Time Oil: [redacted] MSE

VOLUNTARY CLEANUP SECTION

PROJECT STATUS AND ISSUE REPORT

REPORTING PERIOD: May, 1992

PROJECT: Time Oil Company Terminal, North Portland

PROJECT MANAGER: Mike Kortenhof

PROJECT TYPE: Responsible Party Initiated Letter Agreement

BACKGROUND:

Time Oil Company owns and operates a petroleum products storage terminal on approximately 52 acres located in the Rivergate area of North Portland. It is situated on the east bank of the Willamette River at 12005 North Burgard Road. Terminal operations began at this site in the 1940's. The facility, including 30+ above ground storage tanks, has handled jet fuel, gasoline, xylene, toluene, fuel oil, lube oil, butyl alcohol, isobutanol, methanol, Methyl 10, turpentine, pentachlorophenol, fatty acid, lignin liquor and liquid fertilizer.

A Federal Preliminary Assessment was performed for the facility in 1985. Soil contamination was identified resulting from waste oil handling and pentachlorophenol blending operations. The site was referred to the State for further action. Confirmed releases of pentachlorophenol, polychlorinated biphenols, lead, naphthalene and chrysene were identified. The facility is listed by the State as needing further information or investigation.

Time Oil Company ran a pentachlorophenol (penta) blending operation for Koppers Company on a portion of the subject property from 1967 to 1982. Operations consisted of heating and mixing penta granules with paraffin wax, mineral spirits and other solvents to produce various woodtreating products. The raw materials arrived on site by rail-tank car and truck. The product was shipped in 55 gallon drums and by tank truck.

Soil contamination in the area surrounding the penta operation was discovered in March of 1982. The tanks, piping and related equipment were removed. In 1985 surface soils throughout the penta operations area were removed to a depth of 1.5 feet and disposed of at the hazardous waste landfill at Arlington. Shortly thereafter, the Environmental Protection Agency banned land disposal of penta waste. Time Oil began investigating methods to treat the soil on site with the goal of reducing penta concentrations to 0.5 mg/kg or less. An additional 3,400 cubic yards of penta contaminated soil, with an average penta concentration of 950 mg/kg, was excavated in 1989 and stockpiled in a bermed, lined and covered soil pile.

10000

Soil with penta concentrations as high as 574 mg/kg remains in place at and below the water table (13 feet) in the area of the excavation. Higher levels of contamination remain in place under one corner of an adjacent warehouse. Sampling results show that the groundwater has been impacted in the immediate area of the blending operations, although the magnitude and extent of groundwater contamination is ambiguous.

Time Oil has identified bioremediation as a possible treatment method for the stockpiled soil, although full scale field tests have shown that it will not reach the 0.5 mg/kg goal. Time Oil has asked DEQ to consider alternative cleanup levels so they can start soil treatment operations as soon as possible.

PROJECT STATUS SUMMARY:

Time Oil entered a Voluntary Cleanup Agreement with the Department of Environmental Quality (DEQ) on July 17, 1991. They submitted a report describing work relating to the penta cleanup on December 6, 1991. A site visit was made by Mike Kortenhof on January 30, 1992. DEQ completed review of the report and prepared detailed comments on April 8, 1992. As a result of the review it was determined that the stockpiled soil was a listed hazardous waste that was not stored in compliance with Resource Conservation and Recovery Act (RCRA) regulations. Compliance with those regulations is expected to include site investigation and cleanup requirements. The project was been referred to the RCRA program of DEQ for resolution of those issues.

PROJECT ISSUE SUMMARY:

Time Oil is proposing on-site treatment and disposal of a listed hazardous waste (F027). Applicable Resource Conservation and Recovery Act (RCRA) regulations must be evaluated before comments on this proposal can be prepared.

The fate of penta contaminated soil remaining under the warehouse and below the water table is unknown.

The magnitude and extent of groundwater contamination due to the penta release is undefined.

The releases identified during the 1985 Preliminary Assessment still require additional investigation.

QUARTERLY PLANNING:

April - June, 1992:

Work on this project under the voluntary cleanup program has been deferred pending resolution of the RCRA compliance issues. Further work on this project will be considered upon identification of RCRA mandated site investigation and cleanup requirements.

10000

c: RC Hamilton ✓
(1/30/89)

86-102

PHONE 285-2400
CABLE ADDRESS: TIMOIL
(FAX) 206-283-8036

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

PRODUCTS TIME TESTED

TIME OIL COMPANY

2737 WEST COMMODORE WAY
P.O. BOX 24447, TERMINAL STATION

SEATTLE, WASHINGTON 98199-1233
SEATTLE, WASHINGTON 98124-0447

January 27, 1989

William F. Giarla
Koppers Company, Inc.
436 Seventh Avenue
Pittsburgh, PA 15219

Re: Meeting - Portland, Oregon
March 1, 1989

Dear Bill:

This is to confirm our discussion yesterday in which we agreed that March 1, 1989 would be an agreeable date to meet at Time Oil Co.'s facility at 12005 North Burgard, Portland, Oregon. The purpose of the meeting to be for us to review the remedial measures that have been and will be taken at the facility in order to remove the pentachlorophenol in the soil surrounding the tanks that had been used to store Koppers' products and to resolve the division of responsibility for the costs being incurred in this cleanup.

Please let me know what time would be most convenient for you to meet. We look forward to meeting you and working with Koppers to resolve this matter in a manner that will be fair to both companies.

Very truly yours,

TIME OIL CO.

Terrill L. Henderson
Corporate Counsel

TLH:mw

cc: Robert D. Abendroth
Fred Proby

0063C

10000

TOLS003283

BZTO104(e)040104

Koppers Company, Inc.
436 Seventh Avenue
Pittsburgh, PA 15219
Telephone 412-227-2000

86-11J

KOPPERS

January 13, 1989

Mr. Terrill L. Henderson
Corporate Counsel
Time Oil Company
2737 West Commodore Way
Seattle, WA 98199-1233

Re: Northwest Terminal Property Time Oil

Dear Terry:

Enclosed please find a check from Koppers Company in the amount of $59,185.55. This represents Koppers' share of the costs incurred through September 19, 1988 for the investigation and cleanup of the above site.

I look forward to talking with you soon concerning the scheduling of a meeting to discuss the allocation of responsibility for the remaining work Time Oil plans for the property.

Very truly yours,

Bill Giarla

William F. Giarla
412-227-2635

Enclosure

TOLS003284

BZTO104(e)040105

10000

Vendor No.	Div.	Our Audit No.	Your Invoice N	Inv. Date Mo.	Day	Invoice Amt.	Discount	Net Amt. Payal.	Cr
7 125619011	100	10090100280		01	09	59185.55	0.00	59185.55	

Detach Before Depositing

BZTO104(e)040106

Beazer Materials and Services, Inc./Koppers-Pittsburgh, PA 15219

Vendor No.	Div.	Our Audit No.	Your Invoice No.	Inv. Date Mo.	Inv. Date Day	Invoice Amt.	Discount	Net Amt. Payable
12561901	100	1CC90100280		01	09	59185.55	0.00	59185.55

Detach Before Depositing

BEAZER MATERIALS AND SERVICES, INC./KOPPERS
PITTSBURGH, Pa. 15219

80-28
815

NO. 0607809

PAY
FIFTY NINE THOUSAND ONE HUNDRED EIGHTY FIVE AND 55/1CC ONLY

To the order of

Date JANUARY 11 1989

Pay this amount $59185.55

TIME OIL CO
BOX 24447 TERM ANNEX
SEATTLE WA 98124-0447

CENTERRE BANK
ROLLA, MD

AD-396 9/88

⑈0607809⑈ ⑆081502899⑆ 09 9789 ⑈ Dean McAllister

TOLS003286

BZTO104(e)040107

Pittsburgh, PA 15219
Telephone 412-227-2000

KOPPERS

December 21, 1988

Terrill Henderson, Esq.
Time Oil Company
2737 West Commodore Way
P.O. Box 24447
Terminal Station
Seattle, Washington 98124-0047

Re: Northwest Terminal

Dear Mr. Henderson:

This will confirm our conversation of last week in which I informed you that Koppers Company has reviewed your letter of September 19, 1988 and decided how to proceed with respect to the proposal you described.

In our past conversations and your letter of September 19, 1988 you indicated that on January 23, 1986 Koppers agreed to pay one-half of the costs for the cleanup and related work on the above property. After our conversation we reviewed our files, both in the Law Department and in our environmental subsidiary, in an effort to confirm that statement.

We were unable to find anything indicating an agreement as broad as the agreement you describe. We did, however, find a letter dated February 19, 1986 from Robert D. Abendroth of Time Oil which indicated that Koppers and Time had reached a more limited agreement. Mr. Abendroth's letter states:

> "During our January 23, 1986 meeting at your offices in Pittsburgh, you mentioned that Koppers would agree to pay one-half the cleanup costs incurred/committed to date and that further coordination between Koppers and Time would be appropriate for future commitments. Time concurs with this approach."

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TOLS003287

BZTO104(e)040108

Mr. Abendroth's letter convincingly evidences Time's understanding of this more limited agreement between Koppers and Time, and nothing in our file indicates that any Koppers' personnel took exception to Mr. Abendroth's characterization of the agreement.

It seems clear, then, that Koppers did not make a blanket agreement to share all costs of cleanup for the site. The agreement between Koppers and Time was that Koppers would share equally the cost of cleanup and related work which Time incurred or to which Time committed by February 19, 1986. Commitments for additional cost sharing were clearly deferred pending "further coordination" between Koppers and Time.

In light of this agreement to share past costs, Koppers will reimburse Time Oil for one-half of the investigation and cleanup costs referenced in your letter of September 19, 1988. I have requested that a check be issued to Time in the amount of $59,185.55.

With respect to the future costs, the same turnover in personnel which required first hand research into the details of any agreement between our companies now requires an explanation of why Koppers should agree to pay one-half of all the cleanup costs for the Northwest Terminal site. As I told you in our conversation, the current Koppers' management personnel responsible for such costs would like to meet with Time Oil personnel in order to hear Time Oil's views on this subject, and to discuss the issue generally. I will contact you following our next Environmental Claim Review Meeting in order to schedule a meeting between our companies to discuss "future commitments".

Several weeks ago I received a copy of a letter from Mr. Abendroth to Koppers Company's President, Frederick Moore. Mr. Abendroth stated that Koppers Company appeared to be ignoring Time's communications during the last year. Much has happened here at Koppers Company in the last year, including a lengthy takeover battle, a subsequent merger, a divestiture of business units representing almost one-half of the company, and reductions in staff. The level of activity and the turnover in personnel have made communications difficult. My expectation is that future events here at Koppers Company will allow for smoother communications.

(Ironically, Mr. Abendroth's letter also asserted that Koppers had entered into a blanket cost sharing agreement, an assertion contradicted by Mr. Abendroth's February 19, 1988 letter.)

Please feel free to call me if you have any questions or comments concerning the above.

Very truly yours,

William F. Giarla

William F. Giarla
412-227-2635

WFG:km

cc: R. Abendroth
B Moore

10000

TOLS003289

BZTO104(e)040110

PHONE 285-2400
CABLE ADDRESS: TIMOIL
(FAX)206-283-8036

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

TIME OIL COMPANY

2737 WEST COMMODORE WAY
P.O. BOX 24447, TERMINAL STATION

SEATTLE, WASHINGTON 98199-1233
SEATTLE, WASHINGTON 98124-0447

September 19, 1988

Mr. Bill Giarla
Koppers Company, Inc.
Koppers Building, Room 750
Pittsburg, Pennsylvania 15219

Dear Mr. Giarla:

On July 27, 1988 you and I discussed the matter of the costs incurred in the cleanup of Koppers' pentachlorophenol at Time Oil's Northwest Terminal in Portland. Since that time, Time Oil has been searching for an economic and effective method of disposing of the problem. In that regard, enclosed is a preliminary work plan prepared by Ecova Corporation for the cleanup of the pentacholorophenol contaminated soils. Although Time Oil is still in the process of evaluating the merits of the work plan, we anticipate following it subject to approval by the Oregon Department of Environmental Quality.

The cost of the proposed cleanup and related work is estimated at $400,000. Pursuant to the January 23, 1986 agreement between Koppers and Time Oil, Kopper's share would be $200,000.

As a reminder, Time Oil has spent $118,371.10 to date on investigation and cleanup of our mutual problem. Of this we have invoiced you $54,780.28 by invoices dated 3/6/86 and 4/17/87 (copies enclosed). We have not yet received payment for those invoices. Also enclosed is our invoice dated 9/21/88 for $4,405.27, which brings Kopper's total share of moneys spent to date to $59,185.55.

Very truly yours,

TIME OIL CO.

Terrill L. Henderson
Corporate Counsel

TLH:pjv

Enclosures

0297C

10000

TOLS003290

BZTO104(e)040111

TI E OIL CO.

INVOICE 091868

P.O.BOX 24447 TERM. STATION - SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY - SEATTLE WA 98199-1233
PHONE (206) 285-2400

DATE 03/06/86
REF. 03-03028 JKJ

CUSTOMER #: 03/05505623

ACCOUNT:
KOPPERS COMPANY INC
ATTN: DONALD F. MARION
KOPPERS BUILDING ROOM 750
PITTSBURGH PA 15219

657 60 123 27831.21
120 9 . 14250.00

TO CHARGE YOU FOR 1/2 OF THE FOLLOWING PER MUTUAL AGREEMENT IN REFERENCE TO CLEAN UP COSTS AT 12005 N. BURGARD RD., PORTLAND, OREGON.

EXPENDITURES

4/26/85 CHEM-SECURITY SYSTEMS (LABORATORY ANALYSIS OF SOIL SAMPLES)	150.00
7/10/85 NORTHWEST VACUUM TRUCK SERVICE (RELOCATING 242.76 TONS OF SOIL TO ARLINGTON)	9,000.00
7/29/85 CHEM-SECURITY SYSTEMS (RECEIVING 243.30 TONS OF SOIL AT ARLINGTON)	27,270.88
8/8/85 ENVIRONMENTAL EMERGENCY SERVICES (OBTAIN AND ANALYZE 3 COMPOSITE SAMPLES)	
12/31/85 ENVIRONMENTAL EMERGENCY SERVICES (PRIMARY SAMPLING AND ANALYSIS PLUS REPORT)	18,741.55
	55,662.43

COMMITTMENTS

DEQ PER OAR 240-102-065	3,500.00
*RIEDEL ENVIRONMENTAL SERVICES (ADMENDMENT 2)	25,000.00+
	84,162.43

50% = 42,081.21

*NAME CHANGE FROM ENVIRONMENTAL EMERGENCY SERVICES

INVOICE TOTAL $42,081.21

TOLS003291

Encl. 1

10000

ACCOUNTS RECEIVA

TIME OIL CO.
BOX 24447 TERM. STATION · SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY · SEATTLE WA 98199-1233
PHONE (206) 285-2400

DEBIT MEMO 020190

DATE 04/17/87
REF. 04-03131 FER

CUSTOMER #: 03/05505623

ACCOUNT: 120 9 12699.07

KOPPERS COMPANY
Koppers Building - Room 750
Pittsburgh, PA 15219

ATTN: JAY STEBBINS

THIS IS AN ADDITION TO INVOICE # 091363 DATED MARCH 6, 1986 FOR $ 42,081.21 TO CHARGE YOU FOR HALF OF EXPENDITURES, PER MUTUTAL AGREEMENT, IN REFERENCE TO CLEAN UP COSTS AT 12005 NORTH BURGARD PORTLAND, OREGON. 12,699.07

COPIES OF THE ORIGINAL INVOICE (#091363, 3/6/86, $42081.21) AND THE UPDATED CHARGES FOR $ 54730.28 ARE ATTACHED.

INVOICE TOTAL $12,699.07

TOLS003292

ORIGINAL

10000

BZTO104(e)040113

TIME OIL C

O.BOX 24447 TERM. STATION - SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY - SEATTLE WA 98199-1233
PHONE (206) 285-2400

INVOICE 056677

DATE 09/21/88
REF. 09-03116 CJC

CUSTOMER #: 03/05505623

ACCOUNT: 657 60 123 4405.27
KOPPERS COMPANY INC
KOPPERS BUILDING ROOM 750
ATTN: BILL GIARLA
PITTSBURGH PA 15219

- -

TO CHARGE YOU FOR 1/2 THE FOLLOWING PWR MUTUAL AGREEMENT IN REFERENCE TO CLEAN UP COSTS AT 12005 N BURGARD RD, PORTLAND OREGON

	EXPENDITURES		
11/9/87	SRH-COLLECT AND ANALIZE WATER SAMPLES	2810.53	
8/31/88	ECOVA-PREPARE PENTA CLEANUP WORK PLAN	6000.00	
		8810.53	
	50%=	4405.27	4,405.27

INVOICE TOTAL $4,405.27

10000

TOLS003293

REVERSE SIDE FOR GENERAL TERMS AND CONDITIONS
190 REV. 8/82

ORIGINAL

BZTO104(e)040114

PHONE 285-2400
CABLE ADDRESS: TIMOIL
(FAX)206-283-8036

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

TIME OIL COMPANY

2737 WEST COMMODORE WAY
P.O. BOX 24447, TERMINAL STATION

SEATTLE, WASHINGTON 98199-1233
SEATTLE, WASHINGTON 98124-0447

11/30 called T. Henderson wcb
12/1 Called T. Henderson wcb
12/2 called T. Henderson wcb
12/8 called T. Henderson wcb

November 17, 1988

Mr. Frederick C. Moore
President
Koppers Company, Inc.
436 Seventh Avenue
Pittsburgh, Pennsylvania 15219

Dear Mr. Moore:

I am writing to you in hopes of resolving a situation that exists between Time Oil Co. and Koppers before it develops into a needless and costly dispute.

Briefly, the situation arises out of an agreement dated March 1, 1967 under which Time Oil agreed to provide certain labor and services to store and blend wood preservatives containing pentachloraphenol belonging to Koppers Company at our Portland, Oregon terminal. After the agreement was terminated in 1982 it was discovered that the ground at the terminal contains substantial quantities of the product belonging to Koppers. As you know pentachloraphenol is a hazardous substance under federal and state law and gives rise to authority by the federal and state governments to compel cleanup of the product by responsible parties including the owner of the product.

Since the problem first materialized Time Oil has been in contact with Koppers Company and initially there appeared to be willingness on the part of Koppers to work with Time to resolve this problem as inexpensively as possible and without exciting the interest of the federal and state authorities. To that end we met with Koppers personnel on January 23, 1986 in Pittsburgh where an agreement in principle was reached under which the cost of resolving this problem would be shared on a fifty fifty basis.

It is not my purpose here to detail the efforts that Time Oil has undertaken to resolve this environmental problem nor the efforts it has taken to obtain the continued cooperation of Koppers. Suffice it to say here that within the last year and half Koppers Company appears to be simply ignoring the problem and our communications.

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I would appreciate anything you might be able to do to advise us as to how this matter may be resolved. My telephone number is (206) 285-2400.

Very truly yours,

TIME OIL CO.

Robert D. Abendroth
Vice President

RDA:TLH:pjv

cc Mr. Bill Giarla ✓
Koppers Company, Inc.
Koppers Building, Room 750
Pittsburgh, Pennsylvania 15219

0297C

10000

M E M O R A N D U M

November 9, 1987

TO: Robert Abendroth — Seattle
John Luckovich — Seattle

FROM: John Denham — Seattle

SUBJECT: PENTACHLOROPHENOL CONTAMINATION - NORTHWEST TERMINAL

Today I contacted Jim Campbell of Keystone Environmental Resources Inc. (412-227-2689) regarding above subject. I again asked that Koppers provide two things:

a. The results of sample analysis accomplished in their laboratory, which was promised not later than June 1, 1987, plus Koppers recommended solution to the contamination problem and;

b. A check in the amount of $54,780.28 as their payment of half the costs incurred to date.

Campbell said they would do so.

Campbell expressed Koppers desire to do two things:

a. Pay us half the costs to date as requested.

b. Come to some agreement where Time Oil will accept all liability for site contamination and relieve Koppers completely. Koppers is willing to pay money for this status.

I plan to discuss b above with our attorneys as soon as possible. Will advise results for consideration.

JPD/ch

10000

TOLS003296

BZTO104(e)040117

cc: B. Nolan - K-1

PHONE 285-2400
CABLE ADDRESS TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

TIME OIL COMPANY

OCT 07 1987

2737 WEST COMMODORE WAY
P.O. BOX 24447, TERMINAL STATION

SEATTLE, WASHINGTON 98199-1233
SEATTLE, WASHINGTON 98124-0447

RECEIVED

OCT 5 1987

Environmental Resources

October 2, 1987

Keystone Environmental Resources Inc.
Jim Campbell
436 7th Ave.
Pittsburg, PA 15219

Dear Mr. Campbell:

This is in reference to our discussion regarding clean up costs at 12005 North Burgard in Portland, Oregon.

Enclosed are copies of the documents you wish to review.

A. The Original invoice #091868 dated March 6, 1986 for $42,081.21.

B. A complete list of expenditures as of April 1, 1987.

C. Billing for the additional charges of $12,699.07 for expenses after the date of the original invoice.

Your cost for half the expenditure, per mutual agreement is $54,780.28.

We appreciate your working with us and look forward to hearing from you at your earliest convenience.

Yours Truly,

TIME OIL CO.

John Luckovich

John E. Luckovich
Credit Manager

JEL:ltd

Enclosures

00028

10000

TOLS003297

BZTO104(e)040118

TIME OIL CO.
P.O.BOX 24447 TERM. STATION - SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY - SEATTLE WA 98199-1233
PHONE (206) 285-2400

INVOICE 091868

DATE 03/06/86
REF. 03-03028 JKJ

CUSTOMER #: 03/05505623

ACCOUNT: 657 60 123 27831.21
KOPPERS COMPANY INC 120 9 . 14250.00
ATTN: DONALD F. MARION
KOPPERS BUILDING ROOM 750
PITTSBURGH PA 15219

TO CHARGE YOU FOR 1/2 OF THE FOLLOWING PER MUTUAL AGREEMENT IN REFERENCE TO CLEAN UP COSTS AT 12005 N. BURGARD RD., PORTLAND, OREGON.

EXPENDITURES

4/26/85 CHEM-SECURITY SYSTEMS (LABORATORY ANALYSIS OF SOIL SAMPLES)	150.00
7/10/85 NORTHWEST VACUUM TRUCK SERVICE (RELOCATING 242.76 TONS OF SOIL TO ARLINGTON)	9,000.00
7/29/85 CHEM-SECURITY SYSTEMS (RECEIVING 243.30 TONS OF SOIL AT ARLINGTON)	27,270.88
8/8/85 ENVIRONMENTAL EMERGENCY SERVICES (OBTAIN AND ANALYZE 3 COMPOSITE SAMPLES)	
12/31/85 ENVIRONMENTAL EMERGENCY SERVICES (PRIMARY SAMPLING AND ANALYSIS PLUS REPORT)	18,741.55
	55,662.43

COMMITTMENTS

DEQ PER OAR 240-102-065	3,500.00
*RIEDEL ENVIRONMENTAL SERVICES (ADMENDMENT 2)	25,000.00+
	84,162.43

50% = 42,081.21

*NAME CHANGE FROM ENVIRONMENTAL EMERGENCY SERVICES

INVOICE TOTAL $42,081.21

TOLS003298

Encl. 1

10000

ACCOUNTS RECEIVA

BZTO104(e)040119

As of 04/01/87

TIME OIL CO. EXPENDITURES IN REFERENCE TO PENTACHLOROPHENOL CLEAN UP COSTS AT 12005 NORTH BURGARD, PORTLAND, OR.

04/26/85	Chem-Security Systems (Laboratory analysis of soil sample)	$ 150.00
07/10/85	Northwest Vacuum Truck Service (Relocating 242.76 tons of soil to Arlington)	$ 9,000.00
07/29/85	Chem-Security Systems (Receiving 243.30 tons of soil at Arlington)	$ 27,270.88
08/08/85	Environmental Emergency Services (Sampling and analysis)	$ 500.00
12/05/85	Environmental Emergency Services (Well drilling, sampling & analysis)	$ 18,741.55
03/24/86	Environmental Emergency Services (Sandblast and demolish wall; install wells)	$ 17,252.67
05/16/86	Instrumentation Northwest (Monitoring well materials)	$ 3,702.66
06/11/86	Century West Engineering (Develop and sample wells)	$ 2,739.50
06/11/86	Department of Environmental Quality (Per OAR 240-102-065)	$ 3,500.00
07/08/86	Century Environmental Sciences (sampling wells)	$ 1,800.00
08/03/86	Riedel Environmental Services, Inc. (Sampling and analysis)	$ 4,452.81
08/25/86	Jack Eatch Construction Co. (Relocate soil and dispose of concrete wall)	$ 1,465.00
09/10/86	Concrete Coring Co. (Cut holes through concrete floor of warehouse)	$ 390.00
10/24/86	SRH Associates, Inc. Investigation of pentachlorophenol as per contract dated 08/14/86	$ 18,465.00
01/26/87	Century West Engineering (Well sampling and analysis)	$ 130.50
		$109,560.57
	Koppers Company share of costs = 50% =	$ 54,780.28
	TOTAL DUE FROM KOPPERS =	$ 54,780.28

Encl. 2

10000

TOLS003299

BZTO104(e)040120

TIME OIL CO.
P.O.BOX 24447 TERM. STATION - SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY - SEATTLE WA 98199-1233
PHONE (206) 285-2400

DEBIT MEMO 020190

DATE 04/17/87
REF. 04-03131 FER

CUSTOMER #: 03/05505623

ACCOUNT: 120 9 12699.07

KOPPERS COMPANY
Koppers Building - Room 750
Pittsburgh, PA 15219

ATTN: JAY STEBBINS

THIS IS AN ADDITION TO INVOICE # 091363 DATED MARCH 6, 1986 FOR $ 42,081.21 TO CHARGE YOU FOR HALF OF EXPENDITURES, PER MUTUTAL AGREEMENT, IN REFERENCE TO CLEAN UP COSTS AT 12005 NORTH BURGARD PORTLAND, OREGON. 12,699.07

COPIES OF THE ORIGINAL INVOICE (#091363, 3/6/86, $42081.21) AND THE UPDATED CHARGES FOR $ 54730.28 ARE ATTACHED.

INVOICE TOTAL $12,699.07

10000

TOLS003300

Encl. 3
SEE REVERSE SIDE FOR GENERAL TERMS AND CONDITIONS

ORIGINA

BZTO104(e)040121

PHONE 285-2400
CABLE ADDRESS: TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

TIME OIL COMPANY

2737 WEST COMMODORE WAY
P.O. BOX 24447, TERMINAL STATION

SEATTLE, WASHINGTON 98199-1233
SEATTLE, WASHINGTON 98124-0447

April 20, 1987

Koppers Company Inc.
Attn: Jay Sebbins
Koppers Building, Room 750
Pittsburgh, PA 15219

Dear Mr. Sebbins:

This refers to our previous telecon regarding clean-up of Koppers pentachlorophenol at 12005 North Burgard, Portland, OR and Time Oil invoice 091868 dated 03/06/86, which you agreed to look into and give me a call back regarding payment.

To my knowledge, there has been no call hence this letter as a reminder. Since invoice 091868 was forwarded, those items shown on invoice as "COMMITMENTS" became a reality and have been paid by Time Oil. In addition, other essentials have been accomplished and fees for those services have been also paid by Time. The net result is an increase to Koppers share of costs by $12,699.07.

Enclosed is copy of original invoice, a listing of expenditures to date and an invoice for one-half the cost of those expenditures incurred since original invoice. This package reflects total costs as of 04/01/87.

Your processing of these invoices for prompt payment is truly appreciated.

Sincerely,

John P. Denham

John P. Denham
Environmental Manager

Encl. a/s

JPD/jam

TOLS003301

10000

BZTO104(e)040122

TIME OIL CO.

P.O.BOX 24447 TERM. STATION - SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY - SEATTLE WA 98199-1233
PHONE (206) 285-2400

INVOICE 091868

DATE 03/06/86
REF. 03-03028 JKJ

CUSTOMER #: 03/05505623

ACCOUNT:
KOPPERS COMPANY INC
ATTN: DONALD F. MARION
KOPPERS BUILDING ROOM 750
PITTSBURGH PA 15219

657 60 123 27831.21
120 9 14250.00

TO CHARGE YOU FOR 1/2 OF THE FOLLOWING PER MUTUAL AGREEMENT IN REFERENCE TO CLEAN UP COSTS AT 12005 N. BURGARD RD., PORTLAND, OREGON.

EXPENDITURES

4/26/85 CHEM-SECURITY SYSTEMS (LABORATORY ANALYSIS OF SOIL SAMPLES)	150.00
7/10/85 NORTHWEST VACUUM TRUCK SERVICE (RELOCATING 242.76 TONS OF SOIL TO ARLINGTON)	9,000.00
7/29/85 CHEM-SECURITY SYSTEMS (RECEIVING 243.30 TONS OF SOIL AT ARLINGTON)	27,270.88
8/8/85 ENVIRONMENTAL EMERGENCY SERVICES (OBTAIN AND ANALYZE 3 COMPOSITE SAMPLES)	
12/31/85 ENVIRONMENTAL EMERGENCY SERVICES (PRIMARY SAMPLING AND ANALYSIS PLUS REPORT)	18,741.55
	55,662.43

COMMITTMENTS

DEQ PER OAR 240-102-065	3,500.00
*RIEDEL ENVIRONMENTAL SERVICES (ADMENDMENT 2)	25,000.00+
	84,162.43

50% = 42,081.21

*NAME CHANGE FROM ENVIRONMENTAL EMERGENCY SERVICES

INVOICE TOTAL $42,081.21

10000

Encl. 1

TOLS003302

ACCOUNTS RECEIVABL

BZTO104(e)040123

As of 04/01/87

TIME OIL CO. EXPENDITURES IN REFERENCE TO PENTACHLOROPHENOL CLEAN UP COSTS AT 12005 NORTH BURGARD, PORTLAND, OR.

04/26/85	Chem-Security Systems (Laboratory analysis of soil sample)	$ 150.00
07/10/85	Northwest Vacuum Truck Service (Relocating 242.76 tons of soil to Arlington)	$ 9,000.00
07/29/85	Chem-Security Systems (Receiving 243.30 tons of soil at Arlington)	$ 27,270.88
08/08/85	Environmental Emergency Services (Sampling and analysis)	$ 500.00
12/05/85	Environmental Emergency Services (Well drilling, sampling & analysis)	$ 18,741.55
03/24/86	Environmental Emergency Services (Sandblast and demolish wall; install wells)	$ 17,252.67
05/16/86	Instrumentation Northwest (Monitoring well materials)	$ 3,702.66
06/11/86	Century West Engineering (Develop and sample wells)	$ 2,739.50
06/11/86	Department of Environmental Quality (Per OAR 240-102-065)	$ 3,500.00
07/08/86	Century Environmental Sciences (sampling wells)	$ 1,800.00
08/08/86	Riedel Environmental Services, Inc. (Sampling and analysis)	$ 4,452.81
08/25/86	Jack Eatch Construction Co. (Relocate soil and dispose of concrete wall)	$ 1,465.00
09/10/86	Concrete Coring Co. (Cut holes through concrete floor of warehouse)	$ 390.00
10/24/86	SRH Associates, Inc. Investigation of pentachlorophenol as per contract dated 08/14/86	$ 18,465.00
01/26/87	Century West Engineering (Well sampling and analysis)	$ 130.50
		$109,560.57
	Koppers Company share of costs = 50% =	$ 54,780.28
	TOTAL DUE FROM KOPPERS =	$ 54,780.28

Encl. 2

10000

TOLS003303

BZTO104(e)040124

TIME OIL CO.
P.O.BOX 24447 TERM. STATION - SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY - SEATTLE WA 98199-1233
PHONE (206) 285-2400

DEBIT MEMO 020190

DATE 04/17/87
REF. 04-03131 FER

CUSTOMER #: 03/05505623

ACCOUNT: 120 9 12699.07
KOPPERS COMPANY
Koppers Building - Room 750
Pittsburgh, PA 15219
ATTN: JAY STEBBINS

- -

THIS IS AN ADDITION TO INVOICE # 091363 DATED MARCH 6, 1986 FOR $ 42,081.21 TO CHARGE YOU FOR HALF OF EXPENDITURES, PER MUTUTAL AGREEMENT, IN REFERENCE TO CLEAN UP COSTS AT 12005 NORTH BURGARD PORTLAND, OREGON.	12,699.07
COPIES OF THE ORIGINAL INVOICE (#091363, 3/6/86, $42081.21) AND THE UPDATED CHARGES FOR $ 54780.28 ARE ATTACHED.	
INVOICE TOTAL	$12,699.07

10000

TOLS003304

Encl. 3
SEE REVERSE SIDE FOR GENERAL TERMS AND CONDITIONS
TDP 190 REV. 8 82

ORIGINAL

BZTO104(e)040125

TIME OIL CO.

P.O.BOX 24447 TERM. STATION - SEATTLE WA 98124-0447
2737 WEST COMMODORE WAY - SEATTLE WA 98199-1233
PHONE (206) 285-2400

INVOICE 091868

DATE 03/06/86
REF. 03-03028 JKJ

CUSTOMER #: 03/05505623

ACCOUNT: 657 60 123 27831.21
120 9 14250.00

KOPPERS COMPANY INC
ATTN: DONALD F. MARION
KOPPERS BUILDING ROOM 750
PITTSBURGH PA 15219

TO CHARGE YOU FOR 1/2 OF THE FOLLOWING PER MUTUAL AGREEMENT IN REFERENCE TO CLEAN UP COSTS AT 12005 N. BURGARD RD., PORTLAND, OREGON.

EXPENDITURES

4/26/85 CHEM-SECURITY SYSTEMS	
(LABORATORY ANALYSIS OF SOIL SAMPLES)	150.00
7/10/85 NORTHWEST VACUUM TRUCK SERVICE	
(RELOCATING 242.76 TONS OF SOIL TO ARLINGTON)	9,000.00
7/29/85 CHEM-SECURITY SYSTEMS	
(RECEIVING 243.30 TONS OF SOIL AT ARLINGTON)	27,270.88
8/8/85 ENVIRONMENTAL EMERGENCY SERVICES	
(OBTAIN AND ANALYZE 3 COMPOSITE SAMPLES)	
12/31/85 ENVIRONMENTAL EMERGENCY SERVICES	
(PRIMARY SAMPLING AND ANALYSIS PLUS REPORT)	18,741.55
	55,662.43

COMMITTMENTS

DEQ PER OAR 240-102-065	3,500.00
*RIEDEL ENVIRONMENTAL SERVICES (ADMENDMENT 2)	25,000.00+
	84,162.43
50% =	42,081.21

*NAME CHANGE FROM ENVIRONMENTAL EMERGENCY SERVICES

INVOICE TOTAL $42,081.21

TOLS003305

10000

EE REVERSE SIDE FOR GENERAL TERMS AND CONDITIONS
DP 190 REV. 8/82

ORIGINAL

BZTO104(e)040126

PHONE 285 2400
CABLE ADDRESS TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

PRODUCTS TIME TESTED

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

February 19, 1986

Koppers Company, Inc.
Attn: Donald F. Marion
Forest Products Group
Koppers Building, Room 750
Pittsburgh, PA 15219

Dear Don:

This refers to our mutual problem of pentachlorophenol contamination at 12005 North Burgard Road in Portland Oregon.

During our January 23, 1986 meeting at your offices in Pittsburgh, you mentioned that Koppers would agree to paying half the clean-up costs incurred/committed to date and that further coordination between Koppers and Time would be appropriate for future committments. Time concurs with this approach.

In this light, the below accounting to date will be followed by an invoice two weeks from today unless we hear some objections from you before then.

EXPENDITURES

4/26/85	Chem-Security Systems (Laboratory Analysis of soil sample)	150.00
7/10/85	Northwest Vacuum Truck Service (Relocating 242.76 tons of soil to Arlington)	9,000.00
7/29/85	Chem-Security Systems (Receiving 243.30 tons of soil at Arlington)	27,270.88
8/8/85	Environmental Emergency Services (Obtain and analyze 3 composite samples)	500.00
12/5/85	Environmental Emergency Services (Primary sampling and analysis plus report)	18,741.55
		$55,662.43

TOLS003306

61

BEP116793

10000

BZTO104(e)040127

COMMITTMENTS

DEQ per OAR 240-102-065	3,500.00
* Riedel Environmental Services (Amendment 2)	25,000.00 + $84,162.43
	50% = $42,081.21

* Name change from Environmental Emergency Services

Should you have any questions regarding the above, please give me a call.

Sincerely,

Robert D. Abendroth
Operations Manager

RDA/ch

61

10000

TOLS003307

BEP116794

BZTO104(e)040128

PHONE 285-2400
CABLE ADDRESS TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

PRODUCTS TIME TESTED

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

February 19, 1986

Koppers Company, Inc.
Attn: Donald F. Marion
Forest Products Group
Koppers Building, Room 750
Pittsburgh, PA 15219

Dear Don:

This refers to our mutual problem of pentachlorophenol contamination at 12005 North Burgard Road in Portland Oregon.

During our January 23, 1986 meeting at your offices in Pittsburgh, you mentioned that Koppers would agree to paying half the clean-up costs incurred/committed to date and that further coordination between Koppers and Time would be appropriate for future committments. Time concurs with this approach.

In this light, the below accounting to date will be followed by an invoice two weeks from today unless we hear some objections from you before then.

EXPENDITURES

4/26/85	Chem-Security Systems (Laboratory Analysis of soil sample)	150.00
7/10/85	Northwest Vacuum Truck Service (Relocating 242.76 tons of soil to Arlington)	9,000.00
7/29/85	Chem-Security Systems (Receiving 243.30 tons of soil at Arlington)	27,270.88
8/8/85	Environmental Emergency Services (Obtain and analyze 3 composite samples)	500.00
12/5/85	Environmental Emergency Services (Primary sampling and analysis plus report)	18,741.55
		$55,662.43

61

10000

BEP116793

TOLS003308

BZTO104(e)040129

COMMITTMENTS

DEQ per OAR 240-102-065	3,500.00
* Riedel Environmental Services (Amendment 2)	25,000.00 +
	$84,162.43
	50% = $42,081.21

* Name change from Environmental Emergency Services

Should you have any questions regarding the above, please give me a call.

Sincerely,

Robert D. Abendroth
Operations Manager

RDA/ch

61

TOLS003309

10000

BEP116794

BZTO104(e)040130

KOPPERS

Interoffice Correspondence

To W. J. Baldwin — From D. F. Marion

Location K-1350 — Location K-750

Subject Time Oil Visit - October 9, 1985 — Date October 14, 1985

On October 9, 1985, Jim Garrity, Denise Burrell and I visited with Neil Wallis at Time Oil Company's terminal in Portland, Oregon. We discussed the clean-up efforts at the Portland terminal to date and reviewed where we would go in the future. At this time, Time Oil has disposed of nine truckloads of soil and incurred costs of $55,000 - $60,000. While visiting Neil Wallis, he made copies of the pentachlorophenol sampling and analysis report prepared by Riedel Environmental Services which is attached for everyone's review and comments. Neil indicated that a meeting with John Denham and John Ruddick of Riedel Environmental Services was to be held on Thursday, October 10, in Portland. After this meeting, Neil Wallis, John Denham and Bob Abbendroth would like to get together to determine the next steps in meeting allowable limits of PCP at the Portland Terminal. In addition, Bob Abbendroth would like to set up a meeting to finalize Koppers portion of the payment for services to clean up the Portland Terminal.

After you have had an opportunity to review the attached report, please give me a call to determine our options at this point in time. If you have any questions regarding the above information or attached report, please call me immediately.

Donald F. Marion

DFM/jls

Attachment

cc: J. F. Garrity
R. G. Hamilton
J. D. Hite
J. Kusar
R. J. Parry
T. Smith
M. R. Urbassik
A. S. Wells

5 REV. 2 10000

TOLS003310

BZTO104(e)040131

PHONE 285-2400
CABLE ADDRESS: TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

TIME
PRODUCTS TIME TESTED

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

February 4, 1985

Department of Environmental Quality
Attn: Janet Gillaspie, Northwest Region Manager
522 S.W. 5th Avenue, P.O. Box 1760
Portland, Oregon 97207

Dear Ms. Gillaspie:

This pertains to our Northwest Terminal location at 12005 North Burgard in Portland, Oregon and the bulk pentachlorophenol operation at that site. The purpose of this letter is to acquaint you with concurrent actions being taken by two companies to voluntarily correct what both felt may become a problem.

BACKGROUND

In March of 1982, a potential problem with the ground surrounding the pentachlorophenol operation was determined. Contract between Koppers Co. (product owner) and Time Oil Co. (land owner) was cancelled. Product phaseout and clean-up actions were jointly agreed upon by both companies. Accomplishments to date have been:

a. Bulk pentachlorophenol operations ceased.

b. On hand product inventory blended off and shipped out.

c. All tanks and piping cleaned.

d. Waste from cleaning shipped to Arlington.

e. Piping removed and scrapped.

f. Time Oil Co. tanks removed and scrapped.

Remaining to be accomplished are:

a. Removal of Koppers owned tanks (scheduled for week of February 4, 1985).

b. Contaminated soil removal and replacement.

10000-

On December 12, 1984, Messrs. John Smits and Rick Gates of your office conducted soil sampling activities at the site. Twelve samples were taken inside diked areas. Split samples were provided Time Oil Co. DEQ laboratory test results (49 pages) were received here on February 1, 1985. Telecon with Messrs. Smits and Gates on that date revealed the following:

a. All samples were tested for lead content. None were found to be above normal limits (page 1).

b. All samples were tested for fourteen different pesticides. None were found to be above normal limits (pages 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36).

c. All samples were scanned for organic chemicals other than priority pollutants (pages 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37). No unknowns were identified above detection limits on nine of these samples. On three sample, (pages 13, 28, 31), the compounds tentatively identified were those petroleum residues normally expected to be found in a tank farm. Estimated concentrations were so low that none were at all significant, simply present.

d. All samples were tested for priority pollutant chemicals (pages 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35). No unknowns were identified above detection limits on eight of these samples. On one sample (page 11), only two trace elements were found. Both were in the 1 ppm quantity, which is not considered significant and certainly cannot be classed as a problem. On one sample (page 23), three residues of polynuclear aeromatics were found, again insignificant in quantity. On one sample (page 26), one more polynuclear aeromatic of insignificant quantity was found along with a small quantity (515 ppm) of pentachlorophenol and 12 ppm of tetrachlorophenol. It is my understanding that since this quantity (515 ppm) of pentachlorophenol is below 1000 ppm, it falls in the gray area of consideration regarding significance. The tetrachlorophenol is a part of commercial pentachlorophenol so its presense would naturally be expected. On one sample (page 29), pentachlorophenol (1820 ppm) and tetrachlorophenol (71 ppm) were found. This latter finding confirms our unitedly expressed (Koppers and Time Oil) concern and substantiates the need for corrective action as we had previously planned.

CURRENT

As of today, it appears that our (Koppers and Time Oil) initial plan of action remains valid. Progress has been made. Time and more favorable weather conditions should result in the contaminated soil being removed, necessary second soil tests being conducted and new soil being put in place without difficulty.

Sincerely,

John P. Denham

John P. Denham
Environmental Manager

JPD/ch

10000

PHONE 285-2400
CABLE ADDRESS: TIMOIL

Time Oil File - Portland Ore.

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

PRODUCTS TIME TESTED

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

January 16, 1985

Templeton Smith
Law Department
Koppers Co. Inc.
Pittsburg, PA 15129

Dear Mr. Smith:

Per your request, attached is copy of plot plan 1140 showing location at our Northwest terminal where the Department of Environmental Quality sampled the ground within the diked area in which Pentachlorophenol operations were conducted. Sample was a composite of surface, one foot and two foot depths.

It was a pleasure to meet you in St. Louis last week.

Sincerely,

John P. Denham

John P. Denham
Environmental Manager

Attachment a/s

JPD/ch

10000

TOLS003313

BZTO104(e)040134

M E M O R A N D U M

January 15, 1985

TO: File
Robert Abendroth (info) Seattle
Neil Wallis (info) Portland

FROM: John Denham Seattle

SUBJECT: WOODTREATING AT NORTHWEST TERMINAL

On October 3, 1983, Neil Gallagher, Neil Wallis and I (TOC) met with John Palmer and Bill Baldwin (Koppers) at Northwest terminal to establish phaseout actions necessitated by the March 31, 1982 contract termination between the two companies. A verbal agreement was reached.

On January 11, 1985, Robert Abendroth, Neil Wallis and I (TOC) met with Koppers Co. personnel in St. Louis, Missouri. Present from Koppers were Templeton Smith (Counsel); Don Marion, Jim Garrity and Jeff Stern (Operations) and Bill Baldwin (Environmental). Purpose of meeting was to provide an update on actions taken thus far and to resolve any differences regarding closure of work site at Northwest terminal.

Accomplishments to date have been:	Action Co.
a. Bulk Pentochlorophenol operations ceased.	Both
b. On-hand inventory blended off and shipped out.	Both
c. All tanks and piping cleaned.	Koppers
d. Waste from cleaning shipped to Arlington.	Koppers
e. Piping removed and scrapped.	TOC
f. TOC tanks removed and scrapped.	TOC
g. Warehouse steam cleaned.	TOC

Remaining to be accomplished are:	Action Co.
a. Removal of Koppers owned tanks.	Koppers
b. Contaminated soil removal and replacement.	Both
c. Cost sharing of contaminated soil problem.	Both

10000

TOLS003314

BZTO104(e)040135

It is my understanding that Northwest Vacuum Truck Service will remove Koppers owned tanks immediately on receipt of tank release from Koppers.

Soil removal efforts, as planned on October 3, 1983, have been temporarily thwarted due to Department of Environmental Quality (DEQ) December 12, 1984 intrusion on another matter. The DEQ took one soil sample within the diked area where Koppers operation took place. We must now await receipt of DEQ laboratory reports on this sample to determine extent of soil removal needed. Soil removal plan remains the same - remove and dispose of discolored soil (about one foot deep), sample ground below that point and either continue removal until no further contaminated soil is found or stop when that point is reached and refill area with clean soil. While we are waiting for DEQ laboratory reports, Neil Wallis will obtain estimated soil removal and disposal costs from Northwest Vacuum Truck Service, Chem-Security and Environmental Emergency Services on a cubic yard basis.

Once extent of soil removal and its related costs become known, it is my understanding that Robert A. will coordinate with Koppers and settle the cost sharing matter. Job can then be completed.

JPD/ch

10000

WESCOMP inc.
Western Compliance Services, Inc.

"The Waste Management People"

INVOICE # 10442

SOLD TO: Koppers Inc.
701 Koppers Bldg.
Pittsburgh, PA 15219

MANIFEST # 2766NWVT
DATE: 11-30-84
YOUR ORDER # 10-4-3032
SHIPPED TO: Arlington

OUR ORDER #	CONTACT	TERMS
TK	Terry Kraft	2%/10 NET 15 DAYS

DESCRIPTION	UNIT PRICE	unit	AMOUNT
Hazardous Waste Services: Permitting, labeling, loading, manifesting, inspecting, transportation and disposal.	$6.40	2500	$16,000.00
	$1.50	1000	$ 1,500.00

61

Please Pay This Amount $17,500.00

Please Remit Payment to: Western Compliance Services, Inc.
P.O. Box 338
Tualatin, Oregon 97062

10000

TOLS003316

BZTO104(e)040137

To: J. GARRITY
ST. LOUIS MC

12/11/84

From: DONALD F. MARION

Jim,

Attached for your processing is Wascomp, Inc's invoice for hazardous waste services at the D.S. Please call me regarding this invoice. Let's make sure it's paid in December prior to the end of fiscal 1984 & don't want it to affect 1985.

Thanks
Don

61

10000

TOLS003317

BZTO104(e)040138

M E M O R A N D U M

December 13, 1984

TO: Robert Abendroth (less encl) Seattle
Terry Henderson (less encl) Seattle
Neil Wallis Portland

FROM: John Denham Seattle

SUBJECT: DEQ INSPECTION AT NORTHWEST TERMINAL

This is a follow-up to my July 5, 1984 memo on above subject and DEQ inspection (part on October 25 and part on December 12).

BACKGROUND

DEQ is participating in EPA's HW 3012 Superfund Inspection Program during 1984 to determine hazardous wastes at 44 abandoned, uncontrolled hazardous wastes facilities in Oregon. Our Northwest terminal has been designated as such a facility even though neither TOC nor any of the other companies listed meet any of these three categories. ORS 459.670 authorizes such inspections and all that follows. The time frame of DEQ interest is from date of facility ownership (1953) until 1972.

On October 25, DEQ inspected the site, heard how we did what, viewed our procedures and decided it would sample the ground within all diked areas. On December 12, DEQ took 12 samples at locations shown on attached plot plan. We obtained split samples and are maintaining them at 40°F. in the Northwest terminal refrigerator. DEQ estimates sample analysis to be completed by January 15, 1985 and will advise us of results in writing. We in turn would then consider having only unfavorable results analyzed by a laboratory of our own selection and take it from there.

Attachments a/s

JPD/ch

10000

TOLS003318

BZTO104(e)040139

PHONE 285 2400
CABLE ADDRESS: TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

November 20, 1984

Department of Environmental Quality
Northwest Region
Attn: John L. Smits, R.S.
522 S.W. Fifth Avenue, P.O. Box 1760
Portland, Oregon 97207

Dear Mr. Smits:

This is to acknowledge receipt of your November 14, 1984 letter regarding DEQ HW-3012 assessment of Time Oil Co. facility at 12005 N. Burgard in Portland, Oregon.

As per our telecon today, date of sampling was confirmed to be December 12, 1984. One additional bit of information is needed at the time sampling is done - the name of the tests to be performed on soil samples taken.

Sincerely,

John P. Denham

John P. Denham
Environmental Manager

JPD/ch

VICTOR ATIYEH
Governor

Department of Environmental Quality

522 S.W. FIFTH AVENUE, BOX 1760, PORTLAND, OREGON 97207 PHONE: (503) 229-5696

November 14, 1984

Time Oil Company
P.O. Box 24447
Terminal Annex
Seattle, WA 98124

Re: HW-3012 Superfund
Time Oil Company
Multnomah County

The Department is conducting an assessment of past waste disposal practices at your facility at 12005 N. Burgard, Portland, Oregon as part of a RCRA Section 3012 cooperative agreement with EPA. The assessment included a site inspection and interview with John Denham and Neil Wallis on October 25, 1984.

In order to properly complete the assessment, a grid of composite soil samples tested for priority pollutants is required from within the tank farm. This includes the old Bell Oil Terminal and additional samples near the tanks leased to Crosby and Overton. Proposed sampling points are shown on the attached map.

The purpose of this activity is to determine if there are environmental problems associated with past handling of tank bottoms, draw waste waters, separator sludge, pentachlorophenol and wastes handled by Crosby and Overton. The Department cites Oregon Revised Statutes (ORS) 459.670 (copy enclosed) governing hazardous waste as authority to enter the site for sample collection.

The Department requests your cooperation in completing the assessment work. We have a limited amount of time to complete this activity and, therefore, as agreed we propose to collect samples on December 5(6) 1984 beginning at 1:30 p.m. Sampling will take two to three hours. Split samples will be provided in containers to you. If you wish to hold samples for later analysis, the temperature should be maintained at 4° C. We expect to be able to phone preliminary results about 30 days after collection. Test procedures will be provided to you at the time of sampling.

If you have any questions, please feel free to contact me at our Portland office at (503) 229-5296 or (503) 738-5949.

Sincerely,

John L. Smits
Environmental Analyst
Northwest Region

JLS:b
RB3953
Enclosure(s)
cc: Northwest Region, DEQ
Hazardous Waste Operations, DEQ
Crosby and Overton
EPA Region X
Superfund Program Management Section
DEQ - Laboratory

DEQ-1

10000

TOLS003320

BZTO104(e)040141

cc: B BALDWIN
R. HAMILTON

KOPPERS

Interoffice Correspondence

To Don Marion — From James F. Garrity Over St Louis Plant mgr.

Location K-700 — Location St. Louis

Subject Time Oil — Date October 17, 1984

Met with Neil Wallis, John Denham, Fred Proby, and Neil Gallagher to discuss a clean-up procedure at Time Oil.

The clean-up will be broken down into three phases: Phase one, internally clear theirteen tanks and remove as bulk waste; Phase two, remove Koppers own storage tanks to an area to be scrapped; Phase three, determine soil contamination.

Phase One:

Western Compliance Service, Inc. (Wescomp) is taking care of arranging the tank clean-out. One tank will act as a holding tank for the waste and rinse liquids. From this tank a homogeneous sample will be taken and submitted to Coffey Labs. Once results are known, either the existing profile sheet can be used or a new profile sheet must be submitted to the Department of Environmental Quality for approval. Once approved Chemical Security will solidify and arrange to move the hazardous waste to the waste landfill in Arlington, OR. (Estimated completion time, eight weeks.)

Phase Two:

George McGinley, Pittsburgh Purchasing, is receiving bids on removing the six horizontals and one mobile tank that Koppers own. These seven tanks will be scrapped (away from danger) on Time Oil's property.

Phase Three:

The diked area where the storage tanks rest need ground samples taken. The floor in this area of concern consists of sand and dirt. Over the years an unknown amount of Woodtox Preprime and 140 has leaked into the soil. The clean-up responsibilities are Time Oil's, but they would like Koppers to contribute. I'll be in contact with Bill Baldwin to update him so he can get involved.

This is a general description of what will take place over the next few months. If a more detailed report is needed, please advise.

WTC Inventory (10/2/84)

1.	Mineral Spirits	300 gals.
2.	Paraffin Wax	1111 gals.
3.	Phosphoric Acid	125 lbs.
4.	WR-340 Conc.	165 gal.
5.	55 gal., TH, B&W, Drum	50 ea.

61

K-5 REV. 2

10000

TOLS003321

BZTO104(e)040142

1. The mineral spirits will be used to rinse the storage tanks after they have been pumped dry.

2. The paraffin wax is being sent back to St. Louis to be used there.

3. The phosphoric acid will be returned to Van Walter and Rogers.

4. Three drums of WR-340 are being offered at distressed price to Cal Wood Door.

5. Sold Time Oil the 50 empty drums.

Jim/mp
James F. Garrity

JFG/mp

61

10000

M E M O R A N D U M

July 5, 1984

TO:	Robert Abendroth	Seattle
	Terry Henderson	Seattle
	Neil Wallis	Portland
FROM:	John Denham	Seattle

SUBJECT: DEQ PROPOSED INSPECTION OF NORTHWEST TERMINAL

On April 27, 1984, the DEQ advised our Portland office by letter, that the Northwest terminal was on a list of 44 companies, which are scheduled to be inspected during 1984. Inspection was allegedly pertinent to "uncontrolled abandoned" hazardous waste disposal sites in Oregon". Letter was finally received by me on May 15th.

Since TOC does not operate a hazardous waste disposal site, I attempted to find out from both the DEQ and the EPA, just why we were on the list at all. As it turned out, the EPA provided DEQ with Superfund money for coming up with a list of sites to be inspected, the inspection of those sites and the rendering of a report of inspection. It is of interest to note that none of the 44 companies scheduled for inspection are TSD's. All this information was noted in my May 25th request to the DEQ that TOC be removed from the list.

Today my May 25th request was denied, copy attached. Contact with Terry on this matter resulted in a legal opinion that we can do nothing to prevent the inspection. Contact with the DEQ (John Smits 503 325-8660) revealed inspection is scheduled for late August. I will be there.

JPD/ch

Attachment a/s

10000

TOLS003323

BZTO104(e)040144

VICTOR ATIYEH
Governor

Department of Environmental Quality

522 S.W. FIFTH AVENUE, BOX 1760, PORTLAND, OREGON 97207 PHONE: (503) 229-5696

April 27, 1984

Time Oil Company
12005 N. Burgard Street
Portland, OR 97203

Inspection Program mgr. Greg Goesler 229-5296

Dear Plant Manager:

Your company has been listed as one of 44 which our staff will be inspecting this year to gather better information about your past waste disposal practices. This effort is part of a year-long study funded by the federal Environmental Protection Agency (EPA).

The inclusion of your company on this list does not indicate that we believe any environmental problem exists on your property. Generally, there have been hazardous waste management problems nationwide at other types of businesses similar to yours and consequently we would like to gather additional data. The list of 44 sites was developed by EPA using a variety of information sources including industrial categories, information voluntarily gained under the Superfund reporting system, and others.

John Meyer 442-7215

I have enclosed a report which went to our Commission earlier this month which discusses our abandoned site investigation work in greater detail. Should you need additional information about the specific reason your company was included on the list, please contact Debbie Flood in EPA's 37 Times Seattle Regional Office at 206/442-2722. Should you want more information about our hazardous waste management program here in Oregon, please contact Rich Reiter in Portland at 229-6434. Our toll-free telephone number is 1-800-452-4011.

developed list in 11 Times

Sincerely,

Fred Hansen

Fred Hansen
Director

FH:d
FD761 (44)

10000

EQ-1

TOLS003324

BZTO104(e)040145

cc: J. D. Hite
ROUTE PGH: JFB, WHS, MAS, DBM, WJB, MAC, KEC, SS
Conley: F. Boge/F. Klasnick
Orrville: C. McIntyre/H. Fry
St. Louis: J. Palmer/C.Kempinska

KOPPERS

Interoffice Correspondence

To Joe Kusar
Location K-750
Subject MAY MONTHLY REPORT

From D. W. May
Location K-750
Date June 4, 1984

SALES HIGHLIGHTS - May, 1984

WOOD TREATING CHEMICALS

	May '84 ($000)	YTD '84 ($000)	May '83 ($000)	YTD '83 ($000)	Performance YTD
NON-TRADEMARK CCA					
Distributor	0	0	249	1278	0
Others	275	988	201	842	17
TOTAL NON-TRADEMARK	275	988	450	2120	(53)
PENTA					
Customers	10	58	22	44	32
Koppers Plants	152	518	115	657	(21)
TOTAL PENTA	162	576	137	701	(18)
ARSENIC ACID					
Filtered Tech	80	227	104	165	37
High Purity	23	274	137	303	(10)
TOTAL ARSENIC ACID	103	501	241	468	7
FORMULATED PRODUCTS					
Millwork Solutions	79	345	67	347	0
Sawn Lumber Chemicals**	96	413	89	353	(17)
Remedial Pole Treatments	45	70	37	112	(37)
MISCELLANEOUS	101	613	306	1003	(39)
TOTAL FORMULATED PRODUCTS	321	1441	499	1815	(20)

**Sawn lumber chemicals ($) includes all Sapstain and end sealer/lumber castings.

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TOLS003325

BZTO104(e)040146

TIME OIL

We have recommended that we discontinue production of Woodtox at this location due to the lack of justification for a $90M capital expenditure based on future sales potential of 80,000-100,000 gallons/year. A full report will be issued.

ARSENIC ACID

Hoover

This customer has not as yet signed our proposed contract for purchase of Arsenic Acid. It is still under review by the customer and hopefully a decision will be made prior to the next report period.

GTE (Versailes,KY)

This account has decided to stop using Arsenic Acid due to EPA requirements on stack emissions. We have arranged for Bill Baldwin to discuss this subject with the account directly in the event that a change in decision is possible.

Langdale

Sales of Arsenic Acid have been exceptionally good here being almost twice the volume required by the contract. We will continue to call on this account as a prime account and develop a forecast as to their requirement from Koppers for the rest of this year.

PB&S

We have contacted this account to urge increased effort to distribute Koppers Arsenic Acid. We have learned that pricing has reduced possibility of increased sales in that the market price in the areas involved is approximately $0.52/lb. delivered in drums. Koppers price to this account is $0.48/lb. in drums F.O.B. plant. PB&S is mostly interested in large volume business rather than promoting the Arsenic Acid to small accounts. They will, however, work up a program as to what they feel they can sell at the prices we have discussed and we can then make a decision whether to continue with them as a distributor or perhaps find a more aggressive distributor to replace them.

cc: B Stuart
K Adamson
C Brooks
H Hollis

KOPPERS
Interoffice Correspondence

To J. D. Hite

From D. F. Marion

Location K-724

Location K-724

Subject Monthly Report - February, 1984

Date March 9, 1984

Listed below are the major items covering the month of February, 1984.

1. During February, all three arsenic acid cars were utilized to the maximum. UTLX-85653 and GATX-74970 were shipped to Jones-Hamilton on 2/7 and 2/14, respectively. UTLX-78581 was shipped 2/14 and 2/27 to Valpo. The UTLX-85653 car has been unloaded at Jones-Hamilton and is enroute to Conley. It should arrive in Conley the week of 3/5/84 for loading. The other two cars are in transit and should arrive at Valpo and Jones-Hamilton the week of 3/5/84 for unloading.

2. During February, we again shipped 75% high purity arsenic acid to Corning's plants in Martinsburg, WV and Charleroi, PA. We also received orders for March from those two plants as well as the Corning plant in Danville, VA. Thus, thru March, excluding the small quantity of Strategic Inventory material shipped in January, we will have shipped Corning approx. 330,000 pounds of 75% high purity arsenic acid. Their 1984 blanket purchase order only estimated 500,000 pounds for the entire year and I'm confident we'll surpass that amount. I believe we are currently getting 100% of the business in Charleroi, PA, Martinsburg, WV and Danville, VA. In the near future, Hooker Horton and I plan on getting together to discuss the strategic inventory program for Conley. At that point, I will pursue other Corning locations for us to ship to.

Bill Baldwin is currently working with the people from the Corning plant at Charleroi on cleaning out one of their arsenic acid storage tanks.

In addition, Doug Myers called on the GTE plant in Central Falls, RI and he was advised that the 1984 blanket order for that plant was mailed to Koppers by Frank Lyons, the purchasing agent. Pam Armbruster called on the GTE plant in Versailles, KY and will visit the North American Phillips plant in Danville, KY. She also visited Salsbury Labs in Charles City, Iowa and is optimistic that we'll get an order from them in the near future.

Also, Pete Williams from Woolfolk Chemical called me and ordered a load of technical grade, filtered, arsenic acid for delivery on 3/1/84. This material will be sold at $.40/lb. FOB Conley.

Also, per Joe Kusar, contracts have been finalized with Langdale and Hoover and PB&S has been offered 500,000 pounds of technical grade, filtered, arsenic acid for distribution. PB&S material will be moved via Chem. Lehman or Kennan and PB&S will pay for the tanker clean out after each shipment. Conley is to advise costs to wash out tanker and

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TOLS003327

BZTO104(e)040148

On Feb. 23, Glenn Knowles and Doug Steven of American Chrome visited Pittsburgh to discuss their new chromic acid plant in Corpus Christi, TX. The plant will be completely constructed by early March and start-up will begin immediately therafter. Per Doug Steven, American Chrome will move chromic acid into the domestic market at whatever price level it takes. They are extremely anxious to see our chromic acid unloading system and participate in our business. I believe we must address this situation very thoroughly.

8. Duty Drawback Claim #8 was liquidated in February and we received a check for $15,641.41. Thus, we have received checks covering all outstanding claims. To date, we have received checks totaling $214,916.66 for claims 1-10. Claim #11, for approx. $8,000 covering exports for the fourth quarter of 1983, will be filed with the U.S. Customs Service in early March. At that point, we will have covered all exports from mid-1979 thru 1983.

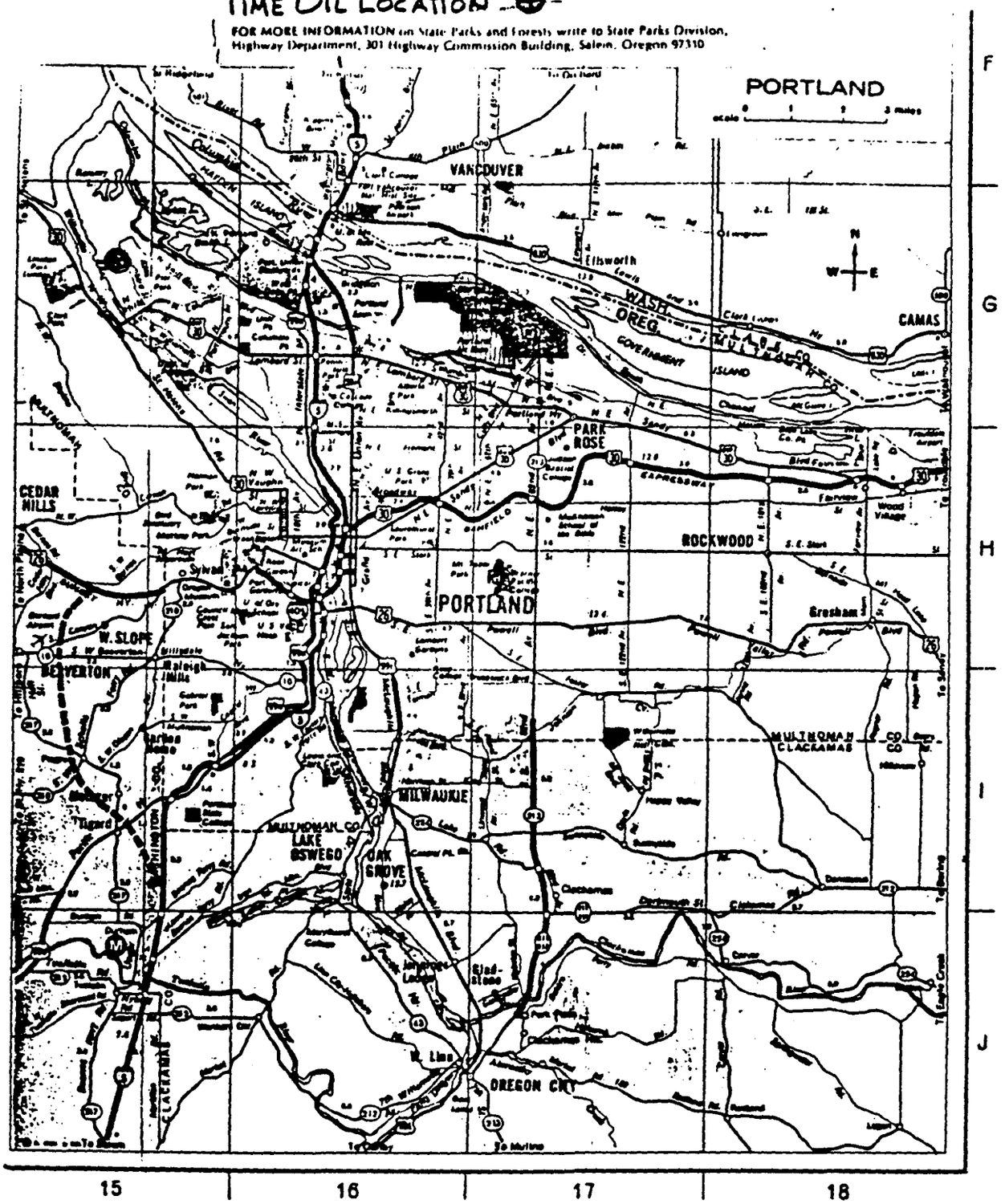
9. A proposal was received by John Palmer in St. Louis covering the dilution of Woodtox Preprime by Time Oil in Portland. A separate memo regarding the proposal from Time Oil has been issued. John Palmer will be visiting both Portland, Neil Wallis and Seattle, Bob Abendroth, during the week of 3/5/84 to try to wrap things up with Time. When we have finalized the Time Oil situation, we will again pursue the consignment agreement with Union Oil on mineral spirits.

10. On 2/22, I received the new pricing for liquid azide, liquid noxtane SS-1, and sapstain control chemical T-1 from Dan Gilbert of Jones-Hamilton. A separate sheet showing 1983 and 1984 costs was finalized 2/28/84 and circulated for review. The new Jones-Hamilton costs were actually lower and thus the 1984 product costs were lower as shown on the comparison sheet. These costs, along with the selling prices, will be reviewed with Mary Lou Beck, John Palmer and Joe Kusar to calculate gross margins and absorption rates for the WTC products produced at Jones-Hamilton in Newark, CA.

11. On 2/21 and 2/22, Jim Lamb, George Meanor, Dick Cook, Glenn Schultz, John Palmer, Steve Shields and I met in Valparaiso to discuss the Dricon expansion. The meeting was extremely productive and finalized several items. A process flow sheet with specifications, as well as completed drawings for pouring concrete floors and dykes, should be available by the end of February or early March. We should be able to start pouring concrete the week of 3/5/84. Equipment orders will also start to be placed. Currently, only the belt conveyor and heaters have been ordered. Also, the chiller has been received from Orrville, Ohio and a technical representative from Trane has been contacted to come out and inspect the unit to insure its adequacy for the new plant expansion.

12. During my visit to Valpo on 2/21-22, I also reviewed the two open AFE's on the Stock Beam Distribution Center. Both AFE's are nearly complete and probably will be closed in March. We are currently getting quotes for a fence to provide some security around the pole building. We are also looking at different options for security services for Valparaiso.

TIME OIL LOCATION -⊕-



TOLS003329

BZTO104(e)040150

M E M O R A N D U M

October 5, 1983

TO:	Robert Abendroth	Seattle
	Neil Gallagher (info)	Portland
	Terry Henderson	Seattle
	Jock Streidl	Seattle
	Neil Wallis (info)	Portland
FROM:	John Denham	Seattle

SUBJECT: WOODTREATING AT NORTHWEST TERMINAL

Neil Gallagher, Neil Wallis and I met with the following from Koppers Company at Northwest Terminal on Monday, October 3, 1983.

John D. Palmer
Manager
St. Louis Production Region

KOPPERS

Specialty Wood Chemicals Division
Koppers Company, Inc.
5137 Southwest Ave.
St. Louis, MO 63110, 314-772-2200

William J. Baldwin
Manager, Customer & Technical Services

KOPPERS

Specialty Wood Chemicals Division
Koppers Company, Inc.
Pittsburgh, PA 15219, 412-227-2457

We walked the woodtreating site thoroughly, then met to discuss site condition and planned remedies. The following is my understanding of verbal agreements reached.

Bulk pentachlorophenol operations ceased, effective immediately, until clean-up is completed and a new contract (if there is to be one) is consummated.

The only chemical product input allowable is that necessary to permit "blending off" and/or "shipping out" of remaining inventory. Both Koppers and TOC jointly agreed on inventory quantities. Planned "empty" date is November 15, 1983. Koppers felt date could be met but TOC agreed to slide it if needed to allow Koppers time to locate customers for on-hand inventory.

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Koppers is to clean both Koppers owned and TOC owned tanks, dispose of any waste accumulated and pay costs of both actions. Koppers is to use TOC I.D. number on waste manifest since they have no I.D. number in Oregon. Most tanks are ready for cleaning now. Cleaning is to start as soon as Koppers can schedule it - estimated one week.

After cleaning, Koppers will physically remove the following Koppers owned tanks from TOC property.

Quantity	Capacity (gal)
1	3,000
1	6,000
1	7,000
3	8,000
1	10,000

TOC will remove its tanks, except 38009, all piping from area and pay these costs.

TOC will remove and dispose of ground to below test depth showing contamination, then replace ground and correctly grade to sump. Cost of this action is to be shared by Koppers and TOC based on an agreement to be reached between attorneys from both companies. Name of Koppers attorney for contact to be furnished within a week by Bill Baldwin.

TOC is to install impervious liner, spill control sump, pump and tank.

TOC will replace tanks, install complete new manifold system from tank car rack to drumming rack, painting and identifying both tanks and lines correctly.

TOC is to steam clean warehouse as soon as Koppers products are removed. Warehouse and/or tank farm refurbishment is to be in consonance with new contract requirements as negotiated between Koppers and TOC in the future. TOC will continue warehouse handling of pre-drummed penta based materials if desired.

NOTE: Robert Abendroth received telecon briefing of this meeting on October 4, 1983.

JPD/ch

Koppers Company, Inc., Forest Products Group
Pittsburgh, PA 15219, Telephone 227-2775

KOPPERS

Donald F. Marion
Manager, Raw Materials
Specialty Wood Chemicals Division

June 14, 1983

Mr. Neil Wallis
Time Oil Company
12005 N. Burgard Street
Portland, OR 97203

Dear Neil:

I would like to take this opportunity to thank you and Don Schwendiman for meeting me in Seattle at the airport on Thursday, June 9 to discuss the Storage and License Agreement. I feel that all of the non-economic verbage items have been resolved to our mutual satisfaction. I would hope that we can now agree on the minimum storage fee and the per gallon blending fee and have the agreement executed by both parties by June 30, 1983. I would like to get the first 10,000 gallon railcar in motion to you as quickly as possible. Please review your numbers and advise if you need to discuss any remaining items. I am truly looking forward to getting these negotiations behind us.

Again, my sincere thanks to both Don and yourself for meeting me in Seattle. I will be anxiously awaiting your call on the remaining open items.

Sincerely yours,

Donald F. Marion

DFM/dkm

cc: Robert D. Avendroth
Donald L. Schwendiman

10000 -

cc: J. D. Hite
J. Kusar
D. MacArthur
D. F. Marion
K. E. Cogan K/700

JUN 2 1983

KOPPERS

Interoffice Correspondence

To Paul A. Goydan

Location K/750

Subject May Monthly Report

From John D. Palmer

Location WTC - St. Louis

Date June 2, 1983

GENERAL COMMENTS

Time Oil
The contract is in the hands of Time Oil. George Mills has completed various tests on the concentrate and has also prepared a draft label for Bill Baldwin.

Jones-Hamilton - WTC
Four batches of Liquid Noxtane SS-1, three batches of T-1, and one small batch of Liquid Azide are being produced by Jones-Hamilton.

Jones-Hamilton - CCA-C
Production and inventory variances have been discussed with Dan Gilbert. We will be setting up new guidelines.

St. Louis
Production of all products were still at an increased level. We did find time to allow each man to take one week of vacation.

May Inventory:

Current $ (000)	500
Percent of Change from Previous Month	(11%)
Month Prior Year	(10%)

St. Louis invoicing for WTC formulated products was at an all time high of $520,000 for the month of May.

Raw Materials
A source of #2 fuel oil has been secured at a price below $0.80/gallon delivered.

KB-3 continues to be in tight supply.

Miscellaneous
I will enter the hospital for surgery May 31. Everyone has been briefed on filling in for me. George, with Pittsburgh's assistance, will handle purchasing and production. Carol will handle penta and KB-3 purchasing and Newark payables. Harold will handle St. Louis payables. All production men will be working.

55

John D. Palmer

JDP:klc

TOLS003333

K-S REV. 10000

BZTO104(e)040154

cc: [illegible]usar
D. MacArthur
R. Stefanski
E. Yeadon

KOPPERS

MAR - 1983

Interoffice Correspondence

To John D. Hire — From Paul A. Coydan

Location K-1001 — Location K-1001

Subject February Monthly Report — Date March 1, 1983

CHEMICAL SALES HIGHLIGHTS
($ 000's)

	Month 1983 Actual	Month 1982 Actual	1983 YTD	1982 YTD	YTD % Relative Performance
Formulated Products					
Millwork Solutions	74	51	131	86	52
Sawn Lumber Chemicals	54	40	86	54	59
Log Home Solutions	49	--	49	0	
Remedial Pole Treatments	23	4	50	6	733
All WTC Formulated Products	270	140	535	264	101
Pentachlorophenol					
Outside	22	24	22	99	(77)
Koppers Plants	108	141	264	179	47
Non-Trademark CCA					
Direct	144	152	435	125	248
Distributor	300	27	418	57	633
	444	179	858	282	204
Arsenic Products					
Acid-Merchant	0	54	44	109	(60)
Acid-KHC	86	138	136	246	(45)
	86	192	180	355	(49)
Chrome Products					
Acid-Merchant	0	0	0	0	
Acid-KHC	144	181	214	309	(31)
Sodium Bichromate	34	0	62	0	--
Copper Products					
Copper Sulphate	0	0	0	0	

5 REV. 2

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TOLS003334

BZTO104(e)040155

Although we ran three Saturdays of overtime in December and January, we are now operating without overtime in St. Louis. This will be the rule and the exception to run overtime will be an extraordinary one.

