfieldCompany Legal Division
1500 Market Street
Philadelphia, Pennsylvania 19101
Telephone 215 557 2350

RECEIVED
EPA REGION VI

1985 APR 12 AM 11:46

SUPERFUND BRANCH

April 9, 1985

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

United States Environmental Protection
Agency, Region VI
Superfund Enforcement Section
Air & Waste Management Division
1201 Elm Street
Dallas, Texas 75270

Attention: Mr. Lou Barinka (6AW-SE)

Re: Brio Refining, Inc. Site
2501 Choate Road
Friendswood, Texas

Dear Mr. Barinka:

This letter is Atlantic Richfield Company's response to the letter on this subject dated 30 October 1984 from Allyn M. Davis of EPA to William F. Kieschnick, President and Chief Executive Officer of Atlantic Richfield Company.

(1) As explained in V. Peter Wynne's 19 December 1984 letter to you, our delay in responding has been necessitated by a lengthy search and analysis of voluminous old records at several locations to determine whether we have any information pertaining to your request.

(2) This search indicates that certain materials were transported from facilities owned or operated by Atlantic Richfield Company or its predecessor companies to the site at 2501 Choate Road. These materials and shipments are described in the appendix to this letter.

(3) The information contained in the appendix is provided for the sake of thoroughness only, as Atlantic Richfield Company does not concede that any of the materials sent from its facilities to the site are hazardous, are wastes or are in any other way subject to your letter. The materials were sent to the site for processing, not disposal, and, to the best of our knowledge, they were thus processed and the products were removed from the site.

R007349

(4) Please be advised that Atlantic Richfield is a participant in the Brio Refining, Inc., Task Group. The Task Group as you are aware has retained a prominent local technical consultant, Resource Engineering, Inc., to provide technical assistance. It is the intent of the Task Group to perform an RI/FS on this site provided the necessary details can be worked out with the EPA and the Texas Department of Water Resources.

(5) We have learned that Atlantic Richfield has been named as a third party defendant in Powell v. Pulte Home Corporation, Harris County District Court Case No. 84 75865. However, we have not been served.

(6) All contact regarding this matter should be through the undersigned:

Anthony M. Paul
Legal Division
ARCO Chemical Company
1500 Market Street, Suite 2100
Philadelphia, Pennsylvania 19103.

Sincerely yours,

Anthony M. Paul

Anthony M. Paul

AMP/sm
Attachment

R007350

APPENDIX

Quantity of high molecular weight tars from styrene distillation columns* at Sinclair-Koppers' Pasadena, Texas, plant (formerly owned by Atlantic Richfield Company) sent to NPL site commonly referred to as Brio Refining, Inc.

Year	Transporter	Quantity (Million Pounds)
1964	Lowe Chemical Co.	3.0
1965	Lowe Chemical Co.	2.7
1966	Lowe Chemical Co.	2.8
1967	Lowe Chemical Co.	3.1
1968	Lowe Chemical Co.	3.2
1969	Lowe Chemical Co.	2.6
1970	Phoenix Chemical Co.	3.3
1971	Phoenix Chemical Co.	3.0
1972	Phoenix Chemical Co. Lowe Chemical Co.	3.6
1973	Lowe Chemical Co.	4.1
1974	Lowe Chemical Co.	2.6
1976	JOC Oil Company	3.6

* High molecular weight tar styrene distillation column bottoms: viscous liquids with a flash point greater than 140° F, typically containing 1-2 percent styrene, 5-15 percent sulfur, styrene dimers, styrene trimers, low molecular weight styrene polymers and unidentified tars.

74, 75

KG COH004437

JOC Oil Aromatics Inc.

2501 Choate Rd., Houston, Texas
P.O. Box 135, Friendswood, Texas 77546
713-482-7575 Telex: 775475 Cable: JOCARO

PURCHASE ORDER

SELLER

ARCO/ Polymers, Inc.
P. O. Box 8500 S-3130
Philadelphia, PA 19178

Attention: Mr. D. K. Stall

SHIP TO:

JOC Oil Aromatics, Inc. 2501 Choate Road, Houston, Texas 77089

ORDER NO. F-31276	Terms Net 30 days	Confirming To D. K. Stall		
Purchase Order Date: 3/12/76	Period Covered Calendar Year 1976	Freight Buyer's Truck	PPD.	COL. X
Shipping Point Item One Only ARCO Plant, Houston, TX		Ship Via: Best Way		

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
1. Entire production Estimated at 45,000 gallons per month	Styrene Tars --	$0.09 gal./FOB ARCO's plant	
2. One third of Item 1 Estimated at 15,000 gallon per month	P.E.S. Bottoms	$0.145 gal./delivered JOC's plant	

Special Conditions:
1. Deliveries to be evenly spread over the year.
2. ARCO to invoice once a month for previous month deliveries.

Issued By: [signature] Title: Manager - Supply and Distribution

Accepted By: ______________________ Title: ______________________

220735

WHP 0540952

1020240

BRIO-99-003077

KG COH004438

C O P Y

March 12, 1976

Mr. D. K. Stall
ARCO Polymers, Inc.
P. O. Box 8500 S-3130
Philadelphia, Pennsylvania 19178

Dear Mr. Stall:

Attached please find our Purchase Order covering our take of styrene tars and PEB bottoms as agreed with our Mr. Fred Jackson. Please sign one copy and return it for our files.

As you can see, we made the purchase order retroactive to January 1, 1976. Our records indicate that you delivered us 29,467 gallons of styrene tars in January for which you did not invoice us, and 24,825 gallons in February covered by your invoice #435-29H.

Based on 1/3 supply of PEB bottoms, you should supply us 18,098 gallons in addition to the future 1/3 of styrene deliveries. We would appreciate it if you could catch up with the PEB bottoms in the shortest possible time.

We thank you for this business, and hope you will find our relationship a pleasant one.

Sincerely,

Pierre Fairon
Manager
Supply and Distribution

PF:cmn

Attachment

BRIO-99-003076

220794

WHP 0540951

J020239

KG COH004439

76

3

THIS ME[illegible]DUM is an [illegible]ledgment that a Bill of Lading has been is[illegible] and is not the Or[illegible] Bill of Lading, nor a copy or duplicate, coveri[illegible] property named[illegible], and is intended solely for filing or record.

G[illegible] [illegible]KE TRANSPORT

Name of Carrier

RECEIVED subject to the classifications and tariffs in effect on the date of the receipt by the carrier of the property described in the Original Bill of Lading

At NORTH SEADRIFT, TEXAS 10-2[illegible] , 197[illegible] From UNION CARBIDE CORPORATION

Chemicals & Plastics

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

Shipper's Order No. | Customer's Order No.

Consigned to LOWE CHEMICAL CO.

Destination HOUSTON, State TEXAS

Route Tank No. 1174 Seals

DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS

Cont. No.	Commodity	Capacity	Gallons (or loading temp.)	Loading temp. °F	Gallons at Load. Temp.	Gallons at 60° F	Weight Subject to Correction	Class or Rate
[illegible]	STYRENE WASTE, HAVING AN API GRAVITY OF LESS THAN 17.6 AT 60°							

Gross 70,350

Tare Actual 22,480

Tare Marked

Net 4[illegible],870

Weighed at UNION CARBIDE CORPORATION Chemicals & Plastics NORTH SEADRIFT, TEXAS

SPECIAL INSTRUCTIONS

PUMP HOSE No. OF FEET NOZZLE

Subject to Section 7 of Conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Signature of Consignor

If charges are to be prepaid, write or stamp here "To be Prepaid."

TO BE PREPAID

Received $ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per (The signature here acknowledges only the amount prepaid.)

Charges advanced

Carrier certifies that the container supplied by it for this shipment is a proper container for the transportation of each commodity named hereon.

Note. Where the rate is dependent on value, the agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding 50 cents per pound.

† This is to certify that the above named articles are properly classified, described, packaged, and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

† Shipper's imprint in lieu of stamp, not a part of bill of lading approved by Interstate Commerce Commission.

UNION CARBIDE CORPORATION Chemicals & Plastics Shipper. [illegible] Agent

Per Per F. E. Lopez

Permanent Postoffice Address of Shipper P. O. BOX 186, PORT LAVACA, TEXAS 77979

250693

J02368

78

KG COH004442

BAKER & BOTTS
ONE SHELL PLAZA
HOUSTON, TEXAS 77002

TELEPHONE (713) 229-1234
TELECOPIER (713) 229-1730
TELEX 76-2779

170 PENNSYLVANIA AVE., N. W.
WASHINGTON, D. C. 20006

1410 UNITED BANK TOWER
400 WEST FIFTEENTH STREET
AUSTIN, TEXAS 78701

RECEIVED
EPA REGION VI
1985 MAR 14 AM 10: 45
SUPERFUND BRANCH

G-11,738
UNION CARBIDE CORPORATION
(Brio Site)

March 12, 1985

Mr. Lou Barinka (6AW-SE)
Superfund Enforcement Section
Air & Waste Management Division
1201 Elm Street
Dallas, Texas 75270

Dear Mr. Barinka:

This letter is in response to your letter dated October 30, 1984 to Union Carbide Corporation requesting information under Section 104 of CERCLA and 3007 of RCRA. In response to your questions, Union Carbide answers as follows:

1. Union Carbide sold material to persons operating at the Brio Site. At this time, Union Carbide has no information to indicate which companies, if any, may have sent wastes to the Brio Site. Although Union Carbide admits that it sold material to companies operating at the site, Union Carbide does not admit that any of this material would be considered "hazardous wastes" as defined by § 101(14) of CERCLA.

2. Based on Union Carbide's review of records to date, Union Carbide may have sold to persons operating at this site cellosolve acetate, ethyl benzene, polyethyl benzene, or styrene tars. Union Carbide estimates that in 1975 and 1976, approximately 1,600,000 gallons of styrene tars were sold to Lowe Chemical or JOC Oil. In May of 1976, 5,000 gallons of cellosolve acetate was sold to JOC Oil. Union Carbide's records indicate that Union Carbide sold 28,000 gallons of ethyl benzene to Lowe Chemical in September and October of 1975.

3. Union Carbide's records indicate that Lowe Chemical and Sunco transported the styrene tar in 1975 and 1976 by vacuum truck. Union Carbide's records indicate that Kay Bee Resources transported the cellosolve acetate.

4. Union Carbide understood that its materials were to be used as feed stocks in chemical processing operations. Union Carbide does not know the ultimate disposition of any material which it sent, but Union Carbide did not send any material to this site for disposal.

Union Carbide has made an examination of its records in the preparation of this response and has made its estimates based on these records. Should Union Carbide discover new information responsive to EPA's questions, Union Carbide will promptly supplement this response.

Please call me at (713) 229-1374 if you have any questions or comments.

Very truly yours,

BAKER & BOTTS

By James E. Smith
James E. Smith

JES:220

80, 82, 83, 84, 87,
100

KG COH004445

STYRENE TAR FEEDSTOCKS

Received at JOC Oil Aromatics

2501 Choate Rd., Friendswood, Texas

	Gulf Oil 2-28-76	Amoco Oil 2-19-76	American Oil 2-18-76 ✓	Alex Pit 2-19-76 ✓	El Paso Tar 2-26-76 ✓	Arco Polymer 2-26-76	Monsanto 2-19-76	Foster Grant 2-28-76
A.P.I. 60/60	5.9	8.7	13.7	5.1	3.1	6.4	4.2	4.3
Lbs./Gal.	8.577	8.406	8.116	8.627	8.755	8.546	8.685	8.678
Water by Dist'l Wt./%	0.10	0.23	0.12	1.18	0.10	0.25	0.14	0.06
Viscosity @°122 F - S.F.S.	53.16	1,514	61.98	2,390	31.03	64.49	782.5	12,418
Ash Wt./%	0.010	0.045	0.005	0.019	0.005	0.020	0.023	0.081
Pour Point °F	Minus 5	10	<Minus 30	35	40	0	40	60
Sulfur Wt./%	<0.01	<0.01	0.026	1.44	7.42	0.874	<0.01	<0.01
Flash Point C.O.C. °F	130	125	85	85	165	175	185	85
Iron ppm	2	3	2	0	1	9	4	0
Lead ppm	2	2	3	2	2	2	2	2
Copper ppm	0	0	0	0	0	0	0	0
Chromium ppm	0	0	2	1	0	0	0	2
Aluminum ppm	5	4	4	3	0	3	4	0
Nickel ppm	0	0	0	0	0	0	0	0
Silver ppm	0	0	0.4	0	0	0	0	0.3
Tin ppm	0	0	0	0	0	0	0	0
Organic Chloride ppm	<10	<10	<10	<10	<10	<10	<10	<10

P-00361

KG COH004446

Titanium ppm	0	0	0	0	0	0	0	0
Molybdenum ppm	0	0	0	0	0	0	0	0
Cadmium ppm	0	0	0	0	0	0	0	0
Antimony ppm	0	0	0	0	0	0	0	0
Silicon ppm	0	0	0	0	0	0	0	0
Boron ppm	0	0	0	0	0	0	0	0
Sodium ppm	3	12	3	5	2	9	6	5
Phosphorus ppm	0	0	0	0	380	30	0	0
Zinc ppm	0	0	0	0	0	0	0	0
Calcium ppm	0	30	110	40	0	20	20	90
Barium ppm	0	0	0	0	90	0	0	0
Magnesium ppm	300	190	330	210	100	80	150	180
Vanadium ppm	1.5	0.6	0.5	0.5	0.6	<0.5	0.6	1.5
Aliphatics Mol. %	0	0	<0.01	0.01	0.05	0.00	0.00	0.04
Benzene Mol. %	0.01	0	0.00	0.00	0.00	0.10	0.00	0.00
Toluene Mol. %	0.08	0.05	0.02	0.03	0.50	0.11	0.10	0.03
Ethylbenzene Mol. %	0.31	0.28	0.42	1.72	6.31	1.37	0.57	0.18
O-Xylene Mol. %	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.00
Cumene Mol. %	0.03	0.10	0.00	0.30	2.04	0.54	0.09	0.00
Styrene Mol. %	7.21	8.11	18.51	8.11	2.52	0.14	2.27	8.28
C_{10} Alkylbenzene Mol.%	1.14	0.59	0.20	0.89	0.65	0.48	0.85	0.62
Blend Oil Yield(160°C to 335°C) Wt./%	28.17	34.47	30.71	21.45	21.26	40.10	24.02	17.98

Btm. Pitch (335°C +) Wt./%	62.15	55.85	50.14	65.53	64.39	56.29	75.98	71.47
Loss Wt./%	0.90	0.55	0.00	1.96	2.27	0.00	0.00	1.40
Total Wt./%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

88, 107

AMOCO

Amoco Chemicals Corporation
Post Office Box 568
Texas City, Texas 77590

October 5, 1984

Certified Mail No. P 660 101 195

Mr. Lou Barinka (6AW-SE)
Superfund Enforcement Section
U.S. Environmental Protection Agency
1201 Elm Street
Dallas, Texas 75270

Dear Sir:

Re: Amoco Chemicals Corporation, Texas City, Texas
Involvement with BRIO Refining Company, Inc.
2501 Choate Road, Friendswood, Texas

Mr. Davis' letter of August 9, 1984 which requested information on the BRIO site was directed to Amoco Oil Company and was received at the corporate offices of Standard Oil Company of Indiana in late August. Subsequent to this R. J. Ganim, Standard Oil Law Department, contacted you by phone on September 4, and requested an extension to October 1, or at the latest October 8. This request was granted.

Review of the letter by Amoco Oil indicated that the request should have been sent to Amoco Chemicals Corporation since the matter apparently addressed styrene residues which could have been generated by Amoco Chemicals operations. The letter was therefore referred to me for a response.

The request for information asked four questions, listed below.

1. Have you sent, or do you have knowledge of anyone who may have sent, hazardous waste or substances to the BRIO Refining Company, Inc. site? If so, please provide the names and addresses of any generators and transporters involved, and indicate to which entity or entities the materials were sent.
2. What was the chemical composition and volume of materials sent to the site, and on what dates were such materials delivered to the site?
3. How and by whom were the materials transported?
4. What was the ultimate disposition of the hazardous materials or substances sent to the site (i.e., landfilled, land farmed, recycled, etc.)?

Finally, please note our willingness to cooperate with EPA and potentially responsible parties in exploring the many issues raised in this case. I believe it is highly likely that our response, whatever it is, will be acceptable to both Amoco and the EPA.

Sincerely yours,

R. M. Zielinski

R. M. Zielinski
Plant Manager

RMZ/RJG/LCC/a

Mr. Lou Barinka (6AW-SE)
Superfund Enforcement Section
Air & Waste Management Division
1201 Elm Street
Dallas, Texas 75270

Mr. R. J. Ganim
Standard Oil Company (Indiana)
200 E. Randolph Drive
Mail Code 2102A
Chicago, Illinois 60601

AMOCO CHEMICALS CORPORATION
TEXAS CITY, TEXAS

ATTACHMENT I
ANSWER TO QUESTION NO. 2

Component	Weight %
Ethylbenzene	Less than 2%
Diethylbenzene	Less than 3%
Triethylbenzene	1-10%
Styrene, monomer	2- 8%
Styrene, polymer	10-20%
Diphenyl ethane	25-35%
Ethyldiphenyl ethane	20-30%
Other heavy hydrocarbons	20-30%
Inhibitors	0-10%

This composition is an estimate based on the present composition and our knowledge of the Styrene Unit operations during the time that the styrene residues were sold to the companies operating at the BRIO site. There have been several process modifications which have changed the composition of the residue to some degree.

Answers

1. Amoco Chemicals Corporation, Texas City plant did sell material to Lowe Chemical Company, Phonenix Chemical Company and JOC Oil Aromatics. The material sold is described in the following answers. The material was sent to these companies for reclamation and recycling. In our opinion, the material would therefore not be considered a solid waste under 40 CFR 261.2 or a CERCLA hazardous substance. The Malone Trucking Company, P. O. Box 709, Texas City, Texas 77590, transported this material for Amoco Chemicals.

   We are aware that other generators are listed in TDWR files, which we assume EPA has already seen.

2. An approximate range of chemical composition of the styrene residue sent to the site is shown in Attachment I.

   We have been unable to find sufficient documentation which specifically establishes the volume of residues Amoco Chemicals sent to the site. We will continue to review our files for such documentation. Sales of the by-product styrene residues to the aforementioned companies began in early 1965, and continued until early 1977.

3. The styrene residues were hauled by tank truck. The Malone Trucking Company hauled the styrene residues for Amoco Chemicals, but in some instances the buyer contracted for the transportation of the styrene residues.

4. In our opinion the material sold to the aforementioned companies which operated at the site was not a solid waste under RCRA nor a CERCLA hazardous substance. The styrene residues were sold for reclamation and recycling. We believe that essentially all of the residues were, in fact, reclaimed, but some residual materials may have been generated from processing.

These answers are accurate to the best of our knowledge, based on the information we were able to obtain during the limited time available. Should you have further questions or need clarification of our answers you may contact L. C. Courtney at (409) 948-1601, extension 296. However, any written correspondence should be directed to me.

Sincerely,

R. M. Zielinski/Cmmg

R. M. Zielinski
Plant Manager

JSS/a

Attachment

90

JOC Oil Aromatics Inc.

2501 Choate Rd., Houston, Texas
P.O. Box 138, Friendswood, Texas 77546
713-482-7575 Telex: 775478 Cable: JOCARO

September 15, 1976

JOC
Re COSMAR.

Mr. R. Gordon
COSMAR Company
P.O. Box 11
Carville, LA 70721

Dear Mr. Gordon:

This letter duly signed, will represent the agre
chase of your Styrene tars.

1. BUYERS:

JOC Oil Aromatics, Inc.
P.O. Box 138
Friendswood, Texas 77546

2. SELLERS:

COSMAR Company-Operated by Cosden Oil & Chemicals
P.O. Box 11
Carville, Louisiana 70721

3. PRODUCTS:

One-half of Cosmar's entire production of styrene tars from the Cosmar, Carville facility.

4. SPECIFICATIONS:

The products are by-products of Cosmar processes. The products could therefore vary slightly but typically would remain as sampled and previously shipped. In the event the quality of the product would differ from previous shipments, JOC Oil Aromatics, Inc. reserves the right to reduce its take, renegotiate the terms of the contract or terminate it if further receiving of this changed material would adversely affect its operation.

5. QUANTITY:

Estimated at 210,000 gallons per month of styrene tars. It is understood that the styrene tars quantity will be one-half of Cosmar's entire production. The quantity to be evenly spread during the ye 111946

WHP 0541185

BRIO-99-003072

093221

KG COH004455

6. PRICE:

8¢ per gallon FOB Seller's plant, Carville, La. for styrene tars.

7. PAYMENT TERMS:

Net 30 days from date of invoice. Cosmar to invoice once a month for all previous month deliveries.

8. TERMS OF CONTRACT:

This contract will be in effect for one year from October 1, 1976 and thereafter will be automatically renewed from year to year unless either party cancels the contract with written notice 90 days prior to any anniversary after the initial one year period.

9. DELIVERY:

Seller will pump into Buyers tank trucks. Loading time shall not exceed 1½ hours for loading a 7,000 gallon tank truck. Two (2) hours shall be allowed for hooking up, disconnecting and loading tank trucks. Demurrage will be charged at the rate of $10.00 per hour for all hours in excess of two (2) hours after arrival of transport to be loaded.

Buyer shall be permitted to pick product up anytime during any 24 hour period.

10. INSPECTION AND TESTING:

Buyer's test at Buyer's plant shall govern.

11. OTHER CONDITIONS:

A. Buyer standard terms and conditions of sale attached will govern as amended by the above.

B. In the event Seller elects to consume the styrene in its facility, one-half of the quantity so consumed to be deducted from the quantity of paragraph 5 above.

We trust this will be satisfactory to you. Please sign the copy and return for our files.

COSMAR

BY ____________________

Title ____________________

JOC OIL AROMATICS, INC.

Pierre M Fairen

Pierre M. Fairen
Vice President
Supply & Distribution

WHP 0541186

111947
J093222

BRIO-99-003073

KG COH004456

JOC Oil Aromatics Inc.

2501 Choate Rd., Houston, Texas
P.O. Box 138, Friendswood, Texas 77546
713-482-7575, Telex: 775478, Cable: JOCARO

PURCHASE ORDER

SELLER

Cosmar
Carville, Louisiana

PURCHASE ORDER # 2777 A 1

Date: 2-7-77	Confirming Tlx: R. Gordon		
SHIPPING POINT: Cosmar Plant Carville, LA.	DELIVERY POINT:	SHIP VIA: Buyer's Trucks	Freight: ppd. X Col.
Measurement for Invoicing: Truck Weight Light & Heavy	Inspection Required: Yes No X	Payment, Terms & Method: Net 30 Days	

QUANTITY	DESCRIPTION	UNIT PRICE
Approximately 230,000 Gallons per month	Styrene Tar	$0.02/Gal.

This order applies for delivery from 2-7-77 to 3-1-77

SPECIAL CONDITIONS:

1) Pounds per gallon factor to be 8.65.

Issued By: _______ Accepted By: _______

Title: Vice-President, Supply & Distribution   Title: _______

PLEASE SIGN THE COPY AND RETURN TO JOC OIL AROMATICS, INC.

WHP 0541187

111184

J003043

BRIO-99-003071

KG COH004457

92, 105

KG COH004458

3.0 EXPERIMENTAL RESULTS

The iodine number of the styrene pitch was about 80. The melting point was determined to be 70°C. The chemical analysis was supplied by Dow.

	per cent by weight
Styrene	5.9
methyl styrene	5.7
methyl styrene	3.1
Benzaldehyde	0.9
High boiling oils	11.4
Sulfur	14.4
Polystyrene and tar	58.6

It was assured that this analysis is typical of a representative sample of styrene pitch.

The weight loss at elevated temperatures were determined at 160 and 250°F in a forced draft oven. These results are found in Table 1.

43
0019
AW00038
R002716

101

File

File: Styrene

[redacted]

J. L. McCartney — St. James

B. F. Short — Port Arthur

STYRENE RESIDUE — 2/16/72

The St. James styrene unit produces a styrene residue (bottoms off the styrene finishing column) which is a heavy tar. This material contains styrene, ethyl and vinyl toluene, alpha methyl styrene, heavy unknowns and sulfur.

The product is a disposal problem because of the high sulfur content. Sulfur is added to the process to inhibit the polymerization of styrene in the distillation train. The sulfur added is molten sulfur received from Port Arthur.

We are currently disposing of the material by contract with Phoenix Chemical Co. in Houston. They process the material for the recovery of aromatics and high sulfur fuel oil. They also process this material from several other styrene producers.

Some producers in our area have been disposing of the material in open pits; however, the state is "hot after this avenue". One producer in our area is shipping the material from his plant to Phoenix and also recovering the material from a pit he had previously been using and shipping this material to Phoenix.

Bill, I said this material presents a disposal problem. It doesn't at the immediate time, because we can move it to Phoenix. However, I feel that it could become a problem at any time. Phoenix has had problems with the Texas pollution people. I understand they now have a variance which gives them until sometime this fall to make improvements. I also know that they have been having cash problems. One of their fuel oil customers has been on strike and still is.

Our arrangement with them may continue; however, I am concerned as to how we could dispose of the material if we could not continue with Phoenix.

I felt that perhaps since Phoenix could process the material on a profitable basis, it may have some value as a refinery feedstock, which we have been overlooking.

I would appreciate it if you would look at the material, advise if it could be processed in the refinery and what value it might have as a feedstock.

Attached is a description of the material prepared by our laboratory. In addition we would be glad to send a sample for your evaluation. Also attached is a patent assigned to Sun Oil Company, Philadelphia, Pennsylvania, on the use of styrene residue as a delayed coking feedstock.

Our production of this material at design rate would be around 1.5 MM pounds per month. We expect to produce approximately 1.1 MM pounds per month in 1972. This material is shipped by tank truck.

J. L. McCartney

JLM:lcm

000512

ACW 0032015

KG COH004461

BRIO-99-012844

102

LETTER OF AGREEMENT

July 10, 1975

SELLER: A-G Fuel Oil Company
P. O. Box 1110
Texas City, Texas

BUYER: JOC Oil Aromatics, Inc.
P. O. Box 12426
Houston, Texas 77017

Product: Styrene Tars

Quality: Product has to be suitable for processing in Buyer's Plant, for production into Ethylbenzene and Fuel Oil.

Period: July 10, 1975 - June 30, 1980

Quantity: 500,000 Barrels, minimum. This will include all Styrene Tars stored in Seller's pitts in Geisman, La.

Payment Terms: From July 10, 1975 through October 15, 1975, Payment will be made every 15 days.
From October 15, 1975 onwards, payment will be made 10 days after the end of each month, for deliveries made the preceeding month.
Quantities will be measured by strappings on the truck tanks or by Buyer's metering system. And by independent surveyors for barge shipments.

Price and Delivery Terms: $0.13 per gallon, delivered to Buyer's Plant. The price can be increased or decreased every 6 months to allow for changes in Seller's fuel cost for transportation or at it's option Buyer can supply such fuel at a price to be agreed upon.
Delivery will be made either in Seller's trucks or by Seller's barge, at Buyer's option. Rental cost incurred by Buyer for shore tanks for delivery by barge as well as trucking cost from such tanks to Buyer's plant will be deducted from the delivered price. Such cost is estimated at $0.01 per gallon.

Monthly deliveries will be agreed upon ten days before the beginning of each month. Monthly quantities will be 400,000 gallons up to 1 Million Gallons at Buyer's Option.

Title and risk will pass at unloading into Buyer's tanks.

KF

JC05220

Force Majeure:

Both parties are not to be held responsible for any failure to carry out or to observe any of the stipulations of this agreement if a failure arises from any cause reasonably beyond the control of either party.

In the event of either party being rendered unable wholly, or in part, by force majeure to carry out their obligations under this agreement other than to make payments of amounts due hereunder, it is agreed that on such party giving notice and full particulars of such force majeure in writing or by telegraph to the other party as soon as possible after the occurrence of the cause relied on, then the obligations of the party giving such notice, so far as they are affected by such force majeure, shall be suspended during the continuance of any inability so caused but for no longer period, and such cause shall, so far as possible, be remedied with all reasonable dispatch.

The term "force majeure" as employed herein shall mean acts of God, strikes, lockouts, or other industrial disturbances, acts of the public enemy, wars, blockades, insurrections, riots, epidemics, landslides, lightening, earthquakes, fires, storms, washouts, arrest and restraint of rulers and people, civil disturbances, explosions, breakage or accident to machinery, or any delay or failure of the seller to make delivery of all or any part of the subject merchandise due to demands, embargoes, or other actions of any government, or any other causes, contingencies, or circumstances whatsoever which prevent or hinder delivery of said goods, or any part thereof, or make fulfillment of this agreement impossible, or impracticable, any of which, without liability excuse the seller from the performance of this agreement.

Claims:

Any claims regarding quality, quantity, laytime, or otherwise, either party may have against the other party should be issued within 60 days from the date of delivery.

Assignment:

Neither of the parties will assign its interests in this contract to a third party without the express written consent of the other party.

Law:

This contract is governed by the law of the State of Texas.

J005221

A-G Fuel Oil Company	JOC Oil Aromatics, Inc.
U T Alexander	Michael M Fowler
U. T. Alexander	Michael M. Fowler

KG COH004464

P-00356

103

5-17-60 Maute memo re:
annual vc Tar quantity

S-87

WHP 0009314

BRIO-99-006113

KG COH004466

JGM/TES

MONSANTO CHEMICAL COMPANY

Inter-Office Correspondence

FROM LOCATION: Texas City, Texas

DATE: May 17, 1960

SUBJECT: Mercury Analyses and Losses in VCM Unit

TO: T. E. Shirley

cc: J. M. Chamberlin/W.R. Nisbet
W. H. Lane/H. H. Nelson
J. S. Putnam/H.M. Keating

CONFIDENTIAL

Summary

Analytical results are complete on the mercury content of the last two batches of spent VCM catalyst. These and previous analytical findings are given here and plans made for future studies of mercury losses.

Conclusions

1. Improved analytical methods confirm that considerable mercury is lost from VCM catalyst. Analyses of the last two batches of spent catalyst indicate that about 3200 pounds of mercuric chloride are lost per year from the catalyst (assuming these batches are representative).

2. Mercury found throughout the remainder of the VCM system amounted to only about 600 pounds of mercuric chloride. This leaves unaccounted losses of about 2600 pounds of mercuric chloride per year.

3. The most likely spot for the loss is in waste tars. The mercury content could be much higher than found due to sampling difficulties. Attempts will be made to obtain better samples for analyses. Catalyst sampling error, unrepresentative spent catalyst, product VCM and inaccessible solids in the system are other possible sources of mercury.

4. Product VCM will be analyzed to determine whether mercury is present and its level. An independent laboratory detected traces of mercury in our product VCM.

5. Future batches of spent catalyst and solids found during the next shutdown will be analyzed to permit a more accurate knowledge of mercury losses.

PLAINTIFF'S EXHIBIT Px S-87

2514289

MTC 0003922

Discussion

I. Mercury Losses in VCM Unit

Mercury in VCM catalyst was determined by Dayton by X-Ray Fluoresence and in Research by isotope dilution technique. The values agree fairly well with each other and with standards. The precision (95% confidence level) of the isotope dilution method is ±1.4% at 10.7%; the Dayton precision is unknown but believed to be less than ±1%.

The results are based on 17,300 pounds catalyst in the system. The initial concentration was assumed to be 12.0% $HgCl_2$ or 2076 pounds mercury per reactor charged. The results:

22R1-6 - 10-30-59 (Primary Reactor)

	% $HgCl_2$		Lbs. $HgCl_2$ Found	
	Dayton	T.C.	Dayton	T.C.
0-3 ft.	3.1	4.2	63	86
3-6	3.6	2.9	123	98
6-9	9.1	8.3	314	287
9-12	9.4	9.1	324	315
12-15	11.3	10.9	390	376
15-16	12.0	12.4	139	145
			1353	1307 lbs.

$HgCl_2$ lost - 723 lbs (Dayton)
$HgCl_2$ lost - 769 lbs (T. C.)

2514290

22R1-1H - 12-29-59 (Secondary Reactor)

	% $HgCl_2$		Lbs. $HgCl_2$ Found	
	Dayton	T.C.	Dayton	T.C.
0-3 ft.	7.8	7.4	158	150
3-6	9.1	8.9	314	307
6-9	10.4	10.8	359	380
9-12	12.0	11.7	414	404
12-15	12.1	12.3	417	423
15-16	11.3	14.7, 15.0	131	171
			1793 lbs.	1835 lbs.

$HgCl_2$ lost - 283 lbs (Dayton)
$HgCl_2$ lost - 241 lbs (T. C.)

If the average loss of $HgCl_2$ found by Dayton and Research is used then 262 lbs was lost in the secondary reactor and 746 pounds in the primary reactor. In a yearly operation, four secondary reactor charges and three primary reactor charges are used. Assuming the above losses to be representative for each reactor, then 3280 pounds $HgCl_2$ is lost per year in the VCM plant or 273 pounds $HgCl_2$ per month.

II. Mercury Found

		Lbs. $HgCl_2$/yr.
1.	Residue from 22R1-1 Cleanup 27 lbs $HgCl_2$/reactor	189
2.	Product and Series Line 18 lbs/reactor	126 ?
3.	22A2 Desiccant	5
4.	Flare Base	15
5.	VCM Waste Tars 21 lbs $HgCl_2$/Mo.	250
6.	Wash Water from 22R1-1 1.22 lbs. $HgCl_2$/reactor	[illegible]
7.	Regeneration of Dryer (1 week on stream) 0.27 lbs. $HgCl_2$ in gas	14
	TOTAL	608

Unaccounted losses (3280 lbs-608 lbs) [illegible] 2682 lbs. mercuric chloride per year.

III. Other Possible Unaccounted Losses

1. Sampling Error

Sampling error could be as high as ±10%. This could possibly lead to as much error as 1000 pounds mercuric chloride per year (if additive) based on seven charges of catalyst having a total mercuric chloride content of over 14,000 pounds. Statistical sampling will be used to minimize this error.

In addition, the weight of the final catalyst charge has been assumed to be the same as the initial charge. An increase in catalyst weight due to moisture, polymer build-up or tars would give low mercury content on used samples. Improved effort will be made to determine any catalyst weight change on use.

2. Unrepresentative Used Catalyst

If the catalyst from 22R1-6 contained less mercury than normal, the losses would be high. No other batches of spent catalyst are available for analyses by the improved methods. To eliminate this as a possible source of error, future samples of spent catalyst will be analyzed by one of the improved procedures for mercury.

3. VCM Waste Tars

This stream is about 9 MM pounds per year. Previous analyses for mercury ranged from 10-25 ppm mercuric chloride. However, difficulty was experienced obtaining representative samples and the values are in doubt. This is the most likely source of mercury losses. A 200 ppm concentration of mercury here would give about 2440 pounds per year of mercuric chloride or about 75% [illegible] loss. This stream will be carefully res[illegible] and re-analyzed.

4. Product VCM

Mercury was detected in a sample of VCM, according to an independent laboratory; however, the exact content was not determined. At a VCM production rate of 10 MM pounds per month, a 16 ppm content of mercury would account for 217 pounds mercuric chloride per month or a large percentage of mercury losses. The presence of mercury in product VCM would be of great interest in PVC manufacture.

5. Losses in the VCM System

Mercury could be deposited and built up in various places in the system which can only be examined during shutdown. For example, the series and product headers have not been examined for mercury. Any sludge in the D3 diesel oil scrub could contain considerable mercury. These and other possible sites will be examined during the next shutdown.

IV. Future Sampling Plans

1. VCM Tars and Product VCM

Analysis for mercury will be performed here as soon as possible. These two streams are the most likely to contain the lost mercury. We are particularly anxious to confirm whether mercury is present in product VCM and its level, if present.

2. Spent VCM Catalyst

The spent catalyst to be taken off stream late this month or early in June will be analyzed to determine mercury losses.

3. Sampling During Shutdown

The product and series header, sludge in D3 column, solids in various lines, desiccant, etc. will all be examined for mercury.

Robert [illegible]
Robert [illegible]

J. R. Deslatte by KLM
J. R. Deslatte

jd

2514293

MTC 0003926

From the desk of
R. L. MAUTE

3/9/61

Tony

Here are Mita Chem results. I told him I wasn't happy with results. I specified running as received & be dried. I told him to try one as received - he exposed it to air for a week. His results look sad - I'm not going to give him anymore work.

Bob

| 2514294 |

MTC 0003927

KG COH004472

WHP 0009320

BRIO-99-006119

104

(3e4 (

8441 V

1977

TSCA DATA SHEET

1/2

Material: STYRENE TARS

Synonyms/Acronyms: SM TAR, SM DISTILLATION Residues, Mixed High Boiling Aromatics.

Plant Site: Texas City

Manufacturing Unit: Styrene

Department(s): 16

Process Stream: 16D4 Btms + 16T21

Material Classification: BE-U · Byproduct, External Sale — Useful Byproduct

Quantity (ppy): 3.62 Million[1]

Vendor: Not Applicable

Chemical Composition:

	Wt. % ANALYSIS - TYPICAL RANGE[2]	Component Quantity Million PPY[4]
Styrene MONOMER	2-8	0.18
α-Methylstyrene	1-5	0.11
Diphenylethane	2-8	0.25
Ethylated Diphenylethane	10-18	0.34
DiEthylated Diphenylethane	2-10	0.13
STILBENE	3-10	0.23
Phenanthrene	1-5	0.11
Alkyl Subistuted Tetrahydro Napthalenes	1-2	0.08
Miscellaneous AROMatics	5-15	0.36
Polymer and Other Non Volatiles	25-55 (Diff)	1.83
2,4 Dinitrophenol	0.14 (Note 3)	.005
		3.62

Estimated Analytical Accuracy = ± 30% relative.

PT Co-ordinator: J.R. GARTON / R.A. NEWSOM

Notes: 1. Petro-chemicals Business GP-Monomers, Report No. 6, Dec 1977.

2. EC-201, "Styrene Tar", July 15, 1977.

WHP 0328097

3. Calculated from design use and Actual use.

4. Flux Oil components PPY (proportional Amount), other components at range midpoint.

13

1977

TSCA DATA SHEET

Material: STYRENE TARS 3/2

Synonyms/Acronyms: SM TAR, SM Distillation Residues, Mixed High Boiling Aromatics.

Plant Site: Texas City

Manufacturing Unit: Styrene

Department(s): 16

Process Stream: 16D4 Btms + 16T21

Material Classification: BF-U Byproduct to Fuel — Useful Byproduct

Quantity (ppy): 25.50 Million[1]

Vendor: Not Applicable

Chemical Composition:

	Wt. % ANALYSIS - Typical Range[2]	Component Quantity[4] Million PPY
Styrene monomer	2-8	1.28
α-Methyl Styrene	1-5	0.76
Diphenylethane	2-8	1.76
Ethylated Diphenylethane	16-18	2.37
Di Ethylated Diphenylethane	2-10	0.92
Stilbene	3-10	1.66
Phenanthrene	1-5	0.76
Alkyl Substituted Tetrahydronapthalenes	1-2	0.53
MISCELLANEOUS AROMATICS	5-15	2.55
Polymer and other non volatiles	25-55 (Diff)	12.87
2,4 Dinitrophenol	0.14 (Note 3)	0.036
		25.50

Estimated analytical Accuracy = ±30% relative.

PT Co-ordinator: J.R. GARTON / R.A. Newsom

Notes: 1. Dept 16 Factory Ledger, Dec 1977, Production less Sales (Report No. 6)

2. EC-201, "Styrene Tar", July 15, 1977.

3. Calculated from Design usage and actual usage.

4. Flux oil components ppy (proportional Amount), other components at range midpoint.

WHP 0328098

CS06983

KG COH004475

P-00564

1977

TSCA DATA SHEET

Material: STYRENE MONOMER 1/2

Synonyms/Acronyms: Styrene monomer Inhibited, Styrene, SM

Plant Site: TEXAS City

Manufacturing Unit: Styrene

Department(s): 16

Process Stream: 16D30H

Material Classification: PE - P Product, External Sale - Product

Quantity (ppy): 444.5 million[1]

Vendor: Not Applicable

Chemical Composition:	SPECIFICATION[2]	TYPICAL AVERAGE[3]
Styrene Monomer	99.6% Min	99.72 wt% (CP) 99.77 wt. % (GC)

Complete Specification and Analysis attached

Estimated Accuracy = ± .1% absolute for SM.

PT Co-ordinator: J. R. GARTON / R. A. NEWSOM

Notes: 1. Petrochemicals Business GP-Monomers, Report No. 6, Dec 1977. and International Division Report No. 6, Dec. 1977.

2. Finished Material Specification #SM-100, 12/25/72

3. Monsanto Special Report No. 16, "Styrene Monomer Competitor Quality Evaluation - 1976", J. R. Garton, July 27, 1977.

WHP 0328099

CS06984

KG COH004476

P-00565

7/14

STY NE MONOMER COMPOSITIO 1977

	Specification[1] Min	Max	Typical Average[2]
Styrene Monomer	96.6%		99.72% (CP)
TBC (tert-Butylcatechol)	10 ppm	15 ppm	--
Polymer		10 ppm	< 1 ppm
Aldehydes		.01 %	.001 %
Peroxides		.005 %	< .0001 %
Sulfur		20 ppm	< 1. ppm
Chlorides		.005 %	.0001 %
			Wt. % (Chromatograph)
Styrene			99.767
Non-aromatics			0.017
Ethylbenzene			0.125
(p)+ m-xylene			0.012
Cumene			0.022
O-xylene			0.004
n-Propylbenzene			0.006
M+P-Ethyltoluene			0.005
α- methylstyrene			0.031
Vinyltoluenes			0.003
β -methylstyrene			0.001
Phenylacetylene			0.006
Benzaldehyde			0.001
Acetophenone/styrene oxide			0.0004
Benzene			Not Det. *
Toluene			Not Det. *

* less than 1 ppm

Impurities, estimated accuracy = ± greater of 10% relative or .001% absolute

Notes:

1. Monsanto finished material specification No. SM-100, 7/1/73.

2. Monsanto Special Report No. 16, "Styrene Monomer Competitor Quality Evaluation - 1976", J. R. Garton, July 27, 1977.

WHP 0328100

CS06985

1-A

U

1977 8405

TSCA DATA SHEET

Material: Ethylbenzene 4/6

Synonyms/Acronyms: EB, Ethyl Benzene

Plant Site: TEXAS City

Manufacturing Unit: Styrene

Department(s): 15+16

Process Stream: 16T31 and 14T6

Material Classification: R-R Raw material - Raw material, Purch

Quantity (ppy): 11.54 Million[1]

Vendor: Joc Oil and Aromatics + ARCO

Chemical Composition:

	TYPICAL Analysis Wt% ARCO[2]	Joc[3]	weighted Average wt.%
Ethylbenzene	99.67	93.52	99.2
TOTAL Non-Aromatics	0.09	0.21	0.10
Benzene	0.005	0.04	0.01
Toluene	0.05	0.56	0.09
Cumene	0.06	1.57	0.17
Styrene	<0.001	4.02	0.28
n-Propylbenzene	0.02	—	0.02
m+p-Ethyltoluenes	0.06	—	0.06
t-Butylbenzene	0.003	—	0.003
sec-Butylbenzene	<.001	—	<.001
p+m-xylenes	<.002	0.06	0.005
o-xylenes	0.04	0.02	0.04
Diethylbenzene	<.001	—	<.001

PT Co-ordinator: J.R. GARTON / R.A. NEWSOM

Notes: 1. Dept 16 Bin Sheets, Jan-Dec 1977. 10.72 million ppy from ARCO, 0.815 million ppy from JOC.

2. Average Control Lab Analysis of 2 ARCO receipts, Barges on 1/8 and 1/18/77.

3. Average Control Lab analysis of 12 receipts from JOC, 2/28-4/22/77. Note: receipts discontinued in May 1977

Analytical Accuracy estimated at ±10% relative for impurities

WHP 0328101

0

1977

TSCA DATA SHEET

Material: Ethylbenzene 5/6

Synonyms/Acronyms: EB, Ethyl Benzene

Plant Site: Texas City

Manufacturing Unit: Styrene

Department(s): 15 + 16

Process Stream: 16T32 and 14T6

Material Classification: RME — M Raw Material, Monsanto, External site — Monsanto Supplied

Quantity (ppy): 48.0 Million[1]

Vendor: Monsanto, Chocolate Bayou

Chemical Composition:

	wt. % Analysis		
	Specification[2]		Typical[3]
	Min	Max	
Ethylbenzene	-	-	99.2
EB (Toluene Free Basis)	99.1	-	99.4
Toluene		1.0	0.12
o-xylene		0.05	0.003
m-xylene, p-xylene		0.50	0.47
Non-Aromatics		0.40	0.05
Benzene		-	0.17
Cumene		-	<.001
Styrene		-	<.001

PT Co-ordinator: J.R. Garton / R.A. Newsom

Notes: 1, Sum from monthly BIN sheets, Jan-Dec 1977.

2. Raw Material Specification, CB EB, dated 8/1/73.

3. Average of 2 control Lab analyses, Barges, 11/3 and 11/14/77.

WHP 0328102

KG COH004479

P-00568

1977

TSCA DATA SHEET

6/6

Material: Ethylbenzene

Synonyms/Acronyms: EB, Ethyl Benzene

Plant Site: Texas City

Manufacturing Unit: Styrene

Department(s): 15 + 16

Process Stream: 14D3OH, 14T6, and 14T12

Material Classification: RMI-M Raw material, Monsanto, Internal Site — Monsanto Supplied

Quantity (ppy): 1,364.6 Million [1]

Vendor: Monsanto, Texas City, Dept 14

Chemical Composition:

	Wt. % Analyses[2]	
	Specification	Typical
Ethylbenzene	99.50 min	99.86

Estimated Accuracy of EB analysis = ± 0.1% by wt.

PT Co-ordinator: J.R. GARTON / R.A. Newsom

Notes: 1. Calculated from Dept. 14 production (Dec 77 cost Report) less Sales (Jan-Dec Bin Sheets)

2. Complete Specification and Analysis attached to PIE-P form

WHP 0328103

CS06988

2

1977 ✓ 2448

TSCA DATA SHEET

Material: Ethylbenzene 1/6

Synonyms/Acronyms: EB; Ethyl Benzene

Plant Site: Texas City

Manufacturing Unit: Ethylbenzene

Department(s): 14

Process Stream: 14D30H and 14T12

Material Classification: PE - P product, External Sale - Produc

Quantity (ppy): 35.17 million[1]

Vendor: Not Applicable

Chemical Composition: Wt% ANALYSIS[2]

	Specification	Typical
Ethylbenzene	99.50 min	99.86

Estimated Accuracy: EB = ±.1%; Impurities ± 20% relative.

PT Co-ordinator: J.R. GARTON/R.A. NEWSOM

Notes: 1. Petrochemicals Business GP - Monomers Report No. 6, Dec 1977.
(35.17 = .14 USA + 29.35 Export + 5.68 exchange).
2. Complete Specification and Analysis Attached to PII-P FORM.

WHP 0328104

CS06989

7

1977

TSCA DATA SHEET

Material: Ethylbenzene 2/6

Synonyms/Acronyms: EB, Ethyl Benzene

Plant Site: Texas City

Manufacturing Unit: Ethylbenzene

Department(s): 14

Process Stream: 14D30H

Material Classification: PIE-P Product, Internal Sal, External S – product

Quantity (ppy): 2.06 Million[1]

Vendor: Not Applicable

Chemical Composition:

	WT. % ANALYSES	
	Specification	TYPICAL
Ethylbenzene	99.50 min	99.86

Estimated accuracy of analysis = ± 0.1% EB.

PT Co-ordinator:

Notes: 1. Petrochemicals Business GP-[illegible] Report No. 6, Dec 1977 (Intercompany Sales).

2. Complete Specification and Analysis attached to PII-P Form.

8

WHP 0328105 CS06990

1977 2450

TSCA DATA SHEET

Material: Ethylbenzene %

Synonyms/Acronyms: EB, Ethyl Benzene

Plant Site: Texas City

Manufacturing Unit: Ethylbenzene

Department(s): 14

Process Stream: 14D30H

Material Classification: PII-P Product, Internal Sale, Internal Si — Product

Quantity (ppy): 1,364.6 Million[1]

Vendor: Not Applicable

Chemical Composition:

	wt % Analysis[2]	
	Specification	Typical
Ethylbenzene	99.50 min	99.86

Estimated accuracy of EB analysis = ± .1% by wt.

PT Co-ordinator: J. R. GARTON / R. A. Newsom

Notes: 1. Dept 14 production (cost report) Less sales (BIN sheets) = production to Dept 16, 1977.

2. Complete Specification and Analysis attached.

WHP 0328106

CS06991

(1977 8451

TSCA DATA SHEET

Material: Benzene 1/5

Synonyms/Acronyms: recycle benzene

Plant Site: TEXAS City

Manufacturing Unit: Styrene

Department(s): 16

Process Stream: 16D6OH

Material Classification: BII-U Byproduct, Internal Sale; Intern: Site — useful byproduct

Quantity (ppy): 32.02 Million[1]

Vendor: Not Applicable

Chemical Composition:

	Wt % Composition	
	Specification[2]	Typical[3]
Benzene	—	99.788
Non-Aromatics	0.100 max	0.212
Toluene	0.050 max	<.001
Ethylbenzene	—	<.001

Estimated Accuracy for impurities = ± 10% relative

PT Co-ordinator: J. R. GARTON / R. A. NEWSOM

Notes: 1. Dept 16 Factory Ledger, Dec 1977 (to Dept. 14).
2. Raw material Specification RMS-3-1, 1/27/72.
3. Average Monomer Lab Analysis, 16D6OH, 13 Samples, 12/1-12/15/77.

WHP 0328107 CS06992

KG COH004484 P-00573

1977

TSCA DATA SHEET

Material: BENZENE 7/5

Synonyms/Acronyms: –

Plant Site: TEXAS City

Manufacturing Unit: Ethylbenzene

Department(s): 13 + 14

Process Stream: 14T1 + 14T11

Material Classification: R-R Raw material - Purchased

Quantity (ppy): 698.4 million[1]

Vendor: Incontrade, Texaco, Shell, Conoco, Exxon, ARCO, Coastal States, Crown.

Chemical Composition:

	wt % ANALYSIS	
	Specification[2]	TYPICAL[3]
Benzene	----	99.96
NON-AROMATICS	0.100 max	0.04
Toluene	0.050 max	<0.001
Ethylbenzene	------	<0.001

PT Co-ordinator: J. R. GARTON / R. A. NEWSOM

Notes: 1. Purchasing Dept. (T. McDonald). By difference (Total Purchases less imports and Monsanto, Chocolate Bayou).

2. MONSANTO Raw material Specification RMS-3-1, 1/27/72.

3. Control Lab Analysis; Average of 28 Barge receipts, Nov. 1977.

WHP 0328108

CS06993

9.5

1977

TSCA DATA SHEET

2/5

Material: BENZENE

Synonyms/Acronyms: ——

Plant Site: TEXAS CITY

Manufacturing Unit: Ethylbenzene

Department(s): 13 + 14

Process Stream: 14T1 + 14T11

Material Classification: R I - I Rawmaterial, Import - Import

Quantity (ppy): 30.0 Million

Vendor: Monsanto Canada (18.6) and Canada Petrofina (11.4). = 30 [1]

Chemical Composition:

	Wt. % Analyses	
	Specification[2]	TYPICAL[3]
Benzene	-----	99.96
NON-AROMATICS	0.100 max	0.04
Toluene	0.050 max	<0.001
Ethylbenzene	-----	<0.001

Estimated Analytical Accuracy = ± 10% relative for impurities

PT Co-ordinator:

Notes: 1. Purchasing Dept. Import Report from T. McDonald to J. C. Good, 1977 volumes.

2. RAW Material Specification RMS-3-1, 1/27/72.

3. Control Lab analysis of 28 Barge Receipts; Nov 1977.

WHP 0328109

CS06994

7

KG COH004486

P-00575

1977

TSCA DATA SHEET

4/5

Material: Benzene

Synonyms/Acronyms: —

Plant Site: Texas City

Manufacturing Unit: Ethylbenzene

Department(s): 13 + 14

Process Stream: 14T1 + 14T11

Material Classification: RME – M Raw material, Monsanto, external site – Monsanto supplie

Quantity (ppy): 289.9 million [1]

Vendor: MONSANTO Chocolate Bayou

Chemical Composition:

	wt % ANALYSES	
	Specification [2]	TYPICAL [3]
Benzene	-----	99.96
non-Aromatics	0.100 max	0.04
Toluene	0.050 max	<0.001
Ethylbenzene	-----	<0.001

Estimated Analytical Accuracy = ± 10% relative for impurities

PT Co-ordinator: J.R. GARTON/R.A. NEWSOM

Notes: 1. Purchasing Dept. (T. MacDonald) Jan. 1978.

2. Raw material Specification RMS-3-1, 1/27/72.

3. Control Lab Analysis; Average of 28 Barge Receipts; Nov. 1977.

WHP 0328110

CS06995

KG COH004487

P-00576

1977 1455

TSCA DATA SHEET

5/5

Material: Benzene

Synonyms/Acronyms: Recycle Benzene

Plant Site: Texas City

Manufacturing Unit: Ethylbenzene

Department(s): 13 + 14

Process Stream: 16D6OH to 14T1

Material Classification: RMI-M Raw material, Monsanto, Internal site - Monsanto supplie

Quantity (ppy): 32.02 Million[1]

Vendor: MONSANTO Texas City Dept 16

Chemical Composition:

	WT. % ANALYSES	
	Specification[2]	TYPICAL[3]
Benzene	-----	99.788
NON-AROMATICS	0.100 max	0.212
Toluene	0.050 max	<.001
Ethylbenzene	-----	<.001

Estimated Analytical Accuracy = ± 10% relative for impurities.

PT Co-ordinator: J.R. GARTON/R.A. Newsom

Notes: 1. Dept 16 Factory Ledger, Dec 1977.

2. Raw material Specification RMS-3-1, 1/27/72.

3. Average Monomer Lab Analysis of 13 Samples, 16D6OH, 12/1-12/15/77.

WHP 0328111 CS06996

1

KG COH004488 P-C0577

84 5/10

1977

TSCA DATA SHEET

Material: Styrene monomer 7/2

Synonyms/Acronyms: Styrene, SM

Plant Site: TEXAS City

Manufacturing Unit: STyrene

Department(s): 16

Process Stream: 16D30H

Material Classification: PIE - P Product, Internal Sale, External Site - Product

Quantity (ppy): 784.0 Million[1]

Vendor: Not Applicable

Chemical Composition:	Specification[2]	TYPICAL AVERAGE[3]
Styrene Monomer	99.6% Min	99.72 wt % (CP)
		99.77 wt % (GC)

Complete specification and Analyses Attached.
Estimated Accuracy = ± 0.1 % Absolute for SM.

WHP 0328112

PT Co-ordinator: J.R. GARTON / R.A. NEWSOM

Notes: 1. Petrochemicals Business GP - Monomers, Report No. 6, Dec 1977, and International Division Report No. 6, Dec 1977; and warehouse Inventory Report, Dec 1977.

2. Finished Material Specification #SM-102, 12/25/72,

3. Monsanto Special Report No. 16, "Styrene Monomer Competitor Quality Evaluation - 1976", J. R. GARTON, July 27, 1977.

8457

STYRENE MONOMER COMPOSITION - 1977

	Specification[1] Min	Specification[1] Max	Typical Average[2]
tyrene Monomer	96.6%		99.72% (CP)
'BC (tert-Butylcatechol)	10 ppm	15 ppm	--
Polymer		10 ppm	< 1 ppm
Aldehydes		.01 %	.001 %
Peroxides		.005 %	< .0001 %
Sulfur		20 ppm	< 1. ppm
Chlorides		.005 %	.0001 %

	Wt. % (Chromatograph)
Styrene	99.767
Non-aromatics	0.017
Ethylbenzene	0.125
(p)+ m-xylene	0.012
Cumene	0.022
O-xylene	0.004
n-Propylbenzene	0.006
M+P-Ethyltoluene	0.005
α- methylstyrene	0.031
Vinyltoluenes	0.003
β -methylstyrene	0.001
Phenylacetylene	0.006
Benzaldehyde	0.001
Acetophenone/styrene oxide	0.0004
Benzene	Not Det. *
Toluene	Not Det. *

* less than 1 ppm

Impurities, estimated accuracy = ± greater of 10% relative or .001% absolute

Notes:

1. Monsanto finished material specification No. SM-100, 7/1/73.
2. Monsanto Special Report No. 16, "Styrene Monomer Competitor Quality Evaluation - 1976", J. R. Garton, July 27, 1977.

WHP 032811

CS06998

KG COH004490

P-00579

106

Column #	1	2	3	4	5	6	7	8	9	10	11	12	13
Year	Lowe Processing Capacity		Mon.	Amoco	Monsanto Plus Amoco	Sty Pits Open	Approx. Pit Capacity	Annual Approx Total Capacity **	Cumm. Approx. Total Capacity ***	Δ ****	Δ Adj.	From B+B Data ~~other~~ PRPs	Yet to Acct'd For
1960	2.4		2.4	—	2.4	R	0.5	2.9	2.9	0.5	0.5	—	0.5
1961	4.8		2.5	—	2.5	E, G	2.4	7.2	7.7	5.2	2.9	—	2.9
1962	4.8		2.5	—	2.5				7.7	5.2	2.9	—	2.9
1963	4.8		2.5	—	2.5				7.7	5.2	2.9	0.2	2.7
1964	4.8		2.5	—	2.5	N	0.4	5.2	8.1	5.6	3.0	0.2	2.8
1965	4.8		2.8	0.9	3.7	I, J	11.6	16.4	19.7	16.0	6.9	0.6	6.3
1966	9.6		5.4	1.4	6.8				24.5	17.7	3.9	0.6	3.3
1967	9.6		6.1	1.5	7.6				24.5	16.9	2.0	0.6	1.4
1968	9.6		6.8	1.8	8.6	K	5.8	15.4	30.3	21.7	4.3	0.5	3.8
1969	9.6		6.2	3.4	9.6	L	3.9	13.5	34.2	24.7	7.3	1.9	5.4
1970	12.0		5.5	3.2	8.7	F*, H	5.7	17.7	42.3	33.6	6.5	1.8	4.7
1971	12.0		4.8	3.0	7.8				41.8	34.0	6.8	1.9	4.9
1972	12.0		4.7	4.7	9.4				41.8	32.4	2.6	2.7	(?)
1973	12.0		4.3	5.1	9.4				41.8	32.4	2.6	1.7	0.9
1974	12.0		3.9	4.9	8.8				37.4	28.6	3.2	1.0	2.2
1975	12.0		2.5	3.6	6.1				37.0	30.9	5.9	1.3	4.6
1976	12.0		3.1	4.7	7.8	O	0.3	12.3	25.1	17.3	5.2	4.9	0.3
1977	12.0		0.3	0.6	0.9				25.1	24.2	11.9	0.2	11.7

MM GALS. ⟶ MM GALS ⟶

CHLORINATED PITS: A(~1961), B(~1960), Q(~1960)

* F OPENED ~1965 AS COPPER WATER PIT, ASSUMED CONVERTED TO STY. STORAGE IN 1970, AFTER COPPER BUSINESS STOPPED (~1969)

** ADD COLUMN 1 AND COLUMN 7 (EACH YEAR INDIVIDUALLY)

*** " " 1 " " 7 (CUMMULATIVE TOTAL OF ALL PIT STORAGE)

**** COLUMN 9 MINUS COLUMN 5 EQUALS Δ

Δ ADJ. ADD COLUMN 1 AND AN ADJUSTED AMOUNT OF COLUMN 7 TO REFLECT DEGREE OF FULLNESS (1/4, 1/2, 3/4, FULL) EQUALS ADJUSTED CAPACITY. ADJUSTED CAPACITY MINUS COLUMN 5 EQUALS Δ ADJ.

COLUMN 13 EQUALS COLUMN 11 MINUS COLUMN 12

CMT 254067

Vinyl chloride Process Research

S-44

WHP 0008656

4

VINYL CHLORIDE PROCESS RESEARCH

I. PURPOSE: To analyze the technology of the vinyl chloride process

To define areas of Research on the process or alternates

To plan a Research Program based on this analysis

II. GENERAL: As the black diagram on the next page shows (Figure No. 1), vinyl chloride is produced by two routes in the present process:

1. C_2H_2 + HCl $\xrightarrow{100°C}$ $CH_2=CH-Cl$

Acetylene M. W. 26 — M. W. 36.5 — Vinyl Chloride M. W. 62.5

2. $Cl-C_2H_4-Cl$ $\xrightarrow[Cl_2,\ 480-520°C]{\Delta}$ $CH_2=CH-Cl$ + HCl

1,2-dichloroethane M. W. 99 — Vinyl Chloride M. W. 62.5 — M. W. 36.5

3. C_2H_4 + Cl_2 $\xrightarrow{50°C}$ $Cl-C_2H_4-Cl$

ethylene M. W. 28 — M. W. 71 — M. W. 99

In-balance operation describes the operating condition when the lbs/hr of HCl from reaction No. 2 is equal to the lbs/hr of HCl used in reaction No. 1. This amounts to optimum utilization of the chlorine introduced in reaction No. 3.

III. AREA ANALYSIS: (Numbers and letters refer to the Analysis Chart Attached)

WHP 0008657

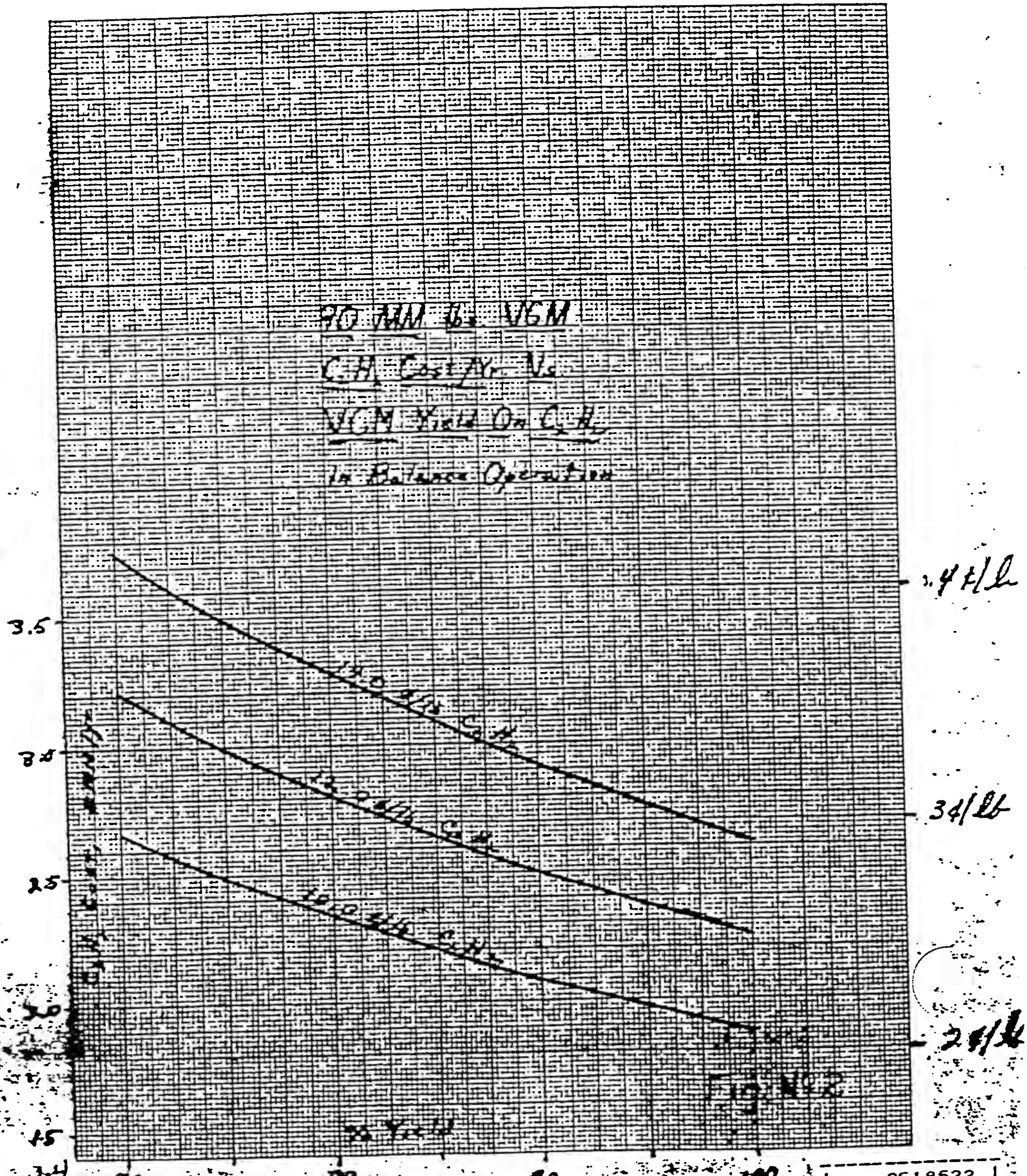
PLAINTIFF'S EXHIBIT Px 5-44

2518521

KG COH004494

MTC 0007354

MON 0000283



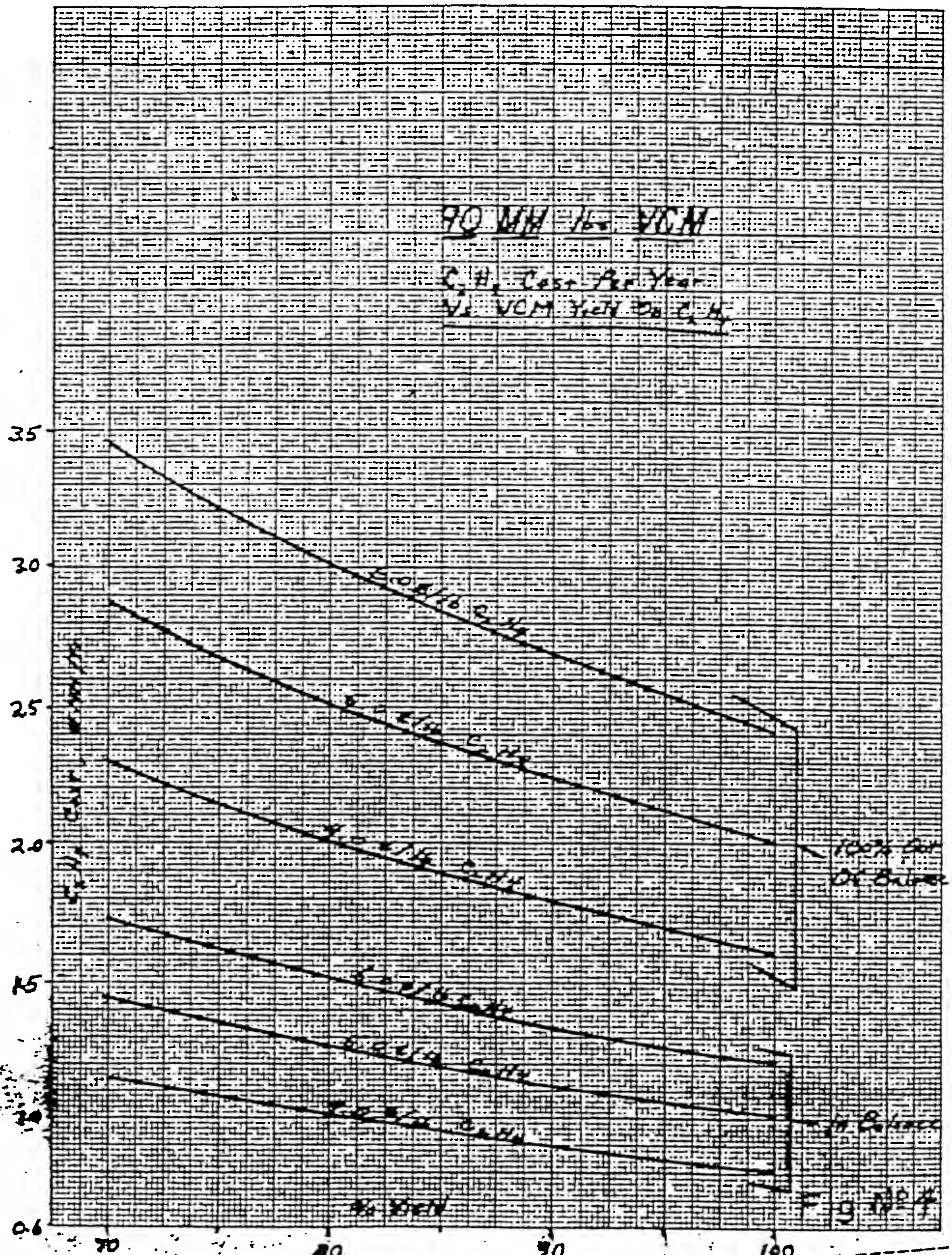
2518522

KG COH004495

WHP 0008658

MTC 0007355

MON 0000284

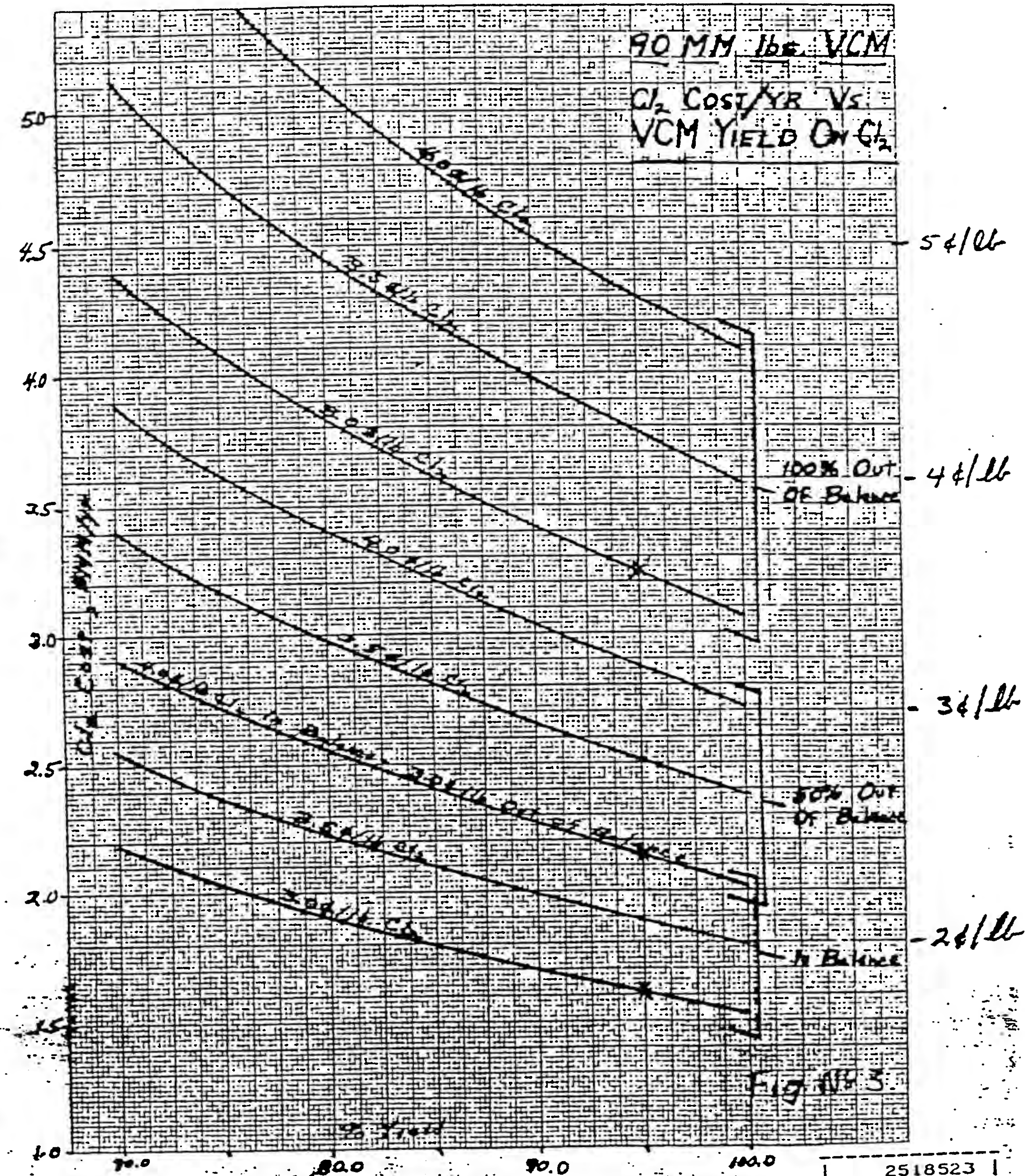


KG COH004496

2518524

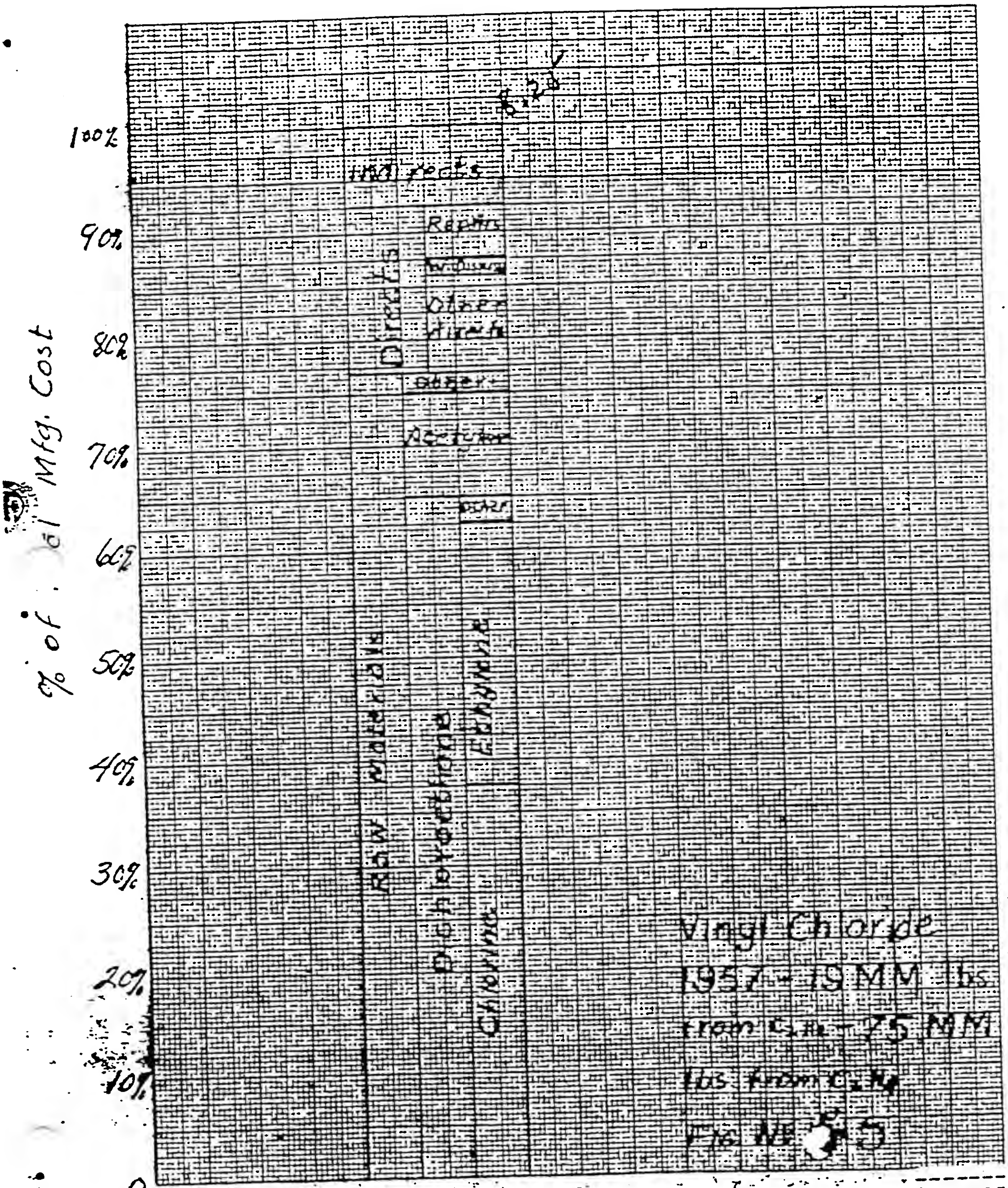
WHP 0008660

MTC 0007357



90 MM lbs VCM
Cl2 COST/YR Vs VCM YIELD ON Cl2
5¢/lb
4¢/lb
3¢/lb
2¢/lb
100% Out Of Balance
50% Out Of Balance
In Balance
Fig No 3
% Yield

2518523


% of Mfg. Cost
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0
Indirects
Repairs
Directs
Other Directs
Labor
Acetylene
Other
Raw Materials
Dichloroethane
Ethylene
Chlorine
Vinyl Chloride
1957 - 19 MM lbs
from C_2H_2 - 75 MM
lbs from C_2H_4
Fig. No. 5

A. Cost Reduction

1a. Raw Material Utilization (Yields)

The VCM plant is unique for Texas City in its flexibility of operation, basing the type of operation upon the current, almost hourly, availability of raw materials and the conditions in Department 18, 19, and 20. This flexibility has made VCM quite valuable as a sponge to soak up acetylene when AN is down or cannot take all its share of acetylene. This allows Department 18 to stay on-stream and at as high a rate as possible. In actuality, VCM is forced to operate cut-of-balance most of the time due to the shortage of acetylene. The flexibility of operation that is such an asset also forces the exact operating conditions to be specified when raw materials and yields are discussed in detail.