Jones-Hamilton and Time Oil

We have still not finalized our contract with Time Oil. John Palmer and I will be visiting Time Oil the week of March 7 to bring this negotiation to a conclusion.

We have had complaints on two recent CCA shipments that truck drivers did not handle their responsibilities properly. In one case the driver was accused of letting the hose drain on unprotected soil. We are looking into these allegations now. I have instructed Don Danka to work with John Palmer to see that Jones-Hamilton has a monthly safety review and driver training sessions. I have also asked Harold Struessel to begin putting together a feasibility study on justification of our own tank truck on the west coast and our own driver. If we do get into the arsenic acid business on the west coast with J. H. Baxter, this will greatly swing the pendulum toward justifying our own truck and driver.

John Palmer's and Glenn Schultz's monthly reports were not available at the time of this writing, however, they are attached.

KOPPERS HICKSON CANADA

General Business Activity

We blended 224,000 oxide pounds of CCA for KHC in February versus 196,000 ox. lbs. in February 1982. Our YTD performance is flat compared with 1982. Canadian retailers committed heavily to treated lumber in January and February to take advantage of the relatively depressed white lumber prices. However, in the past three weeks as lumber prices began to rapidly increase, buying activity on the part of the retailer, and consequently licensee treating volumes, declined. We do not expect any significant rebound for another month when the retailer will have to commit for the spring and summer markets.

We just learned that Revelstoke, who buys three to four loads of concentrate per year primarily for treating fence posts, has decided to go out for open tender. They have asked for extended terms and are apparently shopping for the lowest pricing. We have just learned that we will not be honored with this business despite of reducing our price to nearly $1.20 FOB Valparaiso with 60 day terms. We are not sure whether Osmose or Great Western Chemical has obtained this business. We will attempt to learn more about this situation. This position on Revelstoke's part was apparently prompted by severe economic pressure within the corporation. It is being rumored that there are financial problems in the corporation.

We have recently had some general discussions with PDL Corporation, a large Osmose licensee in Toronto. PDL utilizes approximately 500,000 lbs. of CCA per year, 75% of which goes into utility poles. PDL did approach us. We are putting together a package deal to try to wrestle PDL away from the Osmose camp.

FILE GTIME OIL

KOPPERS

Interoffice Correspondence

FEB 17 1983

To John D. Palmer

Location WTC - St. Louis

Subject Time Oil Company

From Paul A. Goydan

Location SWCD - Pittsburgh

Date 2/15/83

Regarding Time Oil's desire to clean out Tank 20001 and Tank 13001 that apparently have some settled sludge in them, I would like to advise that settled material in a tank that is being continuously used for operations is not considered hazardous waste. The only time something is considered hazardous waste is if the material is physically removed from an operating or working tank and put into separate containers purely for the purpose of holding or storing waste. If Neil Wallace of Time is concerned about having hazardous waste in a tank that is under operational or working control, he is in error and you should advise Neil.

The question I have is whether these tanks really need to be cleaned now or whether we can wait and continue to produce adequate and good product. Another question I have is whether we can try to redissolve some of the so-called sludge or solids on the bottom and recover some of this material.

I would appreciate your discussing with me what you think we can do to minimize our costs and expenses. I have a feeling that this is not as "sludgy" or as unusable as perhaps Neil Wallace believes. I would also be interested in knowing what George Mills' analysis has shown and your further thoughts on the matter.

Paul A. Goydan

PAG:klc

cc: ~~K.~~ E. Cogan
G. B. Mills

KS REV 2

10000

TOLS003336

BZTO104(e)040157

KOPPERS

Interoffice Correspondence

Trace 3/1/83

To John D. Palmer

Location St. Louis

Subject Time Oil

From K. E. Cogan

Location Pittsburgh

Date January 25, 1983

On January 19, Neil Wallace called and indicated that Time Oil was just getting into the RCRA program and tank Nos. 20001 and 13001 have sludge present. I have arranged for Neil Wallace to have samples taken and forwarded to St. Louis to determine if these materials can be reworked. If they can, we should institute a program to recover and reuse those solids. If they cannot be recovered, then it will be necessary to have Neil determine cleanout and disposal costs. Tank 20001 has 795 gallons and tank 13001 has 145 gallons. You indicated that this material is not in our inventory so that our cleaning costs will only include placing the material in drums and its subsequent disposal if necessary.

As soon as those samples come in, please arrange to have George Mills analyze them so that we can reach a decision early in the year on what to do with these two tanks.

K. E. Cogan

KEC:mtd

cc: P. A. Goydan

K43-REV. 5 100M 10-81 10000

TOLS003337

BZTO104(e)040158

KOPPERS

MAY 6 1982

Interoffice Correspondence

To K. Cogan — From G.B. Mills

Location Pittsburgh K-1001 — Location St. Louis

Subject Time Oil Production of Lot WC-014 Woodtox Pre-prime RTU — Date May 4, 1982

Subject product was manufactured 4/19/82 and the sample received at St. Louis on 4/22/82 was analyzed and found to contain 17.17% penta (RTU should contain 5% penta).

Called Neil Gallagher 4/22/82 and he said he would check and call me back. He later called and said that all components had been added, but that possibly insufficient mixing had been performed. A resample was submitted (rec'd 4/26/82 and this was found to contain 4.82% penta. Notified Gallagher and he said that he would mix for a longer time and send another sample. This was received 4/28/82 and was found to contain 5.09% penta. I then released as OK.

G.B. Mills

cc: J.D. Palmer

REV. 2

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TOLS003338

BZTO104(e)040159

John Palmer

[redacted]

Neil,

3-5-82

Here are revised formulas for all the products that you produce. Please note that most have changes in them. If you have any questions please call me or George Mills.

Thanks

John

[redacted]

[redacted]

[redacted]

[redacted]

10000-

TOLS003339

BZTO104(e)040160

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.
5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product Woodtox 140 Concentrate - T Lab. Book No. _____ Date. Feb. 20, 1982

Made for Portland, Oregon Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
22.00	1.416	Penta	15.54			
2.54	.339	125 mp Paraffin	7.5			
50.77	6.917	KB-3	7.34			
12.69	1.750	Oxobottoms	7.25			
12.00	1.866	Mineral Spirits	6.43			
100.0	12.288		8.138			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS: Cost (Per Gallon)

Blending Procedures

1. Meter in KB-3, Oxo Bottoms and Mineral Spirits
2. Heat to 180°F
3. Circulate and add wax and penta continuing to circulate until completely dissolved.
4. Sample and mail to St. Louis

1000 gallons batch

#'s		Gallons
1791	Penta	-------
207	Wax	-------
4132	KB-3	563
1033	Oxo	142 1/2
977	mineral spirits	152
8140		1000 gallons

10000

TOLS003340

DISTRIBUTION: Sales Dept. ..... Tech. Svc. ..... Plant Mgr. ..... Plant ..... Office Mgr. ...
Purch. ..... Safe File ..... Lab Group ..... Other .....

BZTO104(e)040161

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.
5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product Woodtox Pre-Prime RTU - T Lab. Book No. _____ Date Feb. 20,. 1982

Made for Portland, Oregon (Time Oil) Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL	COST PER UNIT	EXTENSION	%
5.20	.335	Penta	15.54			
0.75	.100	Paraffin Wax	7.5			
15.00	2.069	Oxo Bottoms	7.25			
0.50	.063	Nalco 6SJ 743 (6RJ 947)	7.9			
78.55	12.216	Mineral Spirits (Quick Dry)	6.43			
100.0	14.783		6.765			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS: Cost (Per Gallon)

1. Charge Blender with oxo bottoms Nalco and 1/3 of the mineral spirits.
2. Heat to 170°F and agitate while adding wax and penta
3. Continue mixing until dissolved but heat and add remaining mineral spirits and mix unhomogenous.
4. Mail sample to St. Louis.

1000 gallon batch

#	gallon	
360		Penta
51		Wax
1015	140	Oxo
34	4.3	Nalco
5314	826 1/2	Mineral Spirits

DISTRIBUTION: Sales Dept. ..... Tech. Svc. ..... Plant Mgr. ..... Plant ..... Office Mgr. .....
Purch. ..... Safe File ..... Lab Group ..... Other .....

TOLS003341

BZTO104(e)040162

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.

5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product Woodtox Preprime Conc. T Lab. Book No. _____ Date Feb. 20, 1982

Made for Time - Portland, Oregon Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
22.50	1.448	Penta	15.54			
3.25	.433	125 mp Paraffin Wax	7.5			
64.95	8.959	Oxo Bottoms	7.25			
4.00	.545	KB-3	7.34			
2.00	.253	Nalco 6SJ 743	7.9			
3.30	.513	Mineral Spirits (Quick Dry)	6.43			
100.0	12.151		8.230			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS: Cost (Per Gallon) ———

Blending Procedures

1. Meter in oxo bottoms, KB-3, and mineral spirits and Nalco
2. Heat to 180°F and circulate
3. Add wax and penta and continue circulation until completely dissolved.
4. Sample and sent to St. Louis.

1000 gallon batch

#	gallon	
1852		Penta
267		Wax
5345	737	Oxo Bottoms
329	45	KB-3
164.5	20.8	Nalco
272	42.3	Mineral Spirits

DISTRIBUTION: Sales Dept. ..... Tech. Svc. ..... Plant Mgr. ..... Plant ..... Office Mgr. .....
Purch. ..... Safe File ..... Lab Group ..... Other .....

TOLS003342

BZTO104(e)040163

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.

5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product Woodtox 140 RTU - T Lab. Book No. _____ Date Feb. 20, 1982

Made for Time Oil Company - Portland, Oregon Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
5.20	.335	Penta	15.54			
.60	.080	128-130 mp Paraffin	7.5			
12.00	1.635	KB-3	7.34			
3.00	.413	Oxo Bottoms	7.25			
79.20	12.317	Mineral Spirits	6.43			
100.0	14.78		6.766			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS: Blend Procedures

1. Charge blender with KB-3, Oxobottoms, and 1/3 of mineral spirits
2. Heat to 170°F and agitate while adding wax and penta
3. Continue mixing until dissolved, cut heat, and add remaining mineral spirits and mix until homogenous
4. Sample and mail to St. Louis

1 1000 gallon batch

#'s	Gallons
(375) 352	------Penta
41	------Wax
812	111 KB-3
203	28 Oxo
5359	833 1/2 Mineral Spirits

10000

DISTRIBUTION: Sales Dept. ..... Tech. Svc. ..... Plant Mgr. ..... Plant ..... Office Mgr. ..... Purch. ..... Safe File ..... Lab Group ..... Other .....

TOLS003343

BZTO104(e)040164

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.
5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product Timbertox 40 Concentrate Lab. Book No. _____ Date Feb. 20, 1982

Made for Portland, Oregon (Time Oil Co.) Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
40.5	2.606	Penta	15,54			
59.5	8.106	KB-3	7.34			
100.0	10.712		9.335			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS:

Blending Information

1. Meter in KB-3 & WTL, Heating to 170°F Max.
2. Circulate, add Penta
3. Continue circulation until dissolved
4. Cut Heat and sample and [illegible] St. Louis

1000 gal. Batch

	#	Gallon
Penta	3781	243
KB-3	5554	757
	9335	1000

DISTRIBUTION: Sales Dept. ..... Tech. Svc. ..... Plant Mgr. ..... Plant ..... Office Mgr. .....
Purch. ..... Safe File ..... Lab Group ..... Other .....

TOLS003344

BZTO104(e)040165

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.

5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product WR 340 Concentrate Lab. Book No. _____ Date Feb. 20, 1982

Made for Time - Portland Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
5.66	.755	Paraffin Wax (125-130)	7.5			
94.34	12.853	Eastman KB-3	7.34			
100.0	13.608		7.349			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS: Blending Procedure for 1000 gallon batch

1. Meter 944 1/2 gallon KB-3 into mixer
2. Heat and circulate until 160°F
3. Add 416 lbs. Wax and circulate until dissolved.
4. Do not allow temperature to drop below 110°F until packaging completed.

Cost /Dr- " '

Package 408 lbs. net per 55 gal. drum _____

TOLS003345

10000

DISTRIBUTION: Sales Dept. ..... Tech. Svc. ..... Plant Mgr. ..... Plant ..... Office Mgr. .....
Purch. ..... Safe File ..... Lab Group ..... Other .....

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.

5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product LST Co-Solvent II Lab. Book No. _____ Date February 20, 1982

Made for Portland, Oregon Chemist _____

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
30.0	4.138	Heavy Oxo Bottoms	7.25			
70.0	9.537	KB-3	7.34			
100.0	13.675		7.313			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS:

Packed in 55 gal. tight head drums (395 #/dr.) 20 drum minimum order requirement.

Costs: [illegible] drum

	1100 gal. batch	
	lbs.	Gal.
I	2413	333 oxo
(	5631	767 KB
I	[illegible]	1100
I	8044	
(		

10000

DISTRIBUTION: Sales Dept. ..... Tech. Svc. ..... Plant Mgr. ..... Plant ..... Office Mgr. ....
Purch. ..... Safe File ..... Lab Group ..... Other .....

TOLS003346

BZTO104(e)040167

PHONE 285 2400
CABLE ADDRESS TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

February 22, 1982

Department of Environmental Quality
Attn: Mike Ebeling
P.O. Box 1760
Portland, Oregon 97207

Dear Mr. Ebeling:

This is a request for assignment of a "Generator Identification Number". It is submitted, as required by OAR 340-63-210, for use by Time Oil Co. at 12005 North Burgard in Portland, Oregon 97203.

Three (3) Hazardous Wastes, as defined in ORS 459.410 (6), may periodically be generated at this terminal location. They are listed below with identifications as shown in 40 CFR 261.32 and 261.33.

NO.	WASTE
K051	API Separator Sludge
K052	Tank bottoms (leaded)
P090	Pentachlorophenol

Enclosed is copy of EPA I.D. number ORD009597543 assigned to this installation. Please send "Generator Identification Number" to me.

Sincerely,

John P. Denham

John P. Denham
Hazard Control Manager

Dept. of Environm Quality
RECEIVED
FEB 24 1982

JPD/jam

Encl. a/s

10000

TOLS003347

BZTO104(e)040168

Paul Goydan K/1001
Joe Kusar K/1001
Rosemarie Stefanski K/1001
Eric Yeadon K/1001
Jack Kozak
PamArmbruster
Jonette Wharton K/1001

KOPPERS

Interoffice Correspondence

To Ken Cogan
Location Conley, GA - K/1001
Subject Monthly Report - December

From J. D. Palmer
Location St. Louis, Missouri
Date January 5, 1982

1. ST. LOUIS INVOICING - December Accounting Month $

	% Profit	1981	1980	1979
FPG Penta	15.0	168036	268798	171611
Customer Penta	15.0	46110	109967	96975
WTC	25.5	127325	213929	158125
CCA-C	19.8	169363	204381	108590
CCA-B	-----	------	20140	50707
		510834	817215	586008

II. WTC Inventory

November Closing Inventory		559572
December Purchasing		40733
December Raw Materials	40392	
Containers	341	
Penta 1408	60323	
Penta 1414	84482	
December Material Converted to Product	121773	
Cost of Product Sold		70429
DECEMBER CLOSING INVENTORY		529876

Inventory is Down-$26586 from November report - BUT ---- at December closing our Inventory Pick-up of $45,000 was ADDED to final totals, therefore inventory was actually down $71 586 from the November report.

III. RAW MATERIALS

Eastman is offering a TVA of $0.02/lb. We are taking advantage of this by moving it into TIME and St. Louis.

We will be purchasing several raw materials for both St. Louis and Portland as our inventories are at a very low point.

TOLS003348

BZTO104(e)040169

KOPPERS

Interoffice Correspondence

To _____ From _____

Location _____ Location _____

Subject _____ Date _____

The Pittsburgh Purchasing Department is assisting us with Blanket Purchase Orders for 1982. This will enable us to obtain better pricing on many raw materials and establish a procedure acceptable to Pittsburgh Auditing Department, where we have price quotations prior to purchasing.

IV. St. Louis and other Plants

The electric eye in our Fuel Oil burner for the boiler went out Saturday Night December 19. This required constant round the clock monitoring by Ed Floretta and myself. We kept the boiler going manually until Monday morning when it was repaired by an outside engineering consultant. This necessitated several hours of overtime.

We limited damage to one broken pipe and valve, due to the temperature in the building dropping to freezing. We are in the process of obtaining quotes on renovating one of the other boilers for back-up.

The move of the lab is almost complete. The exhaust hood has been installed and all gas lines, water lines and electricity is finished.

The move of the lab has reduced our janitorial cost by 25%, along with lowering theneed for electricity, heating (air conditioning in summer), water etc. to the upstairs. The entire office area upstairs now is available for renovating, or?

I have renegotiated our trash hauling contract and reduced this cost by 50% by having pick-up twice a week instead of every-other day. If we have an excess amount of trash there is a $20 charge for an extra pick-up, which is nothing to what we are now paying.

We have eliminated one telephone and added (moved) George Mills' phone to his new lab. More phone changes next month, to lower operating costs.

TIME OIL has not furnished any proposal for a contract. Don Marion will be suggesting a six to nine month extension, so that we are not placed in a bind, when contract expires - March 31, 1982.

KOPPERS

Interoffice Correspondence

To _____ From _____

Location _____ Location _____

Subject _____ Date _____

Harold is continuing to update our labels and resolve any problems we have with exporting our products.

V. Newark, CCA-CCA Production

Newark, CA Plant	Produced	Shipped
Oxide lbs.	64857	71780
Production Schedule for January		
Oxide lbs.	142000	
Production Schedule of February	90000	
Production Schedule for March	90000	

Because of delays in ICD Chrome Don Marion and I have decided to purchase two loads of chrome from Jones-Hamilton. This is needed because we have orders on the books and need production to meet requirements.

John Palmer

/pa

KOPPERS

Interoffice Correspondence

To D. F. Marion

From John D. Palmer

Location K/801

Location St. Louis, Missouri

Subject TIME OIL COMPANY

Date October 29, 1981

The cost of servicing our West Coast Customers from St. Louis is as follows:

Truck loads of drums can be shipped from St. Louis to Portland, Oregon for a cost of approximately $37.00/drum which equates to $0.67/gallon.

The freight on bulk shipments of Woodtox Preprime by tankcar to Portland would add $0.47/gallon to the product. Using St. Louis manufacturing costs for Woodtox Preprime - T, and adding the freight the cost would be $2.11/gallon. (Present selling price at 21% margin on the west coast is $2.20/gallon).

If we manufactured Woodtox Preprime - T Concentrate and shipped it to a bulk location to be blended with mineral spirits, the final cost of Woodtox Preprime T Ready-to-Use would be $1.851/gallon excluding a blend fee. Assuming a blend and storage fee of $0.10/gallon the cost would still be cheaper than shipping direct to a customer.

John D. Palmer

JDP/pa

cc: Mr. Ken Cogan
Mr. J. D. Hite K/1001
Mr. Paul Goydan K/1001

10000

KOPPERS

Interoffice Correspondence

To D. F. Marion

Location K/801

Subject Time Oil Company

From J. D. Hite

Location K/1001

Date October 16, 1981

I believe it is extremely important that we not procrastinate in making decisions relative to our direction in serving our West Coast millwork business. Along with your evaluations of the Time Oil proposals, we must weigh the cost of servicing that business from St. Louis. The St. Louis production evaluation should include direct tank car or bulk truck delivery to customers from St. Louis as well as production of St. Louis and transportation to a bulk terminal on the West Coast for subsequent transport to customers. We should also look at drum production in St. Louis railing the product to the West Coast for inventory in a warehouse for final distribution to accounts from a contract warehouse.

Obviously, I hope that we are also looking for alternate production locations on the West Coast.

JDH:jw

John D. Hite
Ext. 2445

cc: K. E. Cogan
P. A. Goydan
J. D. Palmer

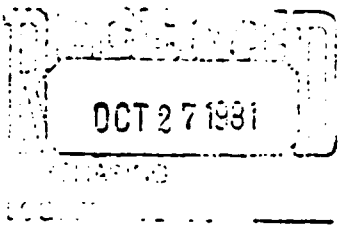
TOLS003352

43-REV. 5 100M 9-80

BZTO104(e)040173

cc: Don Marion K/800
Paul Goydan K/1001

OCT 27 1981



KOPPERS

Interoffice Correspondence

To Ken Cogan
Location Conley, GA
Subject Your 10-12-81 Memo on TIME OIL

From John Palmer
Location St. Louis
Date October 23, 1981

1. In regards to your first question, we are not aware of any item blended that was not specifically covered in the agreement or in the amended schedule.

2. George Mills is reviewing the written instructions as they regard to manufacturing. I have reviewed with Andy Anderson the instructions as to the safe handling of the materials. He said to use our safety pages from the ACCIDENT PREVENTION PROGRAM GUIDEBOOK. Those pertinent parts are copied for your approval. (Attached)

3. TIME OIL does not have any hazardous waste at the present time. They do have some tanks that haven't been cleaned out in years and they do need to be cleaned.

4. As discussed with you earlier, Neil Gallagher of TIME informed me that the complaints occur after taking the mask off.

The masks used are WILSON FULL FACE masks with R-21 filters and R-10 dust filters. These were recommended to Neil by Bob Simmons.

5. I am still reviewing the JONES-HAMILTON instructions - some of which (CCA) are attached. These were written in 1976-77.

John D. Palmer

JDP/pa

61

K1 REV 5 100M 9-80

10000

TOLS003353

BZTO104(e)040174

Koppers Company, Inc., Wood Treating Chemicals Department
5137 Southwest Ave., St. Louis, MO 63110
Telephone 314-772-2200

KOPPERS

October 7, 1981

Mr. Neil Gallagher
TIME OIL COMPANY
P. O. Box 3117
12005 N. Burgard
St. Johns Station
Portland, Oregon 97203

Dear Neil:

Attached are the formulation changes for:

WOODTOX PRE-PRIME - T READY-TO-USE
WOODTOX PRE-PRIME - T CONCENTRATE

Please replace in your formulation book and destroy the present formula.

Please acknowledge the bottom of this letter and return to my attention when this has been completed.

Agai n, if you have any questions, please let me know.

Sincerely yours,

John D. Palmer
Production Manager

/pa

Attachments

cc: Mr. Ken Cogan - Conley, GA

TOLS003354

BZTO104(e)040175

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.

5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product Woodtox Pre-Prime RTU - T Lab. Book No. _____ Date September 20, 1981

Made for Portland, Oregon (Time Oil) Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
5.20	.335	Penta	15.54			
0.75	.100	Paraffin Wax	7.5			
15.00	2.098	Oxo Bottoms	7.15			
0.50	.063	Nalco 6SJ 743 (6RJ 947)	7.9			
78.55	12.048	Mineral Spirits (Quick Dry)	6.52			
100.0	14.644		6.829			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS:

1. Charge Blender with oxo bottoms Nalco and 1/3 of the mineral spirits.
2. Heat to 170°F and agitate while adding wax and penta
3. Continue mixing until dissolved but heat and add remaining mineral spirits and mix unhomogenous.
4. Mail sample to St. Louis.

1000 gallon batch

#	gallon	
360		Penta
52		Wax
1024	143	Oxo
34	4.3	Nalco
5364	823	Mineral Spirits

1n000

TOLS003355

DISTRIBUTION: Sales Dept. . . . . Tech. Svc. . . . . Plant Mgr. . . . . Plant . . . . . Office Mgr. . . .
Purch. . . . . Safe File . . . . . Lab Group . . . . . Other . . . . .

BZTO104(e)040176

WOOD TREATING CHEMICALS DEPT.

KOPPERS COMPANY, INC.

5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110

CONFIDENTIAL FORMULA RECORD

Product Woodtox Preprime Conc. T Lab. Book No. _____ Date September 20, 1981

Made for Time - Portland, Oregon Chemist G. B. Mills

POUNDS	GALLONS	MATERIAL	POUNDS PER GAL.	COST PER UNIT	EXTENSION	%
22.50	1.448	Penta	15.54			
3.25	.433	125 mp Paraffin Wax	7.5			
64.95	9.122	Oxo Bottoms	7.15			
4.00	.545	KB-3	7.34			
2.00	.253	Nalco 6SJ 743	7.9			
3.30	.506	Mineral Spirits (Quick Dry)	6.52			
100.0	12.307		8.13			

DILUTION: ONE TO _____ DILUENT _____ LBS. PER GAL. _____

REMARKS:

Blending Procedures.

1. Meter in oxo bottoms, KB-3, and mineral spirits and Nalco
2. Heat to 180°F and circulate
3. Add wax and penta and continue circulation until completely dissolved.
4. Sample and sent to St. Louis.

1000 gallon batch

#	gallon	
1829		Penta
264		Wax
5280	728.5	Oxo Bottoms
325	45	KB-3
162.6	20.5	Nalco
268	41	Mineral Spirits

10000 #

DISTRIBUTION: Sales Dept. . . . . Tech. Svc. . . . . Plant Mgr. . . . . Plant . . . . . Office Mgr. . . . .
Purch. . . . . Sale File . . . . . Lab Group . . . . . Other . . . . .

TOLS003356

BZTO104(e)040177

K. E. Cogan
Conley, GA

KOPPERS

Interoffice Correspondence

To John D. Palmer

Location St. Louis, MO

Subject Time Oil Company
Visit - September 28, 1981 and
September 30, 1981

From Donald F. Marion

Location K-801

Date October 5, 1981

On Monday, September 28, 1981, I visited with Mr. Robert Abendroth and Mr. Neil Wallis of Time Oil Company in Seattle, Washington and on Wednesday, September 30, 1981, visited with Mr. Wallis and Mr. Neil Gallagher at the Time Oil Company blending facility in Portland, Oregon. During my visit to Seattle, we thoroughly reviewed the 1967 contract which has been renewed for five (5) year increments thru March 31, 1982. Mr. Abendroth indicated that they still would be interested in pursuing a new agreement, but due to the current average labor cost of $16.04 per hour and the environmental impact, they would have to review their entire economic basis for a new agreement. Attached for your review are two (2) memorandums that were given to me by Mr. Abendroth. These detail the concerns of Mr. Neil Gallagher and Mr. John Denham and are an indication of the needed upgrading prior to pursuing a new agreement.

In order to maintain your files up to date, I have also enclosed a copy of the amended and original agreement and a copy of plot plan 1356.

I am confident that Mr. Abendroth and Mr. Wallis will be able to put together an agreement for 1982. However, I am concerned about how expensive this new contract will be. I believe that we should seriously consider obtaining one or two additional proposals in light of our March 31, 1982 deadline. We would then be in a position to evaluate the entire situation well in advance of this deadline. After you have had an opportunity to review the attached information, let's discuss our approach for the next few months.

Donald F. Marion

Donald F. Marion

DFM/hls

cc: J. D. Hite
K. E. Cogan
P. A. Goydan

Q3 — Do we instruct how to mix?
Did we recommend safety gear?
Who is responsible for medical inspection?
How are hazardous wastes handled?

63

K43-REV. 5 100M 9-80

10000

TOLS003357

BZTO104(e)040178

From the desk of

PAUL A. GOYDAN

J. Hite

K. Cogan

Three deferments @ Time will cost us a bundle of $.

I believe we will be better off trying to Sell the TANKS & equipment to Time & seek another blender who will Toll for us with their EQUIPMENT & Maintain the Environmental & Health aspects. We can't Monitor our Investment sitting in PITTSBURGH or St Louis & Be Responsible for Maintance. PAG

TOLS003358

10000

BZTO104(e)040179

M E M O R A N D U M

August 27,1981

TO: R.D. Abendroth Seattle

FROM: John Denham Seattle

SUBJECT: WOOD TREATING (KOPPERS COMPANY)

Reference last sentence of my August 17,1981 memo, copy attached.

My August 21,1981 inspection of this operation revealed the following deficiencies:

A. TANK FARM OUTSIDE WAREHOUSE

1. Tanks 20001 and 13001 are too close to warehouse. (relocation needed to distance at least five feet from building)

2. Tanks are rusted in many places. (cleaning and painting white needed)

3. No stairways, railings or walkways exist on horizontal tanks 3010, 6008, 8005, 8006 and 8007. (installation needed)

4. No ladder cages exist on tanks 20002, 20003, and 38009. Walkways and railings are damaged, missing or improper. (installation needed)

5. Several heating coils in 1400 gallon heating tank under platform do not work. (replacement needed)

6. Deck atop 1400 gallon heating tank is damaged, unsafe to walk on and permits vapors from this volatile mixture to readily escape into working area. (new metal deck needed)

7. No suction pipelines or manifold exist at rail car siding for unloading purposes. (installation needed)

8. No manifold system exists on incoming product lines for receipt, blending or storage purposes. (manifold needed)

9. Valves on tanks and lines are not maintained at all. (repair and testing or replacement needed)

63 10000

10. Valves, lines, pumps, hoses and tanks (in some places) are thickly covered with product. (steam cleaning badly needed)

11. Several valves in system are not chained and locked. (installation needed)

12. Valve at end of isolated line to tank 38009 is leaking product onto ground. (replacement valve needed)

13. Pipeline supports are improper and inadequate. (replacement needed)

14. Pipelines are not painted or identified as to product content. (maintenance needed)

15. Product identification is not on all tanks. (signs needed)

16. Ground area at end of pipelines is saturated with product about four inches deep. (dirt removal and replacement needed)

17. Pump journal cover is not secured to pump. (four sheetmetal screws needed)

18. Cargo hoses are not marked or recorded to show condition, manufacturer, dates inspected or pressure tested. Some are damaged. (repair and recording needed)

19. Weeds are prevalent in quantity within diked compound. Good fire hazard. (weed removal needed)

20. Rail car siding wheel bumpers are not fastened to track. (repair needed)

21. Fire extinguisher on platform by 1400 gallon heating tank is not tagged, has not been inspected for operational capability and is fixed so it can not work, even if needed. (replacement system needed)

22. No spill control system exists at rail car rack or within diked area. One was recommended in 1975, copy attached, but apparently not approved by management. (installation needed)

B. INSIDE WAREHOUSE

1. Operation is not isolated. Fumes generated during process can readily enter lube oil warehousing area and overcome any individual not wearing appropriate respiratory equipment. (wall needed in warehouse to isolate operation)

6 8

TOLS003360

10000

BZTO104(e)040181

2. Ventilation inadequate even with doors open. (installation of three - four foot sucker fans needed - one in south wall, one in east wall and one over 1400 gallon heating tank)

3. No spill control system exists in building. Now liquid can run all over area and out of doors at will. (floor sloping and drain installation needed)

4. Four ceiling joists are damaged severely from fork lift operation. (repair and/or replacement beams needed)

5. No clearance signs exist on beams to alert fork lift operators. (signs needed)

6. Lighting is inadequate for the work. Several bulbs are out but even with all lights on, only one candle power was recorded during middle of the day bright daylight. (additional lighting to a minimum of five foot candles needed. An assist to this would be to paint ceiling white)

7. Work area is caked with product and very very dirty. (steam cleaning needed badly)

8. Small floor fan thickly covered with product. Fire hazard. (cleaning needed)

9. No emergency deluge shower exists. Material handled can be injurious. (shower would help. Eyewash should be included on such a permanent hookup)

Nearly all of these deficiencies have been reported previously.

JPD/mm

Attachments

TOLS003361

BZTO104(e)040182

WOOD TREATING

Modifications needed per Neil Wallis and Neil Gallagher 8/18/81.

a. Outside

✓1. Install fixed manifold system.

✓2. Repair or replace existing valves.

✓3. Install spill control system. (within warehouse)

✓4. Install ladders and walkways on horizontal tanks 3010, 6008, 8005, 8006 and 8007.

ths-20Ft ✓5. Install cages on tanks 20002, 20003, and 38009.

ELECTRICAL PR COST. YET. (6). Replace 2 or 3 heating coils in heating tanks.

✓7. Install pipe suction lines (in lieu of hoses) at rail car siding.

b. Inside Warehouse

✓1. Install shower and fixed water system eyewash.

NO ELECTRICAL (2). Improve lighting.

✓3. corrected Repair 2 ceiling joists and replace 2 ceiling joists.

✓4. Install spill collection system.

✓5. Install ventilation.

Est Cost - $\frac{\$25,000}{36} = \$695$ - basic plus interest cost

61

10000 -

TANKS

1 mineral Spirits tank	40 M
1 core tank	15 M
1 Finished Prod	10 M
1 Meter	
1 mix pump	
1 loading pump	

61

10000

TOLS003363

BZTO104(e)040184

Time Oil tank Cleanout

Crosby & Overton 503-283-1150
Bob [illegible]

will visit 5/26 & call them on Friday

10000

TOLS003364

BZTO104(e)040185

POWER MASTER 503-257-8801

GEO. DODSON = They have vacuum Eqpt

They will check with N. wallace @ Time oil

Cost based on Time & Material basis
(have cleaned Shell Crude Oil tanks)

$145/hr for big truck extra man $16.50/HR
Truck + helper

16 yd

9 yd truck - $109/HR

[illegible] will have [illegible] call back
[illegible]

10000

TOLS003365

BZTO104(e)040186

A J. Zinda Co. 503-[illegible]

Jim Tenney

KOPPERS

Interoffice Correspondence

To SEE BELOW

From W. J. Baldwin

Location --

Location K-700

Subject WOODTOX 140T RTU

Date April 27, 1981

TO: R. D. Arsenault
P. A. Goydan
~~R. F. Simmons~~
P. Armbruster
J. D. Palmer

J. S. Sebbens
C. W. Flickinger
M. S. Marino
W. H. Lederer

Due to a recent request for a Material Safety Data Sheet on subject product and the length of time since its last review, the literature has been revised.

Please destroy the sheets dated September, 1975 and May, 1977-- replace with the attached.

Bill B.

W. J. Baldwin

WJB:dsg
Attachment

Mr. Neil Gallagher
Time Oil Company
P. O. Box 03117
Portland, Oregon 97203

Attached is a copy of our new APRIL 1981 MSDS on WOODTOX 140 T Ready-to-Use - made at your Portland Blending facility. Please replace this copy in your files and discard sheets as dated above.

FILE

John D. Palmer
Plant Manager
St. Louis, Missouri -
Koppers Company, Inc.

April 29, 1981

100001

TOLS003367

BZTO104(e)040188

KOPPERS

Interoffice Correspondence

To R. F. Simmons — From Real Estate Section

Location FPG-St. Louis, MO — Location Pittsburgh

Subject Operating agreement and lease of tanks - Portland, Oregon — Date February 3, 1981

The attached letter dated January 30, 1981 covers the captioned subject. We presume that your office will negotiate the new agreement.

Mac

T. F. McGuire

TFM/smk
Attachment

TOLS003368

K-5 REV. 2

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

PHONE 285-2400
CABLE ADDRESS: TIMOIL

~~BWE~~ TFM
~~TEB~~ MAP

FEB 3 1981

BAK SAF
FILE

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

Mac
Is Simmons to negotiate with Time?
B.

January 30, 1981

T. F. McGuire
Koppers Company
Room 2900, Koppers Building
Pittsburg, PA 15219

Dear Mr. McGuire:

Enclosed is a copy of a letter to your Mr. Simmons date January 28, 1981 advising of our election to terminate the agreement of March 1st, 1967 under which we have been storing, blending and sipping certain products of yours at our Portland, Oregon terminal.

Should you desire to discuss a new agreement with us I suggest you contact Robt. Ab endroth at this office.

Your very truly,

TIME OIL CO.

A. A. Schneider
Vice-President

10000

PHONE 285-2400
CABLE ADDRESS: TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

TIME
PREMIUM
GASOLINE

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

January 28, 1981

Wood Treating Chemicals Dept.
Koppers Company
5137 Southwest Ave.
St. Louis, Missouri 63110

Attention: Mr. Robt. F. Simmons

Gentlemen:

Under date of March 1st, 1967 we entered into an Agreement with you to provide certain labor and services to receive, store, handle, blend and redeliver certain products of yours at our Portland, Oregon terminal.

The term of said agreement ran from April 1, 1967 to March 31, 1972 and automatically renewed for two additonal terms of five years each, the present term expiring March 31, 1982.

As discussed with you on the phone this date, we are hereby giving you notice of our election to terminate said Agreement effective March 31, 1982.

Very truly yours,

TIME OIL CO.

A. A. Schneider
Vice-President

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

10006

TOLS003370

BZTO104(e)040191

December 16, 1980

Mr. Neil Gallagher
Time Oil Co.
P. O. Box 03117
St. John's Station
Portland, OR 97203

Dear Neil:

EPA has transferred pentachlorophenol from the list of acutely hazardous wastes (Section 261.33 (E) to the list of chemicals classified as toxic wastes (Section 261.33 (F) if discarded under RCRA regulations (45 FR 78532). Penta's new hazardous waste number is U242.

To us, this means that empty drums from penta containing products and penta bags are not subject to RCRA regulations. (Previously, under the regulation, containers were exempt only after triple rinsing or equivalent method of cleaning). Further now, drums, bags and other packaging forms that are stored and/or transported prior to being used, reused, recycled, or reclaimed are not subject to RCRA regulations.

We are not sure at this point if your state has regulations that might provide any other restriction on disposal of empty penta bag or used, unrinsed drums, although we assume this RCRA down regulation will allow you to again return to simple trash disposal of empty bags and disposal of used drums to reconditioners after proper rinsing. We will keep you advised of any regulatory restriction we learn of applicable to your operation and trust you will likewise keep us informed if you hear it locally first.

Best regards,

R. F. Simmons,
Operations Manager

RFS/pds

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TOLS003371

BZTO104(e)040192

cc: P. A. Goydan
H. P. Struessel
P. Armbruster

KOPPERS

Interoffice Correspondence

To Alex Saucedo
Ken Luse

From R. F. Simmons

Location

Location St. Louis, Mo.

Subject Order Entry - Time Oil Co. &
Jones-Hamilton Co.

Date May 15, 1979

We have occasionally had verbal orders misunderstood and improperly shipped form these locations because of the misunderstanding.

Today, in conversation with Neil Gallagher at Time Oil we have had to agree that no orders will be shipped until confirming written order is received at the plant, with complete shipping information. This is a result of one of those instances of either incomplete information being given by telephone order or the plant improperly handling; in any event, neither of us want to accept additional expesnes incurred.

The same problem has occurred at Newark, very infrequently, but it has happened.

We have likewise previously asked your cooperation in securing and transmitting written orders and to large measure, had noticeable improvement; this is greatly appreciated.

Now eith our latest problem however, we see so alternative but to insist upon complete written orders being at the plants prior to shipment to alleviate any further misunderstandings.

R. F. Simmons

RFS/pds

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TOLS003372

K 43 - REV. 5 100M 8-77

BZTO104(e)040193

February 12, 1979

Mr. Nell Gallagher
Time Oil Co.
P. O. Box 03117
St. John's Station
Portland, Oregon 97203

Dear Nell:

Enclosed find a copy of the National Institute of Occupational Safety & Health's guide for pesticide formulators. Whereas your only pesticide formulation is for us, this booklet is basically pertinent information for all industry and is specifically aimed at those plants which handle chemicals and petroleum products.

I hope this booklet enables and aids you to stay abreast of federal standards. Note on the inside front cover addition guides prepared for specific industries, some of which may be of interest to you.

Yours truly,

R. F. Simmons,
Operations Manager

RFS/pds

5295

July 26, 1978

Time Oil Company
P.O. Box 03117
Portland, Oregon 97203

Attention: Mr. Newton Lash
Terminal Manager

Re: AQ - Time Oil Company
Multnomah County
NWR-AQ-78-188
NOTICE OF VIOLATION

Gentlemen:

Department personnel have verified that gasoline products are being stored at Time Oil Company, 12005 N. Burgard, Portland, Oregon 97203, in volumes greater than 40,000 gallons without approved vapor emission control devices on the storage tanks. This is in violation of Oregon Administrative Rules (OAR) Chapter 340, Section 28-050 (1).

You or your representatives are requested to attend an office conference at our offices located at 522 SW 5th Avenue, Portland, Oregon, on August 29, 1978, at 10:00 a.m. At this time please be prepared to present a program and time schedule which will bring your facility into compliance.

If the Department can be of any assistance to you in this matter, please call me at 229-5295.

Sincerely,

James R. Close
Environmental Specialist
Northwest Region

JRC/eh
Enclosure
cc: Air Quality Division, DEQ
Regional Operations, DEQ

TOLS003374

BZTO104(e)040195

Wood Treating Chemicals Dept., Koppers Company, Inc.
5137 Southwest Ave., St. Louis, Mo. 63110
Telephone 314-772-2200

KOPPERS

May 19, 1978

Mr. Neil Gallagher
Time Oil Co.
12005 N. Burgard Rd.
Portland, Oregon 97203

Dear Neil:

Upon my visit in February, we left you a booklet which contains sections concerning:

- Product Data
- Pentachlorophenol & Solution Safety Precautions
- Product Material Safety Data Sheets
- Raw Material Data Sheets
- Tank Entering & Cleaning Procedure (Used by Koppers)

Confirming our verbal discussion, this information was given to you as an aid for possible improvement of your understanding of our products and the products you manufacture for us and should not be taken as mandatory recommendations or procedures to be followed. Koppers assumes no liability for the accuracy of the information and it should be used as reference material only.

It is suggested by OSHA that the Product and Raw Material Safety Data Sheets be available for easy reference by your plant workers. We at Koppers incorporate these in our Safety Program, review the program with our workers and have them sign a statement that such a review has been presented and that they understand the safety procedures they should follow. It is, of course, Time Oil's decision to follow or discard these comments. We attach a sample statement that is retained in our employee's files, and recommend an annual review and statement updating. (Exhibit A)

Again, to assist you in establishing a medical surveillance procedure, enclosed you will find a medical examination record. (Exhibit B) The standard items on the form are done upon pre-employment examination; upon annual re-examination our employees are subject to a physical examination that directs its attention to detecting pentachlorophenol exposures. The examination concentrates on the following:

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TOLS003375

BZTO104(e)040196

1. A thorough occupational history with respect to possible exposures to pentachlorophenol and other chemicals.

2. A thorough skin examination checking for acne-like lesions.

3. An examination for chronic irritations of the nose and throat.

4. An examination of the eyes for cornea and iris damage.

5. Blood pressure tests in the standing and sitting position.

6. An examination of the abdomen for possible liver enlargement and/or tenderness.

7. A check on neurological functions in the arms and legs.

8. A chest x-ray.

9. Urinalysis including a microscopic examination, sugar and albumin.

10. Blood chemistry analysis, SMA-12 including blood sugar.

The doctor provides a short narrative explicitly noting abnormalities, particularly of these 10 items.

All of the employees at the St. Louis operation who have a potential exposure are required to participate in this program. After two years there have been no abnormal results from this examination program.

The physicians performing the examinations have been provided with listings of the chemicals handled. These physicians retain the records of the examinations and have been instructed to contact the employee and local management if abnormalities occur.

This extensive program was started to determine the effectiveness of the engineering controls and personal protective equipment programs that were designed to prevent employee exposure to chemicals. It is also possible to determine if there would be any adverse effects to our employees who handle chemicals. The application of this program is audited during routine loss prevention surveys.

Good personal hygiene practices cannot be overemphasised, therefore we insist on the following standards for employees working with chemicals:

All plant employees-

1. Upon arrival to begin work, wash hands, arms, face and neck with soap and water and rinse thoroughly. This is to remove any trace of oily film that accumulates on the skin since chlorophenols from penta are oil soluble and an oily skin greatly increases the probability of skin absorption of the chlorophenols.

2. This washing is to be repeated at each and every coffee, smoke or lunch break prior to eating or smoking.

3. Each employee is provided a daily change of clothing which should be utilized on plant. Work uniforms are not to be worn away from the plant, nor should street clothing be worn in the plant. An additional uniform clothing change should be on hand for unexpected accidental chemical wetting.

4. Safety items - gloves, goggles, respirators, air-pacs, shoes, boots, rain gear, protective suits and helmets - are all provided and instructions given for usage. This equipment is to be maintained, cleaned, inspected, and used as has been instructed.

5. Finally, each plant employee is required to shower thoroughly at his shift-end, prior to leaving the plant.

Again please note, Koppers has provided this material to you as reference and guidance, not for specific recommendation or required procedure under our blending contract. Advise if you have further questions.

Sincerely,

Bob

R. F. Simmons,
Operations Manager

RFS/pc

10000

The following procedures were reviewed and understood at

_____ (location) by _____

(supervisor's name) with _____ (employee) on

_____ (date).

Pentachlorophenol & Solution Safety Precautions.
Material Safety Data Sheets

(List)

1.
2.
3.
4.
etc.

Lock-out Procedure.
Tank Entering & Cleaning Procedure.

Exhibit A

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TOLS003378

BZTO104(e)040199

FLS-20

MEDICAL EXAMINATION RECORD

KOPPERS COMPANY, INC.

DATE _____

NAME _____ DATE OF BIRTH _____ SEX _____ M. S. W. D. SEP.

ADDRESS _____ PHONE _____ DIVISION _____ LOCATION _____

PREVIOUS OCCUPATIONS: (INDICATE EXPOSURES TO DUST AND SKIN IRRITANTS): _____

OCCUPATION FOR WHICH EXAMINED: _____

FAMILY MEDICAL HISTORY

CANCER	DIABETES	EPILEPSY	HEART DISEASE	HIGH BLOOD PRESSURE	MENTAL DISEASE	STROKE	TUBERCULOSIS

PERSONAL MEDICAL HISTORY

ALLERGY	EPILEPSY	HERNIA	MALARIA	SKIN CONDITION	PLEURISY	PNEUMONIA	TUBERCULOSIS	RHEUMATISM

VACCINATIONS	OPERATIONS	MEDICAL ATTENTION PAST 2 YEARS

	NO	YES	WHEN	FOR WHAT
COMPENSATION FOR INDUSTRIAL INJURY				

	NO	YES	WHEN	WHAT KIND
OCCUPATIONAL DISEASE				

MENSTRUAL HISTORY	REGULAR	PAINFUL	LOST TIME

HAVE YOU ANY PHYSICAL DEFECTS OR ALLERGIES WHICH MIGHT MAKE IT INADVISABLE TO ACCEPT EMPLOYMENT IN THE JOB FOR WHICH EXAMINED: _____

NAME OF FAMILY DOCTOR: _____

I CERTIFY THE ABOVE STATEMENTS TO BE TRUE AND CORRECT

APPLICANT'S SIGNATURE _____

Exhibit B

TOLS003379

BZTO104(e)040200

BEFORE THE STATE OF OREGON WORKERS' COMPENSATION DEPARTMENT
ACCIDENT PREVENTION DIVISION
Labor and Industries Building
Salem, Oregon 97310

In the Matter of the Alleged Violation)
of the OREGON SAFE EMPLOYMENT ACT.)
By: Time Oil Co.

CITATION AND NOTICE OF PENALTY

To: Mr. Newton P. Lesh, Vice-President
Time Oil Co.
12005 North Burgard
Portland, Oregon 97203

Employer I.D. No.: 521536-3-009
Citation No.: D7255-024-78
Date Issued: April 6, 1978

An inspection of a workplace under your ownership, operation or control located at or near 12005 North Burgard, Portland, Oregon

and described as follows: petroleum products wholesale

was conducted on October 13, 1977

On the basis of the inspection it is alleged that you have violated the Oregon Safe Employment Act, ORS Chapter 654, as alleged on the attached Exhibit "A" and incorporated herein by reference.

The penalty for all violations is: NONE

The "Notice of Correction" card must be received by: May 8, 1978

THE LAW REQUIRES THAT A COPY OF THIS CITATION BE PROMPTLY POSTED IN A CONSPICUOUS MANNER ABOUT YOUR WORKPLACE AND IN A SUFFICIENT NUMBER OF PLACES TO INFORM YOUR WORKERS OF THE FACTS. IT SHALL BE PROMINENTLY POSTED FOR A PERIOD OF 3 DAYS OR UNTIL THE VIOLATION IS CORRECTED, WHICHEVER OCCURS LAST.

EMPLOYER: SEE REVERSE SIDE OF THIS FORM FOR RIGHTS AND RESPONSIBILITIES REGARDING THIS CITATION

ACCIDENT PREVENTION DIVISION

Helen M. Greene
Sanction Officer

R8219:mh

RIGHTS OF EMPLOYEES

Any employee or representative of employees who believes that any period of time fixed in this Citation for the correction of alleged violations is unreasonable has the right to request a hearing by submitting a letter to the Workers' Compensation Department, Safety Hearings Clerk, Hearings Division, Labor and Industries Building, Salem, Oregon 97310, within 20 days of your employer's receipt of this Citation.

cc: C. T. Corporation System

10000

TOL5003380

BZTO104(e)040201

EXHIBIT "A"

Employer Name: Time Oil Co. Date Issued: April 6, 1978

Employer I.D. No.: 521536-3-009 Citation No.: D7255-024-78

Item No.	Standard Allegedly Violated OAR Chap. 437	Description of Alleged Violation /436	Date Correction Required	Penalty
1.	22-011(2)	Although the following employees were exposed to known health hazards they were inadequately informed as to the nature of the hazards, the measures taken to prevent and control such hazards, or the proper methods of utilizing such control measures. Employee / Location — Hazard 1. Don Stell - Mixing Area — Pentachlorophenol 2. David Wood Mixing Area — Pentachlorophenol within the compliance deadline the firm must undertake one of the following: A. Provide adequate information or training to affected employees by internal efforts and/or by the firm's Workmen's Compensation carrier, or, B. In cooperation with the Occupational Health Section prepare, develop and obtain approval of an employee information program. This program shall be designed to insure that employees are adequately informed of the health hazards to which they are exposed and the measures necessary to control such exposures. (Complied with at time of inspection). FIRST INSTANCE VIOLATION----------$25.00	N/A	SUSPENDED
2.	22-069 (4)(b)(1)	There were no written standard operating procedures governing the selection and use of respirators. FIRST INSTANCE VIOLATION-$0.00	5-6-78	SUSPENDED
3.	22-069 (4)(e)(5) (1)	Don Stell and David Wood, who were wearing respirators, had full beards which interferred with an effective face seal. (Complied with at time of inspection). FIRST INSTANCE VIOLATION----------$0.00	N/A	SUSPENDED
4.	7-5-1 & 7-2-1	Boots and raingear made of material impervious to pentachlorophenol were not provided to employees during mixing and filling operations when it was possible for this substance to come in contact with the employees skin. FIRST INSTANCE VIOLATION----------$15.00	5-6-78	SUSPENDED
			Total Penalty	

WCB 1221 (Rev. 1/76)

TOLS003381

BZTO104(e)040202

EXHIBIT "A"

Employer Name: Time Oil Co. Date Issued: April 6, 1978

Employer I.D. No.: 521536-3-009 Citation No.: D7255-024-78

Item No.	Standard Allegedly Violated OAR Chap. 437 /436	Description of Alleged Violation	Date Correction Required	Penalty
5.	7-3-6	Adequate eye protection was not provided for employees during mixing and filling operations as evidenced by the safety glasses provided that did not prevent splashes from coming up under the bottom rim and entering their eyes. FIRST INSTANCE VIOLATION----------$35.00	5-6-78	SUSPENDED
6.	22-060(12)	There was no eye wash fountain in the warehouse area where pentachlorophenol was handled. FIRST INSTANCE VIOLATION----------$25.00	5-6-78	SUSPENDED
7.	22-015 (1)(a)	In the warehouse area where pentachlorophenol was stored and mixed there was no warning sign or other equally effective means of calling attention to such hazards at their location where the hazards exist. FIRST INSTANCE VIOLATION----------$0.00	4-20-78	SUSPENDED

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TOLS003382

Page 2 of 2 Pages Total Penalty NONE

CB 1221 (Rev. 1/76)

BZTO104(e)040203

cc: J. D. Hite
File Copy
J. R. Brummett
G. A. Schultz
J. M. Montgomery
J. D. Palmer

KOPPERS

Interoffice Correspondence

To T. A. Beatty

Location K-1001

From R. F. Simmons

Location St. Louis, MO.

Subject Monthly Report January 1978

Date February 1, 1978

Wood Treating Chemicals Dept.

I Shipments January Accounting Month

(1) Camden, New Jersey Warehouse

Woodtox Preprime Conc.	5 X 55 Gal.
Woodtox Preprime RTU	1 X 55 Gal.
Woodtox 140 RTU	2 X 55 Gal.

(2) Enfield, North Carolina Warehouse

Lumbrella 33 Redwood Soft	19 X 55 Gal.
Lumbrella 33 Redwood Soft	162 X 3 Gal.
Lumbrella 15 Yellow	1 X 53 Gal.
Green End Spray 400	2 X 55 Gal.

(3) Atlanta, Georgia Warehouse

Lumbrella 33 Clear	15 X 55 Gal.
Lumbrella 33 Redwood Soft	5 X 55 Gal.
Green End Spray 400	1 X 55 Gal.
WTC #71	1 X 515 Lb.

(4) Newark, California Warehouse

Liquid Noxtane SSI	20 X 55 Gal.

(5) Cotton Valley, Louisiana Blender

Woodtox 140 RTU	884 Gal. Bulk

10000-

TOLS003383

43 - REV. 5 100M 12-76

BZTO104(e)040204

KOPPERS

Interoffice Correspondence

To _____ From _____

Location _____ Location _____

Subject _____ Date _____

(6) Portland, Oregon Blender

Woodtox Preprime RTUq	6044 Gal. Bulk
Woodtox Preprime RTU	80 X 55 Gal.
Woodtox 140 T RTU	41 X 55 Gal.
Woodtox 140 T Conc.	1 X 55 Gal.
Redy Coat Penta Conc.	30 X 55 Gal.
Redy Coat Penta RTU	10 X 55 Gal.
Timbertox 40 Conc.	4083 Gal. Bulk
WR 340 Conc.	6 X 408 Lb.

(7) Sauget, Illinois Blender 0

(8) Phoenix, Arizona Blender 0

(9) St. Louis, Missouri Plant

Woodtox Preprime RTU	24571 Gal. Bulk
Woodtox Preprime RTU	7 X 55 Gal.
Woodtox Preprime Conc.	5 X 55 Gal.
Woodtox 140 RTU	1018 Gal. Bulk
Woodtox 140 Conc.	80 X 55 Gal.
Woodtox S Conc.	10 X 55 Gal.
Penta Wood Pres. RTU	7 X 55 Gal.
Penta Wood Pres. Conc	5 X 55 Gal.
Tritox	4 X 57 Lb.
Timbertreat 625	1 X 55 Gal.
KLB Beam Sealer	12 X 55 Gal.
Liquid Noxtane SSI	1 X 55 Gal.
Green End Sealer	10 X 5 Gal.
Blue Anstrik 50 Conc.	1 X 5 Gal.
WTC #71	5 X 515 Lb.
Dowicide GST Beads	160 X 50 Lb.
Super Noxtane	322 X 100 Lb.
Lumbrella 33 Redwood S	27 X 3 Gal.
Red/Orange End Spray 400	4 X 55 Gal.
Black End Spray 400	2 X 55 Gal.

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TOLS003384

BZTO104(e)040205

KOPPERS

Interoffice Correspondence

To _____ From _____

Location _____ Location _____

Subject _____ Date _____

Penta Stain #502	2 X 5 Gal.
Penta Stain #504	5 X 55 Gal.
Penta Stain #508	4 X 55 Gal.
Penta Stain #509	3 X 55 Gal.

Penta Shipments January Calendar Month - Lbs

	Supplier					Jan. Comparison	
To	WTC	Monsanto	Reichhold	Vulcan	Total	1977	1976
FPD	-	-	180,927	80,000	260,927	395,335	398,381
Customer	51,600	42,000	93,900	-	187,500	301,893	290,860
WTC	-	-	-	-	-	70,700	67,650
	51,600	42,000	274,827	80,000	448,427	767,928	756,841

Invoicing ($) January Accounting Month

	1978	1977	1976
FPD Penta	142,870	176,297	149,592
Customer Penta	49,785	102,211	62,512
WTC Products	131,328	170,369	129,753
Total	323,983	448,877	341,857

II Raw Materials

Penta - No problems being encountered with distribution either Reichhold or Vulcan. We took into St. Louis a 2,000 Lb. box of Vulcan flakes that was carrier spilled enroute from Vulcan's plant to St. Louis warehousing; the product was exceptionally dark and produced unacceptable Woodtox Preprime upon testing. Conclusion: we will have to scrutinize Vulcan shipements and need to get assay reports and samplings from both Vulcan and Reichhold.

10000

TOLS003385

BZTO104(e)040206

KOPPERS

Interoffice Correspondence

To _____ From _____

Location _____ Location _____

Subject _____ Date _____

Mc Phillips reports Monsanto continuing production to the end of February. Weather conditions have not permitted much production however, and inventory situation has not been provided as requested, except in very non-descript terms.

Solvents - Oxo bottoms again increases 2¢/Lb; this makes 25% increase since Sept. 1, 1977.

Steel Containers - U. S. Steel making a big howl on reduced profits to justify their position on increase of 5-6% May 1st. Rheem also announced expected increase of about the same on May 1.

Pigments - Cal Ink increase received today effective March 1 ranging from 4¢/Lb. to 22¢/Lb. Average per Lb. increase 8¢.

III Inventory & Expenses

December closing inventory		630,939	
January purchases			
Raw Materials	107,410		
Containers	8,758		
(Resale Penta	191,493)		
January raw material converted to finished goods		101,575	
January estimated cost WTC products sold		111,000	
January estimated closing inventory		636,107	
February estimated closing inventory		650,000	
March estimated closing inventory		670,000	
April estimated closing inventory		670,000	
Actual physical inventory year end St. Louis			439,388
All other WTC locations			273,701

January Plant Expenses

Detail 130 Safety	273	
170 Rent	25	
190 Office Expenses & Svcs	599	
270 Telephone	383	
290 Postage	14	
331 Tankcars	(289)	

10003

TOLS003386

K 43 - REV. 5 100M 5-76

BZTO104(e)040207

KOPPERS

Interoffice Correspondence

To _____ From _____

Location _____ Location _____

Subject _____ Date _____

350/351	Repairs & Maint.	113
370	Stationary & Printing	34
390/392	Direct Operating Expense	455
520	Prof. Svcs (Traffic & Lab.)	468
170	Whse. Rent	1232
390	Whse. Op. Expense	660
395	Whse. Freight	1149
391	Tote Bins	1692
	Chem. Pumps	1205

IV Sales Forecast

	Feb.	Mar.	Apr.
FPD Penta	170,000	200,000	200,000
Customer Penta	160,000	175,000	200,000
WTC Products	175,000	200,000	200,000
	505,000	575,000	600,000

V Assistance Requirements

1. Sales - Weather has been a plague for two months. Situation has to improve!

2. To our situation we have no solution if Dow discontinues EC-7 prills as scheduled. It is bound to cost plenty to convert to using block EC-7 for Liquid Noxtane, if possible at all.

VI General Comments

December closing physical reported. Terry Franklin, plant worker, laid off Feb. 10. Cecelia Wright, office, retired end of January.

10000

43 - REV. 5 100M 5-76

TOLS003387

BZTO104(e)040208

KOPPERS

Interoffice Correspondence

To_____ From_____

Location_____ Location_____

Subject_____ Date_____

VII Travel & Meetings

Januray
3-4 Bud Harris - Pittsburgh photographer
12 & 20 - Monsanto, scrap penta inspection
30 & 31 - Harry Fry, Orrville, quality assurance inspection (to our knowledge, no plant gigs.)

February
2-3 - Newark, CA (LN-SSI production quality problems) and visit suppliers.
6 - Reichhold, Tacoma, Wa.
7-8 - Portland, OR Plant - Safety seminar, supplier visits.

R. F. Simmons

RFS/pdc

10000

43 - REV. 5 100M 5-76

cc: F. N. Klasnick
Miss Edythe Emanuel

KOPPERS

Interoffice Correspondence

To Ms. Sharyn Ott

From Pat Coleman

Location Real Estate Section K-1928

Location St. Louis, Mo.

Subject Oregon Personal Property Tax Figures

Date January 26, 1978

Sharyn, the following are inventory figures by month, for inventory located at Time Oil Co. Portland, Oregon for 1977.

January	$ 81,161.36
February	97,732.92
March	88,063.96
April	84,147.62
May	83,812.30
June	100,782.62
July	95,575.74
August	85,108.18
September	101,539.57
October	109,651.63
November	115,057.39
December	106,802.88

Pat Coleman

10000

43 - REV. 5 100M 12-76

TOLS003389

BZTO104(e)040210

KOPPERS

Interoffice Correspondence

To Mr. David W. Stevenson
Real Estate Section
Location Pittsburgh, PA K/1928

From R. F. Simmons
Location St. Louis, Missouri

Subject Operating Agreement/Tankage Lease
Time Oil Co., Portland, Or and
W T C Dept.

Date January 14, 1976

Confirming our conversation we desire for our arrangement to continue another five year term through February 28, 1982.

R. F. Simmons

RFS/sjk

cc: R. G. Hamilton
F. Klasnick

10000

TOLS003390

3- REV. 5 100M 2-75

BZTO104(e)040211

KOPPERS

Interoffice Correspondence

To Mr. R. E. Simmons

Location St. Louis, Missouri

Subject Operating Agreement and Lease of Tanks Portland, Oregon

From Real Estate Section

Location Pittsburgh, Pa.

Date January 9, 1976

Under date of March 1, 1967, Wood Treating Chemicals Co. (now Koppers Company, Inc.) entered an operating agreement and lease of tanks with Time Oil Company at Portland, Oregon, for a term of five years from March 1, 1967, to February 29, 1972, at an annual handling charge of $7,380. This agreement automatically renewed in 1972 for a further term of five years from March 1, 1972, to February 28, 1977, at the same handling charge.

Under the terms of the agreement, both parties have the right to cancel the agreement as of February 28, 1977, by giving notice to the other party on or before February 29, 1976.

We assume that you will permit this operating agreement and lease of tanks to renew automatically for a further term of five years from March 1, 1977, to February 28, 1982. If such is not the case, please advise.

David W. Stevenson

DWS/sf

cc: R. G. Hamilton

REV. 2

May 9, 1975

Mr. Neil Gallagher
Time Oil Company
P. O. Box 03117 - St. John's Station
Portland, Oregon 79203

Dear Neil:

We are writing to inform you of a recent oil spill at one of our customers' plant and resultant action because they were slow in reporting it. The wood preserving plant, operating on an inland stream, had a small spill and apparently were negligent in immediately reporting it to the authorities. The coast guard considered the slowness in reporting to be a criminal offense and the president and an employee who was considered the lowest one in line authority to instruct personnel on spill procedure handling was hauled into court. Fortunately, it was our customers' good fortune to draw an understanding judge who thought they were not trying to evade the law and assessed only a $100 fine; we understand the fine could have been $5000.

We bring this incident to you as information only in the hope that we all are more vigilant in guarding against industrial pollution.

Best Regards,

R. F. Simmons
Operations Manager

RFS/sjk

10000

TOLS003392

BZTO104(e)040213

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

WQ-

TIME OIL CO.

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

March 14, 1975

Department of Environmental Quality
1234 S. W. Morrison Street
Portland, Oregon 97205

Dear Sirs:

Attached detailed report of oil spill at the Time Oil Company terminal facility in Portland, Oregon is submitted in compliance with paragraph (1)(e), section 47-015, of the Oregon Administrative Rules Compilation.

Sincerely,

John P. Denham

John P. Denham
Environmental Control Engineer

JPD/jf

Copy to:

Region X
Environmental Protection Agency
Attn: Mr. Jim Willman
1200 Sixth Avenue
Seattle, Washington 98101

NORTHWEST REGION OFFICE
RECEIVED
MAY 16 1975
DEPARTMENT OF
ENVIRONMENTAL QUALITY

TOLS003393

BZTO104(e)040214

STATISTICS

Diesel	Bbls.
Conditions:	
On barge prior to discharge	15,244
Discharged into tank 55021	11,334
On barge prior to discharge to tank 29508	3,910
Discharged into tank 29508 before rupture	1,837
Isolated on barge at time of rupture	2,073
In tank 29508 before receipt	24,470
In tank 29508 after rupture	5,301
On barge after rupture	7,480
In tank 15002 after rupture	4,843
In tank 5312 after rupture	3,283
In tank 5313 after rupture	1,737
Loss:	
Quantity in tank 29508 before receipt	24,470
Plus quantity discharged into tank 29508 before rupture	1,837
Less quantity in tank 29508 after rupture	5,301
Less quantity recovered	17,343
Equals loss of	3,663

SUBJECT: OIL SPILL AT TIME OIL COMPANY TERMINAL - PORTLAND, OREGON

On March 8, 1975 Heating oil and Diesel on board PAC Barge 25 were being discharged to terminal storage tanks. Heating oil discharge operation started about 0700 hours and was completed at 1020 hours. Diesel discharge operation began immediately thereafter. Spill occurred, during the diesel operation, at tank 29508 and was due to tank rupture.

Operation took place as follows. Approximately 11,334 of the 15,244 total net barrels on board barge was received into tank 55021. At approximately 1530 hours, tank 55021 was filled and pumping to tank 29508 was started. When pumping to tank 29508 began, Neil Gallagher (Terminal Superintendent) departed for home. Otto Saylor and Wayne Schmidt remained on duty. At approximately 1630 hours, Schmidt was inspecting the pipelines being used and was within 100 feet of tank 29508 when the vertical weld on the second ring from the tank bottom ruptured. Schmidt observed the initial rupture (approximately 6 inches in length) instantly spread to the full six (6) foot length of the vertical weld. Schmidt immediately caused barge pumping to stop. The bargeman isolated remaining product on board, then opened all empty barge tanks and started receiving tank 29508 product back on the barge. Superintendent was notified, returned to the terminal at about 1650 hours, and effected emergency actions. Empty tank 15002, adjacent to tank 29508, was opened and began receiving product by gravity flow through an 8 inch line. Tank 5313, already containing approximately 121 bbls. of diesel and on a common line with tank 15002, was also opened. The U.S. Coast Guard office was informed of the rupture at approximately 1700 hours.

Spill accumulation had flowed to a low area adjacent to tank 5312. A portable 3 inch transfer pump was put into operation and spill recovery operations began about 1730 hours with the pumping into empty tank 5312. Another 2 inch pump was put into operation at a second low spot by tank 5313 and pumping started to that tank. Two additional personnel were called in to work. The Willamette Tug and Barge Company was called to deploy the company's on hand oil containment boom just in case any oil might reach the river. Boom was deployed by 1830 hours.

PO-2 Melvin Harris of the U.S. Coast Guard was on site. He requested his office call the Portland Fire Department, then took pictures of the tank rupture. The plant entry gate had been closed as part of the emergency operations procedure, and a company employee was standing by it with instructions to permit only necessary company personnel or emergency vehicles to enter. The fire department arrived at approximately 1930 hours and surveyed the area.

At approximately 2200 hours, when the product level in tank 29508 had been decreased somewhat and there was no possible chance of injury to personnel, a ladder was placed against the tank and cedar shingles were driven into the crack. Spill was then reduced to a minimum.

10000

At 0015 hours, March 9th, the product in tank 29508 was below the rupture. Transfer to the barge was stopped. Barge was gauged. Gauge showed barge had received approximately 7,480 barrels. When tank rupture occurred, there was 2,073 barrels remaining on the barge. 1,837 barrels had, therefore, been discharged into tank 29508 before the rupture. The 7,480 barrels of product returned to the barge and the 2,073 barrels previously on board were then pumped to tank 16804. Final product transfer was completed at 0500 hours on March 9th.

Meanwhile, portable pumps were continually being moved to different locations where other low spots existed and all visible spill accumulations were recovered by 1700 hours on March 9th. Recovery operations continued on March 10th. Beginning at 0700 hours, holes were hand dug in many places and any small quantities of oil were transferred to tank 5312. Oil sorbent pads were simultaneously deployed throughout the area and pick-up accomplished. A backhoe was then brought in and large holes dug throughout the area in search of remaining oil accumulation. None could be found. As a final recovery effort on March 11th, certain areas were flooded with fresh water. No oil accumulation resulted.

Overall corrective action started March 12th when complete removal and disposal of all ground in the spill area was begun. Ground is being replaced with newly purchased soil. Tank is to be repaired and tested prior to being returned to service.

Synopsis: At approximately 1630 hours on March 8, 1975, a diesel oil spill occurred at the Time Oil Co. terminal in Portland, Oregon. Spill resulted from a tank rupture. Emergency procedures were effected in accordance with Operations Manual. Spill was contained by secondary containment diked area inside property boundaries. At no time did any product reach navigable waters. 3,663 bbls. of diesel oil were lost.

January 31, 1975

Time Oil Company
P. O. Box 03117
Portland, Oregon 97203

Attention: Mr. Newton P. Lesh
Vice President

Re: WQ - Time Oil Company
Multnomah County

Gentlemen:

The Department has reviewed Time Oil Company's application for a State of Oregon Water Pollution Control Facilities Permit. Because your wastewater is discharged to the City of Portland sewerage system, we have determined that a permit will not be required for your terminal. Further processing of your permit application has, therefore, been terminated.

If you have any questions relative to this procedure, please feel free to contact Mr. Dick Nichols of this office at 238-8471.

Very truly yours,

KESSLER R. CANNON
Director

E. J. Weathersbee, Administrator
Northwest Region

RJN:cs

cc: Water Quality Division, DEQ

10000

TOLS003397

BZTO104(e)040218

SEATTLE
TACOMA
PORTLAND
STOCKTON
OAKLAND
SAN PEDRO
LOS ANGELES

PHONE 286-1611

TIME OIL COMPANY

12005 N. BURGARD, P. O. BOX 03117, ST. JOHNS STATION, PORTLAND, OREGON 97203

July 2, 1974

State of Oregon
DEPARTMENT OF ENVIRONMENTAL QUALITY
RECEIVED
JUL 3 1974
WATER QUALITY CONTROL

Mr. L. Sawyer, Director of Water Quality
Department of Environmental Quality
Room 205 Terminal Sales Building
1234 S. W. Morrison St.
Portland, Oregon 97205

Dear Mr. Sawyer:

On August 1, 1972 we were issued a Waste Discharge Permit #1198, which expires December 31, 1974. Your file number was 38780, application number 1460, receiving streem Willamette River, County of Multnomah.

I talked to William Lesher in your office today, relative to the procedure to renew this permit when it expires. He told me that perhaps we did not need a permit.

In our operation here we do not discharge any water or wastes into the Willamette River. In 1972 we installed a water draw system for all of our tanks and this water is piped to a slop tank, together with any storm water from around our loading rack and a small portion of our payed yard. The water and oil that is collected in the slop tank is periodically ran through our Fram Oily Water Separator. The oil collected in this operation is disposed of or returned to storage and the water which contains less than 100 ppm ether soluble oil is dumped into the City of Portland sewer.

With our method of operation we would like to know if we need a NPDS permit or a State of Oregon permit, since we dump nothing in the river and the storm water from a small area in our paved yard is processed through our collection system.

If you need any additional information, please contact me.

Yours very truly,

Newton P. Lesh

NPL/s

10000

TOLS003399

BZTO104(e)040220

State of Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE MEMO

cc: CKA, Jim Sweeney 7/2/74

To: ~~RJNichols~~, ~~REGilbert~~, ~~RJZitka~~ Date: June 28, 1974

From: LDPatterson

Subject: WQ - Time Oil Company - Multnomah County

This is in reference to an inspection of the Time Oil Company facilities located in the Rivergate District.

The large majority of the property is sand which allows storm water to percolate into the ground. All paved areas drain to collection sumps which connect to a closed private sewer system. Water from this private system, including tank draw water, is pumped to a large oil storage tank. The liquid from this tank is periodically pumped through a portable oil-water separator from which the water is discharged to the City of Portland's sanitary sewer.

The oil dock has been concreted, curbed and plumbed to carry any oil spillage to the same oil storage facility.

Pac-Mar has been contracted to remove waste oils from the separator.

The Time Oil Company has no discharges to the Willamette River. The facility appears to be clean, neat and well maintained.

An NPDES Permit will not be required for this facility.

Should get a state permit to this facility when we get time.

10000

TCLS003400

DEQ 4

BZTO104(e)040221

December 31, 1973

Mr. Neil Gallagher
Time Oil Co.
P. O. Box 03117
St. John's Station
Portland, Oregon 79203

Dear Neil:

John Hite from Pittsburgh general office will be out with John Messner on February 4 and 5. Messner will be contacting you to advise that Mr. Hite would like to visit Time Oil while in the area. For your information, John Hite is the assistant manager of the Speciality Wood Chemicals Group of which Wood Treating is a department. We will appreciate the usual fine courtesy extended your visitors and am sure you will find Mr. Hite an energetic and pleasant fellow.

Best regards,

R. F. Simmons,
Plant Manager

P.S. Have also been intending to drop you a note as a reminder that beginning Jan. 1, 1974, Lot Numbers should begin with WD-001-T.

RFS/pc

10000

TOLS003401

BZTO104(e)040222

DEPARTMENT OF ENVIRONMENTAL QUALITY

TERMINAL SALES BLDG. • 1234 S.W. MORRISON ST. • PORTLAND, OREGON 97205

January 12, 1972

Time Oil Company
Portland Division
12005 N. Burgard Street
Portland, Oregon 97203

Attention: Mr. N. P. Lesh, Vice President

Gentlemen:

Re: WDP File #88780

The Department of Environmental Quality staff has reviewed your plans and proposals set forth in meetings in connection with proposed facilities for the collection and treatment of tank water draw waste waters at Time and Bell Oil Terminals. It is understood Bell Oil is a wholly owned subsidiary of Time Oil Co.

The basic components of the system are as follows:

1. A water draw box at each tank having water draw fittings (8 tanks at Time Terminal and 4 tanks at the Bell Terminal).

2. Drainage piping to centrally located sampling sumps in the tank farm area where waters may be sampled before discharge. (Two at the Time Terminal and 1 at the Bell Oil Terminal.)

3. A portable Fram-Aker oil/water separator coupleable to tank water draw fitting, discharging treated water to collection system and returning oil to the tank.

4. Three dry well stations each with sampling platform and sump (overflow to dry well).

10000

COPY

DEQ-2

TOLS003402

BZTO104(e)040223

Approval is herewith granted for the proposed construction and facilities subject to confirmation by the Environmental Quality Commission.

Approval of the above facilities does not preclude discharge of treated waters to the sanitary sewer by arrangement with the city of Portland.

If you have any questions, please contact this office.

Very truly yours,

L. B. Day
Director

WDL/lb

10000

WOOD TREATING
CHEMICALS CO.