In general, the yields in the VCM operation are very good--all in the 95% plus range. Average yields since October, 1955, have been as follows: acetylene, 96.7%; ethylene, 96.1%; EDC, 95.0%; and chlorine, 94.2%. Gross savings by a 1% increase in all yields would be about $90 M per year.

There are actually two products, VCM and EDC, involved in the VCM operation, and these should be considered separately. The cost breakdown on EDC in cents/lb EDC is given below.

Material	1957	1956	Average % of Total Manufacturing Cost
Chlorine	2.316	2.379	56.3
Ethylene	1.491	1.457	35.3
50% NaOH	0.049	0.036	1.0
Oxygen	0.001	0.001	---
Total	3.857	3.873	92.6

VCM raw material costs are a function of the type of operation; therefore no breakdown is given. The average raw material cost during 1956 and 1957 was 76.7% of the total manufacturing cost. See Figures No. 2, 3, 4 and 5.

The plant was operated out-of-balance much of that time. The value should be a good estimate of future operation, for if AN continues to expand then acetylene will remain in short supply and VCM will be forced to run out-of-balance much of the time. The effects of Carbide acetylene and oxidative chlorination will probably cancel one another, oxidative chlorination forcing out-of-balance operation with the acetylene forcing in-balance, and vice-versa.

The only catalyst used in the entire VCM operation is in the acetylene-HCl reaction. The average catalyst cost per pound of VCM from reaction during 1955, 56, and 57 was 0.68¢/lb. During this period, 290 lbs of VCM were produced per pound of catalyst, or about one-half of design. Catalyst life can be doubled by using a carbon bed scrubber on the HCl stream, and work is in progress to determine if it is economically feasible on a plant scale. This would bring the VCM produced per pound of catalyst to design rate and save about $100 M per year in catalyst cost at design in-balance rate, along with decreased maintenance costs for recharging the reactors.

In summary, there is no place where research can be justified in this area except on the catalyst life, and work will soon be completed on it. The only way the high raw material costs can be overcome is by switching to cheaper raw materials via such methods as oxidative chlorination.

1b. Utility and Energy Requirements

Utility costs for EDC during 1956 and 1957 averaged 0.8% of the total manufacturing costs. During the same period, VCM utility cost averaged 4.9% of the total manufacturing cost. Both these values include waste disposal, which increased markedly in VCM during 1957 because of the incr in acid waste in out-of-balance operation.

In VCM the major utility requirement is steam, much of which is used to operate the refrigeration unit. Refrigeration is a bottleneck, but pressure operation to be tested soon will increase the refrigeration capacity and ease this problem. In-balance operation or oxidative chlorination would decrease acid dumping and return the waste disposal costs to normal.

1c. By-Product Recovery and Utilization or Integration

See memo, Donner to Hartzog, February 12, 1958, Chlorinated Hydrocarbons Recovery from Department 22 Tars - Preliminary Evaluation.

The above memo discusses plans for selling the chlorinated tar stream.

200-300 lb/hr of HCl produced from out-of-balance operation is being transferred to the styrene plant for catalyst preparation.

1d. Maintenance

The VCM compressor, 22C2, has had a very high maintenance cost. Engineering is checking the possibility of replacement with another type.

Loading the reactors with catalyst is a very time consuming and expensive operation. Out-of-balance operation reduces this considerably, but this is no solution to the problem. Increased catalyst life, if achieved, will decrease this costly item.

1e. On Stream Time

The standard operating year is 330 days. The VCM plant operates about 345 days per year. Obviously there is little room for improvement here.

2. Areas for Capital Reduction in a New Plant

Not applicable now.

B. Capacity Analyses

1. See VCM Capital Expansion Original Calculations, Volume 3, 1957, Texas City Engineering Department.

AREA "C"

C. Process Weaknesses

1a. High Raw Material Costs

Acetylene and ethylene are both upgraded products. Under present economic conditions production from ethylene provides a higher return than in-balance operation. Oxidative chlorination of ethylene, if successful, will make possible conversion to an all ethylene base. This should ease the high raw material cost problem. Of course, if improvements in Department 18 cut acetylene costs, then this too would improve the cost picture. In balance operation or all ethylene base will give the minimum chlorine cost.

1b. Out-of-Balance Operation

The process design originally called for Department 21 to store HCl produced during out-of-balance operation as muiatic acid, and then regenerate anhydrous HCl as it was needed. Only the absorption step proved operational, therefore all HCl produced during out-of-balance operation is lost. Not only does this double the chlorine cost per pound of VCM, but disposal and pollution problems are created when the acid is dumped. Yet even with these disadvantages out-of-balance operation brings a larger return on investment than in-balance due to decreased invested capital (acetylene capital). Oxidative chlorination will eliminate out-of-balance problems and make this type of operation a real asset rather than a weakness.

1c. Catalyst Cost

Neither catalyst life nor pounds of VCM per pound of catalyst have ever approached design. This makes the catalyst cost per pound of VCM produced from acetylene quite high. Work is in progress to evaluate cleaning up the HCl stream with a carbon bed scrubber, a method which has proved capable of doubling catalyst life. Other methods to increase catalyst life will also be checked. Total savings by doubling catalyst life will be about $0.1 MM at design rates (of VCM from acetylene in-balance).

1d. Chlorinated Solvents

About five pounds of chlorinated solvents are produced per 100 lbs of VCM. Considering only chlorine and EDC value, the cost is 0.14¢/lb VCM. Much of this is due to process improvements which more than compensate for the small increase in by-product make. The major problems from this stream are disposal and pollution. We have a prospective customer for the stream, and Research and Engineering work have been completed on a steam distillation unit to make the stream usable. We are now awaiting our customer's decision on building his own recovery unit and his commitment before further plans are made. If the stream is sold, then the disposal and pollution problems are removed, and at least $25,000/yr profit would be realized from the operation.

1e. Possible VCM Losses From the System

When VCM is operating out-of-balance, the unabsorbed gases in Department 21 are vented. This could be a potential VCM loss of several million pounds per year at high rates. A gas chromatograph for HCl stream analyses has been developed to determine how much, if any, VCM is actually lost. Close watch will be kept on this stream and methods will be developed to stop any losses that occur.

2. Product Quality

Since the advent of 22D8 chlorination, product quality has ceased to be a problem. When acetylene specifications were recently tightened some problems were experienced, but improved operation of 22D5 and 22D6 virtually eliminated them. Our

VCM is as good as, if not better than, any other on the market.

3,4. Present and Potential Competition

Ethyl Corporation with their low cost plant, their ability to utilize all by-product HCl in tetraethyl lead manufacture, and their all-ethylene-based plant are in a very good position. They have all of our know-how plus inherently good quality due to the all EDC base. Their equipment is sized to produce many times their 60 MM lb/yr rated capacity, and they have already authorized expansion to 90 MM lb/yr. When they find out how much actual cracker capacity they now have due to cracker chlorination their surprise will only be surpassed by their return on investment. Ethyl should be our roughest competition, both now and in the future.

5. Are we Competitive? Yes.

CAN WE GET AN EDGE? YES, especially with all ethylene or ethane based VCM and oxidative chlorination.

6,7. Alternate Routes

See the following memos and reports.

P. M. Dellasciucca and G. H. Lovett to B. L. Williams, March 4, 1958, Short Cut Process for Ethylene Dichloride. The use of crude ethylene for EDC offers attractive economics. These are discussed. Some research has been done on the process.

C. P. Fullerton to R. J. Schatz, February 10, 1958, Oxidative Chlorination of Ethane. All ethane based EDC is another way to overcome the high raw material problem. This is discussed in the memo, but insufficient laboratory work has been done.

Burkett, Fullerton, and Ryan, Special Report No. 32, A Study of the Use of Oxidative Chlorination of Ethylene in the Expansion of the Texas City Vinyl Chloride Plant. Major conclusion was to use oxidative chlorination of ethylene in the expansion program.

G L Wofford
G. L. Wofford

W F Yates
W. F. Yates

B L Williams
B. L. Williams

jad
3/17/58

2518530

MTC 0007363

REFERENCES

Burkett, Fullerton, and Ryan, A Study of the Use of Oxidative Chlorination of Ethylene in the Expansion of the Texas City Vinyl Chloride Plant, Special Report No. 32.

Dellasciucca and Lovett to Williams, March 4, 1958, Short Cut Process for Ethylene Dichloride.

Dorner to Hartzog, February 12, 1958, Chlorinated Hydrocarbon Recovery from Department 22 Tars - Preliminary Evaluation.

Fullerton to Schatz, February 10, 1958, Oxidative Chlorination of Ethane.

H. M. Walker, Texas City Research-Development Department Report No. 27, Ethylene Long Term Supply-Demand Considerations.

VCM Capital Expansion, Original Calculations, Volume 3, 1957, Texas City Engineering Department.

Cutcher to Ryan, February 25, 1958, Ethyl Corporation VCM Plant Start-Up.

108

KG COH004505

H L Chemical Co.

APPROXIMATE CHEMICAL COMPOSITION OF HARD-LOWE HEAVY AROMATIC OILS

COMPOUND	B.P. °C	AMOUNT	
TOLUENE	110.6		
ETHYL BENZENE	136.1		
STYRENE	145.2		
PHENYL PROPYLENE	156-7		
PROPYL BENZENE	159.2	[illegible]	5
CUMENE	152.4		
ALPHA METHYL STYRENE	165		
ETHYL TOLUENE	161		
METHYL ETHYL BENZENE	165		
ISO ALLYL BENZENE	176		
o DIETHYL BENZENE	183.5		
m DIETHYL BENZENE	181.1		
p DIETHYL BENZENE	183.8		
n BUTYL BENZENE	183.3		
s BUTYL BENZENE	173.3		
t BUTYL BENZENE	169.1		
i BUTYL BENZENE	172.8	1%	2.5
m VINYL ETHYL BENZENE	190		
p VINYL ETHYL BENZENE	193		
DIETHYL TOLUENE	199		
1,2,4 TRIETHYLBENZENE	218		
1,2,3 TRIETHYLBENZENE	222	2%	5
1,3,5 TRIETHYLBENZENE	216		
1,2,4,5 TETRAETHYLBENZENE	250		
1,2,3,4 TETRAETHYLBENZENE	253	1%	2.5
1,2,3,5 TETRAETHYLBENZENE	251		
1,3 DIPHENYLPROPANE	#305		
DIPHENYLMETHANE	265		
PENTAETHYLBENZENE	277		
cis STILBENE	283		
sym DIPHENYLETHANE	284		
HEXAETHYLBENZENE	298	30 %	75
ETHYLDIBENZYL	300		
DIETHYL 1,3 DIPHENYL CYCLOBUTANE (1,3)	307		
trans STILBENE	307		
1,3 DIPHENYL CYCLO BUTANE	290		
1,3,5 TRIPHENYL CYCLOHEXANE			10
1,3,5,7 TETRAPHENYL CYCLOOCTANE			
DIETHYL DIBENZYL			
2,4 DIPHENYL 1 BUTENE 1,4			

AH00024

BRIO-99-047327

KG COH004506

109

JOC Oil Aromatics Inc.

2501 Choate Rd., Houston, Texas
P.O. Box 138, Friendswood, Texas 77546
713-482-7575 Telex: 775478 Cable: JOCARC

Pollution file

February 9, 1977

Mr. Gene Speller
Texas Air Control Board
5555 West Loop - South
Bellaire, Texas. 77401

Dear Mr. Speller:

This will confirm our discussion today about an analysis of the Waste Tar Pit on the plant property.

Here attached is a typical analysis of the pit along with a report on total chlorides by Chromaspec Labs. Also, I have made some comments on how the pit developed from Lowe's chlorinated solvents operation.

Yours very truly,

Balfour J. Augst

Balfour J. Augst
Pollution Control Officer

CC: Mr. M. M. Fowler

RC00614

KG COH004508

P-00371

JOC Oil Aromatics Inc.

2501 Choate Rd., Houston, Texas
P.O. Box 138, Friendswood, Texas 77546
713-482-[illegible] Telex [illegible] Cable JOCARO

Typical Analysis
(Chlorinated Solvent [illegible])

Dichloroethane	< .01 %
Trichloroethane	< .01 %
Tetrachloroethane	1.[illegible]0 %
Pentachloroethane	[illegible].30 %
Hexachloroethane	< [illegible] %
Phenol	1.00 %
Hydrogen chloride	.30 %
Neoprene (type complex)	44.30 %
Complex aromatics (some polymerics, vinyl-[illegible])	14.30 %
Water (not bound)	3[illegible].00 %
Copper (Cu++)	50 ppm
Iron (ferrous chloride)	500 ppm
Styrene monomer	< [illegible] ppm
Ash	[illegible] to .30% (by weight)
Heat Value	100,[illegible] btu/gal
pH	1.5 to [illegible]
vapor pressure	.1 psi
specific gr.	1.3[illegible] to 1.330
Density [illegible]	10.35 to 11.1 lbs./gal.
Organic Chlorides	25.5% to [illegible].3% by Wt.

Note: This is an exceptionally complex waste to be analyzed and it is uncertain just what the various wastes disposed of here actually were.

However, the above information is the best that is available and will indicate what we are dealing with.

[illegible] August
[signature]

2-9-77

RC00615

JOC OIL WASTE DISPOSAL PIT
(in-plant location)

This is the last ground storage area remaining to be removed. It is one of the oldest pit used by this plant when it operated as the Lowe Chemical Company.

Several years ago, the "bottoms" from making vinyl chloride (CH_2:CHCl) monomer were brought into this plant to be processed (heating) to produce:

— Dichloroethane (ethylene dichloride) $ClCH_2CH_2Cl$ (b.p. 83.5°C)
and
— Trichloroethane (vinyl trichloride) $CHCl_2CH_2Cl$ (b.p. 113.7°C

These two products were considered the "light ends" recoverable from the styrene bottoms.

The "heavies" were disposed of by placing them in the "Waste Pit" for ultimate disposal at some future date. The vinyl chloride monomer was made either by the oxychlorination of ethylene or reacting acetylene with hydrogen chloride. Phenol was used as a polymerication inhibitor which would show up in the "bottoms". Also, the reaction produced traces of other compounds so that the "styrene bottoms" contained several complex compounds. The eventual heat/cracking and distillation by Lowe Chemical Co. would yield about 65%-67% of "goodies" (i.e. dichloroethane and trichloroethane) that could be sold.

The "heavies" were drawn from the heating unit and placed in the waste pit. The various batches of "heavies" were not uniform in composition but it is expected that composits from the pit will show the approximate compounds present:

			Approx. %
Tetrachloroethane	($CHCl_2CHCl_2$)	b.p. 146.5°C	2.5
Pentachloroethane	($CHCl_2CCl_3$)	b.p. 159.1°C	3.5
Hexachloroethane	(Cl_3CCCl_3)	b.p. 185.0°C	1.0
Phenol	(C_6H_5OH)	b.p. 182.0°C	1.5
Hydrogen Chloride			0.5
Neoprene	$(C_4H_5Cl)_n$		69.0
Complex combinations of aromatic compounds			22.0

The above analysis will give a reasonable account for the composition of th waste pit. Some copper bearing waste(cupric chloride) was placed in the pit and will be found in the water-portion of the waste --- about 50 ppm

Much of this pit material is not soluble in water --- however, rain has covered the waste material for years and has become dispersed through some of the lighter elements. The bottom of the pit is mostly Neoprene "gunk" which is very stringy and viscous. The Hydrochloric Acid in the pit

RC00616

KG COH004510

P-00373

is in the water phase which results in a pH ranging from 1.5 to 3.5 This would appear to be a heavy acid concentration because of the hyd ion concentration --- however, only a small amount of an organic acid will produce this results. The acid in the water has been successful neutralized with powdered shells.

It should be noted that the pit waste material came from the "bottoms" of manufacturing the vinyl chloride monomer. It might be expected th a large percentage of the monomer would be present in the waste pit. This does not appear to be so as the monomer is quickly polymerized in air and sun light. Probably there is less than 2 ppm of the monome present. Because of the corrosive nature of the Lowe Styrene Solvent process, the equipment gave up a considerable amount of iron to the overall waste in the form of ferrous chloride which can be found in th water phase of the pit. It can be precipitated by bringing the pH up to 6.8 or higher. The iron will exceed 500 ppm.

The vapor pressue of the waste material will be less than o.1 psi so that "blow off" from a storage tank is of no danger. No special ventin should be required from a 1¼ lb. safety cap on the tank. For extra sa a pipe from the "blow-off" cap could lead into a suitable drum or cont of ethyl alcohol. Any light ends or monomer coming over would be solub in the alcohol and thus kept out of the atmosphere.

Various composit samples show a specific gravity from 1.302 to 1.330 which translates into 10.85 to 11.1 lbs. per gallon, or about 82 lbs./ The BTU value of the waste material (as checked by Rollins Environment Services) is about 100,000 BTU's per gallon compared to about 170,000 for a good grade of fuel oil.

B.J. Augst
1-21-77

RC00617

110

KG COH004512

VINYL CHLORIDE MONOMER SAMPLING

AT

JOC OIL COMPANY

FRIENDSWOOD, TEXAS

ON

MAY 1976

JULY 5, 1976

PREPARED BY THE STAFF OF THE

TEXAS AIR CONTROL BOARD

RC00608

KG COH004513

P-00376

Summary

In response to a request by the Compliance Division of the Texas Air Control Board, sampling for vinyl chloride monomer was performed at JOC Oil Company in the vicinity of waste pits and waste disposal operations. Samples consisted of eight upwind-downwind bag samples, three bag samples from disposal holes (clay-tar mix), two bag samples from pit #2 drawpipe and continuous withdrawal samples from the liquid surface and pit #2 drawpipe. All samples were analyzed within three hours of collection by gas chromatography (gc). Concentrations of vinyl chloride monomer (VCM) were below the detectable limit (250 ppb) in all except the pit #2 drawpipe samples. In these, concentrations of VCM ranged from 6900 ppm to 50,000 ppm. The continuous withdrawal system gave lower results (see Table) because the stagnant vapors in the pipe in the course of sample pumping were displaced with outside air and thus diluted. Also, it was evident that some adsorption of VCM occurred in the system.

Ambient air samples were collected in 5-liter aluminized plastic bags with a portable piston pump. Prior to each use, all bags were flushed with UHP zero air three times then filled again and analyzed by gc for traces of VCM. Any bags containing detectable VCM were rejected. Samples from disposal holes and drawpipe were collected in aluminized bags by means of an all stainless steel metal bellows pump and a 1/8 in. O.D. stainless steel tube for a probe. The drawpipe was placed by JOC Oil on the inside slope of the dike, extending down into the oil/tar layer for the purpose of sucking out the waste material. At the same time it provided a convenient means of analyzing volatile components of the oil layer. Samples from the pit surface were taken by means of a continuous withdrawal system consisting of 3/8 in. O.D. S.S. probe, 15 feet of 1/4 in. O.D. nylon line, an MSA in-line filter and a stainless steel metal bellows pump.

Analysis Procedure

Analyses were done by gas chromatography. Each sample was analyzed three successive times so that reported values are averages of triplicate analyses. The gc was a Hewlett Packard model 5700 equipped with flame ionization detector (FID), 6-foot Porapak QS (80/100 mesh) column and 1 cc sample loop. Column temperature was 90°C, detector temperature 250°C, nitrogen carrier flow 21 + 1 ml/min. Peaks were quantitated by means of a Columbia Scientific Industries Supergrator-2 integrator.

Weather Data

Weather data was taken with hand-held instruments, foregoing use of more sophisticated gear since no detectable ambient levels of VCM were being found.

Lower Detection Limit

The lowest concentration of VCM which produced a clearly discernible gc peak at maximum instrument sensitivity was 340 ppb (this sample came from an inadvertently contaminated sample system, and is thus not reported in the summary of results). Determination of the lower detection limit as 250 ppb is based on peak height obtained from the 340 ppb sample. Although the integrator calculated lower values for several samples, no peaks were discernible in the chromatograms, retention times were non-reproducible, and integrated areas varied by as much as 100% for replicate analyses.

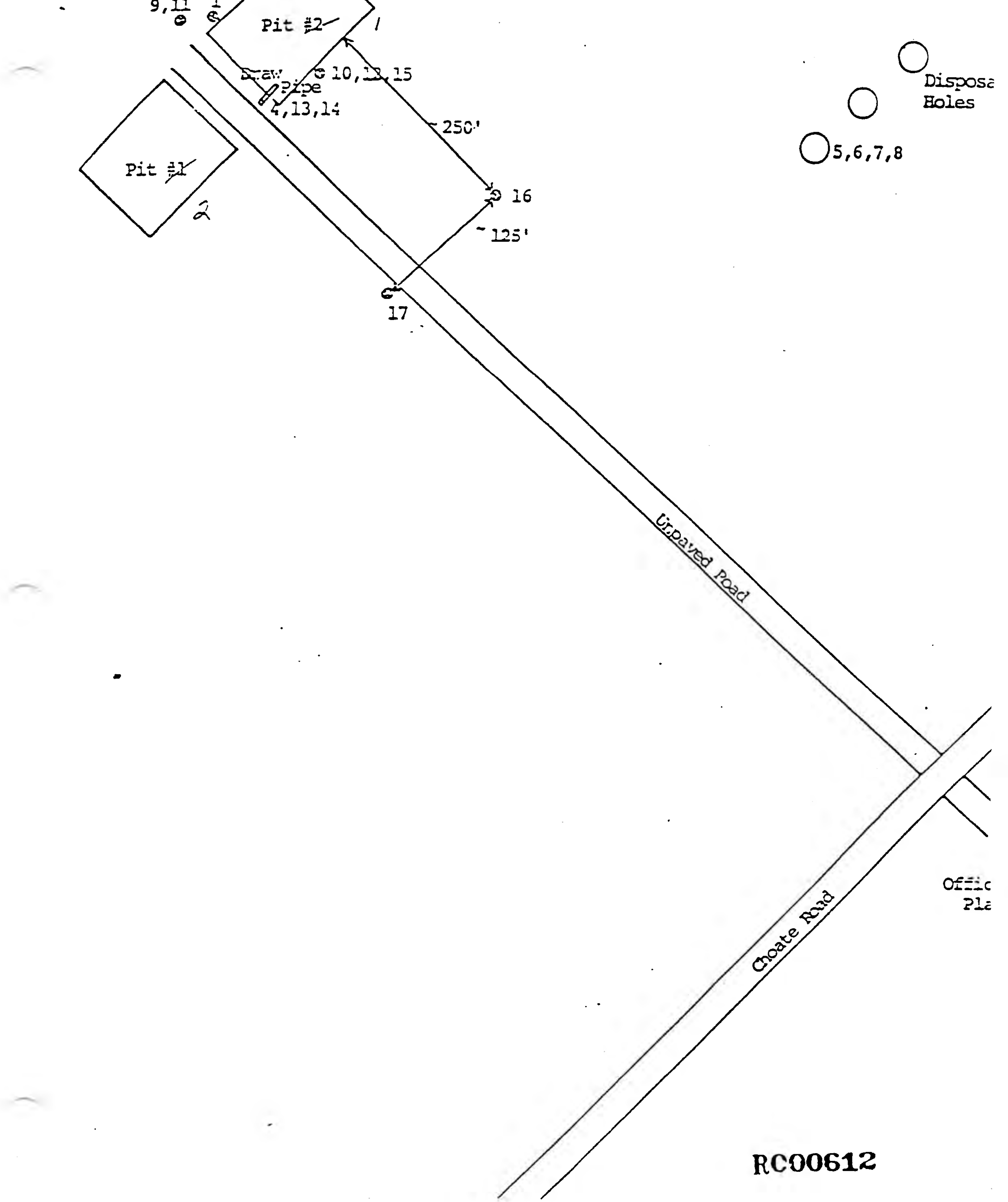
RC00610

SUMMARY OF RESULTS

	Sample No.	Time	Wind	Location	VCM conc ppb (V/V)
			Upwind, downwind samples near pits		
5/26/76	3	1750-1800	W 5-12 mph	inside slope of dike (see map)	N.D.
5/27/76	9	1511-1516	WNW-NW 4-14 mph	upwind between pits, below dike bank (see map)	N.D.
	10	1510-1517	WNW-NW 4-14 mph	downwind, pit #2 on dike (see map)	N.D.
	11	1521-1528	WNW-NW 4-14 mph	upwind, same location as #9	N.D.
	12	1521-1528	WNW-NW 4-14 mph	downwind, same location as #10	N.D.
	15	1604-1610	WNW-NW 4-14 mph	downwind, same location as #10	N.D.
	16	1605-1612	WNW-NW 4-14 mph	downwind (see map)	N.D.
	17	1615-1622	WNW-NW 4-14 mph	downwind (see map)	N.D.
			Samples over surface of liquid		
5/25/76	1,2		SE 5-13 mph	(analysis aborted due to gc malfunction)	
/27/76	Continuous withdrawal system	1739-1753 1816-1832		pit ~~#2~~ 1, probe 3-4 in. from surface	N.D.
	Continuous withdrawal system	1756-1806		pit ~~#1~~ 2, probe 3-4 in. from surface	N.D.
			Samples from disposal holes		
5/27/76	6	1358-1402		disposal hole, probe in bottom	N.D.
	7	1404-1412		disposal hole, probe in bottom	N.D.
	8	1413-1423		disposal hole, probe 1 ft. below ground level	N.D.
			Samples from Drawpipe (Pit #2)		
5/26/76	Continuous withdrawal system	1841 1844 1848		Drawpipe, pit ~~#2~~ 1	16,500 10,200 6900
5/27/76	13 (bag sample)	1536-1546		Drawpipe, pit ~~#2~~ 1	50,000
	14 (bag sample)	1549-1559		Drawpipe, pit ~~#2~~ 1	39,600

RC00611

JOC Oil Company



RC00612

KG COH004517

P-00380

AIR POLLUTION SAMPLE REPORT

...ame of Property Sampled: JOC Oil Address: MSSL #

...ity: Friendswood County: Harris Region: 7 Type of Industry: Aromatics recovery from styrene ta...

...ame and Title of Party Contacted at Property: Balfour Augst, Consulting Chemist

****

...ampled By: Robert E. James Plant Status: "Plant" process emissions not sampled, sample is from waste pits.

...emarks: FID-GC Porapak Q column showed approx. 5% vinyl chloride monomer in bag sample.

****

...lease analyze as checked below. Date: 6/7/76 Requested By: R. E. James

SAMPLE IDENTITY								LABORATORY ANALYSIS				
Date Collected / Field Number	Sampling Equipment	TIME Start / Total Min.	TIME End	SAMPLE Rate(cfm) / Total Vol(ft^3)	WIND Direction / Speed(mph)	NUMBER ACL Number	Susp. Part. ($\mu g/M^3$)	ppm Vinyl Chloride		% Vinyl Chloride	
27 May 76 / #2 (bottle)	Dipper					1600		78,000		7.8%	
27 May 76 / #13 Bag 105	Stainless steel metal bellows pump							98,000		9.8%	

RC00613

Remarks: Bag sample from oil layer of pit. Bottle sample is of same oil. Samples were run by GC/MS. Quantitation and qualification were carried out using this instrumentation.

Gravimetrical Analysis:

Date Received: 6-7-76 Date Reported: 6-25-...

Chemical Analysis: [signature]

James F. Lindgren

J0381

AIR POLLUTION SAMPL EPORT

Name of Property Sampled: JOC Oil & Aromatics Address: 2501 Choate Road

City: Friendswood County: Harris Region: 7 Type of Industry: Chemical Salvage

Name and Title of Party Contacted at Property: Balfour Augst

****

Sampled By: Gene Speller Plant Status:

Remarks: Composite liquid sample taken from slop pit. Please analyze for vinyl chloride monomer in liquid and vapor

****

Please analyze as checked below. Date: 1-6-77 Requested By: Gene Speller

SAMPLE IDENTITY							LABORATORY ANALYSIS				
Date Collected / Field Number	Sampling Equipment	TIME Start / Total Min.	TIME End	SAMPLE Rate(cfm) / Total Vol(M^3)	WIND Direction / Speed(mph)	NUMBER ACL Number	Susp. Part. ($\mu g/M^3$)	Headspace conc VCM ppm by volume		Liquid Phase Conc VCM ppm by weight	
1-5-77											
070130 S-1						1715		8.0		3.0	

Remarks: The liquid phase was very viscous and difficult to handle It is possible that the conc. of this phase is much higher, since the analyst is not certain that all of the aliquot taken was indeed injected Ref: Notebook '-?

Gravimetrical Analysis:

Date Received: 1-10-77 Date Reported: 1-13-77 Chemical Analysis: Jim L. Lindgren

0008145

3C

KG COH004519

File

VINYL CHLORIDE MONOMER SAMPLING

AT

JOC OIL COMPANY

FRIENDSWOOD, TEXAS

ON

MAY 1976

JULY 5, 1976

PREPARED BY THE STAFF OF THE

TEXAS AIR CONTROL BOARD

Lower Detection Limit

The lowest concentration of VCM which produced a clearly discernible gc peak at maximum instrument sensitivity was 340 ppb (this sample came from an inadvertently contaminated sample system, and is thus not reported in the summary of results). Determination of the lower detection limit as 250 ppb is based on peak height obtained from the 340 ppb sample. Although the integrator calculated lower values for several samples, no peaks were discernible in the chromatograms, retention times were non-reproducible, and integrated areas varied by as much as 100% for replicate analyses.

Summary

In response to a request by the Compliance Division of the Texas Air Control Board, sampling for vinyl chloride monomer was performed at JOC Oil Company in the vicinity of waste pits and waste disposal operations. Samples consisted of eight upwind-downwind bag samples, three bag samples from disposal holes (clay-tar mix), two bag samples from pit #2 drawpipe and continuous withdrawal samples from the liquid surface and pit #2 drawpipe. All samples were analyzed within three hours of collection by gas chromatography (gc). Concentrations of vinyl chloride monomer (VCM) were below the detectable limit (250 ppb) in all except the pit #2 drawpipe samples. In these, concentrations of VCM ranged from 6900 ppm to 50,000 ppm. The continuous withdrawal system gave lower results (see Table) because the stagnant vapors in the pipe in the course of sample pumping were displaced with outside air and thus diluted. Also, it was evident that some adsorption of VCM occurred in the system.

Ambient air samples were collected in 5-liter aluminized plastic bags with a portable piston pump. Prior to each use, all bags were flushed with UHP zero air three times then filled again and analyzed by gc for traces of VCM. Any bags containing detectable VCM were rejected. Samples from disposal holes and drawpipe were collected in aluminized bags by means of an all stainless steel metal bellows pump and a 1/8 in. O.D. stainless steel tube for a probe. The drawpipe was placed by JOC Oil on the inside slope of the dike, extending down into the oil/tar layer for the purpose of sucking out the waste material. At the same time it provided a convenient means of analyzing volatile components of the oil layer. Samples from the pit surface were taken by means of a continuous withdrawal system consisting of 3/8 in. O.D. S.S. probe, 15 feet of 1/4 in. O.D. nylon line, an MSA in-line filter and a stainless steel metal bellows pump.

Analysis Procedure

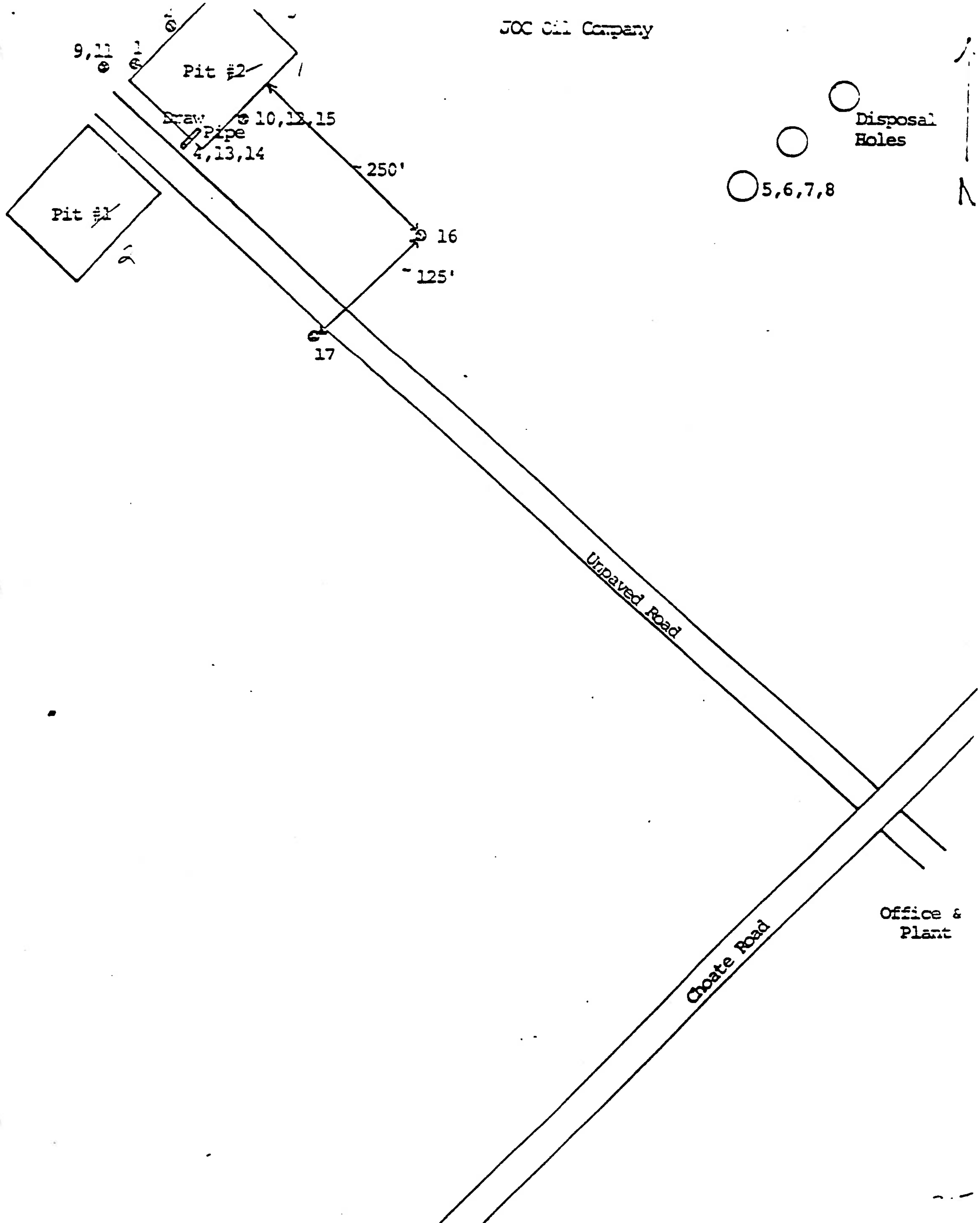
Analyses were done by gas chromatography. Each sample was analyzed three successive times so that reported values are averages of triplicate analyses. The gc was a Hewlett Packard model 5700 equipped with flame ionization detector (FID), 6-foot Porapak QS (80/100 mesh) column and 1 cc sample loop. Column temperature was 90°C, detector temperature 250°C, nitrogen carrier flow 21 ± 1 ml/min. Peaks were quantitated by means of a Columbia Scientific Industries Supergrator-2 integrator.

Weather Data

Weather data was taken with hand-held instruments, foregoing use of more sophisticated gear since no detectable ambient levels of VCM were being found.

SUMMARY OF RESULTS

	Sample No.	Time	Wind	Location	VCM conc. ppb (V/V)
				Upwind, downwind samples near pits	
5/26/76	3	1750-1800	W 5-12 mph	inside slope of dike (see map)	N.D.
5/27/76	9	1511-1516	WNW-NW 4-14 mph	upwind between pits, below dike bank (see map)	N.D.
	10	1510-1517	WNW-NW 4-14 mph	downwind, pit #2 on dike (see map)	N.D.
	11	1521-1528	WNW-NW 4-14 mph	upwind, same location as #9	N.D.
	12	1521-1528	WNW-NW 4-14 mph	downwind, same location as #10	N.D.
	15	1604-1610	WNW-NW 4-14 mph	downwind, same location as #10	N.D.
	16	1605-1612	WNW-NW 4-14 mph	downwind (see map)	N.D.
	17	1615-1622	WNW-NW 4-14 mph	downwind (see map)	N.D.
				Samples over surface of liquid	
5 [illegible]/76	1,2		SE 5-13 mph	(analysis aborted due to gc malfunction)	
5/27/76	Continuous withdrawal system	1739-1753 1816-1832		pit ~~#2~~ 1, probe 3-4 in. from surface	N.D.
	Continuous withdrawal system	1756-1806		pit ~~#1~~ 2, probe 3-4 in. from surface	N.D.
				Samples from disposal holes	
5/27/76	6	1358-1402		disposal hole, probe in bottom	N.D.
	7	1404-1412		disposal hole, probe in bottom	N.D.
	8	1413-1423		disposal hole, probe 1 ft. below ground level	N.D.
				Samples from Drawpipe (Pit #2)	
5/26/76	Continuous withdrawal system	1841 1844 1848		Drawpipe, pit ~~#2~~ 1	16,500 10,200 6900
5/27/76	13 (bag sample)	1536-1546		Drawpipe, pit ~~#2~~ 1	50,000
	14 (bag sample)	1549-1559		Drawpipe, pit ~~#2~~ 1	39,600



JOC Oil Company
N
Pit #2
Pit #1
9,11
Straw
Pipe
10,12,15
4,13,14
250'
16
125'
17
Disposal
Holes
5,6,7,8
Unpaved Road
Choate Road
Office &
Plant

AIR POLLUTION SAMPLE ORT

MSSL #

...ame of Property Sampled: JOC Oil Address:

...ity: Friendswood County: Harris Region: 7 Type of Industry: Aromatics recovery from styrene tars

...ame and Title of Party Contacted at Property: Balfour Augst, Consulting Chemist

****

...ampled By: Robert E. James Plant Status: "Plant" process emissions not sampled, sample is from waste pits.

...emarks: FID-GC Porapak Q column showed approx. 5% vinyl chloride monomer in bag sample.

****

...lease analyze as checked below. Date: 6/1/76 Requested By: R. E. James

Date Collected / Field Number	Sampling Equipment	TIME Start / End / Total Min.	SAMPLE Rate (cfm) / Total Vol (M³)	WIND Direction / Speed (mph)	NUMBER ACL Number	Susp. Part. (μg/M3)	ppm Vinyl Chloride		% Vinyl Chloride	
27 May 76 #2 (bottle)	Dipper				1600		78,000		7.8%	
27 May 76 #13 Bag 105	Stainless steel metal bellows pump						98,000		9.8%	

Bag sample from oil layer of pit. Bottle sample is of same oil.
Remarks: Samples were run by GC/MS. Quantitation and qualification were carried out using this instrumentation.

Date Received: 6-7-76 Date Reported: 6-25-76

Gravimetrical Analysis:

Chemical Analysis: James L. Lindgren

Approved By:

P-0

KG COH004525

111

JOC Oil Aromatics Inc.

2501 Choate Rd., Houston, Texas
P.O. Box 138, Friendswood, Texas 77546
713-482-7575 Telex: 775478 Cable: JOCARO

February 18, 1977

To: Mr. M.M. Fowler

From: B.J. Augst

Subject: Dow Chemical Co. - Freeport, Tx. Incineration of Chlorinated solvents

Today, I went to Freeport and discussed the possibility of having Dow Chemical Co. incinerate our chlorinated solvent pit, along with their own pit removal over an extended period of time;

with: Mr. J.H. McIver
Environmental Control Specialist
Waste Control Department - Building B-1226
Dow Chemical U.S.A.,
Freeport, Texas 77541 (713) 238-2195

I explained our problem and that the T.W.Q.B. & T.A.C.B. had suggested that we look into that possibility. Mr. McIver checked with one of their officials (he did not identify the person) with the results that it did not appear that they could take on such a project in view of their limited incineration capacity, permit limitations, and the time they have to remove their own chlorinated solvent waste pits in Freeport. Mr. McIver said that he was sure that they would give us their technology for building our own incinerator. However, he appreciated that our volume of chlorinated waste was too small to justify building an incinerator.

Conclusions:

1. Dow Chemical (Freeport) has the capability for incinerating chlorinated solvent wastes and are actively working on their own pits at this time. It appears that they must have worked out a program with the T.A.C.B. to work off the waste over a period of time. Mr. McIver asked if we had considered Rollins and he recognized the cost was extremely high.

2. Mr. Johnson (T.W.Q.B.) and Mr. Speller (T.A.C.B.) have discussed the Dow possibility with me and it appears that an ad hoc permit would be possible for Dow to take in our material for disposal. Their permit covers only their own material and to bring in wastes from other sources would require a "commercial permit" or an ad hoc agreement for a specific pit (like ours).

If a firm arrangement could have been made with Dow to handle our pit within some period (say the next year or two), it is my feeling that the environmental agencies would let us wait until Dow could handle the incineration.

However, it would be inadvisable for us to make it appear to Dow that either the T.W.Q.B. or T.A.C.B. is attempting to help us "force" Dow to treat [illegible]

KG COH004527 WHP 0086012

EXHIBIT 3436

1601694

F20673

PRIO-99-014080

Recommendations:

1. At this initial meeting with Mr. McIver, I was advised that their help with our waste pit was virtually nil. However, I feel that there are several steps that we can take to eventually obtain favorable consideration.

   a) Do we have anybusiness connections that would help establish a working relationship on the waste pit?

   b) Political help might be available.

   c) Economic consideration:

      (1) In that Dow's incineration is an "out-of-pocket" cost, their management might be interested in an initial offer from us on a fee/gal.

      (2) Does JOC (at any corporate level) have any sales relations with Dow that could help us?

   Thus, whatever we feel is the best step to take, I feel that you, Mack, as president of the company or possibly any board member with connections, might consider contactin the highest official in Dow to get help in this matter.

2. If it is felt that JOC has a chance of working out a "high level" deal with Dow, then it would be well to do the following:

   a) Advise the environmental agencies what we are attempting to do so that time will be available for us to work out a program — especially as to time (which could easily be two years or more).

   b) Get the T.A.C.B. and T.W.Q.B. to agree that we can leave the material in the pit by building the dike sides up a little and covering with a tarp. The material would be safe and it would avoid the cost of building a tank, etc. for removing the waste from the pit which, at the best, is only an interim step to eventually removing it again for permanent disposal (i.e. incineration, land-fill, ocean dump, etc.)

   Thus, you would have very little cost at the present — and, it would appear that, at best, Dow would be many months off in handling our waste if they were to agree to it.

In the Meantime:

1) I am checking to see if DuPont is still operating the "incinerator ship" Vucan in the Gulf of Mexico. This is a possibility.

2) Rita feels that one of our wood-treating accounts might use our chlorinated solvent waste with their pentachlorophenol. If it could be done, the main objection would be a limited supply, then it would be gone.

3) Any of our sales personnel might have some ideas about prospective companies that could help us dispose of the waste pit. I feel that this possibility is quite remote.

After you have had a chance to consider this, we can go over the details of the action to be taken. Right now, Dow Chemical capabilities to burn up the chlorinated solvent waste appears to be our best chance for actually disposing of this pit. I know that they would not do it without cost but it will certainly be more realistic than Rollins —— and I feel that the agencies would give us time to wait for Dow if an agreement could be worked out.

Bal Angst

118

7/26/78mb

ARCO/Chemical Company

Division of Atlantic Richfield Company

Invoice

Remit to—ARCO Chemical Company
Post Office Box 8068-1194
Philadelphia, Pennsylvania 19177

sm/022
AR-739-HT

Shipped From	Invoice Number	Invoice and Shipping Date	Terms	Customer's Order Number
Channelview	300/07469	7/13/78	Net 30	Verbal

TO
336000
Dixie Oil Processors
P O Box 856
Friendswood,Tx. 77546

SHIPPED TO
Same

Shipped Via	Car Initial and Number	Prepaid	Collect	Delivered F.O.B.	Prices F.O.B.
T/T (Customer)	B/L33492		XX	Channelview	Channelview

Articles: Name or Brand	Code	Quantity: Temp.	Gross Gallons	Net Gallons	Unit Price	Amount
Pyrolysis Gas Oil				171	$12/BBL	2052.00

Sales/use tax will be charged to your account if exemption certificate is not received prior to (30 days); a blank certificate is enclosed for your convenience.

Terms and Conditions—Prices subject to change without notice.
Claims for short or damaged items must be accompanied by original freight bill with each item noted and signed by transportation agent. Claim must be filed within thirty (30) days from date of invoice.
Deposit for containers are due on payment for contents and will be accounted for under seller's regulations.

ARCO Chemical Company warrants that the goods covered hereby were produced under terms and conditions of employment which comply with the requirements of the federal fair labor standards act of 1938 as amended.
ARCO Chemical Company shall not be responsible under any circumstances for any consequential damages or injuries.

Warning—Do not use any petroleum products for starting fires unless specifically recommended.

ARCC-8-B (2-76)

KG COH004531

KG COH004532

8/2/78 mg

ARCO/Chemical Company

Division of Atlantic Richfield Company

Invoice

Remit to—ARCO Chemical Company
Post Office Box 8068-1194
Philadelphia, Pennsylvania 19177

sm/022
AR-774-HT

Shipped From	Invoice Number	Invoice and Shipping Date	Terms	Customer's Order Number
Channelview	300/07898	7/28/78	Net 30	Verbal

TO
336000
Dixie Oil Processors
P.O. Box 856
Friendswood, Texas 77546

SHIPPED TO
Same

Shipped Via	Car Initial and Number	Prepaid	Collect	Delivered F.O.B.	Prices F.O.B.
T/T's (Customer)	B/L 24540		XX	Channelview	Channelview

Articles: Name or Brand	Code	Quantity: Temp.	Gross Gallons	Net Gallons	Unit Price	Amount
Polysis Gas Oil				148/BBL	$12/BBL	1776.00

Sales/use tax will be charged to your account if exemption certificate is not recieved prior to (30 days).

Terms and Conditions—Prices subject to change without notice.
Claims for short or damaged items must be accompanied by original freight bill with each item noted and signed by transportation agent. Claim must be filed within thirty (30) days from date of invoice.
Deposit for containers are due on payment for contents and will be accounted for under seller's regulations.

ARCO Chemical Company warrants that the goods covered hereby were produced under terms and conditions of employment which comply with the requirements of the federal fair labor standards act of 1938 as amended.
ARCO Chemical Company shall not be responsible under any circumstances for any consequential damages or injuries.

Warning—Do not use any petroleum products for starting fires unless specifically recommended.

ARCC-8-B (2-76)

KG COH004533

8/2/78 n

ARCO/Chemical Company

Division of Atlantic Richfield Company

Invoice

Remit to—ARCO Chemical Company
Post Office Box 8068-1194
sm/022 Philadelphia, Pennsylvania 19177
AR-774-HT

Shipped From	Invoice Number	Invoice and Shipping Date	Terms	Customer's Order Number
Channelview	300/07899	7/31/78	Net 30	Verbal

TO
336000
Dixie Oil Processors
P.O. Box 856
Friendswood, Texas 77546

SHIPPED TO
Same

Shipped Via	Car Initial and Number	Prepaid	Collect	Delivered F.O.B.	Prices F.O.B.
T/T's (Customer)	B/L 24541		XX	Channelview	Channelview, Texas

Articles: Name or Brand	Code	Quantity: Temp.	Quantity: Gross Gallons	Quantity: Net Gallons	Unit Price	Amount
Polysis Gas Oil				169/BBL	$12/BBLS	2028.00

Sales/use tax will be charged to your account if exemption certificate is not received prior to (30 days).

Terms and Conditions—Prices subject to change without notice.
Claims for short or damaged items must be accompanied by original freight bill with each item noted and signed by transportation agent. Claim must be filed within thirty (30) days from date of invoice.
Deposit for containers are due on payment for contents and will be accounted for under seller's regulations.

ARCO Chemical Company warrants that the goods covered hereby were produced under terms and conditions of employment which comply with the requirements of the federal fair labor standards act of 1938 as amended.
ARCO Chemical Company shall not be responsible under any circumstances for any consequential damages or injuries.

Warning—Do not use any petroleum products for starting fires unless specifically recommended.

ARCC-8-B (2-76)

119

KG COH004534

Copy CRB, LOH, JAB
Cal - Lets ~~discuss~~ response
RTS

Dixie Oil Processors, Inc.

P.O. BOX 856
FRIENDSWOOD, TEXAS 77546
713-482-7578

RECEIVED
DEC 27 1982
ARCO CHEMICAL CO.

December 10,1982

Arco Chemical Co.
P.O. Box 100776
Houston, Tex 77212

Attn: Randy Snakenburg 1/6/83

Dear Randy,
As per your request the following is a synopsis of the events of the past year regarding Dixie Oil Processors, Inc. and Oxirane/Arco shipments of the Luwa waste stream.

Due to problems caused by their Luwa bottom stream Arco Chemical, represented by John E. Allen, agreed to reduce the price of Luwa bottoms sold to Dixie Oil to $5.00 per barrel starting October 1,1981 and continuing until 48,111.89 barrels of Luwa bottoms had been delivered to Dixie Oil. (See letter dated October 6,1981.) During the months of October, November, and December 1981 Arco Chemical delivered to Dixie Oil 37,265.29 barrels of Luwa bottoms for which Dixie Oil paid $5.00 per barrel. In January of 1982 Dixie Oil was charged $9.00 per barrel for the Luwa bottom material. The difference between 48,111.89 and 37,265.29 barrels is 10,846.60 barrels. This 10,846.60 barrels was paid for at the price of $9.00 per barrel instead of the agreed upon price of $5.00 for an increased cost to Dixie Oil of $43,386.40 all of which was paid to Arco Chemical in February of 1982. R.L. Lowe's understanding was the rebate of $43,386.40 in January would guarantee that Dixie Oil would continue as the sole receiver of the Luwa stream during 1982. With payment of these funds and the letter from Arco (see January 15 Arco letter attached) Dixie Oil made its contractual agreements for 1982 with its customers assured that the pivotal Luwa stream would continue in 1982 just as it had for the previous three years.

On May 28,1982, R.L. Lowe of Dixie Oil met with Randy Snakenburg and Cal Barnes of Arco Chemical. At this meeting R.L. Lowe was informed that Arco Chemical was reducing their shipments of Luwa bottoms to Dixie Oil by one tank truck (approximately 5500 gls.) per day and would do this for the next ninety days. This program to reduce the amount of Luwa bottoms received by Dixie Oil was to be done with or without the concurrence of R.L. Lowe.

Dixie Oil Processors, Inc.

P.O. BOX 856
FRIENDSWOOD, TEXAS 77546
713-482-7578

On July 1,1982, R.L. Lowe of Dixie Oil met with Randy Snakenburg and Cal Barnes of Arco Chemical. At this meeting R.L. Lowe was told that Arco Chemical was again reducing the amount of Luwa bottoms delivered to Dixie Oil by approximately 5500 gallons per day, bringing the total reduction of material delivered to 11,000 gallons per day. R.L. Lowe again informed Arco Chemical representatives that Dixie Oil used the Luwa bottoms material as a cutter stock and a blending agent and reducing the volume delivered to Dixie Oil would lower the specifications of Dixie Oil's #6 oil blend stock to an unacceptable level.

During the next sixty days the amount of Luwa bottoms delivered to Dixie Oil continued to decline. Arco Chemical delivered only 5,479.48 gallons of Luwa bottoms to Dixie Oil in the month of September, 1982. For the month of October 1982 Dixie Oil received 4862.89 gallons of Luwa bottoms and none was delivered either in November or December of 1982.

Dixie Oil plant superintendent, James Appel, contacted Arco Chemical Bayport plant personel a number of times but was told that they had received instructions to cease deliveries to Dixie Oil.

If the understanding R.L. Lowe had with Randy Snakenburg and Cal Barnes of Arco Chemical had been consummated according to the verbal agreement that prompted the $43,386.40 rebate to Arco Chemical in February of 1982, and if the 15,000 gallons per day minimum volume of Luwa bottoms (see attached letter date January 4,1982) had continued to be delivered to Dixie Oil, Dixie Oil would have received as additional 60,667.38 barrels of Luwa bottom material. This shortage of Luwa bottom material for Dixie Oil is still unresolved as of this date.

Thank you for past courtesies and cooperation in business matters. We look forward to meeting with you in the near future in our efforts to reconcile this difference.

Sincerely,

Ralph L Lowe

Ralph L. Lowe
Dixie Oil Processors, Inc.
President

RLL/ls

ARCO Chemical Company
Division of AtlanticRichfieldCompany

Material Safety Data Sheet
MSDS

ARCO Chemical Company requests Customer to study this Data Sheet and become aware of Product hazards. To promote safe handling Customer should (1) notify its employees, agents and contractors of the information on this Data Sheet, and any Product hazards and safety information, (2) furnish a copy of this Data Sheet to each of its customers for the Product and (3) request such customers to notify their employees and customers for the Product of the information on this Data Sheet and any Product hazards and safety information.

Section I General

Manufacturer's name	
Material name	LUWA Bottoms
Manufacturer's address	
Emergency telephone (24 hour)	
Name (brand-trade) and synonyms	
Chemical family	Residue from Alphatic acids, alcohols, polyols and esters

Section II Summary of hazardous information

Occupational Exposure Standard Not Established

Summary

WARNING - HIGHLY FLAMMABLE
CAUTION - MODERATE EYE HAZARD
CAUTION - MODERATE INHALATION HAZARD
CAUTION - SLIGHT SKIN HAZARD
CAUTION - SLIGHT INGESTION HAZARD

Section III Physical and reactivity data

Boiling point (°F)	> 350
Evaporation rate (ratio of time) (= 1)	n/a
Other	Viscosity 200-1,000 centipoises @ 70°F
Vapor pressure (mm Hg at 70 °F)	Unknown
Incompatibility (materials to avoid)	Strong oxidizing agents; water
Vapor density (air = 1 at 60-99° F)	Unknown
Stability	(x) Stable ( ) Unstable
Conditions to avoid	High temperature
Specific gravity (H_2O = 1 at 39.2° F)	1.01
Hazardous polymerization may	( ) Occur (x) Not occur
Appearance and odor	Dark viscous liquid with sharp alcohol-like odor at room temperature
Volatile characteristics	Slight
Solubility in water	Slight
Hazardous decomposition products	Decomposes at elevated temperature (> 350°F) and emits highly irritaging vapors of unknown composition. Incomplete combustion will generate carbon monoxide. A minor amount of metal oxide dust will also be present.

Section IV Fire and explosion data

Flash point (°F) (method used) (cc)	80-120
Flammable limits at normal atmos. temp. and pressure (% by volume in air) — Lower flammable limit / Upper flammable limit	Unknown
Autoignition temp. (° F)	Unknown
Extinguishing media	Alcohol resistant foam, water spray, dry chemical carbon dioxide. Water alone may be ineffective but should be used to limit exposure.

Special fire fighting procedures For fires involving this material do not enter enclosed or confined space without full face-piece, self-contained breathing apparatus. Electrical circuits must be shut off as quickly as possible. Firefighting should be conducted from a safe distance or protected location. Extinguishing media containing water must be applied with caution to prevent frothing or steam explosion, from contact with hot liquid, which may spread the fire. If liquid enters sewer or public waters, notify proper authorities immediately.

Unusual fire and explosion hazards

When heated above the flash point, this material releases vapor. When mixed with air in the proper proportions and exposed to a source of ignition, this vapor can burn or explode if within a confined space.

Section V First aid and emergency procedures

Note to physician

Eye contact Immediately flush eyes with clean, low pressure water for 15 minutes. If pain or redness persists, obtain medical attention.

Skin contact Remove all contaminated clothing including shoes and wash affectd area with plenty of soap and water. Wash clothing thoroughly before reuse. Discard grossly contaminated shoes.

Inhalation Immediately move from contaminated area to fresh air. Keep victim quiet. In event of breathing difficulty administer oxygen or artificial respiration. Obtain medical attention immediately.

Ingestion DO NOT INDUCE VOMITING. If victim is conscious, administer warm water (quart). Seek medical attention immediately.

Material name

LUWA Bottoms

Section VI — Health hazard data

Primary hazard

Vapor contact with the eyes. Inhalation of excessive vapor or aerosol concentration.

Route of exposure	Affected	Signs and symptoms
Eye contact	X	Vapors emitted when liquid is heated to high temperature (> 350°F) will cause intense burning sensation followed by heavy tearing. Effect is usually reversible.
Skin irritation	X	May cause minor skin irritation following extensive and prolonged contact.
Inhalation	X	May result in irritation of respiratory tract, headache, nausea.
Ingestion	X	May be toxic if swallowed in large quantity.
Skin absorption		Does not conform to Consumer Products Safety Commission definition of a toxic substance, according to 16 CFR 1500.3(c)(2)(iii).

Effects of overexposure

Overexposure to vapors from hot liquid will cause heavy tearing of the eyes and may constitute accident hazard through falling, carelessness around moving machinery etc.. No permanent eye damage has been experienced. May also cause headaches and nausea.

Section VII — Spill or leak procedure

Precautions if material is spilled or released

FOR SPILL OR LEAK PROCEDURE PLEASE SEE SECTION X - SUPPLEMENT

Waste disposal methods

FOR WASTE DISPOSAL METHODS, PLEASE SEE SECTION X - SUPPLEMENT

Section VIII — Special protection information

Ventilation

Use only in well ventilated area to prevent accumulation of irritating vapors.

Eye protection

Self contained or supplied air breathing apparatus with full face mask should be used to prevent eye exposure to vapors emitted by this material when hot.

Skin protection

Impervious protective clothing including gloves, apron, sleeves, boots and full head and face protection should be worn. This protective clothing should be cleaned frequently.

Respiratory protection

Use self contained or supplied air breathing apparatus with full face mask to prevent overexposure to lacrimatory vapors released when this material is hot.

Other protection

Emergency eyewash fountains and safety showers should be available in the immediate vicinity of any potential exposure to either vapor or liquid.

Section IX — Handling and storage

Store in tightly closed containers away from heat, spark, open flame or strong oxidizing agents. Store away from moisture. Excessive contact with moisture may result in accelerated corrosion of container(s).

General comments

This material, under DOT regulations, is shipped as "Flammable liquid, n.o.s. (LUWA Bottoms)" under hazard class "Flammable Liquid" with identification No. UN1993. If determined to be RCRA hazardous waste, contaminated product, soil or water should be shipped as "Hazardous Waste Flammable liquid, n.o.s., UN1993."

Date issued

December 30, 1981

N/A = Not applicable

Material Safety Data Sheet
MSDS

Section XI Supplement | LUWA Bottoms

Precautions If Material Is Spilled or Released

Release may create fire and explosion hazard. If feasible, evacuate affected area and extinguish all ignition sources including electric circuits. Stop release if feasible without risk. Immediately notify fire and pollution control authorities in area affected.

If possible, blanket spill with suitable fire extinguishing foam to limit vapor emissions. Equip clean-up crews with proper protective equipment including both eye and respiratory protection. Spread clay or sand if necessary to prevent falls due to slippery surface. On land, to prevent drainage to public waters, dike and impound large spills for recovery and recycle; adsorb small spills onto inert solids (earth, sand, vermiculite, etc.) and shovel into suitable containers for disposal. On water, this material is slightly soluble and may float or sink. It should be contained and recovered as quickly as possible to minimize uncontrolled dispersion. The National Response Center should be notified at 800/424-8802, if this material is released to the environment.

Waste Disposal Methods

The water soluble portion of this material is biodegradable if carefully fed as a dilute solution (< 10%) to any available biotreatment plant. Care should be exercised to avoid any personnel exposure to the material. If properly collected, contaminated liquid may also be burned in compliance with any and all applicable air pollution regulations. If burned, care should be exercised to prevent excessive fouling of tubular surfaces with fine metal oxide dust. Properly collected contaminated solids should be landfilled only at RCRA approved sites using only approved contractors. Contaminated product, soil or water intended for disposal should be designated RCRA Hazardous Waste Number D001 (40 CFR 261.21b) unless flash point is determined to be greater than 140°F.

Date issued
December 30, 1981

120

TOXCON ENGINEERING COMPANY

FYI

32389

June 29, 1983

Mr. Ray Austin, Head
Storage and Processing Facilities Unit
Solid Waste Section
Texas Department of Water Resources
P. O. Box 13087, Capitol Station
Austin, Texas 78711

Dear Mr. Austin:

This letter is written on behalf of Mr. James Appel, Plant Manager of Dixie Oil Processors, Inc. The purpose of this letter is to respond to your letter of 6-13-83 to Dixie.

After reviewing Section 335.1 (a) of the Texas Administrative Code, it is our understanding that solid waste is defined as any garbage, refuse, or sludge from pollution control facilities, as well as, discarded materials from industrial, municipal, commercial, mining and agricultural operations. The material that Dixie purchases from industrial facilities for processing does not fit this definition since it is not discarded or intended for disposal. Additionally, the fuel oil and creosote extenders that Dixie produces and sells do not fit the solid waste definition. Furthermore, none of the materials that Dixie purchases or produces could be considered as RCRA listed hazardous wastes, even if they were intended for disposal. None of the materials that are purchased or produced are halogenated. There are materials puchased by Dixie that have a flash point less than 140°F and would therefore be considered a hazardous waste if intended for disposal. However, none of the material purchased or produced is regarded or treated as waste material. Dixie's feed stock has a monetary value to the generating facility and the resulting product has an obvious monetary value to Dixie.

Dixie currently processes various hydrocarbon streams for resale as creosote extender and fuel oil extender. Dixie's process consists of transporting the material, in tank trucks, to their Friendswood facility; storing the material in one of eleven tanks; processing the product in firetube boilers; and storing the product in tanks. The treatment in the firetube boilers can consist of emulsion breaking, chemical treatment or distillation. A process flow diagram is attached.

The source and thus the characteristics of Dixie's feedstock material is continually changing. However, prior to purchasing any material for processing, Dixie and Toxcon personnel carefully evalulate the material's source and characteristics. At this time the following streams are received:

Air Pollution Control
Toxic Chemicals
Process Engineering

6601

16821 Buccaneer, Room 212
Houston, Texas 77058
(713) 488-4264

EXHIBIT
3366
5856

- dimethyl toramide copolymer resin
- furfural - butadiene copolymer
- creosols tar
- API separator skimmings (chemical plant)
- polyglycerine

In regard to the material sold to Paragon Paint and Lacquer Co., Dixie has been unable to recover all of the creosote extender sent to Paragon. As was stated in our 5-27-83 correspondence, creosote extender was sold to Paragon Paint in October of '82 and March of '83. Dixie discovered that the material was being misused in April of this year. Subsequently, Dixie attempted to recover the 8473 gallons of creosote extender sold to Paragon. However, only 4809 gallons were recovered. The remainder was presumably sold to individual customers by others. The whereabouts of the remainder is unknown to Dixie personnel.

As always, Dixie will strive to deal with reputable firms while continuing to accurately represent their products. Creosote extender and fuel oil extender are intended to be used as bulk type additives in creosote and fuel oil, respectively. Dixie has always attempted to inform customers of the proper uses of their product so that it is not inadvertently misused. However, as with any company selling chemical type products Dixie cannot anticipate or control the deliberate misuse of their material.

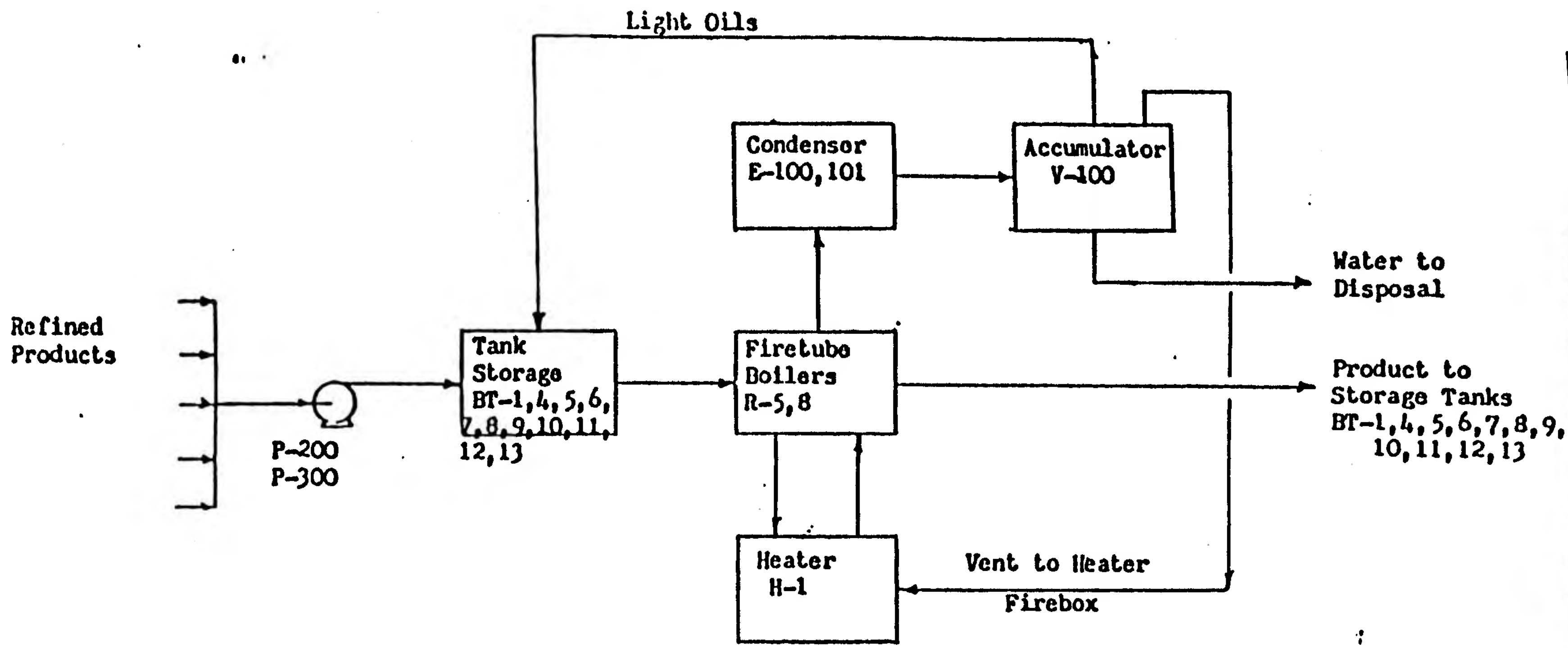
If you have any questions call me at (713) 488-4264.

Regards,

Jim TARR

Jim Tarr
Engineer

cc: Mr. James Appel
Plant Manager
Dixie Oil Processors, Inc.
P. O. Box 856
Friendswood, Texas 77546



Process Flow Diagram For Refined Products Recovery Line

Dixie Oil Processors, Inc.

SCALE	APPROVED BY	DRAWN BY RF
DATE 11/11/82	RF	

Toxcon Engineering Company

Houston, Texas

DRAWING NUMBER

KG COH004543

TXD089793046

ADDENDUM: INCOMING BYPRODUCT STREAMS
DIXIE OIL PROCESSORS, INC.

Stream Designation	Stream Source	Approximate Quantity Handled (gals./month)
Phenol Heavy Ends*	Monsanto-Chocolate Bayou	20,000
Phenolics ↳ K001 ?	Merichem	25,000
Luwa Bottoms	Oxirane-Bayport	20,000
Polyglycerine	Dow-Texas	50,000
BMA Residue	Rohm and Haas	10,000
Aromatic Oil	Oxirane-Channelview	intermittant
Light Oil	American Chemical	5,000
Styrene Tar	Dow-Texas	50,000
Furfural-Butadiene Copolymer	Petro Tex	20,000
Off-Spec Fuel Oil	Amoco	intermittant
Off-Spec Fuel Oil	Texaco-Beaumont	intermittant
Glue Hydrocarbon	Goodyear-Beaumont	30,000
Creosote Waste Water ↳ K001 ?	Southern Pacific	120,000

* This material is identified as hazardous waste KO22 on Form 8700-12.

K001 Bottom sediment sludge - creosote &/PCP treatment of wood

K035 PCP sludges from creosote

K049 Slop oil emulsion solids from petroleum refining industry

[illegible] Barge & Tank crude oil slop wastes

KG COH004544

122

Dixie Oil Processors, Inc.

P.O. BOX 856
FRIENDSWOOD, TEXAS 77546
713-482-7578

September 15,1980

Goodyear Tire and Rubber Company
P.O. Box 3687
Beaumont, Texas 77704

Attention: Mr. David Strah

Dear Mr. Strah:

We are pleased to offer you three dollars ($3.00) per barrel for the waste hydrocarbon that you produce in your plant. We agree to pick up the hydrocarbon in our 5000 to 6000 gallon tank trailers which will be loaded by your personnel at your Beaumont plant with the quantity being verified by your weight scales.