5137 Southwest Avenue / St. Louis, Missouri 63110 / 314 PR 2-2200

December 8, 1971

Time Oil Co.
5150 Wilshire Boulevard
Los Angeles, California

Gentlemen:

This notice is to advise you that effective as of December 1, 1971, Wood Treating Chemicals Co. sold to Koppers Company, Inc., Pittsburgh, Pennsylvania 15219, the majority of its wood preservatives business assets. As an integral part of this transaction, Wood Treating is seeking your consent to the assignment and assumption of your contract dated April 1, 1967, by and between your company and Wood Treating to Koppers. Koppers is in possession of a copy of this document and has pledged to abide by all the terms and conditions of the contract.

While Wood Treating will no longer be in the wood preservatives business, it is anticipated that upon your consent the aforedescribed transfer will have no material effect upon the business you previously transacted with Wood Treating and that Koppers will continue the wood preservatives business in a most vigorous fashion in furtherance of your mutual interests and profits.

If you consent to the assignment and assumption of your contract by Wood Treating Chemicals Co. to Koppers Company, Inc., please indicate your agreement by executing a copy of this letter and returning same to Wood Treating Chemicals Co., 800 North Lindbergh Boulevard, St. Louis, Missouri 63166, Attention John Mason, President.

Very truly yours,

John Mason
President

Accepted and Agreed to this
____ day of _____, 1971.

TIME OIL CO.

By_____

10000

TOLS003404

BZTO104(e)040225

State of Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY INTEROFFICE MEMO

To: ~~Industrial Waste Section~~ RCS ✓ cc: PDO WDL Date: Feb. 16, 1971

From: WDL

Subject: IW 3-0 Time Oil Co.

Visited Time Oil Company's Terminal at 12005 N. Burgard this afternoon and talked to the plant engineer, Neil_____. Time Oil has a dock and a fairly good size tank farm storing:

1. Gasoline
2. Jet Fuel
3. Diesel
4. Raw turpentine from paper mills
5. Other miscellaneous products.

When they draw water from tank bottoms they allow it to flow on the ground. But they maintain they have no effluent going into the river, drainage ditch or storm sewer.

But they may be saturating the soil with oil over a long period.

They also lease a tank to PacMar Services to store wastes from refinery separators, ships tank cleaning, etc.

WDL

10000

TOLS003405

DEQ-1

BZTO104(e)040226

bcc: R. F. Simmons
R. J. DeLargy/J. Michalski

WOOD TREATING CHEMICALS CO.

5137 Southwest Avenue / St. Louis, Missouri 63110 / 314 PR 2-2200

July 27, 1970

Mr. Newton P. Lesh
Time Oil Company
12005 N. Burgard
P. O. Box 03117 - St. Johns Station
Portland, Oregon 97203

Dear Newt:

We have reviewed your proposed amended schedule and other changes to the original contract dated March 1, 1967, and are in agreement, except for the following:

1) Add in the 38,000 gallon tank under the Facilities caption and change the $440 per month to $615 in the Handling & Transfer Charges section.

2) On your page 2, paragraph 3, line 6 - I am sure the $5,8125 was a typing error and should read: $5.8125.

3) Reference to page 5, paragraph 8, line 2 - I have no Exhibit B, and if I did have I think you should have to give us notice of such rules change.

4) Reference to page 7, paragraph 10 - we would have no leverage here since the proposed language would eliminate, for practical purposes, the value of this provision to us as the customer.

5) If you feel it necessary to add the provision relating to pollution, I would suggest it read: "Customer shall reimburse Operator for fines imposed upon Operator by a court of law and paid in full by Operator, which fines are for pollution, expressly prohibited by statute, proved in said court to have been caused solely by the correct, non-negligent performance by Operator of written instructions given by Customer to Operator under and pursuant to this Agreement."

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TOLS003406

BZTO104(e)040227

6) I would suggest that the following text be used for the force majeure provision of the contract, section 13, sub-paragraph (a):

"Performance of any obligation under this Agreement may be suspended by either party, in whole or in part, without liability, in the event of Act of God, war, riot, fire, explosion, flood, drought, sabotage, inability to obtain fuel or power, accident, national, state, or other governmental laws, regulations, rules or orders, or any other circumstance of like nature beyond the reasonable control of such party, or labor trouble, strike, lockout, or injunction, whether or not any such event is within the reasonable control of such party, which delays, prevents, restricts or limits the performance of this Agreement or the consumption, sale, use or end use of the Products or any Product manufactured or processed therefrom or therewith. The affected party shall invoke this provision by promptly notifying the other party of the nature and estimated duration of the suspension period. At Customer's option, the period specified for processing and/or delivery of the Products hereunder shall be extended by the period of delay occasioned by any such suspension and processing or deliveries not performed or made during any suspension period shall be performed or made during such extension period, or the period specified for processing and/or delivery shall not be extended and the total contract quantity hereunder shall be reduced by the processing or deliveries not performed or made during such suspension period and, in either event, the Contract shall otherwise remain unaffected."

7) The effective date should be August 1, 1970.

Regards,

Lowell E. Gutzler
Controller

LEG/lr

10000

TOLS003407

BZTO104(e)040228

503 PHONE 286-1611

SEATTLE
TACOMA
PORTLAND
STOCKTON
OAKLAND
SAN PEDRO
LOS ANGELES

TIME
ETHYL
GASOLINE

TIME OIL COMPANY

12005 N. BURGARD, P. O. BOX 03117, ST. JOHNS STATION, PORTLAND, OREGON 97203

July 6, 1970

Mr. R. F. Simmons
Wood Treating Chemicals Co.
5137 Southwest Avenue
St. Louis, Missouri 63110

Dear Bob:

Attached are three copies of the Amended Schedule of our Agreement dated March 1, 1967 to adjust the charges for our services as we discussed when you were here recently. After you have reviewed the Schedule, if you have any questions, please call me. The charges are as we discussed when you were here.

A few additional changes or additions were made to the Agreement which our company felt necessary to have in order that there might be no misunderstanding in our operation. The Amended Schedule is dated to commence on June 1, 1970, but since we have already billed you for the month of June, this starting date should be changed to July 1, 1970.

Regarding the rental for the 38,000 gallon tank, we believe we should have $175.00 per month for this tank. We have been unable to find any used 6,000 or 8,000 gallon tanks for sale, but believe that some will be available in the future, as we have several feelers out for tanks of this size. We recently purchased a new 8,000 gallon tank for $863.00 and 6,000 gallon tanks would probably cost around $650.00. If you are interested in new tanks, please let me know and I will get an exact quotation for them.

Yours very truly,

Newton P. Lesh

NPL/s
3 Encl.

10000

TOLS003408

BZTO104(e)040229

PHONE 286-1611

SEATTLE
TACOMA
PORTLAND
STOCKTON
OAKLAND
SAN PEDRO
LOS ANGELES

TIME OIL COMPANY

12005 N. BURGARD, P. O. BOX 03117, ST. JOHNS STATION, PORTLAND, OREGON 97203

June 19, 1970

Mr. R. F. Simmons
Wood Treating Chemicals Co.
5137 Southwest Avenue
St. Louis, Missouri 63110

Dear Bob:

I thought I would have the Amended Schedule for our Agreement approved and in the mail to you before I left, but the wheels of industry sometimes turn at a slow pace. I am sure it will be ready to send you when I return on the 29th.

Regarding the sandblasting and painting of the 7,000 gallon tank you have here, we have a man, Paul Hendricks, who will sandblast to bare metal and apply two coats of Rustoleum for $100.00. He will furnish the paint needed for the tank for this price. Paul is our maintenance man and I am sure he will do a good job. He said that he would keep track of the time and material on this tank and if you have more tanks in the future, he could perhaps lower his price some.

I find that we do not have any used tanks available, but will keep my eyes open for any that might be for sale in this area.

I enjoyed your visit very much and hope you can make it out this way this fall.

Yours very truly,

Newt.

NPL/s

Newton P. Lesh

10000 -

TOLS003409

BZTO104(e)040230

→ Rummy

(2)

PHONE AVENUE 6-1611

SEATTLE
TACOMA
PORTLAND
STOCKTON
OAKLAND
SAN PEDRO
LOS ANGELES

TIME ETHYL GASOLINE

TIME OIL COMPANY

12005 N. BURGARD, P. O. BOX ~~2997~~, ST. JOHNS STATION, PORTLAND, OREGON 97203
03117

August 15, 1967

Mr. R. M. Morriss, Jr.
Wood Treating Chemicals Co.
5137 Southwest Avenue
St. Louis, Missouri 63110

Dear Mr. Morriss:

I am forwarding you three samples of Woodtox 140 which have been taken at different levels from our storage tank. One has been taken from the top, one from the middle and one from the bottom.

We mixed a 7,000 gallon batch yesterday and filled our tank to capacity, circulating the tank for four hours from top to bottom. In a conversation with Herb Morissette today, we want to try and determine if this period of circulating the tank is sufficient to properly mix the product so that the penta content is the same at all levels of the tank. If you will have the samples checked and advise us as to the percent of penta in each sample, we can decide if we should circulate the product for a longer length of time after a blend.

If the product checks out with the same percentage of penta at each level, perhaps you will want us to adjust our formula slightly to bring the penta more in line to the desired amount.

Let me know how the samples check and we will govern ourselves accordingly as to the length of time to circulate each blend.

Yours very truly,

Newton P. Lesh

Newton P. Lesh

NPL/s
cc HEMorissette

10000

TOLS003410

BZTO104(e)040231

August 23, 1967

Mr. Newton P. Lesh
Time Oil Company
P. O. Box 03117
Portland, Oregon

Dear Mr. Lesh:

Thank you for your letter of August 15th, and our laboratory has been alerted to process the three samples of Woodtox 140 from your blending plant as soon as they have been received.

George Mills has been asked to send the results of the analyses to you and to Herb as soon as the testing has been completed.

Yours very truly,

R. M. Morriss, Jr.

RMM:jm
cc-Mr. H. E. Morissette
Mr. G. B. Mills

10000 -

TOLS003411

BZTO104(e)040232

March 22, 1967

Mr. Newton P. Lesh
Time Oil Company
P. O. Box 03117
Saint John's Station
Portland, Oregon 97203

Dear Mr. Lesh:

This will acknowledge your letter of March 3rd with regard to the pending storage and blending agreement between our companies, and this has now been handled with the Monsanto law department.

With some minor changes, or corrections, it would appear that we are now to the point of preparing the final draft for execution and which we presume your people will handle. The original and copy that was sent to us with your letter of March 3rd is enclosed. Re-typing of the entire document is certainly not indicated to cover the following:

1. Time has omitted the definition of gallons in paragraph 9(d) of the Monsanto draft of the agreement. I see no objection to calculating the amount of Products shipped or delivered in other convenient units, but I would suggest that you check to see what measurement procedure Time is contemplating.

2. In paragraph 13(a) of the Time draft of the agreement, in line 2 "lieable" should be "liable" and in line 12 "delivery" should be "deliver".

3. In paragraph 16(a) Time has stated the term of the agreement to be March 1, 1967 to February 29, 1972. Of course, there is no objection to this term. The change made by Time to paragraph 16(b) appears to be appropriate since some of the improvements to the Facilities will be made prior to the date of the agreement and the Monsanto draft provided for reimbursement only for improvements made subsequent to the date of the agreement.

10000

4. In line 2 of paragraph 17 of the Time draft "State of Federal" should read "State or Federal".

With respect to the starting date, it was supposed to be when the facility was ready; but for accounting purposes it might be more convenient to date it April 1, 1967, and the few extra days of income in March 1967 would be picked up in March 1972. Whatever date you decide will be satisfactory in March, or April 1, 1967 for the final draft.

Enclosed is a copy of the Monsanto Warehousing and Terminaling Unified Procedure. In general this is to apply, although we will cover by separate letter or correspondence the Wood Treating Chemicals Co. forms, etc., that we actually use which are different from those of the parent company.

Yours very truly,

R. M. Morriss, Jr.

RMM:jm
Enc.

10000

PHONE AVENUE 6-1611

SEATTLE
TACOMA
PORTLAND
STOCKTON
OAKLAND
SAN PEDRO
LOS ANGELES

TIME
ETHYL
GASOLINE

TIME OIL COMPANY

12005 N. BURGARD, P. O. BOX 03117 ST. JOHNS STATION, PORTLAND, OREGON 97203

March 3, 1967

See (d) P 8 Mons. not in Time Oil version March 17.

Mr. R. M. Morriss, Jr.
Wood Treating Chemicals Co.
5137 Southwest Avenue
St. Louis, Missouri 63110

Dear Mr. Morriss:

Enclosed are four executed copies of the Agreement for storing and blending your products. The enclosed Agreement has been changed very little from the one you sent us recently which was prepared by your people.

Paragraph 9b has had a clause added at the end which reads "or 3/4 of 1% of maximum amount of products stored in any one month, whichever is the greater". Our people feel that this is necessary and it conforms with our Standard Form Agreement previously submitted to you.

Check this

Paragraph 16b has been rewritten and I believe is the understanding of all concerned in the event you cancel this Agreement at any time during the first five years.

We have not seen a copy of the booklet "Monsanto Warehousing and Terminaling Unified Procedures". We have agreed in the Agreement to follow the procedures outlined in the booklet, but will want to read the booklet before final acceptance of this Agreement. We do not anticipate any problem with the procedures as long as they are not contradictory to this Agreement.

The Schedule attached to the Agreement covers 3 tanks with a capacity of 20,570 gallons each, one tank with a capacity of 13,000 gallons, one blending tank with a capacity of approximately 1,500 gallons and equiped with 6 electric heating elements, warehouse space for approximately 100,000 pounds of additives in drums and bags. The charges for this we have reduced to $440.00 per month, which we believe is fair for this number of tanks and the amount of warehouse furnished. It was our understanding in our last conversation with Mr. Morissette that this is the number of tanks you desired and the amount of warehouse space needed.

We have the above tanks all set up and ready to go. The electrical work will be completed Monday and painting of the tanks will be completed in a few days, weather permitting. We received the tank car of Solvent B-6 on February 28, 1967 and discharged it into one of the 20,000 gallon tanks.

Two of the 20,000 gallon tanks have been piped so that the product can be circulated from the bottom of the tank to the top of the tank; products can be transfered from any one tank to another; and up turned elbows are in the bottoms of all the

tanks so that the product is not drawn directly from the bottom of the tank, excepting the blending tank which has a bottom draw so that the tank can be drained completely. There are bottom draws on all of the tanks so that any sludge or tank bottoms can be drained completely.

Mr. Morissette has been out of town since we have been putting the tanks together, but I expect to see him the first of the week so that he can inspect the tanks. We will be ready to start blending products for you at any time.

The dollar value to be inserted in paragraph 16b will be confirmed to you by letter when all the costs are completed.

Yours very truly,

TIME OIL CO.

By Newton P. Iesh

Newton P. Iesh

NPL/lp

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File

WOOD TREATING
CHEMICALS CO.
5137 Southwest Avenue / St. Louis, Missouri 63110 / 314 PR 2-2200

February 14, 1967

Mr. Newton P. Lesh
Time Oil Company
P. O. Box 03117
Portland, Oregon 97203

Dear Mr. Lesh:

As per my letter of January 30th, we referred to the Monsanto law and distribution departments your standard "Agreement" form covering your terminal services, etc., and the schedule attachment thereto covering the special blending services at Portland that we are in the process of working out between our companies.

With respect to your Agreement form, Mr. J. M. Bray of the Monsanto law department has drafted, as per duplicate copies enclosed, a new agreement to conform to Monsanto practice on such terminalling arrangements, etc. The memo from the distribution department, two copies of which are also enclosed, will possibly explain in all instances the reasons for the changes. Undoubtedly, you will now want to refer this to your legal counsel and let them advise you of what significant changes have been made between the two drafts and/or which of these changes are unacceptable and need to be further negotiated or resolved. A lot of the wording is, of course, just standard "boiler plate", but I do not believe you will find it too biased in our favor.

With respect to the "Schedule" attachment to the Agreement we have the following comments.

Storage Tanks

We note that the rate is to be $250 monthly if one of the 20,570 gallon tanks is provided, or $450 monthly if three of the 20,570 gallon tanks are provided. This is equivalent to $100 per month for each of the extra 20,570 gallon tanks. Our engineering department advised that the cost of a coiled, new 20,000 gallon

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Storage Tanks (continued)

vertical storage tank is about $2,400 in this area, or approximately $3,500 each piped up for receipt and car or truck shipment of blended product. On the basis of the rental proposal, Time Oil Company could offset the cost of a new tank installation in about three years, and used tanks are to be provided. The three 20,000 gallon tanks at $350 monthly would seem to be a more equitable rental.

Receiving Tanks

We instructed Herb Morissette to ask that you include with the storage tanks a receiving tank of at least 15,000 gallons capacity or sufficient to unload two tank trucks of solvent. The cost of blending one truck of product at a time would probably be excessive, and the standard procedure would be to blend at intervals and three or four truckloads at a time. One 20,000 gallon tank will be for storage of a raw material or additives, but two of the 20,000 gallon tanks would be used for blended product and from each of which about three trucks could be shipped. Once either of the finished product tanks were below one truckload or less, you could fill it, or both tanks, up again to 20,000 gallons each and that would mean scheduling in three or four truckloads of mineral spirits; hence the need for a solvent receiving tank to avoid truck demurrage. The question is the extra cost for this extra tank, and even though it would serve as a convenience for your people.

Charges

These seem to be in order except for the discrepancy of rental for just the two extra tanks. At the moment no blending of concentrate is contemplated; but if, and when, we want such service, that charge would have to be negotiated.

Term, Etc.

This is covered in the proposed Monsanto agreement, as well as reimbursement for the installation costs in the event that we cancel at an early date.

We are desirous of getting this settled as soon as possible, and to get started with the blending. I shall be out of town for the next two weeks, but Herb Morissette will know how to reach me at all times and if we are so far apart on any of these details that they might cause a hold up or delay.

Yours very truly,

R. M. Morriss, Jr.

Enc.
cc-Mr. H. E. Morissette

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January 30, 1967

Mr. Newton P. Lesh
Time Oil Company
P. O. Box 03117
Saint John's Station
Portland, Oregon 97203

Dear Mr. Lesh:

As I will be out of the office until February 13th, please consider this letter as notice of our intention to proceed with the arrangements for blending and storage of certain of our products at your terminal in Portland, and as per the substance of the proposals that you have submitted to us on performance of these services.

Being a part of the large Monsanto organization, it will be necessary for us to consult with the legal department on the final form of the agreement, and we have this in progress but it will be a time consuming process before it is completed. Because it is something of a terminal, warehousing and blending contract, we have both terminal and warehouse legal specialists lending us assistance. Also, as you know, we have requested additional tankage and facilities which are still in the process of negotiation between you and our Mr. Morissette. We would like to get the work underway so that we can be operational by the end of February, or early March, on this blending. Presumably we will be able to finalize on the exact agreement later and back date the effective date to whenever the blending facility is ready.

It is understood that we will have the right to cancel the agreement at the end of any year and after giving due notice; but that a penalty would apply equal to the undepreciated cost of the installation, and you will not have that cost figure until the facility is completed. We are assuming that you will depreciate on a five year rate, excepting the tanks which are already on your books and which may take a different rate. The cost of moving and setting the tanks at the new location, piping, the blending unit and all of that would be for our account, or the undepreciated part thereof if we were to cancel prior to five years.

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We hope to get the agreement itself resolved the week of February 13th, but as we may be a while accomplishing that we trust you can anticipate this by getting the necessary materials on order and sending us a plan of the proposed installation which we will immediately check over and approve, if it appears that it will do the work that our Mr. Morissette has explained and discussed with you at length.

Yours very truly,

R. M. Morriss, Jr.

RMM:jm
cc-Mr. H. E. Morissette
(Dictated 1/27/67, and
transcribed in RMM's
absence)

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C. F. Grafton
B. C. Downs

January 20, 1967

Time Oil Company
Portland, Oregon

H. E. Morissette

Will you please advise Mr. Lesh that we are, in principle, accepting his proposal on the blending subject to adjustment or clarification of some of the details pertaining thereto and which are as follows:

1. It appears now that we will probably want an additional 20,000 gallon tank for storage of finished product. We probably should also have a storage tank for mineral spirits and for immediate unloading of solvent upon receipt of up to two tank truck or trailer loads. Presumably this would mean another or second extra tank of a capacity of about 15,000 gallons. What would the extra rental per month be for this added tankage and assuming the same thru put income annual figures, or would they provide the extra tankage for free if we guaranteed a 300,000 gallon annual thru put?

2. This proposal is based on their storing approximately 60,000 pounds of additive: 55 gallon drums of concentrates and pallets of the bagged penta. We would plan to start off with at least 40,000 pounds of penta and 100 drums of concentrate, which might be about 100,000 pounds. Also if we achieve the anticipated activity here we may hit peak inventory storage of 150,000 pounds, but the usage probably would not exceed 100,000 pounds.

3. They have set up the terms of the agreement as 5 years and we presume this is to amortize the cost of the blending installation. We have no great objection to the 5 year term, although we might prefer a 3 year term, but because of this part of the commitment it will have to be cleared with Monsanto and we have that underway. There will be two questions in that connection that we can anticipate: the inclusion of an option to renew for another 5 years, and our termination rights for cause if Time Oil does a poor job of the mixing or blending, etc. The rights to cancel for nonpayment, etc. are standard phraseology, but our rights under certain conditions are not spelled out. Perhaps this could be handled in a codicil letter to the agreement and still use their standard agreement form.

4. Our target date is now March 1st to get started. Presumably the agreement would start from the date the facility is ready for the blending, and this is so indicated in Mr. Lesh's cover letter.

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5. We are also interested in this bulk storage on the mineral spirits which you reported on separately. That would depend on our being able to negotiate a favorable barge price on mineral spirits and how our volume goes or is shaping up on products shipped from this Portland blending plant. Miller seems to think we might get about 2¢ per gallon off, but you might try 3¢ per gallon on "your friend" Bronson, and while you are at it insist on a 375° F. end point to match LP3. If he will furnish that at 2¢ under schedule I think we can make a deal with him to take the 210,000 gallon tank. If the product volume really picks up we might have to take the larger tank because the minimum barge lot would probably be 200,000 gallons and the scheduling would have to be almost foolproof and exactly timed to get the second lot in just when the other has been used up. Anyway this bulk storage would have to be a separate negotiation agreement with Time Oil, and could they pipe or hook up the bulk storage tank 5006 or tank 9509 with the blending plant? If long lines are involved it might be cheaper for them to run it by their tank trucks to the blending plant solvent storage.

6. We need a clarification on the escalation clause which is the next to the last paragraph on page 2 of the agreement. Presumably this increase in their charges if the labor rates go up applies only to the thru put, which is referred to in the agreement as applying to transfer charges and as set forth in schedule S.

7. The final question on the blending agreement would be the suitability or cleanliness of the small storage tanks for our product storage. Their agreement form gives almost release therein in full to themselves for product contamination, but if the tanks were formerly used for heavy oil products they must be adequately cleaned prior to our usage. I understood Mr. Lesh to say that they were formerly used at the Portland Gas plant for storage of light coal tar solvents such as Benzol or Toluol. However, if they have been idle for years they may be badly rusted or otherwise fouled up inside.

I do want to get this wrapped up and started before I take off for vacation the end of next week, so get with Mr. Lesh as soon as possible to get the answers to the above. I am sending the Time Oil Company agreement over to the Monsanto legal department to see if there are any major objections to the form of this agreement, advising them that the final figures in the attached schedule are still being negotiated.

R. M. Morriss, Jr.

RMM/lr

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Monsanto RAPID-GRAM

TO (Please Print) Rube Morriss Jr

SUBJECT

MESSAGE

Rube:

We located Time Oil Co in Portland yesterday.

They have a 30,000 gal tank and will misc R.T.U. using 4000 gals of Conc + 16000 gals of Mineral Spirits. they will handle + store, there Charges

REPLY

will be 1/4 Cent in and 1/4 cent out plus tank rental of 150.00/month. this includes the cost of mixing, sampling ect.

We are meeting to morrow with there engineers from Seattle and we will work on costs to mfg. the R.T.U from the dry Pentas + Slurry drumed)

SENDER'S FULL NAME (Please Print) DATE

SIGNATURE DATE

Page 1 →

G-1140

Monsanto RAPID-GRAM

TO (Please Print)

SUBJECT Page 2

MESSAGE

attached is a copy of there regular agreement they have done work for Shell Chemicals + other major producers.

We will give you a complete report when we have had a chance to talk

REPLY

to there engineers.

Hub
Monsseth

Please make me a copy of the attached so I can study it

SENDER'S FULL NAME (Please Print) DATE

SIGNATURE Hub M DATE Dec 14 66

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BZTO104(e)040243

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

PRODUCTS TIME TESTED

TIME OIL CO.

PHONE 285-2400
CABLE ADDRESS: TIMOIL
(FAX) 206-283-8036

2737 WEST COMMODORE WAY
P.O. BOX 24447

SEATTLE, WA 98199-1233
SEATTLE, WA 98124-0447

Time 2

February 2, 1996

Oregon Department of Environmental Quality
Northwest Region
Voluntary Cleanup and Site Assessment
Attn: Karla L. Urbanowicz
Senior Hydrogeologist
2020 S.W. Fourth Avenue, Suite 400
Portland, OR 97201-4987

RE: Conceptual RI/FS Work Plan
Time Oil Co. Northwest Terminal, Portland, Oregon

Dear Ms. Urbanowicz:

This letter transmits for your review a conceptual work plan for activities and investigations to be conducted in the upcoming remedial investigation/feasibility study (RI/FS) at the Time Oil Co. Northwest Terminal. In December 1993, Time Oil Co. submitted to the Oregon Department of Environmental Quality (DEQ) a draft RCRA facility investigation (RFI) work plan for the former pentachlorophenol mixing area at the Northwest Terminal. In October 1995, Time Oil Co. received correspondence from DEQ announcing the return of the project to DEQ's Voluntary Cleanup Program (VCP). Under the VCP, the investigation shifts from a RCRA facility investigation (RFI) to an RI/FS. As discussed with you in our meeting of December 14, 1995, the scope of the previously submitted RFI work plan meets most of the requirements of an RI under the VCP, and will address most of the data gaps identified in the DEQ file summary (dated October 3, 1995) for the former PCP mixing area. The enclosed RI/FS conceptual work plan supplements the previously submitted RFI work plan in response to data gaps and recommendations specified by DEQ in its recent correspondence to Time Oil Co.

As discussed with you previously, Time Oil plans to phase the RI/FS activities at the terminal. Phase I will address the soil previously excavated from the former PCP mixing area that is currently stockpiled on a liner and under a cover just to the southwest of the former PCP mixing area. Early investigation of this material will allow remedial actions for the soil to move forward promptly. Phase I will include a stockpile sampling event, followed by a focused endangerment assessment and a focused feasibility study.

Phase II will address any remaining *in situ* soil and groundwater contamination associated with the former PCP mixing area and the former Crosby and Overton tank area (which is directly south of the former PCP mixing area) with an RI, an endangerment assessment (EA), and FS.

Phase III will address the extent of any soil and groundwater contamination associated with historical operations of the tank farm and loading areas and, if determined necessary based on the Phase II investigation results, the potential for impacts from contamination from the former PCP mixing area on surface water and sediments in the Willamette River. Phase III may also include an RI, an EA, and an FS.

This conceptual work plan covers Phases I and II in detail and Phase III conceptually. It is expected that the appropriate scope for the Phase III RI/FS is best developed after data from the first two phases are obtained and evaluated. A Phase III RI/FS work plan, to be submitted to DEQ for review and approval, would be developed at that time.

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As discussed in our meeting of December 14, 1995, the purpose of this conceptual work plan is to provide DEQ with an informal look at the framework for the RI/FS, prior to Time Oil's formalization of the RI/FS work plan. In this conceptual work plan, we have described the expected tasks for each phase of the RI/FS. For RI activities, the conceptual work plan provides a list of investigation tasks presented in the RFI work plan to be carried forward into the RI and describes supplemental tasks identified for the RI based on data gaps and recommendations by DEQ (the site background, sampling procedures, and QA/QC protocols have not been reiterated in this conceptual work plan but will be included in the final work plan). Because an EA and FS were not described in the RFI work plan, this conceptual work plan provides descriptions of these tasks that are similar in detail to the descriptions to be provided in the upcoming RI/FS work plan.

Thank you for the opportunity to streamline the work plan process with this conceptual work plan. We look forward to your comments.

Sincerely,

Kevin M. Murphy
Senior Environmental Specialist

KMM/chh

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CONCEPTUAL WORK PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
TIME OIL CO., NORTHWEST TERMINAL
PORTLAND, OREGON

INTRODUCTION

This conceptual work plan provides a summary for activities and investigations to be conducted in the upcoming remedial investigation/feasibility study (RI/FS) at the Time Oil Co.'s (Time Oil) Northwest Terminal in Portland, Oregon (Figures 1 and 2). The purpose of this conceptual work plan is to provide DEQ with an informal look at the framework for the RI/FS prior to Time Oil's formalization of the RI/FS work plan.

As required under the terms of DEQ's Voluntary Cleanup Program (VCP), the Northwest Terminal RI/FS will be performed in accordance with the state of Oregon's Hazardous Substance Remedial Action Rules (OAR 340-122), as amended and supplemented by Oregon House Bill 3352 (HB 3352). Key provisions of HB 3352 pertinent to the Northwest Terminal RI/FS include, but are not limited to, the following:

- Remedial action selection shall consider current and reasonable likely future land use scenarios.
- The preferred remedial alternative shall be a response action that balances the effectiveness of the alternative in achieving protection, the practical implementability of the alternative, long-term reliability of the response, any short-term risks posed to the community during response implementation, and the reasonableness of the costs for implementation.
- Protection of human health shall be achieved at or below a risk level of 10^{-6} for exposure to individual carcinogens and a hazard quotient of 1 for exposure to noncarcinogens; an unacceptable risk level for the protection of ecological receptors is significant adverse impacts to the health or viability of threatened or endangered species or of a population of plants or animals in the vicinity of the facility.
- "Protectiveness" shall emphasize acceptable levels of risk for exposure.
- Remedial actions for groundwater shall be considered protective of human health and the environment if they result in the restoration of current or likely beneficial groundwater uses.
- Risk assessments shall use a probabilistic risk model if practicable.

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- Protection of human health and the environment may be achieved through risk management (such as containment or access restrictions) as well as through risk reduction.

- Treatment shall be the preferred action for hot spots.

The FS will implement HB 3352 to the extent practicable. Substantive elements of the U.S. Environmental Protection Agency (EPA) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*" (EPA 1988) that are consistent with Oregon law also will be used in the preparation of the RI/FS documents and in performance of the investigations and evaluations.

REMEDIAL INVESTIGATION

The overall objective of the RI at the Northwest Terminal is to collect data sufficient to characterize the nature and extent of contamination from releases during former site operations to use in conducting endangerment assessments and in evaluating remedial alternatives during the FS process. This objective was addressed in the previously submitted RFI work plan (Landau Associates 1993) through the following planned activities:

- Sampling and analyzing soil in areas associated with the former PCP mixing operation where soil contaminated with PCP or carrier compounds may still exist

- Obtaining additional geologic information in the former PCP mixing area from soil borings

- Redeveloping existing monitoring wells, installing new monitoring wells, and sampling and analyzing groundwater in areas downgradient of previously identified soil or groundwater contamination associated with the former PCP mixing area and/or where previous hydrogeologic characterization is determined to be insufficient

- Abandoning two damaged existing wells (Wells I and E)

- Measuring water levels in monitoring wells and the Willamette River to evaluate groundwater flow directions, piezometric head gradients between the upper and lower water-bearing zones, and the relationships of the water-bearing zones to the river

- Conducting aquifer tests in selected monitoring wells to evaluate aquifer properties and potential contamination migration pathways

- Conducting a survey of all measurement points so that field measurements can be confidently evaluated and compared, and the extent of contamination can be accurately evaluated.

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The RFI work plan will be modified for the RI with the following changes:

- Adding soil stockpile sampling (to be designated Phase I) to support the subsequent identification of the appropriate remedial action for the stockpiled soil. Soil samples will be collected from the surface and at depth and composited into a single sample at each of ten randomly generated locations within ten rectangular grids.

- Renaming the RFI tasks as Phase II RI tasks.

- Adding to Phase II the sampling and analysis of soil in the Crosby and Overton tank area, beneath the former PCP warehouse floor, and in other areas associated with the former PCP mixing operation where previous activities otherwise suggest the potential for contamination, and revising a few RFI soil and groundwater sampling locations based on these additions (see Table 1 and Figure 3). Soil samples for geologic/hydrogeologic characterization also will be collected from these new areas.

- Clarifying that existing monitoring wells will be redeveloped at the beginning of Phase II for future groundwater sampling.

- Adding to Phase II a field evaluation of the construction at wells 2 and 3 to determine whether defensible water quality and water level data can be obtained at these locations or whether abandonment is necessary.

- Adding to Phase II the abandonment of Well 1 because of damage to the well casing (existing well points will be retained for water level measurements only).

- Adding an initial groundwater sampling event at selected wells (including wells O and R in the operating tank farm area) to the beginning of Phase II to aid in identifying permanent Phase II monitoring well locations (see Figures 4 and 5). The ground water will be analyzed using the ENSYS field screening method for PCP.

- Adding to Phase II the installation of monitoring wells and sampling and analyses of groundwater in or adjacent to the Crosby and Overton tank area (see Figure 4 and Table 2).

- Adding to Phase II a beneficial well use survey for active and inactive water supply and domestic wells within 1 mile of the terminal (east of the Willamette River). Information on the existing site monitoring well network also will be verified and tabulated.

- Adding to Phase II the sampling and analysis of dust on structural support members (e.g., beams, sills, rafters) within the PCP warehouse.

- Referencing a third RI phase that will address the tank farm and the loading rack areas. The required scope for the third phase will be developed in a work plan that will be submitted for DEQ review and approval following completion of the Phase II RI.

Figures 3 and 4 (revised from the RFI work plan) identify approximate locations for the soil and groundwater sampling for Phases I and II of the RI. Table 1 (also revised from the RFI work

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plan) describes the Phase II sampling program and rationale. The Phase II monitoring well locations, shown on Figure 4, were developed using historical groundwater sample results and water level data collected monthly at the site since August 1993. The water quality assumptions behind these locations will be confirmed prior to well installation by screening level analyses conducted at the start of the Phase II RI on samples from selected existing monitoring wells (Figure 5). These groundwater screening samples will be analyzed for PCP by the ENSYS field screening method (EPA Method 4010). As noted in Table 2, all subsequent Phase I and II soil and groundwater samples will be analyzed for volatiles, semivolatiles, chlorinated phenols (including PCP and associated chemicals), total petroleum hydrocarbons (TPH), and priority pollutant (PP) metals. Selected samples also will be analyzed for dioxins/furans. Samples collected from the Crosby and Overton tank area also will be analyzed for PCBs. Please note that pesticide analyses are not included in the Phase I or II sampling programs. The DEQ recommendation, in their file summary, for pesticide analyses is believed to be based on an incorrect identification by DEQ of gamma-BHC as a component of a product formulated at the facility (also note that pesticide analyses have been conducted as part of previous investigations at the terminal and pesticides were not detected).

ENDANGERMENT ASSESSMENT/PRELIMINARY REMEDIATION GOALS

An endangerment assessment (EA), consistent with OAR 340-122-080, will be conducted as part of the RI/FS for the Northwest Terminal. The OAR relies on EPA risk assessment guidance. These guidances, which include EPA (1989a,b), EPA (1991a,b,c), and EPA (1992), will be followed when conducting the EA. In addition, the EA will be consistent with the risk assessment provisions set forth in the Oregon Environmental Cleanup Law amendment, HB 3352.

The EA will be conducted in phases. The Phase I EA will address the soil previously excavated from the former PCP mixing area. This phase of the EA is expected to be streamlined to focus on the development of preliminary risk-based cleanup levels for the stockpiled soil. The Phase II EA will address environmental media (e.g., *in situ* soil and groundwater) that are identified as containing contaminants associated with the former PCP mixing area and the former Crosby and Overton tank area during the Phase II RI. The goal of the Phase II EA will be risk-based preliminary remediation goals for those media of concern. If necessary, a Phase III EA will address environmental media that are identified as containing contaminants associated with the tank farm and loading rack areas during the Phase III RI. Also, if necessary, a Phase III EA may address surface water and sediments if the Phase II or III RIs suggest significant adverse impact to these media from

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the Northwest Terminal. As with the Phase II EA, the goal of any Phase III EA will be to develop risk-based preliminary remediation goals for the subject environmental media. The results of each phased EA will be utilized in the associated FS process for that phase. The following sections describe the EA methods to be utilized during each phase.

In each EA, potential impacts of hazardous substance releases to human health and the environment will be evaluated. Although each EA will follow the same basic methodology, the scope of each EA will reflect the nature and complexity of the media requiring remedial action for each phase. Descriptions of the elements included in the human health evaluation and environmental evaluation are provided in the following sections.

HUMAN HEALTH EVALUATION

The human health evaluation will be composed of four distinct, but interrelated elements:

- Data evaluation and identification of chemicals of concern (COCs)
- Exposure assessment
- Toxicity assessment
- Risk characterization.

The risk characterization component will be streamlined to develop risk-based preliminary remediation goals (PRGs) corresponding to values that are protective of potentially exposed human populations. The PRGs will be refined in the environmental evaluation, if necessary, to account for potential impacts to ecological receptors. The approach and preliminary information for the Phase I and II human health risk assessment elements, as well as for the Phase I and II environmental evaluations, are presented in the following sections.

Data Evaluation and Identification of COCs

Previous investigations at the site indicate that the medium of concern for the Phase I EA is the stockpiled soil and the media of concern for the Phase II EA are *in situ* soil and groundwater within the former PCP mixing area and the Crosby and Overton tank area. Constituents detected in these media during the RI Phase I and II investigations, as well as during previous investigations, will be evaluated, and statistics compiled, as the initial step in developing risk-based PRGs. The statistics will include the range of detected concentrations, the frequency of detection, and the average and median concentrations.

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A risk-based screening procedure will be conducted to identify COCs for the site. Maximum concentrations of constituents detected in each medium will be compared to risk-based screening levels, which will be established using conservative EPA standard default exposure assumptions for both human (industrial exposures) and environmental receptors. COCs will be identified as those constituents with maximum concentrations exceeding these screening levels. Constituents with maximum concentrations not exceeding these screening levels will be eliminated from further consideration. The identified COCs will be further evaluated to derive risk-based PRGs.

Exposure Assessment

Exposure scenarios used to develop risk-based PRGs will be selected based on potential receptors identified both onsite and offsite. Existing and potential reasonable future land use and the physical setting of the site, including climate, soil characteristics, and hydrogeology will be considered in selecting exposure scenarios and pathways. Because the site is located in an industrial area, current potential human receptors for both the Phase I and II EAs include onsite workers (potentially exposed via ingestion, inhalation, and dermal contact with contaminants in soil or dust) and offsite workers (potentially exposed via inhalation). Groundwater is not currently being used for onsite purposes; therefore, there are no current onsite receptors. During the Phase II RI, a well survey will be conducted in the surrounding area to identify any potential offsite users of local groundwater. Based on currently available information, the only residential area within a 1-mile radius of the site is located on the opposite side of the Williamette River from the site. This population is not expected to be exposed to onsite soil and groundwater, and, therefore, unless the RI results indicate otherwise, no human receptors other than workers will be evaluated in the development of risk-based PRGs for the Phase I and II EAs.

Figure 6 illustrates the site preliminary conceptual exposure model, based on available site information. The groundwater pathways shown in the figure are hypothetical (it is possible that some facilities in the area may currently, or in the future, use the groundwater as process water in industrial operations; this use could lead to potential worker exposure via dermal contact and inhalation). Future land use plans and constraints of the site and surrounding area will be reviewed to identify reasonable future uses and verify these human exposure scenarios. Fate and transport also will be considered in the EA evaluation of potential exposure pathways.

As part of each EA, exposure models and parameters used to estimate risk-based PRGs will be developed for each identified exposure scenario and pathway combination. Site-specific information, along with EPA guidance, will be considered when determining appropriate exposure

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assumptions for the selected exposure scenarios. Exposure assumptions will include media contact rates, frequency and duration of contact, and contaminant absorption.

To address the statistical uncertainty associated with estimating the average concentrations from sample data, the 95 percent upper confidence limit on the arithmetic mean concentration for each COC will be calculated to represent the exposure point concentration. All "J" qualified data will be included in calculations at reported values. For COCs with nondetects, one half of the reported detection limit will be used in calculations.

Toxicity Assessment

As part of each EA, a toxicity assessment will be conducted by compiling toxicity factors and adverse health effects for each COC. This information, combined with the exposure parameters developed in the exposure assessment, will be used to derive risk-based PRGs. Toxicity factors for carcinogens (cancer slope factors) and for noncarcinogens (reference doses) will be obtained from EPA's online integrated risk information system or health effects assessment summary tables. If toxicity criteria are not available for a constituent from either of these sources, the EPA Health Risk Technical Support Center in Cincinnati, Ohio will be contacted to determine if interim values are available for use, and any available interim values will be evaluated for applicability and validity.

Risk Characterization

The results from the toxicity and exposure assessments will be combined to estimate risk-based PRGs for each COC in each medium of concern and exposure scenario. The acceptable cancer risk level in Oregon's HB 3352 is $1x10^{-6}$ for individual carcinogens and hazard quotient of 1 for noncarcinogens. These risk levels will be used to estimate the PRGs unless, following discussion with DEQ, more appropriate levels for this site are identified. The PRGs for noncarcinogenic compounds will be adjusted, as appropriate, for multiple constituent and multiple exposure pathway effects. Noncancer risks will be considered additive only if the same or similar organs and health outcomes are involved. A qualitative uncertainty analysis will be conducted as part of characterizing risks at the site by addressing uncertainties associated with each step of the endangerment assessment. Exposure point concentrations will be compared to the risk-based PRGs to evaluate the magnitude and extent of potential risks posed by the COCs.

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ENVIRONMENTAL EVALUATION

The environmental evaluation will be conducted consistent with EPA guidance on ecological risk assessment (EPA 1995). This guidance recommends using the following three steps to conduct an environmental evaluation:

- Problem formulation
- Exposure and ecological effects assessment
- Risk characterization.

The problem formulation step involves identifying COCs and constructing a conceptual site model to evaluate whether complete exposure pathways for ecological receptors exist. As noted previously, this will have been done early in the EA process for both human health and ecological receptors.

Ecological exposure pathways at the Northwest Terminal that are identified in the problem formulation step will be further assessed by estimating exposure concentrations; identifying indicator species and any endangered, threatened, or sensitive species likely to be exposed; predicting exposure levels; analyzing toxicity data and developing toxicity criteria; and estimating potential exposure and response relationships.

Estimates of wildlife exposure levels will be integrated with toxicity criteria to estimate ecological risk-based concentrations for each medium of concern. To evaluate the relative conservativeness of the risk-based concentrations, they and the estimated exposure concentrations will be compared with published ecological criteria (e.g., surface water and sediment quality criteria). The PRGs estimated in the human health evaluation will be refined, if necessary and appropriate, using the ecological risk-based concentrations.

FEASIBILITY STUDY

The objective of the FS for the Northwest Terminal will be to develop and evaluate remedial action alternatives for contaminated media so that effective response actions may be selected for implementation. The FS for the Northwest Terminal will proceed with a phased approach to allow expedited evaluation, selection, and implementation of response actions for the stockpiled soil previously excavated from the former PCP mixing area. A Phase I FS, focused on the stockpiled soil only, will allow remedial actions for the stockpiled soil to move forward promptly so that remedial action may be implemented and completed within the 5-year time period established by DEQ (letter

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to Time Oil dated October 24, 1995). A Phase II FS will be conducted following completion of the Phase II RI and EA to address environmental media affected by releases from the former PCP mixing area and the former Crosby and Overton tank area. A Phase III FS may be performed to address environmental media affected by releases from the tank farm area and the loading rack or any additional media identified during the Phase I and II RIs and EAs.

As described in the following sections, the FS process, during each phase, will:

- Develop remedial action objectives
- Delineate affected media
- Develop general response actions
- Evaluate appropriate remedial technologies and process options
- Develop and evaluate specific remedial alternatives
- Recommend a preferred alternative
- Document the FS in a written report.

REMEDIAL ACTION OBJECTIVES

As the first step in each phased FS, remedial action objectives (RAOs), consisting of medium-specific goals for protecting human health and the environment, will be developed from the risk-based preliminary remediation goals (PRGs) resulting from the phased EAs. The RAOs will be as specific as possible, but not so specific that the range of possible remedial alternatives would be unnecessarily limited. The RAOs will be quantitative, specifying the contaminants of concern, potential exposure pathways and receptors, and acceptable contaminant levels or range of levels for each exposure pathway, as appropriate. As noted earlier, it is anticipated that the RAOs for the Northwest Terminal will address the following site risk issues:

- Potential for inhalation, ingestion, or direct contact with soil containing concentrations of hazardous substances above soil remediation goals
- Potential for ingestion or direct contact with groundwater containing concentrations of hazardous substances above groundwater remediation goals
- Potential for cross-media (soil-to-groundwater) transfer of hazardous substances that result in groundwater concentrations above groundwater and/or surface water remediation goals for the site.

As noted previously, available data suggest that groundwater at the site is not a current drinking water resource and is not likely to represent a viable future drinking water source. If these conditions are confirmed during the RI and it can be demonstrated that it is unlikely that migration of contaminated groundwater will adversely affect a current or potential future drinking water source, RAOs for groundwater and cross-media transfer may need to focus only on potential impacts to the local surface water.

As the RAOs are developed, consideration will be given to the manner in which HB 3352 has amended Oregon law and policy on cleanup. With the enactment of HB 3352, Oregon law now focuses on risk of exposure rather than on concentration levels. Therefore, background levels are no longer relevant to protectiveness of a remedial action. Additionally, under HB 3352, contamination may be contained, or people and activities may be excluded from the site, effectively eliminating risk by interrupting exposure pathways. This later revision to the definition of protectiveness incorporates the concept of risk management into the process of remediation. Finally, HB 3352 states that the "preference for treatment" no longer applies to all contamination, only to "hot spots". The changes instituted by HB 3352 are most aptly applied in the development of RAOs so that the subsequent development and analysis of remedial alternatives properly consider the effect these changes have made on the FS process.

AFFECTED MEDIA

After establishing the RAOs, each FS process will continue by defining the volumes or areas of affected media that must be addressed by some remedial response action. Soil volumes will be defined by evaluating the RI data and determining the points where compliance with the RAOs is not achieved. Generally, the definition of a volume of soil will require an interpretation of available data. This interpretation will be based on best professional judgment, which may be based on a statistical analysis of the data, as appropriate. In refining soil volumes, consideration will be given to the location of the soil in relation to other physical features, such as tanks, buildings, and foundations, which may restrict application of some technologies. Consideration also will be given to the location of soil with respect to the groundwater table and whether some soil volumes might be more effectively remediated through *in situ* rather than *ex situ* technologies.

Groundwater zones for which remedial response is required in order to achieve compliance with RAOs will be defined in a similar manner.

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General Response Actions, Technologies, and Process Options

After establishing the RAOs and identifying the volume and location of affected media, general response actions will be developed to address impacted media to achieve compliance with the RAOs. As part of this process, technologies will be identified for each general response action, and process options will be developed for each technology, in accordance with CERCLA guidance.

Based on available data, the general response actions for the various site media are likely to include: no action, institutional controls, containment, and onsite treatment/management. However, the final selection of general response actions will depend on the RAOs, the volumes and locations of affected media, the types of contaminants to be remediated, and action-specific ARARs.

Potentially applicable technology types (e.g., capping, stabilization, thermal destruction, biological destruction, etc.) and process options (e.g., asphaltic capping, fly ash/lime stabilization, pyrolysis, slurry-phase bioremediation, etc.) will be identified by drawing on a variety of technical resources and experiences at similar sites. For example, the presumptive remedies identified by EPA for contaminants and remedial options at wood preserving sites (EPA 1992) will be evaluated in selecting potential remedial technologies for contaminated soil within the former PCP mixing area, from the associated stockpiled soil, and from the former Crosby and Overton tank area.

During each phase of the FS, candidate technologies and process options will be screened to reduce the number of options to be considered during development of remedial alternatives. The screening will focus on the technical and institutional implementability, effectiveness, long-term reliability, and cost of candidate technologies and process options. Implementability and effectiveness will be the primary screening criteria. Cost will be used as a basis for screening out the more expensive option(s) when less expensive, but adequately protective options can be identified. Examples of process options for PCP-contaminated site soils that will likely be eliminated during the screening process include vitrification (due to technical uncertainties and cost), offsite disposal (due to land ban restrictions), and incineration (due to air emission, permitting issues, and cost). Upon completion of the screening and evaluation process, at least one process option will be selected to represent a potentially viable technology in the development of remedial alternatives.

Remedial Alternatives

Development

General response actions, including the process options chosen to represent the various technology types that could be applied to treat or contain contaminated media of concern, will be

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combined to form proposed remedial alternatives for the volumes of media addressed. The development and screening of alternatives will be completed in accordance with OAR 340-122-080 and 340-122-090 and applicable guidance documents.

Each alternative will be sufficiently defined to permit evaluation against certain screening criteria in an effort to reduce the number of alternatives that will undergo a more detailed comparative analysis. The description of each alternative will include the following information:

- Description of the remedial action and associated process option(s)
- Estimated time frame for implementation of the alternative and attainment of remedial action objectives
- Comparison of anticipated performance to RAOs established for the media of concern
- Technical and administrative implementability issues
- An estimate of the probable capital and long-term operation and maintenance costs (+50 percent to -30 percent).

Screening

Once technologies and process options have been assembled into remedial alternatives, the alternatives will be screened to reduce the number of alternatives carried forward to detailed analysis. Prior to screening, the scope and details of implementation for one or more of the remedial alternatives may be expanded to develop a basis for evaluating and comparing the alternatives against the screening criteria. In this regard, the volume of affected media addressed by each alternative may require refinement; the size and configuration of onsite equipment will be conceptualized; process flow rates will be evaluated and revised, if necessary; and time frames in which treatment, containment, or removal goals would possibly be achieved will be estimated.

After further defining the scope of the remedial alternatives, each alternative will be evaluated against the short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost, with the purpose of the screening to reduce the number of alternatives that will undergo a more thorough and extensive analysis. The evaluation of effectiveness focuses on the degree of protection that the alternative affords to human health and the environment. The degree that an alternative reduces the toxicity, mobility, or volume of contaminants at the site also will be considered in this analysis. The evaluation of implementability estimates the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative. Technical feasibility refers to the ability to construct, reliably operate, and meet technology-specific

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regulations for process options, among other factors. The anticipated time to complete the remedial action using the technology proposed also is considered. Administrative feasibility refers to the ability to obtain the approvals for treatment, storage, and disposal services, when necessary, and the requirements for, and availability of, specific equipment and technical specialists. The cost evaluations will rely on estimates that range from +50 percent to -30 percent.

Treatability Investigations

Treatability studies may be required to obtain sufficient data to allow treatment alternatives to be fully developed and evaluated during the detailed analysis of alternatives and, ultimately, to support the remedial design of the selected alternative, or to reduce cost and performance uncertainties for treatment alternatives to acceptable levels so that a remedy can be selected.

The need for treatability testing will be assessed as early in each RI/FS phase as possible. If it is determined that treatability testing is required to complete the FS evaluation, DEQ will be notified, and a treatability study work plan will be prepared and implemented.

Detailed Analysis

The overall objective of the detailed analysis is to compare the advantages and disadvantages of the alternatives retained after screening. As a first step in the process, the description of each alternative will be further refined and the details and assumptions underlying the implementation of the alternative will be presented. In completing this work, the results of treatability testing will be incorporated to size treatment equipment, modify equipment configurations, and revise estimates for treatment time and treatment costs.

The evaluation criteria to be used in the detailed analysis will be the following, as presented in HB 3352:

- The effectiveness of the alternative in achieving protection
- The technical and practical implementability of the alternative
- The long-term reliability of the alternative
- Any short-term risk associated with implementing the alternative posed to the community, to the remedial contractor, or to the environment
- The cost reasonableness of the alternative.

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Based on the results of the comparative analysis, a preferred alternative will be recommended for implementation at the site. The preferred alternative will be one that provides a favorable balance in satisfying the evaluation criteria, while meeting the RAOs.

REPORTING

The results of each RI, EA, and FS phase will be submitted to DEQ in separate draft reports for review and comment. Upon receipt of DEQ's comments, Time Oil will revise and finalize each report.

SCHEDULE

Phase I and II RI/FS work activity will begin upon DEQ's approval of the final RI/FS work plan. This presumes that an agreement covering the RI/FS is in place between Time Oil and DEQ prior to approval of the final RI/FS work plan. Figure 7 illustrates a proposed schedule for the RI/FS.

Inherent within this schedule is the expectation that reviews of the progress of the work with DEQ personnel will occur periodically throughout the RI/FS process. The proposed schedule is based upon assumptions consistent with current knowledge and experience; the schedule may change if actual site conditions or program implementation deviates from those assumptions.

The Phase II RI/FS is expected to commence concurrently with the Phase I RI/FS, but is expected to require more time to complete. The third phase of the RI/FS will be scheduled when the Phase I and II RI characterizations are completed and the scope of the analyses to be included in those phases has been clarified.

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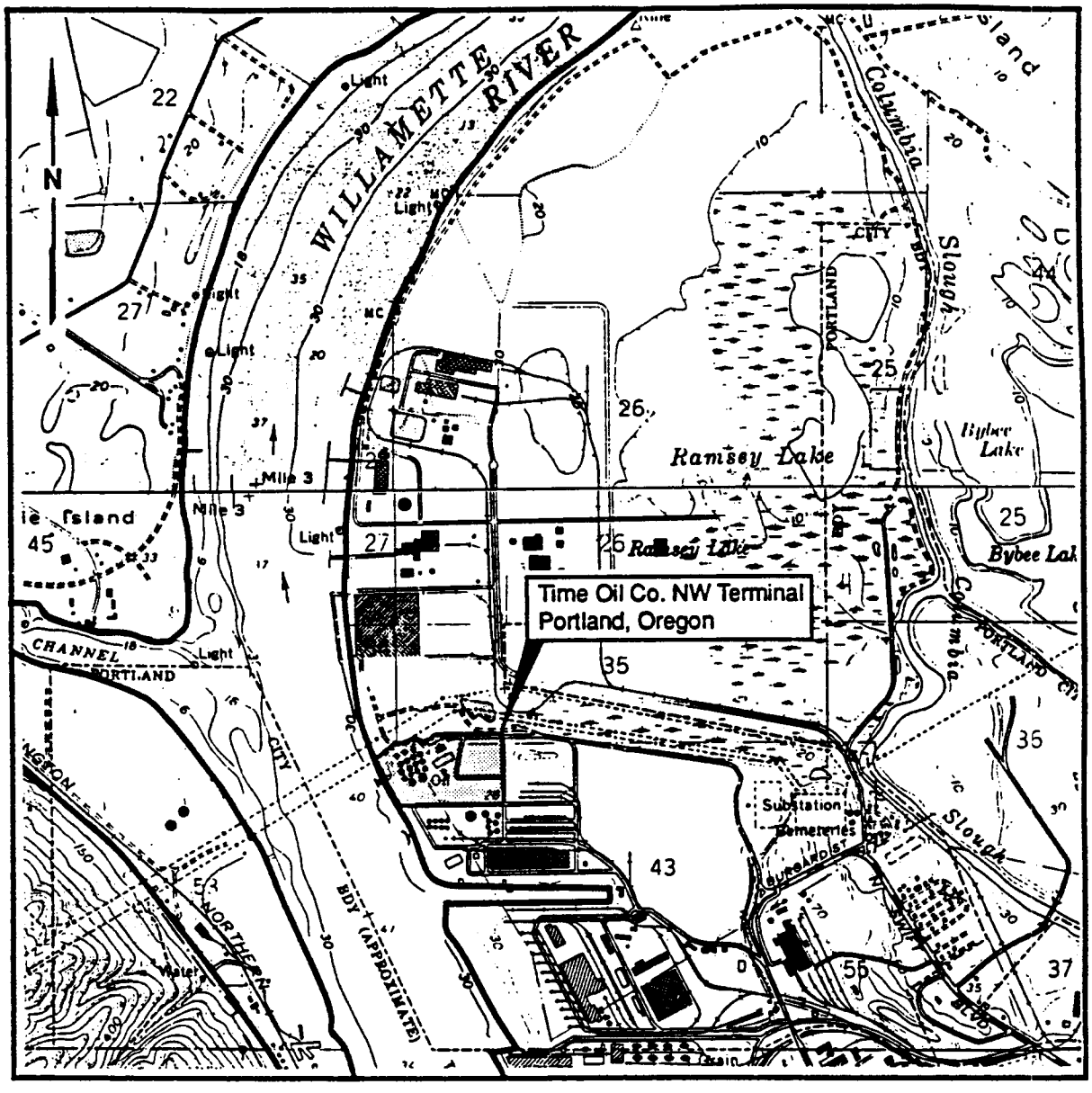

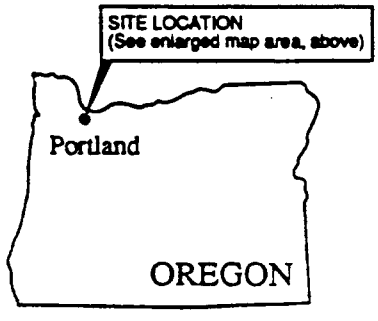

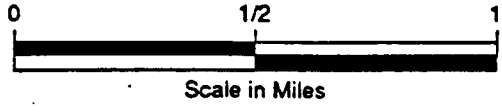

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	Vicinity Map	Figure 1

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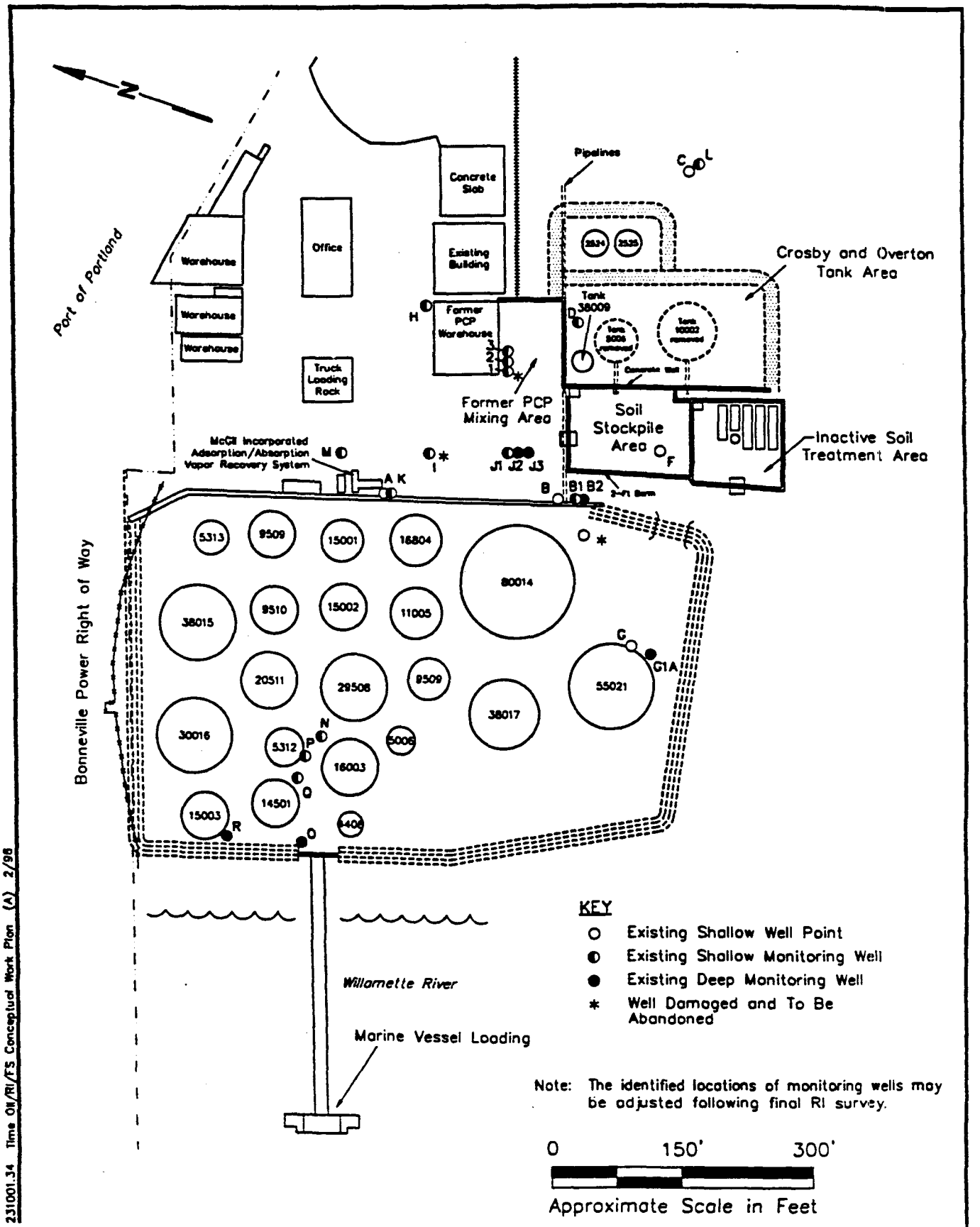

231001.34 Time Oil/RI/FS Conceptual Work Plan (A) 2/98

Site Map

Figure 2

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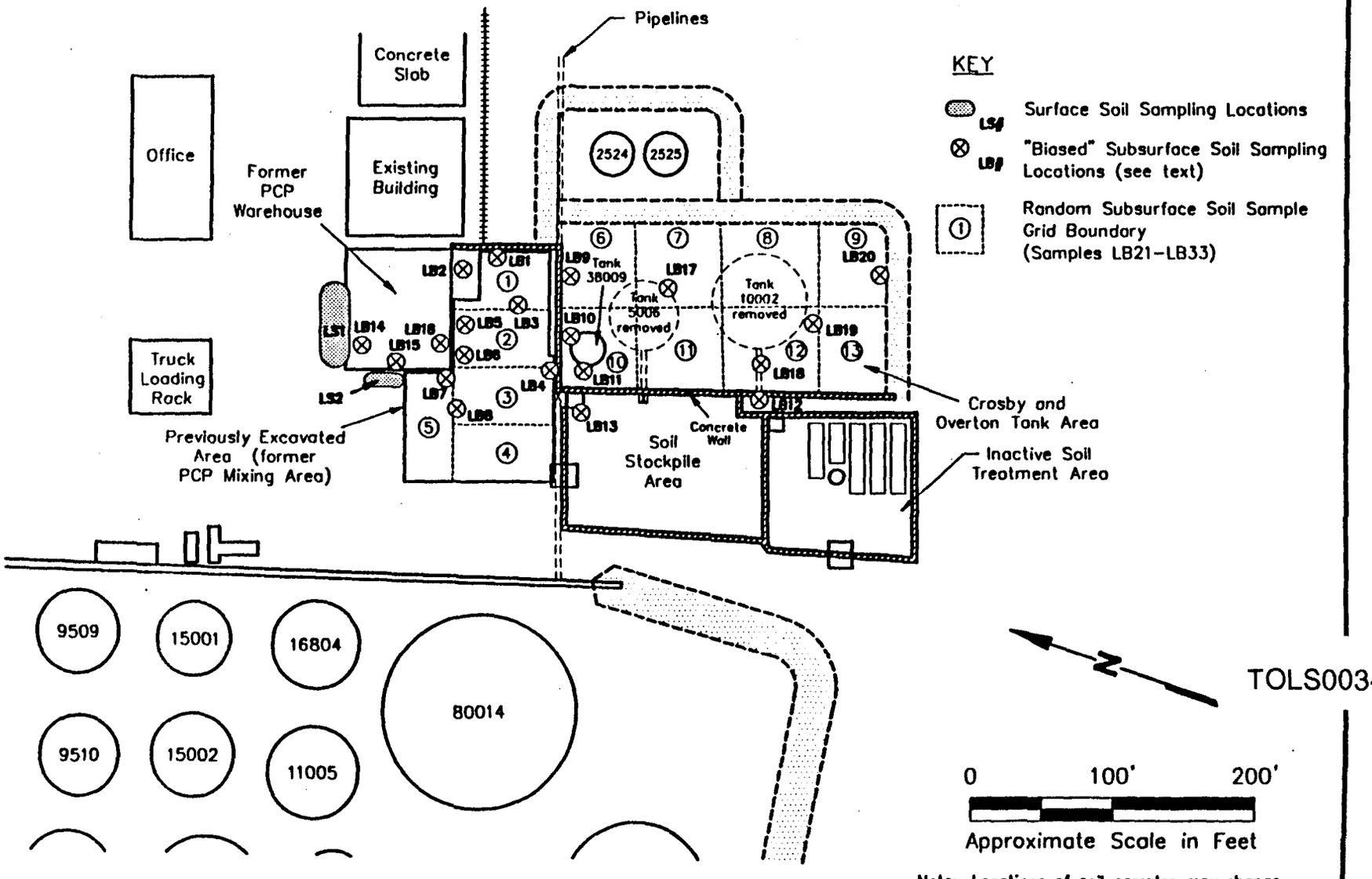

Note: Locations of soil samples may change based on field conditions.

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Recommended Locations for Phase II Subsurface and Surface Soil Samples

Figure 3

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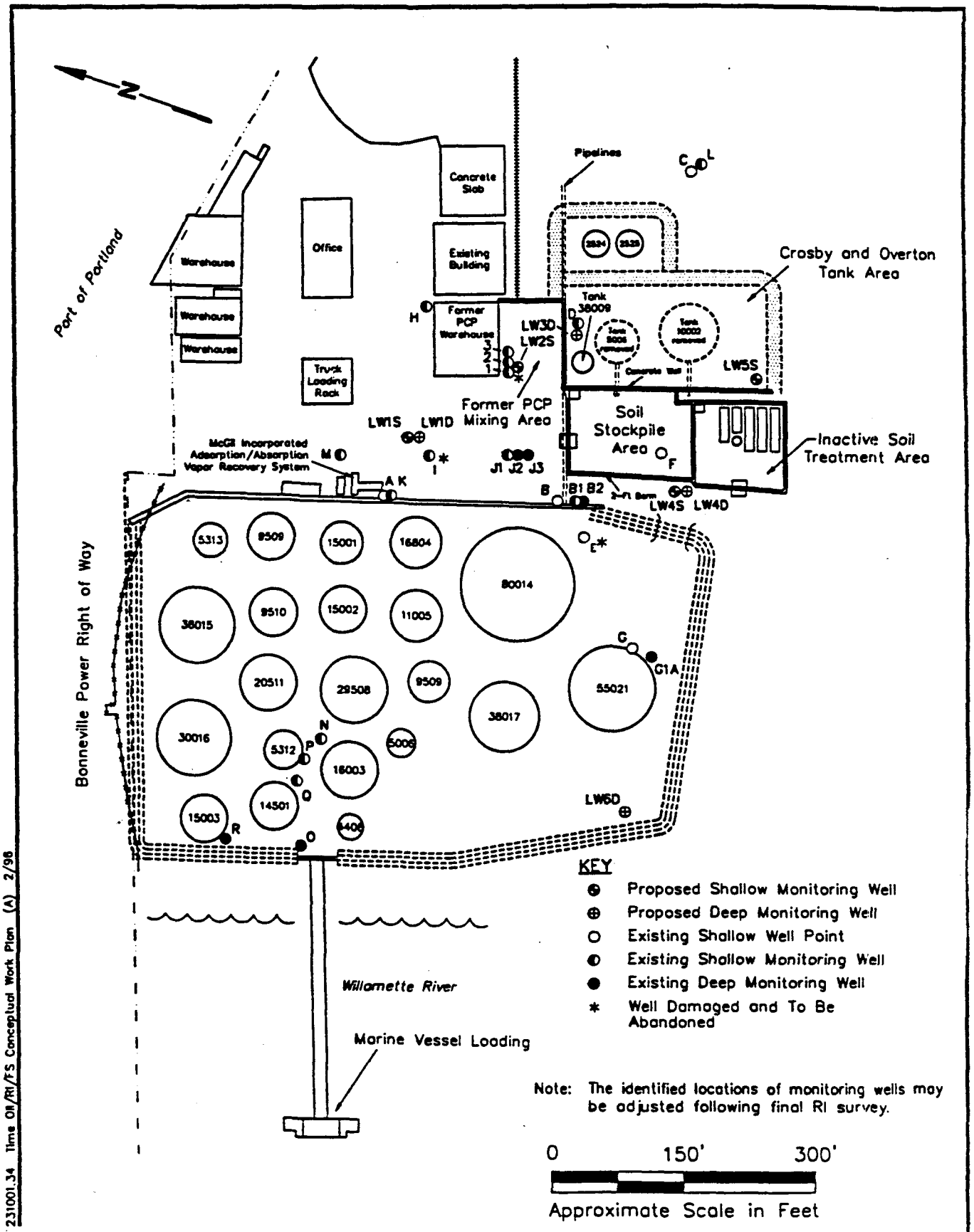

231001.34 Time OR/RI/FS Conceptual Work Plan (A) 2/96

Existing Wells and Proposed Phase II Monitoring Well Locations | Figure 4

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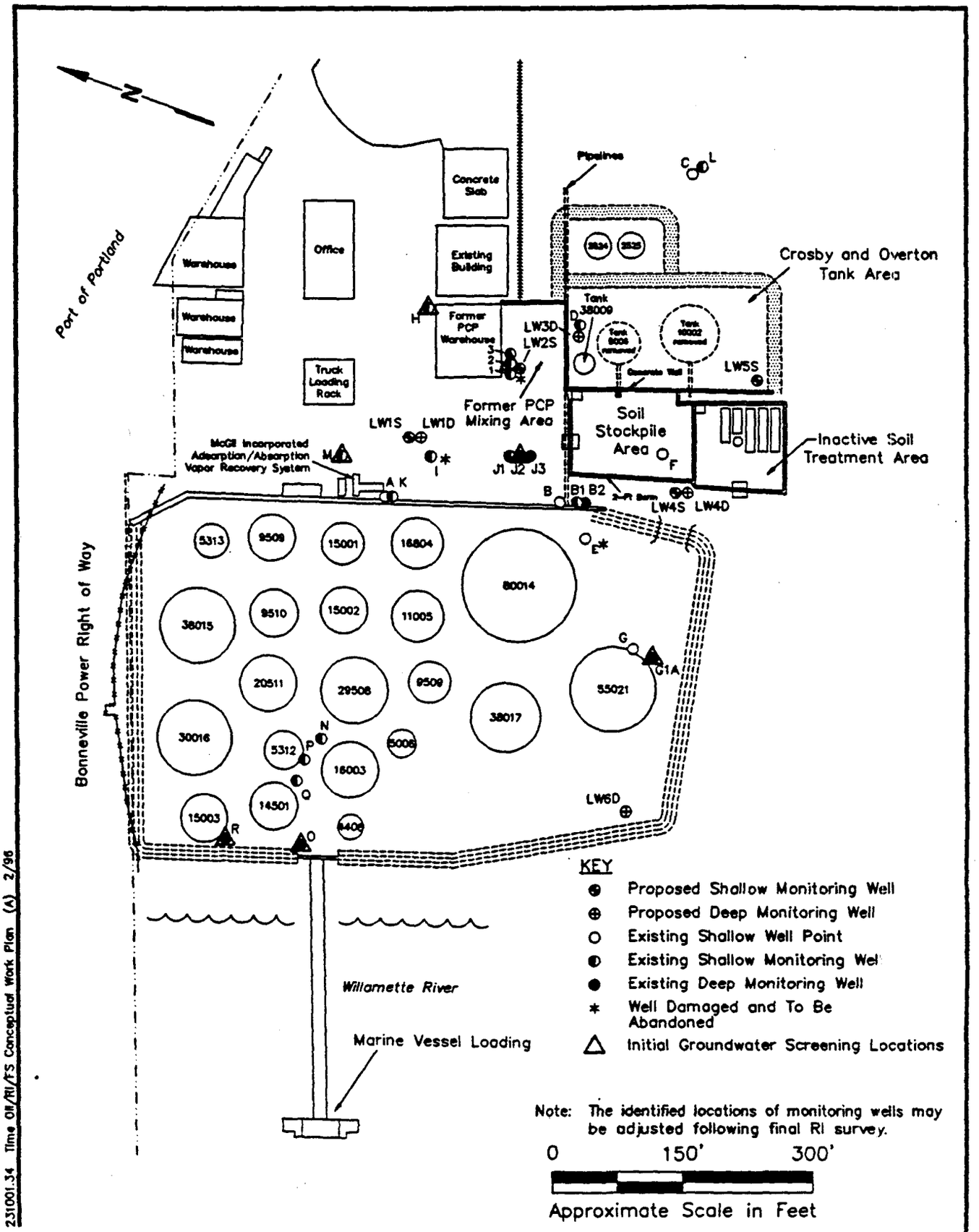

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Proposed Initial Groundwater Screening Locations | Figure 5

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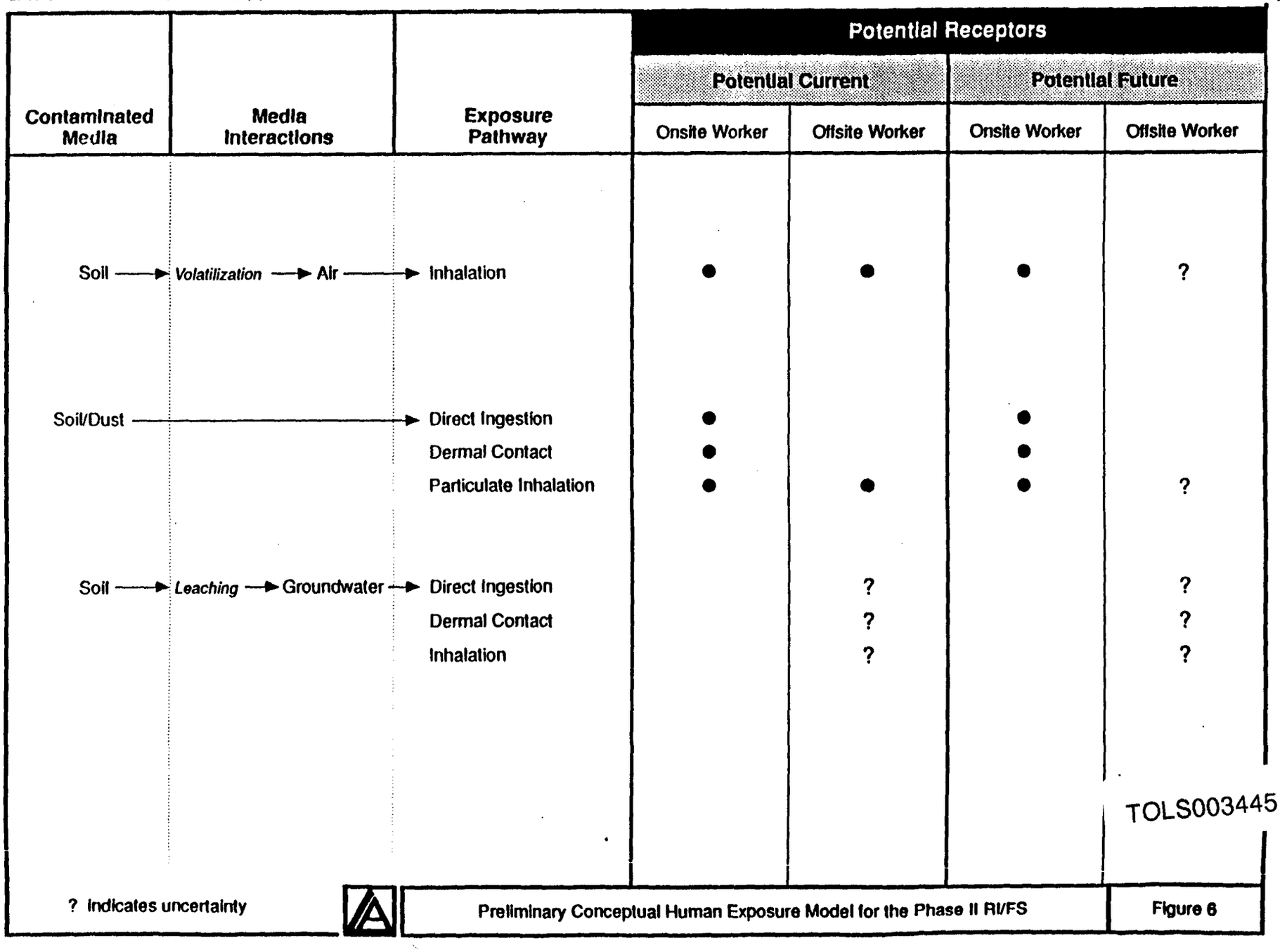

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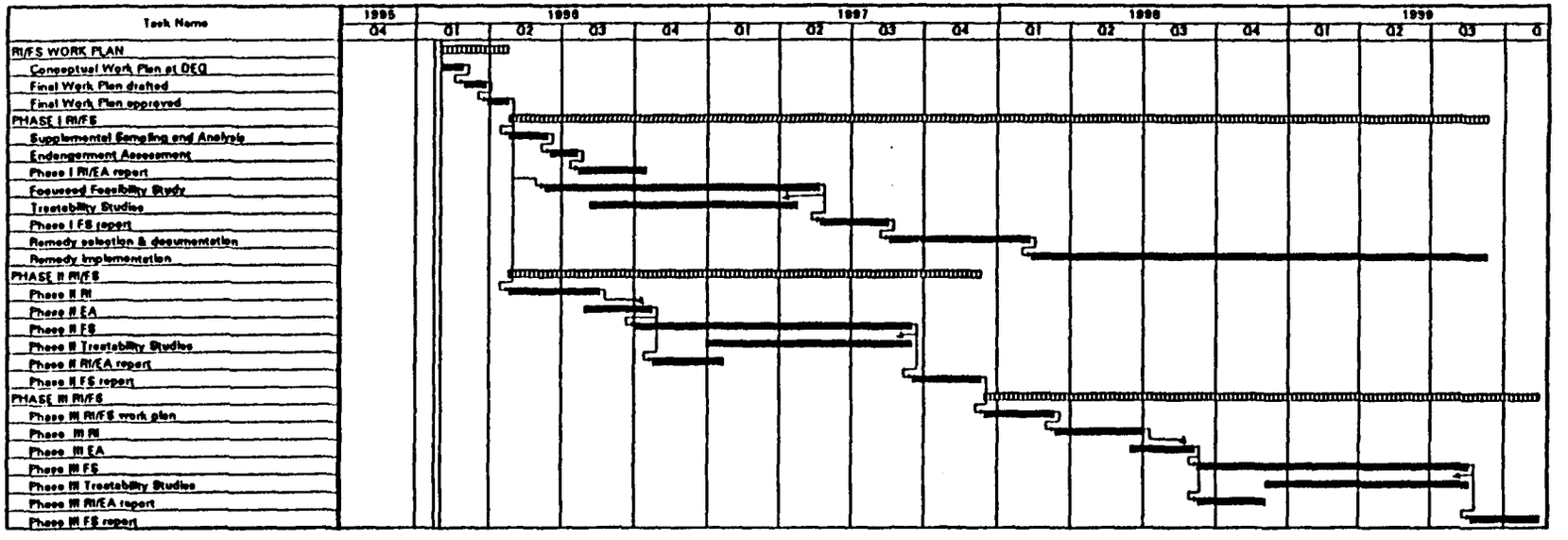

KEY

Task Schedule

Subtask Schedule

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Conceptual Schedule for RI/FS

Figure 7

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TABLE 1

SOIL SAMPLE AND MONITORING WELL LOCATIONS AND ANALYSES
TIME OIL CO. PHASE II REMEDIAL INVESTIGATION
PORTLAND, OREGON

		Location[a]/Rationale	No. of Soil Samples[b]	Soil Analyses	Groundwater Analyses
Wells					
LW1S	Shallow	Between source and pumping Well M	3 chem[c] + 1 F&T[d]	PCP and carrier chems[e]	PCP and carrier chems[f]
LW1D	Deep	Between source and pumping Well M; forms a cluster with new Well LW1S	2 chem[c][g] + 1 K_v, F&T[d]	PCP and carrier chems[e]	PCP and carrier chems[f]
LW2S	Shallow	Within the former PCP mixing area (at subsurface soil location LB5)	3 chem[h] + 1 F&T[d]	PCP and carrier chems[e]	PCP and carrier chems[f]
LW3D	Deep	Forms cluster with Well D for vertical gradient and lower zone quality data	5 chem[c] + 1 K_v, F&T[d]	PCP and carrier chems[e]	PCP and carrier chems[f]
LW4S	Shallow	Cross gradient from J wells; seasonally downgradient from former PCP mixing area	3 chem[c] + 1 F&T[d]	PCP and carrier chems[e]	PCP and carrier chems[f]
LW4D	Deep	Cross gradient from J wells; forms a cluster with new well LW4S	2 chem[c][g] + 1 K_v, F&T[d]	PCP and carrier chems[e]	PCP and carrier chems[f]
LW5S	Shallow	Within/downgradient of Crosby & Overton tank area	3 chem[c] + 1 F&T[d]	PCP, PCBs, and carrier chems[e]	PCP, PCBs, and carrier chems[f]
LW6D	Deep	Between former PCP mixing area and Crosby & Overton tank area and the river	5 chem[c] + 1 F&T[d]	PCP and carrier chems[e]	PCP and carrier chems[f]
Subsurface Soil					
"Biased" Locations					
LB1-LB8		Inside former PCP mixing area to evaluate carrier chemicals and remaining extent of PCP	3 chem[c][i] (2-3 borings will also include K_v analyses)	PCP and carrier chems[e]	NA
LB9-LB12		South of PCP excavation, including pipelines and near old storage tanks-for lateral definition	3 chem[c]	PCP and carrier chems[e]	NA
LB13		Adjacent to sump at northwest corner of soil stockpile area	3 chem[c]	PCP and carrier chems[e]	NA
LB14-LB16		Underneath former PCP warehouse; near previously reported detections	3 chem[j]	PCP and carrier chems[e]	NA
LB17-LB20		Within Crosby & Overton tank area where previous analytical results yielded PCB values of greater than 10 ppm	3 chem[c]	PCP, PCBs, and carrier chems[e]	NA

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TABLE 1

SOIL SAMPLE AND MONITORING WELL LOCATIONS AND ANALYSES
TIME OIL CO. PHASE II REMEDIAL INVESTIGATION
PORTLAND, OREGON

	Location[a]/Rationale	No. of Soil Samples[b]	Soil Analyses	Groundwater Analyses
Random Locations				
LB21-LB25	Inside and adjacent to PCP excavation area to provide representative data regarding PCP and associated carrier chemicals	3 chem[c][j]	PCP and carrier chems[e]	NA
LB26-LB33	Inside Crosby & Overton tank area	3 chem[c]	PCP, PCBs, and carrier chems[e]	NA
Surface Soil				
LS1	Near former PCP loading dock	1	PCP and carrier chems[e]	NA
LS2	Along southwest side of former PCP warehouse	1	PCP and carrier chems[e]	NA

(a) Monitoring locations may change based on conditions encountered in the field and initial groundwater sampling screening results from drive points and existing monitoring wells.