This material will be handled and disposed of as fuel oil by safe, acceptable procedures and will not violate any local, state or federal pollution laws.

Our records reflect that a copy of our insurance policies was mailed to you on September 2.

We have enclosed our purchase order #915 pertaining to this matter. We would like to pick up this material as soon as possible and we appreciate this opportunity to do business with you.

Sincerely yours,

Ralph L. Lowe

Ralph L. Lowe
Dixie Oil Processors, Inc.
President

D083675

RLL/ll

cc:Mr. Jim Beverly

0019857

[redacted]

F-778 (2-75)

CONFIRMATION OF SALE
BY
THE GOODYEAR TIRE & RUBBER COMPANY

№ 2920

AT: [redacted] DATE: 9/16/80

TO: Dixie [redacted]essors, Inc.

P O Box [redacted]
ADDRESS

Friendswood, Texas 77546
CITY STATE

THIS CONFIRMS OUR SALE OF ________ 197 ____

ITEM	Waste hydrocarbon liquid
QUANTITY	One to ten loads per week solely determined by Goodyear. This arrangement is based on uninterrupted continuity and is to continue until sixty (60 days prior written notification is received by either party
PRICE	$3.00 per barrel (7.82 lbs. per gal.)
SHIPPING TERMS	FOB SP Unless otherwise indicated, all shipments are made F.O.B. Seller's shipping point.
DATE OF SHIPMENT AND PASSAGE OF TITLE	As available Title to and risk of loss for the items sold hereunder transfer to Purchaser at the F.O.B. point.
TERMS OF PAYMENT	Net 10 Prox Upon failure of the Purchaser to make payments as hereinbefore provided, the Seller may, at its option, cancel this agreement or defer additional shipments hereon until all overdue accounts have been paid. Anything herein to the contrary notwithstanding the Seller may decline to make deliveries except for cash whenever it is not satisfied with the Purchaser's financial responsibility.
REMARKS	The Purchaser understands and agrees that the items referred to herein are used and are sold without any warranty whatsoever. "As Is".

THIS CONFIRMATION IS SUBJECT TO THE TERMS AND CONDITIONS SET OUT ON THE REVERSE SIDE HEREOF.

THE GOODYEAR TIRE & RUBBER COMPANY
SELLER

BY J A Beverly H R Sontag

SHIPPING INSTRUCTIONS

IN CONFORMANCE WITH THE CONFIRMATION OF SALE, I HEREWITH SUBMIT THE FOLLOWING SHIPPING INSTRUCTIONS:

D083682

DIXIE OIL PROCESSORS, INC.
PURCHASER

BY

0019859

WHITE - TO BE SIGNED AND RETURNED BY THE PURCHASER
CANARY - TO BE RETAINED BY PURCHASER
PINK - TO SALVAGE SALES
BLUE - BILLING & ACCTS. REC. - 610
GOLDENROD - FILE COPY

FORM NO. BC-22 A (4-67)

THE GOODYEAR TIRE & RUBBER COMPANY
BEAUMONT CHEMICAL PLANT
Post Office Box 3687
Beaumont, Texas 77704

SHIP TO:

INVOICE NO. Z 2150

DATE October 21, 1980

PPD/COLL. VIA Your truck

CUSTOMER ORDER NO. COE #2920

CREDIT ACCT. NO. Process 070

BILL TO: Dixie Oil Processors, Inc
PO Box 856
Friendswood, Texas 77546

DEBIT FRT. ACCT.

TERMS Net 10th Prox

APPROVALS:
ALM

QUANTITY	DESCRIPTION	CLASS	PRICE	UNIT	EXTENSION	EXTENSION
380 Barrels	Waste Hydrocarbon Liquid		$3.00	barrel		$1,140.0[illegible]
	SEE ATTACHED DETAIL					

D083636

DEBIT ACCT. NO. 142-114-101-100

KG COH004548

P-00267

FORM NO. BC-22 A (4-67)

THE GOODYEAR TIRE & RUBBER COMPANY
BEAUMONT CHEMICAL PLANT
Post Office Box 3687
Beaumont, Texas 77704

SHIP TO: Dixie Oil Processors, Inc
Friendswood, Texas

INVOICE NO. Z 2121

DATE September 30, 1980

PPD COLL. ______ VIA ______

CUSTOMER ORDER NO. COS #2920

CREDIT ACCT. NO. Process 070

BILL TO: Dixie Oil Processors, Inc
PO Box 856
Friendswood, Texas 77546

DEBIT FRT. ACCT. ______

TERMS Net 10th Prox

APPROVALS: .LM

QUANTITY	DESCRIPTION	CLASS	PRICE	UNIT	EXTENSION	EXTENSION
239 Barrels	Waste Hydrocarbon Liquid 73,600 lbs		3.00	barrel		$717.00
	SEE DETAIL ATTACHED					

D083662

DEBIT ACCT. NO. 142-114-131-100

KG COH004549

P-00268

123

Oil Processors, Inc.

(CHICK)
E. R. SCOGIN

D080046

Manager Sales
Recyclable Products
HELL CHEMICAL COMPANY

~~One Shell Plaza~~
HOUSTON, TEXAS 77002
Telephone: (713) ~~220-5656~~
526-4671

April 21,1978

Mr. E.R. Scroggins
Shell Chemical Company
2001 Kirby Drive
Houston, Texas 77019

Dear Mr. Scroggins:

We wish to pick up tank truck loads of your PTC bottoms at K.M.C.O. in Crosby, Texas.

It is our understanding that we will mail you the weight tickets pertaining to each load and you will invoice us at $.04 per gallon.

We are aware that this is a carcinogenic material and we are experienced in safely handling materials of this nature.

I have contacted my insurance agent, Holt & Alexander, and requested that they forward a copy of our insurance certificate to you for your records.

We appreciate your cooperation in this matter. If I may be of further assistance to you, please do not hesitate to call me.

Sincerely,

Ralph L. Lowe

Ralph L. Lowe
President
Dixie Oil Processors, Inc.

RLL/jh

D080047

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

KG COH004551

P-00330

Dixie Oil Processors, Inc.

April 28, 1978

Mr. E.R. Scogin
Shell Chemical Company
2001 Kirby Drive
Houston, Texas 77019

Dear Mr. Scogin:

We acknowledge receipt of PTC and related allylic chloride derivatives which we have reviewed and agree to hold Shell harmless on our receipt of PTC bottoms from Shell.

We are experienced in handling and processing other chlorinated products, some of which are known carcinogins. We see no unusual problems in handling and utilizing your PTC bottoms.

Thank you for the opportunity to be of service to you.

Sincerely,

Ralph L. Lowe

Ralph L. Lowe
President
Dixie Oil Processors, Inc.

RLL/jh

D080043

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

0014791

We acknowledge receipt of toxicity data on PTC and related allylic Chloride derivatives which we have reviewed and agree to hold Shell ~~Har~~ harmless on our receipt of PTC bottoms from Shell.

We ~~routinely the receive and~~ are experienced in handling and processing ~~process~~ other Chlorinated ~~Products derivatives~~ products some of which ~~are~~ are known carcinogens, ~~and~~ we see no unusual ~~prob~~ problems in handling and utilizing your PTC bottoms.

Thank for the opportunity be of service to you.

Sincerely
RLL

D080044

124

R. S. K.

Dixie Oil Processors, Inc.

AUG 7 1978

July 31, 1978

Mr. D. K. Rose
One Market Plaza
San Francisco, California 94105

Dear Mr. Rose:

We were happy to discuss some of the various problems confronting Southern Pacific with Mr. Robert Kilpatrick recently.

An in-depth study of the waste water that you discharge from your Englewood plant and the quality of your creosote extender were our primary concerns.

A series of analyses and tests by various pollution control agencies and independent testing laboratories left us with certain conclusions and recommendations. The recommendations are as follows:

1. Southern Pacific continue to purchase the blend of phenollic bottoms and cutter stocks oils that you have purchased from our company for the past ten years as a creosote extender.

2. The waste water effluent containing variable amounts of acetic acids and phenols currently being discharged by Southern Pacific into the sewage systems of the City of Houston be terminated.

3. The discharged waste waters to be removed would be loaded by Southern Pacific into the empty 6000 gallon tank trailers that we will use to ship Southern Pacific their daily requirements of creosote extender oils.

4. The waste waters would be removed from the Englewood yard facilities in our tank trailers in an acceptable controlled manner. These waste waters would then be discharged into the Bayport plant of the Gulf Coast Waste Disposal Authority.

5. Total cost to Southern Pacific by Dixie Oil Processors, Inc. would be that the present price of the creosote extender would remain $.239 per gallon until the waste water removal program has started.

0011074

452-7575

BOX 856 • FRIENDSWOOD, TEXAS 77546 • Telephone 713 331-6196

15%

6. When the waste water removal program started, the price of the creosote extender would increase by .015% and the new billing price would be $.239 x .015%, or an increase per gallon of $.0036. The new billing price of the creosote extender would be $.2426 per gallon.

7. If Southern Pacific needs to remove additional quantities of waste waters, the cost per 6000 gallon tank trailer load would be $100.00.

8. All other costs relating to the removal of waste water discharges would be borne by Dixie Oil Processors, Inc..

9. All the above conditions are valid for six (6) months from the date of this contractual letter. If Southern Pacific enters into a contract with Dixie Oil Processors, Inc., the length of said contract will be for a one (1) year period and will on an "Evergreen" basis. Any changes by either party would necessitate a sixty (60) day written notice prior to termination or change of contract.

We have included a copy of Gulf Coast Waste Disposal Authority's letter validating their willingness to legally dispose of Southern Pacific's waste water discharges.

Thank you for the opportunity to offer these suggestions and we look forward to serving you in the future as we have in the past. If you need additional information or if you would like me to visit any Southern Pacific officials in San Francisco, please do not hesitate to call on me.

Sincerely,

Ralph L. Lowe
President
Dixie Oil Processors, Inc.

RLL/cb

Enclosures

cc: Mr. H. B. Berkshire
Mr. Art Lane
Mr. G. F. Bozeman

KG COH004556

125

KG COH004558

D. K. ROSE
GENERAL PURCHASING MANAGER

SOUTHERN PACIFIC TRANSPORTATION COMPANY
Southern Pacific Building • One Market Plaza
Room 977, San Francisco, CA. 94105

FORM S-2004
REV 10-77

ORIGINAL ORDER

Date MARCH 14, 1978 Bid No. 9873-05 Order No. 0088-08-99286

SHOW THIS NUMBER ON ALL PAPERS & PACKAGES

DIXIE OIL PROCESS
P. O. BOX 856
FRIENDSWOOD, TX. 77546

FOR FURTHER DETAILS PHONE (415) 362-1212, EXT. 22363

SEND ORIGINAL INVOICE WITH BILL OF LADING OR RECEIPT TO P. O. BOX 3979, SAN FRANCISCO, CALIF. 94119.

PLEASE SHOW OUR CODE NUMBERS ON INVOICES, PACKING LISTS, ETC.

SHIP TO SOUTHERN PACIFIC TRANSPORTATION COMPANY,
c/o SUPT. WOOD PRESERVING WORKS, 4910 LIBERTY RD. HOUSTON, TX.

SHIP AS REQ. BY SUPVR. WOOD PRESERVING WORKS

SHIP VIA YOUR TRUCK

TERMS NET

TAX CODES STATE LOCAL

F.O.B. DELVD. HOUSTON, TX.

OUR CODE NO.	DESCRIPTION	QUANTITY	PRICE
	APPROXIMATELY 200,000 GALLONS PER MONTH OF ALKYLATED BENZINE BOTTOMS (RESIDUAL PETROLEUM OIL) FOR BLENDING WITH CREOSOTE OIL SIMILAR TO RESIDUAL OIL PER AMPA SPEC. P-4-56 AS REQUESTED FOR WOOD TREATING OPERATION. TO BE DELIVERED IN YOUR 6000 GALLON TRANSPORT TRUCKS AT 125 DEG. FARENHEIT AND PRODUCT MUST FLOW FREELY AT DESTINATION. QUANTITY DELIVERED TO BE CORRECTED TO 60 DEG. F FOR BILLING PURPOSES. MATERIAL TO BE THE SAME AS CURRENTLY BEING FURNISHED. EXEMPT FROM TEXAS SALES AND USE TAX PER CONDITION 17 ON REVERSE SIDE.		.02715 LB SUBJECT TO CHANGE ON WRITTEN NOTICE AND MUTUAL AGREEMENT

Separate invoices must be rendered for each phone or written release against this order.
Complete 11 digit release number to be shown on each invoice.
Releases bearing identical 11 digit numbers may be recapped on a monthly or semi-monthly basis.
All invoices are to be supported by signed (for this Co.) receipts whenever possible.
It is understood that we shall be protected so as to receive the benefit of any price reduction.
All shipments to be unit packaged.
Subject to termination by written notice.

The Equal Employment Opportunity clauses contained in Section 202 of Executive Order #11246 and Section 503 of Vocational Rehabilitation Act of 1973, as amended, and implementing Rules and Regulations, are incorporated herein by specific reference.

D. K. Rose
GENERAL PURCHASING MANAGER

BY: [signature]

SEE REVERSE SIDE FOR CONDITIONS AND INSTRUCTIONS

KG COH004559

0011075

CONDITIONS AND INSTRUCTIONS

'NERAL:

1. Unless otherwise provided herein, any written acknowledgement of mis order, the delivery of any supplies or the furnishing of any service pursuant to this order shall constitute an unqualified acceptance by the Seller of all the terms and conditions of this order. This contract shall be construed according to the laws of the State of California.

2. All correspondence relative to this order and invoices applying on it must give reference to complete order number as well as name of consignee and destination.

3. In consideration of One (1) Dollar and other good and valuable considerations in hand paid, the receipt whereof is hereby acknowledged, the Seller hereby grants to the Buyer the right to repair the subject matter of this contract by replacing any part that may be destroyed, damaged, lost, stolen or worn out, by making such part for itself or by purchasing it in the open market, provided, such part is not individually covered by patents, this right to repair to apply to all patents now or hereafter owned or controlled or acquired by Seller or under which Seller may become licensed, and to thereafter use and/or vend such repaired subject matter; and, if this contract relates to rolling stock or equipment interchanged with other railroads the rolling stock or equipment of the Buyer may be repaired by other railroads irrespective of where the repair parts may be obtained, and the Buyer shall have the same right to use and/or vend such repair parts for the purpose of repairing foreign rolling stock or equipment received in interchange with other railroads. This agreement shall include the right on the part of the Buyer to purchase repair parts in anticipation of breakage instead of waiting until the breakage actually occurs before ordering the repair parts. The exercise of the rights granted to Buyer in this section 3 shall not void or otherwise affect any liabilities or warranties, express or implied, arising out of the purchase and sale of the subject matter of this contract.

4. Seller will hold harmless Buyer from claims, costs, and liability to seller's employees or equipment arising out of and in the course of their employment and while on Buyer's premises or equipment, regardless of any negligence on the part of Buyer's employees.

5. Seller agrees to indemnify Buyer against all claims, damages, losses, costs and expenses, including attorney fees, arising or growing out of patents and copyrights and all royalties in connection therewith, and arising or ~wing out of the purchase and use by Buyer of the subject matter of this ract, and for any damages, costs and attorney fees incurred by Buyer as esult of suit or claim made or brought against Buyer caused either

(1) solely by defective or negligently designed or constructed tools, services or equipment supplied by Seller, or

(2) by concurrence of defective or negligently designed or constructed tools, services or equipment supplied by Seller, and negligent acts or omissions, active or passive, of Buyer or any other person.

The foregoing is designed to place entire responsibility upon Seller for defective equipment in any case in which such defect causes or contributes to loss or damage.

SELLER WARRANTS TO BUYER THAT:

(1) The subject matter of this contract conforms with the Safety Orders of the State of California, Division of Industrial Safety;

(2) Seller has been informed and knows the purposes for which the subject matter of this contract are required and that the Buyer is relying on the Seller's skill and judgment to select or furnish suitable goods or services, and Seller therefore warrants that the goods are fit for those purposes;

(3) The subject matter of this contract is of merchantable quality and that the goods or services conform to the description and labeling thereon.

6. The Seller warrants that he has not employed any officer or employe of the Buyer or of any subsidiary of the Buyer or any member of their immediate families or near relatives to solicit or secure this order under any agreement for a commission, percentage, brokerage or compensation of any nature. Breach of this warranty shall give the Buyer the right to cancel this order and/or recover from the Seller the amount of commission, percentage, brokerage, or other compensation without waiver or any legal right which the Buyer may have under applicable statutes.

7. The provisions hereof shall inure to the benefit of and be binding upon the principals, agents, personal representatives, successors and assigns of the Seller and the agents, successors and assigns of the Buyer.

8. No equipment is to be brought on to Buyer's property for test or trial purposes, without written authorization which must be obtained in advance from the Purchases and Materials Department.

'MENTS:

9. All material must be marked or tagged with complete order number and stock item numbers and be accompanied by packing list in detail. Send shipping notice direct to consignee.

10. No charge for package or drayage will be allowed. Material must be packed in conformity with tariff classification requirements so as to secure lowest freight rate.

11. All shipments unless otherwise specified must move "Collect" from f.o.b. point.

12. When forwarding by express both package and express receipt must plainly indicate express routing desired.

13. Material should not be forwarded by Parcel Post unless you are specifically instructed to so handle.

14. Shipments on this order must be routed as directed on face of order.

15. In order that our material may move at lowest possible cost, shipments of less than minimum carload should only be made when material is such as is usually ordered in less than carload quantities, or it is not reasonable to assume we could increase sufficiently to make minimum carload nor authorize consolidation of shipments for two or more destinations.

In all other cases before allowing less than a carload to leave your plant you should have authority for such action either from Purchasing Agent placing order or Traffic Representative to whom you were referred for routing.

When there are different rates on the same commodity depending on the carload minimum used, you should load to a minimum taking the lowest rate unless authorized as above to do otherwise.

INVOICES:

16. Invoices, separately for each order, showing complete order number and accompanied by original signed bill of lading, shipping receipt, express receipt or other original receipt indicating delivery to our representative together with copy of inspection or test report if any required, should be forwarded as directed on face of order. Transportation charges included on invoices must be supported by signed paid copy of transportation bill.

SALES and/or USE TAX EXEMPTIONS:

17. The undersigned certifies that the items covered by this order are exempt from the taxes imposed by the Texas Limited Sales, Excise and use Tax under the exemption provisions thereof, of either Article 20.04(G) (2); 20.04(G) (3) (a) and (d); 20.04 (S) or combinations.

The undersigned will be liable for payment of said tax if it uses the items covered hereby in some other manner or for some other purpose not exempt from taxation.

SALES TAX EXEMPTION CERTIFICATE COVERING SOUTHERN PACIFIC TRANSPORTATION CO. SHIPMENTS FROM CALIFORNIA POINTS:

18. Shipments to be made on commercial bill of lading showing seller as consignor and purchaser as consignee at specific destination outside California with freight collect via our facilities. The properly executed bill of lading or copy thereof together with following certificate exempts this purchase from California Sales Tax under Section 6385 Revenue and Taxation Code.

This is to certify that Southern Pacific Transportation Co. is a lawfully authorized common carrier having been issued Permit BX-14134 by California State Board of Equalization, and that this material is to be shipped via purchasing carrier under a bill of lading from point of shipment within California to destination for use by us in conduct of our business as a common carrier and is legally authorized to transport such property through California over routes used.

This is to further certify that property covered by this order will not be used by purchaser prior to delivery to destination.

Seller is required to retain bill of lading in its records.

SALES TAX EXEMPTION CERTIFICATE COVERING FOLLOWING PACIFIC MOTOR TRUCKING CO. SHIPMENTS:

19. Shipments from California Points to Oregon destination should be made on commercial bill of lading showing seller as consignor and purchaser as consignee at specified destination outside California with freight collect via our facilities. The properly executed bill of lading or copy thereof together with following certificate exempts this purchase from California Sales Tax under Section 6385 Revenue and Taxation Code.

This is to certify that Pacific Motor Trucking Co. is a lawfully authorized common carrier having been issued Permit BX-33903 by California State Board of Equalization, and that this material is to be shipped via purchasing carrier under a bill of lading from point of shipment within California to destination for use by us in conduct of our business as a common carrier and is legally authorized to transport such property through California over routes used.

This is to further certify that property covered by this order will not be used by purchaser prior to delivery to destination.

Seller is required to retain bill of lading in its records.

SOUTHERN PACIFIC TRANSPORTATION COMPANY

INVOICING INSTRUCTIONS

We prefer that invoices be rendered monthly or semi-monthly so they may be processed more rapidly for payment. Please cover invoices by recap statement as shown in sample below. Separate recap must be prepared for each eleven-digit order number. All invoices on a recap must have identical eleven-digit order numbers.

FIRM: A B C Company

ADDRESS: 200 West Main Street
Chicago, Illinois 60614

ORDER NO. E506-00-79831

RECAP NO. 1 FROM: Jan. 1 TO: Jan. 31, 1978

INVOICE NO.	DATE	AMOUNT
210035	1-07-78	$189.25
711789	1-20-78	215.79
220006	1-29-78	76.59
	TOTAL	$481.63

It is important that a number be assigned to your recap as our payment voucher will give reference to this number only.

Please do not include a previous balance in total. Attach all invoices, together with pink copies of CS-2004-G, "Shipping Release," to recap and mail to:

P. O. Box 3979
San Francisco, Ca. 94119

If you have any questions regarding this method of invoicing, please contact our representative nearest you for assistance -

K. J. Ashworth, Manager Purchasing & Services
P. O. Box 39608, Los Angeles, CA 90039
Telephone: (213) 624-6161, Extension 22733

R. J. Balanesi, Manager Purchasing and Services
401 "I" Street, Sacramento, CA 95814
Telephone: (916) 444-8011, Extension 323

J. E. Wilson, Manager Purchasing & Services
1400 Fulton Street, Houston, Texas 77018
Telephone: (713) 222-1121, Extension 6201

GENERAL PURCHASING MANAGER

SOUTHERN PACIFIC TRANSPORTATION COMPANY
Southern Pacific Building • One Market Plaza
Room 977, San Francisco, CA. 94105

FORM S-2004
REV 10-77

ORIGINAL ORDER

Date MARCH 14, 1978 Bid No. 9873-05 Order No. 0088-08-99286

SHOW THIS NUMBER ON ALL PAPERS & PACKAGES

DIXIE OIL PROCESS
P. O. BOX 856
FRIENDSWOOD, TX. 77546

FOR FURTHER DETAILS PHONE (415) 362-1212, EXT. 22363

SEND ORIGINAL INVOICE WITH BILL OF LADING OR RECEIPT TO P. O. BOX 3979, SAN FRANCISCO, CALIF. 94119.

PLEASE SHOW OUR CODE NUMBERS ON INVOICES, PACKING LISTS, ETC.

SHIP TO SOUTHERN PACIFIC TRANSPORTATION COMPANY,
c/o SUPT.WOOD PRESERVING WORKS, 4910 LIBERTY RD. HOUSTON, TX.

SHIP AS REQ.BY SUPVR. WOOD PRESERVING WORKS

SHIP VIA YOUR TRUCK

TERMS NET

TAX CODES STATE LOCAL

F.O.B. DELVD.HOUSTON,TX.

OUR CODE NO.	DESCRIPTION	QUANTITY	PRICE
	APPROXIMATELY 200,000 GALLONS PER MONTH OF ALKYLATED BENZINE BOTTOMS (RESIDUAL PETROLEUM OIL) FOR BLENDING WITH CREOSOTE OIL SIMILAR TO RESIDUAL OIL PER AMPA SPEC. P-4-56 AS REQUESTED FOR WOOD TREATING OPERATION. TO BE DELIVERED IN YOUR 6000 GALLON TRANSPORT TRUCKS AT 125 DEG. FARENHEIT AND PRODUCT MUST FLOW FREELY AT DESTINATION. QUANTITY DELIVERED TO BE CORRECTED TO 60 DEG. F FOR BILLING PURPOSES. MATERIAL TO BE THE SAME AS CURRENTLY BEING FURNISHED. EXEMPT FROM TEXAS SALES AND USE TAX PER CONDITION 17 ON REVERSE SIDE.		.02715LB SUBJECT TO CHANGE ON WRITTEN NOTICE AND MUTUAL AGREEMENT

Separate invoices must be rendered for each phone or written release against this order.
Complete 11 digit release number to be shown on each invoice.
Releases bearing identical 11 digit numbers may be recapped on a monthly or semi-monthly basis.
All invoices are to be supported by signed (for this Co.) receipts whenever possible.
It is understood that we shall be protected so as to receive the benefit of any price reduction.
All shipments to be unit packaged.
Subject to termination by written notice.

The Equal Employment Opportunity clauses contained in Section 202 of Executive Order #11246 Section 503 of Vocational Rehabilitation Act of 1973, as amended, and implementing and Regulations, are incorporated herein by specific reference.

D. K. Rose
GENERAL PURCHASING MANAGER

BY: [signature]

SEE REVERSE SIDE FOR CONDITIONS AND INSTRUCTIONS

0011075

129, 130, 132, 137,
141, 142, 143, 144

Jermit ~~~~LE C-6611

DOM+SAPP

RECEIVED

MAY 19 1978

CONTROL AND PREVENTION
TEXAS AIR CONTROL BOARD

JUN 4 1 24 PM '79

DRAFT

Interim Report

An investigation into possible sources

of Vinyl Chloride emissions from:

1) Southern Pacific Wood Preservative Works
   Houston, Harris County

2) Texas City "Wye"
   Galveston County

Gene Speller
Environmental Health Specialist
Region VII

Gene Speller

May 18, 1978

Investigator's Comments

DRAFT

(1) Dominquez & Sapp Enterprise
Houston, Harris County

(2) Texas City "Wye"
Galveston County

(3) Southern Pacific Wood Preservative Works
Houston, Harris County

This report is an update of the TACB activities that have occurred at the above named facilities within the past several weeks. There have been several on-site inspections and several samples taken to determine the air pollution impact of handling a styrene tar waste material contaminated with vinyl chloride.

There is a long and complex history of the material at the Texas City "Wye". There have been numerous people involved from several regulatory agencies and companies. Attached are records of communications between the various people involved.

HISTORY - The Texas City "Wye" is located just NW of the intersection of Highway 146 and I-45. It has reportedly been there for approximately 20 years or longer. The ownership has reportedly changed hands several times. The last owner, MOTCO, went bankrupt, and the facility is now being managed by bank trustees.

At one time the facility used to reprocess industrial liquid waste materials which were stored in open pits. Some of the material stored was styrene tar, reportedly bottoms from the styrene process at Monsanto, Texas City and possibly some other companies. There are also reports of other wastes having been dumped into pits at the "Wye".

There has been a long standing water pollution problem in that the materials are not adequately contained and seepage occurs. There have also been odor complaints due to the odoriferous nature of the styrene tar. The Texas Department of Water Resources obtained a court order against MOTCO (just before they went bankrupt) to have the materials removed and the area cleaned up.

Dominquez & Sapp Enterprise, a minority service company, contracted to the bank trustees to purchase and remove the saleable styrene tar from the open pits. Dominquez & Sapp obtained a contract with Southern Pacific to sell the material as a diluent or extender for their creosote wood preservative operation at 4910 Liberty Road, Houston. That operation reportedly has been going on since December, 1977.

TACB INVOLVEMENT - The reason for concern about the "Wye" operation was because vinyl chloride, a known human carcinogen, had been found in some contaminated pits owned by JOC Oil, Harris County. It was suspected that the "Wye" material may have also been contaminated. It was reported that vinyl chloride bottoms had been dumped into and contaminated the styrene tar pits. Previous sampling confirmed that there was vinyl chloride in the JOC material (8 ppm by volume in the headspace, see sample report ACL No. 1715, sampled 1-5-77). JOC had been required by court order to remove the contaminated material and store it in controlled storage tanks until ultimate disposal could be accomplished. The court order also specifies that the ultimate disposal method has to be approved by the Texas Air Control Board.

I first became aware of the latest "Wye" activity sometime in late February by way of notice from JOC Oil (Mack Fowler), a competitor of Dominquez & Sapp because they (JOC) were also supplying Southern Pacific with styrene tar extender.

My first action was to notify the local air pollution control agency in Galveston County. They made a preliminary investigation, contacted Dominquez and requested that an analysis be run on the material for vinyl chloride (see attached copy of letter from Jim Aldridge to Dr. Dominquez, 3-9-78).

On 3-22-78 this office received a complaint (No. 071557) from Mr. Ron Johnson, the manager of an apartment complex just north of the Southern Pacific Plant. Mr. Johnson was complaining of the odor from Southern Pacific and said he was also getting headaches from it. Mr. Johnson was also concerned about the health of his tenants, especially infants and young children. Mr. Johnson was complaining about the nature of the creosote treating operation itself and said that it had been going on for several years.

I decided to investigate to see if there was any correlation of Mr. Johnson's complaint to Southern Pacific's handling of the "Wye" material.

On 3-23-78 a City of Houston investigator and I visited the Southern Pacific Plant. We contacted Mr. M. A. Lane, the Superintendent. I informed him of the purpose of my investigation and that I was especially concerned that there might be vinyl chloride in the materials that he was receiving from the "Wye" and that it could be causing an air pollution problem.

Mr. Lane explained the wood treating process as described below. There are five reactor vessels ∿ 8' in diameter x 140' long. The vessels are charged with wood ties, the ties are dried with a solvent, the vessels are evacuated and the solvent recycled, the vessels are then charged with the preservative material (∿ 70% styrene tar or other petroleum base extender and ∿ 30% creosote pruchased from Koppers or Witco Chemicals). The preservative material is heated to ∿ 190°F and the reactor vessels are pressurized to ∿ 190 psig. The ties then remain in the vessels for 24 hour cycles. At the end of the cycle, the vessels are evacuated of preservative material which is recycled to storage.

The reactor vessels are then opened. At this point when the ties are still hot and are removed from the vessels there is apparently the greatest potential for an air pollution problem - both odor and possible health effects from not only vinyl chloride, but also other unknown contaminants in the styrene tar and from the creosote itself (possibly pentachlorophenol, unknown at this time). During my inspection, a reactor vessel was opened and I was exposed to the plume of vapor from the reactor. It was visible, highly odoriferous and obnoxious (ranking of 4 on a scale of 0 to 5). The City reported confirming 3 complaints against Southern Pacific within the past few weeks and reported that it had been a chronic odor problem.

Mr. Lane said that he had been receiving ∿ 40,000 gallons/week from the "Wye" until the past few weeks. Shipment had been stopped because there had been an operational problem with the process equipment at Southern Pacific and it was suspected that the "Wye" material may have caused it. An independent analysis was being run by Southwestern Labs to test for corrosion problems in the material.

The material was found to be corrosive, but a corrosion inhibitor was added and shipment was resumed ∿ 3 weeks later.

On 3-28-78 I made an inspection at the Texas City "Wye" after contacting a Dominquez representative, Foy Phillips.

The process was explained basically as described below. The styrene tar is removed primarily from one pit (draw pit) with three other pits flowing into the draw pit. The tar is pumped from the pit to a 5000 bbl. fixed roof tank. It is then circulated to a "hot oil truck" used to heat the tar to an average temperature of 150°F to make it less viscous and easier to ship and handle. (see attached photographs).

At that time there was an estimated 100,000 bbls of styrene tar material remaining. There was no type of vapor control on the tank.

On 3-29-78 samples of the tar were taken by Superintendence Laboratories, an independent lab employed by Dominquez to do the analytical work. I was provided a portion of those samples and sent it to our Austin Lab for analysis.

On 4-4-78 Foy Phillips of Dominquez & Sapp called to report that vinyl chloride was found in the tar and that they estimated between 50 - 100 ppm in the liquid. At that time, as per my suggestion, he said that he would make arrangements to seal the tank and have carbon adsorption units installed on the tanks.

On 4-14-78 the carbon units were installed and operational, air samples were taken from the vent from the carbon unit and from the tank truck, and a liquid sample from the tank truck was taken. Samples were analyzed by Superintendence and the TACB.

I also requested that Dominquez monitor the carbon vent weekly and suggested a control level of 10 ppm.

Meanwhile, preliminary results (not official) were reported from Austin on vinyl chloride concentrations:

Liquid Samples Collected On 3-29-78

Pit	Vapor Space ppm by Vol. at Room Temp.	Vapor Space % by Vol. at 150°F
1	64,000	16.8
2	100,000	15.7
3	50,000	13.7
4	7,000	4.5

Samples Collected On 4-14-78

Sample	Concentration	
air bomb from truck	155 ppm by volume	
liquid from truck	Vapor space @ ambient 16,000 ppm	Vapor space at 150°F 20,000 ppm

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DRAFT

However, Dominquez reported that Superintendence showed < 1 ppm in the bomb samples. I suggested that our lab people get together and find out why there was such a magnitude of difference. Superintendence later reported numbers approaching those found by the TACB when their analytical procedure was adjusted.*

In subsequent discussions with Dr. Dominquez and Foy Phillips, I asked them to see if they could reduce the concentration further, at least to the point where any vapor space would be less than 10 ppm. They agreed.

On May 5, 1978, Jim Lindgren from the Austin Lab, Bill Kwie and I conducted sampling at the "Wye" and at Southern Pacific. Jim used a syringe and glass tube with an adsorption material for sampling. Samples were taken at the tank carbon vent, the tank truck and upwind and downwind of the pits at the "Wye". At Southern Pacific upwind and downwind property line samples were taken; and, at the request of Mr. Lane (Southern Pacific, Superintendent) samples were taken on his property at the treated ties (24 hrs. after treating) and at the unloading sump while a truck was unloading styrene tar.
Preliminary results were reported as:

AT WYE

Sample	Vinyl Chloride Concentration in PPM	
Liquid from Truck	Headspace @ ambient	Headspace @ 150°F
	5600	20,000

Pit No. 4

Sample 1	PIT #4	0.012 ppm	DOWNWIND	UPWIND	N.D.
Sample 2	ALL PITS	0.005 ppm			

Southern Pacific (SP)
Downwind Property Line

Sample 1	0.4 ppm
Sample 2	0.3 ppm
SP at Sump On Property	0.4 ppm
SP at Cross Ties	0.015 ppm

CONCLUSIONS:

Although there has not been an official lab report, the sampling and analysis thus far indicates potentially significant air pollution health problems at Southern Pacific. The samples taken were not representative of the worst case conditions in that samples were not taken during the time of reactor vessel opening. I'm sure that much higher numbers would be found at the property lines during those times.

However, I feel that the operation at the "Wye" can be controlled to the point where there is an acceptable level of vinyl chloride residue where it will not cause a problem at Southern Pacific.

*Gas chromatography used by both labs. Refer to Jim Lindgren, TACB Austin Lab for details on procedures.

DRAFT

In order to make further reductions at the "Wye", Dominquez has put an additive into the tar which, he says, will knock out the VC in the vapor space. This was tried, but apparently there was a problem with the vapor phase in the tank not being vented fast enough. They are now planning to install a N_2 purge system on the tank to blow out the VC through the carbon units. It appears that this may work.

RECOMMENDATIONS

(1) That samples be taken at the "Wye" of the processed liquid after it has been heated and purged with N_2. A level of 10 ppm in the vapor phase should provide adequate assurance that there are not resultant problems at Southern Pacific.

(2) That additional samples be taken at Southern Pacific's property lines during worst case conditions i.e., during reactor openings.

A property line concentration of 0.01 ppm at the property line should provide adequate protection to the public (1/100 of the OSHA TWA standard of 1 ppm, adjusted for sampling time and target population differences).

(3) That samples of the Southern Pacific reactor feed (styrene tar and creosote) be analyzed for VC in the head space.

(4) That further investigation be made into the possibility of other hazardous air pollutants being emitted from Southern Pacific.

(5) That the TACB investigate further and take the necessary action to correct the apparent chronic odor problems at Southern Pacific.

Gene Speller TR

Gene Speller
Environmental Health Specialist
Region VII

TEXAS AIR CONTROL BOARD
Laboratory
8520 Shoal Creek Boulevard
Austin, Texas 78758

Sample:	adsorbed gases to be analyzed for vinyl chloride	ACL Number:	1959
		Delivered By:	Jim Lindgren
Description:		Date Sampled:	5/5/78

LABORATORY ANALYSIS

Samples monitoring vinyl chloride emissions during handling of Texas City "Wye" products.

Sample Tube Number	Sample taken at	conc., ppm by volume
1	hatch of freshly loaded truck	*
2	hatch of freshly loaded truck	*
3	Downwind Pit #4	0.012
4	Upwind Pit #4	none detected
5	Downwind all pits	0.005
6	Vent after last charcoal drum	1.5
7	Vent after last charcoal drum	2.4
8	Southern Pacific gate Liberty & Erastus	0.008
9	Southern Pacific Crosstie stack	0.025
10	Southern Pacific Crosstie stack	0.020
11	Downwind Southern Pacific unloading sump	0.400
12	Downwind Southern Pacific unloading sump	0.425
13	At Southern Pacific unloading sump	0.220
14	Upwind of Southern Pacific facility on Tyre	none detected

continued on next page....

5/5/78
Date Received

5/19/78
Date Reported

James L. Lindgren
Analysis Performed By James L. Lindgren

MW

*Sample #1 was run with chromatographic conditions far from ideal for the complexity of the sample. No results were obtained.

Sample #2 was analyzed after chromatographic conditions had been adjusted to allow the separation of vinyl chloride from the other sample components. The peak eluting at the retention time assigned to vinyl chloride, flooded the detector. No accurate number could be obtained. If one must estimate a concentration of vinyl chloride in this sample, I would estimate well into the thousands of parts per million by volume.

AIR POLLUTION SAMPLE REPORT

Name of Property Sampled: Texas City "Wye" Address: Hwy. 146 & I-45

City: Texas City County: Galveston Region: 7 Type of Industry: chemical salvage

Name and Title of Party Contacted at Property: Foy Phillips of Dominguez and Sapp

****

Sampled By: Superintendance Laboratory Plant Status: inactive

Remarks: Please analyze each sample for vinyl chloride monomer in the liquid and vapor phase at room temp. and 150°F

****

Please analyze as checked below. Date: 4/3/78 Requested By: Gene Speller / Orbie Cowling

SAMPLE IDENTITY							LABORATORY ANALYSIS	(at room temp.)		(at 150°F)	
Date Collected / Field Number	Sampling Equipment	TIME Start	End / Total Min.	SAMPLE Rate(cfm) / Total Vol(M3)	WIND Direction / Speed(mph)	NUMBER ACL Number	Susp. Part. (μg/M3)	VCM in head space ppm by vol. ±10%	VCM in liquid ppm by wt. ±25%	VCM in head space, % by vol. ±10%	VCM in liquid ppm by wt. ±25%
3/29/78 / 070201-1						1930		42,970	10,100	18.5	7240
3/29/78 / 070201-2								31,490	4,340	11.2	3760
3/29/78 / 070201-3								44,280	7,260	8.6	3880
3/29/78 / 070201-4								6,740	960	3.3	740

Remarks: Ref: notebook L-2 page 31 Gravimetrical Analysis:

Date Received: 4/4/78 Date Reported: 5/3/78 Chemical Analysis: James L. Lindgren

AIR POLLUTION SAMPLE REPORT

Name of Property Sampled: Texas City "Wye" Address: Hwy. 146 and I-45

City: Texas City County: Galveston Region: 7 Type of Industry: chemical salvage

Name and Title of Party Contacted at Property: Foy Phillips of Dominguez and Sapp

****

Sampled By: Superintendance Laboratory Plant Status: running, loading

Remarks: Please analyze each sample for vinyl chloride.

****

Please analyze as checked below. Date: 4/14/78 Requested By: Gene Speller, Orbie Cowling

SAMPLE IDENTITY						LABORATORY ANALYSIS				
							(at room temp.)		(at 150°F)	
Date Collected / Field Number	Sampling Equipment	TIME Start / End / Total Min.	SAMPLE Rate(cfm) / Total Vol(M^3)	WIND Direction / Speed(mph)	NUMBER ACL Number	Susp. Part. (µg/M3)	VCM in head space, ~~ppm by~~ vol. ±10%	VCM in liquid ppm by wt. ±25%	VCM in head space, ~~ppm by~~ vol. ±10%	VCM in liquid ppm by wt. ±25%
4/14/78 / 070204-1	one liter vacuum bomb				1934		134			
4/17/78 / 070204-2	liquid sample						13280	1580	21800	2540

Remarks: Ref: Notebook L-2, page 33 Gravimetrical Analysis:

Date Received: 4/17/78 Date Reported: 5/3/78 Chemical Analysis:

James L. Lindgren

MW

KG COH004574

AIR POLLUTION SAMPLE REPORT

Name of Property Sampled: Texas City "Wye" Address: Hwy. 146 and I-45

City: Texas City County: Galveston Region: 7 Type of Industry: Chemical Salvage

Name and Title of Party Contacted at Property: Foy Phillips of Dominguez & Sapp

****

Sampled By: Gene Speller Plant Status: in operation, loading

Remarks: Please analyze sample for vinyl chloride.

****

Please analyze as checked below. Date: 5/9/78 Requested by: Gene Speller / Orbie Cowling

SAMPLE IDENTITY						LABORATORY ANALYSIS				
							@ room temp.		@ 150°F	
Date Collected / Field Number	Sampling Equipment	Time: Start / End / Total Min.	Sample: Rate (cfm) / Total Vol.	Wind: Direction / Speed (mph)	Number: ACL Number	Susp. Part. (µg/M³)	VCM in head space-ppm by volume	VCM in liquid-ppm by weight	VCM in head space-ppm by volume	VCM in liquid-ppm by weight
5/5/78 / 070218	one liter sample from truck				1955		5600	1860	22,500	1920

Remarks: Gravimetrical Analysis:

Date Received: 5/11/78 Date Reported: 5/17/78 Chemical Analysis: [signature]

James L. Lindgren

KG COH004575

131, 134

KG COH004576

TEXAS WATER QUALITY BOARD

AUSTIN, TEXAS

TO: John B. Latchford, Jr., Director of Field Operations

FROM: Bill Reeves, District 7 Representative

SUBJECT: Petro-Processors, Incorporated, W.C.O. #01051

INTER-OFFICE MEMORANDUM

ATTENTION: Ken Jorgens, Chief, Administrative Enforcement

I. Introduction:

The former Petro-Processors site in La Marque has a long history of problems, including illegal discharges.

Mr. U. T. Alexander established this commercial industrial solid waste disposal site in 1959. Various materials such as styrene bottoms, oil, catalyst containing hazardous metals, etc., were dumped into a large borrow pit. Other pits were eventually added to the operation and, as a result, a large inventory of waste materials accumulated at the site. The principal generator of the styrene tars was Monsanto, Texas City, and the principal haulers using the site were Malone Trucking and French Limited.

On August 6, 1964, the company was granted a no discharge W.C.O. (#01051). Since that time, the file reflects numerous complaints and documentations of illegal discharges originating at this site. As a result of odors and discharges, the City Council of La Marque declared the site a health hazard and passed an ordinance on 3-22-68 making such an operation illegal within the La Marque city limits. On 7-8-68, the Council passed Resolution #139 asking that the TWQB cancel said company's W.C.O.

Mr. Alexander contended that he was planning to clean up the site and change his mode of operation. His permit was not cancelled and he was given time to obtain professional consultation and present a plan for the improvement of the subject facility.

At a public hearing held in La Marque on 8-29-64, it was learned that Mr. Alexander had suddenly left the state and the Land Bank and

Signed Bill Reeves

KG COH004577

Date December 16, 1974

Trust of Texas City had foreclosed on a lien held against the property. Shortly thereafter, the Attorney General's office was contacted and asked to initiate legal action against the owner. On 10-18-69,the Attorney General was once again contacted and requested to give bank officials time to reconcile the problems associated with the site. Some dike improvements were made by said bank, but on 1-2-70, the property was sold to Mr. J. W. Yeatman of Galveston. Mr. Yeatman sold it to the Wye Corporation.

Mr. James Brady and Mr. Dee Celli were co-owners of the Wye Corporation At the time of the purchase, they were unaware of the contents of the pits and did not realize the problems involved. In an attempt to clean up the site, it was leased to Mr. Tom Holman of La Marque and Mr. J. R. McDonald of San Antonio on 3-12-73. Mr. Holman planned to build a rotary kiln, use the styrene tars as fuel and recover copper, mercury, and lead; however, he was unable to obtain a permit from the Texas Air Control Board (TACB).

On June 3, 1974, Mr. Brady sold Petro-Processors to the Motco Corporation of Minneapolis, Minnesota. Both Mr. Holman and Mr. McDonald each received ¼ interest. The principal name associated with Motco is Mr. Martin Brown, address unknown. Motco is allegedly planning to remove the styrene tars from the pits and market it at an undisclosed location. The land will be reclaimed and retained for its commercially strategic location.

An inspection of the site by the writer on 12-3-74 revealed very little change in the situation as outlined in the report of 5-2-74.

On 12-4-74, the writer continued the investigation at the Galveston County courthouse and Stewart Title Company, Galveston, for the purpose of determining actual ownership of the subject facility.

The facility was again inspected on 12-11-74. On this occasion, it was noted that Mr. Holman had completed a truck loading facility that would facilitate loading the styrene tars from pit Nos. 1-6.

II. <u>Findings</u>:

<u>12-3-74</u>

1. Freeboard of the pits was 1 inch on the west corner of pit No. 5,

KG COH004578

3-4 inches on the north corner of pit No. 7, and 2-3 inches on the N.E. dike of pit No. 1. All of the pits at the site are hydraulically connected by cuts in common dikes.

There was evidence of recent overflows adjacent to low spots on the dikes. The overflow from pit Nos. 1 and 7 was pooled on the N.E. portion of the property. From there, it eventually drains to the road ditch along Highway 146 and thence the marshy area north of Jones Bay. Overflow from pit No. 5 enters the borrow ditch along the southwest side of the property thence to the aforementioned marsh.

The writer had previously advised Mr. Holman to maintain a reasonable freeboard in the pits. Mr. Holman stated that recommended freeboard has not been maintained because he was financially unable to repair the dike. A change in ownership in June of 1974 alleviated the money problem, but now he contends that wet weather has hampered the dirt work.

2. Pit No. 7 was seeping for a distance of 225 feet along the southeast dike. Seepage pools by the dike and eventually flows to the previously described marsh.

3. Pit No. 7 contains styrene bottoms, heavy oil, oily sludge, polyurathane pellets, and spent catalyst containing lead, copper, and mercury.

4. Pit Nos. 1-6 contain primarily styrene bottoms.

5. Mr. Holman is currently laying a 4" steel pipe between pit No. 2 and the four steel tanks located near the east boundary. Styrene tars will be pumped to storage tanks, loaded onto tank trucks, and shipped to an undisclosed location. Mr. Holman indicated that he did not know the ultimate destination or fate of the styrene tars. He said that all marketing details were being handled by Mr. Martin Brown of Motco. He evaded questions regarding the removal and disposal of this material. He refused to give me Mr. Brown's telephone number and address, but he did say that Mr. Brown would contact me in the near future and answer all of my questions.

6. Mr. Holman is still undecided as to the method for disposing of the materials in pit No. 7. As noted before, he was once planning to burn the material in a rotary kiln and recover the copper, lead, and mercury. He has indicated that he may make another attempt to obtain a permit from the TACB and build a rotary kiln.

7. The large borrow ditch located along the S.W. side of the site was full of contaminated water as indicated by the apparent absence of aquatic life. Drainage is blocked at a high spot in this ditch near the south corner of pit No. 6.

   This ditch is normally full of water and the bottom is usually not visible, but on 10-25-74, most of the water had either soaked in or evaporated leaving the bottom exposed. It was noted that a considerable portion of the ditch was covered by a layer of styrene tars - approximately 8-10 feet wide and at least 75-100 yards long. It began at the upper reaches of the ditch by the west corner of pit No. 3 and extended southeast down the ditch. The dikes along this ditch gave no indication of recent styrene tars overflow, so it was, therefore, concluded that the material had been there for quite some time.

8. According to the 1954 USGS map, the natural elevation of the site is approximately 5 feet. The dikes surrounding the pits range from 1 foot to 4 feet above ground level, therefore, there is not adequate protection against a 50-year tidal surge as required in the Solid WasteBoard Order No. 71-0820-18. According to Mr. George Marinos, Army Corps of Engineers, the 50-year tidal surge outside the protection of the Texas City dike is 11.5 feet. Petro-Processors does not lie within the protection of the Texas City dike.

9. Mr. Holman has indicated that once the site is cleaned up, the 11.29 acre tract will be commercially developed.

<u>12-4-74</u>

Galveston County courthouse records reveal that the last known owner of the property was Mr. Foster Jones in 1969. More recent evidence at the courhouse shows that back taxes were paid in July 1974 by Stewart Title Company of Galveston. According to the Stewart Title Company, the site had been sold by the Wye Development Corporation on 6-3-74 to Motco, Incorporated of Minneapolis, Minnesota, Mr. Thomas Holman of La Marque, and Mr. J. R. McDonald of San Antonio. Motco, Incorporated owns ½ of the site, while Messrs. Holman and McDonald each owns ¼ of the site. (A copy of the deed is attached.)

12-11-74

1. Pit No. 5 was overflowing.

2. The truck loading facilities had essentially been completed.

II. Recommendations:

1. The substandard dikes should be reconstructed in order to comply with the specifications outlined in Board Order #71-0820-18.

2. The accumulation of styrene tars in the bottom of the borrow ditch bordering the SW boundary of the property should be returned and impounded within the pits.

3. Representatives of Motco should inform District 7 of its plans for disposing of or marketing the waste materials. Until this is done, absolutely no waste material should be removed from the site.

4. The present W.C.O. #01051 should be cancelled because it is no longer valid.

5. Legal action should be initiated to insure that Motco and its associates take prompt and positive steps toward the elimination of this solid waste site. Consideration should also be given for the inclusion of the previous owners of the site in any ensuing legal action.

IV. Narration:

Petro-Processors has been a highly controversial site in La Marque since its conception in the late 1950's. Citizens living in the La Marque area expressed their dissatisfaction of having such a site located within their city limits by passing an ordinance forbidding the establishment and operation of open petrochemical pits within their jurisdiction. The City Council later passed a resolution which requested the Texas Water Quality Board to cancel the Petro-Processors W.C.O., however, this was never done.

Ownership of the property has changed many times over the past 15 years. As each new owner became aware of the magnitude of the problems associated with the site, a quick sale would transpire and a new owner would be burdened with the problem. This was not the case with the present owners, however. Mr. Holman and Mr. McDonald were quite aware of th problems at the time of purchase. Mr. Holman has indicated that Motco was fully aware of the situation as well. The site was bought with the intention of making a profit from the sale of the waste materials stored in the pits and later reclaiming the land for commercial development. Regardless of this good intent, little or nothing has been done to improve conditions at the site and the plans for removal of the styrene tars are not readily available to District 7. Mr. Holman has been noncommittal as to the details for the removal of the styrene tars from the site, and he has indicated that he is completely unaware of Mr. Brown's plans for the sale or disposal of the material. Please note that Mr. Holman has researched alternatives for disposal or marketing of this material for several years, and he does retain ½ interest in the operation.

Mr. Holman has not arranged for a meeting between Mr. Brown and District 7. He has refused to furnish Mr. Brown's telephone number or address.

It is the feelings of District 7 that it would be in the best interest of everyone concerned that this situation be resolved as soon as possible. As I have previously recommended, consideration should be given to legal action as a means of arriving at a satisfactory solution.

Signed Bill Reeves
Date Dec 16, 1974

BR:pb
Attachments: Copy of deed
Plat of Petro-Processors

133, 136

KG COH004583

AUG 2 1985

Contains Privileged and Confidential
Information-Prepared in the Context
of Mediation and Compromise Negotiation

DECISION ON VOLUMETRIC

WASTE ALLOCATION

FOR THE

MOTCO SITE

August 1985

6503545

Contains Privileged and Conf
Information-Prepared in the C
of Mediation and Compromise N

MOTCO Site Location Map

(from EPA's Record of Decision)

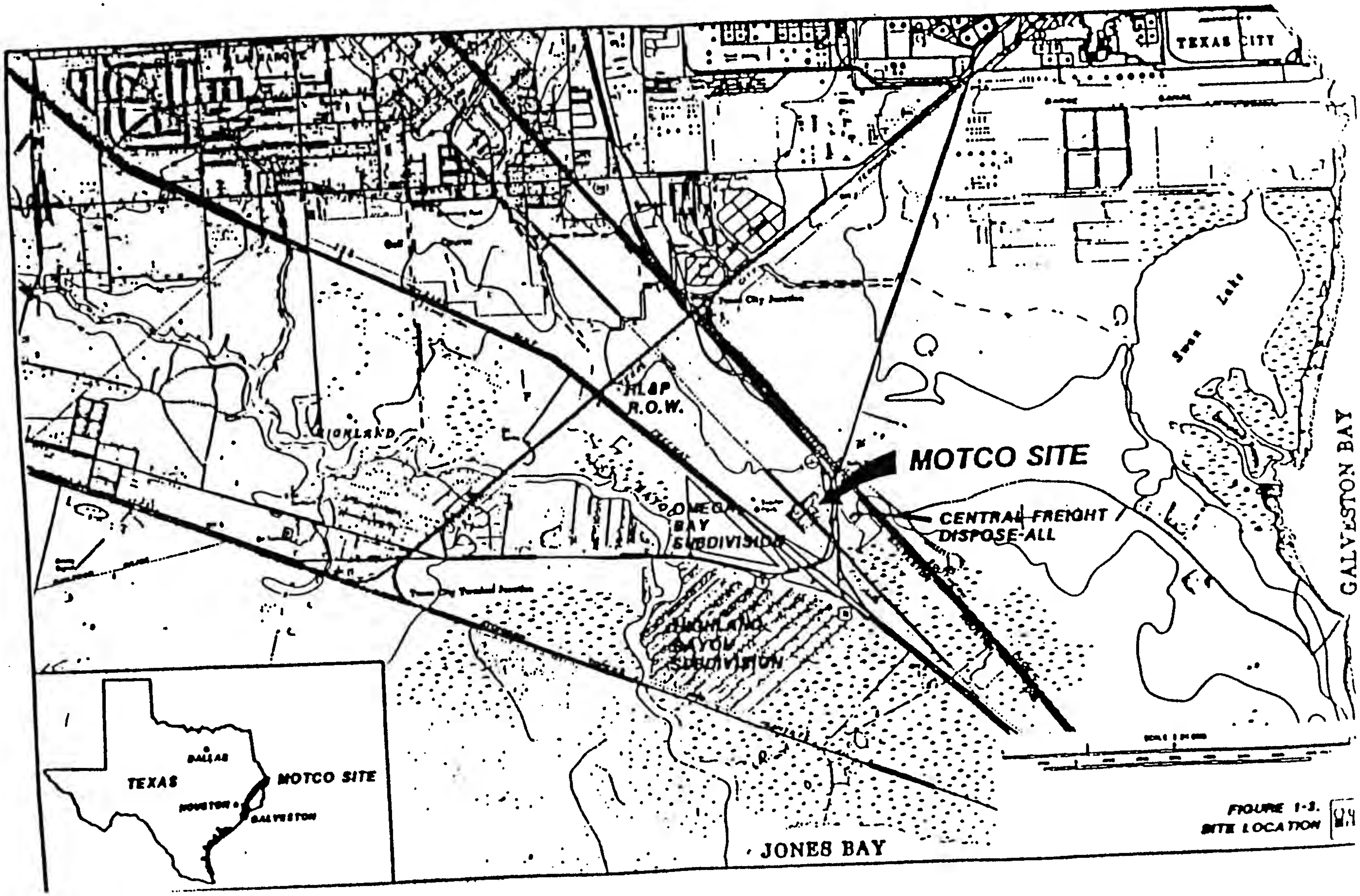

FIGURE 1-3.
SITE LOCATION

6503546

Contains Privileged and Confidential Information-Prepared in the Context of Mediation and Compromise Negotiation

MOTCO Site Location Map

(from EPA's Record of Decision)

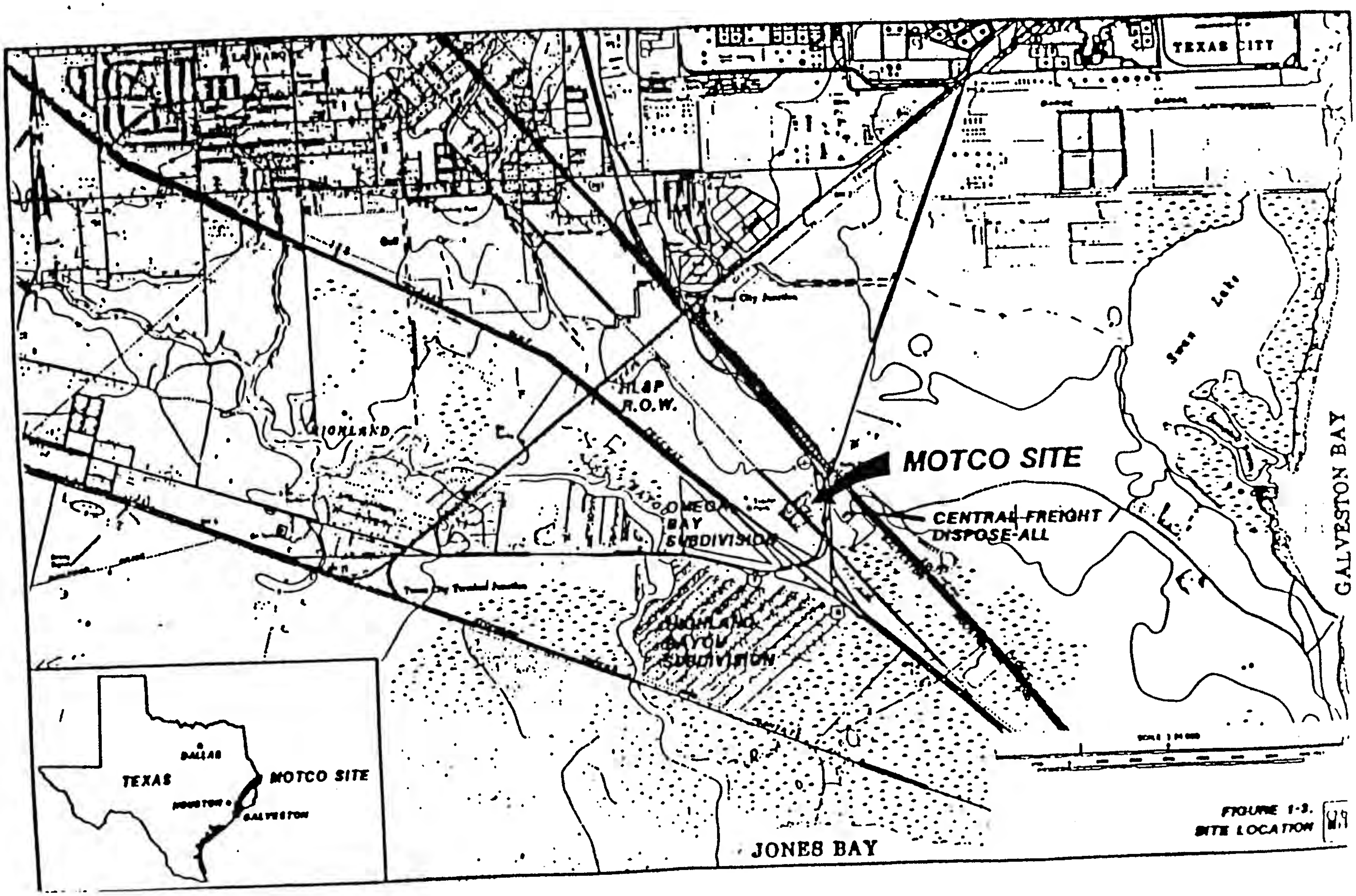

FIGURE 1-3. SITE LOCATION

6503547

KG COH004586

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INTRODUCTION

On the 21st day of February, 1985, Clean Sites, Inc. ("CSI") was requested by the Steering Committee of the MOTCO site (a.k.a. the Texas City Wye site), representing various interested parties, to assist in an allocation process that would assign waste contributions to the MOTCO site among the several companies. Thus, a basis would be provided for parties to apportion response costs at the site. The impetus for the companies' utilization of this settlement process was to accomplish cleanup of the site as carefully and expeditiously as possible with probable cost savings for all concerned. This panel is fully cognizant of the intention of the parties that information and statements made to the panel and conclusions reached by the panel are in the context of an effort to reach settlement and should be protected under Rule 408 of the Federal Rules of Evidence.

The Steering Committee established a consensus that an apportionment of response cost could be negotiated if an authoritative allocation of wastes present at the site could be established. It determined that allocation of the MOTCO site wastes among the companies would best be achieved by the independent panel of experts selected by CSI.1/ The parties recognized that apportioning waste would be difficult due to the passage of time and the loss or destruction of most of the relevant documents. Thus, the panel would assign volumes and types of waste to each of the known contributors after applying its best judgment to the evidence gathered by it through independent investigation and from submissions of information and argument by interested companies and individuals. The panel would then issue

1/ Ed Ekholm is a professional engineer with more than 30 years experience in the petroleum and petro-chemical industry, including Exxon, Pace, Allied Chemical and Bechtel Corp. His son is currently employed by Texas City Refining, Inc.
Kit Krickenberger is a PhD geochemist with 12 years experience with the federal government, MITRE Corp. and Exxon.
Tony C. Liotta is a former Assistant Attorney General of the United States with over 30 years experience in resolving disputes through litigation and negotiation.

its opinion for the review and use of those companies that participated fully in the process. If any such company is dissatisfied by the results of the initial phase of the deliberations, as presented in this opinion, the matter can be resubmitted for a final decision on the challenged allocation which then will be binding as among the full participants.

Seven corporate entities elected to participate in both phases of the process, including binding allocation should it prove necessary. Many of the remaining companies decided not to commit to the possibility of a binding second opinion but agreed to submit all available information and to respond to inquiries from the panel. After the panel's effort is completed, the Steering Committee intends to resume the negotiation process in hopes of converting the information and judgments provided by the panel into an apportionment of response costs.

Dr. John Klacsmann, Executive Vice President of CSI, and Mr. Vance Hughes, Senior Consultant to CSI, convened a preliminary meeting of the panel on March 13, 1985. The purpose of this meeting was to advise the panel of its assignment and deliver various technical reports and other information CSI had on hand concerning MOTCO. On behalf of the Steering Committee, CSI representatives confirmed the independence of the panel in its deliberations and pledged full administrative support.

Initially the panel was to complete its task by April 26, 1985. By mutual consent, the scope of the review and the completion date were extended to allow the panel sufficient time to visit the site and environs, conduct interviews of plant personnel and others and review the submissions of the various parties in excess of 1000 documents.1/ The extended date also allowed the parties the additional time they requested to make their submissions and sufficient time for oral presentations to the panel.

1/ An index to the submissions and documents reviewed by the panel is attached to this opinion as Appendix A. Copies of all submissions and documents are available to participating parties for review at CSI headquarters at 1199 North Fairfax Street, Alexandria, Virginia.

The panel formally convened at Clean Sites' headquarters on April 1, 1985. The original information base consisted of EPA documentation relative to the site, primarily its Remedial Investigation and Feasibility Study ("RI/FS") performed by NUS and its subcontractors (G-244, G-245), Monsanto's companion RI/FS-like document prepared by Woodward Clyde ("W/C") (G-1001), Monsanto's original allocation analysis also performed by Woodward Clyde (G-55), and a collection of truck driver interviews conducted by the Joseph I. Giarrusso investigative agency.

DATA COLLECTION

Early in the process, it became clear that the information on hand was not sufficient to make a fair and credible allocation of waste. Significant controversy surrounded some of the data sources (particularly the driver interviews) and other data was not sufficient to obtain a clear understanding of events that occurred more than two decades ago. Conflicting and unsupported data added to the burden.

Recognizing the need for additional information and clarification of information on hand, the Steering Committee commissioned the panel to obtain as much information as reasonable relevant to its assignment. Needless to say, this was a tedious and time-consuming task ameliorated to a great extent by the cooperation extended by companies.

Accordingly, the panel visited a number of areas and conducted a substantial number of interviews. The panel met with the Giarrusso investigative firm in New Orleans to discuss the investigative procedure and review transcripts of interviews and records; visited the EPA Dallas Regional Offices to obtain a complete copy of their files pertaining to the Wye; inspected the Wye site and environs, including plant locations on the Houston ship channel; visited a number of plants to conduct interviews of various plant personnel and knowledgeable retirees concerning production and waste disposal practices that obtained during the Wye period and to get a better perspective of plant operations. The panel visited the Monsanto, Amoco Chemical, Marathon Oil, American Oil, Texas City Refining Plants, and Texas

City Terminal Railway. The panel also visited the Vacuum Trucks, Inc. ("VTI"), Exxon, Dow, and El-Tex (a.k.a. Mecklo) offices to discuss their waste disposal practices. Similar discussions were had with the Hard-Lowe and Shell representatives. The panel reinterviewed Driver #4, Clifton, and Driver #7, Legg, as requested by many parties. Telephone interviews and discussions took place with a myriad of others to obtain or supplement data concerning the site operation, Swan Lake, and various individual waste generating operations and incidents. The panel propounded written questions to various companies to which most responded with material very relevant and helpful to the panel in assessing the scope of their activity at the Wye. Four companies, namely Monsanto, Amoco Corp., Texas City Refining, and Petro-Chemical Transport, accepted the panel's invitation to make an oral presentation on June 11 and 12. Those hearings consumed the entire allotted time and were extremely helpful to the panel.1/

The data collection effort described above resulted in the general categories of information set forth below. A complete listing of information may be found in Appendix A.2/

(1) Documentation (letters, memos, invoices, trip tickets, etc.) generated contemporaneous to the Wye's operation
(2) Sworn testimony (depositions and affidavits)
(3) Non-sworn interviews and statements
(4) Analytical data
(5) Documentation generated after the Wye's closure

1/ The panel commends counsel and all others who participated for their informative presentations.

2/ Throughout this opinion the panel references certain evidence to support a particular point. It should be understood that the panel relied on the entire record before it and that the references used are not to be considered exclusive.

All available information relevant to the problem before the panel was carefully reviewed. Older plant documentation was generally accorded substantial weight. Unfortunately, due to normal retention policies and practices, those kinds of records had generally been destroyed or remained only in fragments. Statements under oath, made without reservations or limitations, were accorded particular attention. In most instances, it was necessary to analyze a mass of information to arrive at a determination because no one piece of information was generally conclusive.

Although it has assembled its own record consisting of well over a thousand documents and diligently reviewed each of them many times, the panel recognizes the difficulty in completely accurately portraying the Wye site or activities occurring there within the last 25 years. Indeed, due to the fogginess that time inevitably lends the past, it believes that such knowledge cannot be acquired no matter the level of effort expended. Lacking it, the panel has nevertheless strived to achieve a fair allocation. It has done this by using the data sources in the way described above, consulting its professional experience in the industrial world as to what would have constituted standard operating practices during the time period being addressed, and considering the level of assistance provided by the potentially responsible parties.

It is appropriate at this time to address three of the ground rules the panel established and followed:

(1) The panel did not address any illicit dumping that may have occurred subsequent to the Wye's closure in April 1968.

(2) "Coincident with the Wye" is defined as eight calendar years from 1960 through 1967. This is the period of time applied to routine use of the Wye by all companies. 1959 was exclusively devoted to relocation of Monsanto's N-80 wastes. The transfer of that waste extended into 1960.

(3) There was insufficient evidence to determine whether or not

transporters were responsible as generators, except as to materials hauled from their wash-out pits. The Table of Inputs identifies the principal haulers.

APPROACH AND SUMMARY

The panel established three volumetric allocations, the last of which distributes the waste remaining at the site to those companies for which the evidence and the panel's reasoning and assumptions supported attribution. Table 8 at the end of this report presents a tabulation of Gross Inputs (wet), Contained Material Inputs (dry) and Residuals (waste remaining).

Waste-in Allocation

The relationship between "waste in" and volume presently in the Wye pits is believed to be relevant to the problem before us as heretofore stated. There is no question that W/C considered "waste in" part of the overall equation as evidenced by their report. W/C not only used the truck drivers' testimony to identify the parties sending waste to the Wye but to estimate volumes of wastes sent to the Wye. Suffice it to say at this point, however, that the panel is fully cognizant of its mission to determine, within reasonable limits proscribed by the evidence before it, the volumes of different wastes in the pits.

The waste-in determinations provide part of the basis for arriving at a best judgment allocation of waste remaining. The waste-in volumes were developed on a company-by-company basis and the rationale for each is summarized below. Generally, waste type, volume and site of disposal were assessed by reviewing production data and waste handling procedures where some form of information was available.

The generators fall into three categories - routine users, incidental users and those for whom insufficient evidence was available for the panel to confirm disposal at the Wye. Consideration was not limited to the official EPA Potentially Responsible Party list as the panel attempted to address the entities that appeared in the record even if only to establish that it lacked sufficient evidence to make an attribution.

The panel was able to assign to several companies some 55 million gallons of waste disposed at the Wye. It estimates that an additional 15 to 20 million gallons were disposed at the Wye but could not be assigned.

Waste Remaining

In order to reconcile the results of this pro-ration methodology, consideration was given the analysis of the pit contents. The pro-ration method utilized involved developing migration factors based upon intuitive judgment, rather than a mathematically derived consideration of the material densities, viscosities, solubilities in water and other mass transfer properties. In doing so, the panel principally relied upon the available Woodward-Clyde fingerprint and Remedial Investigation/Feasibility Study data (G-55, G-1001), and made some use of EPA sponsored reports (CH2M Hill, Black and Veatch and others) and, of course, the analytical work of Monsanto and Amoco, which helped to clarify many of the technical identification issues. Through this approach, the panel was better able to judge and make any necessary corrections to the selected migration factors by comparing the calculated residue and the residue shown by actual analysis. It was recognized that the pit analysis represents the residual from attributed as well as unattributed waste-in streams, and the panel's approach was limited to attributed waste-in streams. As noted later in this report, the panel found that there was at least 20 million gallons of unattributed waste streams (which would have resulted in an estimated residuum of about 2-1/4 million gal). These unattributed waste streams could, depending upon their actual volume and makeup, bear significantly on the extent to which the calculated residuum and actual residuum should in fact equate. The panel used its best judgment in applying this correction.

THE SITE AND ENVIRONS

The MOTCO site is located in LaMarque (Galveston County), Texas, about two miles south of Texas City near the junction of Interstate Highway 45 and Texas Highway 3. The site consists of about eleven acres of land and is bounded on the east by State Highway 3, on the northwest by an abandoned trailer park and on the southwest by Houston Lighting & Power transmission lines. (See map at front.)

A majority of the chemical companies and refineries in the Texas City area are within a five-mile radius of the Wye. The Wye is approximately 25 miles south of the Houston ship channel where some of the companies of interest are located. The Texas City Municipal Dump on Bay Street is approximately five miles northeast of the Wye. There was an industrial dump located in the hurricane protection levee near the intersection of FM 519 and Loop 197, approximately two miles northeast of MOTCO, that was abandoned prior to 1967. Permits were granted to Petro Processors, Inc. (permit # 01051 issued 8/20/64)1/ (AAA-496) and Malone (permit # 01049 issued 8/7/64)2/ (AV-1022). Location 2 of Petro Processors' permit and Malone's permit pertained to disposal sites in the Swan Lake area. The extent to which those sites were available for use or utilized will be hereinafter discussed. Those sites were in close proximity to the properties being developed by Gulf Coast Waste Disposal Authority. There are other disposal sites in the Texas Gulf Coast area that are referred to in this opinion when describing waste disposal practices of certain companies.

The site is situated on the edge of a coastal marsh system, approximately 3-4 feet above mean sea level. Approximately 3000 people live within a one-mile radius of the site.

1/ The Wye was designated location #1 on said application for the permit and Swan Lake as location #2 (AAA-500).

2/ On 3/19/76, this permit was amended to permit #39004 (AV-1023). The Malone permit was cancelled on 12/5/77 (AV-1024).

U.T. Alexander (Petro Processors, Inc.) purchased the Wye site in 1959 (AAA-1059). The site contained a number of storage tanks and seven unlined waste pits #1-7 (7 & 7N combined), estimated to contain approximately 15 million gallons of contaminated water, high and low B.T.U. liquid organics and sludges/tars/solids; according to Black and Veatch, consultants, the pits covered approximately 4.6 acres of the 11.3 acre site. U.T. Alexander caused pits 1-5 to be dug before 9/11/59 and pits 6, 7 and 7N in late 1959 to early 1960. Pits 1-6 were utilized for the storage of mixed tars, obtained from Monsanto's N-80, to be utilized in Alexander's reclaiming operation (AY-466). After Hurricane Carla in 1961, Alexander essentially abandoned his reclaiming operation but from 1960 to 1968 waste materials from other companies were accepted for dumping at the site for a set fee.