(b) In addition, quality control samples will be run at the frequency of 1 field duplicate and 1 MS/MSD for every 20 samples, by media.

(c) "3 chem" = sampling intervals identified in text: 0-0.5 ft BGS; at water table; and at bottom of upper water-bearing unit; all analyzed for chemistry.
"5 chem" = the above 3 chem plus additional intervals to be sampled in deeper borings: in confining zone and in lower water-bearing zone.

(d) F&T refers to the fate and transport parameters grain size and total organic carbon to be analyzed in the water-bearing zone. K_v refers to vertical conductivity tests to be run on the confining layer sample.

(e) Soil analyses will include: semivolatile organics, EPA Method 8270, with lab also required to report first 10 tentatively identified compounds (TICs) (these may help identify carrier chemicals): chlorinated phenols, modified EPA Method 8040, provides PCP and tetrachlorophenol (both needed for risk assessment) at the lower detection levels needed for potential cleanup standards; TPH-HCID and/or TPH-D, will provide information to help ID carriers; volatile organics, EPA Method 8260, with lab also required to report first 10 TICs (see semivolatile organics); polychlorinated biphenyls (PCBs) (EPA Method 8080) also will be conducted on samples collected within and downgradient of the Crosby & Overton tank area; and priority pollutant (PP) metals (by ICP). Dioxin/furan analyses will be conducted (EPA Method 8280 or 8290) for a limited number of samples (~4).

(f) Groundwater analyses will utilize the same analyses identified in (e) above and will be conducted on samples collected from all wells. Groundwater from selected wells also will be analyzed for major ions. See Table 2 for the sampling program for all (new and existing) wells.

(g) The two chemistry samples at this location will be collected from the confining layer and the lower water-bearing zone only (to avoid duplication with the three chemistry samples collected from the adjacent shallow boring.

(h) Surface soil at this location is clean backfill; therefore, the 0-0.5 ft BGS sample will not be collected.

(i) Surface soil at this location is clean backfill; therefore, a sample from near the base of the 1989 excavation will be substituted for the 0-0.5 ft BGS sample. If the base of the excavation coincides with the water table, the 0-0.5 ft BGS sample will not be collected and the planned water table sample also will serve as the base-of-excavation sample.

(j) The upper two chemistry samples at this location will be collected at the surface and at the base of the foundation sand fill layer underlying the warehouse floor. The deeper soil sample will be collected within the top foot of the native soil material.

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TABLE 2

GROUNDWATER ANALYSIS PROGRAM
TIME OIL CO. PHASE II REMEDIAL INVESTIGATION
PORTLAND, OREGON

Monitoring Location	Shallow Well	Shallow Well Point	Deep Well	Chemical Analysis: Semivolatiles	Volatiles	Chlorinated Phenols	TPH-D	Dioxin/ Furan[a]	Priority Pollutant Metals	Major Ions
1[b]	✓	–	–	–	–	–	–	–	–	–
2	✓	–	–	–	–	–	–	–	–	–
3	✓	–	–	–	–	–	–	–	–	–
A	–	✓	–	–	–	–	–	–	–	–
B	–	✓	–	–	–	–	–	–	–	–
B1	✓	–	–	✓	✓	✓	✓	–	✓	✓
B2	–	–	✓	✓	✓	✓	✓	–	✓	✓
C	–	✓	–	–	–	–	–	–	–	–
D	✓	–	–	✓	✓	✓	✓	–	✓	✓
E[b]	–	✓	–	–	–	–	–	–	–	–
G	–	✓	–	–	–	–	–	–	–	–
G1A	✓	–	–	✓	✓	✓	✓	–	✓	✓
H	✓	–	–	✓	✓	✓	✓	–	✓	–
I[b]	✓	–	–	–	–	–	–	–	–	–
J1	✓	–	–	✓	✓	✓	✓	✓	✓	✓
J2	–	–	✓	✓	✓	✓	✓	–	✓	✓
J3	–	–	✓	✓	✓	✓	✓	–	✓	✓
K	✓	–	–	✓	✓	✓	✓	–	✓	–
L	✓	–	–	✓	✓	✓	✓	–	✓	–
M	✓	–	–	✓	✓	✓	✓	–	✓	–
LW1S[c]	✓	–	–	✓	✓	✓	✓	–	✓	–
LW1D	–	–	✓	✓	✓	✓	✓	–	✓	–
LW2S	✓	–	–	✓	✓	✓	✓	–	✓	–
LW3D	–	–	✓	✓	✓	✓	✓	–	✓	✓
LW4S	✓	–	–	✓	✓	✓	✓	–	✓	–
LW4D	–	–	✓	✓	✓	✓	✓	–	✓	–
LW5S	✓	–	–	✓	✓	✓	✓	–	✓	✓
LW6D	–	–	✓	✓	✓	✓	✓	–	✓	✓

(a) The well locations for any additional dioxin/furan analyses will be determined following the first groundwater sampling event.
(b) Scheduled to be abandoned.
(c) May not be installed, based on results from groundwater field screening analysis.

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Time ZP

Site Characteristics Report

Former PCP Mixing Area
Northwest Terminal
Portland, Oregon

August 30, 1993

Prepared for

Time Oil Company
2737 West Commodore Way
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Prepared by

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APPENDIX A: Preliminary Assessment/Data Evaluation and Proposed Remediation Plan for Pentachlorophenol Contaminated Soil at Time Oil Co.

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SITE CHARACTERISTICS REPORT

INTRODUCTION

This site characteristics report summarizes past and known current environmental conditions at the former pentachlorophenol (PCP) mixing area (the site) at Time Oil's Northwest Terminal. The intent of this report is to provide Time Oil Company (Time) and the Oregon Department of Environmental Quality (DEQ) with a clear basis for the planned RCRA Facility Investigation (RFI and related activities). This report is based in part on, and supplements, the discussion of previous investigations in ECOVA's 1991 *Preliminary Assessment/Data Evaluation and Proposed Remediation Plan for Pentachlorophenol Contaminated Soil at Time Oil Co. (Preliminary Assessment Report)* (applicable portions reproduced as Appendix A). Time's files also were reviewed in the development of this report.

SITE DESCRIPTION

The site is a former pentachlorophenol (PCP) mixing area located within a small portion of Time's Northwest Terminal, in the industrialized Rivergate area of north Portland, Oregon (Figure 1). The site currently consists of a former PCP storage warehouse, the adjacent former PCP mixing area from which soil has been excavated (currently backfilled), a stockpile of the excavated PCP-containing soil located south-southwest of the excavation area, and an inactive soil treatment area (Figure 2).

SITE HISTORY

Former site operations consisted of PCP blending services that were operated by Time under a lease agreement with Koppers Company, from 1967 through 1982. Operations included import of solid PCP, the various carrier liquids into which the PCP would be mixed, and various additives; interim storage of the chemicals in the former pentachlorophenol warehouse and in product tanks within the site; transfer and mixture of the chemicals to formulations specified by Koppers Company; interim storage of the PCP products; and transfer of the products to drums for offsite transport. No PCP blending activities have occurred at the site since 1982. Figure 3, reproduced from the ECOVA *Preliminary Assessment Report*, shows the relative arrangement of site equipment at the time of the PCP mixing operations.

Releases of PCP, carriers, additives, and PCP formulations to soil in the mixing area appear to have occurred through intermittent spillage from hoses, mixing vessels, and daily operations. Environmental investigations and remedial actions conducted by and for Time since 1984 resulted in the previously noted excavation of PCP-containing soil. The excavation area was filled and regraded; approximately 3,000 yd^3 of excavated soil remains stockpiled onsite and approximately 500,000 gallons of PCP-containing water is stored in a nearby tank. In addition, a limited but unquantified volume of PCP-containing soil remains unexcavated at the site.

SUMMARY OF PREVIOUS INVESTIGATIONS

Beginning in 1984, a series of investigations at the site have been conducted to evaluate the potential for contamination associated with former site operations. This section summarizes the previous investigations of soil and groundwater at the site. Previous investigations are discussed in more detail in the *Preliminary Assessment Report* as presented in Appendix A.

Soil

In 1984, DEQ collected one soil sample from the former pentachlorophenol mixing area, as part of a larger sampling program. The elevated concentration of PCP in the sample prompted Time to initiate excavation and offsite disposal (to the RCRA-permitted landfill at Arlington, Oregon) of PCP-contaminated soil from the PCP mixing area to a depth of approximately 1.5 ft (approximately 288 yd^3) in mid-1985. Shortly thereafter, the U.S. Environmental Protection Agency (EPA) banned land disposal of the soil (which EPA classified as F027 waste).

Subsequent soil testing in 1985-86 identified additional areas within the PCP mixing area that contained elevated PCP concentrations, generally ranging from about 1 to 8000 mg/kg. The highest reported PCP concentration (116,000 mg/kg) was in a soil sample collected from a well boring (MW-3) drilled underneath the southwest corner of the former PCP warehouse, at a true vertical depth of 3 ft (the well was drilled at a 45 degree angle).

These results led to an evaluation of remedial technologies and in 1989, to reduce the potential for groundwater contamination, additional excavation within the former PCP mixing area was accomplished, with the intent of biologically treating the soil. Approximately 3,000 yd^3 of PCP-contaminated soil were excavated in 1989 to depths ranging from less than 4 ft to a maximum of 12 ft below original grade (the approximate water table surface) within the former PCP mixing area (Figure 4). Despite promising bench scale results, the field studies of the

treatment system were unsuccessful. The excavated soil was stockpiled onsite in a bermed and lined storage area and the excavated area was backfilled to the present ground surface elevation. Time's file data from sidewall sampling at the time of excavation in 1989 indicate that soil containing PCP at or above 1,000 ppm potentially remains in isolated areas of the site (PCP at 1,007 ppm was reported from the southern sidewall at a depth of 7 ft) and beneath the former pentachlorophenol warehouse, which was initially left unexcavated to maintain the warehouse's structural integrity (one 1989 sample from below the slab contained 1,882 ppm PCP). Data for soil samples collected within the excavated area in 1989 and in the Well 4 boring prior to the excavation also indicate that elevated PCP concentrations likely still exist in soil below the vertical limit of excavation.

Additional soil samples were collected in 1989 for PCP analyses within a bermed tank area southeast of the excavation, within the area where excavated soil was to be stockpiled, and within the bioremediation process area. All sample results were reported to be nondetected except for samples collected near Tank 38K and near the pipelines for the old Tanks (5006 and 10002). These samples were reported to contain PCP concentrations ranging from about 5 to 2424 ppm (near Tank 38K).

Groundwater

Between 1985 and mid-1990, Time and/or its consultants installed 16 monitoring wells and seven well points at or near the site. Because well points were driven, no geologic data exists at those locations. Of the 16 monitoring wells installed, boring logs have been located for seven. Based on these logs, and the available water level information, a general understanding of site hydrogeology can be developed. Table 1 identifies construction details for the monitoring wells and well points, and Figure 5 identifies the approximate location of each. For convenience, well points and monitoring wells are both referred to as wells in the remainder of this report's text.

Available site data [Ecova 1991 (Appendix A) and Time's files] suggest that groundwater exists in alluvial sands of two shallow water-bearing zones underlying the site. The upper water-bearing zone, occurring at a depth interval between about 13 to 18 ft below ground surface, appears to be a discontinuous perched aquifer. A sandy silt aquitard ranging from about 2-5 ft thick reportedly separates the perched zone from a lower water-bearing zone, and is reported to terminate south of the site (toward the Willamette River). The lower water-bearing zone has been reported as both confined and unconfined (possibly due to seasonal or tidal

response in the aquifer); available data indicate that the average water level of the lower water-bearing zone is about 20 ft below the ground surface. Groundwater flow within the upper water-bearing zone has been reported to be to the southwest, toward the river. There is not sufficient information to determine the groundwater flow direction for the lower water-bearing zone at this time.

Test results from the onsite wells indicate the presence of elevated PCP concentrations in the upper water-bearing zone downgradient of the former PCP mixing area. The highest reported PCP concentration (60 mg/L) was detected in Well J1 during the most recent sampling event (March 1991). PCP also has been detected in groundwater from Wells B and M in the upper water-bearing zone, at 2.3 and 4 mg/L, respectively, and at Wells B2, G1A, and J2 in the lower water-bearing zone at the detection limit of 1 mg/L. Benzene, ethylbenzene, toluene, and xylenes (BETX), believed to be associated with the PCP carrier liquids, also were detected in wells B1 and J1 during 1991, at concentrations ranging from 0.005 to 1.8 mg/L.

POTENTIAL CONSTITUENTS OF CONCERN

Chemicals associated with PCP mixing operations at the site which, at elevated concentrations, could pose a threat to human health or the environment are the potential constituents of concern for the site. Based on current information, the potential constituents of concern include the following:

- Pentachlorophenol (PCP), and its breakdown products 2,3,4,6-tetrachlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4-dichlorophenol, and 2-chlorophenol
- Tetrachlorodibenzo-dioxins and -furans, which are common trace contaminants in technical grade PCP
- Benzene, ethylbenzene, toluene, and xylenes (BETX) which may have been present in low proportions in several of the petroleum products used as carriers for the PCP
- Polynuclear aromatic hydrocarbons (PAHs; in particular, those designated by EPA as carcinogenic) which may have been present in low proportions in several of the petroleum products used as carriers for the PCP.

Because several carrier chemicals or additives used at the site were proprietary, the RFI will include priority pollutant analyses that will assist in evaluating whether carrier and additive chemicals used in the former blending operations also are present in soil and/or groundwater at concentrations of concern.

POTENTIAL MIGRATION PATHWAYS

Chemicals released during past operations at the site would be expected to leach into the subsurface soil and the water of the upper water-bearing zone in the dissolved phase and, perhaps, as a pure phase. Based on a review of the MSDS sheets available for components of the Koppers formulations and for the formulations themselves, the most likely forms of historical contamination in the subsurface at the site are the following:

- Pure (solid) PCP in near surface soil near the point of release (or deeper if surface disturbance or filling has occurred). Previous soil excavations at the site are expected to have addressed most soil affected by pure PCP.
- Dissolved phase PCP and carrier components. PCP exhibits a relatively high tendency to sorb to organic carbon in soil, thereby retarding its movement in the environment relative to both water and some of the constituents in the carriers and additives used in the various formulations. The extent to which this retardation actually occurs at the site is dependent upon, among other things, the amount of organic carbon in the subsurface soil.
- Pure phase carriers or PCP-containing formulations. If a pure phase exists at the site, it would be expected to exist near the point of release in the unsaturated zone as residual, or possibly at the top of the capillary zone of the upper water-bearing zone (because most of the carriers and formulations appear to have had densities less than that of water). Any pure phase that exists at the top of the capillary zone of the upper water-bearing unit would in fact be expected to be distributed over an interval that corresponds to the seasonal or tidal fluctuation of the groundwater.

There is also a potential at the site for a dense pure phase which could migrate downward under gravity through the saturated soil of the upper water-bearing zone, and accumulate on lenses or units of low permeability. This potential exists because one Koppers product produced at the site reportedly had a specific gravity greater than 1 (the volume of the denser PCP product produced at the site relative to that of the numerous other lighter PCP products is not known, but is believed to be significantly less). PCP itself is also denser than water, but at its solubility limit, would not form a solution denser than water (and it is unlikely that dissolved PCP could form a solution denser than water even if carriers were also dissolved in the water, thereby inducing a cosolvency effect).

CURRENT DATA GAPS

Previous investigations at the site provide important but limited information regarding the nature of the subsurface hydrogeology, and the occurrence of contamination at the site. Therefore, certain issues important in the evaluation of any further remedial action remain unresolved. These include the following:

- The nature and lateral extent of the confining layer between the upper and lower-water-bearing zones
- The predominant flow directions in each of the water-bearing zones, and whether tidal fluctuations in the Willamette River or seasonal factors significantly influence groundwater flow at the site
- Whether nonaqueous phase contamination exists at the site
- Whether PCP is the primary constituent of concern, or whether carrier and additive chemicals used in the former blending operations also are present in soil and/or ground water at concentrations of concern
- Site-specific values for the aquifer properties that influence contaminant transport rates
- The lateral and vertical extent of contamination in unexcavated soil and in groundwater at the site

FUTURE SITE ACTIVITIES

The Oregon Department of Environmental Quality (DEQ) has determined that the soil contaminated with PCP formulations apparently spilled intermittently during former site operations are RCRA hazardous wastes (waste code F027). At present, approximately 3,000 yd^3 of soil previously excavated from the site remain stockpiled onsite. In addition, as noted in the previous section, the current condition of in-place soil and groundwater at the site requires further evaluation. And finally, Time is currently pursuing options to treat and dispose of water generated through previous site investigations and soil treatment tests and that is currently stored onsite. To address these issues, Time has retained Landau Associates, Inc. to perform the following activities:

- A RCRA Facility Investigation (RFI)
- Design of a RCRA containment building to store the stockpiled soil
- Design and implementation of a batch water treatment system.

Each of these activities is described briefly below.

RFI Site Characterization

Because information from previous investigations performed by DEQ and Time confirm that releases have occurred at the site, Time is ready to proceed directly to an RFI in lieu of waiting for a RCRA Facility Assessment.

RFI site characterization activities will be described in detail in the draft RFI Work Plan to be submitted to DEQ shortly after this report (currently expected to be on or before September 30, 1993). The RFI is being designed to fill the data gaps noted above. The information collected as part of the RFI site characterization activities will be used in conjunction with data collected during previous investigations to determine the nature and extent of contamination that currently remains at the site, and the risks that the current contamination poses. The data collected and the evaluations made during the RFI will subsequently be used to evaluate whether any additional corrective measures are needed and if so, in the evaluation of those measures.

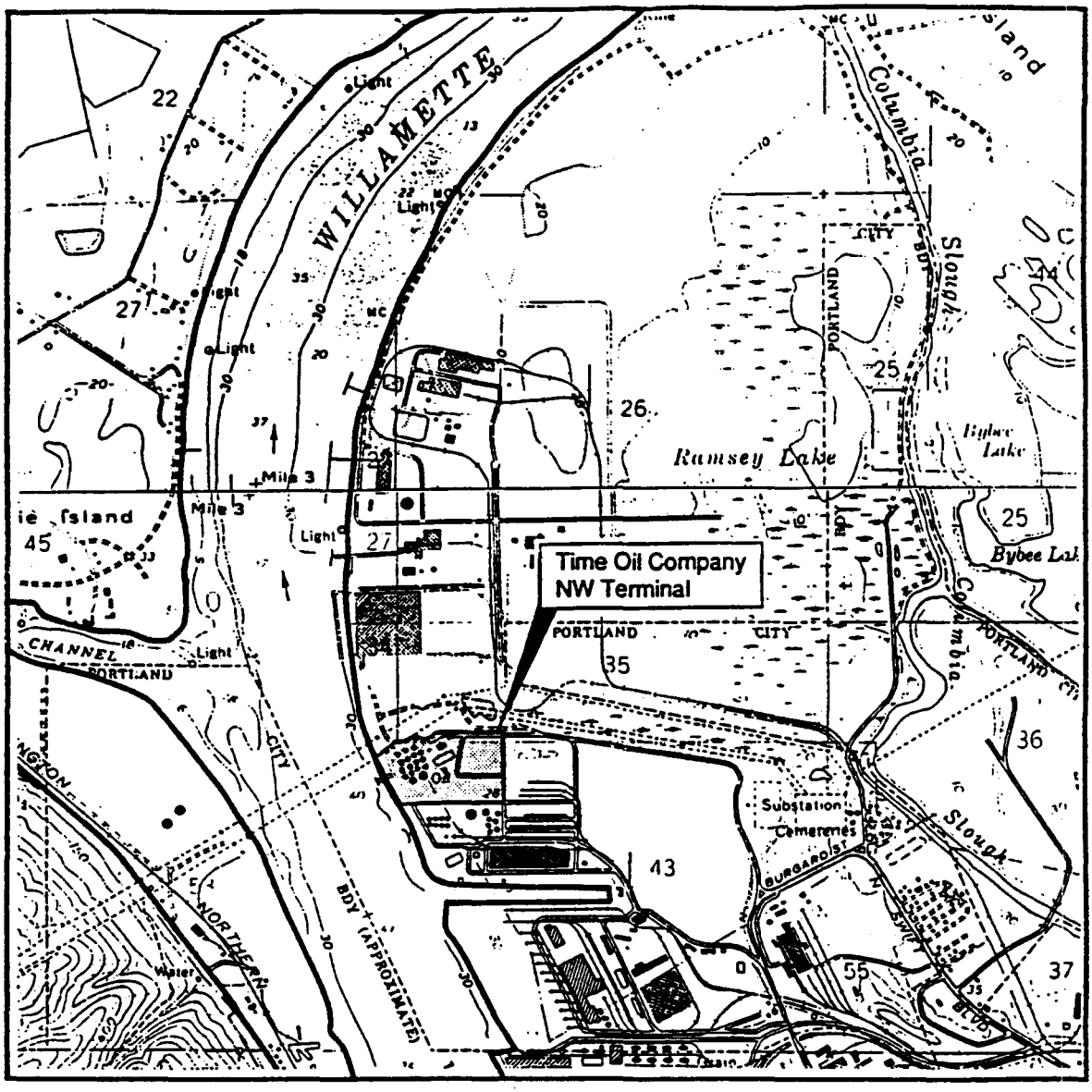
The RFI Work Plan describes planned field activities to be conducted as part of the RFI, including: 1) surface and subsurface soil sampling in and adjacent to areas previously identified as contaminated, 2) installation of monitoring wells and sampling of groundwater in and downgradient to previously identified contaminated areas, and 3) measurement of water levels and performance of aquifer tests to determine groundwater flow direction in both water-bearing units and aquifer parameters.

Soil Containment Building

Landau Associates recently completed an evaluation of a number of viable alternative designs for containment buildings for the currently stockpiled soil and is initiating preliminary design of that unit. Submittal of the draft design to DEQ for review is currently scheduled for fall, 1993.

Water Treatment

Landau Associates has completed an evaluation of water treatment alternatives for Time, and is proceeding with design of a portable batch carbon treatment system. Following treatment and verification of the treatment, the water is expected to be disposed to the local publicly owned treatment works (POTW).



Source: U.S.G.S., 7.5-min. series quadrangle map; Linnton and Sauvie Island, OR (1956; photorevised 1968 and 1973)

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Scale in Miles

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	Vicinity Map	Figure 1

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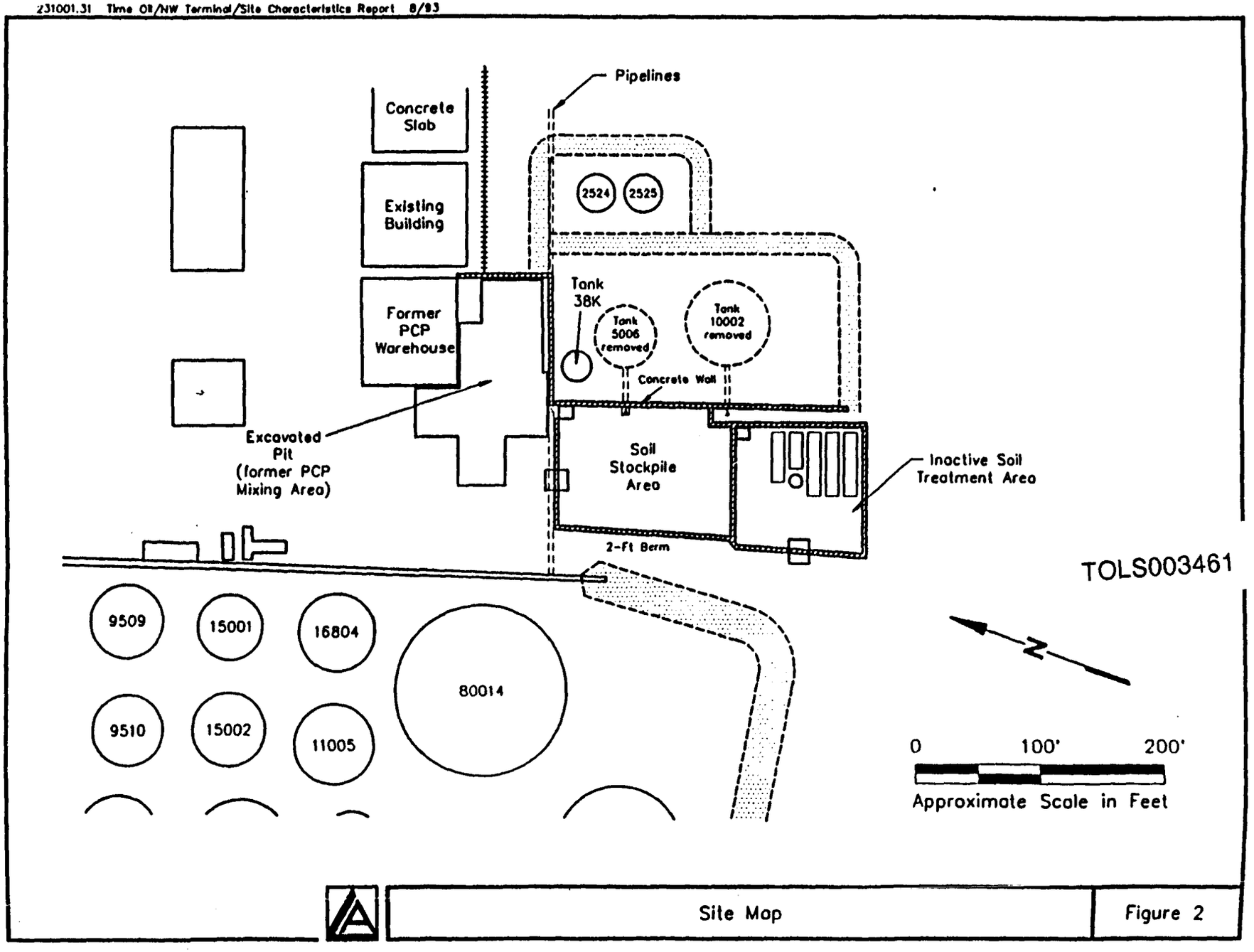

Site Map — Figure 2

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LANDAU ASSOCIATES, INC.

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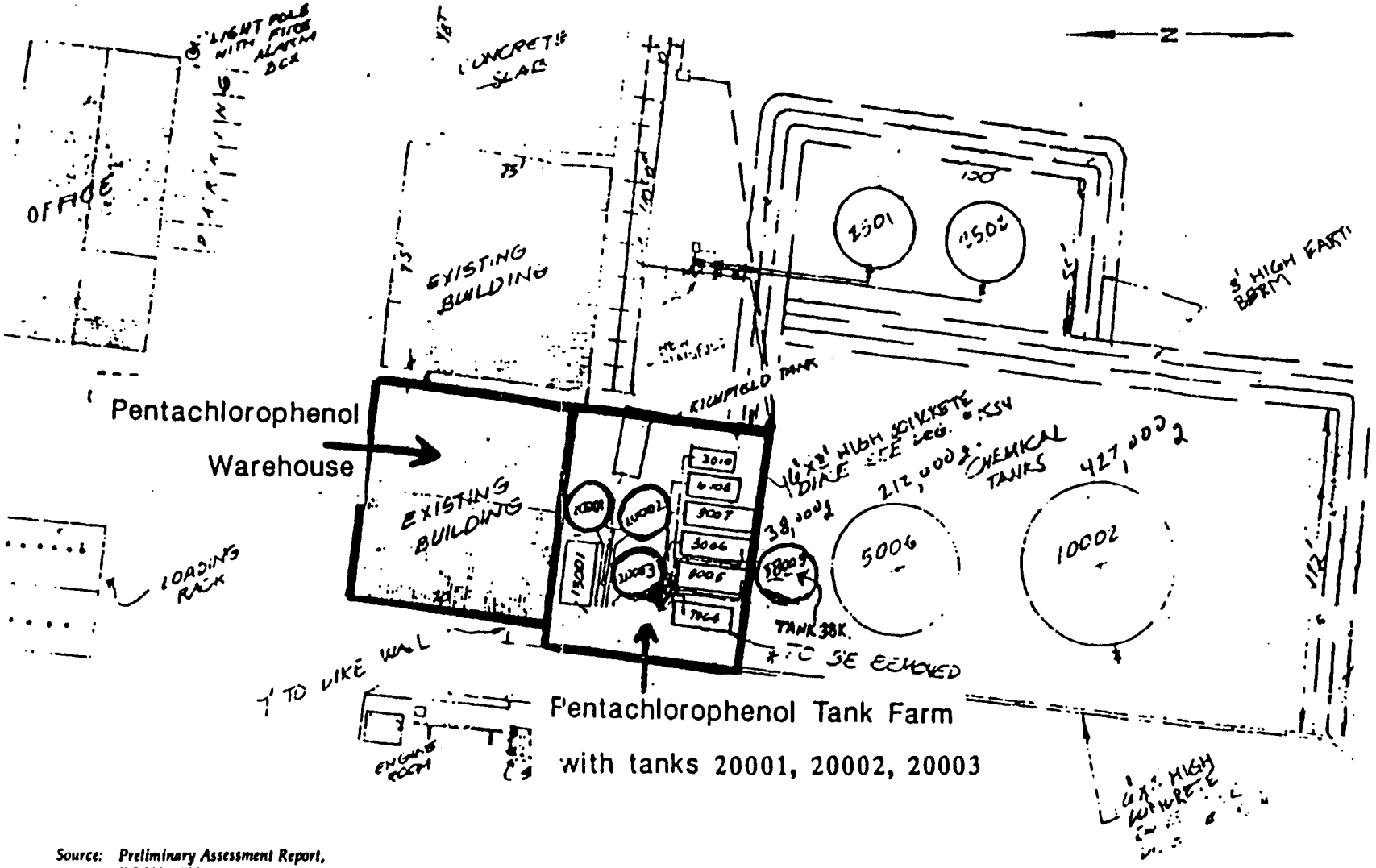

Source: *Preliminary Assessment Report, ECOVA 1991.*

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Site Operations | Figure 3

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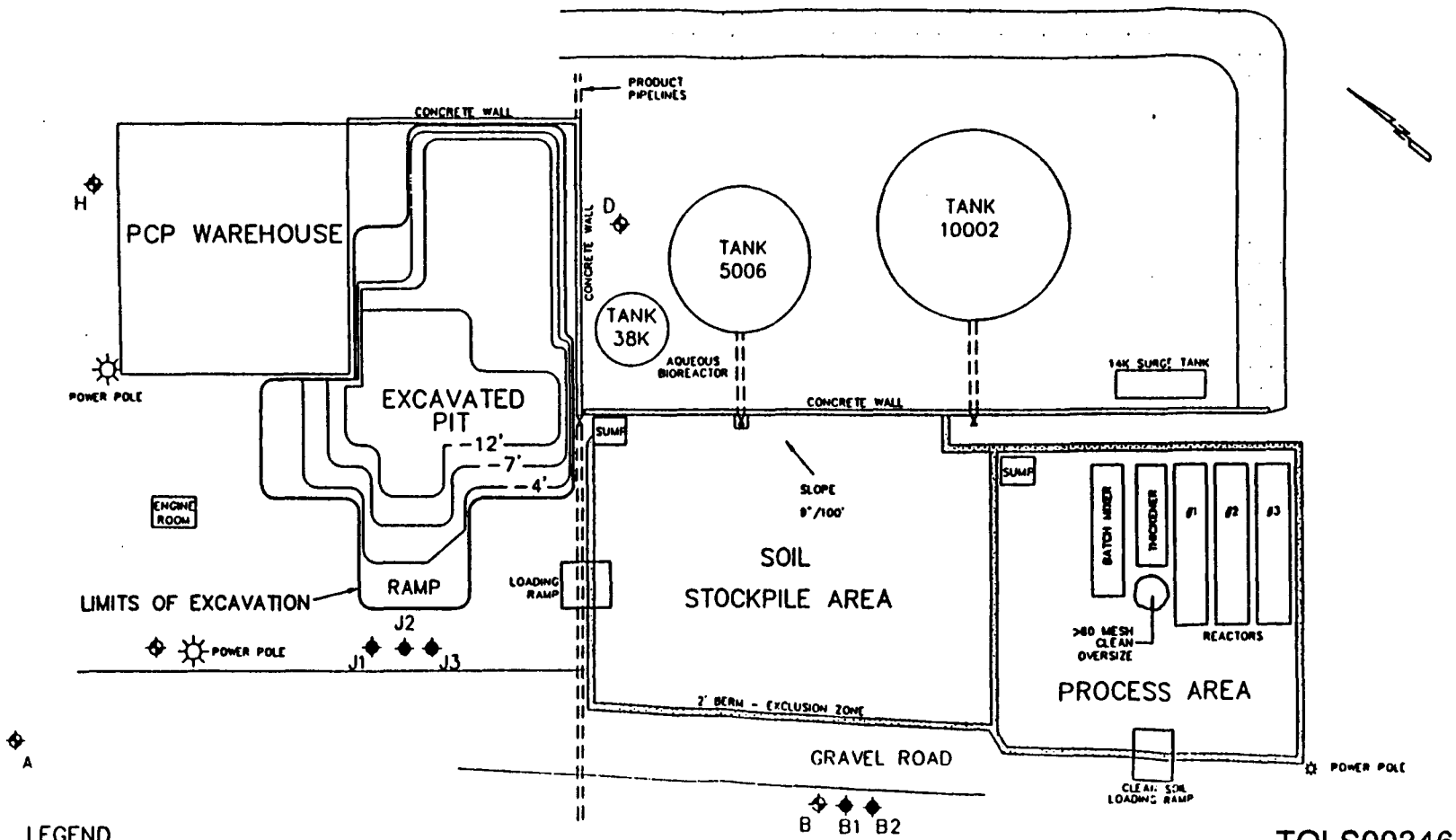

Excavation Area

Figure 4

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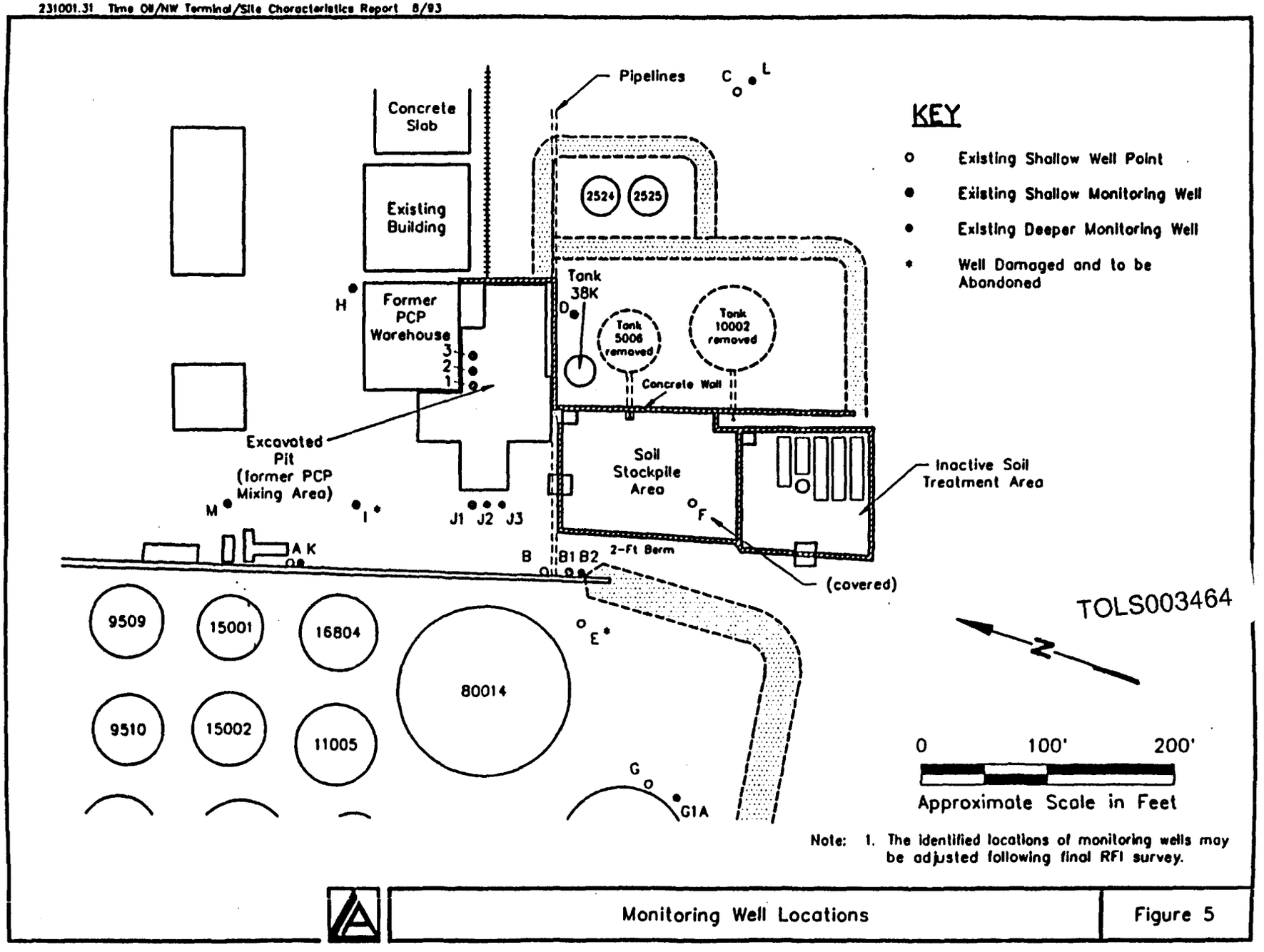

Note: 1. The identified locations of monitoring wells may be adjusted following final RFI survey.

Monitoring Well Locations

Figure 5

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TABLE 1

SUMMARY OF WELL CONSTRUCTION DETAILS
FORMER PENTACHLOROPHENOL MIXING AREA
TIME OIL COMPANY NW TERMINAL SITE
PORTLAND OREGON

WELL	TYPE	WATER BEARING ZONE	DATE	INSTALLED BY	DIAMETER	RECORDED DEPTH	TOP OF SCREEN	BOTTOM OF SCREEN	SCREEN LENGTH	SLOT SIZE	TOP OF SANDPACK	REF ELEV(1)	NOTES
A	WP	Shallow	Feb 88	TIME	1.25	20	UNK	UNK	20	UNK	UNK	97.14	
B	WP	Shallow	Feb 88	TIME	1.25	20	UNK	UNK	20	UNK	UNK	96.83	REPLACED WITH B1, 08 NOV 88; CAP RUSTED ON
B1	MW	Shallow	Nov 88	ECOVA	4	20.5	10.5	20.5	10	0.02	9.5	97.34	LOG SHOWS TD 22 FT B/LT SANDPACK ONLY TO 20.5; STICKUP 1.4 FT
B2	MW	Deep	Nov 88	ECOVA	4	41.75	30	40	10	0.02	27	99.09	CONDUCTOR CASING TO 19 FT
C(1)	WP	Shallow	Feb 88	TIME	1.25	8	UNK	UNK	20	UNK	UNK	98.73	RENAMED 'C' MAR 88
C(2)	WP	Shallow	Feb 88	TIME	UNK	UNK	UNK	UNK	UNK	UNK	UNK	98.73	REMOVED MAR 88
D	MW	Shallow	Mar 88	REIDEL	2	UNK	UNK	UNK	UNK	UNK	UNK	97.80	
E	WP	Shallow	Mar 88	TIME	2	20	UNK	UNK	UNK	UNK	UNK	97.83	DAMAGED AND TO BE ABANDONED
F	WP	Shallow	Mar 88	TIME	2	19	UNK	UNK	UNK	UNK	UNK	97.97	COVERED BY SOIL STOCKPILE
G	WP	Shallow	Mar 88	TIME	2	13	UNK	20	10	UNK	24	98.08	REPLACED WITH G1A MAR 88
G1A	MW	Deep	Feb 89	ECOVA	2	35	25	UNK	UNK	UNK	UNK	UNK	STICKUP 1.5 FT; UPPER/LOWER WATER-BEARING ZONE INDISTINGUISHABLE; REFERRED TO AS 'G' IN SOME DOCUMENTS
H	MW	Shallow	May 88	REIDEL	2	UNK	UNK	UNK	UNK	UNK	UNK	94.73	FLUSH MOUNT
I	MW	Shallow	May 88	REIDEL	2	UNK	UNK	20	10	0.02	9.5	99.00	DAMAGED AND TO BE ABANDONED
J1	MW	Shallow	Nov 88	ECOVA	4	20	10	40	10	0.02	28	97.48	LOG SHOWS TD 21.5 FT NATURAL BACKFILL TO 20
J2	MW	Deep	Dec 88	ECOVA	4	41.92	30	33	3	0.02	27	97.44	CONDUCTOR CASING TO 29 FT; JUST BELOW SILTY CONFINING LAYER
J3	MW	Deep	Jan 89	ECOVA	4	35.08	25	UNK	UNK	UNK	UNK	97.39	CONDUCTOR CASING TO 29 FT
K	MW	Shallow	1990	TIME	2	UNK	UNK	UNK	UNK	UNK	UNK	UNK	LOGS NOT AVAILABLE
L	MW	Shallow	1990	TIME	2	UNK	UNK	UNK	UNK	UNK	UNK	UNK	LOGS NOT AVAILABLE
M	EW	Shallow	1990	TIME	4	UNK	UNK	UNK	UNK	UNK	UNK	UNK	LOGS NOT AVAILABLE; SUBMERSIBLE PUMP IN WELL; FLUSH MOUNT
1	MW	Shallow	Nov 88	REIDEL	4	14	6.9	14	UNK	UNK	UNK	UNK	ANGLED AT 45 DEGREES; DEPTH IS TRUE VERTICAL
2	MW	Shallow	Nov 88	REIDEL	4	14	6.9	14	UNK	UNK	UNK	UNK	ANGLED AT 45 DEGREES; DEPTH IS TRUE VERTICAL
3	MW	Shallow	Nov 88	REIDEL	4	14	6.9	14	UNK	UNK	UNK	UNK	ANGLED AT 45 DEGREES; DEPTH IS TRUE VERTICAL
4	MW	Deep	Nov 88	REIDEL	4	80	35.6	40.6	UNK	UNK	6	96.48	LOG SHOWS BORING TO 40 FT; WELL OVERDRILLED AND GROUTED 14MAY88, SEAL FROM SURFACE TO 40 FT

KEY:

WP = well point

MW = monitoring well

EW = extraction well

(1) Historical reference elevations based on an onsite reference point assigned an elevation of 100 ft, to be verified by survey prior to RFI

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APPENDIX

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APPENDIX A

Preliminary Assessment/Data Evaluation and Proposed Remediation Plan for Pentachlorophenol Contaminated Soil at Time Oil Co.

(Applicable Portions Only)

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PRELIMINARY ASSESSMENT / DATA EVALUATION AND PROPOSED REMEDIATION PLAN FOR PENTACHLOROPHENOL CONTAMINATED SOIL AT:

TIME OIL CO.

NORTHWEST TERMINAL
12005 NORTH BURGARD ROAD
PORTLAND, OREGON

ECOVA Corporation
18640 NE 67th Court
Redmond, WA 98052

Project No. 1067

December, 1991

ECOVA

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EXECUTIVE SUMMARY

Since the 1940's, Time Oil Co. has operated a petroleum products terminal in the Rivergate area of northwest Portland, Oregon, which provides tank storage facilities for its products. Time Oil Co. has, on occasion, leased tanks to outside customers for storage of their (customers') products; in these cases, Time Oil Co. has also provided product handling and distribution services. In an arrangement of this type, Time Oil Co. ran a Pentachlorophenol (PCP) blending operation for Koppers Company on a portion of the subject property from March 1, 1967 to March 31, 1982. This operation consisted of heating and mixing PCP granules with paraffin wax, mineral spirits and other similar solvents to yield various woodtreating products per Koppers' specifications. These products were then stored in tanks on site and later shipped to Koppers' customers in 55 gallon drums.

PCP is a light brown material in the solid form, and with a melting point of 360 degrees F., is a solid under most conditions. It is largely water insoluble, although it can be dissolved in water with the pH elevated to 10 or more. Its primary use is as a wood preservative when blended with various types of oil products. Details of its characteristics, as well as the characteristics of the various solvents it was blended with, are given in the Material Safety Data Sheets included in Appendix C.

At some time during the lease agreement between Time Oil Co. and Koppers, PCP was released into the soil adjacent to the warehouse in the Mixing Area. This material was probably released in combination with the various solvents used in the process. The primary cause for these releases appears to have been intermittent spillage from hoses, mixing vessels and daily operations, rather than a specific, large spill event.

Since the termination of the agreement between Time Oil Co. and Koppers, Time Oil Co. has been actively pursuing remediation of the contaminated area.

In 1984 the Oregon Department of Environmental Quality inspected this site. At that time samples were taken from throughout the site which showed no lead contamination, no pesticide contamination, no PCP contamination outside the limits of the PCP Mixing Area and warehouse, and very limited contamination by selected hydrocarbon compounds.

In 1985 Time Oil Co. began a program to excavate the contaminated soil for disposal at an appropriate landfill. Early in that year, approximately 290 cubic yards of the most contaminated soil were removed from the site and disposed of at Arlington, Oregon. Investigations continued to determine the exact extent of the contamination. However, before the remaining contaminated soil could be removed, PCP was reclassified as a hazardous waste bearing the number F027, and thus became ineligible for disposal at hazardous waste facilities in the United States.

Pending resolution of acceptable soil disposal techniques, Time Oil Co. switched their focus to determining if the groundwater had been contaminated. This involved installing an extensive network of groundwater monitoring wells and repeated sampling and analysis. This work indicated low levels of groundwater contamination, however, the results are somewhat inconclusive. In an effort to limit any possible continuation of groundwater contamination, the contaminated soil was excavated and stock piled in a bermed, lined area, and covered.

Since 1988 Time Oil Co. has been working with ECOVA Corp. to remediate the contaminated soil on site. Efforts originally were focused on soil washing techniques. These efforts were halted when it became apparent that meeting a "background" cleanup level of 0.5 mg/kg would not be practicable.

Currently, Time Oil Co. would like to work with the Oregon Department of Environmental Quality to set an achievable cleanup level that would be considered safe to both the environment and personal health, so that the contamination problem at the site can be remediated.

From the time significant contamination at the site was verified, Time Oil Co. has continuously pursued voluntary cleanup of the site, and compliance with environmental regulations. This report is submitted in furtherance of that policy.

This document is divided into four sections. The Preliminary Assessment Part I is a general site overview discussing the site history, and a description of the contamination problem.

The Preliminary Assessment Part II is a more detailed analysis of the situation. Descriptions of soil and groundwater contamination are given along with the available analytical information that was obtained prior to 1989.

The Preliminary Assessment Part III is an account of the work ECOVA Corporation has performed on site since 1989 and describes the objectives of the current site activities.

The Preliminary Assessment Part IV is a recommendation of future actions.

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PAI - PRELIMINARY ASSESSMENT PART I

ECOVA

I. GENERAL SITE DATA

A SITE NAME

Time Oil Co. Northwest Terminal

B SITE ADDRESS

12005 North Burgard Road

Portland, Oregon 97203

C SITE CONTACT

Dick Basney

Terminal Manager

12005 North Burgard Road

Portland, Oregon 97203

(503) 286-1611

D CURRENT LEGAL OWNER AND OPERATOR

Property is owned by Northwest Terminal Co., a wholly-owned subsidiary of Time Oil Co. located at 2737 West Commodore Way Seattle, Washington 98199-1233. Improvements are owned by Time Oil Co., which also operates the terminal. Contact for environmental affairs is Mr. Fred Proby at (206) 286-6444.

Northwest Terminal Co. has owned the property since 1943.

E CURRENT OPERATOR

Time Oil Co.

II. SITE DESCRIPTION

A LEGAL DESCRIPTION

The subject property is comprised of four parcels situated in Section 35 of Township 2N Range 1W: tax lot #18 (12.47 acres), #31 (32.40 acres), #63 (0.22 acres) and #38 (6.04 acres). Tax lots #18, #31, and #63 (45.09 acres total) are referred to as the "Northwest Terminal" and tax lot #38 is referred to as the "Bell Terminal"; both are operated by Time Oil Co.

B COORDINATES

The Time Oil Co. facilities are located at approximately the following (unsurveyed) coordinates:

Longitude	122 degrees, 47 minutes West
Latitude	45 degrees, 37 minutes North

C ROAD DIRECTIONS

From St. Johns, go north on Lombard, and turn left onto Burgard Road at the bend where Lombard turns into Columbia. Stay to the right at the first fork (approximately 1 block from Lombard), and follow the road around to the left (west). Where the road turns north, go straight (west) down driveway to Time Oil Co.

D TOTAL AREA OF SITE

The Time Oil Co. facilities cover an area that is approximately 51 acres, but the area of contamination covered an area that originally was approximately 100 feet by 100 feet.

E DESCRIPTION OF LAND USES IMMEDIATELY SURROUNDING SITE BOUNDARIES

The land surrounding the subject site is the Rivergate Industrial area. It is occupied by the Port of Portland facilities and heavy industrial complexes.

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III. OWNERSHIP INFORMATION

A PAST LEGAL OWNER(S)

Northwest Terminal Co. acquired title to the approximately 12.5 acres on which the warehouse and Mixing Area is located from Oregon Shipbuilding Corp. on December 2, 1943. The current address, telephone number and years of ownership of Oregon Shipbuilding Corp. are not known.

The approximately 40 acres to the east of the Mixing Area was acquired from the United States of America on May 20, 1950.

The property comprising the Bell Oil Terminal was acquired from William Shenker and others on September 9, 1953. His current address, telephone number and years of ownership are not known.

B TYPE OF OWNERSHIP

Corporate, government and private

C PAST LESSEES OR OPERATORS

Unknown

IV. SITE HISTORY AND POTENTIAL PROBLEMS

A SITE OPERATIONS

Since the 1940's, Time Oil Co. has operated a petroleum products terminal in the Rivergate area of northwest Portland, Oregon, that provides tank storage facilities for its products. Time Oil Co. has, on occasion, leased tanks to outside customers for storage of their (the customers') products; in these cases, Time Oil Co. has also provided handling and distribution services. In an arrangement of this type, Time Oil Co. ran a PCP blending operation for Koppers Company on a portion of the subject property from March 1, 1967 to March 31, 1982. This operation consisted of heating and mixing PCP granules with paraffin wax, mineral spirits and other similar solvents to yield various woodtreating products per Koppers' specifications. These products were then stored in tanks on site and later shipped to Koppers' customers in 55 gallon drums. The 1972 site map in Appendix B, Figure 1, illustrates the Time Oil Co. facilities configuration and shows the contaminated site at the time of these operations. Tanks No. 20001, 20002, and 20003 were leased to Koppers, as well as several smaller, above ground, horizontal tanks.

At some time during the lease agreement between Time Oil Co. and Koppers, PCP was released into the soil adjacent to the warehouse and Mixing Area. This material was probably released in combination with the several hydrocarbon solvents used in the process. The primary cause for these releases appears to have been intermittent spillage from hoses, mixing vessels and daily operations, rather than a specific, large spill event.

Following termination of Time Oil Co.'s agreement with Koppers on March 31, 1982, the tanks, piping, and related equipment were removed and soil samples were collected. These samples indicated that PCP had been released.

Upon removal of the equipment used in the PCP operation, plans were made to excavate and dispose of the contaminated soil. This was to be a three phase effort, fully coordinated with the Oregon Department of Environmental Quality (ODEQ). Phase I consisted of initial soil excavation and transport to an authorized disposal facility. Phase II involved a thorough investigation to determine the extent of PCP contamination. Phase III planned the removal and disposal of all contaminated soil with concentrations above acceptable limits.

Phases I and II were completed, but the ban on landfilling PCP contaminated materials impeded progress toward completion of Phase III.

B SITE EMERGENCY/REMEDIAL ACTIONS

No "emergency" operations have been undertaken on the site with respect to the PCP operations. Remedial actions that have occurred at the site, and a summary of analytical information, are described in the following historical summary. A more thorough discussion of analytical information is included in Preliminary Assessment II under Soil Pathway and Groundwater Pathway.

1983

April

Bioassay tests indicated that surface soil from the PCP mixing area was toxic to juvinile Rainbow trout at soil concentrations of 100 and 1000 mg/l. The PCP concentration of this soil sample was not determined.

1984

April

Oregon Department of Environmental Quality (ODEQ) advised Time Oil Co. that the Northwest Terminal was to be inspected as part of ODEQ/EPA "hit list" of 44 companies.

October

ODEQ inspected the site and determined that soil samples should be collected and analyzed.

December

ODEQ collected 12 soil samples throughout the entire Mixing Area, of which one sample was in PCP area.

1985

January

Time Oil Co. received results of ODEQ soil sampling, showing 1820 mg/kg PCP in woodtreating area.

All 12 soil samples tested for EP Toxicity lead showed concentration of less than 0.1 mg/l.

All 12 soil samples were tested for 14 pesticides and showed concentrations of less than 5 mg/kg (the detection limit).

Samples tested for acid extractables (phenols) showed 10 of the 12 sites to contain less than 1 mg/kg (the detection limit). One sample contained 515 mg/kg PCP and 12 mg/kg tetrachlorophenol (this sample was taken near the site of tanks leased to Crosby and Overton).

The second sample which tested over the detection limit contained 1820 mg/kg PCP and 71 mg/kg tetrachlorophenol (this sample was taken at the site of the tanks leased to Koppers).

All 12 soil samples were tested for base-neutral extractables. Of these, nine of the 12 contained less than the detection limit (1 mg/kb).

February

On February 4, 1985, Time Oil Co. reiterated to the ODEQ its intent to excavate PCP contaminated soil and dispose of it at an approved disposal facility. This was done via a status update letter to ODEQ (Janet Gillespie).

Letter from John Smits of ODEQ to EPA describes history of site, waste handling practices, and recommendations for future actions (this letter is included in Appendix A).

May

DEQ approved "Disposal Request" for PCP contaminated soil at the hazardous waste facility at Arlington, Oregon.

June

"Waste Transportation and Disposal Agreement" executed with Chem-Security Systems, Inc. for disposal of soil at Arlington.

Between June 25 and June 28, 1985, 288 cubic yards (242 tons) of soil were removed and shipped to Arlington as part of the Phase I excavation described earlier. The soil was excavated to a depth of 2 to 4 feet in the northwest corner of the Mixing Area (documentation included in Appendix A).

On June 28, 1985, Time Oil Co. received a letter from the ODEQ laboratory concerning a previous interpretation by the agency. This letter stated that 600 mg/kg of total chlorophenols in soil and 0.15 mg/l in water represented the hazardous waste threshold. This conclusion was based on extraction and bio-toxicity tests performed by ODEQ. The letter did state that this was only to be used as guidance and did not necessarily reflect specific clean up requirements.

August

Following completion of the Phase I excavation, site characterization by Riedel Environmental Services showed that not all of the PCP contaminated soil had been removed. Samples were taken from 22 locations around the outside of the perimeter of the PCP Mixing Area south of the pentachlorophenol warehouse in an effort to determine the extent of contamination. Three composite samples were also taken in this area which showed concentrations up to 860 mg/kg. Additional samples were then taken from 81 sites just outside of the PCP Mixing Area and analyzed. Results indicated that PCP contamination was localized to the west and south of the warehouse, with little or no contamination occurring to the east of the site.

Soil was then collected from 14 locations at various depths from within the Mixing Area. Contamination contour maps indicated a maximum concentration of 26,500 mg/kg at the surface of the area where the loading of trucks had occurred during the Phase I excavation. A second point of high concentration was at the southwest corner of the PCP warehouse. These contour maps are presented in Appendix D. Analytical information for soil and groundwater is summarized in more detail in PA II under "Observed Releases" for Soil Pathway and Groundwater Pathway respectively.

November

Time Oil Co. retained Riedel Environmental Services to install four groundwater monitoring wells near the southwest corner of the PCP warehouse building (Wells 1, 2, 3 and 4). Soil samples were taken to expand the data from earlier analyses. Wells 1, 2 and 3 were slanted under the warehouse in an effort to determine the extent of contamination in that direction. Samples from the slant borings indicated PCP concentrations as high as 116,000 mg/kg at 2.5 to 4 feet below the surface; concentrations decreased with depth. A map of the well locations is provided in Appendix B, Figure 2.

December

On December 10, 1985, the Environmental Protection Agency, Region X, advised Time Oil Co. that soil contaminated with PCP had been reclassified from U242 to a hazardous waste bearing number F027. The EPA further advised that at that time there were no commercial hazardous waste facilities in the United States that would accept waste designated as F027.

Pending resolution of acceptable disposal techniques, Time Oil Co. switched the focus of its attention to determining if groundwater had been contaminated.

1986

January

In order to identify groundwater flow direction and gradient in the area of the site, Time Oil Co. installed well points at three locations surrounding the PCP warehouse and Mixing Area. On February 12 the report was received on the operations associated with those wells. Two of the wells (A and B) were installed to a depth of 20 feet, and two wells were installed at location C to a depth of 8 feet. Water level measurements were taken on nine occasions in Wells A, B, C1, C2, and 4. The data indicated unexpectedly lower water levels in Well 4.

To further the investigation, three additional well points, four observation pits and a river level reference point were installed by Time Oil Co. in March, 1986. Wells E, F, and G were 20, 19, and 13 feet deep, respectively. Well C2 was removed. Water levels were again measured and supported the data of the previous water level measurements.

Analysis of the data indicated a strong likelihood that Well 4 had penetrated a low permeability zone and had not been completed in such a way as to prevent the perched water table from draining through the well bore.

May

In May, 1986, at Time's direction, three additional groundwater monitoring wells were installed by Riedel (Wells D, H, and I). The purpose of these wells was to further define the upper piezometric surface and to obtain data on groundwater quality.

Time Oil Co. also retained Century Environmental Sciences to perform groundwater sampling and analysis. Water level readings in Wells 4, A, B, C, E, F, and G indicated a persistent zone of depression around Well 4. Well 4 was subsequently over-drilled and sealed.

Analysis of water samples from Wells 4, B, and F indicated PCP concentrations of 6.1, 2.6, and 1.4 ppb respectively. A second group of water samples was taken from Wells A, B, D, E, F, H, and I. The only well which indicated PCP concentrations above detection limits was Well I, with a concentration of 2.2 ppb.

August

In August of 1986 SRH Associates was retained to perform additional sampling and analysis of soil and groundwater at the Time Oil Co. facility. Time Oil Co. had regraded the surface of the Mixing Area gathering all suspected contaminated surface soil into a centralized area, reducing the area to about 60 feet by 60 feet. SRH then collected surface soil samples from the same 14 locations in the Mixing Area which had previously been sampled by Riedel. Additionally, six holes were drilled through the warehouse floor and sampled soil beneath the building. Groundwater samples were also obtained from seven existing monitoring wells and analyzed. The results of this work are summarized in Appendix D, pages 14 to 26.

October

SRH Associates, Inc. evaluated twelve alternative cleanup technologies and recommended soil washing as the most logical clean-up approach, followed by Surface Mounted Thermal Extraction and In-Situ Thermal Extraction. The report recommended performing bench and pilot scale evaluations. At the time, these technologies were still in the experimental stage, so Time Oil Co. chose to seek other treatment approaches.

1988

September

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Time Oil Co. received a work plan from ECOVA for soil and groundwater remediation using biological treatment in above-ground reactors. Three alternative clean up levels were evaluated - 500, 100, and 50 mg/kg.

Time Oil Co. contacted ODEQ (Ed Woods and Tom Miller) to determine DEQ's role and was advised that ODEQ did not necessarily need to approve the treatment process, but would need to sign-off that the cleanup had been effectively completed.

October

ECOVA's Work Plan was amended to set a final cleanup level of 0.5 mg/kg PCP, the practical quantitation limit using standard test procedures. This concentration was selected to reflect ODEQ's goal of remediating to "background" levels.

December

Received notification from ODEQ (letter dated 11/30/88) that facility was listed on "Inventory of Confirmed Releases", site identification number 170.

1989

April - October

To reduce the potential for groundwater contamination, the contaminated soil was excavated and stock piled in a bermed, lined storage area next to site of original contamination. ECOVA performed biological slurry treatment on 10 yards of soil from the stock pile, and achieved reduction of PCP from approximately 250 to 50 mg/kg. Further biodegradation was inhibited by the presence of mineral spirits and related solvents used in the PCP formulation.

1990

January - March

Field studies by ECOVA indicated that, under the existing soil conditions, biodegradation of PCP to 0.5 mg/kg would not be practical. The lowest concentration that could be practically achieved was determined to be 100 mg/kg.

1991

December

Time Oil Co. submits plan to ODEQ for soil cleanup under the voluntary cleanup program.

C DESCRIPTION OF PRIOR SPILLS

As mentioned above, at some time during the lease agreement between Time Oil Co. and Koppers, PCP were released into the soil adjacent to the warehouse and Mixing Area. This material was probably released in combination with the minieral spirits and other solvents which were used in the process. The primary cause for these releases appears to have been intermittent spillage from hoses, mixing vessels and daily operations, rather than a specific, large spill event.

During an October 25, 1984 site visit by the ODEQ, the 20,000 gallon storage tanks were inspected. There was obvious visual contamination of the soil by incidental spills in this former handling area. The tanks were later removed.

D SAMPLING AND ANALYSIS DATA

Copies of all supporting documentation including sampling and analyses are contained in Appendix A in chronological order and are described briefly above in PA I, Section IV, Subsection B. Detailed descriptions of soil and groundwater sampling and analyses are included in PA II, Sections I and II.

E BIBLIOGRAPHY OF ALL FILES, REPORTS REVIEWED

The following documentation is included in Appendix A in support of this report under the referenced subsections of that appendix

A "Northwest Terminal Woodtreating Chronology of Events"

A-1 Department of Environmental Quality "Request for Analysis" for samples taken, December 12, 1984.

A-2 Letter from John L. Smits (ODEQ) to Debbie Flood (EPA Region X) describing site conditions, February 12, 1985.

A-3 Letter from ODEQ (Richard F. Gates) to Time Oil Co. giving 600 mg/kg as the hazardous waste threshold, June 28, 1985.

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A-4 Results of sample analysis for North West Vacuum Truck Service, February 19, 1985. Documentation for excavation of 240 tons of contaminated soil by Chem-Security systems, July 29, 1985.

A-5 Letter from Riedel Environmental Services. Inc. to Time Oil Co. giving sample results, August 15, 1985.

Report to Time Oil Co. from Riedel Environmental Services, October 18, 1985.

A-6 Letter from George C. Hofer (EPA - RCRA Permits Section) to Time Oil Co. giving notice that PCP will no longer be accepted at hazardous waste facilities, December 10, 1985.

A-7 Report to Time Oil Co. from Riedel Environmental Services, February 4, 1986.

A-8 Time Oil Co. internal memo from Fred Proby on groundwater investigation, May 2, 1986.

A-9 Report to Time Oil Co. from Century Environment Sciences, June 4, 1986.

A-10 Report to Time Oil Co. from SRH Associates, Inc., October 1, 1986.

A-11 Report to Time Oil Co. from SRH Associates, Inc., November 5, 1987.

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V. HAZARDOUS WASTE CHARACTERIZATION

HAZARDOUS MATERIALS AND TYPES

PCP is a light brown material in the solid form, and with a melting point of 360 degrees F., is a solid under most conditions. It is largely water insoluble, although it can be dissolved in water with the pH elevated to 10 or more. Its primary use is as a wood preservative when blended with various types of oil products.

Appendix C describes all of the chemicals used in the wood treating operation. It contains the following:

- An industry brochure distributed by Koppers which describes the products which were produced at the site.
- A safety bulletin which describes "Safety Measures and Precautions for Handling Solutions Containing Pentachlorophenol."
- Material Safety Data Sheets for all of the Koppers products and ingredients, which includes formulas for their wood treating products. As these chemicals were used in the PCP operations on the site, they were released as part of the PCP mixture, and thus are be present in the PCP contamination areas.

B WASTE GENERATION

The volumes of hazardous materials and wastes generated annually is unknown. The total volume of PCP contaminated soils is estimated to be 3000 cubic yards based on a survey of the stock piled soil.

C WASTE TREATMENT SYSTEMS

No PCP waste treatment systems were in operation at the site.

D **PERMITS**

On August 11, 1980, Time Oil Co. completed EPA form 8700-12, Notification of Hazardous Waste Activity, as required by RCRA Section 3010. On February 22, 1982, Time Oil Co. requested assignment of a generator identification number by correspondence with the Department of Environmental Quality.

E **PERMIT VIOLATIONS**

There have been no known violations of the above-noted permits.

F **HAZARDOUS WASTE DISPOSAL**

On June 25, and 28, 1985, 243 tons of the most heavily contaminated soil were removed from the surface of the PCP mixing area. The Uniform Hazardous Waste Manifests documenting the removal and proper disposal of this material are provided in Appendix A, with the letter dated July 29, 1985 from Time Oil Co. to Chem-Security Systems, Inc. This constitutes the only removal of PCP contaminated soil from the site by Time Oil Co.

VI. WASTE CONTAINMENT

The PCP arrived at the site in granular form in 55 gallon drums. The solvents arrived in hogsheads. Materials were blended per Koppers specifications (Appendix C), and were stored in tanks 20001, 20002, and 20003, which were 20,000 gallon tanks, and several smaller horizontal, rectangular tanks. These tanks were located to the south of the PCP warehouse in the PCP Mixing Area, as shown on the map in Appendix B, Figure 1. All of these tanks and their associated piping were removed in 1984.

The area containing the PCP solution storage tanks was surrounded by a concrete bulkhead, which was approximately three feet high. This Mixing area was approximately 60 feet in the north-south direction, and 80 feet in the east-west direction. The wall on the west side was decontaminated and demolished in November, 1985, after the tanks were removed. This was the only known secondary containment structure.

The total volume of PCP material spilled at the site can not be accurately determined, since it was the result of an accumulation of small incidents, not a documented event. Excavation activities, subsequent sample taking and analysis, and surveying of the stock piled soil give an approximate volume of 3000 cubic yards of soil that have been impacted.

In July of 1985 Riedel International performed sampling and analysis services at the site. The results of this work is included in Appendix D. Using this data as a basis, an average concentration of 945 mg/kg has been calculated.

The activities that resulted in the contamination under investigation consisted of a simple operation wherein solvents were heated and mixed with PCP to produce a variety of wood treating products. The finished product was stored in tanks, as described above, and then shipped to customers of Koppers. The only waste materials produced by this operation were empty packaging, tanks, drums and buckets with residual PCP and the soil contaminated by spilled PCP.

VII. USGS TOPOGRAPHIC MAP

Topographic maps for the Time Oil Co. site and the surrounding region are included in Appendix B, Figures 3 and 4.

VIII. SITE MAPS

Detailed maps of the Time Oil Co. Northwest Terminal showing the location of the PCP blending area are included as Appendix B, and are described below:

- Figure 1 is a drawing from 1972 of the site which shows the PCP Mixing Area as it existed during the blending operations.
- Figure 2 is a drawing showing the area of contamination and the location of monitoring wells.
- Figures 3 and 4 are topographic maps showing the immediate vicinity around the Northwest Terminal Site.

IX. SUMMARY AND RECOMMENDATIONS

Pentachlorophenol has been spilled on the facilities of Time Oil Co. and has created a contaminated site. Work performed by several consulting groups consistently indicates that the extent of PCP contamination is limited to the PCP mixing area.

Time Oil Co. has, from the early stages of this problem, taken an active, self-motivated approach to cleaning up their facilities. The site has been thoroughly characterized and full-scale field trials have demonstrated that soil washing and biological degradation is an effective remediation method. It is therefore recommended that this method be used to remediate PCP contaminated soils to a level acceptable to the ODEQ.

PAII - PRELIMINARY ASSESSMENT PART II

L SOIL PATHWAY

A OBSERVED RELEASES

As mentioned in PAI - Section VI Waste Containment, no specific incidents of PCP spills have been documented at the site. Accordingly, "observed releases" is best described through a discussion of analytical information indicating the extent of contamination. The following discussion summarizes the sampling and analytical work which was performed on the Time Oil Co. site prior to 1988. Work done on the site after 1988 by ECOVA is included in Preliminary Assessment Part III.

Analytical work began with fish bioassay tests performed in February of 1983. These tests indicated that the soil from the former PCP mixing area was toxic at the 100 to 1000 mg/kg levels.

During an October 25, 1984 site visit by Oregon Department of Environmental Quality, there was visual evidence of soil contamination in the former PCP Mixing Area. On that date, the DEQ advised their intent to collect soil samples throughout the facility. ODEQ laboratory personnel collected twelve soil samples on December 12, 1984 from the entire facility, using a soil core. The sample locations are shown on Figure 6 in Appendix B. Soil for a composite at each location was sampled at the ground surface, and at 1, 2, and 3 foot intervals. Analysis performed on each sample included base-neutral extractables, pesticides/PCBs, acid extractables, pesticides and EP Toxicity for lead. An effort was also made to identify and quantify any other organic chemicals observed with the extraction GC/MS (gas chromatograph/mass spectrometer) procedures.

All 12 soil samples showed concentrations of lead of less than 0.1 mg/l, the detection limit. Concentrations of 5 mg/l or greater for EPA Toxic lead are classified as hazardous waste.

Of 12 soil samples tested for fourteen pesticides(RCRA method 625, extracted by RCRA method 3540), all showed concentrations of less than 5 mg/kg, the detection limit for these pesticides.

Samples for acid extractables (RCRA method 625, extracted by RCRA method 3540) showed all 12 sites to contain less than the 1 mg/kg detection limit for these phenol species except for two samples from the PCP storage area - samples 9 and 10. The results are summarized in the following table.

ODEQ ANALYSIS FOR ACID AND BASE-NEUTRAL EXTRACTABLES

	Sample 4	Sample 8	Sample 9	Sample 10
ACID EXTRACTABLES				
Pentachlorophenol	-	-	515 mg/kg	1820 mg/kg
Tetrachlorophenol	-	-	12 mg/kg	71 mg/kg
BASE-NEUTRAL EXTR.				
Isophorone	1 mg/kg	-	-	-
2,4-dinitrotoluene	3 mg/kg	-	-	-
Fluorene	1 mg/kg	13 mg/kg	-	-
n-nitrosodiphenylamine	2 mg/kg	-	-	-
Phenanthrene	1 mg/kg	14 mg/kg	-	-
Anthracene	1 mg/kg	105 mg/kg	-	-
Chrysene	-	-	1 mg/kg	-
bis(2-ethyhexyl)phthalate	-	-	3 mg/kg	-

Also summarized in the above table are the results of the base-neutral extractables, method 625, extracted by RCRA method 3540. All showed non detectable concentrations except for samples 4, 8, and 9. Although polychlorinated biphenyls (PCBs) were detected at several soil sample sites, total PCBs were well below the 50 mg/kg concentration which requires handling. The analytical results from these samples are included in Appendix A.

Following coordination with the DEQ, the Arlington landfill, and local contractors, 24.76 tons (7781 cubic feet, or 288 cubic yards) of PCP contaminated soil were hauled to Arlington, Oregon. The contamination level of a sample of this soil was 1820 mg/kg PCP. Documentation of the soil removal is included in Appendix A. Continuation of this effort was later halted due to a moratorium on landfilling of PCP contaminated soils.

In October of 1985 Riedel Environmental Services submitted a report (included in Appendix A) detailing the results of their soil sampling operations conducted in July of 1985. A summary of the analytical results is also provided in Appendix D, pages 1 through 13. This contains a list of PCP concentrations in the samples and a contour map showing PCP distribution at various depths.

This data shows high concentrations of PCP immediately to the southwest of the PCP warehouse and a second area which was used as a loading area for blended products. PCP concentrations at these two areas were 13,500 and 26,550 mg/kg respectively. Page 13 gives the analytical results of three preliminary surface composite samples taken from outside the perimeter of the Mixing Area. The samples were collected from the west, south, and east directions and analysis indicated PCP concentrations of 660, 860, and 17 mg/kg respectively.

In February of 1986 Riedel Environmental Services submitted a report (included in Appendix A) on a November 1985 field investigation in which four wells were installed near the southwest corner of the PCP warehouse. Soil samples were taken during installation. The samples from Wells 1, 3, and 4 were analyzed for PCP. The results are summarized below. PCP concentrations are presented in parts per million.

Depth (feet)	Well #1	Well #3	Well #4
0 - 1.5	1690	65.3	-
2.5 - 4	16.8	116000	-
7.5 - 9	886	11000	-
16 - 17.5	110	-	-
17.5 - 19	-	1560	-
18.5 - 20	-	-	574
32.5 - 35	-	-	62.3
43.5 - 45	-	-	1.59
47.5 - 49	-	-	2.81

In August, 1986, Time Oil Co. re-graded the contaminated area in an effort to consolidate the contaminated soil and keep it localized. After re-grading, SRH Associates took samples from the same 14 locations in the Mixing Area as Riedel. SRH also drilled six holes in the warehouse floor and collected samples underneath the warehouse. The results of the analysis are given in Appendix D, pages 14 to 26. This analysis indicates that although the soil does contain some amounts of PCP, these amounts are very low - average concentration for 30 samples is .5 ppm with only 5 samples having detectable amounts of PCP.

Later, in 1989, Time Oil Co., through the services of ECOVA Corporation, excavated approximately 3,000 yards of contaminated soil and placed it in a bermed, protected area. Sampling of the excavated pit at the time indicated that all of the contaminated soil had be removed, except for soil under the southwest corner of the warehouse. This soil remained unexcavated due to fear of structural damage to the warehouse. This work is described in detail in Section PAIII.

B ACCESSIBILITY

Time Oil Co. site in Portland is a restricted access area. The site is completely fenced and access is controlled by a gate which can be opened only with a pass card. The site has a 24 hour guard and operations typically may occur at all hours of the day.

Currently, the possibility of exposure to contaminated soil is limited, since the contaminated soil has been excavated, placed in a lined, bermed, storage area and covered with a tarp.

Although site personnel have access to the area, there are no routine operations that would expose workers to the contaminants.

C CONTAINMENT

There were no containment facilities to prevent spilled PCP mixtures from reaching the soil. A cement bulkhead surrounding the PCP Mixing Area had served to contain spills to that immediate area.

Currently the contaminated soil is covered in a bermed and lined storage area.

D HAZARDOUS SUBSTANCE

The hazardous substances of concern at the site are PCP and various petroleum based solvents used in the blending process for making wood treating products. The solvents include mineral spirits, ketones, and other hydrocarbon products. Product and Material Safety Data Sheets are located in Appendix C. Also included with this material is "Safety Measures and Precautions for Handling Solutions Containing Pentachlorophenol."

PCP was the most hazardous substance used at the facility. A toxicity/persistence evaluation of the characteristics of PCP was conducted using the method described in Appendix G. PCP's combined toxicity/persistence rating factor, using that method, is 15. Persistence of each hazardous substance is evaluated on its biodegradability. PCP exhibits a ring compound structure, and is assigned a persistence value of 2. Toxicity of each hazardous substance being evaluated is given a value using the rating scheme of Sax or the National Fire Protection Association (NFPA). PCP has a rating of Level 3, and is assigned a toxicity value of 3. These values for toxicity and persistence give a combined rating of 15.

PCP's IDLH level (Immediately Dangerous to Life or Health) is 150 mg/m3. It is not considered a carcinogen by the National Institute for Occupational Safety and Health.

E SITE/SOIL GEOLOGY

It is believed that much of the site has been built up with hydraulic fill from dredging the Willamette River. Soil type consists of fine to medium grained sands and minor amounts of silts and gravels. These soils are normally associated with a former river channel deposit of the Willamette River. Little clay appears to be present near the surface, although lenses may occur at depth. Well Completion Forms for ECOVA Wells J1, J2, J3, B1, B2, G1, and G1A provide a more detailed description of subsurface soils (Appendix F).

F TARGETS

1 On-site Population

The total number of people employed at the Time Oil Co. Portland is approximately ten. Personnel do not routinely work or reside on or near the area of PCP contamination.

2 One Mile Population

United States Geological Survey Topographic Maps were inspected to determine the number of residences in the vicinity. The total residential population within a one-mile radius of the site is estimated at 35 people (approximately 15 residences), and appears to be concentrated near Harborton, on the opposite bank of the Willamette River. There are no residences on the contaminated property.

3 Terrestrial Sensitive Populations

The entire site has been disturbed, so there are no natural flora or fauna resident on the site, other than opportunistic species such as mice, rabbits, and birds.

II. GROUNDWATER PATHWAY

A OBSERVED RELEASES

The following discussion summarizes groundwater sampling and analysis work that has been conducted on the Time Oil Co. site prior to 1988. Work conducted after 1988 by ECOVA Corporation is included in Preliminary Assessment Part III.

1985

November, Riedel Environmental Services

In November, 1985 Riedel Environmental Services installed three shallow and one relatively deep well (Well 4) near the southwest corner of the PCP warehouse. A detailed evaluation of the boring log data for Well 4 showed that a series of clay lenses and silty sands were encountered between depths of 18.5 and 35 feet. This zone of low permeability (an aquitard) appeared to be separating a perched upper water-bearing zone from a separate underlying aquifer.

The boreholes were drilled with a 16-inch-diameter hollow-stem auger. Each well was constructed using 4-inch PVC casing and screen. Unfortunately, during construction of Well 4, the annular space was filled with coarse sand to a level extending above the aquitard. This provided a pathway for potentially contaminated water from the upper perched zone to flow into the lower aquifer. This also appeared to have altered the natural direction of groundwater flow within a zone of influence surrounding Well 4. Although the observed water table depression could represent a strong, natural vertical gradient in the vicinity of Well 4, the influence of this well on adjacent wells indicated a strong probability of an induced groundwater sink caused by the unsealed annulus of Well 4. This conclusion was reached by Time Oil Co. upon evaluation of the piezometric surface of the perched water, which indicated that wells in close proximity to Well 4 were apparently influenced by Well 4, showing water level depressions, while wells distant from Well 4 were unaffected. The water level in Well 4 was also found to fluctuate with levels in the Wilamette River, whereas water in the other wells did not.

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In an effort to reinstate natural groundwater flow patterns in the area and to eliminate possible intercommunication between upper and lower water bearing zones, Well 4 was removed by overdrilling and the hole sealed on May 14, 1986.

1986

April, Century Environmental Sciences

Century Environmental Services performed water level measurements and collected samples for PCP analysis on wells which had been installed by Time Oil Co. The results are summarized in the table at the end of this section.

May 28, Century Environmental Sciences

Following abandonment of Well 4, a second group of groundwater samples were collected from Wells A, B, D, E, F, H, and I. Of the seven wells sampled, only Well I showed a detectible PCP concentration (2.2 ppb). The analytical results are listed in the table at the end of this section.

August 29, SRH Associates

Groundwater was sampled at seven monitoring points and was analyzed for pH and PCP. Static water levels were determined in these wells and at a monitoring station for the measurement of Willamette River level elevations. Of the seven wells sampled, only Well D showed detectable PCP concentrations (44 ppb). Wells C and G were dry and could not be sampled. The sample analytical data are included in Appendix E and are summarized in the table at the end of this section.

1987

August 20, SRH Associates

Groundwater was sampled at the nine monitoring points (Wells A through I) and analyzed for PCP. Static water levels were determined in these wells and at a monitoring station for the measurement of Willamette River water elevations. A PCP concentration of 2300 ppb was detected in Well B. No contamination was observed in Wells A, D, F, H, and I. Wells C, E, and

G were dry and could not be sampled. Results of the sampling analyses are provided in Appendix E and are summarized in the table at the end of this section.

October 16, SRH Associates

Well B was resampled to verify the August 20 analysis. A PCP concentration of 1000 ppb was subsequently determined.

SUMMARY OF WELL SAMPLING AND GROUNDWATER ANALYSIS

Well No.	April '86	May '86	Aug '86	Aug '87
A	-	N.D.	N.D.	N.D.
B	2.6	N.D.	N.D.	2300
C	-	N.D.	N.A.	N.A.
D	-	N.D.	44	N.D.
E	<1.0	N.D.	N.D.	N.A.
F	1.4	N.D.	N.D.	N.D.
G	-	-	N.A.	N.A.
H	-	N.D.	N.D.	N.D.
I	-	2.2	N.D.	N.D.
4	6.1	-	-	-
RIVER	-	-	N.S.	N.S.

B ROUTE CHARACTERISTICS

Shallow groundwater exists in the alluvial sands of two aquifers underlying the site. An unconfined upper zone of perched groundwater occurs at a depth interval between about 13 and 18 feet below ground surface. A silt to clay aquitard, about two feet thick, separates the perched zone from a lower, confined zone that maintains an average water level of approximately 20 feet below ground surface. Groundwater flow is towards the Willamette River, with fluctuations related to tides and seasonal river stages. The aquitard appears to pinch out or terminate toward the river. It is likely that the perched water flows somewhat downward and laterally before entering the river.

As subsurface soils appear to be generally quite permeable, groundwater flow can be expected to be fairly rapid (100-200 feet/year). In August and October 1987, water levels and groundwater samples were obtained from the site wells. These measurements confirmed that groundwater was flowing in a southerly direction under an average gradient of 0.008 ft/ft. The estimated annual net precipitation averaged over 20-30 years is approximately 36 inches.

The physical state of the PCP-containing wood-treating chemical at the time of release was that of a liquid, approximately the consistency of a light oil.

C CONTAINMENT

To halt the migration of PCP contamination from the contaminated soil into the groundwater, ECOVA Corporation excavated the contaminated soils. The soils were screened and placed in lifts on a stockpiled area lined with a 12 mil polyethylene plastic liner. A low earthen berm surrounds the stockpile and contains any contaminated rainfall runoff, and a plastic lined sump area catches and accumulates water. Any captured groundwater is pumped into the recovered groundwater storage tank. An equipment decontamination area is located within the bermed, lined area to provide for cleaning of the earthmoving equipment. A steamcleaner is used to assure that decontamination is thorough. Decontamination fluids accumulated in the sump will be treated in the treatment system after startup.

The stockpiled soil was covered by six mil polyethylene plastic sheeting to control airborne dust emissions during storage. The sheeting has been carefully weighted to prevent damage by the high winds occurring periodically in the Willamette River valley.

D HAZARDOUS SUBSTANCES

PCP is the most hazardous substance at the facility. Its presence in the groundwater is low and inconsistent. The mobility of PCP in groundwater is limited to the mobility of the solvents, as it is generally not water soluble at a pH less than 10.

E TARGETS

The shallow water-bearing sediments directly underlying the site are not a source of drinking water in the area. Monitoring well data indicates that groundwater in the shallow units appears to flow toward the

Willamette River. Users of water from the Willamette may, therefore, be indirect receptors of any site groundwater contamination. The potential for vertical (downward) migration of groundwater contaminants is not known.

There are three possible alternatives for attaining groundwater standards at the site:

- Maintain present PCP concentrations
- Reduce levels of PCP concentration
- Prevent any contaminant migration

Present concentrations in the site groundwater pose no direct threats to human health and the environment. The degree of variation in current levels is unknown due to the lack of long-term monitoring data; it is expected that these levels will decline as the source (soil) is treated.

III. SURFACE WATER PATHWAY

The major surface water feature of the site is the adjacent Willamette River. No tributary streams run through the site and/or drain to the Willamette. Other than the immediate shoreline area, no portion of the site drains to the Willamette River.

The area of contamination is approximately 1/4 of a mile from the banks of the Willamette River. Because the site is composed of sandy soils of high permeability, all surface waters percolate into the soil and become groundwater immediately.

There have been no direct releases to surface water features (the Willamette River) at the site. Therefore, any communication between the area of contamination and the river must occur via groundwater pathways.

Due to the lack of surface water features at the site, there are no direct receptors of potentially contaminated surface water runoff.

No analytical testing for hazardous substances has been performed on any adjacent water features.

IV. AIR PATHWAY

PCP is a solid at room temperature. Possibility of air borne contaminants come primarily from wind blown particles such as dust. The stock piled, contaminated soil is currently covered and poses no threat to air quality.

No program of ambient (background) air quality monitoring has been performed for the site. The currently stock piled soil has been covered by six mil polyethylene plastic sheeting to control airborne dust emissions during storage. The sheeting has been carefully weighted to prevent damage by the high winds occurring periodically in the Willamette River valley.

With regard to on-site volatile organic emissions and possible fugitive dust, the long-term objective is to keep any air contaminant concentrations to background concentrations. During remedial actions, however, the objective will be to limit concentrations to OSHA standards.

As mentioned earlier, the only potential targets for volatile emissions are the staff of Time Oil Co. who work on site. Their exposure is being minimized by covering the contaminated soil with tarps.

V. SUMMARY AND RECOMMENDATIONS

Time Oil Co. owns and operates a petroleum products terminal in Portland, Oregon, that provides tank storage facilities for its own and customers' products. From 1967 to 1982 Time Oil Co. ran a PCP blending operation for Koppers Company on a portion of Portland facility. PCP was heated and mixed with a variety of petroleum based carriers to meet Koppers' specifications; the finished product was then shipped off-site.

Following an inspection of the overall facility in 1984, the Oregon DEQ collected and analyzed soil samples from twelve locations including the PCP mixing area.

In 1985, 288 cubic yards of soil were removed from the PCP area and disposed of at the hazardous waste landfill in Arlington, Oregon. Further site sampling revealed that not all of the PCP contaminated soil had been removed. Before additional quantities could be excavated and disposed of, however, the EPA banned the landfill of PCP contaminated soils (1985).

In 1986 and 1987, Time Oil Co. installed groundwater monitoring wells in the area surrounding the PCP Mixing Area to investigate possible groundwater contamination, performed additional soil sampling and initiated an evaluation of site cleanup alternatives. Analysis of water samples indicated limited, low, and inconsistent concentrations of groundwater contamination.

Sample analyses have shown that PCP contamination in soil is limited to the mixing area. This area was excavated in 1989 and approximately 3,000 cubic yards of contaminated soil has been stockpiled in a bermed and line area on site.

Sufficient site characterization has been performed to identify all contaminants and pathways and it has been determined that exposure is limited to on site personnel. Remediation will reduce this exposure to an acceptable level.

PAIV - DATA EVALUATION REPORT

I. BACKGROUND AND OBJECTIVES

The purpose of the Data Evaluation Report in this document, and in fact, the purpose of this entire submittal, is to determine, with support from proper authorities, a cleanup level for PCP at the Time Oil Co. - Portland Terminal site.

Much of the contaminated soil containing PCP and associated solvents has been excavated, and there is little room to stock pile additional soil, if necessary. Some PCP-contaminated soil was left in place, as its removal may have destabilized nearby structures. It is assumed that this unexcavated soil also contains solvents.

Time Oil Co.'s primary interest, as it has been since the PCP-contaminated soil was discovered in 1984, is to remediate the site. Time Oil Co. would like to establish an achievable and appropriate cleanup level which reflects the safety and health conditions at the site so that soil processing can begin. If further sampling and analysis is deemed necessary, it can be performed after processing of the stockpiled soil has begun.

The following discussion proposes potential soil cleanup levels for the Time Oil Co. site. Site location, potential for contaminant migration, and remediation feasibility are among the considerations essential to establishing an appropriate cleanup level.

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II. SOILS

Time Oil Co. would like to work with ODEQ to establish a cleanup criteria for soil at this site which is safe to health and the environment, that is based on the characteristics that exist at the site and that is consistent with cleanup levels established at other similar sites.

The Time Oil Co. Northwest Terminal has restricted access, 24 hour a day security and is completely surrounded by low population density industrial areas.

PCP is a non volatile compound with very low solubility in water. It is our understanding that a health-based cleanup level for PCP as established by Oregon's Department of Environmental Quality in soils is currently 2000 mg/kg.

There has been a precedent set at other Oregon and national sites to treat or remove PCP contaminated soils to less than 500 mg/kg. In a similar situation concerning Cascade Wood Products, a cleanup level was authorized which seemed technically achievable and environmentally safe. They were required to excavate and dispose of all soil with greater than 500 mg/kg PCP (prior to the restriction on land disposal of PCP) and consolidate and cap soil between 20 mg/kg and 500 mg/kg.

Based on full scale treatment tests at the site, it has been demonstrated that PCP can be biodegraded to at least as low as 500 mg/kg. Time Oil Co. therefore proposes that the soil stockpile at the Northwest Terminal site be treated to a level no greater than 500 mg/kg and that the residual soil then be left on site. Soil washing in conjunction with a biological process will be utilized to achieve that cleanup level.

ECOVA

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III. GROUNDWATER

Groundwater sampling has indicated no widespread contamination. However, there does appear to be some consistent contamination of groundwater immediately downgradient of the contaminated area. Therefore, quarterly groundwater monitoring is proposed for one year following treatment.

IV & V. SURFACE WATER AND AIR

As mentioned in Part III, surface water and air contamination does not appear at this time to be a significant problem, assuming reasonable safety precautions are taken. Currently the contaminated soil has been placed in a lined, bermed, storage area and covered with a tarp.

VI. SUMMARY AND RECOMMENDATIONS

Time Oil Co. has identified and excavated approximately 3000 yards of PCP-contaminated soil. This soil has been stored in a bermed, lined, and covered area awaiting processing. While portions of the soil had contained high concentrations of PCP, the process of excavation and stock piling has blended the soil to an average concentration in the range of 950 mg/kg.

Concerted efforts were made to excavate all soils with PCP contamination, yet some contaminated soil remains. Some of this soil lies beneath the PCP Warehouse. Removal of this soil would require demolition of the warehouse. However, this soil is effectively capped and should be safe from leaching by surface waters. Other soil of a lesser degree of contamination was left in situ near Tank 38009. This low volume of soil remains unexcavated for fear of causing structural damage to the tank.

There does appear to be evidence of groundwater contamination at the site; it is limited to low concentrations in wells directly down gradient from the contaminated site.

Time Oil Co. recommends the following:

- The excavated soil should be treated to 500 mg/kg PCP concentration.
- Soil cleanup should be performed through biological remediation methods.
- The soil should be left on site after remediation.
- Groundwater should be monitored on a quarterly basis for one year.

TABLE OF CONTENTS FOR APPENDIX A

A "Northwest Terminal Woodtreating Chronology of Events"

A-1 Department of Environmental Quality "Request for Analysis" for samples taken, December 12, 1984.

A-2 Letter from John L. Smits (ODEQ) to Debbie Flood (EPA Region X) describing site conditions, February 12, 1985.

A-3 Letter from ODEQ (Richard F. Gates) to Time Oil Co. giving 600 mg/kg as the hazardous waste threshold, June 28, 1985.

A-4 Results of sample analysis for North West Vacuum Truck Service, February 19, 1985. Documentation for excavation of 240 tons of contaminated soil by Chem-Security systems, July 29, 1985.

A-5 Letter from Riedel Environmental Services. Inc. to Time Oil Co. giving sample results, August 15, 1985. Report to Time Oil Co. from Riedel Environmental Services, October 18, 1985.

A-6 Letter from George C. Hofer (EPA - RCRA Permits Section) to Time Oil Co. giving notice that PCP will no longer be accepted at hazardous waste facilities, December 10, 1985.

A-7 Report to Time Oil Co. from Riedel Environmental Services, February 4, 1986.

A-8 Time Oil Co. internal memo from Fred Proby on groundwater investigation, May 2, 1986.

A-9 Report to Time Oil Co. from Century Environment Sciences, June 4, 1986.

A-10 Report to Time Oil Co. from SRH Associates, Inc., October 1, 1986.

A-11 Report to Time Oil Co. from SRH Associates, Inc., November 5, 1987.

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NORTHWEST TERMINAL WOODTREATING
CHRONOLOGY OF EVENTS

1981

Jan 28	Notice given to Koppers terminating 3/1/67 agreement effective March 31, 1982.

1983

April 18	Bioassay results show soil sample is toxic.
Oct. 5	Meeting with Koppers at terminal to formulate tank and soil removal agreement.
Nov. 15	Koppers removed all penta product and raw material from terminal.

1984

April 27	DEQ advised that terminal was to be inspected as part of DEQ/EPA "hit list" of 44 companies.
June 28	DEQ denied 5/24/84 TOC request to be deleted from inspection list.
Oct. 25	DEQ inspection and determination to collect samples.
Nov. 7	Information on terminal provided per DEQ request.
Dec. 12	DEQ collected 12 soil samples throughout tank farm, of which one was in penta area.

1985

Jan. 11	Status meeting with Koppers in St. Louis.
Jan. 24	Received results of DEQ soil sampling, showing 1820 ppm penta in woodtreating area.
Feb. 4	Status update letter to DEQ (Janet Gillaspie).
Feb. 19	Contract executed with Northwest Vacuum Truck Service, Inc. for removal of soil and transport to Arlington.
May 14	DEQ approved "Disposal Request" for penta contaminated soil at Arlington.
June 24	"Waste Transportation and Disposal Agreement" executed with Chem-Security Systems, Inc. for disposal of soil at Arlington.
June 25-28	242.76 tons (7781 cubic feet, 288 cubic yards) of soil removed to Arlington.

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June 28	Contract executed with Riedel for penta sampling and analysis.
June 28	Received DEQ interpretation of maximum allowable penta concentration in soil (600 ppm) and water (0.15 ppm).
July 17	Received composite sample results showing maximum of 860 ppm penta.
Aug. 15	Received individual sample results and contour maps from Riedel showing maximum of 26,550 ppm penta (on ground surface where trucks were loaded).
Nov. 5	Amendment 2 to Riedel contract calling for decontamination of wall and installation of groundwater monitoring wells.
Dec.13	Received letter from EPA advising that there were no commercial facilities that would accept penta.

1986

Jan. 8	Northwest vacuum truck contract cancelled.
Feb. 12	Received Riedel report on well installation and soil sampling showing maximum penta concentration of 116,000 ppm beneath warehouse.
Feb. 26	Received sample analysis results from ATW/Cadweld.
Feb. 28	TOC installed 3 well points (A,B,C) to measure water table gradient.
March 6	Submitted invoice to Koppers for their share of clean up costs.
April 1	TOC completed installation of 3 additional well points (E,F,G). Water level measurements indicated drainage through Riedel Well #4.
April ?	Century Environmental Services collected water samples from wells B,E,F, and 4.
May 8	Riedel completed installation of 3 monitoring wells (D,H,I).
May 9	TOC collected water sample from well #4.
May 14	Riedel completed removal and sealing of well #4.
May ?	Century collected water samples from wells A,B,D,E,F,H and I.
June 4	Received results of April water samples showing maximum of 6.1 ppb of penta in well #4.
June 11	Paid $3,500 fee to Oregon DEQ for June 1985 movement of soil to Arlington.

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July 7 — Received results of May water samples showing only well #1 having detectable concentration (0.0022 ppm) of penta.

Aug. 8 — Letter to Koppers briefly summarizing action to date.

Aug. 14 — Contract with SRH Assoc. to collect and analyse soil samples and evaluate clean-up alternatives.

Aug. 20 — Consolidated shallow "hot spots" of penta contamination into one pile.

Oct. 1 — Received report from SRH on project history, remedial alternatives and analysis results. "Soil Washing" recommended as clean-up approach. Bench scale studies suggested as first step in design of system.

1987

Jan. 6 — Received SRH proposal for bench scale studies of soil washing technique.

Feb. 27 — Inquiry into on-site incineration by Waste Tech Inc.: project would cost $2 million and take more than one year to complete.

Mar. 25 — Soil sample sent to Keystone Environmental Resources (per Koppers instructions) for analysis of treatment alternatives.

Apr. 1 — Invoice for $54,780.28 sent to Koppers to cover their share of expenditures to date.

Aug. 13 — Koppers advised that Jim Campbell (Keystone Environmental Resources) and Billy Nolan assigned to replace Jay Stebbins on this project. Results of soil tests and payment of invoice not yet received.

Oct. 2 — Koppers reminded of obligation not yet paid.

Nov. 5 — Received SRH report on samples collected 8/20 and 10/16 showing penta contamination in Well B of 2300 ppm and 1000 ppm, respectively. Highest levels found in groundwater to date.

Nov. 9 — Koppers reminded of obligation. Jim Campbell agreed to provide soil test results and payment of April invoice. Campbell advised Koppers wishes to buy out of future liability.

Dec. 17 — Received SRH proposal for treatment by excavation and soil washing. Treatment technique to be developed by bench scale tests.

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1988

Feb. 2	Received SRH proposal for excavation and temporay stockpile of soil while treatment approach is being developed.
June 14	Revised SRH proposal and cost estimate for development of soil washing techniques.
July 21	Requested cleanup proposal from Ecova Corp.
Sept. 12	Received Ecova Work Plan for soil and groundwater remediation using biological treatment in above-ground reactors. Three alternative treatment levels - 500 ppm, 100 ppm & 50 ppm - were evaluated.
Sept 19-22	Contacted Oregon DEQ (Ed Woods and Tom Miller) to determine DEQ's role. Was advised that DEQ does not necessarily need to approve the treatment process, but does need to sign-off that the cleanup was effectively completed.
Oct. 12	Ammended Ecova Work PLan to achieve final cleanup level of 0.5 ppm pentachlorophenol.
Oct. 18	Ammended Ecova Work PLan to include installation of additional monitoring wells.
Nov. 9	Signed contract with Ecova. Cost for cleanup of penta in soil and water to 0.5 ppm is fixed at $445,000 for 3,440 cubic yards of soil. Excavation and treatment of additional volumes of soil will cost $90 per cubic yard.
Dec. 2	Received notification from DEQ (letter dated 11/30/88) that facility was listed on "Inventory of Confirmed Releases" (site identification number 170).
Dec. 5	Ecova commenced site mobilization.

1989

Jan. 13	Received $59,185.55 from Koppers for their share of investigation and cleanup costs through September 19, 1988.

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DEPARTMENT . .IRONMENTAL QUALITY
Request for Analysis

Laboratory : 84-1020

Location/Site: Tine Oil Date: 13 Dec 84 Date Received Lab: DEC 13 1984 1245

Collected By: REG, JLS Program: 4290 Date Reported: JAN 15 1985

Purpose: RCRA Site Survey Report Data To: Bates/Smith

Comments: Samples locked in Refrigerator # 1208 overnight and removed for log-in 13 Dec 84 lab prepar

Basic (P) unpreserved; Nutrient (R) add H_2SO_4 in field; Metals (Tm) HNO_3 added in lab--don't rinse; Organic(X) mason jar

Item No.	Sampling Point Description (include time)	*Sample Container (bottle) #'s Nutrients / Basic	DO / BOD	Metals / Organic		Test Required
1	Composite soil core (surface + 1' + 2'-3') See map for location				Z1020	EP Lead GC/MS - Acids, BN PCB's
2	"				Z1007	"
3	"				Z1019	"
4	"				Z1008	"
5	"				Z1009	"
6	"				Z1010	"

Laboratory comments

TOLS003521

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Reque for Analysis

Laboratory No. -1020

Location/Site: Time Oil Date: 12 Dec 84 Date Received Lab: DEC 13 1984 1245

Collected By: RFG, JLS Program: 4290 Date Reported: JAN 15 1985

Purpose: Report Data To:

Comments:

Basic (P) unpreserved; Nutrient (R) add H_2SO_4 in field; Metals (Tm) HNO_3 added in lab--don't rinse; Organic(X) lab prepared mason jar

Item No.	Sampling Point Description (include time)	*Sample Container (bottle) #'s Nutrients Basic	DO BOD	Metals Organic		Test Required
7 ~~1~~	"				Z1011	EP tox Pb " GCIMS acid/BN PCB's
8 ~~2~~	"				Z1012	"
9 ~~3~~	"				Z1018	"
10 ~~4~~	"				Z1017	"
11 ~~5~~	"				Z1016	"
12 ~~6~~	"				Z1004	"

Laboratory comments

TOLS003522

BZTO104(e)040343

GTL

DEPARTMENT OF ENVIRONMENTAL QUALITY
Laboratory Data Sheet

Laboratory No: 20
Program Code: 1290
Page: 1 of: 49
Analysis Completed: JAN 0 [illegible]

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Time Oil RFG

Item No.	Test Results (All units in mg/l or ug/ml)											
	Log #	EP Tox Pb										
1	Z1020	<0.1										
2	Z1007	<0.1										
3	Z1019	<0.1										
4	Z1008	<0.1										
5	Z1009	<0.1										
6	Z1010	<0.1										
7	Z1011	<0.1										
8	Z1012	<0.1										
9	Z1018	<0.1										
10	Z1017	<0.1										
11	Z1016	<0.1										
12	Z1004	<0.1										

Comments: _____

TOLS003523

BZTO104(e)040344

LEGAL

DATE: 31 DEC 84

LAB #: 84-1020
ITEM #: 1
SAMPLE: 21020

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT UG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT UG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003524

BZTO104(e)040345

LEGAL

3/49

DATE: 31 DEC 84

LAB #: 48-1020
ITEM #: 1
SAMPLE: Z1020

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

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TOLS003525

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LEGAL

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31 DEC 84

GC/MS SCAN ID

84-1020 Z1020

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

32319

TOLS003526

BZTO104(e)040347

DATE: 02 JAN 84

LAB #: 84-1020
ITEM #: 2
SAMPLE: 21667

LEGAL

5/49

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003527

BZTO104(e)040348

3537c

DATE: 02 JAN 93 DJH

LEGAL

6/49

LAB #: 84-1820
ITEM #: 2
SAMPLE: 21867

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT UG/KG		PARAMETER
	<5	ALPHA-BHC
	<5	HEPTACHLOR
	<5	ALDRIN
	<5	HEPTACHLOR EPOXIDE
	<5	ENDOSULFAN I
	<5	TRANS-NONACHLOR
	<5	P,P'-DDE
	<5	DIELDRIN
	<5	ENDRIN
	<5	ENDOSULFAN II
	<5	P,P'-DDD
	<5	ENDOSULFAN CYCLIC SULFATE
	<5	P,P'-DDT
	<5	GAMMA-BHC (LINDANE)

32319

TOLS003528

BZTO104(e)040349

DM

LEGAL

7/49

02 JAN 85

GC/MS SCAN ID

84-1020 Z1007

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

32319

TOLS003529

DATE: 28 DEC 84

LEGAL

8/49

LAB #: 84-1833
ITEM #: 3
SAMPLE: 21819

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER	AMOUNT MG/KG	PARAMETER
<1	PHENOL	<1	2,4,6-TRICHLOROPHENOL
<1	2-CHLOROPHENOL	<1	2,4-DINITROPHENOL
<1	2-NITROPHENOL	<1	4-NITROPHENOL
<1	2,4-DIMETHYLPHENOL	<1	2-METHYL-4,6-DINITROPHENOL
<1	2,4-DICHLOROPHENOL	<1	PENTACHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL	<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER	AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER	<1	ACENAPHTHENE
<1	1,3-DICHLOROBENZENE	<1	2,4-DINITROTOLUENE
<1	1,4-DICHLOROBENZENE	<1	FLUORENE
<1	1,2-DICHLOROBENZENE	<1	DIETHYLPHTHALATE
<1	HEXACHLOROETHANE	<1	N-NITROSODIPHENYLAMINE
<1	N-NITROSO-DI-N-PROPYLAMINE	<1	4-BROMOPHENYL PHENYL ETHER
<1	NITROBENZENE	<1	HEXACHLOROBENZENE
<1	ISOPHORONE	<1	PHENANTHRENE
<1	BIS(2-CHLOROETHOXY) METHANE	<1	ANTHRACENE
<1	1,2,4-TRICHLOROBENZENE	<1	DIBUTYL PHTHALATE
<1	NAPHTHALENE	<1	FLUORANTHENE
<1	HEXACHLOROBUTADIENE	<1	PYRENE
<1	HEXACHLOROCYCLOPENTADIENE	<1	BUTYL BENZYL PHTHALATE
<1	2-CHLORONAPHTHALENE	<1	BENZ(A)ANTHRACENE
<1	ACENAPHTHYLENE	<1	CHRYSENE
<1	DIMETHYLPHTHALATE	<1	3,3'-DICHLOROBENZIDINE
<1	2,6-DINITROTOLUENE	<1	BIS(2-ETHYLHEXYL) PHTHALATE
		<1	BENZ(A)PYRENE

TOLS003530

32319

LEGAL

9/49

DATE: 28 DEC 84

LAB #: 84-1833
ITEM #: 3
SAMPLE: 21819

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003531

BZTO104(e)040352

LEGAL

10/49

28 DEC 84

GC/MS SCAN ID

84-1020 Z1019

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 10 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

32319

TOLS003532

BZTO104(e)040353

LEGAL

11/49

DATE: 31 DEC 84

LAB #: 84-1828
ITEM #: 4
SAMPLE: 21388

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT UG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT UG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
3	2,4-DINITROTOLUENE
1	FLUORENE
<1	DIETHYLPHTHALATE
2	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
1	PHENANTHRENE
1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003533

BZTO104(e)040355

TOLS003534

LEGAL

12/49

DATE: 31 DEC 84 DJH

LAB #: 84-1628
ITEM #: 4
SAMPLE: Z1998

PESTICIDES
METHOD 625
EITRACTED BY RCRA 3546

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

LEGAL

13/49

31 DEC 84

GC/MS SCAN ID

84-1020 Z1008

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/L. THE FOLLOWING COMPOUNDS WERE TENTATIVELY IDENTIFIED WITH THE ESTIMATED CONCENTRATIONS SHOWN.

COMPOUND	MG/KG
NONANE	1
DECANE	4
4-METHYLDECANE	3
UNDECANE	19
2-METHYLUNDECANE	8
DODECANE	46
TRIDECANE	67
7-METHYLTRIDECANE	38
HENEICOSANE	37

32319

TOLS003535

BZTO104(e)040356

TIME OIL COMPANY
PORTLAND, OREGON

PENTACHLOROPHENOL SAMPLING & ANALYSIS

Prepared by
RIEDEL ENVIRONMENTAL SERVICES
P.O. Box 5007
Portland, Oregon 97208

October 18, 1985

TOLS003536

32319

BZTO104(e)040357

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B TREATED
DUPLICATE

LABORATORY: WCAS
LABORATORY ID: 2153B11

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	Scan	Estimated Conc(J)
1.		PENTACHLOROANISOLE	BNA	950	40
2.		CHISE ALIPHATIC HYDROCARBONS	BNA		2000
3.		UNIDENTIFIED COMPOUNDS	BNA		900
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
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30.					

32319

TOLS003537

BZTO104(e)040358

LABORATORY REPORT

Sample: Time B (Duplicate analyses)

	Treated Mix 1	Dup.	Treated Mix 2	Dup.
Permeability(ft/day)	7 E-07	2 E-06	7 E-07	3 E-05

ug/g (PPM)

Base Neutral/Acids	Raw	Dup.	Treated Mix 1	Dup.
Pentachlorophenol	11,000	10,000	460	490
C18-C30 Hydrocarbons *	2,000	2,000	2,000	2,000
Isophorone	ND(20	ND(20	5	6
Pentachloroanisole *	ND(20	ND(20	20	40

NA = Not analyzed
* = Approximate

TOLS003538

32319

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME 8 TREATED DUPLICATE

LABORATORY: WCAS
LABORATORY ID: 2153811
DATE RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 1)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	30: 1ML: : 0. 2ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
62-75-9	N-NITROSODIMETHYLAMINE	1. ND
18-95-2	PHENOL	1. ND
62-53-3	ANILINE	1. ND
111-44-4	BIS(2-CHLOROETHYL)ETHER	1. ND
95-57-8	2-CHLOROPHENOL	1. ND
541-73-1	1, 3-DICHLOROBENZENE	1. ND
106-46-7	1, 4-DICHLOROBENZENE	1. ND
100-51-6	BENZYL ALCOHOL	1. ND
95-50-1	1, 2-DICHLOROBENZENE	1. ND
95-48-7	2-METHYLPHENOL	1. ND
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	1. ND
106-44-5	4-METHYLPHENOL	1. ND
621-64-7	N-NITROSODIPROPLYAMINE	1. ND
67-72-1	HEXACHLOROETHANE	1. ND
98-95-3	NITROBENZENE	1. ND
78-59-1	ISOPHORONE	6.
88-75-5	2-NITROPHENOL	1. ND
105-67-9	2, 4-DIMETHYLPHENOL	1. ND
65-85-0	BENZOIC ACID	5. ND
111-91-1	BIS(2-CHLOROETHOXY)METHANE	1. ND
120-33-2	2, 4-DICHLOROPHENOL	1. ND
120-82-1	1, 2, 4-TRICHLOROBENZENE	1. ND
91-20-3	NAPHTHALENE	1. ND
106-47-8	4-CHLOROANILINE	1. ND
87-68-3	HEXACHLOROBUTADIENE	1. ND
59-50-7	4-CHLORO-3-METHYLPHENOL	1. ND
91-57-6	2-METHYLNAPHTHALENE	1. ND
77-47-4	HEXACHLOROCYCLOPENTADIENE	1. ND
88-06-2	2, 4, 6-TRICHLOROPHENOL	1. ND
95-95-4	2, 4, 5-TRICHLOROPHENOL	5. ND
91-58-7	2-CHLORONAPHTHALENE	1. ND
88-74-4	2-NITROANILINE	5. ND
131-11-3	DIMETHYL PHTHALATE	1. ND
208-96-8	ACENAPHTHYLENE	1. ND
99-09-2	3-NITROANILINE	5. ND

TOLS003539

32319

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B TREATED
Duplicate

LABORATORY: WCAS
LABORATORY ID: 2153B11
TE RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 2)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	5G: 1ML: : 0.2ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
83-32-9	ACENAPHTHENE	1. ND
51-28-5	2,4-DINITROPHENOL	5. ND
100-02-7	4-NITROPHENOL	5. ND
132-64-9	DIBENZOFURAN	1. ND
121-14-2	2,4-DINITROTOLUENE	1. ND
606-20-2	2,6-DINITROTOLUENE	1. ND
84-66-2	DIETHYL PHTHALATE	1. ND
7005-72-3	4-CHLOROPHENYL PHENYL ETHER	1. ND
86-73-7	FLUORENE	1. ND
100-01-6	4-NITROANILINE	5. ND
534-52-1	4,6-DINITRO-2-METHYLPHENOL	5. ND
86-30-6	N-NITROSODIPHENYLAMINE	1. ND
101-55-3	4-BROMOPHENYL PHENYL ETHER	1. ND
118-74-1	HEXACHLOROBENZENE	1. ND
87-86-5	PENTACHLOROPHENOL	490.
85-01-8	PHENANTHRENE	1. ND
120-12-7	ANTHRACENE	1. ND
84-74-2	DI-N-BUTYL PHTHALATE	1. ND
206-44-0	FLUORANTHENE	1. ND
92-87-5	BENZIDINE	5. ND
129-00-0	PYRENE	1. ND
85-68-7	BUTYL BENZYL PHTHALATE	1. ND
91-94-1	3,3'-DICHLOROBENZIDINE	2. ND
56-55-3	BENZO(A)ANTHRACENE	1. ND
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	1. ND
218-01-9	CHRYSENE	1. ND
117-84-0	DI-N-OCTYL PHTHALATE	1. ND
205-99-2	BENZO(B & K)FLUORANTHENES	1. ND
50-32-8	BENZO(A)PYRENE	1. ND
193-39-5	INDENO(1,2,3-CD)PYRENE	1. ND
53-70-3	DIBENZO(A,H)ANTHRACENE	1. ND
191-24-2	BENZO(GHI)PERYLENE	1. ND

RESULTS ARE REPORTED ON A WET WEIGHT BASIS.

32319

TOLS003540

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B RAW DUPLICATE

LABORATORY: WCAS
LABORATORY ID: 2153B15
DATE RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 2)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	5G: 1ML: : 0.01ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
83-32-9	ACENAPHTHENE	20. ND
51-28-5	2,4-DINITROPHENOL	100. ND
100-02-7	4-NITROPHENOL	100. ND
132-64-9	DIBENZOFURAN	20. ND
121-14-2	2,4-DINITROTOLUENE	20. ND
606-20-2	2,6-DINITROTOLUENE	20. ND
84-66-2	DIETHYL PHTHALATE	20. ND
7005-72-3	4-CHLOROPHENYL PHENYL ETHER	20. ND
86-73-7	FLUORENE	20. ND
100-01-6	4-NITROANILINE	100. ND
534-52-1	4,6-DINITRO-2-METHYLPHENOL	100. ND
86-30-6	N-NITROSODIPHENYLAMINE	20. ND
101-55-3	4-BROMOPHENYL PHENYL ETHER	20. ND
118-74-1	HEXACHLOROBENZENE	20. ND
87-86-5	PENTACHLOROPHENOL	10000.
85-01-8	PHENANTHRENE	20. ND
120-12-7	ANTHRACENE	20. ND
84-74-2	DI-N-BUTYL PHTHALATE	20. ND
206-44-0	FLUORANTHENE	20. ND
92-87-5	BENZIDINE	100. ND
129-00-0	PYRENE	20. ND
85-68-7	BUTYL BENZYL PHTHALATE	20. ND
91-94-1	3,3'-DICHLOROBENZIDINE	40. ND
56-55-3	BENZO(A)ANTHRACENE	20. ND
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	20. ND
218-01-9	CHRYSENE	20. ND
117-84-0	DI-N-OCTYL PHTHALATE	20. ND
205-99-2	BENZO(B & K)FLUORANTHENES	20. ND
50-32-8	BENZO(A)PYRENE	20. ND
193-39-5	INDENO(1,2,3-CD)PYRENE	20. ND
53-70-3	DIBENZO(A,H)ANTHRACENE	20. ND
191-24-2	BENZO(GHI)PERYLENE	20. ND

RESULTS ARE REPORTED ON A WET WEIGHT BASIS.

32319

TOLS003541

BZTO104(e)040362

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B RAW DUPLICATE

LABORATORY: WCAS
BORATORY ID: 2153B15

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	Scan	Estimated Conc(J)
1.		C4-C5 ALIPHATIC HYDROCARBONS	ZHA		3000
2.		UNIDENTIFIED COMPOUNDS	BHA		900
3.					
4.					
5.					
6.					
7.					
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ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B TREATED

LABORATORY: WCAS
LABORATORY ID: 2153B10

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	Scan	Estimated Conc(J) (PPM)
1.	1825-21-4	PENTACHLOROCANIZOLE	BNA	959	20
2.		C_{H-35} AQUATIC HYDROCARBONS	BNA		2000
3.		UNIDENTIFIED COMPOUNDS	BNA		1000
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
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32319

TOLS003543

BZTO104(e)040364

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B RAW DUPLICATE

LABORATORY: WCAS
LABORATORY ID: 2153B15
E RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 1)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	30: 1ML: : 0. 01ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
62-75-9	N-NITROSODIMETHYLAMINE	20. ND
18-95-2	PHENOL	20. ND
62-53-3	ANILINE	20. ND
111-44-4	BIS(2-CHLOROETHYL)ETHER	20. ND
95-57-8	2-CHLOROPHENOL	20. ND
541-73-1	1, 3-DICHLOROBENZENE	20. ND
106-46-7	1, 4-DICHLOROBENZENE	20. ND
100-51-6	BENZYL ALCOHOL	20. ND
95-50-1	1, 2-DICHLOROBENZENE	20. ND
95-48-7	2-METHYLPHENOL	20. ND
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	20. ND
106-44-5	4-METHYLPHENOL	20. ND
621-64-7	N-NITROSODIPROPLYAMINE	20. ND
67-72-1	HEXACHLOROETHANE	20. ND
98-95-3	NITROBENZENE	20. ND
78-59-1	ISOPHORONE	20. ND
88-75-5	2-NITROPHENOL	20. ND
105-67-9	2, 4-DIMETHYLPHENOL	20. ND
65-85-0	BENZOIC ACID	100. ND
111-91-1	BIS(2-CHLOROETHOXY)METHANE	20. ND
120-33-2	2, 4-DICHLOROPHENOL	20. ND
120-82-1	1, 2, 4-TRICHLOROBENZENE	20. ND
91-20-3	NAPHTHALENE	20. ND
106-47-8	4-CHLOROANILINE	20. ND
87-68-3	HEXACHLOROBUTADIENE	20. ND
59-50-7	4-CHLORO-3-METHYLPHENOL	20. ND
91-57-6	2-METHYLNAPHTHALENE	20. ND
77-47-4	HEXACHLOROCYCLOPENTADIENE	20. ND
88-06-2	2, 4, 6-TRICHLOROPHENOL	20. ND
95-95-4	2, 4, 5-TRICHLOROPHENOL	100. ND
91-58-7	2-CHLORONAPHTHALENE	20. ND
88-74-4	2-NITROANILINE	100. ND
131-11-3	DIMETHYL PHTHALATE	20. ND
208-96-8	ACENAPHTHYLENE	20. ND
99-09-2	3-NITROANILINE	100. ND

32

TOLS003544

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B TREATED

LABORATORY: WCAS
LABORATORY ID: 2153810
DATE RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 1)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	30: 1ML: : 0.2ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
62-75-9	N-NITROSODIMETHYLAMINE	1. ND
18-95-2	PHENOL	1. ND
62-53-3	ANILINE	1. ND
111-44-4	BIS(2-CHLOROETHYL)ETHER	1. ND
95-57-8	2-CHLOROPHENOL	1. ND
541-73-1	1,3-DICHLOROBENZENE	1. ND
106-46-7	1,4-DICHLOROBENZENE	1. ND
100-51-6	BENZYL ALCOHOL	1. ND
95-50-1	1,2-DICHLOROBENZENE	1. ND
95-48-7	2-METHYLPHENOL	1. ND
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	1. ND
106-44-5	4-METHYLPHENOL	1. ND
621-64-7	N-NITROSODIPROPLYAMINE	1. ND
67-72-1	HEXACHLOROETHANE	1. ND
98-95-3	NITROBENZENE	1. ND
78-59-1	ISOPHORONE	5.
88-75-5	2-NITROPHENOL	1. ND
105-67-9	2,4-DIMETHYLPHENOL	1. ND
65-85-0	BENZOIC ACID	5. ND
111-91-1	BIS(2-CHLOROETHOXY)METHANE	1. ND
120-33-2	2,4-DICHLOROPHENOL	1. ND
120-82-1	1,2,4-TRICHLOROBENZENE	1. ND
91-20-3	NAPHTHALENE	1. ND
106-47-8	4-CHLOROANILINE	1. ND
87-68-3	HEXACHLOROBUTADIENE	1. ND
59-50-7	4-CHLORO-3-METHYLPHENOL	1. ND
91-57-6	2-METHYLNAPHTHALENE	1. ND
77-47-4	HEXACHLOROCYCLOPENTADIENE	1. ND
88-06-2	2,4,6-TRICHLOROPHENOL	1. ND
95-95-4	2,4,5-TRICHLOROPHENOL	5. ND
91-58-7	2-CHLORONAPHTHALENE	1. ND
88-74-4	2-NITROANILINE	5. ND
131-11-3	DIMETHYL PHTHALATE	1. ND
208-96-8	ACENAPHTHYLENE	1. ND
99-09-2	3-NITROANILINE	5. ND

32319

TOLS003545

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B TREATED

LABORATORY: WCAS
LABORATORY ID: 2153B10
TE RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 2)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	5G: 1ML: : 0.2ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
83-32-9	ACENAPHTHENE	1. ND
51-28-5	2,4-DINITROPHENOL	5. ND
100-02-7	4-NITROPHENOL	5. ND
132-64-9	DIBENZOFURAN	1. ND
121-14-2	2,4-DINITROTOLUENE	1. ND
606-20-2	2,6-DINITROTOLUENE	1. ND
84-66-2	DIETHYL PHTHALATE	1. ND
7005-72-3	4-CHLOROPHENYL PHENYL ETHER	1. ND
86-73-7	FLUORENE	1. ND
100-01-6	4-NITROANILINE	5. ND
534-52-1	4,6-DINITRO-2-METHYLPHENOL	5. ND
86-30-6	N-NITROSODIPHENYLAMINE	1. ND
101-55-3	4-BROMOPHENYL PHENYL ETHER	1. ND
118-74-1	HEXACHLOROBENZENE	1. ND
87-86-5	PENTACHLOROPHENOL	460.
85-01-8	PHENANTHRENE	1. ND
120-12-7	ANTHRACENE	1. ND
84-74-2	DI-N-BUTYL PHTHALATE	1. ND
206-44-0	FLUORANTHENE	1. ND
92-87-5	BENZIDINE	5. ND
129-00-0	PYRENE	1. ND
85-68-7	BUTYL BENZYL PHTHALATE	1. ND
91-94-1	3,3'-DICHLOROBENZIDINE	2. ND
56-55-3	BENZO(A)ANTHRACENE	1. ND
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	1. ND
218-01-9	CHRYSENE	1. ND
117-84-0	DI-N-OCTYL PHTHALATE	1. ND
205-99-2	BENZO(B & K)FLUORANTHENES	1. ND
50-32-8	BENZO(A)PYRENE	1. ND
193-39-5	INDENO(1,2,3-CD)PYRENE	1. ND
53-70-3	DIBENZO(A,H)ANTHRACENE	1. ND
191-24-2	BENZO(GHI)PERYLENE	1. ND

RESULTS ARE REPORTED ON A WET WEIGHT BASIS.

TOLS003546

82319

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B RAW

LABORATORY: WCAS
LABORATORY ID: 2133B14
DATE RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 2)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	5G: 1ML: : 0.01ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
83-32-9	ACENAPHTHENE	20. ND
51-28-5	2,4-DINITROPHENOL	100. ND
100-02-7	4-NITROPHENOL	100. ND
132-64-9	DIBENZOFURAN	20. ND
121-14-2	2,4-DINITROTOLUENE	20. ND
606-20-2	2,6-DINITROTOLUENE	20. ND
84-66-2	DIETHYL PHTHALATE	20. ND
7005-72-3	4-CHLOROPHENYL PHENYL ETHER	20. ND
86-73-7	FLUORENE	20. ND
100-01-6	4-NITROANILINE	100. ND
534-52-1	4,6-DINITRO-2-METHYLPHENOL	100. ND
86-30-6	N-NITROSODIPHENYLAMINE	20. ND
101-55-3	4-BROMOPHENYL PHENYL ETHER	20. ND
118-74-1	HEXACHLOROBENZENE	20. ND
87-86-5	PENTACHLOROPHENOL	11000.
85-01-8	PHENANTHRENE	20. ND
120-12-7	ANTHRACENE	20. ND
84-74-2	DI-N-BUTYL PHTHALATE	20. ND
206-44-0	FLUORANTHENE	20. ND
92-87-5	BENZIDINE	100. ND
129-00-0	PYRENE	20. ND
85-68-7	BUTYL BENZYL PHTHALATE	20. ND
91-94-1	3,3'-DICHLOROBENZIDINE	40. ND
56-55-3	BENZO(A)ANTHRACENE	20. ND
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	20. ND
218-01-9	CHRYSENE	20. ND
117-84-0	DI-N-OCTYL PHTHALATE	20. ND
205-99-2	BENZO(B & K)FLUORANTHENES	20. ND
50-32-8	BENZO(A)PYRENE	20. ND
193-39-5	INDENO(1,2,3-CD)PYRENE	20. ND
53-70-3	DIBENZO(A,H)ANTHRACENE	20. ND
191-24-2	BENZO(GHI)PERYLENE	20. ND

RESULTS ARE REPORTED ON A WET WEIGHT BASIS.

TOLS003547

32310

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B RAW

LABORATORY: WCAS
BORATORY ID: 2153814

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	Scan	Estimated Conc(J)
1.		C14-C ALIPHATIC HYDROCARBONS	BNA		2000
2.		C(A)DENTIFIED COMPOUNDS	BNA		900
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
3.					
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29.					
30.					

32319

TOLS003548

BZTO104(e)040369

Data Reporting Qualifiers

Value - If the result is a value greater than or equal to the Detection Limit (DL), the value is reported.

ND - Indicates that the compound was analyzed for but not detected. The minimum DL for the sample with the ND (e.g. 10.ND) is reported based on necessary concentration or dilution actions.

TR - Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the specified DL but greater than zero.

J - Indicates an estimated value. This flag is used when estimating a concentration for tentatively identified compounds where a 1:1 response factor is assumed.

TOLS003549

BZTO104(e)040370

ORGANICS ANALYSIS DATA SHEET SAMPLE #: TIME B RAW

LABORATORY: WCAS
LABORATORY ID: 2153B14
DATE RECEIVED: 09/16/85

SEMIVOLATILE COMPOUNDS (PAGE 1)

LEVEL:	MEDIUM
MATRIX:	SOIL
DATE EXT/PREP:	09/18/85
DATE ANALYZED:	9/25/85
SPL-->EXTRACT:	5G: 1ML: : 0.01ML: 1ML
STANDARD ID:	BNA46
SENSITIVITY ID:	
UNITS:	UG/G (PPM)

CAS #		CONC
62-75-9	N-NITROSODIMETHYLAMINE	20. ND
18-95-2	PHENOL	20. ND
62-53-3	ANILINE	20. ND
111-44-4	BIS(2-CHLOROETHYL)ETHER	20. ND
95-57-8	2-CHLOROPHENOL	20. ND
541-73-1	1,3-DICHLOROBENZENE	20. ND
106-46-7	1,4-DICHLOROBENZENE	20. ND
100-51-6	BENZYL ALCOHOL	20. ND
95-50-1	1,2-DICHLOROBENZENE	20. ND
95-48-7	2-METHYLPHENOL	20. ND
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	20. ND
106-44-5	4-METHYLPHENOL	20. ND
621-64-7	N-NITROSODIPROPLYAMINE	20. ND
67-72-1	HEXACHLOROETHANE	20. ND
98-95-3	NITROBENZENE	20. ND
78-59-1	ISOPHORONE	20. ND
88-75-5	2-NITROPHENOL	20. ND
105-67-9	2,4-DIMETHYLPHENOL	20. ND
65-85-0	BENZOIC ACID	100. ND
111-91-1	BIS(2-CHLOROETHOXY)METHANE	20. ND
120-33-2	2,4-DICHLOROPHENOL	20. ND
120-82-1	1,2,4-TRICHLOROBENZENE	20. ND
91-20-3	NAPHTHALENE	20. ND
106-47-8	4-CHLOROANILINE	20. ND
87-68-3	HEXACHLOROBUTADIENE	20. ND
59-50-7	4-CHLORO-3-METHYLPHENOL	20. ND
91-57-6	2-METHYLNAPHTHALENE	20. ND
77-47-4	HEXACHLOROCYCLOPENTADIENE	20. ND
88-06-2	2,4,6-TRICHLOROPHENOL	20. ND
95-95-4	2,4,5-TRICHLOROPHENOL	100. ND
91-58-7	2-CHLORONAPHTHALENE	20. ND
88-74-4	2-NITROANILINE	100. ND
131-11-3	DIMETHYL PHTHALATE	20. ND
208-96-8	ACENAPHTHYLENE	20. ND
99-09-2	3-NITROANILINE	100. ND

82319

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Four Foot Contour Data

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	3.6
K	117.5	161	10.5
L	92.5	161	7200
M	67.5	161	22
N	155	143	238
O	130	143	23
P	105	143	15
Q	80	143	2205
R	142.5	125	50
S	117.5	125	184
T	92.5	125	534
U	67.5	125	55
V	155	107	380
W	130	107	8.1
X	105	107	1.3
Y	80	107	598
Z	80	179	2

TOLS003551

BZTO104(e)040372

Calweld Analysis
of treatment feasibility
- pentachlorophenol

WEST COAST ANALYTICAL SERVICE, INC
9840 Alburtis Ave.
Santa Fe Springs, CA 90670

Calweld/ATW
11212 S. Norwalk Blvd.
Santa Fe Springs, CA 90670

ATTN: Frank Manchak October 8, 1985

Job Number 2153 Page 1 of 4

LABORATORY REPORT

Samples: 24 soil samples
Date Received: 9-16-85
Purchase Order No.: 9771/Frank Manchak

The samples were analyzed for the following parameters:

	EPA Method
Permeability	-
Volatile Organics	8240
Semivolatile Organics	8270
PCBs	8080
Priority Pollutant Metals	7000
EP Toxicity Leachate	1310
Sulfur Dioxide	Draeger Tube

The results are summarized in the following tables. Detailed reports are enclosed on Organics Analysis Data Sheets.

Joe Bramblett
Laboratory Manager

D. J. Northington, Ph.D.
Technical Director

We would appreciate a telephone call if you have any questions about this report. (213)948-2225

32319

TOLS003552

BZTO104(e)040373

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Surface Contour Data

Sample #	Coordinates X	Coordinates Y	Concentration Mg/Kg
1	81	171	13500
2	71	171	29
3	71	161	500
4	71	151	5450
5	71	141	5560
6	71	131	8760
7	71	121	4870
8	71	111	92
9	71	101	20
10	81	181	16
11	71	181	7
12	61	181	9
13	61	171	95
14	61	161	175
15	61	151	18
16	61	141	229
17	61	131	88
18	61	121	6
19	61	111	3
20	61	101	2.5
21	61	91	5.2
37	81	95	857
38	91	96	1130
39	101	97	17
40	111	98	3.5
41	121	98	3.1
42	131	99	3.2
43	141	100	2.4
44	151	100	1.8
45	161	101	171
46	71	84	3
47	81	85	3.6
48	91	86	6.1
49	121	87	3.2
50	131	88	1.5
51	141	89	2.3
52	151	90	1.7
53	161	91	1.9
54	171	92	1.2

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	1400
K	117.5	161	N/A
L	92.5	161	N/A
M	67.5	161	4720
N	155	143	4280
O	130	143	3000
P	105	143	N/A
Q	80	143	N/A
R	142.5	125	1712
S	117.5	125	522
T	92.5	125	123
U	67.5	125	26550
V	155	107	317
W	130	107	3385
X	105	107	N/A
Y	80	107	N/A
Z	80	179	21

N/A = Not Available

TOLS003553

32319

BZTO104(e)040374

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Two Foot Contour Data

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	3
K	117.5	161	8.8
L	92.5	161	N/A
M	67.5	161	87
N	155	143	3.1
O	130	143	59
P	105	143	16
Q	80	143	N/A
R	142.5	125	34
S	117.5	125	252
T	92.5	125	123
U	67.5	125	44
V	155	107	260
W	130	107	15
X	105	107	4.5
Y	80	107	N/A
Z	80	179	14

N/A = Not Available

TOLS003554

32319

Department of Environmental Quality

522 S.W. FIFTH AVENUE, BOX 1760, PORTLAND, OREGON 97207 PHONE (503) 229-56

June 28, 1985

John Denham
Time Oil Co.,
2737 W. Commodore Way
Seattle, Washington 98199

Dear John:

Attached is a copy of a letter describing our 600 ppm interpretation of the hazardous waste pesticide rule for chlorophenolics.

Please note that it is used as a guidance for the determination of hazardous waste material and does not reflect subsequent clean-up level requirements. The clean-up criteria should be available from our Northwest Regional Office or our Hazardous Waste Program.

Sincerely,

Richard F. Gates
Supervising Chemist - Organic Laboratory
Environmental Quality Laboratories
and Applied Research
1712 SW Eleventh Avenue
Portland, Oregon 97201

RFG:mm

cc: Janet Gillaspie
Gary Calaba

Encls.

TOLS003555

32,310

BZTO104(e)040376

"Imagineering a cleaner world"

RIEDEL
ENVIRONMENTAL SERVICES, INC.

August 15, 1985

Mr. John P. Denham
Environmental Manager
Time Oil Company
2737 W. Commodore Way
PO Box 24447 Terminal Annex
Seattle, WA 98124

Dear John:

Enclosed are the sample results and contour maps as you requested.

I hope to see you soon.

Sincerely,

John H Ruddick /JHR

John H. Ruddick
Microbiologist

JHR:rrh
Enclosures

For Fast Emergency Response, Call Environmental Emergency Services Co.
on 24-Hour Hotline (800) 334-0004

32319

TOLS003556

BZTO104(e)040377

	DRY TON	TONS	
50,280·00 ÷		2472	2522
2,000·00 =		2651	2705
25·14 *		2629	2683
		2642	2696
54,320·00 ÷		2716	2771
2,000·00 =		2660	2714
27·16 *		2681	2736
		2739	2795
		2654	2708
53,700·00 ÷		23844*	24330*
2,000·00 =			
26·85 *			
53,840·00 ÷			
2,000·00 =			
26·92 *			
55,280·00 ÷			
2,000·00 =			
27·64 *			
53,280·00 ÷			
2,000·00 =			
26·64 *			
54,260·00 ÷			
2,000·00 =			
27·13 *			
56,820·00 ÷			
2,000·00 =			
28·41 *			
54,280·00 ÷			
2,000·00 =			
27·14 *			

TOLS003557

32319

BZTO104(e)040378

DATE	LOADED AT NW	UNLOADED AT CSS	CHANGE ENROUTE
6/25/85	25.14	25.22	-.08
6/25/85	27.16	27.05	+.11
6/25/85	26.85	26.83	+.02
6/26/85	26.92	26.96	-.04
6/26/85	27.64	27.71	-.07
6/26/85	26.64	27.14	-.50
6/28/85	27.13	27.36	-.23
6/28/85	28.14	27.95	+.19
6/28/85	27.14	27.08	+.06
Total Tons	242.76	243.30	
Average Tons	26.97	27.03	-.54

Nine truckloads shipped. Total quantity received at destination was within 1/2 ton of quantity loaded. Good show.

TOLS003558

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. CRD009597514 | 2. Page 1 of 1 | Information in the shaded areas is not required by Federal law

3. Generator's Name and Mailing Address
Tire Oil Co.
12005 N. Burgard Road Portland, Oregon 97203
4. Generator's Phone (205) 285-2400

5. Transporter 1 Company Name: Graham Transfer Inc. | 6. US EPA ID Number: ORD050973127 | C. State Transporter's ID | D. Transporter's Phone (503) 285-[illegible]

7. Transporter 2 Company Name | 8. US EPA ID Number | E. State Transporter's ID | F. Transporter's Phone

9. Designated Facility Name and Site Address
Chem-Security Systems, Inc.
Star Route
Arlington, Oregon 97812
10. US EPA ID Number: ORD 089 452 353
G. State Facility's ID
H. Facility's Phone 503-454-2643

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	EPA/L Waste
a.	RQ Solid Waste Pentachlorophenol Mixture, CRM-E, NA 2020 (RQ 10)	001	DT	56Y20	P	[illegible]
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
a. PCP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above
WPS E13588 | CU. FT | CU. YD 21
AREA | S | D | O | FR | LBS
#10.63 9.CH

15. Special Handling Instructions and Additional Information Waste Profile Sheet Number(s)
a.
b. E13588
c.
d.

D-81

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name: John P. Dunham Environmental Manager | Signature: John P. Dunham | Date Month 06 Day 28

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Bill Morrison | Signature: Bill Morrison | Date Month 06 Day 28

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Date Month . Day .

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: Donald Clough | Signature: Donald Clough | Date 11/13

ORIGINAL - RETURN TO GENERATOR

TOLS003559

32319

BZTO104(e)040380

12010

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: OR D 0 0 9 5 9 7 5 4 3
Manifest Document No.:
2. Page 1 of 1
Information in the shaded area is not required by Federal law.

3. Generator's Name and Mailing Address
Time Oil Co.
12005 N. Burgard Road Portland, Oregon 97203
4. Generator's Phone (206) 285-2400

5. Transporter 1 Company Name: Gresham Transfer Inc.
6. US EPA ID Number: O R D 0 5 0 9 7 3 4 3 7
7. Transporter 2 Company Name:
8. US EPA ID Number:
9. Designated Facility Name and Site Address
Chem-Security Systems, Inc.
Star Route
Arlington, Oregon 97812
10. US EPA ID Number: ORD 089 452 353

A. State Manifest Document Number:
B. State Generator's ID:
C. State Transporter's ID:
D. Transporter's Phone: [illegible]
E. State Transporter's ID:
F. Transporter's Phone:
G. State Facility's ID:
H. Facility's Phone: 503-454-2643

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	EPA/1 Waste No.
a. RQ Solid Waste Pentachlorophenol Mixture, ORM-E, NA 2020 (RQ 10)	0 0 1	DT	54280	P	U242
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
a. PCP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above

WPS	CU. FT	CU. YD.
E13588		24.53

AREA	S	D	Q	PR	LBS
1-10	33	Q	C	4	54120

GAL

15. Special Handling Instructions and Additional Information — Waste Profile Sheet Number(s)
a. E13588
b.
c.
d.

0-81

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name	Signature	Date Month	Day
John P. Denham Envoirnmental Manager	John P. Denham	0 6	2 8

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day
Elgin Taylor	Elgin Taylor	0 6	2 8

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Date Month	Day
Danielle Clough	Danielle Clough	6	2 8

ORIGINAL-RETURN TO GENERATOR

32319

TOLS003560

BZTO104(e)040381

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No: ORD009597543 | Manifest Document No.: [illegible]
2. Page 1 of 1 | Information in the shaded area is not required by Federal law

3. Generator's Name and Mailing Address: Time Oil Co., 12005 N. Burgard Road, Portland, Oregon 97203
4. Generator's Phone: (206) 285-2400

A. State Manifest Document Number:
B. State Generator's ID:

5. Transporter 1 Company Name: Gresham Transfer Inc.
6. US EPA ID Number: ORD050973437
C. State Transporter's ID:
D. Transporter's Phone: (503) [illegible]

7. Transporter 2 Company Name:
8. US EPA ID Number:
E. State Transporter's ID:
F. Transporter's Phone:

9. Designated Facility Name and Site Address: Chem-Security Systems, Inc., Star Route, Arlington, Oregon 97812
10. US EPA ID Number: ORD 039 452 353
G. State Facility's ID:
H. Facility's Phone: 503-454-2643

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	EPA/Waste
a. RQ Solid Waste Pentachlorophenol Mixture, ORM-E, NA 2020 (RQ 10)	~~006~~ 1 (BT)	DT	53250	P	U242
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
a. PCP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above: E13588 | 22
AREA: T-10 | S: 23 | D: Q | Q: I | FR: 4

15. Special Handling Instructions and Additional Information — Waste Profile Sheet Number(s): D-81
a. E13588
b.
c.
d.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name: John P. Denham, Envoirnmental Manager | Signature: John P. Denham | Date: Month 06 Day 26

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Elgin Taylor | Signature: Elgin Taylor | Date: Month 06 Day 26

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: | Signature: | Date: Month Day

19. Discrepancy Indication Space: There was only 1 DT rec'd, not 6. Manifest chgd with John Denham's permission, Joyce Johnson. (BT)

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: Barb Trullinger | Signature: Barb Trullinger | Date: Month 6 Day 2

ORIGINAL - RETURN TO GENERATOR

32319

TOLS003561

BZTO104(e)040382

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. ORD 0 0 9 5 9 7 5 4 3

2. Page 1 of 1

Information in the shaded area is not required by Federal law.