In 1968 when the City of LaMarque prohibited open pit disposal (AAA-552), Petro Processors ceased to exist as a viable company and discontinued all operation at the Wye. In April 1969, Mainland Bank of Texas City foreclosed a lien on the property and sold it to J.W. Yeatman and Associates in 1970 (AAA-1061), who later conveyed it to Wye Development, Inc. (AAA-1062). In 1973, the property was leased to J.R. McDonald and Thomas Holman (AAA-1063) who tried unsuccessfully to recycle the waste material in the pits. In 1974, Wye Development, Inc. sold its property to MOTCO, Inc. (AAA-1060). In July 1976, the Texas Water Quality Board cancelled the waste disposal permit pertaining to the Wye (AAA-498). Subsequently, MOTCO filed for bankruptcy and the assets of the company have been managed by a trustee in bankruptcy (AAA-1063).

WASTE IN

The panel is of the opinion that there is a relationship between "waste in" and volume presently in the Wye pits. "Waste in" helps identify the chemical makeup of the pits and the company or groups of companies that could have been involved in the dumping. Further, heavy density material, e.g., tars, generally were not displaced by natural events to any great extent. Reliance also had to be placed on "waste in" because of the

Monsanto reports that between 1954 and 1959, 15.24 m gallons of the various tars were produced (Table A-2 to A-7, W/C).1/ Of that total, Monsanto reports that 7.14 m gallons were incinerated or burned in boilers (Table A-2 to A-7, W/C and AY-438). W/C's reported boiler burning capacity of 23,000 lbs/dy is supported by internal documents transmitted to the panel by letter dated 5/15/85 (AY-743). The remaining 8.10 m gallons were stored, according to Monsanto, in the five N-80 pits, of which 6.075 m gallons (wet and dry basis) (Table 3.1, pg. 3-4, W/C Summary) were relocated to the Wye. The difference between the amount stored in the N-80 pits and the amount relocated to the Wye was attributed to soakage of waste into the pit walls and floor and to mishandling (AY-1017, pg. 41).

The panel concludes that Monsanto's estimate of 6.075 m gallons of tars relocated to the Wye from the N-80 up to 1959 is reasonably supported by records of production and burning capacity of the boilers hereinafter discussed.2/ Its chemical analysis lends support to that conclusion. The weight the panel has accorded Monsanto's and Amoco's chemical analyses and the reasons, therefore, will be discussed in another section of this opinion.

We now turn our attention to the volume of wastes produced by all relevant Monsanto departments and the volume of <u>other</u> wastes sent to the Wye.3/ The panel reviewed all available data concerning Monsanto's plant

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1/ Woodward-Clyde Consultants.

2/ In addition, the panel also calculated the volume of waste contained in the N-80 pits based on Monsanto dimensions and allowing for the soakage and other factors arrived at approximately the same volume.

3/ On 2/2/60, all Monsanto production and maintenance supervisors were instructed to have all liquid waste materials, except acid and lime slurry, hauled to and dumped at the Wye. Pits at the N-80 were no longer to be used for that purpose (AY-444). There is evidence that tars were hauled directly to the Wye as early as 9/59 (AY-430). Monsanto terminated its contract with Petro Processors to dump at the Wye and ceased dumping at the Wye on 12/31/67 (AY-455, AY-458, AY-459).

volumetric vagaries of the various chemical analyses. The panel's assessment of waste generated by each company beginning with Monsanto follows. Tables 1 and 2 (pages 107-110) summarize the results of the company-by-company analysis of waste types and amounts contributed to the site.

MONSANTO

The Monsanto plant is located in the southeast corner of Texas City, Texas, and is bounded on the east by a hurricane levee and the Texas City harbour; on the west by Loop 197; on the south by the Texas City Terminal Railway property and on the north by 2nd and 6th Avenues. A levee gate provides access to the docks. Monsanto's North-80 (a.k.a. N-80) is approximately 3 miles north of the plant and the MOTCO (Wye) site is approximately 3 miles southeast of the plant with easy access via Loop 197.

The plant was acquired by Monsanto after World War II (mid '40s) from the federal government. During WWII, Monsanto operated the plant for the government in its efforts related to the production of synthetic rubber. After acquisition, the plant continued to be utilized for the production of styrene monomer. Around 1952, an acetylene chemistry-based complex was added in what is commonly referred to as the "west end". There were subsequent plant additions related to that chemistry into the early '60s. Thereafter, low and high density polyethylene plants were added (AY-1017, pp. 1-5).

In early 1959, U.T. Alexander d/b/a Industrial Service Company, as evidenced by an unsigned letter agreement (AY-436), commenced removal to the Wye of Monsanto's styrene, acrylonitrile, vinyl chloride and ethylene (lead pot and Dept. 10) tars which had been collected in pits at Monsanto's N-80.1/

1/ On 12/30/59, Monsanto Chemical Company contracted with Petro Processors, Inc. to dump all its wastes (exclusive of acids) at the Wye. This was a one year contract (expiration date 1/31/61) and provided for payment of $3.75 per load (loads not to exceed 6000 gallons) with a minimum charge of $750 per month or 200 loads per month (AY-437). This agreement was extended on 12/8/60 for an additional term of 5 years (AY-442). The term of this agreement was further extended (AY-450) until its termination on 12/31/67 (AY-455).

operations and waste production for the period of operation of the Wye. The panel appreciates the efforts made by Monsanto to furnish to it all available internal documents bearing on the question of waste production.

The operating history of the various plants relevant to this inquiry is tabulated as follows:1/

Dept. #		Time of Operation
1 (aka 100)	Ethylene-lead pots	1943-64
1	Ethylene	1957-80
2, 3, 4, 5	Ethylene benzene alkylation & distillation	1943-72
6, 7, 8	Styrene dehydro & distillation	1943-72
17, 18	Oxygen & acetylene	1952-70 2/
20	Acrylonitrile-1	1952-70
21, 22, 23	HCl, VCM, EDC	1952-69
24	Waste Incinerator	1952-79
34	Vinyl acetate monomer	1962-70
35, 36	High density polyethylene	1963-82
41, 42, 43	Low density polyethylene	1955-75

1/ Table A - based on AY-433.

2/ AY-430 indicates this operation started in 1951.

DEPT. 1 (a.k.a. DEPT. 100)

LEAD POT ETHYLENE PLANT

The original ethylene producing facility for styrene was built in 1943 and operated to 1964. It employed a novel cracking process utilizing molten lead pots. This plant produced a heavy tar co-product which was dumped at the N-80 and later, for the most part, at the Wye. It was reported by H.P. Chauvin1/ in 1956 (AY-434) that the tar yield was 3.2% of ethylene yield from propane cracking and that tar production for a 3 month period averaged 2000 lbs/dy. In 1956, F.E. Grissom2/ reported the lead pot tar yield at 4200 lbs/dy (AY-435). W/C in its report (Table A-4, pg. 8) utilized 4200 lbs/dy and a density of 8.96 lbs/gal. This equates to 469 gals/dy, 168,840 gals/yr, or 1.01 m gal sent to the N-80 between 1954 and 1959 (W/C Table A-4).

After assessing the available materials, the panel concludes that the daily production as reported by Grissom (4200 lbs/dy) and adopted by W/C is most representative of the volume of waste this type of plant would produce. Chauvin references only a three month yield whereas Grissom uses estimates of total current output to be utilized for planning purposes. The panel is also in agreement with W/C's density factor of 8.96 lbs/gal, considering the type of feed (propane) utilized in this process. The panel, therefore, concludes that the daily production was 470 gals/dy and that 1.01 m gal, produced between 1954 and 1959, was sent to the N-80. The 170,000 gallons produced each year were taken to the Wye for the years 1960-1963.

DEPT. 10

ETHYLENE

In 1957, Monsanto expanded to ethylene production. Until 1980, Dept. 10 operated utilizing a conventional fired heater cracking unit. The panel is aware of the fact that at some point during this period, Monsanto changed from a light hydrocarbon feed to a liquid feed but determined its assessment on reported waste not specific feed stocks.

1/ Former supervisor of waste disposal - retired.

2/ Utilities general operating supervisor - recently retired.

Grissom, in 1958, reports a tar waste stream of 4300 lbs/dy (AY-435). Utilizing W/C's density factor of 8.5, this would equate to 505 gals/dy. W/C applied that density factor to a production figure of 4110 lbs/dy (A.5, pg. A-9). Chauvin, in 1956, reports waste at full production to be 1.0 g.p.m or 43,200 gals/mth (AY-434). Although the panel has ignored tar production for Dept. 10 before January 1957, it is concerned that Chauvin's 1956 report antidates the otherwise reported 1957 plant startup date in exhibit AY-433. The panel does not accept Chauvin's reported production rate believing production is more in line with Grissom's and W/C's reports. Chauvin appears to use projections before startup of the plant whereas Grissom's base is estimated on current output.

Grissom also reports a water oil (40% oil) waste stream from Dept. 10 in the amount of 3500 lbs/dy (AY-435). Assuming a density of 8.3 lbs/gal, typical of such oily waste material when cracking liquid feed, the panel estimates a waste production of 411 gals/dy of water oil which generally conforms with Grissom's data. Combining 411 gals/dy water oil waste production and the reported 505 gals/dy of tar production equates to about 27,480 gals/mth as compared to Chauvin's reported 43,200 gals/mth. Perhaps these anomalies are because of a change of feed stocks. In any event, the panel utilized for its purpose 480 to 500 gals/dy of tar production and 400 gals/dy of 40% water oil. Caustic water was assumed to go into the sewer system and exit through the outfall. W/C (A.5, pg. A-9) reports that this tar went to the N-80 for 3.5 years. The panel concludes that during those 3.5 years approximately 500 gals/dy of tar went into the N-80, part of which was eventually relocated to the Wye. We comment on the disposition of the water oil later in this opinion.

DEPTS. 2, 3, 4, 5
ETHYL BENZENE

Dept. 1 was designed to provide ethylene for ethyl benzene production. This was accomplished by reacting ethylene with benzene in an aluminum chloride alkylation operation, followed by a rerun of the crude EB alkylate in distillation columns. Alkylation and distillation were accomplished in two parallel trains and these units were called Depts. 2, 3, 4 & 5. Depts. 2, 3, 4 & 5 operated from 1943 to 1972 encompassing the entire life span of the N-80 and the Wye. Alkylation (2 & 3) and distillation (4 & 5) produced ethyl benzene and 5 waste products (AY-447):

- Spent Caustic (10%) (1.3 sp. gr.) - 8.9 m lbs/yr, which was 950,000 gals/yr
  Discarded to sewer
- Emulsion (20% HC) 447000 lbs/yr - 50,000 gals/yr
  (reputed to be a waste disposal problem)
- Toluene - sold
- Flux Oil Tower Bottoms (.94 sp. gr.) - 14.4 m lbs - 1.8 m gals/yr to styrene tar
- Spent Al Cl_3 catalyst - 10 lbs/gal (11% Al Cl_3) 2.085 m gals/yr
  1/2 sold
  1/2 to Malone and dumped

J.P. Hickman[1/] reports in an internal memorandum dated 1/17/66 (AY-447) that spent caustic was disposed of in the sewer system and toluene was sold.

The value of toluene precludes consideration of dumping and the memorandum is sufficient evidence of disposal of the spent caustic through the sewer system at that time. The panel finds accordingly. The panel also accepts the statement by Hickman that 1/2 of the Al Cl_3 sludge is also sold, although there is nothing in the record to indicate precisely what use a third party would have for that material. It is also probable that some portion of the Al Cl_3 sludge was dumped at the Wye. It should be noted that toluene is carried as an EB product and is not considered again with the styrene departments.

1/ Materials engineer.

The panel agrees with Monsanto's assessment that disposal of emulsion was a problem. As such, the panel determined to account for that waste stream as part of the "skimmings". Giving Monsanto the benefit of the doubt concerning Al Cl_3 sludge, only 50% of said waste is considered to have been dumped outside the plant. EB bottoms were considered part of the styrene tar waste.

Finally, as to this department, the panel utilized the following waste streams and volumes as reported by Hickman who analyzed waste volumes for these plants:

o	Emulsion	140 gal/dy
o	Spent Catalyst	2900 gal/dy
o	Flux Oil	5000 gal/dy

DEPT. 6 - STYRENE DEHYDRO

DEPTS. 7, 8 - STYRENE DISTILLATION

Ethyl benzene is dehydrogenated in-steam over iron oxide catalyst (Dept. 6) and the product is rerun to remove the heavy tar. The EB flux oil diluted with that tar includes the flux oil production from Depts. 4 & 5. This volume of waste has been included by the panel in its determination. Dehydro catalyst is a solid waste and is accounted for by Hickman in his 1966 memorandum (AY-447). He reports an annual quantity of 450,000 lbs/yr.

Crude styrene tar is an end waste of the styrene distillation process of Depts. 7 & 8. With regard to the net volume of styrene tar to be disposed of, the W/C report presents Monsanto's calculation of volumes in Table A.2, pg. A-6. As previously indicated, the panel is satisfied that the volumes of tars transferred to the N-80 by Monsanto and relocated to the Wye have been reasonably estimated. There is evidence that after 1960 most of the styrene tars were either burned in the boilers or sold. We will deal with that phase of the styrene tar history when we discuss the various agreements concerning the sale of styrene tars and burning capacity of the boilers.

Chauvin, in his memo to Cunningham on 5/7/56 (AY-434) as to Depts. 7 & 8, reports tar residue of 46,130 lbs/dy. At 8.76 lbs/gal, this equates to 5270 gal/dy. Grissom, in 1958 (AY-435), reports tar residue of 17,000 lbs/dy or 1940 gal/dy. This is a net figure after burning (3000 hot gals/dy or 2630 cold gals/dy). His reported tar residue of 1940 gal/dy plus a burn rate of 2630 (cold gal) per day is equivalent to a total tar production of about 4600 gal/dy.

In Sept. 1959, Grissom reports (AY-438) that during August of that year, all styrene tar was burned in No. 1 & 2 Power except 16,000 gallons of styrene tar that went to the Wye.

W/C (A.2, pg. A-6) reports styrene production of 17.33 m lbs for 1959 which equates to 5495 gals/dy.

W/C's table on A-6 shows a steady increase of styrene tar production from 1954 to 1960. The panel, using the data from AY-438, 447, 472, calculated tar production for the years 1960 to 1968. The panel's approximation for those years was based on styrene production capacity as reported in AY-472 (1958-1968) and a tar yield of 4 1/2 lbs per 100 lbs of styrene produced as reported by W/C Table A-12, pg. 6. The conversion to gals/dy was made using 360 days per yr and 8.76 lbs/gal as used by W/C Table A-2, pg. A-6. Beginning in 1960, all this tar was sold and this production was well within the capacity of Hard-Lowe's plant. The panel's resultant estimates (Table B) are as follows:

Year	Styrene m lbs/yr	Tar gal/dy
60	470	6720
62	500	7150
64	500	7150
66	630	9000
68	750	10700

6503569

DEPT. 18

THE ACETYLENE PLANT

The acetylene plant produces three waste streams — soot water, soot oil and filter washings.

The soot in water was approximately 6% which is expensive to incinerate (AY-448). On the other hand, soot oil (#2 fuel oil containing soot) is relatively easy to incinerate and dumping of that waste stream is assumed to be sporadic at most. The filter waste sooty water produced by washing bag filters was taken to the Wye until it closed in 1967 (AY-451).

Acetylene production as calculated by E.R. Hendrick[1/] in his worksheets, for preparation of a response to the Ekhardt questionnaire, reports an average acetylene production for the years 1953-1967 of 50 m lbs/yr. Production ranged from 30 m lbs in 1953 to 100 m lbs in 1967 (AY-461).

In 1959, Grissom reports 936,000 gal/mth or 31,000 gal/dy soot water production (AY-438). Acetylene production at that time appears to have been about 50 m lbs/yr (AY-461).

In Oct. 1965, soot water production was reported at 40,000 gals/dy. This was at a time when acetylene production had increased close to 100 m lbs/yr (AY-461).

The panel adopts an average of 35,000 gals/dy soot water production. Mr. Hendrick's calculations in AY-461 were extremely helpful to the panel although we recognize they were only rough approximations. It is noted that his calculations for soot water are erroneously high, as he himself noted. The error is the soot yield he assumed.

1/ Environmental Engineer

6503570

In 1956, Chauvin reports average soot oil production at approximately 291,000 lbs/mth of about 40,000 gals/mth or approximately 1300 gals/dy. He places the yield of soot oil at 8.58 lbs per 100 lbs of acetylene produced. Soot content in #2 fuel oil is reported to be 7.6% (AY-434).

Grissom reports average soot oil production at approximately 50,000 gals/mth or approximately 1600 gals/dy in 1959 and 8% soot content in #2 diesel fuel oil (AY-438).

For its purposes, the panel concludes soot oil production at the rate of approximately 1600 gals/dy. This is believed to be very reasonable in view of the acetylene production expansion.

It is reported in AY-451 that filter washings were hauled to the Wye. No volumes are stated and no accounting is made of acetylene polymerics. The panel has included filter washings as part of its soot water production figures.

DEPT. 20
AN-1

Monsanto operated this plant from 1952-1970 (AY-433). It is identified as AN-1 to distinguish this plant based on acetylene and hydrogen cyanide from plants built later using ammonia and propylene. Those later plants are not a factor in the history concerning the Wye.

W/C reports AN tar production to be 3300 lbs/dy (density 8.5 lbs/gal) or 390 gals/dy (W/C A-6, pg. A-10). W/C's report is silent as to copper bearing tar. In fact, W/C does not distinguish between AN tar bottoms (heavy ends of the AN distillation tower) and copper tar bottoms (withdrawn from reactors to purge inactive catalyst).

6503571

In late 1955, the tar yield was set at 9.8 lbs/100 lbs AN or 6890 lbs/dy or 810 gals/dy. The composition of that material was: 10% AN; 40% LN; 25% CNB; 25% high boiler (AY-434). This appears to be tar from AN purification, not catalyst tar which is withdrawn from reactors, since no mention is made of copper.

Grissom refers to 3500 lbs/dy of heavy catalyst tar being produced in 1958 and being given to Hard-Lowe. He states that the material would again go to N-80 if the Hard-Lowe agreement is cancelled (AY-435). Assuming a density of 8.5 lbs/gal, 3500 lbs/dy equates to 410 gals/dy. This compares favorably with the 390 gals/dy taken to N-80 as calculated from W/C Table A.6. Grissom also reports an average of 106,000 gals/mth (20-D-26 overhead) of "organic tar" containing 25% CNB and 75% water that was incinerated between January and July 1959. This is not really tar but is a material needing incineration to destroy cyanides.

In 1965, Schoeffel[1/] discusses AN tar sales. His statements as to revenue and price per ton indicates production at the rate of 2400 tons per year or 40,000 lbs/mth. This equates to about 1570 gals/dy. He indicates that selling this amount only reduces dumping at the Wye a negligible amount (AY-446). The volume the panel infers is not negligible, so there could be an error.

In a memorandum dated Oct 7, 1965 (AY-455), Weekley deals with plans for incinerator downtime (10 days). He estimates some 2500 gals/dy of AN tars would have to be stored for that period for later incineration. These are believed to be 20-D-26 cyanide materials.

In September of 1967, Hendrick discusses alternatives for dumping tar materials at the Wye (AY-452). He states that AN tars can't be burned because of its copper content. (This means the material is catalyst tar.) He states that about 20 tons/mth could go to C.O.P.E. which is about 150 gals/dy.

1/ Purchasing agent.

In October 1967, R.M. Eaton[1] reports AN reactors produce about 130,000 lbs/mth of copper bearing tars which have no catalytic activity and, therefore, must be disposed of. He goes on to say that Vaughn recovers (by roasting) copper from the tars for resale (AY-453).

In summary, the panel has production references for AN tar (Table C) as follows:

Document	Year	Gal/dy	Composition
W/C	55/58	390	8.5·lb/gal
AY-434	Late '55	810	HC only
AY-435	10/58	410	Contains copper
AY-435	1958	3530	Cyanide destruction - CBN not tar
AY-446	1963	1570	Contains copper - appears high[2]
AY-445	1965	2500	Cyanide destruction - CBN not tar
AY-452	1967	150	Contains copper
AY-453	1968	500	Contains copper
AY-461	1978	336	Contains copper

The panel infers that there are two AN tar streams and perhaps an additional sludge — a copper containing tar stream and a tar stream produced by fractionating of AN.

For the period 1955 to 1958, the panel believes that W/C's estimate of 390 gals/dy is reasonable as supported by Grissom's report in 1958. After 1958, the panel assigns a production rate of 500 gals/dy of copper bearing AN tars. There is no accounting for a fractionator bottoms stream such as is described in AY-434. In addition, there is a stream called AN TAR that is incinerated. This appears to be overhead from 20-D-26 which must be incinerated for cyanide destruction. The 500 gals/dy were directed to the Wye from 1961-1965.

It appears that copper bearing tars were given to Hard-Lowe from 1959 to 1960 (AY-435). In 1966 and 1967, it was sold to Vaughn Chemical Co. (AY-448). The panel concludes that from 1961 to 1965 said tars were sent to the Wye.

1/ Engineer.

2/ The panel ignores this production.

6503573

DEPTS. 21, 22, 23

ETHYLENE DICHLORIDE/VINYL CHLORIDE

These plants operated between 1952 and 1969 (AY-433). Monsanto either produced or acquired ethylene dichloride and cracked it to produce VCM and HCl. They reacted HCl with acetylene to produce more VCM. This combined operation produced chlorinated tar, the only waste stream associated with this product that was considered by the panel.

W/C, Table A.3, pg. A-7, states that average tar production was 25,000 gal/mth with a density of 8.5 lbs/gal which equates to 833 gals/dy. In fact, this was not production but the amount sent to N-80 over and above what was incinerated. Production was approximately double W/C's reported production. W/C does not indicate the disposition of said tars prior to the opening of the N-80.

Chauvin reports that an average of approximately 500 lbs/hr of residue containing 30% EDC, 60% TCE and 10% tar was produced. His 3 month average in 1956 was 620 lbs/hr or 1750 gal/dy or 52,500 gals/mth (AY-434).

Grissom, in Sept. 1959, reports chlorinated tar production at 53,000 gals/mth or 1,770 gals/dy. Of that 53,000 gals/mth produced, 21,000 gals/mth was incinerated (AY-438).

A synopsis of memos reports volumes of chlorinated tars between 5 and 8 m lbs/yr. A mid-volume (6.5 m lbs/yr) is equivalent to 2120 gals/dy (AY-430).

The panel believes that 1700 to 2000 gals/dy is a representative tar production volume. Commencing 9/2/59 and through 1968, these tars were sold to Hard-Lowe Chemical Co. Commencing in 1954 to 1959, 1/2 of these tars were incinerated and 1/2 sold. Most of the year 1959 is not accounted for and the panel concludes that 1/2 of the tars went directly to the Wye for that year.

6503574

DEPT. 34

VINYL ACETATE

Production of vinyl acetate began in 1962 or '63 and ceased in 1970. The plant is an extension of the acetylene based chemistry to produce this monomer from acetylene and acetic acid using a zinc acetate catalyst (AY-433).

There is no evidence of plant size or quantity of waste generated. Efficiency of the reaction might lead one to interpret that waste was generated on the order of 1% of the production rate, e.g., as in the case of a tar withdrawn from the Dopp Kettle.

It is clear that this material went to the Wye during the plant life (AY-430). The panel finds no evidence of other dispositions. With no evidence to the contrary, the panel assumes 2 m lbs production per year or 650 gals/dy went to the Wye from 1963 to 1968.

DEPTS. 35, 36, 41, 42, 43

LOW & HIGH DENSITY POLYETHYLENE

Dept. 35 produced high density polyethylene from 1963 to 1982. Depts. 41, 42 and 43 produced low density polyethylene from 1955 to 1975 according to Dean Danzer (AY-433). Several waste streams flowed from this production:

1. Scrap - crystalline polymer
2. Pellets - an off spec finished product
3. Wax - recovered from methanol solvent and precipitated as big chunks
4. Powder - slurry - extruded to form pellets

Originally, the scrap was sold to Malone for reprocessing to low grade polymer but as market prices declined Monsanto was required to pay Malone to haul the material to the Texas City Dump on North Bay (Danzer testimony). Similarly a market existed for the wax in the earlier years of production but after the first 5 years when it became a problem, it was probably likewise hauled to the Texas City Dump.

6503575

Pellets and powder were definitely a problem for the Dept. 35 operation and especially in the first year of startup when a large volume was probable, although difficult to quantify.

According to W/C, Table 3.1 - pgs. 3-4, Monsanto sent 7,829,000 gallons (wet basis) or 783,000 gallons (dry basis) to the Wye. W/C in the same table reports 4,326,000 gallons of hexane (wet basis) or 2,163,000 gallons (dry basis) sent to the Wye. This hexane was supposedly absorbed in the polyethylene.

In early 1966, a Monsanto tabulation of annual costs associated with waste disposal (AY-448) shows that Petro Processors was paid $20,000 or $25 a load for hauling and dumping. This equates to 8.4 m gals for 8 years. Hendricks, in his estimate of waste production for the Exhardt report, uses 4 m lbs/yr of total production and then reduces it to 3 m lbs as a more probable average (AY-461). The panel believes Hendrick's figures are consonant with the 8.4 m gals derived from AY-448.

The panel adopts an 8 yr production volume of 8.4 m gals (wet) for polyethylene and hexane, but notes that Dept. 35 had problems during its early years of operation (started in 1963). The panel, therefore, does not use an average and recognizes increased production in '63 and '64. Recognition was also given to the fact that only the low density polyethylene plant operated between 1960 and 1963.

The annual volumes of waste assigned for these departments by the panel for the years 1960 to 1968 is as follows:

1960	-	600,000 gals
1961	-	600,000 gals
1962	-	600,000 gals
1963	-	1,800,000 gals
1964	-	1,500,000 gals
1965	-	1,100,000 gals
1966	-	1,100,000 gals
1967	-	1,100,000 gals

65C3576

KG COH004615

DEPT. 25

TERTIARY BUTYL AMINE

The waste attributable to this operation (lime slurry) which commenced in 1955 (AY-433) was not sent to the Wye but directed to the N-80 (AY-434, 435, 462).

DEPT. 31

METHANOL

The filter backwash waste that was produced by this plant that operated from 1955 to 1970 was sent to the N-80 (AY-433).

DEPT. 27

LACTONITRILE

There is no record of any waste produced from the plant that commenced operation in 1963.

DEPT. 33

LACTIC ACID

The ammonium chloride waste produced from this operation which commenced in 1963, was sent to the N-80 (AY-452). Hendrick estimates waste production to be 8500 tons/yr - 1.9 m gals/yr or 5200 gals/dy. The panel believes this waste was not directed to the Wye.

WATER SLUDGES

These sludges were sent to the N-80 primarily by pipeline (AY-438 and 452).

HYDROGEN CHLORIDE

Minor HCl surpluses were sent to Wye (AY-438 and 452).

6503577

SUMMARY

MONSANTO WASTE PRODUCTION[1]

Dept.	Name	Waste	GPD
1	Lead Pots	Tar	470
10	Ethylene	Tar	500
10	Ethylene	40% Oil H_2O	400
2, 3	E.B. Alkylate	Al Cl_3 Sludge (1/2)	2900
4, 5	E.B. Distillate	Emulsion	140
4, 5	E.B. Distillate	Flux Oil	5000[2]
6	Styrene Dehydro	Iron Oxide Catalyst	110[3]
			Yr — GPD[4]
7, 8	Styrene Rerun	Styrene Tar	1958 — 1550
			1960 — 1720
			1962 — 7150
			1964 — 7150
			1966 — 9000
			1968 — 10700
18	Acetylene	Soot Water (6% soot)	35000-Avg
18	Acetylene	Soot Oil (8% soot)	1600-Avg
20	AN-1	Catalyst Tar	500
20	AN-1	HC Tar	1500
22/23	EDC/VCM	Chlorinated Tar	1700
34	VAM	Tar	650
35/36/41/42/43	Polyethylene	Powder & Pellets	1800-5000

DEPT. 24

INCINERATOR

The incinerator was placed in operation as part of the west end complex in 1952 and remained in operation past the closing of the Wye site (AY-433). It apparently was designed to incinerate soot oil and soot water from the acetylene plant, cyanide containing wastes from AN-1, and chlorinated tars.

1/ Panel-generated table (D).

2/ Did not include in total waste separately in that it is considered to be in styrene tar as flux.

3/ A solid-bulk density of 11.66 lbs/gal.

4/ Net after burning at power plant.

E.L. Haile tabulated gallonage to Dept. 24 from four sources expressed in gals/mth:

Soot water	- 870,000
Soot oil	- 47,000
Organic tar	- 66,000
Chlorinated tar	- 1,200 (corrected by Grissom to 12,100 who also notes that was the minimum monthly production, AY-430)

Haile is silent on stripper overheads from 24D-1. "Organic tar" would appear to be 20-D-26 material from the AN-1 operation (AY-549).

Grissom (AY-438) tabulates incinerator feed in terms of average monthly volumes as follows:

Source	Gals/Mth	Comments
Soot water	936,000	Water & 6% soot
Soot oil	52,000	#2 diesel + 8% soot
Organic tar	106,000	75% CNB in water
Chlorinated tar	21,000	Chlorinated hydrocarbon
Stripper oil	300,000	15% organics in water

AY-438 also mentions wastes not burned but hauled off-plant:

Soot water (excess)
Hydrogen chloride
Lead pot oil
Skimmings
Aluminum chloride solution
Chlorinated tars - some burned, some hauled to Wye

The average volume hauled was estimated to be 400,000 to 600,000 gallons.

Incineration of chlorinated tars was limited because of air pollution and incineration of lead pot tars was prohibited because of lead content. Surplus soot water was produced because of inability to vaporize all the water.

G.H. Weekley, Jr. (AY-445), in planning for an incinerator shutdown in 1965 and disposing of incinerated wastes, reports as follows:

Source	Gals/dy	Equivalent gals/mth
Soot water	40,000	1,200,000
Soot oil	2,500	75,000
AN tar (20D26)	2,500	75,000
24D1	145,000	4,350,000
Waste gases	-	-

NOTE: 145,000 gals/dy from 24D-1 appear to be in error when compared with Grissom's 30,000 gals/mth six years earlier (AY-438).

In AY-448, a report entitled Sale/disposal of by-products, co-products and waste streams, it is stated that VCM chlorinated tars and styrene tars are sold to Hard-Lowe and copper bearing AN-1 tars are sold to Vaughn. Soot oil and soot water are burned.

In 1967, there were plans by Monsanto to shift incinerator loads to accommodate discontinuing use to the Wye. It was proposed that a test be conducted burning selected vacuum truck collections. Skimmings were to be burned at the rate of 2 gpm (AY-451, Ex 50) replacing Chocolate Bayou RFO which was apparently used as a supplemental fuel. There were also plans to incinerate acetylene filter soot water which together with surplus soot water had been going to the Wye (AY-451, Ex. 51).

In September of 1967, Hendrick pursues the matter of incineration of waste then dumped at the Wye. He advises that the burning of skimmings requires that a tank be installed for separation of water and solids. He also states that the polyethylene powder then going to the Wye was probably burnable in a low-cost open incinerator but additional testing was required (AY-452).

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KG COH004620

Still later in October of 1967, R.D. Sadow suggests incinerator revision to burn all vacuum truck waste then going to the Wye. He outlines a staged program for incinerator use after the acetylene complex shuts down.

Tests discussed in AY-451, 452, 454 turned up problems as reported by Weekley on 12/12/67 (AY-456). Weekley concludes, however, that skimmings can be compatible to incineration if burned with "organic tars". He notes that cessation of burning of Chocolate Bayou RFO frees considerable capacity.

The minutes of the Pollution Control Coordinating Committee dated 12/26/67 (AY-457) confirm that wastes formerly going to the Wye over and above incinerator capacity will temporarily go to the N-80. A pit was constructed at the N-68 to concentrate skimmings to facilitate the burning of oils. Burning of methanol waste was deferred pending establishment of incineration capacity. Mention was made that dumping at the N-80 will be replaced by dumping at Malone's disposal area. It is not clear whether this refers to Malone's Swan Lake site or that purchased by Monsanto from Malone.

It is reported that outside dumping was halted at the start of 1968, and further, that wastes were burned in Dept. 24 and in open pits (until mid-year) and the remainder was being stored to await a disposal outlet. Dopp waste from VAM operation was incinerated to eliminate that problem material. Excess tars and sludges continued to be a problem. The purchase of the Swan Lake disposal site is noted (AY-460).

The panel concludes from examination of Dept. 24 operations as follows:

1. Soot oil was burned throughout the period 1954-1968.

2. Excess soot water was taken to the Wye as measured by vacuum truck haulings (AY-448).

| 6503581 |

3. A quantity of AN copper tar was taken to the Wye. The so-called "organic tar" burned at the incinerator was 24D1 overhead. Two streams related to AN-1 were burned at the incinerator for cyanide destruction.

4. Some VCM tar went to the Wye. There was a limit to the amount incinerated. VCM tar was also sold to Hard-Lowe during a considerable period.

5. VAM Dopp Kettle material went to the Wye.

6. Lead pot tar (unsafe to burn) went to the Wye.

7. Skimmings went to the Wye.

MONSANTO
WASTE TO WYE

The panel finds that Monsanto sent wastes to the Wye from two sources--the N-80 and the complex. The panel accepts Monsanto's estimate (6.075 m gals) relocated from the N-80 to the Wye pits 1-6. The panel, however, adds the VCM tar production (Depts. 22-23) not incinerated for 1959 to Wye pits 1-6.1/

The second source, namely, waste sent by Monsanto to the Wye directly from the plant for the period 1960 to 1967 was deposited in Wye pits 7-7N.

1/ No proof in the record to the contrary and no other disposal site indicated, the panel concludes that the net (50% incinerated) VCM tar produced in 1959 went to the Wye either directly from the plant or through the N-80.

I. N-80 TO WYE[1]

Tar	N-80 Vol. 5 pits - m gals	Relocated to Wye (75%) m gals	Added 1959	Into Wye Pits 1-6 m gals
Styrene	4.49	3.37	0	3.37
VCM tar	1.50	1.13	0.30	1.43
Lead Pot	1.01	0.75	0	0.75
Dept #10	0.61	0.46	0	0.46
AN-1	0.49	0.37	0	0.37
TOTAL	8.10	6.08 (rounded)	0.30	6.38

II. WASTE DIRECTLY FROM PLANT TO WYE PITS 7-7N

Material	'60	'61	'62	'63	'64	'65	'66	'67	Total
Styrene Tar	.04	.04	.04	.04	.04	.04	.04	.04	.32
VCM Waste	.17	.17	.17	.17	.17	.17	.17	.17	1.36
Lead Pot Tar	.17	.17	.17	.17	-	-	-	-	.68
Dept #10 Tar	.18	-	-	-	-	-	-	-	.18
Quench Oil	.14	.14	-	-	-	-	-	-	.28
AN-1 Tar	-	.18	.18	.18	.18	.18	-	-	.90
VAM Tar	-	-	-	.23	.23	.23	.23	.23	1.15
Tar Subtotal	.70	.70	.56	.79	.62	.62	.44	.44	4.87
Polyethylene	.60	.60	.60	1.80	1.50	1.10	1.10	1.10	8.4
Soot H20	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	10.08
Subtotal	1.86	1.86	1.86	3.06	2.76	2.36	2.36	2.36	18.48

1/ Panel-generated table (E).

Material	'60	'61	'62	'63	'64	'65	'66	'67	Total
Misc. Skimmings	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	12.80
Subtotal	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	12.80
Polyethylene Burned	-	-	-	-	-1.50	-1.10	-1.10	-	-3.70
Soot H_2O Burned	-	-	-	-	-1.26	-1.26	-1.26	-	-3.78
Subtotal	-	-	-	-	-2.76	-2.36	-2.36	-	-7.48
TOTAL	4.16	4.16	4.02	5.45	2.22	2.22	2.04	4.40	28.67

COMMENTARY CONCERNING MONSANTO

Styrene Tar - W/C Table 3.1 indicates that of the 3.77 m gals of styrene tar that went to the Wye from the N-80, 2.260 m gals remained. This indicates there was soakage and a removal factor. This same reasoning utilizing the panel's judgment as to soakage and migration, if any, was applied by the panel to the styrene tars in pits 7-7N. Monsanto, in the oral presentation on 6/12/85, stated that pits 7-7N contained 160,000 gals of styrene tar. Without commenting on W/C's net volume in the Wye, at this time the panel concludes that 320,000 gals of styrene tar were put in pits 7-7N evenly over 8 years.

VCM Waste - Mr. Wood, maintenance department, states it cost approximately $2,000 a year to clean tar from the reactor and trenches at Depts. 19 and 20 (AY-448). Utilizing a hauling and dumping average of $25 per load, this equates to 80 loads or approximately 170,000 gals/yr (absent any information to the contrary we assume this is 50% water). Material diverted to Hard-Lowe Chemical Co. is not included in this estimate.