3. Generator's Name and Mailing Address
Time Oil Co.
12005 N. Burgard Road Portland, Oregon 97203

4. Generator's Phone (206) 285-2400

A. State Manifest Document Number

B. State Generator's ID

5. Transporter 1 Company Name: Gresham Transfer Inc.

6. US EPA ID Number: ORD 0 5 0 9 7 3 4 3 7

C. State Transporter's ID

D. Transporter's Phone (503) [illegible]

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address
Chem-Security Systems, Inc.
Star Route
Arlington, Oregon 97812

10. US EPA ID Number: ORD 089 452 353

G. State Facility's ID

H. Facility's Phone: 503-454-2643

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	EPA/1 Waste No.
a. RQ Solid Waste Pentachlorophenol Mixture, ORM-E, NA 2020 (RQ 10)	0 0 1	DT	54620	P	[illegible]
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
a. POP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above

WPS	CU. FT	CU. YD.
E13588		23[illegible]

AREA	S	D	Q	PR	LBS
T40	3	Q	C	4	5472

GAL

15. Special Handling Instructions and Additional Information — Waste Profile Sheet Number(s)
a. E13588
b.
c.
d.

D-81

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name	Signature	Date Month	Day
John P. Denham Evniornmental Manager	John P. Denham	06	28

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day
Gerald Schafer	Gerald Schafer	06	28

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month	Day

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Date Month	Day
Danelle Clough	Danelle Clough	6	28

GENERATOR

TRANSPORTER

FACILITY

ORIGINAL-RETURN TO GENERATOR

TOLS003562

32319

BZTO104(e)040383

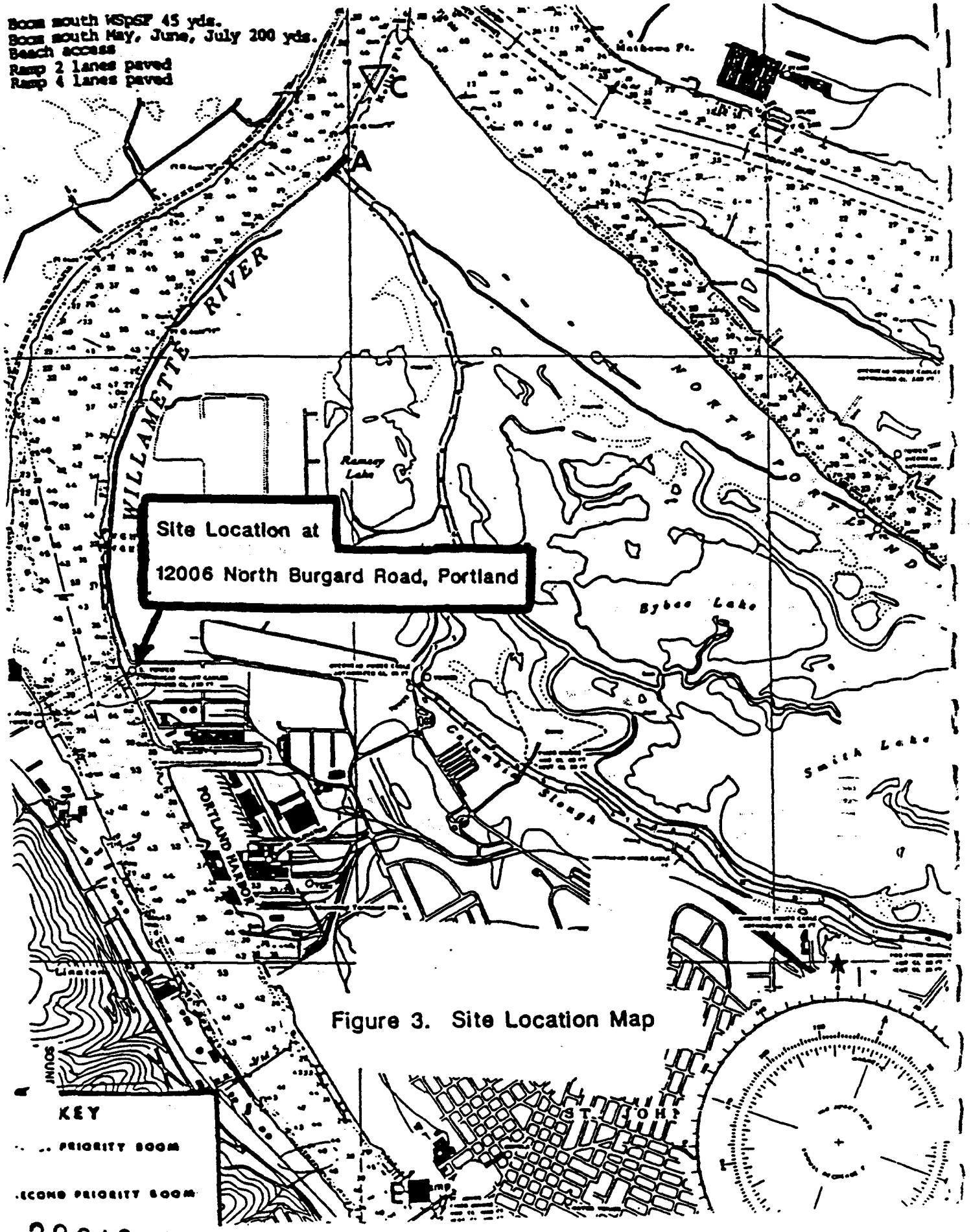


Figure 3. Site Location Map

32319

TOLS003563

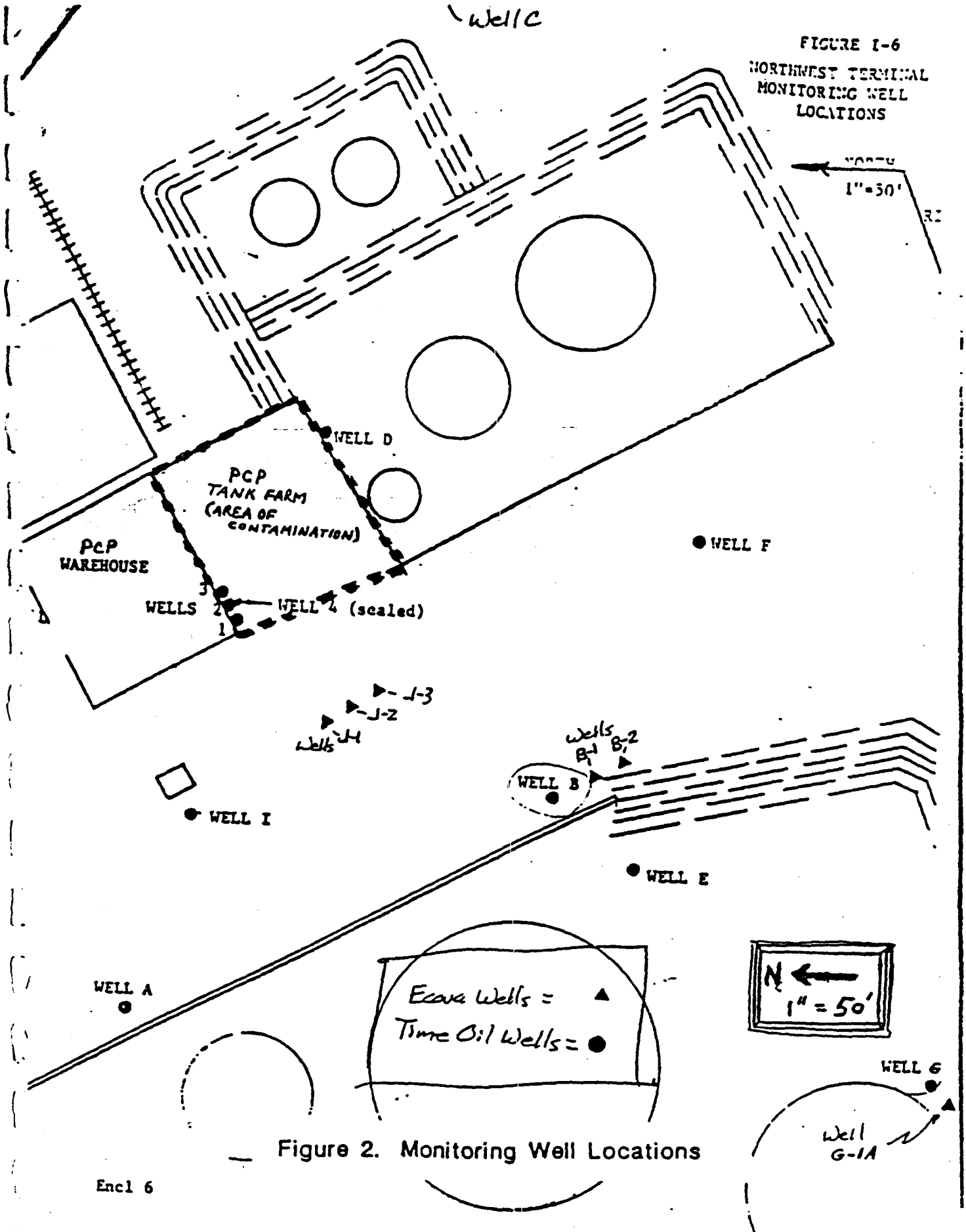


Figure 2. Monitoring Well Locations

Encl 6

TOLS003564

32319

BZTO104(e)040385

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No: O R D 0 0 9 5 9 7 5 4 3 — Manifest Document No.: [illegible]

2. Page 1 of 1 — Information in the shaded area is not required by Federal law

3. Generator's Name and Mailing Address: Time Oil Co. 12005 N. Burgard Road Portland, Oregon 97203

4. Generator's Phone (206) 285-2400

A. State Manifest Document Number

B. State Generator's ID

5. Transporter 1 Company Name: Trocham Transfer Inc.

6. US EPA ID Number: O R D 0 5 0 9 7 3 4 3 7

C. State Transporter's ID

D. Transporter's Phone: (503) [illegible]

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address: Chem-Security Systems, Inc. Star Route Arlington, Oregon 97812

10. US EPA ID Number: ORD 089 452 353

G. State Facility's ID

H. Facility's Phone: 503-454-2643

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	EPA/I Waste
a. RQ Solid Waste Pentachlorophenol Mixture, ORM-E, NA 2020 (RQ 10)	0 0 1	DT (BT)	53840	P	U242
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
a. PCP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above: E13588

AREA	S	D	Q	F	[illegible]
T-10	22	G	F	4	

15. Special Handling Instructions and Additional Information — Waste Profile Sheet Number(s): D-81
a.
b. E13588
c.
d.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name: John P. Denham Enviornmental Manager — Signature: John P. Denham — Date: Month 06 Day 2[illegible]

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Gerald Schafer — Signature: [illegible] — Date: Month 06 Day 2[illegible]

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Date: Month Day

19. Discrepancy Indication Space: There was only 1 DT rec'd, not 4 rec'd. Manifest chgd with John Denham's permission per Joyce Johnson. (BT)

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: Barb Trullinger — Signature: Barb Trullinger — Date: Month 10 Day 2[illegible]

ORIGINAL - RETURN TO GENERATOR

32319

TOLS003565

BZTO104(e)040386

BZTO104(e)040387

TOLS003566

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: ORD009597543 | Manifest Document No.: [illegible]
2. Page 1 of 1

3. Generator's Name and Mailing Address: Time Oil Co. 12005 N. Burgard Road Portland, Oregon 97203
4. Generator's Phone: 206 / 285-2400

A. State Manifest Document Number:
B. State Generator's ID:

5. Transporter 1 Company Name: Grosham Transfer Inc.
6. US EPA ID Number: ORD075097343
C. State Transporter's ID:
D. Transporter's Phone: [illegible]

7. Transporter 2 Company Name:
8. US EPA ID Number:
E. State Transporter's ID:
F. Transporter's Phone:

9. Designated Facility Name and Site Address: Chem-Security Systems, Inc. Star Route Arlington, Oregon 97812
10. US EPA ID Number: ORD 089 452 353
G. State Facility's ID:
H. Facility's Phone: 503-454-2643

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	EPA/L Waste No.
a. RQ Solid Waste Pentachlorophenol Mixture, ORM-E, NA 2020 (RQ 10)	0 0 ~~3~~ 1 (BT)	DT	55700	P	[illegible]
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
a. PCP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above: E13588 | 23.
AREA: T-10 | S: 23 | D: Q | G: C | FR: 4 | LBS: 536 | GAL:

15. Special Handling Instructions and Additional Information — Waste Profile Sheet Number(s)
a. E13588
b.
c.
d.

D-81

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name: John P. Denham Enviornmental Manager | Signature: John P. Denham | Date: Month 06 Day 25 Yr 88

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Bill Morrison | Signature: Bill Morrison | Date: Month 06 Day 25 Yr 88

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: | Signature: | Date: Month Day Yr

19. Discrepancy Indication Space: There was only 1 DT rec'd, not 3 rec'd. Manifest chgd with John Denham's permission per Joyce Johnson. (BT)

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: Barb Trullinger | Signature: Barb Trullinger | Date: Month 7 Day 3 Yr 88

ORIGINAL-RETURN TO GENERATOR

32319

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. ORD 009 597 543 | Manifest Document No. [illegible] | 2. Page 1 of 1

3. Generator's Name and Mailing Address
Time Oil Co.
12005 N. Burgard Road Portland, Oregon 97203

4. Generator's Phone (206) 285-2400

A. State Manifest Document Number

B. State Generator's ID

5. Transporter 1 Company Name: Gresham Transfer Inc.

6. US EPA ID Number: ORD 050 973 437

C. State Transporter's ID

D. Transporter's Phone (503) [illegible]

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address
Chem-Security Systems, Inc.
Star Route
Arlington, Oregon 97812

10. US EPA ID Number: ORD 089 452 353

G. State Facility's ID

H. Facility's Phone: 503-454-2643

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	EPA/ Waste
a. RQ Solid Waste Pentachlorophenol Mixture, CRM-E, NA 2020 (RQ 10)	2 ~~C~~ 2	DT	54320	P	U242
b.					
c.					
d.					

GENERATOR

J. Additional Descriptions for Materials Listed Above
a. PCP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above
WPS E13588 | CU. FT. | 23
AREA T-10 | S 23 | D Q | C | FR 4 | LBS 5 | GAL

15. Special Handling Instructions and Additional Information — Waste Profile Sheet Number(s)
a. E13588
b.
c.
d.

D-81

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name: John P. Denham Enviornmental Manager | Signature: John P. Denham | Date: Month 06 Day 25

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: [illegible] Elgin Taylor | Signature: Elgin Taylor | Date: Month 06 Day 25

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Date: Month Day

FACILITY

19. Discrepancy Indication Space: There was only 1 DT rec'd, not 2 rec'd. Manifest chgd with John Denham's permission pe Joyce Johnson. (BT)

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: Barb Trullinger | Signature: Barb Trullinger | Date: Month 10 Day 26

ORIGINAL-RETURN TO GENERATOR

32319

TOLS003567

BZTO104(e)040388

BZTO104(e)040389

TOLS003568

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: ORD009597543 | Manifest Document No.: [illegible]
2. Page 1 of 1 | Information in the shaded area is not required by Federal law.

3. Generator's Name and Mailing Address:
Time Oil Co.
12005 N. Burgard Road Portland, Oregon 97203

4. Generator's Phone: 206 / 285-2400

A. State Manifest Document Number:

B. State Generator's ID:

5. Transporter 1 Company Name: Gresham Transfer Inc.
6. US EPA ID Number: ORD050973437

C. State Transporter's ID:
D. Transporter's Phone: [illegible]

7. Transporter 2 Company Name:
8. US EPA ID Number:

E. State Transporter's ID:
F. Transporter's Phone:

9. Designated Facility Name and Site Address:
Chem-Security Systems, Inc.
Star Route
Arlington, Oregon 97812

10. US EPA ID Number: ORD 089 452 353

G. State Facility's ID:
H. Facility's Phone: 503-454-2643

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt./Vol.	EPA/1 Waste No.
a. RQ Solid Waste Pentachlorophenol Mixture, CRM-E, NA 2020 (RQ 10)	001	DT	50280	P	U242
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
a. POP Contaminated Soil, Solid
b.
c.
d.

K. Handling Codes for Wastes Listed Above: E13588 | 23

AREA	S	D	C	PR	LBS
FD	23	Q	C	4	GAL

15. Special Handling Instructions and Additional Information — Waste Profile Sheet Number(s): D-81
a. E13588
b.
c.
d.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Printed/Typed Name: John P. Denham Environmental Manager | Signature: John P. Denham | Date: Month 06 Day 25 Year 88

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Gerald Schafer | Signature: Gerald Schafer | Date: Month 06 Day 25 Year 88

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: | Signature: | Date: Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: Barb Trullinger | Signature: Barb Trullinger | Date: Month 6 Day 25 Year 88

ORIGINAL - RETURN TO GENERATOR

32319

CHEM-SECURITY SYSTEMS, INC.
STAR ROUTE
ARLINGTON OR 97812
503/454-2643

NET 30 DAYS AFTER
INVOICE DATE

SERVICE PROVIDED BY:
ARLINGTON FACILITY

TIME OIL CO
12005 N BURGARD RD
PORTLAND OR 97203

450 450 401060
INVOICE NUMBER
1447 06/30/85

850703

SERVICE DATE	REFERENCE NO./DESC	UNIT	QUANTITY	RATE	AMOUNT
06/28/85	0000073874-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	27.95	110.0000	3,074.50
	FEDERAL TAX	OR DRY TON	27.39	2.1300	58.34
				SUBTOTAL	3,132.84
06/28/85	0000073876-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	27.08	110.0000	2,978.80
	FEDERAL TAX	OR DRY TON	26.54	2.1300	56.53
				SUBTOTAL	3,035.33

REMIT TO ADDRESS > P. O. BOX 1866
BELLEVUE WA 98009

PLEASE PAY THIS AMOUNT > 27,270.88

THANK YOU FOR YOUR BUSINESS!

TOLS003569

32319

BZTO104(e)040390

BZTO104(e)040391

TOLS003570

CHEM-SECURITY SYSTEMS, INC.
STAR ROUTE
ARLINGTON OR 97812
503/454-2643

SERVICE PROVIDED BY:
[illegible] FACILITY

NET 30 DAYS AFTER
INVOICE DATE

ALL PAST DUE AMOUNT [illegible] THE MAXIMUM RATE ALLOWED BY LAW WHICHEVER IS LESS

TIME OIL CO
12005 N BURGARD RD
PORTLAND OR 97203

CUSTOMER ACCOUNT NUMBER		
450	450	4010607
INVOICE NUMBER	INVOICE DATE	PAGE
1447	06/30/85	1

350703

VICE DATE	REFERENCE NO./DESC	UNIT	QUANTITY	RATE	AMOUNT
/25/85	0000073813-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	25.22	110.0000	2,774.20
	FEDERAL TAX	OR DRY TON	24.72	2.1300	52.65
				SUBTOTAL	2,826.85 *
26/85	0000073825-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	27.05	110.0000	2,975.50
	FEDERAL TAX	OR DRY TON	26.51	2.1300	56.47
				SUBTOTAL	3,031.97 *
6/85	0000073826-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	26.83	110.0000	2,951.30
	FEDERAL TAX	OR DRY TON	26.29	2.1300	56.00
				SUBTOTAL	3,007.30 *
26/85	0000073848-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	26.96	110.0000	2,965.60
	FEDERAL TAX	OR DRY TON	26.42	2.1300	56.27
				SUBTOTAL	3,021.87 *
/27/85	0000073850-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	27.71	110.0000	3,048.10
	FEDERAL TAX	OR DRY TON	27.16	2.1300	57.85
				SUBTOTAL	3,105.95 *
27/85	0000073851-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	27.14	110.0000	2,985.40
	FEDERAL TAX	OR DRY TON	26.60	2.1300	56.66
				SUBTOTAL	3,042.06 *
/28/85	0000073873-01	PCP CONTAMINATED SOIL		PDX-E13588	
	DISPOSAL SERVICES	OR TONS	27.36	110.0000	3,009.60
	FEDERAL TAX	OR DRY TON	26.81	2.1300	57.11
				SUBTOTAL	3,066.71 *

TO
BESS
P. O. BOX 1866
BELLEVUE WA 98009

PLEASE PAY
THIS AMOUNT

CONTINUED

NK YOU FOR YOUR BUSINESS!

ORIGINAL INVOICE

32319

LEGAL

DATE: 28 DEC 84

LAB #: 84-1828
ITEM #: 5
SAMPLE: 21869

14/49

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003571

BZTO104(e)040392

LEGAL

15/49

DATE: 28 DEC 84

LAB #: 84-1833
ITEM #:5
SAMPLE:21869

PESTICIDES
METHOD 625.
EITRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003572

BZTO104(e)040393

LEGAL

16/49

28 DEC 84

GC/MS SCAN ID

84-1020 Z1009

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 10 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

LEGAL

17/49

DATE: 28 DEC 84 DJH

LAB #: 84-1033
ITEM #: 6
SAMPLE: Z1810

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003574

BZTO104(e)040395

LEGAL

18/49

DATE: 28 DEC 84

LAB #: 84-1833
ITEM #: 6
SAMPLE: 21818

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003575

BZTO104(e)040396

LEGAL

19/49

DM

28 DEC 84

GC/MS SCAN ID

84-1020 Z1010

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 10 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

32319

TOLS003576

LEGAL

DATE: 03 JAN 85

LAB #: 84-1828
ITEM #: 7
SAMPLE: Z1011

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003577

BZTO104(e)040398

LEGAL

21/29

DATE: 03 JAN 85

LAB #: 84-1020
ITEM #: 7
SAMPLE: Z1011

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT UG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003578

LEGAL

2749

8/11

03 JAN 85

GC/MS SCAN ID

84-1020 Z1011

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

DATE: 03 JAN 85

LAB #: 84-1028
ITEM #: 8
SAMPLE: 21012

LEGAL

23/49

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT UG/KG	PARAMETER	AMOUNT UG/KG	PARAMETER
<1	PHENOL	<1	2,4,6-TRICHLOROPHENOL
<1	2-CHLOROPHENOL	<1	2,4-DINITROPHENOL
<1	2-NITROPHENOL	<1	4-NITROPHENOL
<1	2,4-DIMETHYLPHENOL	<1	2-METHYL-4,6-DINITROPHENOL
<1	2,4-DICHLOROPHENOL	<1	PENTACHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL	<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT UG/KG	PARAMETER	AMOUNT UG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER	<1	ACENAPHTHENE
<1	1,3-DICHLOROBENZENE	<1	2,4-DINITROTOLUENE
<1	1,4-DICHLOROBENZENE	13	FLUORENE
<1	1,2-DICHLOROBENZENE	<1	DIETHYLPHTHALATE
<1	HEXACHLOROETHANE	<1	N-NITROSODIPHENYLAMINE
<1	N-NITROSO-DI-N-PROPYLAMINE	<1	4-BROMOPHENYL PHENYL ETHER
<1	NITROBENZENE	<1	HEXACHLOROBENZENE
<1	ISOPHORONE	14	PHENANTHRENE
<1	BIS(2-CHLOROETHOXY) METHANE	105	ANTHRACENE
<1	1,2,4-TRICHLOROBENZENE	<1	DIBUTYL PHTHALATE
<1	NAPHTHALENE	<1	FLUORANTHENE
<1	HEXACHLOROBUTADIENE	<1	PYRENE
<1	HEXACHLOROCYCLOPENTADIENE	<1	BUTYL BENZYL PHTHALATE
<1	2-CHLORONAPHTHALENE	<1	BENZ(A)ANTHRACENE
<1	ACENAPHTHYLENE	<1	CHRYSENE
<1	DIMETHYLPHTHALATE	<1	3,3'-DICHLOROBENZIDINE
<1	2,6-DINITROTOLUENE	<1	BIS(2-ETHYLHEXYL) PHTHALATE
		<1	BENZ(A)PYRENE

32319

TOLS003580

BZTO104(e)040401

LEGAL

24/49

DATE: 03 JAN 85

LAB #: 84-1828
ITEM #: 8
SAMPLE: 21912

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003581

BZTO104(e)040402

LEGAL

25/49

DJH

03 JAN 85

GC/MS SCAN ID

84-1020 Z1012

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

32319

TOLS003582

BZTO104(e)040403

LEGAL

26/49

DATE: 03 JAN 85

LAB #: 84-1828
ITEM #: 9
SAMPLE: 21818

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
515	PENTACHLOROPHENOL
12	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
3	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003583

BZTO104(e)040404

LEGAL

27/49

DATE: 03 JAN 85

LAB #: 84-1028
ITEM #: 9
SAMPLE: Z1818

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003584

BZTO104(e)040405

LEGAL

28/49

DJH

03 JAN 85

GC/MS SCAN ID

84-1020 Z1018

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/L. THE FOLLOWING COMPOUNDS WERE TENTATIVELY IDENTIFIED WITH THE ESTIMATED CONCENTRATIONS SHOWN.

COMPOUND	MG/KG
DODECANE	6
TRIDECANE	8
PENTADECANE	6

32319

TOLS003585

BZTO104(e)040406

DATE: 03 JAN 83

LAB #: 84-1828
ITEM #: 10
SAMPLE: 21817

LEGAL

29/49

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
1820	PENTACHLOROPHENOL
71	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003586

BZTO104(e)040407

LEGAL

30/49

DATE: 03 JAN 85

LAB #: 84-1628
ITEM #: 18
SAMPLE: I1617

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003587

BZTO104(e)040408

LEGAL

31/49

03 JAN 85

GC/MS SCAN ID

84-1020 Z1017

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/L. THE FOLLOWING COMPOUNDS WERE TENTATIVELY IDENTIFIED WITH THE ESTIMATED CONCENTRATIONS SHOWN.

COMPOUND	MG/KG
1-ETHYL-4-METHYLCYCLOHEXANE	10
2,6-DIMETHYLOCTANE	10
4-METHYLNONANE	8
1-METHYL-4-(1-METHYLETHYL)CYCLOHEXANE	12
4-METHYLDECANE	36
BUTYLCYCLOHEXANE	14
5-METHYLDECANE	15
3-METHYLDECANE	8
UNDECANE	18
OCTYLCYCLOPROPANE	53

THE SAMPLE ALSO CONTAINED NUMEROUS OTHER COMPOUNDS NOT IDENTIFIED. THE PATTERN, HOWEVER, WAS INDICATIVE OF A SOLVENT MIXTURE SIMILAR TO PAINT THINNER.

32319

TOLS003588

DATE: 02 JAN 85

LAB #: 84-1820
ITEM #: 11
SAMPLE: 21816

LEGAL

32/49

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003589

BZTO104(e)040410

33/49

DATE: 02 JAN 85

LEGAL

LAB #: 84-1020
ITEM #: 11
SAMPLE: Z1016

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003590

LEGAL

34/39

DJH

02 JAN 85

GC/MS SCAN ID

84-1020 Z1016

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

32319

TOLS003591

BZTO104(e)040412

LEGAL

DATE: 02 JAN 85

LAB #: 84-1020
ITEM #: 12
SAMPLE: Z1004

35/89

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT UG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
<1	PENTACHLOROPHENOL
<1	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT UG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

32319

TOLS003592

LEGAL

36/49

DATE: 02 JAN 85

DJH

LAB #: 84-1859
ITEM #: 12
SAMPLE: Z1864

PESTICIDES
METHOD 625
EXTRACTED BY RCRA 3540

AMOUNT MG/KG	PARAMETER
<5	ALPHA-BHC
<5	HEPTACHLOR
<5	ALDRIN
<5	HEPTACHLOR EPOXIDE
<5	ENDOSULFAN I
<5	TRANS-NONACHLOR
<5	P,P'-DDE
<5	DIELDRIN
<5	ENDRIN
<5	ENDOSULFAN II
<5	P,P'-DDD
<5	ENDOSULFAN CYCLIC SULFATE
<5	P,P'-DDT
<5	GAMMA-BHC (LINDANE)

32319

TOLS003593

BZTO104(e)040414

37/49

LEGAL

02 JAN 85

GC/MS SCAN ID

84-1020 Z1004

THE WATER SAMPLE WAS EXTRACTED BY EPA RCRA PROCEDURE 3540 (ACETONE/HEXANE) AND ANALYZED BY GC/MS. IN ADDITION TO THE PRIORITY POLLUTANT CHEMICALS, THE SAMPLE WAS SCANNED FOR ANY OTHER UNKNOWNS ABOVE THE DETECTION LIMIT OF 1.0 MG/KG. NO UNKNOWNS WERE IDENTIFIED ABOVE THAT DETECTION LIMIT.

TOLS003594

32319

LEGAL

38/49

DATE: 14 JAN 85

LAB #: 84-1020
ITEM #: 1
SAMPLE: I1020

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.5	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003595

BZTO104(e)040416

LEGAL

39/49

DATE: 14 JAN 85

LAB #: 84-1628
ITEM #: 2
SAMPLE: Z1#87

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.25	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003596

BZTO104(e)040417

LEGAL

40/99

DATE: 14 JAN 85

LAB #: 84-1828
ITEM #: 3
SAMPLE: 21819

RZK

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.5	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003597

BZTO104(e)040418

LEGAL

41/49

DATE: 14 JAN 85

LAB #: 84-1829
ITEM #: 4
SAMPLE: Z1868

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.25	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003598

BZTO104(e)040419

LEGAL

42/49

DATE: 14 JAN 85

LAB #: 84-1828
ITEM #: 5
SAMPLE: 21989

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.25	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003599

BZTO104(e)040420

LEGAL

43/49

DATE: 14 JAN 85

LAB #: 84-1828
ITEM #: 6
SAMPLE: Z1818

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.25	PCB GROUP 1
<0.1	PCB GROUP 2
.89	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
.89	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003600

BZTO104(e)040421

LEGAL

44/49

DATE: 14 JAN 85

LAB #: 84-1020
ITEM #: 7
SAMPLE: Z1011

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.25	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

TOLS003601

32319

BZTO104(e)040422

LEGAL

45/49

DATE: 14 JAN 85

LAB #: 84-1826
ITEM #: 8
SAMPLE: Z1812

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.75	PCB GROUP 1
<0.25	PCB GROUP 2
<0.15	PCB GROUP 3
<0.15	PCB GROUP 4
<0.15	PCB GROUP 5
0.	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

TOLS003602

32319

BZTO104(e)040423

LEGAL

46/49

DATE: 14 JAN 85

LAB #: 84-1829
ITEM #: 9
SAMPLE: Z1818

PCB'S
METHOD 608

AMOUNT NG/KG	PARAMETER
<10	PCB GROUP 1
<10	PCB GROUP 2
<5	PCB GROUP 3
<5	PCB GROUP 4
<5	PCB GROUP 5
0	*TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003603

BZTO104(e)040424

LEGAL

47/49

DATE: 14 JAN 85

LAB #: 84-1029
ITEM #: 10
SAMPLE: Z1017

RSK

PCB'S
METHOD 608

AMOUNT MG/KG	PARAMETER
<100	PCB GROUP 1
<100	PCB GROUP 2
<50	PCB GROUP 3
<50	PCB GROUP 4
<50	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

TOLS003604

32319

BZTO104(e)040425

LEGAL

48/49

DATE: 14 JAN 85

LAB #: 84-1020
ITEM #: 11
SAMPLE: Z1016

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.25	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003605

BZTO104(e)040426

LEGAL

49/49

DATE: 14 JAN 85

LAB #: 84-1020
ITEM #: 12
SAMPLE: 21004

PCB'S
METHOD 608

AMOUNT UG/KG	PARAMETER
<0.5	PCB GROUP 1
<0.1	PCB GROUP 2
<0.05	PCB GROUP 3
<0.05	PCB GROUP 4
<0.05	PCB GROUP 5
0	TOTAL PCB

PCB GROUP 1 INCLUDES PCB 1221 AND IS CALCULATED AS 1221.
PCB GROUP 2 INCLUDES PCB 1232 AND IS CALCULATED AS 1232.
PCB GROUP 3 INCLUDES PCB'S 1016, 1242, AND 1248 AND IS CALCULATED AS 1242.
PCB GROUP 4 INCLUDES PCB 1254 AND IS CALCULATED AS 1254.
PCB GROUP 5 INCLUDES PCB'S 1260 AND 1262 AND IS CALCULATED AS 1260.

32319

TOLS003606

BZTO104(e)040427

STATE OF OREGON

DEPARTMENT OF ENVIRONMENTAL QUALITY — INTEROFFICE MEMO

TO: Debbie Flood, Superfund Program Management Section, EPA-Region X

DATE: February 12, 1985

FROM: John L. Smits
Northwest Region, DEQ

SUBJECT: HW - 3012 Superfund
Time Oil Company
ORD 009597543
Multnomah County

Time Oil Company operates a petroleum products storage terminal at 12005 N. Burgard, Portland, Oregon 97203. The terminal occupies a 51.53-acre site along the east bank of the Willamette River and is owned by Time Oil Co., PO Box 24447 Terminal Annex, Seattle, Washington 98124. The present capacity of the terminal in 30+ tanks is 770,000 barrels.

The on-site inspection was conducted on Oct. 25, 1984. John Denham, environmental manager who has worked for Time Oil since 1970 and Neil Wallis, terminal manager employed by Time Oil since 1979 were interviewed. Time Oil Co. acquired the site during 1959. Mr. Denham provided by letter dated Nov. 7, 1984, the attached chart which lists the tanks by number and indicates the types of chemicals stored in each since 1973. As can be seen from the chart, most tanks have held a number of different chemicals at different times. For example, tank no. 4408 held the following during the period:

1973	Methanol
1974	Jet fuel
1975	Premium gasoline
1976-78	Unleaded gasoline
1979-80	Fuel oil no. 2
1981-83	Empty

The terminal has handled the following chemicals:

Fatty acid (wood byproduct)	Liquid fertilizer (ammonium nitrate)
Isobutanol	Lignin liquor
Jet fuel	Lube oil
Methanol	Methyl 10
Premium gasoline	Pentachlorophenol
Regular gasoline	Solvent (xylene, toluene)
Turpentine	Unleaded gasoline
Butyl alcohol	

A number of the substances that have been and are stored at this Time Oil terminal are hazardous substances due to ignitability or toxicity.

TOLS003607

32319

BZTO104(e)040428

It appears that several arrangements have been made at the terminal related to product handling. Time Oil may lease a tank to a company like Chevron with the stored product owned by Chevron and handling, distribution and storage services performed by Time Oil. Time may control the tank, own the product and distribute the product, or rent a tank for storage only.

In the case of tanks 50067 and 10002, Time Oil Co. leased the tanks and possibly that portion of the tank farm site to Crosby and Overton of 5420 N. Lagoon, Portland, Oregon 97217. The same tanks appear to have been leased prior to this time by Pac-Mar, the previous name of Crosby and Overton. The Department has been unable to obtain a copy of the lease agreement. Crosby and Overton provides the service of collecting and then storing waste oils from separators, oil slop tanks, ship tank cleaning, etc. The two tanks appear to have been leased to Crosby and Overton since 1973.

Several smaller tanks, no. 20001, 20002 and 20003 having a capacity of 20,000 gal. each were leased to Koppers Co., Inc., of 5137 Southwest Ave., St. Louis, MO 63110. Several smaller, above-ground, horizontal oriented tanks in this area belong to Koppers Co. as well. According to Mr. Denham, Time Oil Co. formulated pentachlorophenol for Koppers to Koppers specifications and then handled or stored the formulations for later pickup by customers of Koppers.

The 20,000-gal. tanks were present during the Oct. 25, 1984 site inspection (reportedly empty) but had been removed from the site prior to the Dec. 12, 1984 soil sampling event. There was visually obvious contamination of the soil by incidental spills and slops in this former pentachlorophenol handling area. The level of contamination will be discussed later in this narrative.

Present Waste Management Practices

Since around December 1972, all tanks (except 50067 and 10002 leased to Crosby and Overton and the smaller tanks leased to or belonging to Koppers Company), the loading rack area and the pump house have been connected to a water draw system. A water draw box and water draw fittings are located beside each tank. These in turn are connected to a drainage piping network in place throughout the terminal. About once each year, water is drawn from the bottom of each tank and pumped to slop tank 3007 located in the northwest terminal area, or to tank 1406 in the area known as the Bell Oil Terminal. A portable Fram-Akers oil/water separator is periodically connected to the slop tank. The separated oil is either piped back to the appropriate storage tank or to an underground 3000-gal. separator tank near tank 3007 or an above-ground separator tank no. 1407 beside tank 1506. Water removed by the separator which contains less than 100 ppm ether soluble oil is by agreement discharged by a piping system to the City of Portland sanitary sewer system for treatment at the publicly owned treatment works (POTW). Two sampling manholes associated with two sewer lines are periodically monitored by staff with the City Dept. of Public Works. Waste oil from the separator is periodically removed from the underground 3000-gal. tank and above-ground tank 1507, and taken by Crosby and Overton to the tanks 50067 or 10002 that they lease from Time Oil on

the same site area. Alternately, a vacuum truck may be connected directly to the oil/water separator with waste oils transported to the Crosby and Overton tanks.

There is also an underground 6000-gal. spill prevention control and countermeasure (SPCC) tank associated with the off-shore pier to hold any spills and storm water that may be collected during ship loading/unloading. An 8000-gal. underground SPCC tank is located near the pump house and truck loading rack to collect any spills and storm water from those areas. The rail spur line recently constructed with curbing and spill drains has an underground 12,000-gal. tank for containment of any spills in that area. The loading rack area of the Bell Oil Terminal section was proposed to be equipped with an underground 4000-gal. slop and water tank. This section of the terminal has not been in use for quite some time.

Time Oil Co. on Aug. 11, 1980, completed EPA Form 8700-12, Notification of Hazardous Waste Activity, as required by RCRA 3010 listing specific source wastes, K051 - API separator sludge, K052 - tank bottoms (leaded) and P090 - pentachlorophenol. On Feb. 22, 1982, Time Oil requested assignment of a generator identification number by correspondence with the Department of Environmental Quality.

Past Waste Management Practices

According to Mr. Denham, there are no retrievable inventory records of product storage for the period 1959 to 1973. He agreed that it can be assumed similar products were stored on-site in a pattern like that shown on the 1973 to 1983 chart provided by Time Oil Co.

Prior to the installation of the draw water system for each tank, associated piping and use of the portable oil/water separator in late 1972, wastewater from tank bottoms was allowed to spill onto the ground around the site. This practice was apparently common to oil terminal facilities in the area until Oregon DEQ began to work in 1970-71 with terminals to discontinue discharge into public waters and onto ground surfaces. This practice apparently occurred at the Time Oil terminal during the period from 1959 to late 1972. A Feb. 16, 1971 internal memo describes a conversation with the plant engineer employed by Time Oil at that time that confirms the discharge of draw water from tank bottoms onto the ground but states further that the company maintained no such effluent discharged to the river, drainage ditch or storm sewer.

In view of the wasting of water from tank bottoms onto the soil surface for a period of up to 13 years, and the storage of leaded gasoline at one time or another in most of the tanks, a decision was made to collect soil samples in a somewhat random grid fashion throughout the terminal area. Samples were also collected in the area near tanks used by Crosby and Overton and those leased to Koppers to store pentachlorophenol formulations.

Sampling

At each of 12 locations, a composite soil sample using a soil core was collected. The composite was made up of the surface and 1, 2 and 3 foot intervals. Samples were collected and analyzed by the DEQ laboratory. Analysis of each sample included base-neutral extractables, pesticides/PCBs (method 608), acid extractables, pesticides (method 625) and EP Toxicity for lead. An effort was also made to identify and quantify any other organic chemical observed with the extraction/GC (gas chromatograph) MS (mass spectrometer) procedures.

All 12 soil samples tested for EP Toxicity lead showed concentrations of <0.1 mg/l. Concentrations of 5 mg/l or greater for EPA Toxic lead are classified as hazardous waste. The detection limit for this procedure is 0.1 mg/l.

Of 12 soil samples tested for pesticides, method 625, extracted by RCRA method 3540, all showed concentrations of <5 mg/kg (the detection limit) of these pesticides.

Samples tested for acid extractables method 625, extracted by RCRA method 3540 (acetone/hexane) showed all 12 sites to contain <1 mg/kg (detection limit) for these phenol species except item 9, sample Z1018 collected 19 ft. NE of tank 50067 (Crosby and Overton leased tank) contained 515 mg/kg pentachlorophenol and 12 mg/kg tetrachlorophenol. Item 10, sample Z1017 contained 1820 mg/kg pentachlorophenol and 71 mg/kg tetrachlorophenol collected at the site of the tanks leased to Koppers for storage of pentachlorophenol formulations.

Of the soil samples collected and analyzed for base-neutral extractables, method 625, extracted by RCRA method 3540 all showed concentrations of this group of pollutants to be less than the detection limit (< 1 mg/kg) except the following tanks showed:

No. 20511 - Item 4, soil bag Z1008

Isophorone	1 mg/kg
2,4-dinitrotoluene	3 mg/kg
Fluorene	1 mg/kg
n-nitrosodiphenylamine	2 mg/kg
Phenanthrene	1 mg/kg
Anthracene	1 mg/kg

No. 15002 - Item 8, soil bag Z1012

Fluorene	13 mg/kg
Phenanthrene	14 mg/kg
Anthracene	105 mg/kg

Crosby and Overton

No. 50067 - Item 9, soil bag Z1018

Chrysene	1 mg/kg
Bis(2-ethylhexyl)phthalate	3 mg/kg

32319

TOLS003610

BZTO104(e)040431

Although polychlorinated biphenyls (PCBs) were detected at several soil sample sites, total PCBs were well below the 50 mg/kg concentration which requires handling.

At each sample site, in addition to the priority pollutant chemicals, the sample was scanned for any other unknowns above the detection limit of 1.0 mg/l. In the case of 3 sample sites, 4 (Z1008), 9 (Z1018) and 10 (Z1017), a number of other chemicals were tentatively identified and estimated concentrations determined. These results are shown on the attached lab sheets.

Crosby and Overton Leased Tanks

During 1983 on an as yet unspecified date, an individual was allegedly exposed to a substance while cutting an access hole into tank no. 10002 leased to Crosby and Overton by Time Oil Co. The hole was reportedly cut to remove the substance inside. Allegedly, the individual developed immediate symptoms involving skin irritation. Reportedly, the individual returned to the tank some time later and collected three (3) soil samples near the tank. Those soil samples were said analyzed by CH2M/Hill. CH2M/Hill reported PCB concentrations of 29.4 mg/kg, 584, mg/kg and 1060 mg/kg (disposal restrictions apply when PCB concentrations exceed 50 mg/kg).

On May 2, 1984, DEQ laboratory staff collected samples at the Crosby and Overton tank in question. A soil sample 10 ft. from the apparent access hole cut into the tank showed a total PCB concentration of 59.7 mg/kg. Sludge collected on a surface 4 ft. from the edge of the tank entry hole showed a total PCB concentration of 1357 mg/kg.

Detection of PCB near the tank resulted in review of past waste oil disposal records involving the Crosby and Overton tank. The records showed disposal of 210,000 gal. of petroleum-based sludge by Crosby and Overton at the St. Johns Municipal Landfill located on Columbia Blvd. in Portland, Oregon. An application for disposal of special wastes at the landfill was approved by the Metropolitan Service District (Metro) Aug. 10, 1983, following review of sample analysis of the tank contents which showed PCB concentrations to be <1 ppm.

During Sept. 1984, the area at the St. Johns Landfill believed to contain the 210,000 gal. of petroleum sludge was extensively sampled and analyzed for PCBs. The presence of PCBs in the areas tested was not confirmed.

Assessment

There are problems at the Time Oil Co. terminal associated with the past handling of hazardous substances. The long-time discharge of tank bottom draw water onto the ground surface within the terminal area may have impacted groundwater below the site. This could not be confirmed using the sampling equipment available. Surface soil samples did not detect any significant concentrations of priority pollutants to depths of three (3) feet that might be expected within a tank farm that had discharged wastewater onto the ground. As mentioned above under the Sampling section, priority pollutants and other organic chemicals were found in some areas.

The soil on-site appears to be dredge sand that has been in place for many years. Lenses of silt were observed within the 3-ft. sample. The silt appeared to perch water at some sample sites. The permanent groundwater table is apparently about 20 ft. below the land surface. Downgradient groundwater usage could not be confirmed.

Based on past practices of draw water disposal, presence of some contaminants within the upper surface and shallow depth of groundwater, it is recommended that construction of groundwater monitoring wells be seriously considered to better characterize the extent of pollution.

Pentachlorophenol is present in high concentrations within the soil in the area of the tanks leased to Koppers Co. and those leased to Crosby and Overton. These areas need cleanup of the spilled hazardous wastes. Cleanup should include careful evaluation of the effectiveness of the removal including groundwater sampling. Further review of the alleged incident involving presence of PCB at the Crosby and Overton tanks appears to be warranted.

During a Jan. 28, 1985, phone conversation with John Denham of Time Oil, the detection of pentachlorophenol was discussed. He told me the company realized the waste was present on the ground and soil some time ago. Denham also told me that after this information became available, Time had cancelled the contract to handle pentachlorophenol and its ingredients for Koppers as well as the lease of tanks. Denham stated that tanks have been cleaned out and removed and the remaining tanks will be moved out soon and cleanup of the area will start. It was suggested that this information be sent by letter to the Northwest Region of DEQ including proposed cleanup methods and time schedule. He said he would do that after reviewing sampling results.

Backlog Reduction

It is recommended that Time Oil Co. (ORD 009597543) be placed into backlog reduction category B-5. Problems involving hazardous wastes are present. The State of Oregon DEQ, Northwest Region, has the regulatory authority to investigate hazardous waste handling/disposal and to require remedial cleanup action. Northwest Region of DEQ fully intends to follow up this assessment and work with the company to establish necessary monitoring and cleanup.

The site does not appear to present a hazard to the health of the general public by direct contact with wastes present due to the security of fences, 24-hr/day staffing of the site and a watchman service. The threat to the environment appears to be related to the potential impact to groundwater. Groundwater impact needs to be further evaluated.

At this time, it does not appear that further involvement of the RCRA 3012 program will be necessary.

RC2044
Attachment
cc: Northwest Region, DEQ
Hazardous Waste Operations, DEQ
Time Oil Co.
Crosby and Overton

32319

TOLS003612

BZTO104(e)040433

FEB. 1, 1990

~~Ur 24 (-) 1990~~

[illegible] WASTE MATERIAL PROFILE SHEET

[illegible] 13533

GENERAL INFORMATION

GENERATOR NAME: Time Oil Co. | TRANSPORTER: Gresham Transfer Inc.

FACILITY ADDRESS: 12005 N. Burgard Rd. Portland, OR | TRANSPORTER PHONE: (503) 255-7900

GENERATOR USEPA ID: O R D 0 0 9 5 9 7 5

GENERATOR STATE ID:

TECHNICAL CONTACT: John P. Denham | TITLE: Environmental Manager | PHONE: (206) 285-2400

NAME OF WASTE: PCP contaminated soil

PROCESS GENERATING WASTE: Clean up of contaminated site at 12005 N. Burgard Road

B PHYSICAL CHARACTERISTICS OF WASTE

COLOR

ODOR: ☐ NONE ☐ MILD ☐ STRONG DESCRIBE

PHYSICAL STATE @ 70°F: ☒ SOLID ☐ SEMI SOLID ☐ LIQUID ☐ POWDER

LAYERS: ☐ MULTILAYERED ☐ BILAYERED ☒ SINGLE PHASED

FREE LIQUIDS: ☐ YES ☒ NO VOLUME

PH: ☐ < 2 ☐ 2-10 ☒ 7-9 ☐ > 12.5 ☐ EXACT

SPECIFIC GRAVITY: ☐ < .8 ☐ .8-1.0 ☒ 1.1-1.2 ☐ 1.3-1.4 ☐ 1.5-1.7 ☐ > 1.7 ☐ EXACT

FLASH POINT: ☐ < 70°F ☐ 70°F - 100°F ☐ 101°F - 139°F ☐ 140°F - 200°F ☐ > 200°F ☒ NO FLASH ☐ EXACT ☐ CLOSED CUP ☐ OPEN CUP

C CHEMICAL COMPOSITION (TOTALS MUST ADD TO 100%)

Contaminated soil	
pentachlorophenol	.1820
tetrachlorophenol	.0071
trace amounts of other	
chlorinated chemicals less than	.0001
Non-contaminated soil	99.812

D METALS ☐ TOTAL (PPM) ☐ EPA EXTRACTION PROCEDURE (mg/l)

ARSENIC (As)	-0-	SELENIUM (Se)	-0-
BARIUM (Ba)	-0-	SILVER (Ag)	
CADMIUM (Cd)	-0-	COPPER (Cu)	-0-
CHROMIUM (Cr)	-0-	NICKEL (Ni)	-0-
MERCURY (Hg)	-0-	ZINC (Zn)	-0-
LEAD (Pb)	-0-	THALLIUM (Tl)	-0-
CHROMIUM-HEX (Cr + 6)	-0-		

E OTHER COMPONENTS - TOTAL (PPM)

CYANIDES	-0-	PCB'S	-0-
SULFIDES	-0-	PHENOLICS	-0-

F SHIPPING INFORMATION

DOT HAZARDOUS MATERIAL? ☒ YES ☐ NO

PROPER SHIPPING NAME: Waste pentachlorophenol mixture

HAZARD CLASS: ORM-E ID NO: NA 2020 RQ: 10 lbs

METHOD OF SHIPMENT: ☐ BULK LIQUID ☒ BULK SOLID ☐ DRUM TYPE SIZE:

ANTICIPATED VOLUME: GALS: 260 CUBIC YARDS: OTHER:

PER: ☒ ONE TIME ☐ WEEK ☐ MONTH ☐ QUARTER ☐ YEAR ☐

G HAZARDOUS CHARACTERISTICS

REACTIVITY: ☒ NONE ☐ PYROPHORIC ☐ SHOCK SENSITIVE ☐ EXPLOSIVE ☐ WATER REACTIVE ☐ OTHER

OTHER HAZARDOUS CHARACTERISTICS: ☒ NONE ☐ RADIOACTIVE ☐ ETIOLOGICAL ☐ PESTICIDE MANUFACTURING WASTE ☐ OTHER

USEPA HAZARDOUS WASTE? ☒ YES ☐ NO

USEPA HAZARDOUS CODES: U242

STATE HAZARDOUS WASTE? ☒ YES ☐ NO

STATE CODES: U 242

SPECIAL HANDLING INFORMATION

☐ ADDITIONAL PAGES ATTA

I HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN ITEMS 1 AND ALL ATTACHED DOCUMENTS IS COMPLETE AND ACCURATE, AND THAT ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED

AUTHORIZED SIGNATURE | TITLE | DATE

32319

TOLS003613

BZTO104(e)040434

WASTE PROFILE SHEET

CERTIFICATION OF REPRESENTATIVE SAMPLE

GENERAL DIRECTIONS: IN ORDER TO DETERMINE WHETHER WE CAN ACCEPT THE SPECIAL WASTE IDENTIFIED IN THE ABOVE NUMBERED PROFILE SHEET, WE MUST OBTAIN A REPRESENTATIVE SAMPLE OF THE WASTE WE WILL ANALYZE THE SAMPLE TO VERIFY THE INFORMATION YOU HAVE PROVIDED US, SO IT IS PARTICULARLY IMPORTANT THAT THE SAMPLE BE TRULY REPRESENTATIVE. IN MOST CIRCUMSTANCES YOU WILL BE OBTAINING THE SAMPLE. HOWEVER, IN THOSE CASES IN WHICH WE OBTAIN THE SAMPLE, WE MUST ASK THAT ONE OF YOUR EMPLOYEES BE PRESENT TO DIRECT THE PARTICULAR SOURCE TO BE SAMPLED AND TO WITNESS THE SAMPLING. IN SUCH CASE, YOUR EMPLOYEE MUST SIGN THIS CERTIFICATION AS A WITNESS.

THIS CERTIFICATION MUST BE RETURNED, WITH THE REPRESENTATIVE WASTE SAMPLE, TO:

THE UNDERSIGNED CERTIFIES THAT HE/SHE OBTAINED A REPRESENTATIVE SAMPLE OF THE WASTE MATERIAL DESCRIBED IN THE "GENERATOR'S WASTE MATERIAL PROFILE SHEET" ABOVE REFERENCED, AND THAT THE FOLLOWING REPRESENTATIONS ARE TRUE AND CORRECT:

1. HOUR AND DATE OF SAMPLING: 0930 Hours, February 19, 1985
2. SOURCE FROM WHICH SAMPLE TAKEN: 12005 N. Burgard Road, Portland Oregon, pentachlorophenol area shown on attached plot plan.
3. EQUIPMENT AND SAMPLING METHOD USED: Shovel and can used. Surface, one foot and two foot representative samples obtained, mixed together and placed in can.
4. AMOUNT OF SAMPLE OBTAINED: One (1) gallon.
5. TYPE OF CONTAINER INTO WHICH SAMPLE WAS PLACED: New one gallon paint can
6. THE SAMPLING EQUIPMENT USED, AND THE CONTAINER INTO WHICH THE SAMPLE WAS PLACED, WERE THEMSELVES UNCONTAMINATED BEFORE USE. Yes.
7. AT THE TIME OF SAMPLING I AFFIXED A LABEL TO THE CONTAINER IN THE FOLLOWING FORM WITH THE FOLLOWING INFORMATION (FILL IN THIS PORTION, INCLUDING YOUR SIGNATURE, JUST AS IT APPEARS ON THE LABEL YOU PREPARED):

GENERATOR: Time Oil Co.
WASTE NAME: Pentachlorophenol mixture.
SAMPLE HOUR/DATE: 0930 Hours, Feb. 19, 1985
PROFILE SHEET CODE: E13588
SAMPLER SIGNATURE: Neil E. Wallis

WITNESS VERIFICATION: I WAS PERSONALLY PRESENT DURING THE SAMPLING DESCRIBED; I DIRECTED THE WASTE SOURCE TO BE SAMPLED; AND I VERIFY THE INFORMATION ABOVE NOTED.

WITNESS: John H. Somes
SIGNATURE: John H. Somes
TITLE: General Manager
EMPLOYER: North West Vacuum Truck Service
DATE: February 19, 1985

SAMPLER NAME: Neil E. Wallis
SIGNATURE: Neil E. Wallis
TITLE: Terminal Manager
EMPLOYER: Time Oil Co.
DATE: February 19, 1985

LABORATORY REVIEW OF SAMPLING PROTOCOL

BASED UPON MY REVIEW OF THE ABOVE PROFILE SHEET, I CONCLUDE THAT THE ABOVE METHODOLOGY IS:

☐ ADEQUATE FOR YIELDING A REPRESENTATIVE SAMPLE.
☐ INADEQUATE FOR THE REASONS NOTED HEREON.

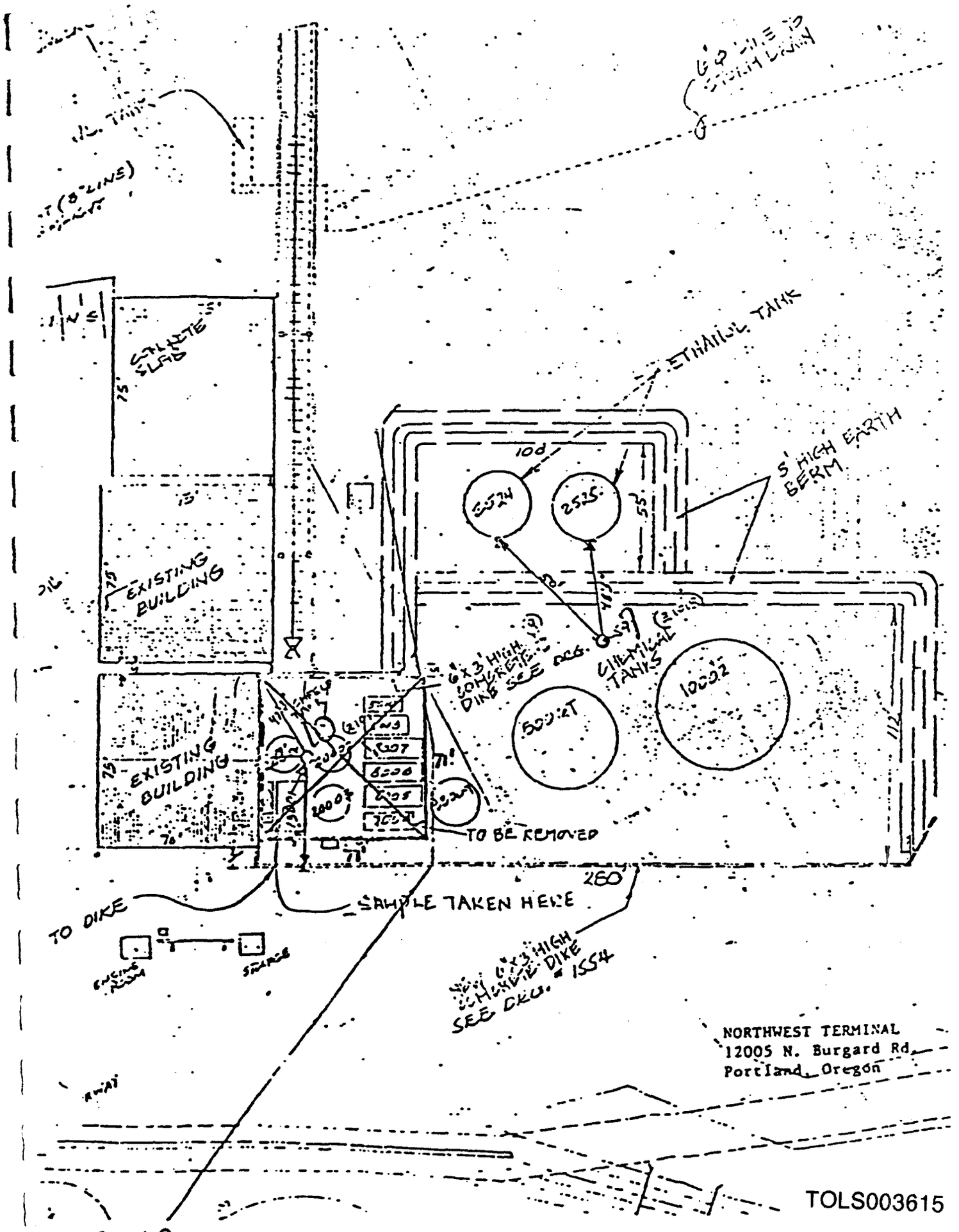
DATE:
LAB MGR:

© 1984 WASTE MANAGEMENT, INC

32319

TOLS003614

BZTO104(e)040435



BZTO104(e)040436

JOHN L. SMITS
Environmental Analyst
NORTH COAST BRANCH OFFICE, ASTORIA
Department of Environmental Quality
Clatsop County Courthouse
P O Box 869
Astoria 97103
Phone 325-8660

HOME 733-5949

229-5245

3/15/85

Soil

BASE/NEUTRAL EXTRACTABLES
METHOD 625
8270

PARAMETER	PARAMETER
BIS(2-CHLOROETHYL) ETHER	
1,3-DICHLOROBENZENE	
1,4-DICHLOROBENZENE	
1,2-DICHLOROBENZENE	
HEXACHLOROETHANE	
N-NITROSO-DI-N-PROPYLAM	
NITROBENZENE	
ISOPHORONE	
BIS(2-CHLOROETHOXY) METH	
1,2,4-TRICHLOROBENZENE	
NAPHTHALENE	
HEXACHLOROBUTADIENE	
HEXACHLOROCYCLOPENTADIENE	
2-CHLORONAPHTHALENE	
ACENAPHTHYLENE	
DIMETHYLPHTHALATE	
2,6-DINITROTOLUENE	

coffee lab

Sample Z 1017
penta 275 mg/kg
tetra
2345 3.1 ppm
2346 10.6 ppm
2356 0.35 ppm

PESTICIDES/PCB'S
METHOD 608

PARAMETER
ALPHA-BHC
[illegible]
LINDANE
HEPTACHLOR
ALDRIN
4,4'-DDE
4,4'-DDD
4,4'-DDT

Sample Z 1018
penta 167.5 ppm
tetra
2345 1.3 ppm
2346 1.9 ppm
2356 7.1 ppm

PCB GROUP 1 INCLUDES PCB'S 1
1242 AND IS CALCULATE
PCB GROUP 2 INCLUDES PCB'S 1
AND IS CALCULATED AS
PCB GROUP 3 INCLUDES PCB'S 1
AND IS CALCULATED AS 1

32319

TOLS003616

BZTO104(e)040437

Ho.4E. 737-5949

Solo

JOHN L. SMITS
Environmental Analyst
NORTH COAST BRANCH OFFICE AS[illegible]

Department of Environmental Quality
Clatsop County Courthouse
P O Box 868 Astoria 971[illegible]

BASE/NEUTRAL EXTRACTABLES
METHOD 625
8270

PARAMETER	PARAMETER
BIS(2-CHLOROETHYL) ETHER	ACENAPHTHENE
1,3-DICHLOROBENZENE	2,4-DINITROTOLUENE
1,4-DICHLOROBENZENE	FLUORENE
1,2-DICHLOROBENZENE	DIETHYLPHTHALATE
HEXACHLOROETHANE	N-NITROSODIPHENYLAMINE
N-NITROSO-DI-N-PROPYLAMINE	4-BROMOPHENYL PHENYL ETHER
NITROBENZENE	HEXACHLOROBENZENE
ISOPHORONE	PHENANTHRENE
BIS(2-CHLOROETHOXY) METHANE	ANTHRACENE
1,2,4-TRICHLOROBENZENE	DIBUTYL PHTHALATE
NAPHTHALENE	FLUORANTHENE
HEXACHLOROBUTADIENE	PYRENE
HEXACHLOROCYCLOPENTADIENE	BUTYL BENZYL PHTHALATE
2-CHLORONAPHTHALENE	BENZ(A)ANTHRACENE
ACENAPHTHYLENE	CHRYSENE
DIMETHYLPHTHALATE	3,3'-DICHLOROBENZIDINE
2,6-DINITROTOLUENE	BIS(2-ETHYLHEXYL) PHTHALATE
	BENZ(A)PYRENE

PESTICIDES/PCB'S
METHOD 608

PARAMETER	PARAMETER
ALPHA-BHC	TOXAPHENE
BETA-BHC	
LINDANE	PCB GROUP 1
HEPTACHLOR	PCB GROUP 2
ALDRIN	PCB GROUP 3
P,P'-DDE	TOTAL PCB
P,P'-DDD	
P,P'-DDT	

PCB GROUP 1 INCLUDES PCB'S 1221, 1232, 1242 AND IS CALCULATED AS 1242.
PCB GROUP 2 INCLUDES PCB'S 1248, 1254 AND IS CALCULATED AS 1254
PCB GROUP 3 INCLUDES PCB'S 1260, 1262 AND IS CALCULATED AS 1260

TOLS003617

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BZTO104(e)040438

ACID EXTRACTABLES
METHOD 625
8270

PARAMETER	PARAMETER
PHENOL	2,4,6-TRICHLOROPHENOL
2-CHLOROPHENOL	2,4-DINITROPHENOL
2-NITROPHENOL	4-NITROPHENOL
2,4-DIMETHYLPHENOL	2-METHYL-4,6-DINITROPHENOL
2,4-DICHLOROPHENOL	PENTACHLOROPHENOL
4-CHLORO-3-METHYLPHENOL	TETRACHLOROPHENOLS **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

PESTICIDES
METHOD 625
8270

PARAMETER	PARAMETER
ALPHA-BHC	DIELDRIN
HEPTACHLOR	ENDRIN
ALDRIN	ENDOSULFAN II
HEPTACHLOR EPOXIDE	P,P'-DDD
ENDOSULFAN I	ENDOSULFAN CYCLIC SULFATE
TRANS-NONACHLOR	P,P'-DDT
P,P'-DDE	GAMMA-BHC (LINDANE)

EP Tox Lead

In addition to these specific chemicals we will identify and quantitate any other organic that is observed with the extraction/gc/ms procedure.

32319

TOLS003618

BZTO104(e)040439

TIME OIL COMPANY

[illegible] WEST COMMODORE WAY
P.O. BOX 24447 TERMINAL STATION
SEATTLE, WASHINGTON 98124

July 29, 1985

Chem-Security Systems, Inc.
P.O. Box 1866
Bellevue, WA 98009

Dear Sirs:

Attached is check 24607 as payment in full for disposal services as shown on your invoice 1447 dated June 30, 1985.

Sincerely,

John P. Denham

John P. Denham
Environmental Manager

Attachment a/s

JPD/ch

32319

TOLS003619

BZTO104(e)040440

(Kick Yates Lab) ~~Dasser~~, Salem

~~PCP TF~~

VICTOR ATIYEH
Governor

Department of Environmental Quality

522 S.W. FIFTH AVENUE, BOX 1760, PORTLAND, OREGON 97207 PHONE: (503) 229-5696

January 17, 1985

[redacted]

Re: Your Letter of 1/3/85

The actual rule that the leach test is intended to simulate is OAR 340-101-034(1)(d) (enclosed). As you can see, the rule refers to conducting a bioassay on pesticide residue, the results of which determine whether or not the residue is a hazardous waste.

In a June 7, 1984 letter to industry, we cited 600 mg/l total chlorophenols as the hazardous waste threshold. This was meant to include -phenates as well. It was derived from some recent EPA data which indicated an average LC_{50} of 0.15 mg/l for salmonid with little toxicological difference between penta- or tetrachlorophenol or -phenate. Thus, if you place 250 mg/l of a residue containing 600 mg/l penta in water, and the penta is 100% leached, you will get a solution of 0.15 mg/l penta. Hence, the 600 mg/l number. However, we would emphasize that the 600 mg/l total chlorophenols is only an approximation which we suggest as being routinely acceptable for determining proper waste disposal. If there is any reason to contest a generator's characterization of his waste, or any reason to suspect improper waste disposal, we would go back to the required bioassay to make a definitive determination.

[redacted] Our data suggest that [redacted] (-phenates) are usually leached from sawdust, dirt, planer shavings, etc.

Please call if me at area code (503) 229-6210 if you wish further discussion. We would appreciate receiving any information you may care to share with us on this subject.

Sincerely,

Fred S. Bromfeld
Senior Environmental Engineer
Hazardous Waste Operations
Solid Waste Division

State of Oregon
Department of Environmental Quality
RECEIVED
JAN 28 1985
Environmental Quality Laboratories

FSB:b
ZB4168
Enclosure(s)

RECEIVE
JAN 18 1985
State of Oregon
DEPARTMENT OF ENVIRONMENTAL Q
SALEM, OFFICE

32319

TOLS003620

BZTO104(e)040441

TIME OIL CO.

P.O. BOX 24447
TERMINAL ANNEX
SEATTLE, WASHINGTON 98124
(206) 285-2400

TO: JOHN DENHAM

FROM: N. WALLIS / PORTLAND

SUBJECT: SOIL SAMPLE / CHEM SECURITY DATE: Feb. 19 '85

PER YOUR REQUEST ARE FINAL COPIES SENT TO CHEM SECURITY WITH THE SOIL SAMPLE TAKEN FROM WOODTREATING AREA.

RETURN TO ⟶ SIGNED N Wallis

DATE SIGNED

THIS COPY FOR PERSON ADDRESSED

TOLS003621

32319

TIME OIL CO.

7-29-85

CHEM-SECURITY SYSTEMS, INC.
P.O. BX 1566
BELLEVUE, WA 98009

PROTECTED AMOUNT	AMOUNT
$ ***27,270.88***	$ ***27,270.88***

BY

BY

⑈024607⑈ ⑆021308176⑆ 30991597⑈

TIME OIL CO.

INVOICE	REFERENCE NO	AMOUNT	INVOICE	REFERENCE NO	AMOUNT
	Inv. # 1447				

CHECK DATE	7-29-85	DISCOUNT	
CHECK NO.	24607	TOTAL	$27,270.88

WHEN DETACHED AND PAID, THIS CHECK BECOMES A RECEIPT IN FULL PAYMENT OF THE ITEMIZED ACCOUNT

TOLS003622

32319

BZTO104(e)040443

Sampling

All sampling was performed in accordance with EPA publication SW846, "Test Methods for Evaluating Solid Waste". Surface soil sampling was achieved using a small trier and/or sampling scoop. Subsurface samples were obtained using a 6" continuous flight hollow stemmed auger fitted with a 2" split-spoon sampler. All sampling equipment was decontaminated between samples with a trisodium phosphate wash, water rinse, hexane wash and a triple rinse with distilled, deionized water. Auger flights were decontaminated by high pressure steam cleaning between bore holes.

Samples were obtained from two areas. Area 1 consisted of a peripheral surface margin surrounding the containment areas on all of the available sides (see Figure 1). Area 2 consisted of the area inside the containment wall. All samples from each site were placed in new 16-ounce wide-mouthed glass jars previously washed with laboratory cleaner, water rinsed, hexane washed, air dried and rinsed three times with distilled, deionized water, then fitted with teflon-lined caps under clean conditions. Samples were labelled with client identification, sample number, date, time, sampler's name, sample location, and other pertinent information. Containers were sealed and placed in portable, refrigerated ice chests for transportation to the laboratory. Samples were delivered to the laboratory by RES courier within 48 hours after collection. Chain of custody forms accompanied all samples from original field sampling to final analysis and are included in this report (Appendix A). A field log of each sample was generated on site during sampling and retained for future reference.

Preliminary surface sampling in Area 1 was performed by preparation of a composite sample obtained from sub-areas A, D and F by pooling grab samples taken with triers or spoons at 10-foot intervals, five feet away from the containment area.

Secondary surface sampling was conducted in Area 1 by obtaining individual grab samples using triers or spoons. The sample sites are numbered 1-81 and are indicated on Figure 1. Secondary samples were obtained in response to the detection of significant concentrations of PCP in preliminary composite samples from sub-areas A and D, above, and were used solely to estimate the limits of contamination beyond the containment area. As stated earlier, no attempt was made in this sampling and analytical protocol to determine average (mean) values of PCP contamination.

TOLS003623

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BZTO104(e)040444

Introduction

Between 1967 and 1982 Time Oil Company operated a pentachlorophenol (PCP) facility at its North Portland, Oregon, terminal. This facility consisted of blending and storage operations used to prepare commercial pentachlorophenol solutions. The facility consisted of various storage and mixing tanks, a warehouse, a bermed, unpaved containment area, various pumps and a truck loading area.

The facility geography is essentially flat and is located less than 1/4 mile from the Willamette River. The soil is principally fine to medium sand with some silt. Ground water is reportedly found from 10 to 20 feet below the surface in this area. During June of 1985, a portion of visibly contaminated soil in the containment area was excavated and disposed of as a hazardous waste. This excavation left a depression in the northwest corner of the containment area sloping gradually to approximately four feet below the adjacent grade. Surface soil was disturbed during this process and, as such, surface sampling was not expected to be representative of conditions existing prior to excavation.

During the years of operation, several intermittent PCP discharges were known to occur, especially during mixing and transfer operations. These discharges resulted in soil contamination in and around the containment area. Initial site visits in April 1985 indicated visible PCP contamination of soils in this vicinity. A sampling plan for surface and subsurface soils extending through the vadose zone was designed and initiated in July 1985.

This sampling and analytical protocol was designed to estimate the spatial limits of PCP contaminant migration in the vadose zone of the soil in and immediately adjacent to the PCP containment area facility. As such, a systematical gridding array was used in lieu of random or other types of probability sampling. No attempt was made to sample underneath structures or paved areas. The protocol was not intended to determine the average concentration of PCP in soil at the facility since the area sampled was not expected to be homogeneous nor to represent a specific population of PCP concentrations. Therefore, statistical evaluations such as mean and standard deviation, have only academic significance in respect to these data.

However, since the origin points in the regular sampling arrays were randomly selected (i.e., a systematic random sampling procedure), there is no reason why some or all of this data could not be used for this purpose at a future time.

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BZTO104(e)040445

triangle with an east-west base of 25 feet and a north-south height of 18 feet. The maximum distance from any point on the grid to the nearest sample point in this case is 13.34 feet as opposed to 14.14 feet for a standard 20-foot x 20-foot rectangular array. This selection allowed for the placement of additional wells just outside the containment wall without increased cost, thereby improving coverage with fewer sampling points (reference: Parkhurst, D.F., Optimal Sampling Geometry for Hazardous Waste Sites; Environmental Science & Technology, 18 No. 7, p. 521 [1984]). The triangular grid is indicated on Figure 1. Bore holes are indicated by the symbol "■" and are labeled with alpha symbols J-Z. A table of samples so obtained is given in Table III.

Following sampling, borings were sealed with bentonite grout in accordance with state well sealing standards under the direction of a registered geologist. Decontamination water, collected into tubs, was analyzed and, following receipt of negative results for PCP, disposed of on site.

Results

Samples were analyzed by Coffee Laboratories, Portland, Oregon, using EPA SW-846 protocols. Soil samples were Sohxlet extracted using EPA protocol #3540. Procedure #8040 was utilized with electron capture quantification for PCP analysis. Results are expressed in milligrams of PCP per kilogram soil (ppm, dry weight). At sites where results could be expected to approach zero (based on results from adjacent sites), samples were held but not analyzed. The results are listed in Table IVA-E. Preliminary composite results are shown in Table IVF and confirm PCP contamination beyond the containment wall.

These tables list PCP concentrations at each sample site as well as the X and Y coordinates used to locate these sites on the plan drawing (Figure 1). These coordinates are tied to an arbitrary grid as shown on Figure 1. The northwest corner of the containment wall is located at coordinates X=76, Y=166 (76,166), for sake of reference. Each sampling depth is listed on a separate table. Copies of the laboratory reports are listed in Appendix B.

The coordinate data and concentration results were plotted using an interpolating contouring program (In-Situ Corp., Laramie WY). This package performs smoothed contouring of the data using a triangularization method and bivariate interpolation. Contours were generated from surface samples (regardless of elevation below grade) and 2-, 4-, 7- and 12-foot depths below grade. The contours are plotted on Figures 2A-E. These contour diagrams have been reduced and printed on mylar sheets in addition to the attached figures.

TOLS003625

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Sampling in Area 1, peripheral samples, was performed to ascertain the surface margins of the contaminated area. It was arbitrarily assumed that the area within the containment walls was contaminated with PCP and the peripheral margins of this area established as consisting of the warehouse south wall, the east and west concrete walls and the southern edge of a pipeline transecting the containment area as indicated in Figure 1. Three concentric, 10-foot-wide marginal strips were staked out surrounding this boundary and are indicated by broken lines in Figure 1. The 10 foot marginal strips were subdivided into areas A, B and C to the west, D, E and F to the south, and G, H, and I to the east (see Figure 1).

Sampling of Area 2, the containment area proper, was performed to evaluate PCP concentrations at the surface and at depth in subsoils to the saturated zone. Grab samples were obtained from a 2-foot x 2-inch split spoon sampler pressed through a 6-inch hollow-stem augered bore hole, and were placed in 16-ounce sample containers as previously described. Decontamination procedures, chain of custody, labelling and logging were identical to Area 1 samples. Auger flights were decontaminated at the completion of each coring to prevent cross contamination. Samples were taken at a maximum depth of 0, 2, 4, 7 and 12 feet below the surface elevation of the unexcavated portion of the containment area.

Due to the sloping contour of the containment area caused by the excavation, the surface elevation below grade was measured from a string line pulled tightly between two unexcavated surface points and spanning the sampling point. Elevation of sampling site surfaces below this grade line was measured using a rigid ruler and is shown in Table I. Data from this table was used to calculate the actual auger depth below the surface required to obtain the split spoon samples to align all samples in the same respective horizontal plane. This data is listed in Table II and indicates the actual depth drilled below the surface required to obtain a sample at the nominal depth listed (0, 2, 4, 7, or 12 feet). In cases where it was deemed practical, soil was hand excavated to the depth corresponding to the first sampling depth indicated and the sample obtained manually with a small trier or spoon.

The horizontal array of borings was selected to minimize the maximum distance from any given point in the sampling area to the nearest boring. To do this most effectively, a triangular grid was staked off. The array was based on a

TABLE II

TIME OIL CO. - PORTLAND, OREGON

Actual Split-Spoon Sample Depths Below Grade

	Nominal Depth				
Boring	0	2	4	7	12
J	0	0-2'	2-4'	5-7'	10-12'
K	NA	0-1 1/2	1 1/2-3 1/2	4 1/2-6 1/2	9 1/2-11 1/2
L	NA	NA	Surf (11")	2-4'	7-9'
M	0	0-2'	2-4'	5-7'	10-12'
N	0	0-2'	2-4'	5-7'	10-12'
O	0	0-2'	2-4'	5-7'	10-12'
P	NA	Surf (4")	0-2'	3-5'	8-10'
Q	NA	NA	0-1 1/2	2 1/2-4 1/2	7 1/2-9 1/2
R	0	0-2'	2-4'	5-7'	10-12'
S	0	0-2'	2-4'	5-7'	10-12'
T	NA	Surf	0-2'	3-5'	8-10'
U	0	0-2'	2-4'	5-7'	10-12'
V	0	0-2'	2-4'	5-7'	10-12'
W	0	0-2'	2-4'	5-7'	10-12'
X	NA	Surf	0-2'	3-5'	8-10'
Y	NA	NA	Surf (11")	2-4'	7- 9'
Z	0	0-2'	2-4'	5-7'	10-12'

NOTE:

Actual depths indicate depth of bottom of split-spoon.

NA = Not available

Surf = Surface sample obtained by hand excavation at depth indicated in parentheses

TOLS003627

32319

BZTO104(e)040448

TABLE I

TIME OIL CO. - PORTLAND, OREGON

Depth of Boring Site Surface Sample Below Grade
(Horiz. String Line)

Boring	Depth
J	0
K	6"
L	3'
M	0
N	0
O	0
P	1'8"
Q	2'6"
R	0
S	0
T	2'
U	0
V	0
W	0
X	2'
Y	3'
Z	0

TOLS003628

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BZTO104(e)040449

TABLE IVA
TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Surface Contour Data

Sample #	Coordinates X	Coordinates Y	Concentration Mg/Kg
1	81	171	13500
2	71	171	29
3	71	161	500
4	71	151	5450
5	71	141	5560
6	71	131	8760
7	71	121	4870
8	71	111	92
9	71	101	20
10	81	181	16
11	71	181	7
12	61	181	9
13	61	171	95
14	61	161	175
15	61	151	18
16	61	141	229
17	61	131	88
18	61	121	6
19	61	111	3
20	61	101	2.5
21	61	91	5.2
37	81	95	857
38	91	96	1130
39	101	97	17
40	111	98	3.5
41	121	98	3.1
42	131	99	3.2
43	141	100	2.4
44	151	100	1.8
45	161	101	171
46	71	84	3
47	81	85	3.6
48	91	86	6.1
49	121	87	3.2
50	131	88	1.5
51	141	89	2.3
52	151	90	1.7
53	161	91	1.9
54	171	92	1.2

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	1400
K	117.5	161	N/A
L	92.5	161	N/A
M	67.5	161	4720
N	155	143	4280
O	130	143	3000
P	105	143	N/A
Q	80	143	N/A
R	142.5	125	1712
S	117.5	125	522
T	92.5	125	123
U	67.5	125	26550
V	155	107	317
W	130	107	3385
X	105	107	N/A
Y	80	107	N/A
Z	80	179	21

N/A = Not Available

TOLS003629

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BZTO104(e)040450

TABLE III

TIME OIL CO. - PORTLAND, OREGON

Nominal Split-Spoon Sample Depths

Boring	0 Surface	2 0-2'	4 2-4'	7 5-7'	12 10-12'
J	X	X	X	X	X
K	-	X	X	X	X
L	-	-	X	X	X
M	X	X	X	X	X
N	X	X	X	X	X
O	X	X	X	X	X
P	-	X	X	X	X
Q	-	-	X	X	X
R	X	X	X	X	X
S	X	X	X	X	X
T	-	X	X	X	X
U	X	X	X	X	X
V	X	X	X	X	X
W	X	X	X	X	X
X	-	X	X	X	X
Y	-	-	X	X	X
Z	X	X	X	X	X

NOTE: X = Sample
- = Not available due to excavation
ND = Not sampled due to presence of groundwater

TOLS003630

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BZTO104(e)040451

TABLE IVC

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Four Foot Contour Data

Core #	Coordinates X	Y	Concentration Mg/Kg
J	142.5	161	3.6
K	117.5	161	10.5
L	92.5	161	7200
M	67.5	161	22
N	155	143	238
O	130	143	23
P	105	143	15
Q	80	143	2205
R	142.5	125	50
S	117.5	125	184
T	92.5	125	534
U	67.5	125	55
V	155	107	380
W	130	107	8.1
X	105	107	1.3
Y	80	107	598
Z	80	179	2

TOLS003631

BZTO104(e)040452

TABLE IV8

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Two Foot Contour Data

Core #	Coordinates X	Y	Concentration Mg/Kg
J	142.5	161	3
K	117.5	161	8.8
L	92.5	161	N/A
M	67.5	161	87*
N	155	143	3.1
O	130	143	59
P	105	143	16
Q	80	143	N/A
R	142.5	125	34
S	117.5	125	252
T	92.5	125	123
U	67.5	125	44
V	155	107	260
W	130	107	15
X	105	107	4.5
Y	80	107	N/A
Z	80	179	14*

N/A = Not Available
* = Data points omitted from contouring program to reduce extrapolation error

TOLS003632

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TABLE IVE

TIME OIL CO. - PORTLAND, OREGON

Pentachlorophenol in Soil

12 Foot Contour Data

CORE #	COORDINATES X	COORDINATES Y	CONCENTRATION mg/kg
J	142.5	161	NA
K	117.5	161	2.3
L	92.5	161	2030
M	67.5	161	690
N	155	143	NA
O	130	143	38
P	105	143	450
Q	80	143	1150
R	142.5	125	1
S	117.5	125	217
T	92.5	125	90
U	67.5	125	NA
V	155	107	3.4
W	130	107	1.9
X	105	107	1.0
Y	80	107	720
Z	80	179	1.0

TOLS003633

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BZTO104(e)040454

TABLE IVD

TIME OIL CO. - PORTLAND, OREGON

Pentachlorophenol in Soil

7 Foot Contour Data

CORE #	COORDINATES X	COORDINATES Y	CONCENTRATION mg/kg
J	142.5	161	(NA)
K	117.5	161	3
L	92.5	161	8400
M	67.5	161	1
N	155	143	(NA)
O	130	143	13
P	105	143	130
Q	80	143	700
R	142.5	125	500
S	117.5	125	1130
T	92.5	125	75
U	67.5	125	5
V	155	107	1
W	130	107	1
X	105	107	1.9
Y	80	107	700
Z	80	179	7

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TOLS003634

BZTO104(e)040455

The scale on the mylar prints is such that the contours are superimposable on Figure 1 (site plan). This allows for facile comparison of PCP concentration profiles at depth with surface features of the facility. A reference point on Figures 1 and 2(a-e) is located at (76,166) for ease of alignment.

Conclusions

As seen in Tables IVA-E, PCP concentrations range from 1 ppm to 26,550 ppm. Two foci of contamination are seen at the surface. One is located at coordinates (83,168) in the northwest corner of the containment area. A second focus occurs just outside the containment wall to the west at coordinates (55,125). Additional minor contamination sites occur at the surface in various positions throughout the sample area; however, no prominent concentration peaks are evident. This may be due, in part, to the partial excavation mentioned previously or to vehicle traffic or other activity in this area.

No evidence of penetration of the "loading area" focus below 2 feet was observed. Note that the results of the 2-foot contouring fail to demonstrate a continuation of the foci found at the surface. This is due, in part, to the excavation which removed the 2-foot material and to the definition of surface samples as surface material regardless of relationship to elevation (i.e. surface samples are not equivalent to "0 foot" samples). This phenomenon is indicated by the lack of sample sites on the 2-foot contour at boring sites L, M, Q, Y and Z. The lack of high PCP concentrations at boring site U, 2-foot contour, implies that no significant penetration occurred at this site and that PCP contamination at this site is restricted to narrowly distributed but high concentration surface contamination.

Contours at 4, 7 and 12 feet indicate appreciable attenuation of PCP concentrations with increasing depth. The maximum concentration at 12 feet is 2030 ppm located at boring "L". Note that no samples were analyzed at boring sites "J" and "N" at 7- or 12-foot depths, since concentrations above these depths indicated that concentrations near zero could be expected. No sample was obtained at "U" due to loss of sample when groundwater was encountered.

The slight tendency of the PCP plume to tail off to the south implies that groundwater flux may be diffusing the plume in this direction. This conclusion can only be substantiated by hydrogeologic evaluations of the site, however.

TOLS003635

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BZTO104(e)040456

TABLE IVF

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Preliminary Surface Composites

Area	PCP (mg/kg)
A	660
D	860
G	17

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TOLS003636

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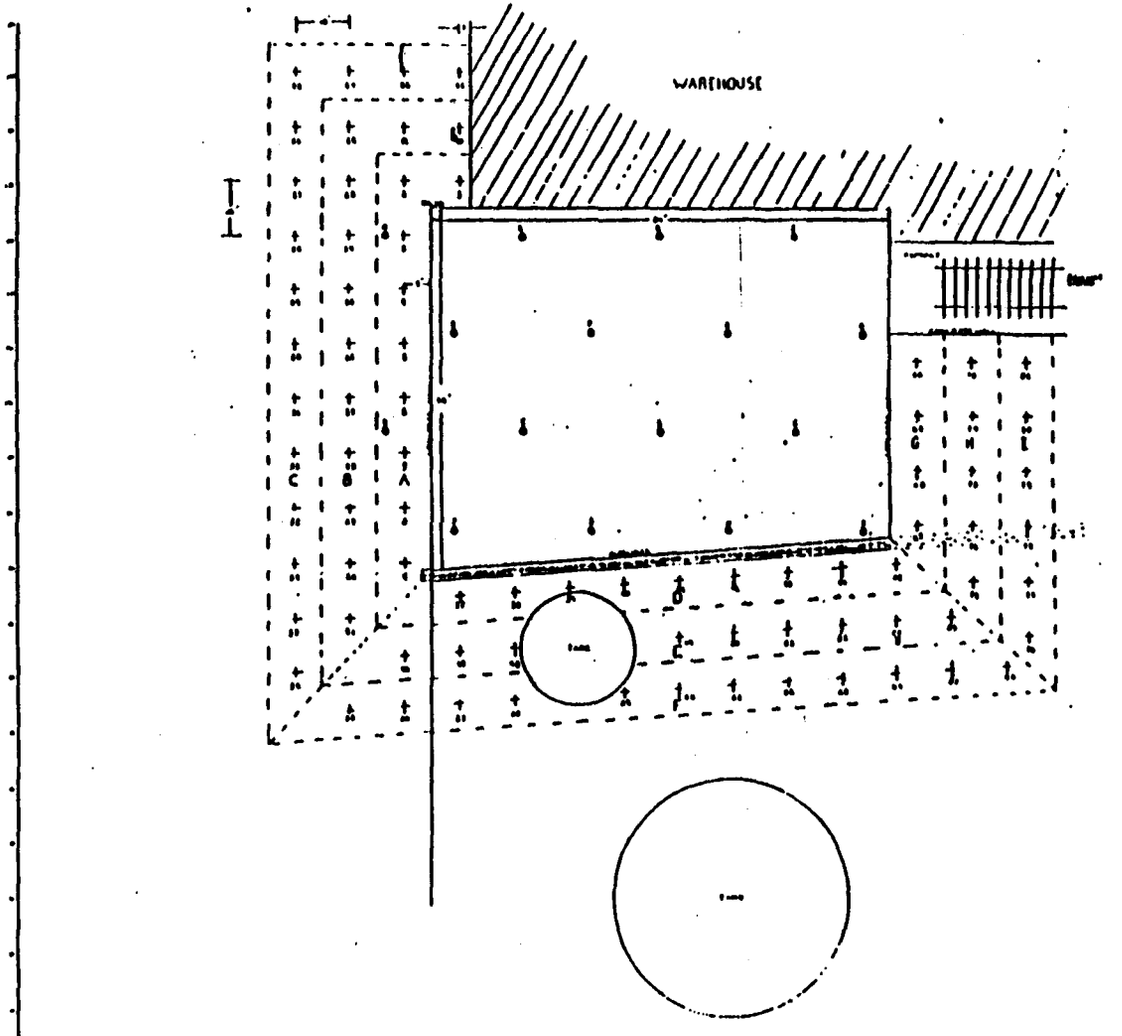
FIGURE 1



TOLS003637

RIEDEL INTERNATIONAL

TIME OIL CO - PORTLAND OR.

PCP SAMPLING PLAN
SAMPLING GRID - LATERAL SAMPL

BZTO104(e)040458

The contaminant plume may be restricted at the surface by the presence of the warehouse foundation. This structure could be expected to prevent diffusion of the PCP plume to the north by presenting a physical barrier to contaminant migration. Identification of concentrations of PCP beneath the building on contour plots is a function of the contouring program and may not be indicative of actual plume morphology in this area.

Summary

Significant PCP concentrations were detected in soil at Time Oil Co.'s north Portland operation. Contamination was pronounced at two focal sites, one at the northwest corner of the containment area and one at the west side of the containment area. Surface concentrations ranged from 1.2 mg/kg to 26,500 mg/kg. Sampling at depth indicated significant PCP concentrations at the northwest focus descending to the saturated zone and approximately 8-12 feet. Concentrations at 12 feet ranged from 1.0 mg/kg to 2,030 mg/kg. Analytical data from surface, 2-, 4- 7- and 12-foot samples were contoured and plotted and may be related to an area plan drawing of the same scale.

TOLS003638

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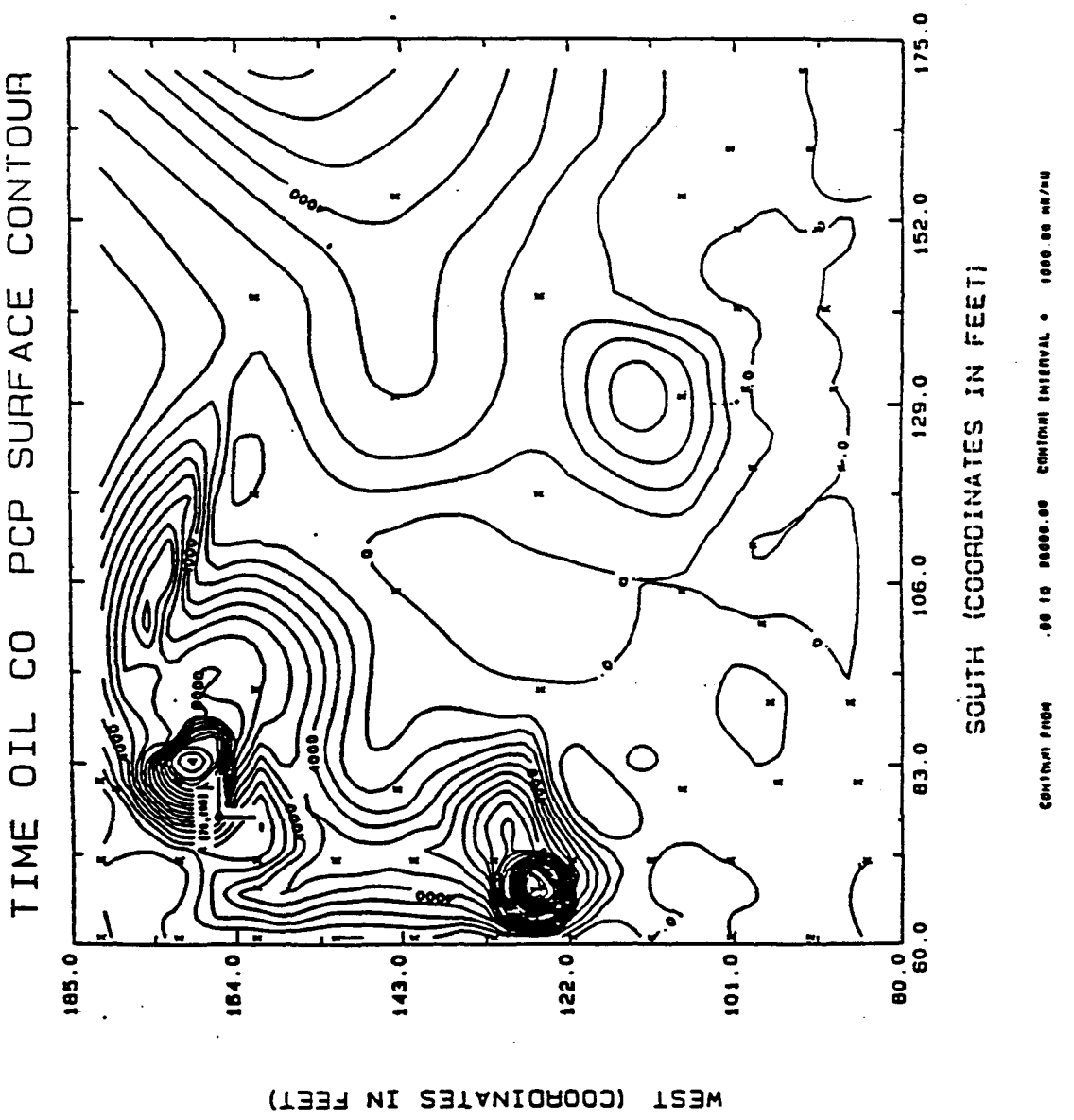
BZTO104(e)040459

TOLS003639

FIGURE 2A:



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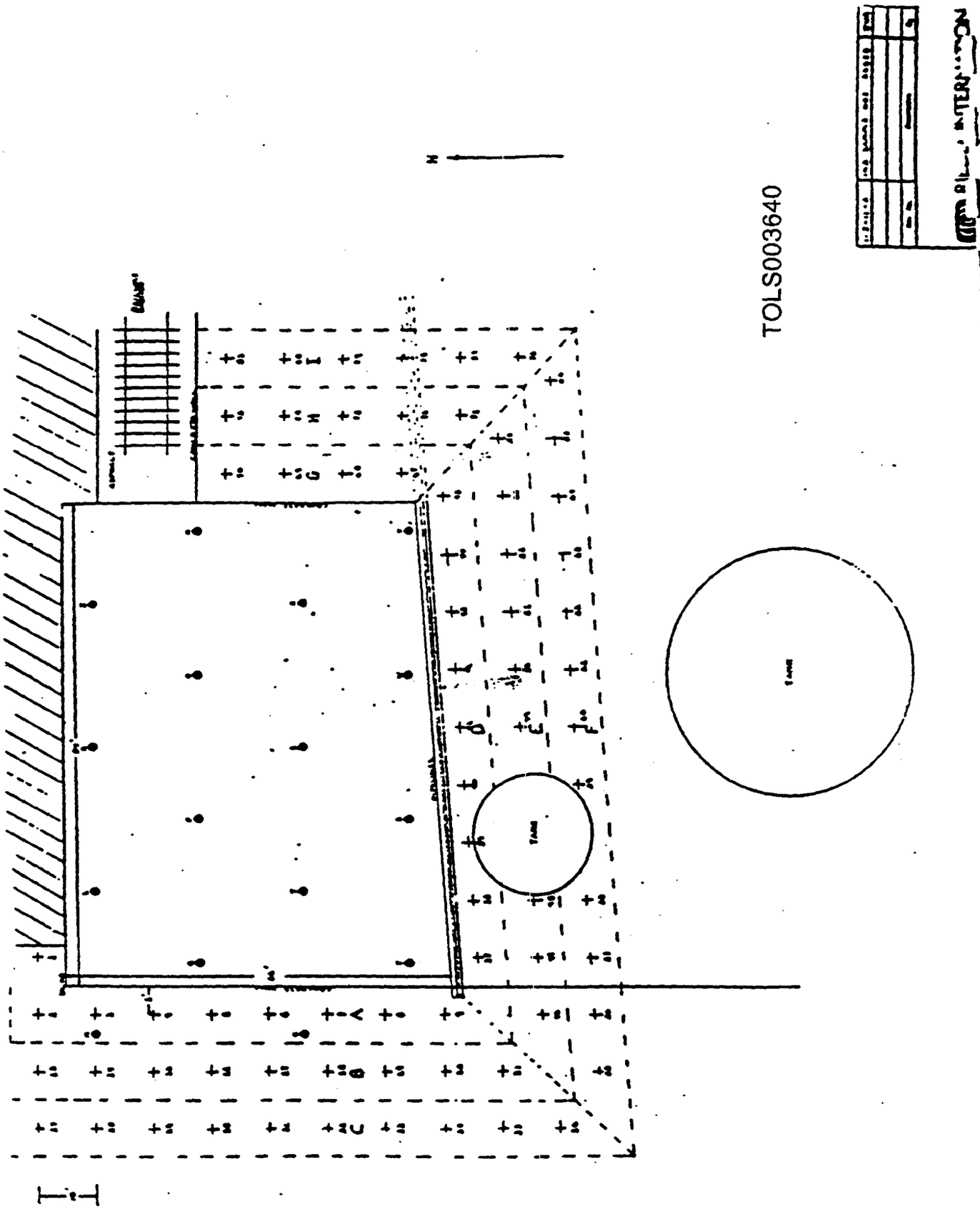
BZTO104(e)040460



TOLS003640

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TOLS003641

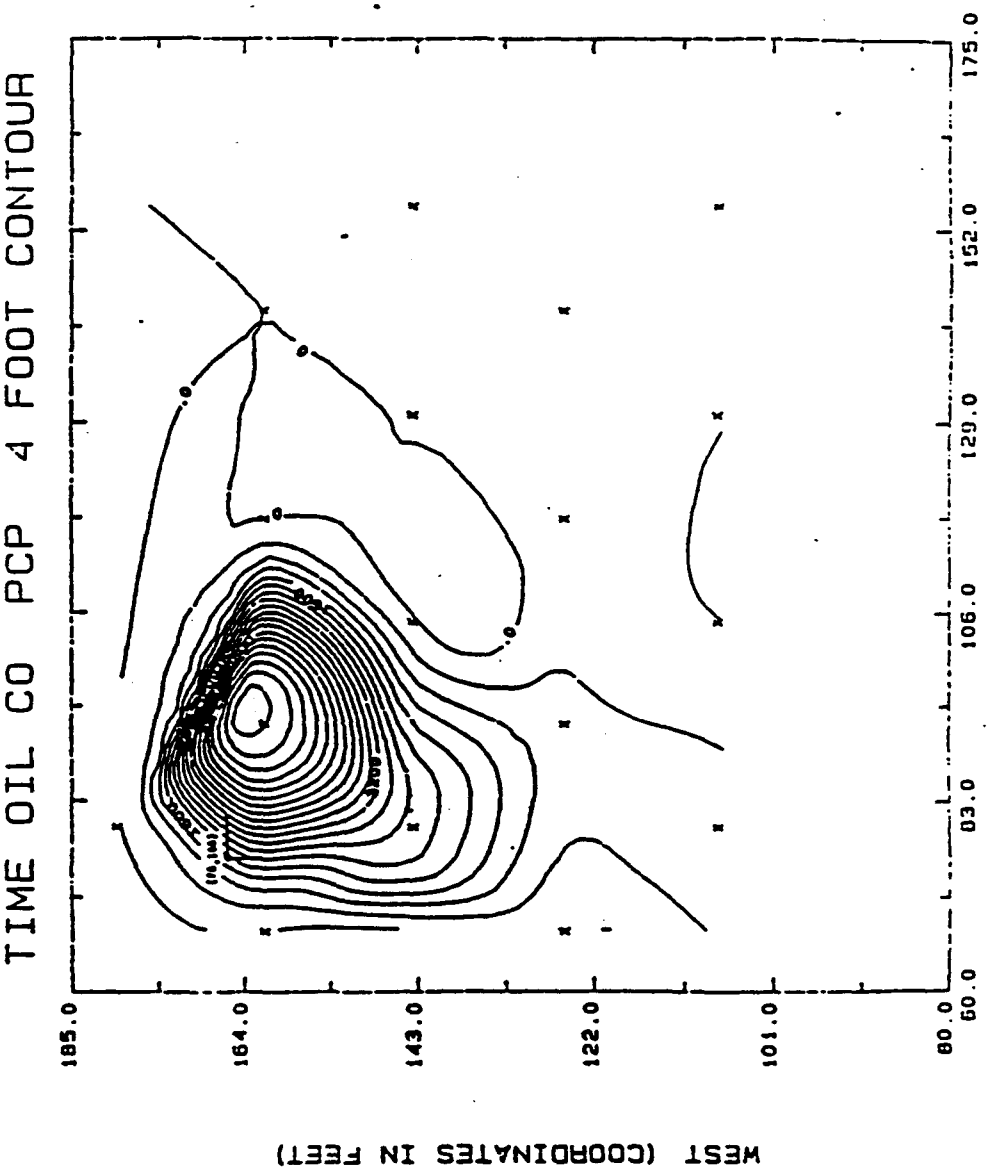

FIGURE 2C

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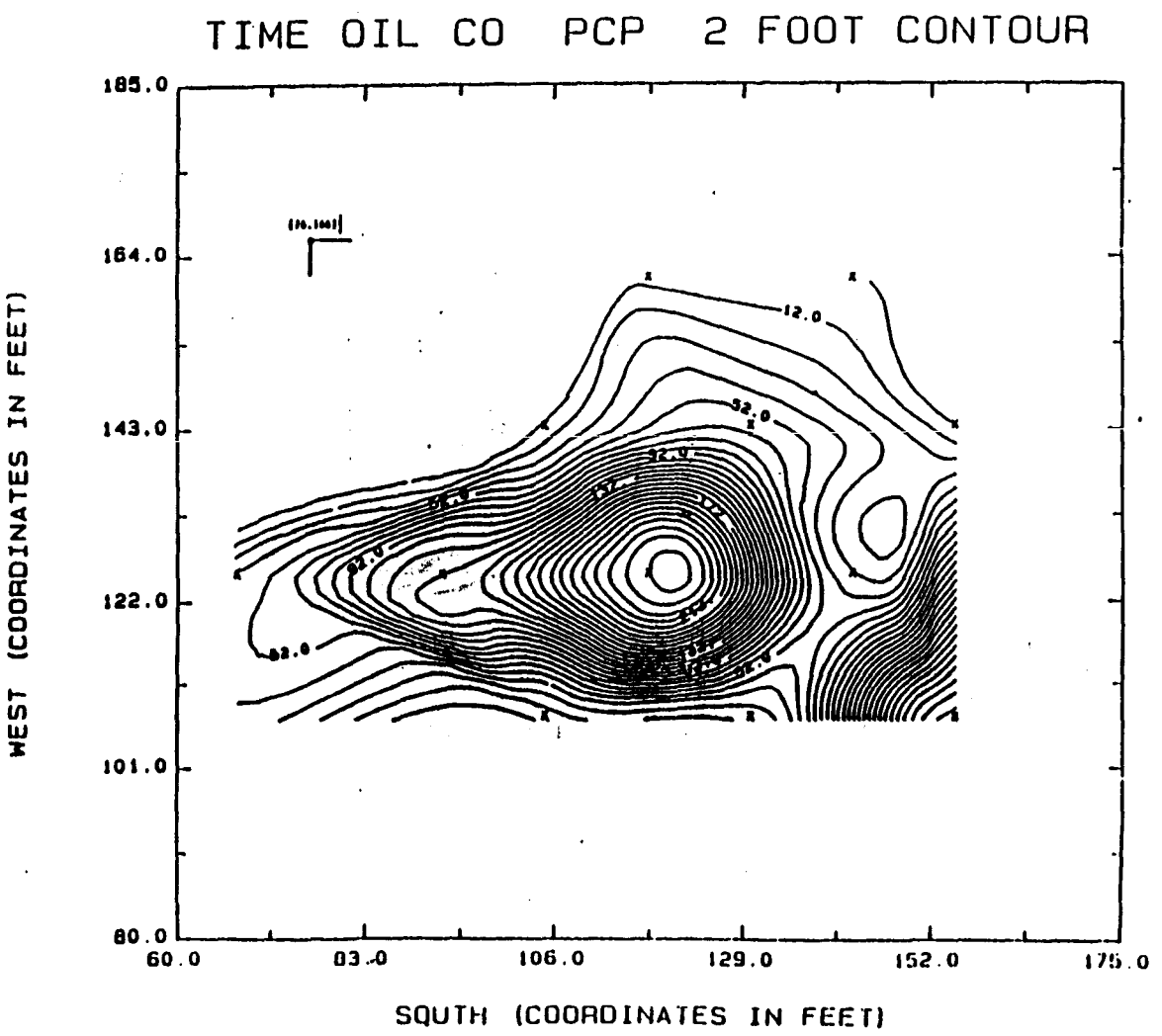
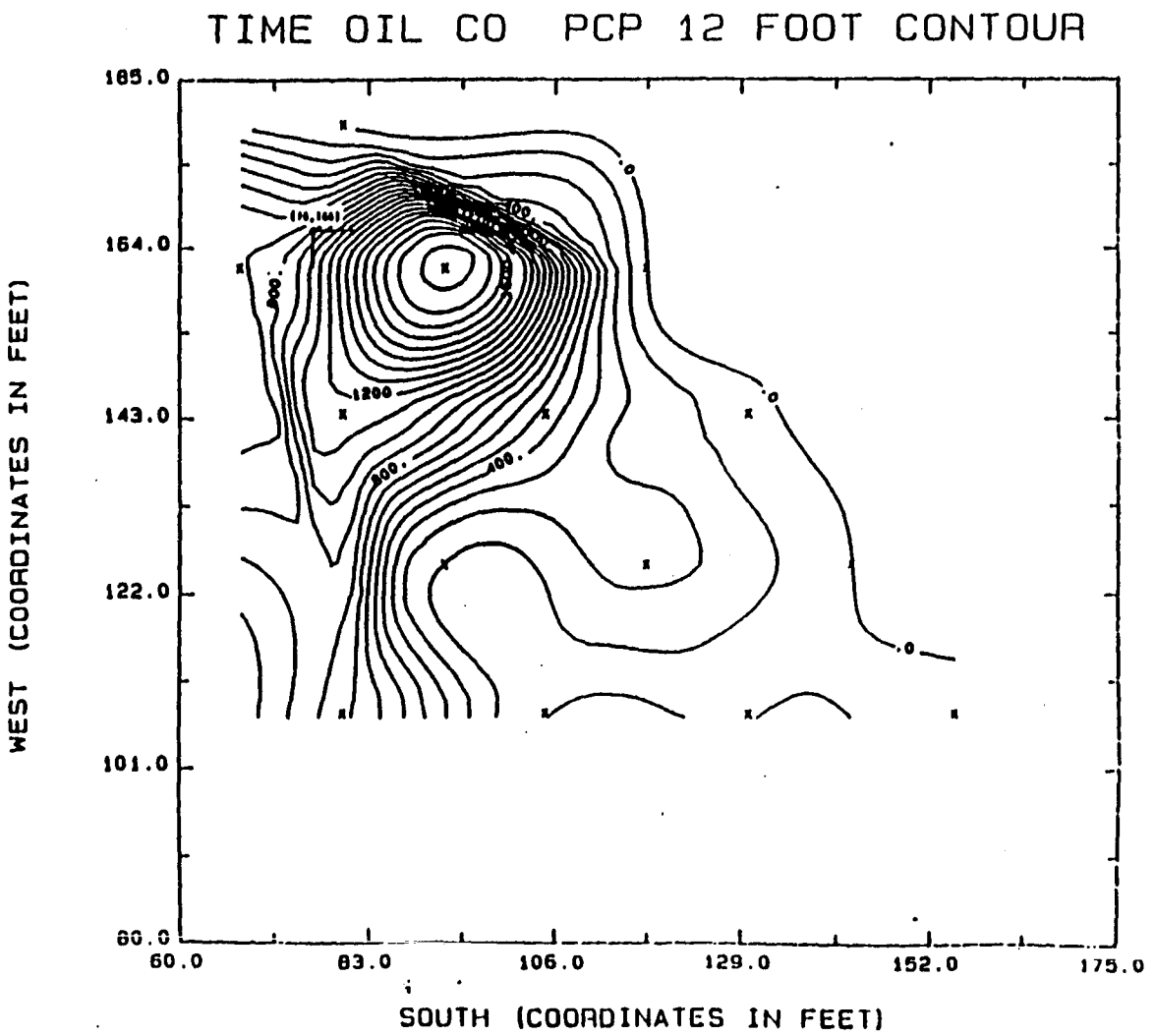
FIGURE 2B



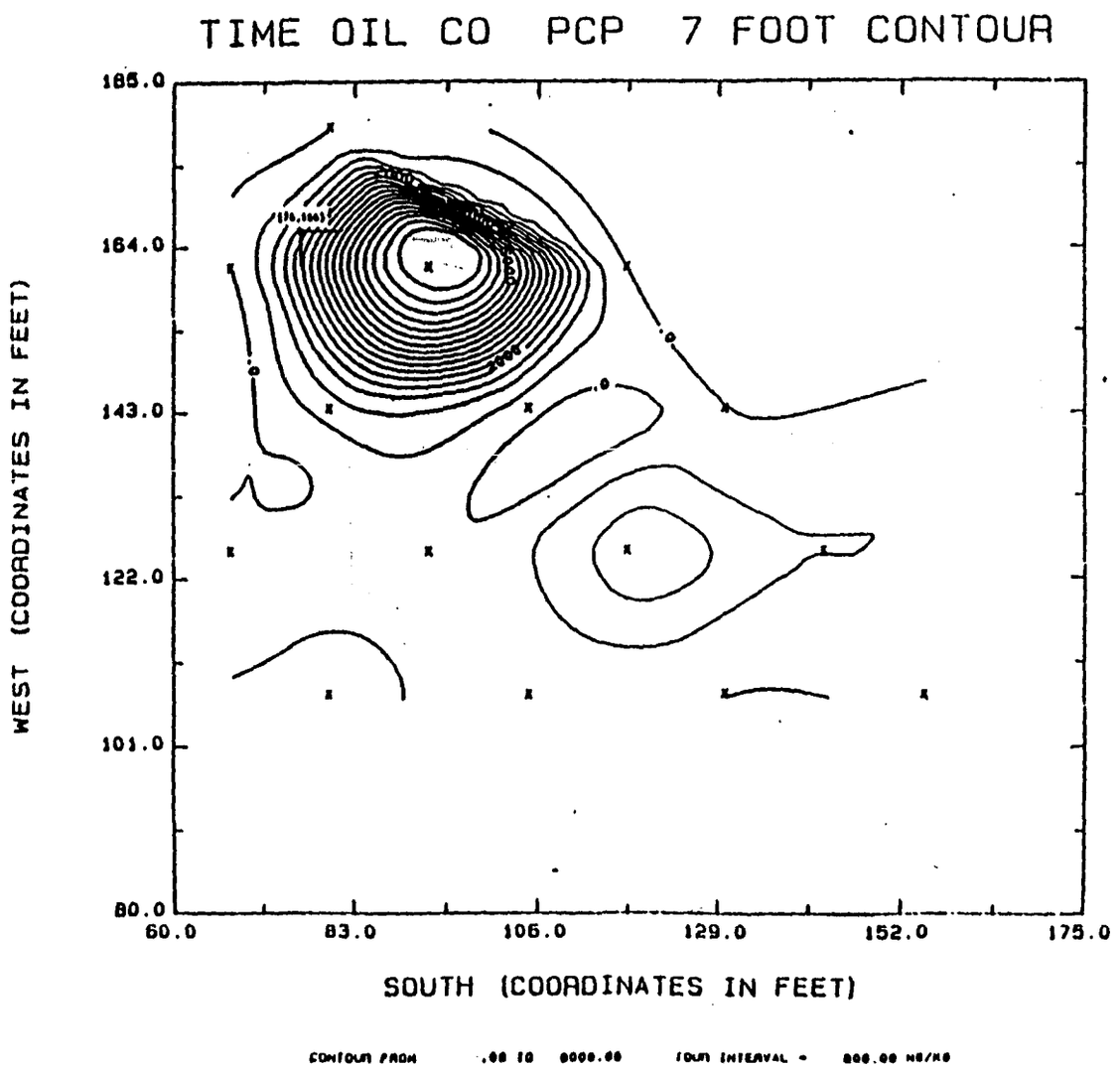
TOLS003642

FIGURE 2E



TOLS003643

FIGURE 2 D



TOLS003644

32319

MENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO. 8247/3011 | PROJECT NAME: Time Oil PCP Sampling

SAMPLERS: (Signature) Robert L Keese

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS							REMARKS
1	7/16	12:00			Area "A"								
2		12:02											
3		12:04											
4		12:06											
5		12:08											
6		12:10											
7		12:12											
8		12:14											
9		12:16											
10		12:18			Area "B"								
11		12:20											
12		12:22											
13		12:24											
14		12:26											
15		12:28											

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	7/16/85 1549	[signature]	[signature]	7-17-85 16:31	Susan M. Coffey
[signature]	7/16 1716	[signature]			
[signature]	7/17 1925	Received for Laboratory by: (Signature) [signature]	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

TOLS003645

3-0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)040466

APPENDIX A

CHAIN OF CUSTODY RECORDS

TOLS003646

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...ITAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO. 8120/3011 PROJECT NAME Time Oil PCP Sampling

SAMPLERS: (Signature) Robert Keese

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS
31	7/16	12:58			Area C								
32		13:00											
33		13:02											
34		13:04											
35		13:06											
36		13:08											
37		13:30			Area D								
38		13:32											
39		13:34											
40		13:36											
41		13:38											
42		13:40											
43		13:42											
44		13:44											
46		13:46											

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Neil Wallis	7/16/85 1549	R. L. Keese	[illegible]	7-17-85 1055	[illegible]
R L Keese	7/16 1716	[illegible]			
[illegible]	7/17 1935	[illegible]			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

TOLS003647

3-0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)040468

32319

MENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
8120/3011	Time 0.1 PCP Sampling

SAMPLERS: (Signature) Robert L Keene

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS							REMARKS
16	7/16	12:30			Area B								
17		12:32											
18		12:34											
19		12:36											
20		12:38											
21		12:40											
22		12:42			Area C								
23		12:43											
24		12:44											
25		12:46											
26		12:48											
27		12:50											
28		12:52											
29		12:54											
30		12:56											

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Neil Wallis	7/16/85 1549	R. L. Keene	[illegible]	7-17-85 10:30	[illegible]
R. L. Keene	7/16 1716	[illegible]			
[illegible]	7/17 0935	[illegible]			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

TOLS003648

3-0605

Figure 3. Example of chain custody record.

BZTO104(e)040469

32319

E: :NTAL PROTECTION AGENCY
.lice of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO. 8121/30n

PROJECT NAME: Tine Oil - PCP Sampling

SAMPLERS: (Signature) Robert L Keese

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS						REMARKS
61	7/16	14:18			Area F							
62		14:20										
63		14:22										
64		14:24										
65		14:26										
66		14:28										
67		14:30			Area G							
68		14:32										
69		14:34										
70		14:36										
71		14:38			Area H							
72		14:40										
73		14:42										
74		14:44										
75		14:46										

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	7/16/85 1549	[signature]	[signature]	7-17-85 1035	[signature]
[signature]	7/16 1716	[signature]			
[signature]	7/17 0935	[signature]			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

Remarks

TOLS003649

3- 0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)040470

32319

ENTAL PROTECTION AGENCY
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CHAIN OF CUSTODY RECORD

PROJ. NO. 8121/3011

PROJECT NAME: Time Oil - PCP Sampling

SAMPLERS: (Signature) Robert L. Keese

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS							REMARKS
46	7/16	13:48			Area F								
47		13:50											
48		13:52											
49		13:54											
50		13:56											
51		13:58											
52		14:00											
53		14:02											
54		14:04											
55		14:06			Area F								
56		14:08											
57		14:10											
58		14:12											
59		14:14											
60		14:16											

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Neil Wallis	7/16/85 1549	R. L. Keese	[illegible]	7-17-85 1635	Susan M. Coffey
R. L. Keese	7/16 1716	[illegible]			
J. Rudolph	7/17 0935	Received ~~for laboratory by:~~ (Signature) [illegible]			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

Remarks: TOLS003650

3- 0605

Figure 3. Example of chain- custody record.

BZTO104(e)04047

32319

...MENTAL PROTECTION AGENCY
... Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
3011	Time Oil

SAMPLERS: (Signature)
R Sobolik

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
R-2	7-23	1555					
R-4	7-23	1600					
R-7	7-23	1610					light sample (not much)
R-12	7-23	1620					water 11'
W-2	7-24	0900					
W-4	7-24	0810					
W-7	7-24	0820					
W-12	7-24	0830					water 11'
S-2	7-24	0900					
S-4	7-24	0910					
S-7	7-24	0915					
S-12	7-24	0920					water 11'

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Sobolik	7-25-85 1000	RS			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

6 / SAMPLING - Chain of Custody

TOLS003651

3 - 0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)040472

32319

ENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO. 8124/2011 PROJECT NAME Time Out PCP Sampling

SAMPLERS (Signature) Robert L. Keese

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS
76	7/16	14:48			Area I								
77	↓	14:50											
78		14:52											
79		14:54											
80		14:56											
81		15:00											

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Neil Wallis	7/16/85 1545	R. L. Keese	Howell	7-17-85 1035	Susan M. Coffey
R. L. Keese	7/16 1716	[illegible]			
[illegible]	7/17 0935	Howell			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

Remarks: TOLS003652

3-0605

Figure 3. Example of chain-of custody record.

BZTO104(e)040473

32319

CHAIN OF CUS RECORD

Sell	PROJECT NAME: Time Oil
SAMPLERS: (Signature) R Schoelich	

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS						REMARKS
V-0	7-24	1605				1						
V-2	7-24	1620				1						
V-4	7-24	1625				1						
V-7	7-24	1640				1						
V-12	7-24	1650				1						Water Sand/Brown/Blackgrey
Water Tank	7-25	0930				1						Decon Water

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Schoelich	7-25-85 1000	[signature]			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

6 / SAMPLING - Chain of Custody

TOLS003653

3- 0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)04047

32319

INMENTAL PROTECTION AGENCY
/ Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
3011	Time Oil

SAMPLERS: (Signature) R Sebastian

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS	REMARKS
T-0	7-24						Not Tide Below grade
T-2	7-24	0930					
T-4	7-24	0935					
T-7	7-24	0945					
T-12	7-24	955					Water Appx 8½'
Y-4	7-24	1045					
Y-7	7-24	1050					Water 8½ - 7'
Y-12	7-24	1100					
X-2	7-24	1115					
X-4	7-24	1120					
X-7	7-24	1150					
X-12	7-24	1140					

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
RSebastian	7-25 1000	DS			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
					TOLS003654

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3-060

Figure 3. Example of chain custody record.

BZT0104(e)0404

32319

IMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
3011	Time Oil

SAMPLERS: (Signature)
R D Sheckler

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
Z-0	7-22	1505				1	
Z-2	7-23	0820				1	
Z-4	7-23	0830				1	
Z-7	7-23	838				1	Inlet water
Z-12	7-23	846				1	
R-0	7/22	1440				1	
W-0	7/22	1500				1	
S-0	7/22	1515				1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R D Sheckler	7-23-85 1500	Jack Fahey			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
Jack Fahey	7/23/85 1540	[illegible]			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

6 / SAMPLING - Chain of Custody

TOLS003655

3-- 0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)040476

32319

MENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
3011	Time Oil

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS
P-2	7-24	1390											
P-4	7-24	1405											
P 7	7-24	1410											
P-12	7-24	1420											water 10½ - 11 ft.
L-4	7-24	1345											
L-7	7-24	1505											
L-12	7-24	1515											Water 3/4 sample
	7-24												Dr Prox 7½ - 9'
Q-4	7-24	1435											Sample appears wet
Q-7	7-24	1445											Sample [illegible] appears [illegible]
Q 12	7-24	1455											Water white sample

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Sebelli	7-25-85 1000	[illegible]			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

TOLS003656

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3-0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)04047

32319

NTAL ...TECT...GENC...
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.: 3011
PROJECT NAME: Time Oil
SAMPLERS: (Signature) R Schoelich

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS						REMARKS
K-0	7-23	1405		X								NA Below Grade
K-2	7-23	1415		X								
K-4	7-23	1420		X								
K-7	7-23	1425		X								
K-12	7-23	1435		X								Water Approx 11½'

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Schoelich	7-23-85 1500	[signature]			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
[signature]	7/23/85 1540	[signature]			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

TOLS003657

3-- 0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)040478

32319

...NMENTAL PROTECTION AGENCY
/ Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO. 3011 | PROJECT NAME TIME DI

SAMPLERS: (Signature) R Scholich

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
M-0	7-22-85	1500		X		1	
M-02	7-23-85	0730		X		1	
M-04	7-23	0735		X		1	
M-7	7-23	0750		X		1	
M-12	7-23	0800		X		1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Scholich	7-23-85 1500	Todd Fretag			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
Todd Fretag	7/23/85 1540	[illegible]		TOLS003658	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3-06[illegible]

Figure 3. Example of cha[illegible]of-custody record.

BZT0104(e)040479

32319

...ENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
3011	Time-Out

SAMPLERS: (Signature)
R Sobolich

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
J-0	7-22	1440		X		1	
J-2	7-23	1035		X		1	
J-4	7-23	1040		X		1	
J-7	7-23	1045		X		1	
J-12	7-23	1055		X		1	water apox 11'

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Sobolich	7-23-85 1500	Jodi Fraley			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
Jodi Fraley	7/23/85 1510	A. Schultz			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

6 / SAMPLING - Chain of Custody

TOLS003659

3-0605

Figure 3. Example of chain-of-custody record.

BZT0104(e)040480

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO. 3011 | PROJECT NAME Time Oil

SAMPLERS: (Signature) R Schaible

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
0-0	7-22	1445		X		1	
0-2	7-23	1115		X		1	Asphalt/Rock 6-8" below Surface
0-4	7-23	1315		X		1	
0-7	7-23	1325		X		1	
0-12	7-23	390		X		1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Schaible	7-23-85 1500				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
	7/23/85 1540				TOLS003660

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3-060

Figure 3. Example of chain-of-custody record.

32319

I. ...ENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
3011	TIME OIL CO

SAMPLERS: (Signature) [signature]

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS							REMARKS
U-0	7/22	1220		X	SURFACE SAMPLE HOLE "U"	1							
U-2	"	1435		X		1							
U-4	"	1445		X		1							
U-7	"	1455		X		1							
U-12	"	1515		X	~~water~~	1							water
U-17	"	1530		X	~~water~~	1							hit water

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	7-23-85 1500	[signature]			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
[signature]	7/23/85 1510	[signature]			

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

TOLS003661

3-0605

Figure 3. Example of chain-of-custody record.

BZTO104(e)040482

IMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
3011	Time Oil

SAMPLERS: (Signature)
R Schoblith

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	REMARKS
N-0	7-22	1430		X		1	
N-2	7-23	0930		X		1	
N-4	7-23	1005		X		1	
N-7	7-23	1015		X		1	
N-12	7-23	1025		X		1	water 10-11'

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
R Schoblith	7-23-85 1500				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
	7/23/85 1540				TOLS003662

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3-0605

Figure 3. Example of chain-of-custody record.

BZT0104(e)040483

COFFEY LABORATORIES, INC.

4914 N.E. 122ND AVE.
PORTLAND, OREGON 97230
(503) 254-1794

TIME OIL

RECEIVED

JUL 19 1985

Foot of North Portsmouth

July 17, 1985

Log #A850701-E

PRELIMINARY SURFACE SAMPLES

Fiedel Environmental Services
P. O. Box 3320
Portland, Oregon 97023
Attention: John Rudolph

Analyses Requested: Pentachlorophenol

SAMPLE ID	RESULTS
A-West Primary Lateral	680 mg/Kg
B-South Primary Lateral	860 mg/Kg
C-East Primary Lateral	17 mg/Kg

Sincerely,

Susan M. Coffey

Susan M. Coffey
President

SMC:ss

TOLS003663

32319

APPENDIX B

LABORATORY RESULTS

32319

TOLS003664

BZTO104(e)040485

COFFEY LABORATORIES, INC.

4914 N.E. 122ND AVE.
PORTLAND, OREGON 97230
(503) 254-1794

Riedel Environmental Services
Page Two
Attention: John Ruddick

July 25, 1985
Log #A850717-L

Analysis Requested: Pentachlorophenol (PCP) Analysis of Soil Samples

Method: EPA SW 846 with Electron Capture Quantitation

SAMPLE ID		RESULTS	SAMPLE ID		RESULTS
STATION	TIME	PCP mg/kg	STATION	TIME	PCP mg/kg
Area E			Area G		
46	13:48	3.0	67	14:30	Hold
47	13:50	3.6	68	14:32	Hold
48	13:52	6.1	69	14:34	Hold
49	13:54	3.2	70	14:36	Hold
50	13:56	1.5	Area H		
51	13:58	2.3	71	14:38	Hold
52	14:00	1.7	72	14:40	Hold
53	14:02	1.9	73	14:42	Hold
54	14:04	1.2	74	14:44	Hold
Area F			75	14:46	Hold
55	14:06	Hold	Area I		
56	14:08	Hold	76	14:48	Hold
57	14:10	Hold	77	14:50	Hold
58	14:12	Hold	78	14:52	Hold
59	14:14	Hold	79	14:54	Hold
60	14:16	Hold	80	14:56	Hold
61	14:18	Hold	81	15:00	Hold
62	14:20	Hold			
63	14:22	Hold			
64	14:24	Hold			
65	14:26	Hold			
66	14:28	Hold			

Sincerely,

Susan M. Coffey,
President

SMC/gs

TOLS003665

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COFFEY LABORATORIES, INC.

4914 N.E. 122ND AVE.
PORTLAND, OREGON 97230
(503) 254-1794

RECEIVED
SEP 27 1985
Foot of North Portsmou

July 25, 1985
Log #A850717-L

Riedel Environmental Services
P.O. Box 3320
Portland, Oregon 97023
Attention: John Ruddick

Analysis Requested: Pentachlorophenol (PCP) Analysis of Soil Samples

Method: EPA SW 846 with Electron Capture Quantitation

SAMPLE ID		RESULTS	SAMPLE ID		RESULTS
STATION	TIME	PCP mg/Kg	STATION	TIME	PCP mg/Kg
Area A			Area C		
1	12:00	13,500	23	12:43	Hold
2	12:02	29	24	12:44	Hold
3	12:04	500	25	12:46	Hold
4	12:06	5,450	26	12:48	Hold
5	12:08	5,560	27	12:50	Hold
6	12:10	8,760	28	12:52	Hold
7	12:12	4,870	29	12:54	Hold
8	12:14	92	30	12:56	Hold
9	12:16	20	31	12:58	Hold
Area B			32	13:00	Hold
10	12:18	16	33	13:02	Hold
11	12:20	7	34	13:04	Hold
12	12:22	9	35	13:06	Hold
13	12:24	95	36	13:08	Hold
14	12:26	175	37	13:30	857
15	12:28	18	Area D		
16	12:30	229	38	13:32	1,130
17	12:32	88	39	13:34	17
18	12:34	6	40	13:36	3.5
19	12:36	3	41	13:38	3.1
20	12:38	2.5	42	13:40	3.2
21	12:40	5.2	43	13:42	2.4
			44	13:44	1.8
			45	13:46	171

THIS REPORT CONTINUES

32319

TOLS003666

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

August 1, 1985
Log #A850723-Z

Riedel Environmental Services
P.O. Box 3320
Portland, Oregon 97023
Attention: John Ruddick

Analysis Requested: Pentachlorophenol (PCP) Analysis of Soil Samples

Method: EPA SW 846 with Electron Capture Quantitation

SAMPLE ID		RESULTS	SAMPLE ID		RESULTS
STATION	TIME	PCP mg/kg	STATION	TIME	PCP mg/kg
P-2	1330	16	S-2	0900	253
P-4	1405	15	S-4	0910	184
P-7	1410	Hold	S-7	0915	Hold
P-12	1420	Hold	S-12	0920	Hold
L-4	1345	7200	T-0		No Sample
-7	1505	Hold	T-2	0930	123
-12	1515	Hold	T-4	0935	534
			T-7	0945	Hold
Q-4	1435	2205	T-12	0955	Hold
Q-7	1445	Hold			
Q-12	1455	Hold	Y-4	1045	598
			Y-7	1050	Hold
R-2	1555	34	Y-12	1100	Hold
R-4	1600	50			
R-7	1610	Hold	X-2	1115	- 4.5
R-12	1620	Hold	X-4	1120	1.3
			X-7	1130	Hold
W-2	0800	15	X-12	1140	Hold
W-4	0810	8.1			
W-7	0820	Hold	V-0	1605	317
W-12	0830	Hold	V-2	1620	260
			V-4	1625	380
Water Tub	0930	106 µg/l	V-7	1645	Hold
			V-12	1650	Hold

Results in mg/kg unless otherwise stated.

Sincerely,

Susan M. Coffey

Susan M. Coffey
President

mC/gs

32319

TOLS003667

BZTO104(e)040488

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone (503) 254-1794

July 30, 1985
Log #A850723-I

Riedel Environmental Services
P.O. Box 3320
Portland, Oregon 97033
Attention: John Ruddick

Analysis Requested: Pentachlorophenol (PCP) Analysis of Soil Samples

Method: EPA SW 846 with Electron Capture Quantitation

SAMPLE ID		RESULTS	SAMPLE ID		RESULTS
STATION	TIME	PCP mg/kg	STATION	TIME	PCP mg/kg
S-0	1505	522	O-0	1445	3900
R-0	1440	1712	O-2	1115	59
W-0	1500	3385	O-4	1315	33
			O-7	1325	Hold
Z-0	1505	21	O-12	1340	Hold
Z-2	0820	14			
Z-4	0830	2	J-0	1440	1400
Z-7	0838	Hold	J-2	1035	3.0
Z-12	0846	Hold	J-4	1040	3.6
			J-7	1045	Hold
M-0	1500	4720	J-12	1035	Hold
M-2	0720	87			
M-4	0735	22	N-0	1430	4380
M-7	0750	Hold	N-2	0950	3.1
M-12	0800	Hold	N-4	1005	338
			N-7	1015	Hold
K-0	1405	No Sample Taken	N-12	1025	Hold
K-2	1415	3.9			
K-4	1420	10.5	U-0	1420	23,550
K-7	1425	Hold	U-2	1435	44
K-12	1435	Hold	U-4	1445	55
			U-7	1455	Hold
			U-12	1515	Hold
			U-17	1530	Hold

Sincerely,

Susan M. Coffey,
President

SMC/gs

32319

TOLS003668

BZTO104(e)040489

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 5, 1985
Log #A850723-Q

Riedel Environmental Services
P.O. Box 5007
Portland, Oregon 97208

Attention: John Ruddick

Analysis Requested: Pentachlorophenol (PCP)

Sample Description: Time-Oil Site

SAMPLE ID	PCP	
R7	500	
V7	1.0	
W7	< 1.0, < 1	
X7	1.9	
K12	2.3	
L12	2030	
M12	690	
O12	38	
P12	450	
Q12	1150	
R12	< 1	
S12	212, 222	$\bar{x}$ = 217
T12	90	
V12	3.4	
W12	1.9	
X12	1.0	
Y12	720	
Z12	1.0	

< denotes "less than"

Results in mg/Kg

Sincerely,

Susan M. Coffey
President

SMC/gs

TOLS003669

32319

BZTO104(e)040490

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone (503) 254-1794

RECEIVED
SEP 27 1985
Foot of North Portsmouth

August 27, 1985
Log #A850813-F

Riedel Environmental Services
P. O. Box 5007
Portland, Oregon 97208
Attention: John Ruddick

Sample ID: Time Oil Sample Description: Soil

Analysis Requested: Pentachlorophenol

SAMPLE NUMBER	PENTACHLOROPHENOL
K-7	3
L-7	8,400
M-7	< 1.0
O-7	13
P-7	150
Q-7	700
S-7	1,130
T-7	75
U-7	5
Y-7	700
Z-7	7

Results in mg/kg

< denotes "less than"

Sincerely,

Susan M. Coffey

Susan M. Coffey,
President

SMC/db

TOLS003670

32319

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

DEC 1 3 1985

REPLY TO ATTN OF M/S 533

John P. Denham
Time Oil Company
2737 West Commodore Way
Seattle, Washington 98199

Re: Time Oil, Environmental Protection Agency ID. No. ORD009597543

Dear Mr. Denham:

Based upon the description you have given the Environmental Protection Agency (EPA) of the activities that have occurred at the facility referenced above, the soil contaminated with leaked pentachlorophenol is classified as hazardous waste F027. F027 designates discarded unused formulations containing pentachlorophenol, and soil contaminated with this waste is a hazardous waste by virtue of the mixture rule of 40 CFR 261.3 (a)(2)(iv).

There are presently no commercial hazardous waste facilities in the United States that will accept waste designated as F027, and it will be approximately six months before any commercial facilities will be certified to accept such waste. In light of this fact, you will have to work closely with the Oregon Department of Environmental Quality (DEQ) in determining the proper way to handle the contaminated soil at your site.

You have told Janet O'Hara of my staff that the storage tanks were completely emptied by approximately the end of January 1985. Therefore, you will be responsible for closing the facility (e.g., removing the hazardous waste) in accordance with the applicable closure and post-closure rules of 40 CFR Part 265. We realize that you have begun this closure process by cleaning and removing the storage tanks and associated piping. Because of the two factors we have discussed with you in telephone conversations, those being the potentially highly toxic nature of the contaminated soil and the lack of storage or disposal sites for it, it would be in your best interest to consult with DEQ personnel before you continue with clean up operations.

Sincerely,

George C. Hofer

George C. Hofer, Chief
RCRA Permits Section

cc: J. Gillespie, DEQ
J. Whitworth, DEQ
C. Rice

TOLS003671

32319

Rec'd 8/12/86 gpa

REPORT ON FIELD ACTIVITIES CONDUCTED IN LATE 1985 AT TIME OIL COMPANY 12005 NORTH BURGARD STREET PORTLAND, OREGON 97203

February 4, 1986

TOLS003672

32319

Well construction diagrams for existing Wells 1-4 are contained in Figures 6 and 7. Table 2 is a geologic log of Well 4.

PCP concentrations in the soil above the water table may decrease downward in areas of surface spillage where the spillage event occurred in sufficiently small quantities such that the spill does not completely saturate the unsaturated zone above the water table. This is the mechanism by which low volume spills may fail to directly reach the water table. A portion of the PCP in the unsaturated zone will be soluble in rainwater percolating through the soils.

Upon reaching the water table, PCP will be diffused as it is transported by groundwater flow and, to a lesser extent, by molecular diffusion and downward movement under gravity.

The rate and direction of movement of PCP in the groundwater environment is principally dependent on the natural flow of groundwater. Proposed Wells 5 through 9, depicted in Figure 5, are recommended for installation in order to determine the lateral direction of groundwater flow and the concentration of PCP in groundwater near the water table. Proposed monitoring Well 5 is placed away from the anticipated direction of groundwater flow to obtain background water quality. Proposed monitoring Wells 6 and 9 are placed outside of but adjacent to the zone of soil contamination and are located laterally to the anticipated groundwater flow direction. Proposed Wells 7 and 8 are planned to intercept groundwater flow leaving the area of soil contamination.

The proposed wells are planned to be constructed of 4" diameter polyvinylchloride (PVC) and have a locking cover placed over the exposed casing. Bumper posts would be placed around proposed Well 9, since this well is in a loading area.

Soil samples will be obtained at 5' intervals. The soil samples will be used to describe soil texture. The first soil samples would be taken at 2-1/2 feet below the land surface for PCP analysis. The second soil sample taken at each location will be obtained at a depth of 5' below the land surface. Additional soil samples will be taken at 5' intervals thereafter. The presence of PCP at the near surface depth would be used to identify areas of surface spillage and possible source areas for PCP in the groundwater.

The groundwater in existing Wells 1-4 would be sampled for PCP along with the sampling at proposed Wells 5 through 9. This would be done upon the completion of the installation of proposed Wells 5 through 9.

"Imagineering a cleaner world"

RIEDEL
ENVIRONMENTAL SERVICES, INC.

Portland Division
Foot of N. Portsmouth Ave.
P.O. Box 5007
Portland, OR 97208
(503) 286-4696

St. Louis Division
529 Spirit of St. Louis
Chesterfield, MO 63005
(314) 532-7660

San Francisco Division
230 Cutting Blvd.
Richmond, CA 94804
(415) 234-7400

Seattle Division
901 Fairview Ave. No.
P.O. Box 1720
Seattle, WA 98111
(206) 622-2900

February 4, 1986

Mr. John P. Denham, PE
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199

Dear John:

Enclosed for your consideration are analytical results from the November, 1985 field investigation of Time Oil's facility at 12005 North Burgard Street in Portland, Oregon. Preliminary pentachlorophenol (PCP) concentration contour maps have been prepared. Well construction diagrams have been provided for existing Wells 1 through 4, and a preliminary field log has been prepared for Well 4.

Some preliminary conclusions are as follows:

- There are high levels of PCP below the southwest corner of the warehouse.
- The concentration of PCP in the soils is generally highest above the water table.
- Based on analyses of saturated soil samples, the concentration of PCP in groundwater appears highest at the water table and decreases with depth.

Table 1 contains the analytical data from soil samples gathered during the November field work. This data has been compiled with previous analytical data on the soil to produce the four PCP concentration contour plots contained in Figures 1, 2, 3 and 4. The contour lines of the plots are in mg/kg, or ppm (parts per million). The contour interval is 100 ppm.

The two-foot contour plot (Figure 1) identifies the highest PCP concentrations at that level as being near the southeast corner of the warehouse. The four-foot depth contouring is identified in Figure 2. The highest concentration of PCP (116,000 ppm) found anywhere on site was identified in the soil sample obtained from 2-1/2 to 4 feet below the land surface in Well 3. This is illustrated by the closely spaced contour lines depicted in Figure 2. The high levels of PCP identified at Well 3 fall off approximately 15 feet to the west at Well 1 (see Table 1). The seven-foot contour plot is shown in Figure 3. The figure illustrates a decrease in the PCP levels from the four-foot contour.

Figure 4 illustrates the PCP in the soil below the water table at a depth of 12 feet below the land surface. The approximate depth to groundwater is 10 feet. The concentration of PCP as shown in this plot is less than that identified above the water table in the contour plot of the 7 foot depth.

For Fast Emergency Response, Call Environmental Emergency Services Co.
on 24-Hour Hotline (800) 334-0004

TABLE 1

SOIL SAMPLE RESULTS

Well Number	Depth, in Feet	Pentachlorophenol, ppm
1	0 - 1-1/2	1690
1	2-1/2 - 4	16.8
1	7-1/2 - 9	686
1	16 - 17-1/2	110
2*		
3	0 - 1-1/2	65.3
3	2-1/2 - 4	116000
3	7-1/2 - 9	11000
3	17-1/2 - 19	1560
4	18-1/2 - 20	574
4	32-1/2 - 35	62.3
4	43-1/2 - 45	1.59
4	47-1/2 - 49	2.81

* Soil samples from Well 2 were not analyzed.

RRF:kps

TOLS003675

32319

BZTO104(e)040496

As we discussed on January 24th, I would like to meet with you to discuss the proposed monitoring well installation. The network can be expanded if you need to minimize the time spent defining the extent of PCP in the groundwater. The additional wells would be located based on best technical judgment using minimal preliminary groundwater information. This usually results in accelerating the definition of the contaminant spread but requires more wells due to their less efficient location.

Please contact me at your earliest convenience should you have any questions about this report.

Sincerely,

RIEDEL ENVIRONMENTAL SERVICES, INC.

Richard R. Ferguson

Richard R. Ferguson
Hydrogeologist

RRF:kps

TOLS003676

32319

BZTO104(e)040497

M E M O R A N D U M

May 2, 1986

TO: File

FROM: Fred Proby

SUBJECT: NORTHWEST TERMINAL GROUNDWATER INVESTIGATION

Purpose of investigation was to establish depth and flow direction of groundwater. Location of groundwater measurement points are shown on attachment 1.

Riedel Environmental Services Inc. installed four 4" diameter PVC wells at the pentachlorophenol mixing site in November, 1985. Wells 1 - 3 were installed at an angle beneath the warehouse. Their vertical depth is 14'. Well number 4 was installed vertically to a depth of 40 feet. The boring log for well 4 is shown on attachment 2.

In February, 1986, Time Oil Co. (Ken McAlpine) installed well points at three locations for the purpose of measuring water table elevation. The well points consisted of 1 1/4" diameter steel pipe attached to a 30" drive point well screen which was driven in with a jackhammer. Wells A and B were driven to a depth of 20 feet. Two wells, designated C1 and C2, were placed at location C. Well C1 could only be driven to a depth of 8'. An attempt to go deeper with well C2 was unsuccessful. The elevation of each well was surveyed relative to an arbitrarily selected benchmark of 100.0'.

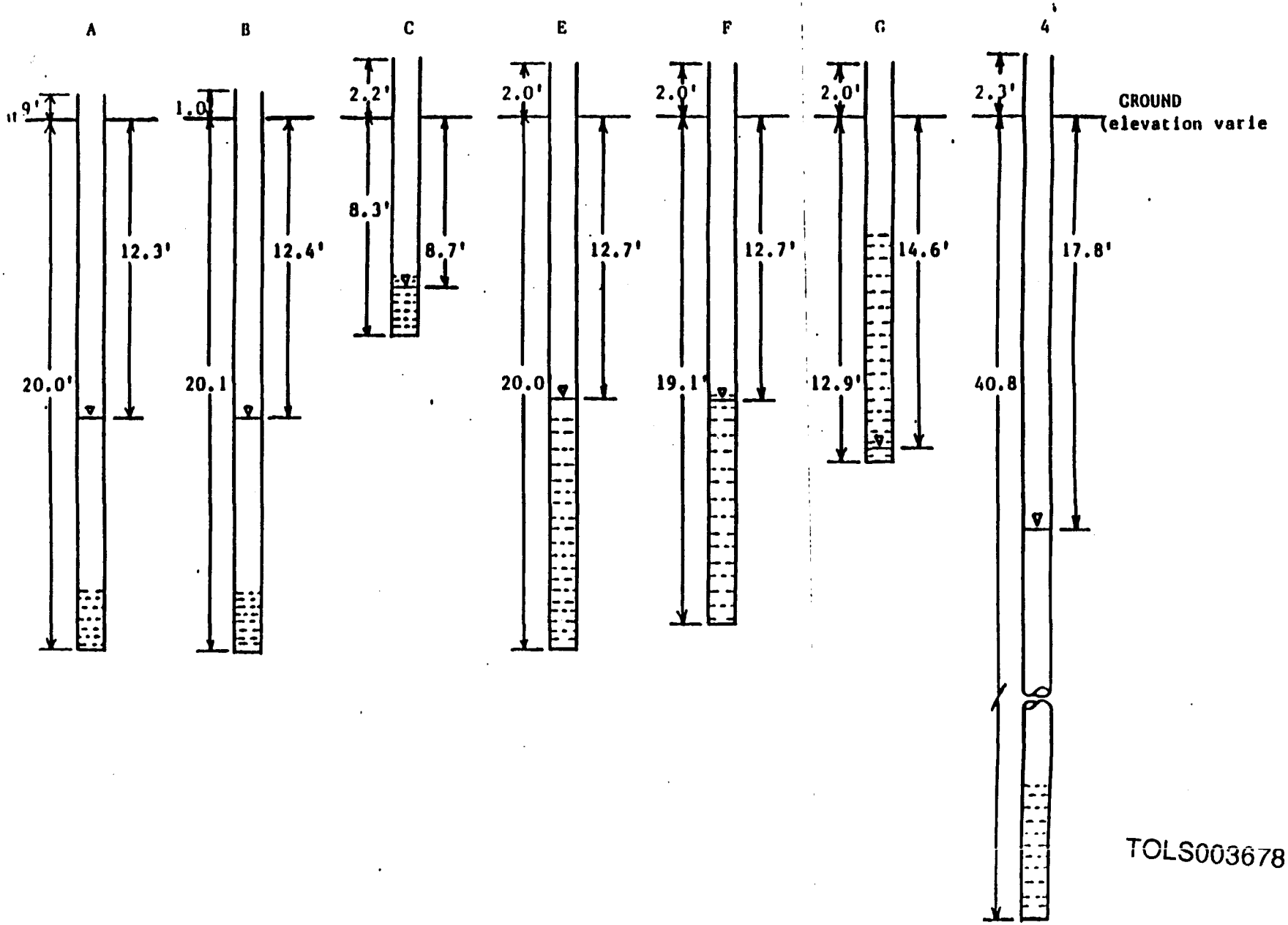
Water level measurements from wells A, B, C1, C2 and 4 were taken on nine occasions between 2/28/86 and 3/11/86. Analysis of this data showed a peculiarity between Well 4 and the well points, in that the water table measured at well 4 was as much as 7 feet lower than that measured by the well points. Furthermore, the water level in well 4 was dropping whereas the well points had a stable level.

In late March, 1986, Time Oil Co. (Fred Proby) installed three more well points (E, F and G), dug four pits, (P1 - P4) and established a river measurement point on the dock. The well points consisted of 2" PVC pipe attached to an 8.5' stainless steel drive point well screen which was driven in with a jackhammer. Wells E and F were driven to 20' and 19', respectively. Well G could only be driven to a depth of 13'. The pits were dug in the back portion of the terminal where it was found that water could be encountered at a depth of approximately 6'. Reference elevations were surveyed for the wells, pits and dock. Water level measurements were taken from all locations over a period of several days. Well point C2 was removed and C1 was redesignated as well C. Construction details of the wells are shown on attachment 3.

The water level measurements from the new well points (E, F and G) and the pits were consistent with those from the old well points (A, B, C). However, the water table elevation in well 4 matched the river elevation. River elevations for March, obtained from the National Weather Service [Mr. Steiger, (503) 249-0666], showed that the water table drop in well 4 observed between 2/28 and 3/11 closely corresponded with a drop in the river elevation. When the wells are plotted in cross section, spaced according to their distance from well 4, the water table depression around well 4 can be clearly seen (attachment 4). Attachment 5 shows water table contours.

Attachment 3

WELL CONSTRUCTION DETAILS



TOLS003678

The boring log for well 4 (attachment 2) shows a series of clay lenses and silty sand between the depths of 18.5' and 25'. Above this zone is gravelly sand and below is medium to fine sand. The clay lenses form a 6.5' thick zone of relatively low permeability.

From these observations it is apparent that there are two aquifers, an upper and a lower, beneath the Northwest terminal. The upper aquifer is "perched" on the clay zone. The water table for this aquifer slopes from the rear fence line of the terminal, where water ponds in winter, to the Willamette River. The lower aquifer is "confined" by the clay zone, as shown by the fact that the water in well 4 rises above the top of the clay zone. This zone can therefore be termed a "confining layer". Only well 4 taps the lower aquifer so the slope and direction of flow can not be determined. Since the lower aquifer is fed by the Willamette River, groundwater flow can be expected to change direction with the seasonal rise and fall of the river.

Since the water level in well 4 is lower than in the surrounding wells, groundwater from the upper aquifer flows toward well 4. This well was drilled with a 16" diameter auger and the annulus was filled with coarse sand to within 6 feet of the surface. Consequently, water from the upper aquifer can flow down through the confining layer via the well annulus. (Water can not flow down through the well itself since it is screened below the confining layer.) This is an undesirable situation, in that contaminant could reach the lower aquifer at a higher rate than would otherwise occur.

The drainage through well 4 creates a cone of depression that extends nearly 200' and forms a groundwater divide between wells B and E. The normal direction of groundwater flow in the upper aquifer should be toward the river. However, this is reversed in the area between well 4 and wells A and B. The actual shape of the cone of depression can not be determined since there are no wells closer than 150 feet from well 4.

Conclusions

Well 4 was improperly installed in that it connected two aquifers which are separated under natural conditions. The result is a depression of the water table around well 4 and a reversal of the normal groundwater flow direction.

Sealing the annulus of well 4 would stop drainage from the upper to the lower aquifer.

Installing additional monitoring wells closer to well 4 would enable better definition of the cone of depression and would allow recovery of the upper aquifer to be observed. Without this, the success of the sealing operation could not be verified.

Recommendations

1. Seal the well 4 annulus.
2. Install additional monitoring wells closer to well 4 to verify that the well 4 annulus has been sealed.

Attachments a/s

FLP/ch

32319

TOLS003679

BZTO104(e)040500

Century Environmental Sciences

June 4, 1986

Mr. John Denham
Time Oil Company
2737 W. Commodore Way
Seattle, Washington 98199

Dear Mr. Denham:

Century Environmental Sciences (Century) is pleased to transmit herein to Time Oil Company (Time) the results of chemical analyses performed on groundwater samples obtained from the Portland facility.

BACKGROUND
In early 1986 Time installed a monitoring well network at this facility. Subsequently, Time retained Century to measure static water levels, purge the wells and obtain groundwater samples using EPA approved sampling protocols, and analyze the samples. The results of this investigation are discussed below.

FIELD ACTIVITIES
Prior to monitoring well purging and groundwater sampling, Century obtained static water level measurements in the Time monitoring wells. These measurements were performed in accordance with EPA approved procedures.

The following results are identified by the letter designation of the well preceeded by either MW (monitoring well) or WP (well point):

RESULTS

WELL NO.	STATIC WATER LEVEL (FEET BELOW TOP OF CASING)
WP-A	13.65
WP-B	13.70
WP-C	8.90 (Filled with sand to 9.20 ft.)
WP-E	12.90
WP-F	13.00
WP-G	Dry
MW-4	18.98

TOLS003680

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One S.W. Columbia Street Suite 1222 Portland, Oregon 97258 Phone (503) 224-4334
Century Environmental Sciences Century West Engineering Corporation Century Testing Laboratories, Inc. Century West Development Services
Portland and Bend, Oregon Spokane and Pasco, Washington Bozeman, Montana

319

BZTO104(e)040501

Attachment 1 contains the laboratory report for this investigation. Analytical method 8270 described in the EPA publication SW-846 ("Test Methods for Evaluating Solid Waste") was utilized to analyze the Time groundwater samples for penta concentration. This method is equivalent to EPA method 625.

Century appreciates the opportunity to complete this work for Time. If you have any questions or comments regarding the data enclosed herein, please do not hesitate to call me.

Yours truly,
CENTURY ENVIRONMENTAL SCIENCES

Samuel R. Rothermel

Sam Rothermel
Environmental Engineer, Hydrogeologist

SR/js

TOLS003681

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BZTO104(e)040502

Century Testing Laboratories (CTL) provided Century with appropriately preserved sample containers. Three well volumes of water were removed from each well and well point prior to sampling so that native aquifer groundwater was sampled as opposed to standing well water. In order to purge the wells and well points, a temporary water treatment system was designed to dispose of the purged groundwater. Essentially, this system involved partially filling a 55-gallon drum with 75-pounds of activated charcoal. Activated charcoal has been proven to be very effective in treatment of Penta contaminated groundwater. A discharge hose was attached to the bottom of the 55-gallon drum and the pre-treated groundwater was directed to the sanitary sewer. A pump was utilized to purge the four-inch monitoring well. Groundwater was discharged directly from the pump line into the treatment drum. The remaining wells were either pumped using a small, nitrogen activated sampling pump (for the 2-inch well points), or bailed using a 3/4-inch outside diameter (OD) 39-inch long stainless steel bailer. Groundwater from the smaller pump and bailer was discharged temporarily into a 5-gallon bucket and subsequently poured into the treatment barrel. After each well that contained groundwater was purged and the static water level was allowed to recover to near its original level, the samples were obtained. The pumps and bailer were steam cleaned between wells following sampling.

Dates, times and locations of sampling were documented on the sample containers, on a field log form and on the sample chain of custody form. Samples were immediately chilled after they were obtained, packed and shipped to CTL on the last day of sampling. Chain of custody documentation accompanied the samples. The chain of custody form documents each individual who was in possession of the sample from the time they were obtained to the time they arrived in the lab. Chain of custody aids in tracking sample possession and assures that the samples were not tampered with enroute from the field to the lab.

WELL NO.	PENTACHLOROPHENOL CONCENTRATION (in ug/l or ppb)
WP-B	2.6
WP-E	<1.0
WP-F	1.4
MW-4	6.1

TOLS003682

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BZTO104(e)040503

Century Testing Laboratories, Inc.

RECEIVED
MAY 22 1986

May 21, 1986

John Ruddick
Century Environmental Sciences
One S. W. Columbia, Suite 1222
Portland, OR 97258

Dear John:

Here are the Penta results from Time oil:

CES #	Pentachlorophenol conc. ug/l (ppb)
WP-B	2.6
MW-4"	6.1
WP-E	<1.0
WP-F	1.4

If you have any questions, please phone.

Sincerely,

CENTURY TESTING LABORATORIES, INC.

Walter F. Burns

Walter F. Burns
Organic Chemistry Supervisor

WFB:lk

TOLS003683

P.O. BOX 1174 • BEND, OR 97709 • (503) 382-6432
Water • Feed • Soils • Construction Materials • General Analytical Services

32319

ATTACHMENT 1

GROUNDWATER ANALYTICAL RESULTS

TOLS003684

32319

Century Environmental Sciences

July 7 , 1986

Mr. John Denham
Time Oil Company
2737 W. Commodore Way
Seattle, Washington 98199

Dear John:

Attached is a copy of the report of field sampling and analytical results for groundwater samples taken at the north Portland terminal. The only detectable concentrations of pentachlorophenol in groundwater was at Well "I" located to the west of the warehouse building. The pH of the groundwater at this site was 5.74.

According to comments made in the Tuesday, March 11, 1986, Federal Register, Volume 51, No. 47, Page 8361, the EPA has proposed water quality criteria for pentachlorophenol. The criteria for fresh water aquatic life for pentachlorophenol indicates that the four day average concentration in parts per billion of pentachlorophenol which should not unacceptably affect fresh water aquatic organisms and their uses, may be calculated by an equation based on the pH of the groundwater. A second equation is given to determine the no-effect concentrations for one hour average values as well.

Based on these equations, the four day average concentration at pH 5.74 is 1.49 parts per billion. The one hour average concentration limit is 2.36 parts per billion. On this basis, the detected concentration in Well "I" is below the one hour average concentration limit cited above. The one hour concentration limit rather than the four day average limit is appropriate since this Well "I" value of 2.2 ppb is a single sample result.

I hope the information provided in this report is helpful to you. Should you have any comments or questions, please don't hesitate to contact me.