65C3584

Lead Pot Tar - This department operated through 1963 (AY-433). W/C Table A-4 only accounts for production through 1959. The lead contents prohibited burning and therefore appears to have been dumped at the Wye. The panel concludes that the statement by Hendrick (AY-353) that some of this material went to the smelter is undocumented and in any event believed to be of insignificant volume. The panel ascribes 470 gals/dy or 170,000 gals/yr to the Wye until plant shut down.

Dept. 10 Tar - It appears that Monsanto began to use the tar as boiler fuel in about 1960. Accordingly, the panel concluded that the tar was dumped in the Wye for only one year. This amounts to 180,000 gals total.

Quench oil contained too much water for boiler use and therefore went to the Wye.

AN-1 Tar - From mid-1958 to 1960 Monsanto sold Dept. 20 heavy copper bearing tar to Hard-Lowe (AY-430). From 1961 through 1965 it was dumped at the Wye. Thereafter, for a period of about 2 years it was sold to Vaughn (AY-453 & AY-446). 500 gals/dy or 180,000 gals/yr were dumped at the Wye between 1961 and 1965.

VAM Tar - In AY-430, it is reported that the waste was dumped at the Wye from 1963 to 1968 (Wye closure). As stated previously, this quantity was estimated to be 650 gals/d: or 230,000 gals/yr.

Polyethylene and Soot H_2O - Monsanto, at the time of the oral presentation to the panel, stated that polyethylene and soot H_2O were burned at Swan Lake from 1963 to 1968. Hendrick suggested in 1967 that tests be conducted to determine if the waste would burn (AY-452). There is no question that burning this material creates a tremendous smoke problem. The panel has difficulty with Monsanto's assertions of total burning. In any event, giving Monsanto the benefit of the doubt, the panel concludes that part of the material, 6.9 m gal, was burned in 1964-1965 and 1966 (polyethylene and soot water) but that, in 1967, all went back to the Wye. This coincides with our conclusions that the crust in Wye pits 6 (sunken crust), 7-7N contain polyethylene.

6503585

Miscellaneous Skimmings - Monsanto's contract with Petro Processors and renewals (AY-437) stipulate a minimum of 2,400 loads/yr during the operation of the Wye. Computing the various amounts of waste except skimmings that were generated during that period from the various departments indicates that an average of approximately 1,450 truckloads/yr were generated by all plants. It is noted that 1963 was an exception. The high density polyethylene plant started in that year and produced a greater volume of waste which required the use of more vacuum trucks - 2,725. In any event, an average of 2,200 truckloads per year was utilized by the panel for the years the Wye operated of which approximately 1,400 was utilized for all wastes except skimmings. This results in 800 truckloads per year devoted to hauling skimmings, which equates to about 1.6 m gals per year. This is not just a mathematical conclusion. Monsanto, at the oral hearing, admitted to approximately 2,168 truckloads per year of which were assigned 557 truckloads to skimmings.1/ The panel is of the opinion that 800 truckloads per year of skimmings is more in accord with what would be produced looking at total plant operations.

DEPOSITIONS AND DRIVER STATEMENTS

Various depositions and driver statements verify Monsanto's heavy parti-cipation in the Wye site and generally sustain the panel's conclusions, as gleaned from internal records, other documents and interviews, as to volume of materials sent to the Wye and other findings.2/ Illustrative of the point is the following:

Alexander (Dep-35): Alexander and Foster Jones purchased the 11 1/2 ± acre Wye site in 1959 and caused 8 pits to be dug (p. 10-11); that only 2 pits were available to others (inferred 7-7N) in that he was using the other pits for the styrene tar he was hauling from Monsanto to the Wye (p. 25); that other chemicals were hauled to the Wye commencing around 1960-61 (p. 25-26);

1/ It should be noted that some data sources became available during the panel's work that were not available during the earlier W/C allocation effort.

2/ The panel notes, insofar as driver statements are concerned, that the Giarrusso investigative firm focused its investigation on companies other than Monsanto.

that many loads came from Monsanto (p. 19); that Alexander had some drainage problems (Alexander claimed it was overflow of rain water) and in fact received a letter from the Mayor of LaMarque complaining about surface drainage of oily waste (p. 31); that if Petro had a dumping contract with a company Malone had to haul the waste to the Wye (p. 26).

Malone (Dep-34, pgs. 33-34): Malone was asked if during the '60s he hauled all styrene tars from Monsanto to the Wye. He stated that after Carla his styrene tar hauling ended; that Lowe Chemical Co. purchased Malone trucks and started their own hauling (styrene tar) from Monsanto to Lowe's Choate Road Plant; that in about two or three instances when Lowe's trucks didn't show up, Monsanto would call and request that Malone haul overflow from the tank to the Wye.

W.S. Meyers (Dep-32): He states he worked for Malone from '62 to '69 and again in 1970 to date of deposition (p. 5); dumped Monsanto waste at Swan Lake in 1970 (p. 8); hauled Monsanto material to the Wye (p. 9-10); Malone stopped hauling to the Wye when LaMarque passed a city ordinance against dumping at the Wye (p. 18); indicates Paul Malone did have a dumping site at Swan Lake which was built in 1969 (p. 20); hauled styrene tars and AN tars from Monsanto to the Wye (p. 31).

Robert Wayne Pace (Dep-33): Worked for Malone from 1958-1969; was helper and driver and finally trucking superintendent (p. 7); indicated that chemical waste from the Wye pits would overflow into ditches by the HL&P line and Highway 146 (p. 13); delivered Monsanto waste to the Wye (p. 13); picked up wastes from Depts. 2, 3, 5, 7, 4, 8, 19, 20, 21, 22, 23, 35, 41 and dumped at the Wye; styrene tars, benzene and toluene from Depts. 4, 5, 7, 8; acrylonitrile and AN tars from Depts. 19 and 20; hexane from Dept. 35; polyethylene powder, pellets and wax from Dept. 41; VCM from Depts. 21, 22, 23 (p. 14); indicates that was not a complete list of all the chemicals he picked up from Monsanto (p. 15); Monsanto employees instructed Malone to dump at th Wye and trip tickets were utilized with the name of the driver, services performed, loads hauled and signature of Monsanto employee thereon; that polyethylene powder was plugging up Alexander's skimmers at the Wye and M started dumping the few loads of polyethylene powder in a pit at Swan La (back when Monsanto Dept. 35 was built (1963)) (p. 44); Malone dumping polyethylene powder at Swan Lake during the lifetime of the Wye (p. 65).

Other Malone drivers generally state in their interviews that they hauled waste from Monsanto to the Wye (Drivers #1, 5, 10, 12, 18, 31, 213). VTI drivers Legg and Clifton make similar statements (Exhibits I-1018, I-1019). Harper (Petro Processors driver) hauled styrene tar from Monsanto's N-80 to the Wye. This apparently contained polyethylene pellets (Dep-57).

SWAN LAKE

A puzzling aspect of this case revolved around the availability and use of certain Swan Lake sites for waste disposal. Several companies identified Swan Lake as the destination for wastes leaving their plants rather than the Wye.

A review of the title and permit history of Swan Lake as it pertains to Malone and Alexander is a necessary starting point to an understanding of the problem. According to the records, on December 6, 1963, Mabel Dick conveyed to Paul Malone et ux an 11.1 acre tract out of the Campbell Homestead Tract in the Samuel C. Bundick League for $7,000 (a.k.a. the Lee Dick tract) (AV-1124). The conveyance was subject to cemetary rights on a part of the property located on the N.W. line and an easement 20' wide on the Northwest line of the tract for access to the cemetary. On 8/27/65, Wetzel conveyed to Malone et ux a tract of land ("Wetzel tract") out of the Samuel C. Bundick League containing 11.95 ± acres (AV-1126). On 11/22/67, Paul Malone et ux conveyed the abovementioned tracts to Malone Service Company, Inc. for a consideration of $45,000 paid by Mainland Savings Association (AV-1127). On 12/30/68, Malone Service Company, Inc. sold 11.95 ± acres (Wetzel tract) to Monsanto Company. On 8/7/64, Malone Service Co. received Texas Water Pollution Control Board permit #01049 to dispose of industrial wastes on the Dick 11 ± acre tract (AV-1022). The permit refers to six storage and disposal pits, reclaiming tanks and a burning pit. In 1976, the permit was endorsed and numbered permit #39004 - permit 39004 was cancelled on 12/5/77. There were two well disposal permits #WDW73 and WDW138 issued on 2/18/70 and 11/14/77, respectively.

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On 7/23/63, Petro Processors, Inc. applied for a permit to deposit polyethylene dust, hexane, soot and solids removed from the Wye to Petro Processors' controlled site at Swan Lake.

This was the property later purchased by Malone from Wetzel on 8/27/65. The Texas Water Pollution Control Board issued permit #01051 (AAA-496) to Petro Processors effective 8/6/64. This permit covered two locations - the Wye and Swan Lake (Wetzel tract).

There is no question then that Malone Service Company's and Petro Processors' permits covered two separate tracts, namely the Lee Dick tract and the Wetzel tract, respectively, contrary to the contention of some parties.

A letter dated 6/15/64 from Winston D. Tyler to Roy D. Payne, Director of Field Operations, Railroad Commission of Texas, is relevant (AAA-520). In discussing Malone's plans to build a reclamation plant, Tyler states, "...he [Malone Service Co.] has already dug several open pits and at the present time has one pit full of tank bottoms recently removed from the Texas City Refinery (those pits are visible on the photo taken 2/23/64 on the Dick tract). He proposes to use those pits to dump any and all types of oil and tank bottoms into a settling pit and remove from the pit by pumping to the storage tank. Some of the pits would also be used for waste removed from chemical plants ..." (emphasis added).1/

Texas Water Quality Board, inter-office memorandum, dated 12/28/67, on Malone's permit #01049 on the Dick tract, references Malone's operation and the disposal system which skims and reclaims oil and various chemicals (AA2-1158).

1/ All photos are available for inspection at Clean Sites' headquarters in Alexandria, VA.

6503589

A memorandum from the files of the Texas Board, Water Pollution Control Division, by Merton J. Coloton, dated 2/7/64, concerning the Swan Lake site permitted to Petro Processors (Wetzel tract) is revealing (AAZ-1158). Coloton states that the pits at Swan Lake were to be used for the same operation as the Wye, but due to its close proximity to Swan Lake and Galveston Bay, it was decided to use the Swan Lake location only for burning pits. The panel examined pictures of Swan Lake for the years 1952 to 1969. A photo taken in 1964 shows one pit on the Dick tract apparently containing oil surrounded by four larger pits, either empty or with water. As late as 1968, a photograph shows one large pit with what appears to be water in it. That one large pit essentially covers the area of the five pits mentioned above. There was no evidence of any waste in any other pit in the area of the Dick or Wetzel tract. There was, however, evidence of burning on the southeast corner of the Wetzel tract.

On 2/12/68, Malone was negotiating to sell a Swan Lake site to Monsanto (letter and attachment - Malone to Butz (Monsanto) AY-463). In one of the attachments (letter of 7/11/69 - Hendrick (Monsanto) to the Texas Board of Regents), Hendrick refers to waste oil leakage from a pit on the Dick tract and states the Wetzel tract will be diked. No mention is made of any chemical waste leakage. It should be noted that the sand pit on the Wetzel tract appears to have been developed first by Willie Baulch, a sand and gravel supplier in Texas City. Mr. Baulch has stated that he believes others acquired fill dirt in that area prior to his development of the sand pit on the Wetzel property. Don Tarpey Construction Co. bought sand and paid Malone a royalty during the period of Malone's ownership of the Wetzel property (Adm-1157).

The use of Swan Lake sites was vital to Amoco Chemical's initial position, viz, that it did not cause any materials to be dumped at the Wye and that prior to 1964 its liquid waste was dumped at the Texas City Landfill and thereafter at Swan Lake. It should be noted that after Amoco Chemical was unable to locate records to substantiate its initial position, Amoco changed its analysis (see letter Sullivan to Clean Sites dated July 22, 1985, and statements by counsel at the oral presentations to the panel on June 12, 1985). Amoco now agrees that some of its liquid waste went to the Wye, and that the Texas City Landfill was never used for liquid waste. It still holds firm, however, to the possibility that Malone used Swan Lake to dispose of some of its liquid waste.

The panel found no documentary evidence that prior to 1968 either the Dick or the Wetzel tract received chemical wastes. Environmental concerns as to the Dick tract were equally applicable to the Wetzel tract. The photos the panel examined at Clean Sites of the area encompassing Swan Lake do not reveal any substantial dumping of oil wastes. There is no documentary evidence of any chemical dumping at either site in the record before the panel. We note the assertion made by Robert Schults, in a letter dated July 29, 1985, to Amoco Corp. counsel, that some Amoco Chemical waste was taken to Swan Lake, but are not persuaded by his statements because the evidence, including the photos before the panel, supports a conclusion that Petro's Swan Lake site was used for some burning of polyethylene with hexane, and perhaps soot after 1964.

In the absence of any documentary evidence that liquid chemical waste was in fact received at the Swan Lake site, no adjustment was made for waste otherwise attributed to the Wye site. This decision is subject to revision if documentary evidence to the contrary is presented to the panel.

AMOCO CHEMICAL CORPORATION

During the period of operation at the Wye site, Amoco Chemical was probably the smallest of the chemical plants in Texas City. At that time, it operated Plant A, a 37 acre site on Loop 197, extending east from the Marathon Refinery to Sixth Street. Four units were operated:

- Pipestill for solvents
- Methyl mercaptan
- Panaflex Plasticizer
- Panarez Hydrocarbon Resin

A. PLANT HISTORY

Monsanto located its plant in Texas City, Texas to take advantage of the supply of petroleum raw materials, adequate shipping facilities and the temperate year-round climate that affords setting up chemical units without protection from extreme weather conditions.

The Texas City plant is located directly on Galveston Bay, within the city limits, on the southeast corner of the city. Other industry in Texas City extends back from Monsanto for several miles and includes three other chemical companies, three oil refineries and a tin alloy plant. The population of Texas City is now over 25,000 people -- having grown consistently with the industry of the Gulf Coast. Adjacent to the city is the residential town of La Marque. Texas City is 13 miles north of Galveston, which is directly across the bay from the Monsanto plant, and is 40 miles south of Houston.

In November of 1941, Monsanto purchased a 30-acre tract of land in Texas City from the Texas Sugar Refining Company. The tract was located on the bayshore adjacent to the dock facilities of the Texas City Terminal Railway. Much of the land had been filled in from the bay. This site contained miscellaneous office buildings, a boiler house, machine shop, warehouse and other buildings, all in a bad state of repair.

Plans were started immediately for the construction of styrene monomer facilities under the auspices of the Defense Plant Corporation for the synthetic rubber program. The site was filled to 15 feet above sea level. The plant design utilized a process developed by Monsanto and actual construction of a 20,000 ton-a-year plant started on March 17, 1942.

In September of 1942, the government asked for expanded production facilities to produce 50,000 tons of styrene monomer a year. In December some units were completed and start-up operations began. On March 13, 1943, four days less than a year after the start of construction, the first tank car of styrene monomer left the plant.

In August of 1944, additional modification work was done to the units to produce the equivalent of 60,000 tons a year.

Until 1946, all of the styrene produced was earmarked for the government's synthetic rubber program. However, with the passing of VE and VJ Days, war requirements declined rapidly and by late 1945 the plant was operating at a reduced capacity. In mid-1946, Monsanto requested and obtained permission from the government to utilize some of the surplus capacities of the plant to provide styrene monomer for the expanded domestic plastics market. Throughout the rest of 1946, Monsanto was engaged in negotiating with the government on the purchase of the plant and the beginning of a styrene polymerization unit at Texas City.

On October 4, 1946, Monsanto purchased the plant from the government for approximately $10 million. However, the company was still committed to supply some styrene to Rubber Reserve on a reduced schedule. Additional units were placed in operation and modifications were made on existing units, effecting a major increase in monthly styrene production.

On January 1, 1947, the Texas Division was established as a separate operating unit of Monsanto. The division included 550 employees with 45 acres of land in the plant site. At the same time, plans were formulated to increase styrene production through a program which would extend over several years.

These plans received a material setback on April 16, 1947, at 9:12 a.m. when the French liner, "S. S. Grandcamp", loaded with 2,300 tons of ammonium nitrate, exploded at the Texas City Terminal Railway dock adjacent to the plant. The explosion resulted in the total destruction of the plant with an extremely heavy toll of dead and injured.

The impact of the explosion was equivalent to 250 five-ton block busters; in the immediate area the detonation was almost equal to that of an atomic bomb. A large warehouse, a steel and brick structure was flattened; not a splinter remained upright. The main power plant was similarly crushed. As the blast fanned out, walls of manufacturing buildings fell, windows of the offices and laboratories were shattered and pipe lines carrying inflammable liquids were torn apart. The explosion's heat ignited the benzol, propane and ethylbenzene which was pouring out of ruptured pipes and storage tanks.

At the time of the explosion, the plant employed 604 people; approximately 451 of them were on duty. Of this number, 145 were killed with over 200 being hospitalized with serious injuries. In addition to company casualties, 123 employees of outside contractors were working in the plant; 82 were killed, bring the death total at the plant to 227 people -- more than one-half of the whole area's total dead.

To provide for payments which were beyond the company's legal liabilities, the Board of Directors immediately appropriated a $500,000 relief fund. This was in addition to many other benefits, financial settlements and assistances given to victims of the disaster. Two days after the explosion, the company president was asked about the future of the plant. He replied -- "We will rebuild the plant, a better plant than was destroyed."

True to its word, Monsanto did rebuild. The plant was again on steam and producing ethylene in March of 1948 and the first styrene was shipped out in August. Changes and modifications in the design made possible the production of styrene monomer well above the original pre-blast figures.

In September of 1950, a major expansion program for Texas City was announced. The expansion included new additions to the styrene plant for barges. Other industries there include Union Carbide Chemicals Company, Texas City Chemicals, AMOCO Chemicals Corporation, American Oil Company, Republic Oil Refining Company, Texas City Refining and Wah Chang Corporation.

and the construction of units for the production of vinyl chloride and acrylonitrile with supporting production units making oxygen and acetylene. Construction actually began in early 1951 and was completed during the latter part of 1952.

On October 14, 1952, the first tank car of vinyl chloride monomer was shipped to the company's plant at Springfield, Mass. On December 30, 1952, the first tank car of acrylonitrile monomer was shipped to the Decatur, Ala., plant of the Chemstrand Corporation where it was used in the production of Acrilan, a new synthetic fiber.

These events marked the beginning of the plant's quantity production of all three of the most important monomers in industry -- styrene, vinyl chloride and acrylonitrile -- making Texas City the "Monomer Headquarters of America." Styrene production capacity, now doubled in size, made the plant one of the world's largest producers of the basic plastic.

On January 1, 1954, Monsanto reorganized its divisions along product lines. As a result of this reorganization, the Texas Division was made a part of the already-existing Plastics Division.

Construction started in 1954 on a major addition to the research laboratories at Texas City. The new building was completed that year and housed 16 additional laboratories plus a wing for offices and an auditorium. The Research Department also uses a three-story structure, a part of the original plant.

Further major additions to the plant were announced in 1954 with the construction of a high purity ethylene plant, a polyethylene plant, a ship dock and a methanol plant.

The high purity ethylene facilities were completed late in 1954. The methanol unit also went on steam in November of 1954. The plant was a joint venture with Heyden Chemical Corporation and was based at Texas City because of the large acetylene operation there.

Monsanto's first polyethylene plant went on steam in December of 1954. The new product represented the first polymer at Texas City that was being shipped directly to customers. The polyethylene plant uses existing ethylene units for its basic raw material.

The ship dock, originally justified on the basis of methanol shipments by Heyden, also permitted tanker shipments of styrene monomer and receipts of benzene. The dock is used by the "S. S. Chemical Transporter" for these shipments.

Construction of boiler water demineralizer facilities were begun in mid-1955. This facility for expanded power needs was placed in service in December of 1955.

A new product was added to Texas City in January of 1956 when the first commercial-size unit for the production of tertiary butylamine went on stream. The unit is operated by the Plastics Division for the Organic Chemicals Division with the product being shipped to the company's plant at Nitro, W. Va.

Another major expansion was announced in 1956 with the construction of a multi-million dollar ethylene plant to supplement existing ethylene units. The new unit was completed and went on stream in April of 1957. Operation of Texas City's ethylene plant is now the responsibility of the company's Lion Oil division. Lion also has a research group at Texas City for ethylene projects and in support of its production and exploration offices in Houston.

The Plastics Division research department began work in 1956 on the construction of a two-story wing to the building finished in 1954. The new research building was finished in the summer of 1957 and houses laboratories, testing facilities and offices.

An expansion of the Plastics Division's engineering department was completed in 1956 with the finishing of new office quarters in an existing structure that had been used as a warehouse. The new quarters include offices and conference rooms for engineering activities.

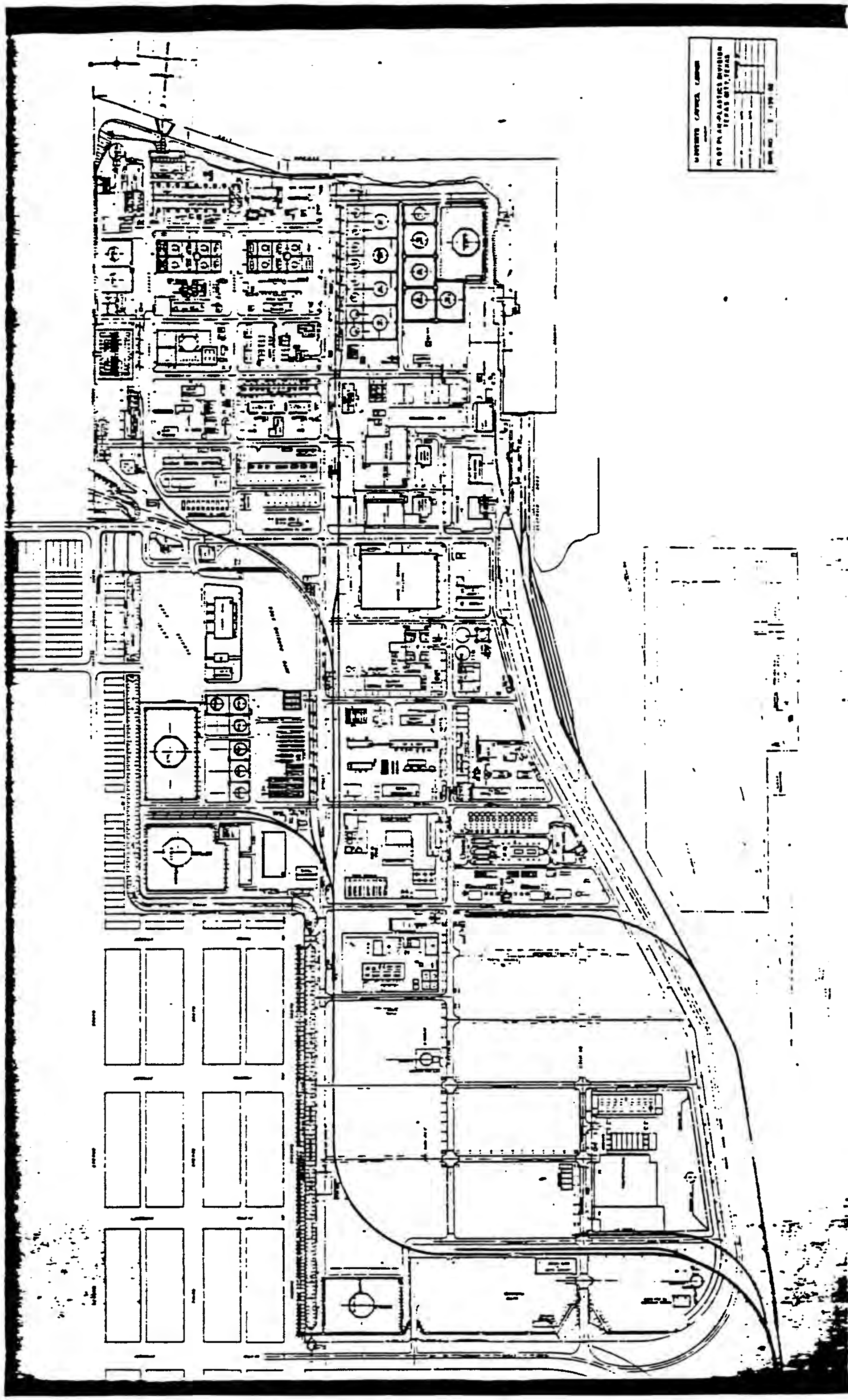
In the spring of 1957, an incremental expansion of the acrylonitrile plant to increase output to more than 100 million pounds was announced. Work on the expansion began that summer.

In July of 1957, internal expansions of Texas City's styrene monomer and acetylene plants were announced. The styrene expansion, completed late in 1958, added 40 million pounds to the plant's rated capacity. The acetylene expansion made a 12 million pound addition to plant capacity.

The latest Texas City expansion was announced in February of 1959 with the news that work was underway to raise capacity of the polyethylene plant to 100 million pounds a year. Work is slated for completion in 1960.

Monsanto now owns approximately 284 acres of land in Texas City. About 136 acres is utilized by the current plant and another 79.7 acres north of town is used for waste disposal. A new 68 acre site directly adjacent to the existing plant was purchased in 1959 and filled in from the bed of Galveston Bay. The additional 68 acres, a 50 per cent expansion in the main plant site, will be utilized in future growth. The plant has 107 buildings with a total floor space of approximately 520,320 square feet. Most of the production units are of semi-open construction. As of January 1, 1960, the plant employed over 1,850 people and was the second largest employer in industrialized Galveston County.

Texas City is served by railway freight, deep water anchorage for sea-going vessels, the Seatrain Lines, and the intra-coastal canal



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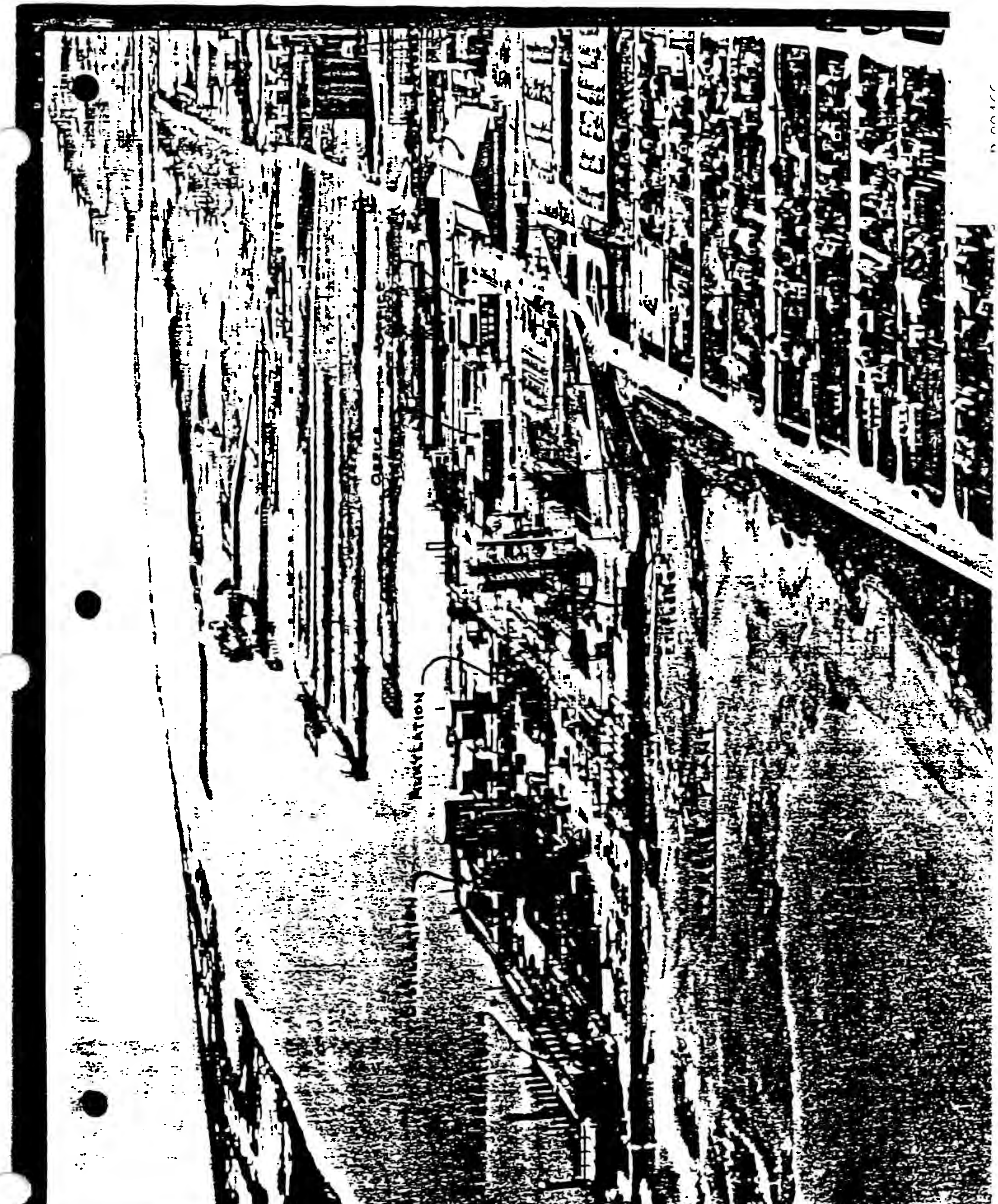
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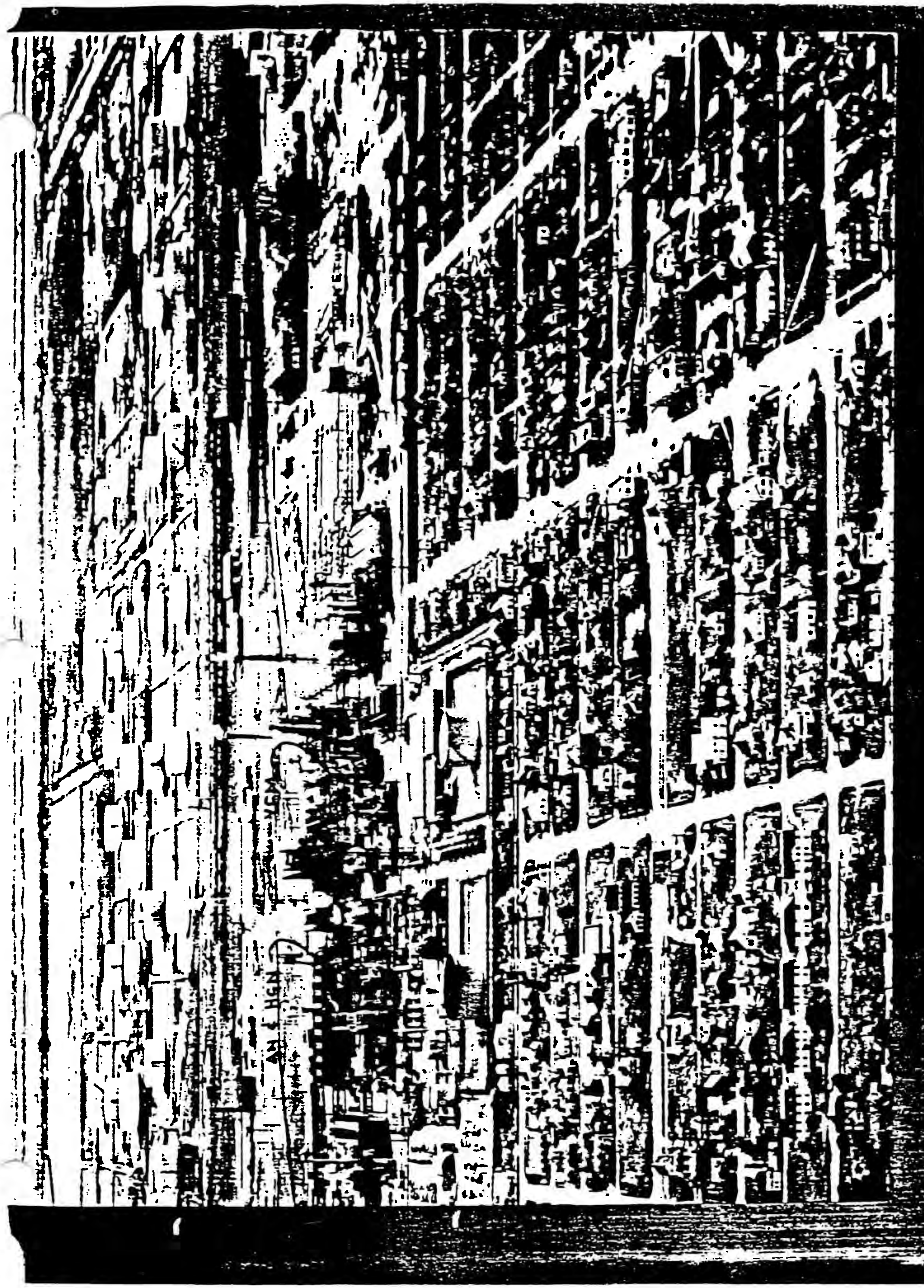

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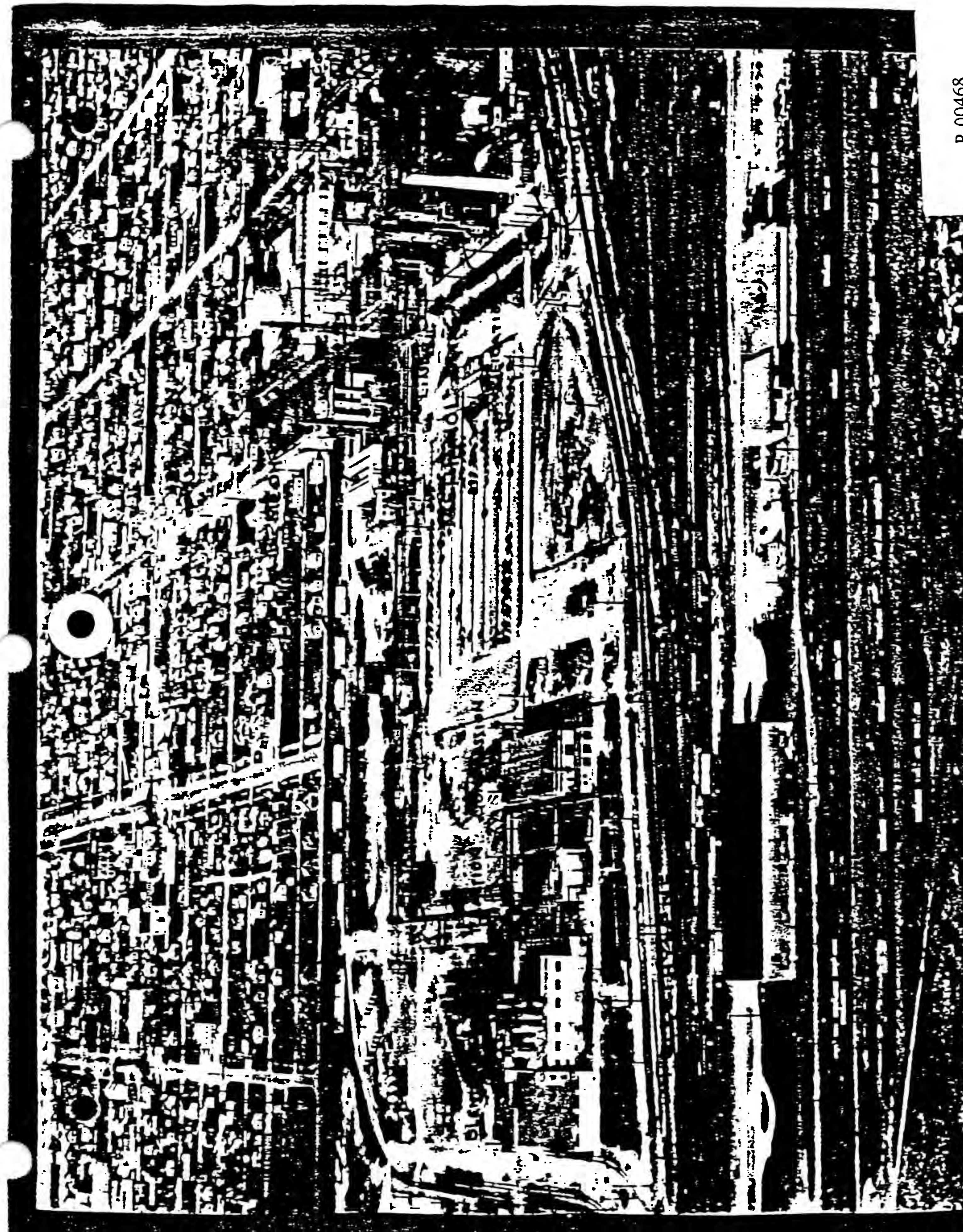

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