Sincerely,
CENTURY ENVIRONMENTAL SCIENCES

John Ruddick
Manager/Senior Scientist

Enclosure

TOLS003685

One S.W. Columbia Street Suite 1222 Portland, Oregon 97258 Phone (503) 224-4334
Century Environmental Sciences Century West Engineering Corporation Century Testing Laboratories, Inc. Century West Development Services
Portland and Bend, Oregon Spokane and Pasco, Washington Bozeman, Montana

32319

BZTO104(e)040506

Property No.: 03-123 Name and Address: NW Terminal

Sampler: Fred Proby 12005 N Burgard

Date and Time: 5/9/86 1300 Portland OR

ITEM	SAMPLE NUMBER	DESCRIPTION	ITEM	SAMPLE NUMBER	DESCRIPTION
1	03-123-4A	Well #1 water	11		
2	03-123-4B	Well #1 Water (duplicate)	12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Sample Collection and Preservation: Prime 3 vols (35 ml) sample w/ brine, kept in refrigerator until picked up by [redacted] Century Envir. Sci.

Laboratory Name and Address: (c/o Century Envir. Sci.) Phone No.: ( )

Instructions for Analysis: Pentachlorophenol (<10 ppb) P.O. No.:

CHAIN OF CUSTODY RECORD

Relinquished By	Received By	Date & Time
Fred Proby	[illegible] TOC - NW Terminal	5/9/86 1330

Relinquished By	Received for Laboratory By	Date & Time

TO BE FILLED OUT BY LABORATORY: Sample ID Numbers:

Person Performing Analysis: Analysis Date:

Methods Used:

Final Disposition of Samples:

IMPORTANT: Return original completed Sample Log and analysis results to Time Oil Co. 2737 W. Commodore Way, Seattle, WA 98199 Attention: John P. Denham, Environmental Manager (206)285-2400

TOLS003686

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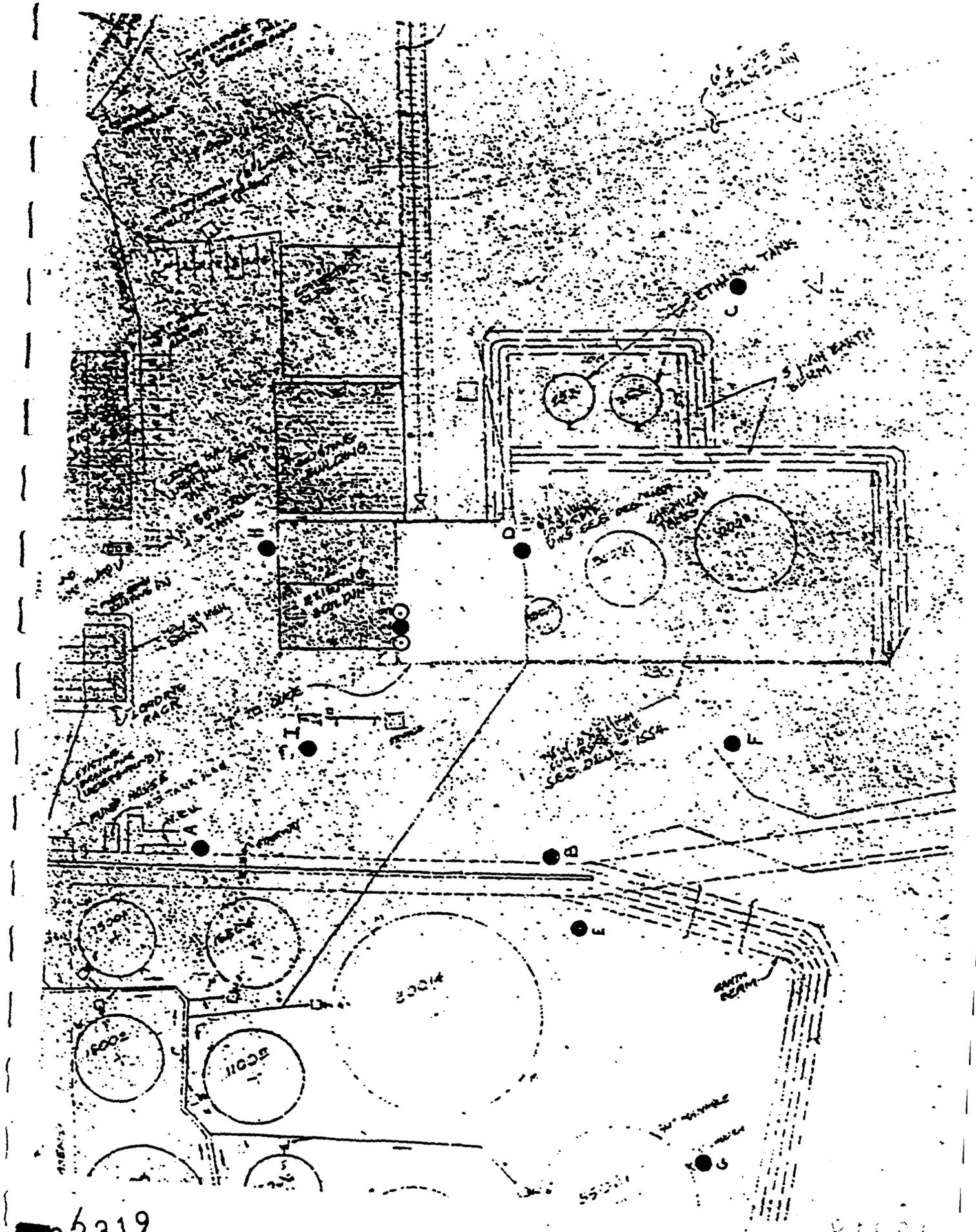
BZTO104(e)040507



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TOLS003687

BZTO104(e)040508

TIME OIL CO.
SUMMARY OF FIELD AND ANALYTICAL RESULTS
GROUNDWATER SAMPLING AND ANALYSIS

Sampling procedures meet EPA Pub. SW846.
Time Oil groundwater samples were analyzed by GC/MS using EPA Method.
The submitted sample from well No. 4 contained an insufficient amount of material for analysis.

WELL NO.	STATIC WATER LEVEL (FEET) (5-28-86)	FIELD Ph	PENTACHLOROPHENOL mg/L (ppm) (1)	STATIC WATER LEVEL (6-5-86)
A	13.17	6.56	N.D.	12.15
B	13.16	6.29	N.D.	13.18
D	12.52	6.49	N.D.	12.65
E	13.65	7.70	N.D.	13.75
F	13.90	6.73	N.D.	13.93
H	9.31	6.32	N.D.	9.46
I	12.89	5.74	.0022	13.02
QA/QC (Duplicate B)			N.D.	
Field Blank			N.D.	
2	15.00			15.11
River	18.52			14.54

NOTE: (1) Samples collected on May 28, 1986;
Laboratory analysis reported on June 9, 1986.
Detection Limit of 002 ppm.

TOLS003688

32319

BZTO104(e)040509

Regulatory Flexibility Analysis

Pursuant to the Regulatory Flexibility Act of 1980 (5 U.S.C. 601, *et seq.*) each agency, when required by 5 U.S.C. 553 to publish a proposed rule, is further required to prepare and make available for public comment an initial regulatory flexibility analysis to describe the impact of the proposed rule on small entities. In this instance, the proposal relates to nonregulatory services provided by Western. Under 5 U.S.C. 601(2), a proposal with particular applicability is not considered "a rule" within the meaning the Act. Since this proposal is of limited applicability and is being set in accordance with specific regulations and legislation under particular circumstances, Western believes that no flexibility analysis is required.

Determination Under Executive Order 12291

The Department of Energy has determined that this is not a major rule because it does not meet the criteria of section 1(b) of Executive Order 12291, 46 FR 13193 (February 19, 1981). Western has an exemption from sections 3, 4, and 7 of Executive Order 12291.

Issued at Golden, Colorado, February 24, 1986.

William H. Clagett,

Administrator.

[FR Doc. 86-4717 Filed 3-10-86; 8:45 am]

BILLING CODE 6450-01-M

ENVIRONMENTAL PROTECTION AGENCY

[OW-FRL-2961-6]

Management Advisory Group Meeting

Under Pub. L. 92-463, notice is hereby given that a one and a half day meeting of the Management Advisory Group to the EPA Construction Grant Program (MAG) will be held on March 26-27, 1986, in Washington, DC, at EPA Headquarters, 401 M Street SW., Washington, DC 20460. The meeting room will be Conference Room 2, at the EPA Washington Information Center located on the ground floor of the Waterside Mall area. The time of the meeting will be 9 a.m. to 5 p.m. on March 26, and 8 a.m. to 1 p.m. on March 27.

The principal agenda item will be work on a MAG report on compliance and operation and maintenance of publicly owned wastewater treatment works, specifically on recommendations to be made by MAG. The agenda will also include briefings and discussions on other topics of current or future interest to MAG. Any member of the public wishing to make comments is invited to submit them in writing to the Executive Secretary at the meeting.

The meeting will be open to the public. For additional information, contact Georgette Brown at (202) 382-5859.

Dated: March 5, 1986.

Edwin L. Johnson,

Assistant Administrator for Water.

[FR Doc. 86-5243 Filed 3-10-86; 8:45 am]

BILLING CODE 6560-50-M

[OW-FRL-2961-4]

Water Quality Criteria; Ambient Aquatic Life Water Quality Criteria Documents

AGENCY: Environmental Protection Agency.

ACTION: Notice of request for comments on ambient aquatic life water quality criteria documents.

SUMMARY: EPA announces the availability for public comment, and provides summaries of four ambient aquatic life water quality criteria documents. When published in final form after the review of public comments, these water quality criteria may form the basis for enforceable standards. These criteria are published pursuant to section 304(a)(1) of the Clean Water Act.

DATE: Written comments should be submitted to the person listed directly below by May 12, 1986.

FOR FURTHER INFORMATION CONTACT: Dr. Frank Gostomski, Criteria and Standards Division (WH-585), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (202) 245-3030.

Availability of Documents

This notice contains summaries of four documents containing proposed ambient water quality criteria for the protection of aquatic life and its uses. Copies of the complete criteria documents may be obtained upon request from the person listed above. These documents are also available for public inspection and copying during normal business hours at: Public Information Reference Unit, U.S. Environmental Protection Agency, Room 2404 (rear), 401 M St., SW., Washington, DC 20460. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying services. Copies of these documents are also available for review in the EPA Regional Office libraries. A list of the proposed documents is presented below:

1. Ambient Water Quality Criteria for Aluminum.
2. Ambient Water Quality Criteria for Chlorpyrifos.
3. Ambient Water Quality Criteria for Nickel.
4. Ambient Water Quality Criteria for Pentachlorophenol.

SUPPLEMENTARY INFORMATION:

Background

Section 304(a)(1) of the Clean Water Act (33 U.S.C. 1314(a)(1)) requires EPA to publish and periodically update ambient water quality criteria. These criteria are to reflect the latest scientific knowledge on the identifiable effects of pollutants on public health and welfare, aquatic life, and recreation.

EPA has periodically issued ambient water quality criteria beginning in 1973 with the publication of the "Blue Book" (Water Quality Criteria 1972). In 1976, the "Red Book" (Quality Criteria for Water) was published. On November 28, 1980 (45 FR 79318), EPA announced the publication of 64 individual ambient water quality criteria documents for pollutants listed as toxic under section 307(a)(1) of the Clean Water Act. A document addressing 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) was announced on February 15, 1984 (FR 49 5831) completing the coverage of the 65 priority pollutants listed in 307(a)(1). Nine ambient water quality documents, including revision of seven of the 1980 documents, were released on July 29, 1985 (50 FR 30784).

Today EPA is announcing the availability for comment four proposed individual ambient aquatic life water quality criteria documents. Two of the documents, nickel and pentachlorophenol, upon final publication, will update and revise appropriate sections of the 1980 criteria documents. The other two, aluminum and chlorpyrifos, will address chemicals which have not been covered before.

The documents announced today will not contain information on the effects of these pollutants on human health. EPA anticipates the release of water quality advisories on aluminum and chlorpyrifos to specifically address human health concerns. Advisories will also be issued to update the human health section of the 1980 ambient water quality criteria documents for nickel and pentachlorophenol if a review of the available information indicate that such a revision is necessary. Both the criteria documents announced today and the water quality advisories addressing human health may form the basis for enforceable standards, when published in final form.

TOLS003689

32319

BZTO104(e)040510

interest to MAC. Any member of the public wishing to make comments is invited to submit them in writing to the Executive Secretary at the meeting.

The meeting will be open to the public. For additional information, contact Georgette Brown at (202) 382-5859.

Dated: March 5, 1986.

Edwin L. Johnson,

Assistant Administrator for Water.

[FR Doc. 86-5243 Filed 3-10-86; 8:45 am]

BILLING CODE 6560-50-M

[OW-FRL-2981-4]

Water Quality Criteria; Ambient Aquatic Life Water Quality Criteria Documents

AGENCY: Environmental Protection Agency.

ACTION: Notice of request for comments on ambient aquatic life water quality criteria documents.

SUMMARY: EPA announces the availability for public comment, and provides summaries of four ambient aquatic life water quality criteria documents. When published in final form after the review of public comments, these water quality criteria may form the basis for enforceable standards. These criteria are published pursuant to section 304(a)(1) of the Clean Water Act.

DATE: Written comments should be submitted to the person listed directly below by May 12, 1986.

FOR FURTHER INFORMATION CONTACT: Dr. Frank Gostomski, Criteria and Standards Division (WH-585), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460. (202) 245-3030.

Availability of Documents

This notice contains summaries of four documents containing proposed ambient water quality criteria for the protection of aquatic life and its uses. Copies of the complete criteria documents may be obtained upon request from the person listed above. These documents are also available for public inspection and copying during normal business hours at: Public Information Reference Unit, U.S. Environmental Protection Agency, Room 2404 (rear), 401 M St., SW., Washington, DC 20460. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying services. Copies of these documents are also available for review in the EPA Regional Office libraries. A list of the proposed documents is presented below:

1. Ambient Water Quality Criteria for Aluminum.
2. Ambient Water Quality Criteria for Chlorpyrifos.
3. Ambient Water Quality Criteria for Nickel.
4. Ambient Water Quality Criteria for Pentachlorophenol.

SUPPLEMENTARY INFORMATION:

Background

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32319

TOLS003690

BZTO104(e)040511

TIME OIL CO.
SUMMARY OF FIELD AND ANALYTICAL RESULTS
GROUNDWATER SAMPLING AND ANALYSIS

Sampling procedures meet EPA Pub. SW846.
Time Oil groundwater samples were analyzed by GC/MS using EPA Method.
The submitted sample from well No. 4 contained an insufficient amount of material for analysis.

Ref Elev	WELL NO.	WT Elev	STATIC WATER LEVEL (FEET) (5-28-86)	FIELD Ph	PENTACHLOROPHENOL mg/L (ppm) (1)	STATIC WATER LEVEL (6-5-86)	WT Elev
97.14	A	83.97	13.17	6.56	N.D.	12.15	84.99
96.83	B	83.67	13.16	6.29	N.D.	13.18	83.65
97.93	D	85.41	12.52	6.49	N.D.	12.65	85.28
97.83	E	84.18	13.65	7.70	N.D.	13.75	84.08
97.97	F	84.07	13.90	6.73	N.D.	13.93	84.04
94.75	H	85.44	9.31	6.32	N.D.	9.46	85.29
98.00	I	85.11	12.89	5.74	.0022	13.02	84.98
	QA/QC (Duplicate B)				N.D.		
	Field Blank				N.D.		
	2		15.00			15.11	
96.30	River	77.58	18.52			14.54	81.76

NOTE: (1) Samples collected on May 28, 1986;
Laboratory analysis reported on June 9, 1986.
Detection Limit of 002 ppm.

TOLS003691

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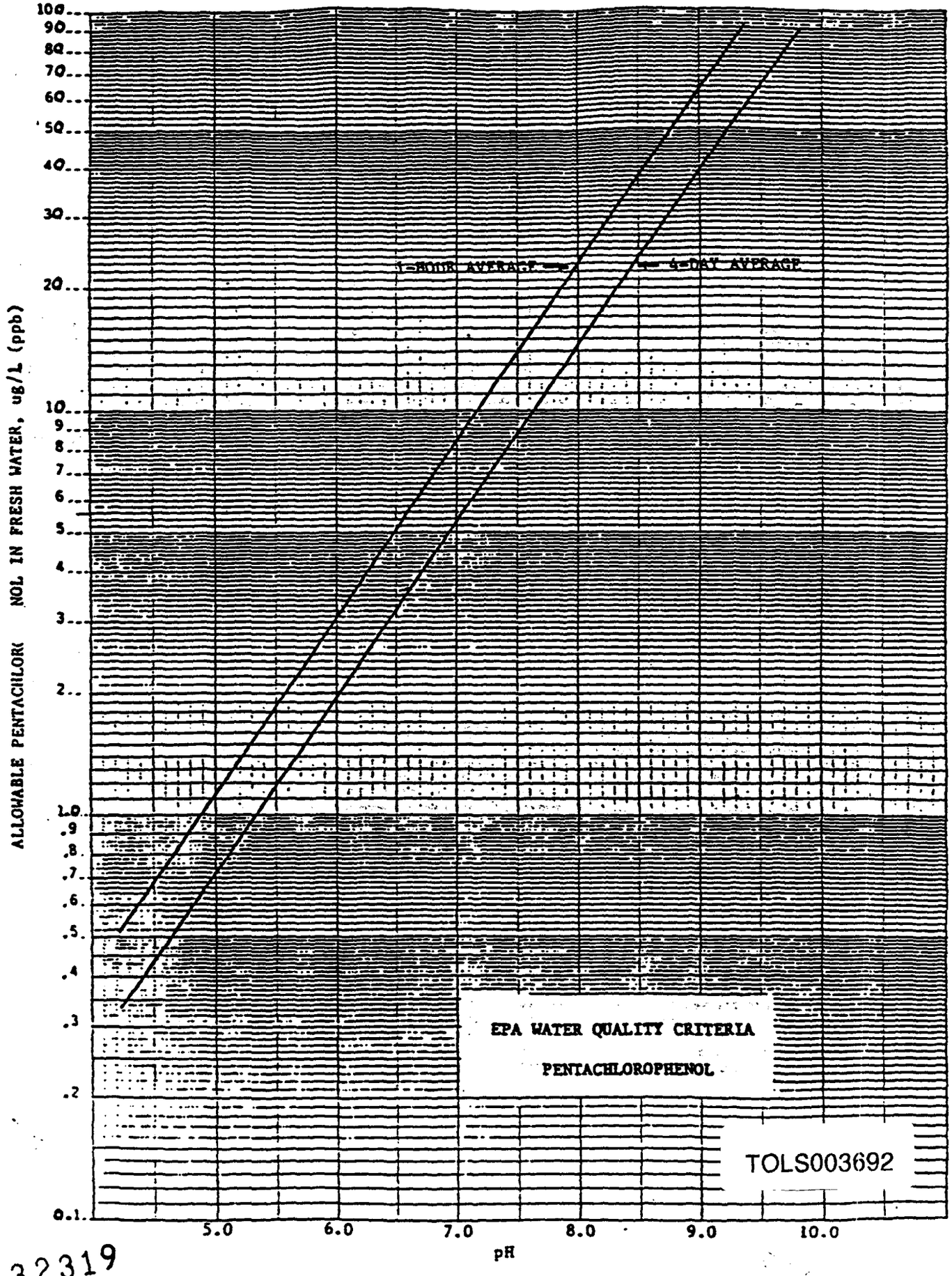
BZTO104(e)040512


ALLOWABLE PENTACHLOROPHENOL IN FRESH WATER, ug/L (ppb)
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1.0
.9
.8
.7
.6
.5
.4
.3
.2
0.1
1-HOUR AVERAGE
4-DAY AVERAGE
5.0
6.0
7.0
8.0
9.0
10.0
pH
EPA WATER QUALITY CRITERIA
PENTACHLOROPHENOL
TOLS003692

32319

established if adequate justifications is provided.

Use of criteria for developing water quality-based permit limits and for designing waste treatment facilities requires selection of an appropriate wasteload allocation model. Dynamic models are preferred for the application of these criteria. Limited data or other considerations might make their use impractical, in which case one must rely on a steady-state model. The Agency recommends the interim use of 1Q5 or 1Q10 for the Criterion Maximum Concentration (CMC) design flow and 7Q5 or 7Q10 for the Criterion Continuous Concentration (CCC) design flow in steady-state model for unstressed and stressed systems respectively. These matters are discussed in more detail in the Technical Support Document for Water Quality-Based Toxics Control (U.S. EPA, 1985).

Saltwater Aquatic Life. Saltwater aquatic organisms and their uses should not be affected unacceptably, except possibly where a locally important species is very sensitive, if the four-day average concentration of nickel does not exceed 7.9 μg/L more than once every three years on the average, and if the one-hour average concentration of nickel does not exceed 71 μg/L more than once every three years on the average.

EPA recommends applying the criteria for metals using the total recoverable method until a protocol for the measurement of "acid-soluble" metals is approved.

The allowed average excursion frequency of three years is the Agency's best scientific judgement of the amount of time it will take an unstressed system to recover from a pollution event in which exposure to these pollutants exceeds the criteria. Stressed systems, for example one in which several outfalls occur in a limited area, would be expected to require more time for recovery. The resilience of ecosystems and their ability to recover differ greatly, however, and site-specific excursion frequencies may be established if adequate justification is provided.

Use of criteria for developing water quality-based permit limits and for designing waste treatment facilities requires selection of an appropriate wasteload allocation model. Dynamic models are preferred for the application of these criteria. Limited data or other considerations might make their use impractical, in which case one must rely on a steady-state model. The Agency recommends the interim use of 1Q5 or 1Q10 for the Criterion Maximum Concentration (CMC) design flow and 7Q5 or 7Q10 for the Criterion Continuous Concentration (CCC) design flow in steady-state model for unstressed and stressed systems respectively. These matters are discussed in more detail in the Technical Support Document for Water Quality-Based Toxics Control (U.S. EPA, 1985).

4. *Pentachlorophenol*

Freshwater Aquatic Life. Freshwater aquatic organisms and their uses should not be affected unacceptably, except possibly where a locally important species is very sensitive, if the four-day average concentration (in μg/L) of pentachlorophenol does not exceed the numerical value given by e^(1.005[pH]−5.368) more than once every three years on the average, and if the one-hour average concentration (in μg/L) does not exceed the numerical value given by e^(1.005[pH]−4.830) more than once every three years on the average. For example, at pH=6.5, 7.8, and 9.0, the four-day average concentrations of pentachlorophenol are 3.2, 12 and 40 μg/L, respectively, and the one-hour average concentrations are 5.1, 19 and 63 μg/L.

The allowed average excursion frequency of three years is the Agency's best scientific judgement of the amount of time it will take an unstressed system to recover from a pollution event in which exposure to these pollutants exceeds the criteria. Stressed systems, for example one in which several outfalls occur in a limited area, would be expected to require more time for recovery. The resilience of ecosystems and their ability to recover differ greatly, however, and site-specific excursion frequencies may be established if adequate justification is provided.

Use of criteria for developing water quality-based permit limits and for designing waste treatment facilities requires selection of an appropriate wasteload allocation model. Dynamic models are preferred for the application of these criteria. Limited data or other considerations might make their use impractical, in which case one must rely on a steady-state model. The Agency recommends the interim use of 1Q5 or 1Q10 for the Criterion Maximum Concentration (CMC) design flow and 7Q5 or 7Q10 for the Criterion Continuous Concentration (CCC) design flow in steady-state model for unstressed and stressed systems respectively. These matters are discussed in more detail in the Technical Support Document for Water Quality-Based Toxics Control (U.S. EPA, 1985).

Saltwater Aquatic Life. Saltwater aquatic organisms and their uses should not be affected unacceptably, except possibly where a locally important species is very sensitive, if the four-day average concentration of pentachlorophenol does not exceed 8.1 μg/L more than once every three years on the average, and if the one-hour average concentration does not exceed 13 μg/L more than once every three years on the average.

The allowed average excursion frequency of three years in the Agency's best scientific judgement of the amount of time it will take an unstressed system to recover from a pollution event in which exposure to these pollutants exceeds the criteria. Stressed systems, for example one in which several outfalls occur in a limited area, would be expected to require more time for recovery. The resilience of ecosystems and their ability to recover differ greatly, however, and site-specific excursion frequencies may be established if adequate justification is provided.

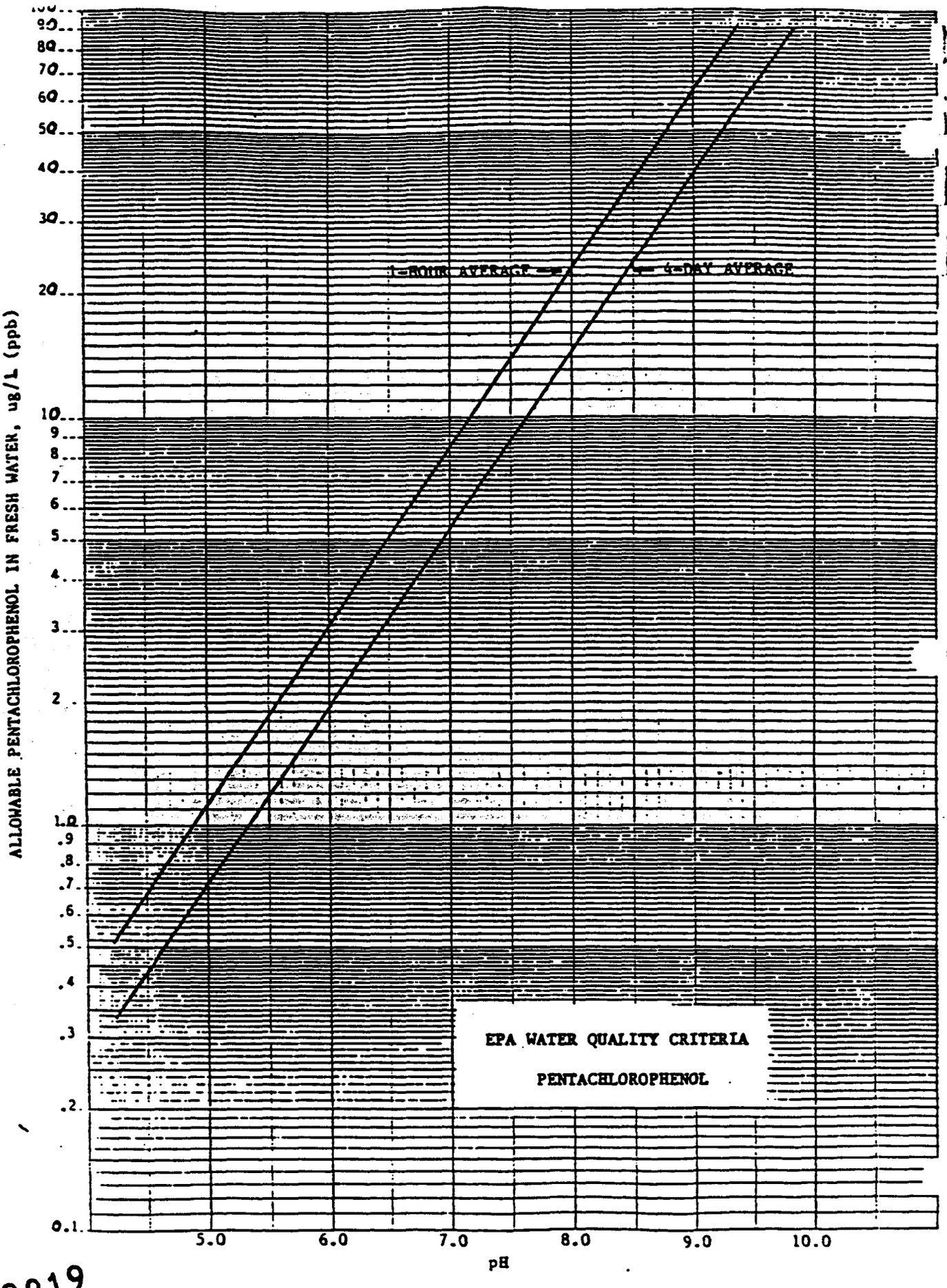
Use of criteria for developing water quality-based permit limits and for designing waste treatment facilities requires selection of an appropriate wasteload allocation model. Dynamic models are preferred for the application of these criteria. Limited data or other considerations might make their use impractical, in which case one must rely on a steady-state model. The Agency recommends the interim use of 1Q5 or 1Q10 for the Criterion Maximum Concentration (CMC) design flow and 7Q5 or 7Q10 for the Criterion Continuous Concentration (CCC) design flow in steady-state model for unstressed and stressed systems respectively. These matters are discussed in more detail in the Technical Support Document for Water Quality-Based Toxics Control (U.S. EPA, 1985).

[FR Doc. 86-5161 Filed 3-10-86; 8:45 am]
BILLING CODE 6560-50-M

TOLS003693

32319

BZTO104(e)040514



32319

TOLS003694

BZTO104(e)040515

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
Page Two

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
S-2 - Boring #5, S.W. Inside Warehouse 5'4" - 7'4" Below Concrete	5.6
S-4 - Boring #5, S.W. Inside Warehouse 7'4" - 9'4" Below Concrete	< 1
S.7 - Boring #5, S.W. Inside Warehouse 10'4" - 17'4" Below Concrete	< 1
S.12- Boring #5, S.W. Inside Warehouse 15'4" - 17'4" Below Concrete	< 1
6-0 - Boring #6, W. Central Inside Warehouse 3'5" - 5'5" Below Concrete	< 1
6-2 - Boring #6, W. Central Inside Warehouse 5'5" - 7'5" Below Concrete	< 1
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete	< 1
6-7 - Boring #6, W. Central Inside Warehouse 10'5" - 12'5" Below Concrete	< 1
6-12- Boring #6, W. Central Inside Warehouse 15'5" - 17'5" Below Concrete	0.94
D-2 - Waste Pile @ T-5, Duplicate of T-5	3420

Results in mg/kg

< denotes "less than"

REPORT CONTINUES

TOLS003695

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

32319

BZTO104(e)040516

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
P.O. Box 14005
Portland, Oregon 97214
Attention: Jonn Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
J-0 - Surface-N.E. Tank Farm	2.3
K-0 - Surface-N. Tank Farm	2964
L-0 - Surface-N.W. Tank Farm	0.7
M-0 - Surface-N.W. Tank Farm	1.8
N-0 - Surface-E. Tank Farm	6.3
O-0 - Surface-N.E. Central Tank Farm	176
P-0 - Surface-N. Central Tank Farm	75.3
Q-0 - Surface-N.W. Central Tank Farm	620
R-0 - Surface-E. Central Tank Farm	891
S-0 - Surface-S.E. Central Tank Farm	736
T-0 - Surface-N. Central Tank Farm	1600
U-0 - Surface-W. Central Tank Farm	0.7
V-0 - Surface-S.E. Tank Farm	5.0
W-0 - Surface-S. Tank Farm	354
X-0 - Surface-S. Tank Farm	44.6
Y-0 - Surface-S.W. Tank Farm	19
Z-0 - Surface-N.W. Roadway	537
1-S - Boring #1, Warehouse Loading Dock, Surface Below Concrete	1.2
1-0 - Boring #1, Warehouse Loading Dock, 3.5 ft. Below Concrete	5.7
5-0 - Boring #5, S.W. Inside Warehouse #5, 3'4" - 5'4" Below Concrete	1.4

Results in mg/kg

REPORT CONTINUES

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letr

TOLS003696

32319

BZTO104(e)040517

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
Page Four

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS	% Recovery
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete (Duplicate)	< 1	
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete (Duplicate)	< 1	
3-12- Boring #3, E. Central Warehouse 15'5" - 17'5" Below Concrete (Duplicate)	< 1	
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete (Spike)	399	101
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete (Spike)	373	96

Results in mg/kg

< denotes "less than"

Analysis by soxhlet extraction, capillary GC/FID, EPA Method 8040 .

Sincerely,

Susan M. Coffey

Susan M. Coffey,
President

SMC/gs

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

32319

TOLS003697

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Associates, Inc.
Page Three.

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
T-S - Waste Pile, Feet Below Top of Pile	1280
Q-S - Waste Pile, Feet Below Top of Pile	298
D-1 - Boring #6, Duplicate of C-S	< 1
4-0 - Boring #4, S.E. Warehouse 3'5" - 5'5" Below Concrete	< 1
4-2 - Boring #4, S.E. Warehouse 5'5" - 7'5" Below Concrete	< 1
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete	< 1
4-7 - Boring #4, S.E. Warehouse 10'5" - 12'5" Below Concrete	0.96
4-12- Boring #4, S.E. Warehouse 15'5" - 17'5" Below Concrete	< 1
3-0 - Boring #3, E. Central Warehouse 3'5" - 5'5" Below Concrete	< 1
3-2 - Boring #3, E. Central Warehouse 5'5" - 7'5" Below Concrete	< 1
3-4 - Boring #3, E. Central Warehouse 7'5" - 9'5" Below Concrete	< 1
3-7 - Boring #3, E. Central Warehouse 10'5" - 12'5" Below Concrete	< 1
3-12- Boring #3, E. Central Warehouse 15'5" - 17'5" Below Concrete	< 1

Results in mg/kg

REPORT CONTINUES

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

32319

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 5, 1986
Log # A860829-K
P.O. None

SRH Associates Incorporated
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Subject: Pentachlorophenol and pH Analysis

Sample Type: Ground Water
Sample Collected by: John Ruddick
Sample Collection Date: August 29, 1986

SAMPLE NAME	PENTACHLOROPHENOL	pH
MW-D	0.04 mg/L	6.53 SU
MW-E	< 0.01 mg/L	6.54 SU
MW-F	< 0.01 mg/L	6.57 SU
MW-H	< 0.01 mg/L	6.91 SU
MW-I	< 0.01 mg/L	6.77 SU

Pentachorophenol analysis by extraction and capillary GC/FID. The symbol "<" means less than and denotes none detected at or above the level indicated.

Sincerely,

Susan M. Coffey

Susan M. Coffey,
President

SMC:hh

This report for the sole and exclusive use of the above named client. Samples are held for a maximum of 15 days from the date of this report.

TOLS003699

32319

BZTO104(e)040520

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860826-C

SRH Associates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland

Sample Date: 8/25/86

SAMPLE ID	RESULTS
2-0	< 1.0
2-2	< 1.0
2-4	< 1.0
2-7	< 1.0
2-12	< 1.0
1-2	< 1.0
1-4	< 1.0
1-7	< 1.0
1-12	< 1.0

Results in mg/kg

< denotes "less than"

Analysis by soxhlet extraction, capillary GC/FID, EPA Method 8040

Sincerely,

Susan M. Coffey

Susan M. Coffey
President

SMC/gs

This report is for the sole and exclusive use of the above client
Samples are retained a maximum of 15 days from the date of this letter

32319

TOLS003700

BZTO104(e)040521

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 18, 1986
Log #4860816-F

SRH Associates, Inc.
P.O. Box 14001
Portland, Oregon 97214

Attention: John Puddick

Analysis Requested: Pentachlorophenol

SAMPLE ID	RESULTS
#20 - 55	< 0.3 mg/kg

Analysis by extraction, capillary GC/FID and comparison with solutions of standards.

Approved by,

Susan M. Brillante

Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,

Susan M. Coffey

Susan M. Coffey
President

SMC/ps

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

32319

TOLS003701

BZTO104(e)040522

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 9, 1986
Log #A8609C3-J

SFH Associates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analyses Requested: Pentachlorophenol (PCP) and pH

SAMPLE ID	PCP*	pH
MWA, 9/3/86, 1030	< 0.01 mg/L	6.8 S.U.
MWA, 9/3/86, 1110	< 0.01 mg/L	6.7 S.U.

< denotes "less than"

* Analysis by extraction, capillary GC/FID, Method 604.

Approved by,
Susan M. Brillante
Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,
Susan M. Coffey
Susan M. Coffey,
President

SMC/gs

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this lett

32319

CHAIN OF CUSTODY RECORD (8010)

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co

SAMPLERS: (Signature) [signature] / SRH

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE: Pentachlorophenol	AMOUNT/PRESERVATIVE: pH					SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
MWA	7/1/86	1030	BAILED	WATER	NEAR W TANK FARM	2	[illegible]	[illegible]							
MWA	"	1030	↓	↓	" "	1	[illegible]	[illegible]							
MWB	"	1110	↓	↓	" "	2	[illegible]	[illegible]							
MWB	"	1110	↓	↓	" "	1	[illegible]	[illegible]							

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature]	7/3/86 1415	[signature]			
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS003703

BZTO104(e)040524

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

October 1, 1986
Log #A860926-A

SRH Associates, Inc.
123 N.E. Third/Suite 230
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

SAMPLE ID	RESULTS
K-O, 9/26 0915, Soil	1200 mg/kg

Analysis by EPA Method 8040, capillary GC/FID.

Approved by,

Susan M. Brillante

Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,

Susan M. Coffey

Susan M. Coffey, D
President

SMC/ys

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter

32319

TOLS003704

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co - Portland

SAMPLERS: (Signature) Jill H Rudd — SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	Gas Amount/ Preservative	Containers (Type)	SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with Initials)
2-5	8/25	1130	GRAB	SOIL	NW Wall Hand Auger	1	8/0				HOLD
2-0		1145	SPLIT Spoon		" " 0'5"-5'5"	1	8/0				
2-2		1430			" " 5'5"-7'5"	1	8/0				
2-4		1520			7'5"-9'5"	1	8/0				
2-7		1545			10'5"-12'5"	1	8/0				
2-12		1720	↓		15'5"-17'5"	1	8/0				Saturated
1-2		1915	SPLIT Spoon		Hand auger outside cabinet Deck 0'5"-2'5"	1	8/0				
1-4		1950			" 2'5"-4'5"	1	8/0				
1-7		2030			" 10'5"-12'5"	1	8/0				
1-12	↓	2130	↓	↓	Hand auger outside cabinet Deck 15'5"-17'5"	1	8/0				SAT-Added Possible Contamination

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
Jill H Rudd - SRH	8/26/82 1225				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/26 1320	
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

BZT0104(e)040526

TOLS003705

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	TIME OIL CO PDX

SAMPLERS: (Signature) John H Riddell

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE	PENTACHLOROPHENOL (8040)	pH				SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
MW-D	8/29	1600	GRAB	WATER	SE TANK FARM	3	[illegible]	[illegible]	[illegible]						
MW-E	↓	1430	↓	↓	SW TANK FARM	↓	[illegible]	[illegible]	[illegible]						
MW-F	↓	1615	↓	↓	ROADWAY (S)	↓	[illegible]	[illegible]	[illegible]						
MW-H	↓	1500	↓	↓	NEAR LOADING DECK	↓	[illegible]	[illegible]	[illegible]						
MW-I	↓	1650	↓	↓	ROADWAY (N)	↓	[illegible]	[illegible]	[illegible]						

TOLS003706

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
John H Riddell / SRH	8/29/02 1800	Susan M Coffey Coffey Labs			
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

BZTO104(e)040527

32319

CHAIN OF CUSTODY RECORD (8040)

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co - Portland Terminal

SAMPLERS: (Signature) [signature] SRH Assoc

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (Ø = NONE) PENTACHLOROPHENOL						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
6-2	8/24	11:40	Split Spoon	Soil	Boring #6 [illegible] 5'5"-7'5" Below Concrete	1	8/0								
6-4	↓	12:00	↓	↓	7'5"-9'5" " "	1	8/0								
6-7	↓	12:30	↓	↓	10'5"-12'5" " "	1	5/0								
6-12	↓	14:20	↓	↓	15'5"-17'5" " "	1	2/0								Saturated Sample only part recovered
D-2	8/24	15:30	Grab	Soil	Waste Pile @ T-S Duplicate of T-S	1	8/0								
T-S	↓	15:30	↓	↓	Waste Pile Feet Below Top of Pile	1	8/0								
Q-S	↓	16:15	↓	↓	Waste Pile Feet Below Top of Pile	1	8/0								
2-1	8/24	10:50	Grab	Soil	Boring #6 Duplicate of 6-S	1	8/0								
4-5	8/24	16:10	Grab	Soil	Boring #4 SE Wase Surface Below Concrete	1	8/0								HOLD
4-0	↓	1650	Split Spoon	↓	Boring #4 SE Wase 2.5'-5'5" Below Concrete	1	8/0								
4-2	↓	1715	↓	↓	5'5"-7'5" " "	1	8/0								
4-4	↓	1745	↓	↓	7'5"-9'5" " "	1	5/0								
4-7	↓	1820	↓	↓	10'5"-12'5" " "	1	6/0								

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature] / SRH	8/25/02 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS003707

BZTO104(e)040528

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	Timeroil Co - Portland Terminal

SAMPLERS: (Signature) [signature] SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE							SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
J-0	8/23	1015	GRAB	SOIL	SURFACE - NE - TANK FARM	1	8/0									
K-0		1030			" - N "	1	8/0									
L-0		1045			" - NW "	1	8/0									
M-0		1055			" - NW "	1	8/0									
N-0		1105			" - E "	1	8/0									
Ø-0		1110			" - NE CENTRAL "	1	8/0									
P-0		1115			" - N CENTRAL "	1	8/0									
Q-0		1120			" - NW CENTRAL "	1	8/0									
R-0		1125			" - E CENTRAL "	1	8/0									
S-0		1130			" - SE CENTRAL "	1	8/0									
T-0		1135			" - N CENTRAL "	1	8/0									
U-0		1140			" - W CENTRAL "	1	8/0									
V-0		1145			" - SE "	1	8/0									
W-0		1150			" - S "	1	8/0									
X-0		1200			" - S "	1	8/0									

TOLS003708

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature] /SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

BZTO104(e)040529

32319

CHAIN OF CUSTODY RECORD 50401

PROJ. NO.	SITE/LOCATION
1003	TIME OIL CO – PORTLAND TERM.

SAMPLERS: (Signature) John H [illegible] – SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE							SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
Y-0	8/23	1205	GRAB	SOIL	SURFACE – SW TANK FARM	1	8/0									
Z-0	"	1210	"	"	SURFACE – NW ROADWAY	1	8/0									
1-S	8/23	1255	GRAB	SOIL	BORING #1 WAREHOUSE LOADING DOCK SURFACE BELOW CONCRETE	1	8/0									
1-0		1635	SPLIT SPOON	"	3.5 FT BELOW CONCRETE [illegible]	1	8/0									HIT CONCRETE OR ASPHALT
5-S	8/23	1655	GRAB	SOIL	BORING #5 SW INSIDE WASH SURFACE BELOW CONCRETE	1	8/0									HOLD
5-0		1710	SPLIT SPOON		BORING #5 3.8-5.4' BELOW CONCRETE	1	8/0									
5-2		1745			BORING #5 SW INSIDE WASH 5.4-7.4' " "	1	8/0									
5-4		1805			BORING #5 7.4-9.4' " "	1	8/0									
5-7		1825			BORING #5 10.4-11.4' " "	1	7/0									
5-12		1900			BORING #5 15.4-17.4' " "	1	8/0									Saturated Sample JHR
6-S	8/24	1050	GRAB	SOIL	BORING #6 W CENTRAL SURFACE BELOW CONCRETE	1	8/0									HOLD
6-0	8/24	1130	SPLIT SPOON	SOIL	BORING #6 " 3.5 FT BELOW CONCRETE	1	8/0									

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
John H [illegible] SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[illegible]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS003709

BZTO104(e)040530

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co - PDX Terminal

SAMPLERS: (Signature) [signature] SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (Ø = None)						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
4-12	8/24	1900	Split Spoon	Soil	Boring #4 15'5"-17'5" Sewage Blue Coloured	1	8/6								Saturated Sample
3-5	8/24	1915	Grab	Soil	Boring #3 Surface Blue Coloured	1	8/6								HOLD
3-8		1955	Split Spoon		3.5"-5'5" " "	1	8/6								
3-2		2010			5'5"-7'5" " "	1	8/6								
3-4		2015			7'5"-9'5" " "	1	8/6								
3-7		2025			10'5"-12'5" " "	1	8/6								
3-12		2100			15'5"-17'5" " "	1	8/6								Sat'd Sample

TOLS003710

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature]	8/25/84 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

BZTO104(e)040531

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH ASSOCIATE TELEPHONE# 232-0824

ADDRESS 123 NE 3RD STE 230 PURCHASE ORDER # VERBAL

ADDRESS 14005 LAB PRICE QUOTE # [redacted]

CITY/STATE ZIP PORTLAND OR 97214 BILLING ADDRESS:

ATTENTION JOHN RUDDICK

SAMPLE COLLECTION DATE 8/29/86 DUE DATE ASAP RUSH

SAMPLE COLLECTED BY J. RUDDICK DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):

Penta by EPA 8040 (SW-846)

ID	Date	Time	Media	Pres	cntnr	Analysis requested	
MW-D	8/29	1600	GROUND WATER	1:1 HEAT PH2	2 L 1 LAMBER GLASS	PENTACHLORO PHENOL	(EPA 8040)
MW-E		1430					
MW-F		1615					
MW-H		1500					
MW-I		1650					
MW-D		1600		NONE	250 ml PLASTIC	PH	
MW-E		1430					
MW-F		1615					
MW-H		1500					
MW-I		1650					

Relinquished by: [signature] Date 8/29/86 Time 1800 Received for Coffey Labs by: Susan M Coffey

SAMPLE INTEGRITY COMMENTS:

LAB LOG # A860829 N 1-10 LOGGED IN BY: S Coffey DATE: 8-29-86 TIME: 175

32319

TOLS003711

BZTO104(e)040532

CLIENT ANALYSIS REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SHR Associates TELEPHONE # 232 0824
ADDRESS 123 N.E. 3RD Suite 230 PURCHASE ORDER # VER. BAC
ADDRESS PO Box 14605 LAB PRICE QUOTE # $60/sample
CITY/STATE/ZIP PORTLAND OR 97205 BILLING ADDRESS: SAME
ATTENTION Jol Puddick
SAMPLE COLLECTION DATE 9/3/86 DUE DATE ASAP RUSH
SAMPLE COLLECTED BY J.R. Reed DELEVERED BY J Puddick
CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTA BY EPA 8040 (SW 846)
(DONT FILTER — DECANT WATER OFF ANY SEDIMENT.

ID	FieldID	Date	Time	Media	Pres	Cntnr	Analysis requested
	MW A	9/3/86	1030	WATER	1:1 HCl to pH 2	2 40ml amber Glass	PENTACHLOROPHENOL
	MW A	"	1030	"	NONE	250ml PLASTIC	pH
	MW B	"	1110	"	1:1 HCl to pH 2	2 40ml amber Glass	PENTACHLOROPHENOL
	MW B	"	1110	"	NONE	250ml PLASTIC	pH

Relinquished by: J.R. Reed / SHR Date 9/3/86 Time 1450 Received for Coffey Labs: M. Schuh

SAMPLE INTEGRITY COMMENTS:

LAB LOG # 11 0903-J LOGGED IN BY: DATE: TIME:

I:\wp\clom\form\log\login.log

TOLS003712

32319

BZTO104(e)040533

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4814 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH ASSOCIATES TELEPHONE# 503 232 0824

ADDRESS 123 NE 3RD STE 230 PURCHASE ORDER # VERBAL

ADDRESS PO BOX 14005 LAB PRICE QUOTE # 60.00/sample

CITY/STATE/ZIP PORTLAND OR 97214 BILLING ADDRESS:

ATTENTION JOHN RUDDICK

SAMPLE COLLECTION DATE 8/24/86 + 8/23 DUE DATE 9/2/86 RUSH

SAMPLE COLLECTED BY J RUDDICK DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTACHLOROPHENOL BY EPA 8040 (SW 846)

ID #	Date	Time	Media	Pres	Cntnr	Analysis requested
4-4	8/24	1745	Soil	None	803 Glass	Pentachlorophenol (EPA 8040)
4-7	8/24	1820				
J-0	8/23	1015				
K-0		1030				
L-0		1045				
M-0		1055				
N-0		1105				
Ø-0		1110				
P-0		1115				
Q-0		1120				

Relinquished by: John H Ruddick / SRH Date 8/25/86 Time 1045 Received for Coffey Labs Stephen E. [illegible]

SPECIAL QUALITY COMMENTS:

LAB LOG: LOGGED IN BY: DATE: TIME:

32319

TOLS003713

BZTO104(e)040534

COFFEY LABORATORIES, INC.

4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY: SRH Associates TELEPHONE# 503 232 0824

ADDRESS: 125 SW 3rd Ste 230 PURCHASE ORDER # Verbal

ADDRESS: PO Box 14005 LAB PRICE QUOTE # 60.00/sample

CITY/STATE: Portland OR 97214 BILLING ADDRESS:

ATTENTION: John Ruddick

SAMPLE COLLECTION DATE: 8/23/86 DUE DATE: 9/2/86 RUSH:

SAMPLE COLLECTED BY: J Ruddick DELIVERED BY: JHR

CLIENT COMMENTS (SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

LAB #	Date	Time	Matrix	Preservative	Analysis requested
R-0	8/23	1125	Soil	None	50z Glass Pentachlorophenol (EPA 8040)
S-0		1130			
T-0		1135			
U-0		1140			
V-0		1145			
W-0		1150			
X-0		1200			

RELINQUISHED BY: J H Ruddick Date: 8/25/86 Time: 1045 Received at Coffey Labs by:

LABORATORY COMMENTS:

LOGGED IN BY: DATE: TIME:

TOLS003714

32319

BZTO104(e)040535

COFFEY LABORATORIES, INC.
4814 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates TELEPHONE# 503 232 0824

ADDRESS: 121 SW Salmon Str 250 PURCHASE ORDER # Verbal

ADDRESS: PO Box 14005 LAB PRICE QUOTE # 60.00/sample

CITY/STATE ZIP: Portland OR 97214 BILLING ADDRESS:

ATTENTION: John Ruddick

SAMPLE COLLECTION DATE: 8/26/86 DUE DATE: 9/2/86 RUSH:

SAMPLE COLLECTED BY: J Ruddick DELEVERED BY: JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pintachlorophenol by EPA 8040 (SW 846)

Date	Time	Media	# of containers	Analysis requested	
6-5	8/24 1050	Soil	Nine 80z glass	Pcp (EPA8040)	(Hold)
6-0	1130				
4-12	1900				
3-5	1915				(Hold)
3-0	1955				
3-2	2010				
3-4	2015				
3-7	2025				
3-12	2100				
6-2	1140				

RELINQUISHED BY: John H Ruddick /SRH Date: 8/27/86 Time: 1045 Received for Coffey Labs

SAMPLE INTEGRITY COMMENTS:

LAB LOG LOGGED IN BY: DATE: TIME:

32319

TOLS003715

BZTO104(e)040536

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4814 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates
TELEPHONE#: 503 232 0824
ADDRESS: 125 NE 3RD STE. 230
PURCHASE ORDER #: Verbal
ADDRESS: PO Box 14005
LAB PRICE QUOTE #: 60.00/sample
CITY/STATE: Portland OR 97214
BILLING ADDRESS:
ATTENTION: John Ruddick
SAMPLE COLLECTION DATE: 8/25/86
DUE DATE: 9/2/86
RUSH:
SAMPLE COLLECTED BY: J Ruddick
DELIVERED BY: JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

Lab No.	Date	Time	Media	Pres	Cntnr	Analysis requested
6-4	8/24	1200	Soil	None	8oz Glass	Penta (EPA 8040)
6-7		1230				
6-12		1420				
D-2		1530				
T-S		1530				
Q-S		1615				
D-1		1050				
4-S		1610				(HOLD)
4-0		1650				
4-2		1715				

Sampled by: John H Ruddick / SRH
Date: 8/25/86
Time: 1045
Received for Coffey Labs by: [signature]

SPECIAL SECURITY COMMENTS:

LAB LOG: LOGGED IN BY: DATE: TIME:

32319

TOLS003716

BZTO104(e)040537

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates
TELEPHONE#: 503 232 0824
ADDRESS: 123 NE 3rd STE 230
PURCHASE ORDER #: Verbal
ADDRESS: PO Box 14005
LAB PRICE QUOTE #: 60.00/sample
CITY/STATE: Portland OR 97214
BILLING ADDRESS:
ATTENTION: John Ruddick
SAMPLE COLLECTION DATE: 8/23/86
DUE DATE: 9/2/86
RUSH:
SAMPLE COLLECTED BY: J Ruddick
DELIVERED BY: JHR
CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

ID	Date	Time	Media	Pres	Cntnr	Analysis requested
Y-0	8/23	1205	Soil	None	802 Glass	Pentachlorophenol (EPA 8040)
Z-0		1210				
1-S		1255				(HOLD)
1-0		1635				
5-S		1655				(HOLD)
5-0		1710				
5-2		1745				
5-4		1805				
5-7		1825				
5-12		1900				

TOLS003717

RELINQUISHED BY: John H Ruddick
Date: 8/25
Time: 1045
Received for Coffey Labs: [signature]

SPECIAL DIVERSITY COMMENTS:

LAB LOG: LOGGED IN BY: DATE: TIME:

32319

BZTO104(e)040538

COFFEY LABORATORIES, INC.

4814 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates TELEPHONE#: 503 232 0824

ADDRESS: 123 SE 3rd STE 230 PURCHASE ORDER #: Verbal

ADDRESS: PO Box 14005 LAB PRICE QUOTE #: 60.00/sample

CITY/STATE/ZIP: Portland OR 97214 BILLING ADDRESS:

ATTENTION: John Ruddick

SAMPLE COLLECTION DATE: 8/25/86 DUE DATE: 9/2/86 RUSH:

SAMPLE COLLECTED BY: J Ruddick DELIVERED BY: JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

ID #	Date	Time	Matrix	Preservative	Analysis requested
2-S	8/25	1130	Soil	None	Glass 80z: Penta by EPA 8040 (HOLD)
2-0		1145			Run
2-2		1450			Run
2-4		1520			Run
2-7		1545			Run
2-12		1720			Run
1-2		1915			Run
1-4		1950			Run
1-7		2030			Run
1-12		2130			Run

RELINQUISHED BY: Date: 8/26 Time: 1125 Received for Coffey Labs by:

SAMPLE ACTIVITY COMMENTS:

LAB LOG # LOGGED IN BY: DATE: TIME:

32319

TOLS003718

BZTO104(e)040539

PENTACHLOROPHENOL

CONTAMINATION

AT

TIME OIL COMPANY

NORTHWEST TERMINAL

12005 NORTH BURGARD ROAD

PORTLAND, OREGON

OCTOBER 1, 1986

PREPARED FOR:

TIME OIL COMPANY
2737 WEST COMMODORE WAY
SEATTLE, WASHINGTON

PREPARED BY:

SRH ASSOCIATES, INC.
123 N.E. THIRD AVENUE, SUITE 230
PORTLAND, OREGON 97232
(503) 232-0824

TOLS003719

32319

BZTO104(e)040540

At the end of 1985, the EPA advised Time that soil contaminated with leaked PCP had been reclassified as hazardous waste (number F027) and that there were currently no hazardous waste facilities in the U.S. that would accept this waste.

Pending resolution of EPA/DEQ acceptable disposal methods for PCP contaminated soil, efforts were directed toward the determination of possible groundwater contamination. Fourteen wells were installed and developed during 1986. Two were subsequently closed due to inefficient operation. Remaining wells have been repeatedly sampled and those samples analyzed for PCP. Concentrations have not exceeded .044 ppm at the highest reading. While well water analysis is scheduled to continue quarterly until the project is completed, to ensure no groundwater migration goes undetected, there appears to be no real groundwater problem.

Since there was no regulatory relief in sight, which would permit off-site disposal of PCP contaminated soil, Time initiated an assessment of on-site remedial alternatives. Recommended actions are:

a. Select the "Surface Mounted Soil Washing" technique as the most logical remedial approach.

b. Perform bench scale and pilot level evaluations.

c. Determine necessary destruction steps of recovered extracts.

d. Ascertain technical permitting and economic feasibility of technique for final disposal action.

e. Compare results with repeat step by step examination of next most logical remedial approaches which are: "Surface Mounted Thermal Extraction" and "In-Situ Thermal Extraction".

EXECUTIVE SUMMARY

On March 1, 1967, Time Oil Co. and Koppers Company entered into an agreement wherein Time would provide certain labor and services connected with the receipt, storage, handling and blending of specified woodtreating products, including pentachlorophenol. All products were owned by Koppers. The site selected for this activity included a warehouse and tank farm on a small (70' x 70') portion of Time's 45 acre Northwest Terminal located at 12005 North Burgard Road in Portland, OR.

The operation started up and continued routinely until January 28, 1981. Time then advised Koppers of its election to terminate the project effective March 31, 1982, the scheduled agreement expiration date. Various in-house inspections had indicated the possibility of soil contamination. Subsequent bioassay tests confirmed the existence of pentachlorophenol in the soil adjacent to the warehouse. Both companies concurred to close the site. Operations ceased. Orderly phase out actions were established and begun.

It is noteworthy that this entire closure effort was jointly planned and undertaken by the two companies to voluntarily correct what both felt may become a future problem.

By February 1985, on hand product inventory had been blended off and shipped out. All tanks and piping had been cleaned, with cleaning wastes being shipped to Arlington. Piping and tanks had been disassembled, removed and scrapped. In short, the site was cleared to ground level.

Soil clean-up began. Following coordination with the DEQ, the Arlington landfill and local contractors, some 242 tons of soil were shipped to Arlington. A sampling matrix was prepared and more than 150 soil samples were collected and analyzed for PCP. Concentration isopleths were generated, which depicted remaining contamination locations and degrees of contamination, the highest of which was 116,000 ppm. Isopleths showed site size had now expanded to about 70' x 140' in area. The concrete wall along the western edge of the site was removed, decontaminated and disposed of to facilitate removal of this newly discovered increased area of soil contamination. To aid in reducing the physical size of this newly defined area, the extremities of site soil were centralized to the one spot having the highest known contaminant concentration. Soil relocation actions were based on previously plotted contour determinations. They were successful in that the area was reduced to about 60' x 60'.

SECTION I

HISTORY

Section I provides a sequential summary of those activities relating to pentachlorophenol (PCP) operations within the Time Oil Company Northwest Terminal located at 12005 North Burgard Road in Portland, Oregon. The information was gathered from Time Oil files at the firm's Seattle headquarters. Data was extracted from reports, memos and other correspondence from Time employees, the Oregon Department of Environmental Quality (DEQ), the US Environmental Protection Agency (EPA) and private consultants.

BACKGROUND

Agreement with Koppers Company, Inc. (1967-1982)

On March 1, 1967, Time Oil Company reached an agreement with the Koppers Company, whereby Time would provide the storage, handling and distribution of Koppers owned specialty woodtreating chemicals, including PCP. The operating area included a warehouse building and an adjacent tank farm area (about 70' x 70') with an earthern surface. This small site was to become known collectively as the woodtreating chemicals area. Early in 1981, Time notified Koppers of their intent to terminate the agreement on March 31, 1982. Time and Koppers jointly agreed to immediately cease all PCP operations at the site, to remove all products, to clean all tanks and pipelines, to remove and dispose of all tanks and pipelines, to effect clean up of whatever contamination existed and to do it all within existing regulatory guidelines.

Various Site Inspections (1971-1984)

A summary of in-house site inspections, over the ten year period (1971-1981), identified the following problems related to the PCP operation.

- o No spill control system in warehouse. Spilled liquid was able to run unrestricted through the warehouse area and drain out through doors. Sloping of the warehouse floor and installation of drains was recommended.

TOLS003722

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BZTO104(e)040543

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TOLS003723

BZTO104(e)040544

physical removal, plans were made to excavate and dispose of soil to a depth below that where PCP contamination was found to exist. This was to be a three phase effort, fully coordinated with the DEQ and the disposal facility. Phase I consisted of initial soil removal and its transport to an authorized disposal facility. Phase II involved a thorough investigation to determine the extent of PCP contamination and its degree of concentration. Phase III was to remove and dispose of any remaining soil which was detected, by laboratory analysis, to be contaminated above acceptable limits.

On November 1, 1983, a delay in Phase I of the planned removal occurred because ownership of the hazardous waste facility at Arlington changed and some period of time was needed for the new management to reach full operational status. Further, an agreement from the new owners (Chemical Waste Management) to accept the soil at Arlington prior to any excavation was absolutely essential to ensure that Time did not become classified as a hazardous waste storage facility.

Removal and Disposal of Contaminated Soil (February - June, 1985)

On February 4, 1985, Time reiterated to the DEQ, its intent to excavate PCP-contaminated soil and dispose of it at an approved disposal facility. On February 19, Time executed a contract with Northwest Vacuum Truck Service, Inc. for removal and transport of the contaminated soil. On May 14, the DEQ granted approval for disposal of the PCP-contaminated soil at the Arlington landfill. On June 24, an agreement covering disposal was reached with Chem-Security Systems, Inc., operator of the Arlington facility.

Between June 25 and June 28, 1985, 288 cubic yards (242.76 tons) of soil were removed and shipped to Arlington. The soil was excavated to a depth of 2 to 4 feet below grade in the northwest corner of the woodtreating chemicals tank farm.

Soil Sampling (June - July, 1985)

On June 28, 1985, following completion of contaminated soil excavation, Time retained Riedel Environmental Services to perform sampling and analysis of the remaining soil. Samples of surface soils were initially collected from 22 locations around the perimeter of the woodtreating chemicals tank farm area. Three composite samples were formed and analyzed, showing PCP concentrations of up to 860 ppm. Samples of the soil from 81 individual sample sites surrounding the woodtreating tank farm area were then collected and analyzed for PCP. The results indicated that the contamination was localized to the west and south of the warehouse with little or no contamination occurring to the east of the site.

TOLS003724

BZTO104(e)040545

- Floor of warehouse work area caked with product. Steam cleaning recommended.

- No warning signs were posted which call attention to hazards in the area where PCP was stored and mixed.

- Ground near end of pipelines saturated with product to a dept. of 12 inches.

During February 1983, Time contracted with the AM-Test Corporation to conduct a fish bioassay test on the site soil. Analysis resulted in a finding of the soil (only) being toxic at the 100 and 1000 ppm levels.

On a subject matter completely unrelated to the pentachlorophenol operation and Time/Koppers planned actions, the DEQ conducted an inspection of the entire Northwest Terminal facility on October 25, 1984. On that date, the DEQ advised their intent to collect soil samples throughout the facility. It is because of this latter DEQ advisory that the following soil test results are included since two samples were taken from the woodtreating chemicals area.

On December 12, 1984, DEQ personnel collected twelve soil samples from the entire facility. Splits of each sample were provided to Time. DEQ analytical results were received by Time on January 24, 1985. The DEQ samples were analyzed for EPA Priority Pollutants and for other substances identifiable through GC/MS scan, with a specific interest in lead content. No samples were found to have lead concentrations above the detection limit. The samples were also analyzed for fourteen pesticides, but no concentrations above the detection limit were found. Non-priority GC/MS scans indicated the presence of low concentrations of petroleum hydrocarbons in three of the twelve samples. In the analysis for EPA Priority Pollutants, ten of twelve samples were found to contain either no concentrations of any organics above the detection limit, or only trace amounts of polynuclear aromatics. One sample, taken from the woodtreating chemicals tank farm, contained 515 ppm of PCP and 12 ppm of tetrachlorophenol (TCP). The second sample from this area contained 1820 ppm of PCP and 71 ppm of TCP.

Sample splits, which had been provided to Time, were then submitted to Coffey Laboratories for analysis in order to confirm DEQ findings. Results of these analyses were received on March 15, 1986 and showed no PCP concentrations higher than 275 ppm. No pentachlorophenol was detected in any sample outside of the woodtreating chemicals area.

INITIAL CLEAN UP EFFORTS

Proposal for Removal of Contaminated Soil (1983)

In October of 1983, pending completion of site tank and pipeline

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BZTO104(e)040546

to a hazardous waste bearing number F027. Referring to a moratorium on landfilling of such wastes, the EPA letter stated that at that time there were "no commercial hazardous waste facilities in the United States that would accept waste designated as F027." EPA also suggested that Time consult with the DEQ before continuing with clean-up operations at the site.

Wells 1, 2, 3 and 4 Installation (November, 1985)

Pending resolution of acceptable disposal techniques for contaminated soil containing PCP, Time concentrated on determination of possible groundwater contamination.

In November, 1985, Time again retained Riedel Environmental Services to install four groundwater monitoring wells near the southwest corner of the warehouse building. Wells 1, 2 and 3 were placed in 16-inch (O.D.) 45° slant borings which penetrated soil beneath the building to a vertical depth of 14 feet. Well 4 was installed in a 16-inch (O.D.) vertical hole drilled to a depth of 50 feet. Samples for PCP analysis were taken to advance and further earlier analyses, particularly to determine if contamination existed beneath the woodtreating chemicals warehouse.

Samples from the slant borings indicated PCP concentrations as high as 116,000 ppm at 2.5 to 4 feet below the surface, with surface concentrations ranging from 65.3 to 1,690 ppm. The concentrations generally decreased with depth. The vertical boring (Well #4) showed concentrations descreasing with depth from 574 ppm at 18.5 to 20 feet below the soil surface to a low of 1.59 ppm at 43.5 to 45 feet below the surface. The conclusion of this report was that contamination exists below the southwest corner of the woodtreating warehouse floor, although the horizontal limits of contamination were not definable with the existing data.

Geologic logging of the soil at Well #4 indicated a minor layer of low permeability about 18 to 35 feet below the surface. The well was completed by installing 4-inch PVC well casing and screen to a depth of 40 feet in the 16-inch auger hole and sand packing the well annulus to within 6 feet of the surface. A well construction diagram is shown in Figure I-3. The geologic log of this boring is shown in Figure I-4. A well construction diagram of the slant borings is shown in Figure I-5.

Installation of Well Points (February - May, 1986)

In February, 1986, in order to identify groundwater flow direction and gradient beneath the Northwest Terminal facility, Time installed well points at three locations surrounding the woodtreating chemicals warehouse and tank farm area. Two of the wells (A and B) were installed to a depth of 20 feet. Two wells were installed at a depth of 8 feet at location C (see Figure 1-6).

Soil was then collected from fourteen locations at depths of 0, 2, 4, 7 and 12 feet below the surface on a triangular grid across the tank farm area. Samples were taken by the split spoon technique using a hollow stem auger drill rig, and analyses were performed in accordance with EPA procedure #8040 (SW-846). Contaminant contour maps were developed from the data which showed a maximum PCP concentration of 26,500 ppm at the surface in the area where the loading of trucks had occurred. This finding of soil contamination caused an increase of the site size to about 70' x 140'. A second focus of contamination was at the southwest corner of the warehouse. The vertical column of contamination at the second location extended to the lowest sampling interval (12-14 feet below the surface), which was noted as being in the saturated zone at the time of sampling. The highest concentration at this depth was 2,030 ppm.

The two focal points of contamination are indicated on the surface contour isopleth map generated by Riedel and presented as Figure I-1 of this report. Figure I-2 indicates the 12 foot contaminant isopleth. (Note: the southwest corner of the warehouse is indicated by the reference mark at coordinates (76,166)).

600 ppm Chlorophenol Toxicity Level Interpretation (June, 1985)

On June 28, 1985, Time received a letter from the DEQ laboratory, concerning previous interpretations by the agency, that 600 ppm of total chlorophenols in soil represented the hazardous waste threshold. This conclusion was based on extraction and bio-toxicity tests peformed by DEQ. The letter stated, however, that this was only used as guidance and did not necessarily reflect specific clean up requirements.

Removal of Concrete Wall (November, 1985)

Time retained Riedel Environmental Services in November, 1985 to remove and decontaminate a concrete wall which stood along the west perimeter of the woodtreating chemicals tank farm area. The intent of the removal of the wall was to allow for easy sample analysis, contaminant containment and future removal of the contaminated soil adjacent to the wall. This project included wall steam cleaning, subsequent testing of the wall for residual PCP and wall demolition following certification of decontamination to background levels of PCP. The wall was broken into pieces by Riedel and disposed of by Time.

Classification of Contaminated Soil as Hazardous Waste (December, 1985)

On December 10, 1985, the EPA Region X office advised Time that soil contaminated with leaked PCP had been reclassified (from U24?)

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In an effort to reinstate natural groundwater flow patterns in the area and to eliminate possible intercommunication between upper and lower water bearing zones, Well 4 was removed by overdrilling and the hole sealed on May 14, 1986. Prior to choosing this method of abandonment, Time evaluated several possibilities, including pressure grouting and two different overdrilling processes, with input from Hart Crowser and Associates, Century Environmental Sciences and Riedel.

Groundwater Sampling (April - May, 1986)

Time retained Century Environmental Sciences to perform groundwater sampling and analysis of the wells and well points at the Northwest Terminal facility. In April, 1986, Century measured static water levels in Well 4, in Wells A-C and Wells E-G. These measurements again showed that the water level in Well 4 was lower than in surrounding wells. Samples collected from each well were analyzed and .0061 ppm, .0026 ppm and .0014 ppm of PCP were detected in Wells 4, B and F, respectively.

On May 28, following abandonment of Well 4, a second group of groundwater samples were collected from Wells A, B, D, E, F, H and I. The locations of these wells is indicated in Figure 6. The analytical results showed PCP in a concentration just slightly above the detection level (.0002 ppm) in Well I. Other wells contained no detectable levels of PCP.

Additional Soil and Groundwater Sampling (August, 1986)

In August, 1986, Time retained SRH Associates to perform additional sampling and analysis of soil and groundwater at the Northwest Terminal facility. Based on previous contour map determinations, Time re-graded the surface of the woodtreating chemicals tank farm area, gathering all suspected contaminated surface soil in a centralized area, reducing the area to about 60' x 60'. SRH then collected surface soil samples from the same 14 locations in the tank farm area which had been sampled earlier by Riedel, drilled six holes through the warehouse floor and sampled soil from beneath the building. Samples were collected from the surface of the soil underlying the concrete floor of the warehouse as well as the same five subsurface intervals sampled by Riedel in 1985. These borings were made in an effort to determine the extent of contamination underlying the warehouse.

SRH also collected groundwater samples for PCP analysis and pH, and made measurements of static water levels from all monitoring wells in existence. The results of these analyses are supplied in Section III of this report.

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Water level measurements were taken on nine occasions between February 28 and March 11 in Wells A, B, C_1, C_2 and 4. The data collected indicated an unexpectedly lower water level in well 4 as compared with the other well locations.

To further investigate this unusual circumstance, three additiona well points, four observation pits and a river level reference point were installed by Time in late March, 1986. Wells E and F were driven to depths of 20 and 19 feet, respectively, while Well G was driven to a depth of 13 feet where advancement of the point was halted by cobbles. Well C_2 was removed, and Well C_1 was henceforth known simply as Well C. Water levels in Well 4 and Wells A-G were again measured repeatedly over a period of several days. The data confirmed earlier indications that a water table depression existed in the area of Well 4.

A detailed evaluation of the boring log data for Well 4 showed that a series of clay lenses and silty sands had been penetrated by the bore hole between the depths of 18.5 and 35 feet.

Gravelly sand lies above this zone and medium to fine sand predominates below it. The clay lenses appear to have formed a zone of relatively low permeability separating a perched upper water bearing zone from a lower aquifer. This zone of low permeability was apparently breached by the installation of Well 4. The boring was drilled with a 16-inch diameter auger while the well consisted of 4-inch PVC pipe. The annulus was filled with coarse sand, violating the integrity of the low permeability layer and providing a potential pathway for water from the upper perched water bearing zone to flow down the hole to the lower aquifer, creating a depression in the natural groundwater flow. This appeared to have altered the natural direction of groundwater flow (toward the Willamette River) within a zone of influence surrounding Well 4.

Although the observed water table depression could represent a strong, natural vertical gradient in the vicinity of Well 4, the influence of this well on adjacent wells indicated a strong probability of an induced groundwater sink caused by an unsealed annulus of Well 4. This conclusion was reached by Time upon evaluation of the piezometric surface of the perched water, which indicated that wells in close proximity to Well 4 were apparently influenced by Well 4, showing water level depressions, while wells distant from Well 4 were unaffected.

Additional Groundwater Monitoring Wells and Well 4 Abandonment (May, 1986)

At Time's direction, three additional groundwater monitoring wells (D, H and I) were installed by Riedel in early May, 1986. The purpose of these wells was to further define the upper piezometric surface and to obtain data on groundwater quality.

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SECTION II

REMEDIAL ALTERNATIVE ASSESSMENT

INTRODUCTION

A small portion of Time's 45 acre property at 12005 N. Burgard Road in Portland, Oregon has been identified as being contaminated with pentachlorophenol (PCP). Contamination at this site has been found to extend to approximately 70' x 140' in area and to depths of about 15 feet below the surface in one spot. The site was used for the formulation and storage of woodtreating chemicals under an agreement between Time and Koppers from 1967 until 1982. In addition to pentachlorophenol, a number of hydrocarbon solvents and petroleum products were used in this process.

Concentrations of PCP, ranging from below detectable limits to 116,000 ppm, have been detected in the soil, with concentrations generally decreasing with depth and distance from the southwest corner of the woodtreating chemicals warehouse. Concentration data has been used to generate equiconcentration isopleths which indicate that soil contamination is generally restricted to the upper 3 feet of soil, with the exception of a major vertical column of contamination located at the corner of the warehouse.

Perched groundwater underlies the site at a depth of approximately 13 feet below the surface. This water appears to be continuous with and potentially discharging to, the Willamette River. The surface soil consists predominantly of medium-grained sands with occasional minor clay lenses and/or gravels. The soil is characteristically homogeneous from the surface to the perched water table. A layer of somewhat lower permeability underlies the perched water and consists of silty sands with clay lenses. Fine-grained sands predominate below this layer.

Concentrations of PCP in groundwater below the known contaminated zone have not exceeded .044 ppm. Most wells indicate no detectable concentrations of PCP, and outside of the contaminated zone, concentrations have not exceeded .003 ppm in any well. Contamination does not appear to have migrated extensively from the known contaminated zone. Analyses of groundwater are continuing on a quarterly basis.

A water well monitoring network consisting of shallow wells and well points has been installed to monitor the upper perched water. A total of nine vertical and three slanted (45°) wells have been installed and are regularly sampled for pH and PCP plus being measured for static water levels.

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SUMMARY

During the duration of the agreement between Time and Koppers, pentachlorophenol and probably some tetrachlorophenol were released into the sandy soil adjacent to the woodtreating chemical warehouse. This material may have been released in combination with various hydrocarbon solvents used as a part of the process. The primary cause for these releases appears to have been intermittent spillage from hoses and mixing vessels during end product formulation and transfer operations, rather than a one-time spill event.

Upon investigation of these findings, Time and Koppers terminated their agreement, ceased all pentachlorophenol operations and began clean up operations at the site.

In investigating the extent of soil contamination, Time has obtained assistance from several consulting firms and clean up contractors, and has analyzed sufficient soil samples to determine the vertical and horizontal extent of contamination. The contamination is localized in the northwest corner of the woodtreating chemicals tank farm, with some slight penetration below the warehouse. An estimated 2,000 cubic yards of soil, a portion of which extends down to the first water bearing zone, is contaminated.

Time has installed an extensive water well monitoring network at the site and is continuously acquiring data on the flow direction and rates of flow of the first water bearing zone, as well as on water quality and PCP concentrations. Early data indicates that gross contamination of the groundwater has not occurred outside of the contaminated zone. PCP can barely be detected in wells in, or immediately adjacent to, the contaminant zone. Groundwater flow is generally in the direction of the Willamette River. Vertical gradients in the vicinity of the contaminant zone have not been determined at this time.

Time attempted to minimize the risk of contaminant migration by disposing of some material at Chemical Waste Management's Arlington facility. This effort was thwarted due to a moratorium on landfilling of PCP subsequently disallowing further such disposal. Time has consolidated the bulk of the contaminated soil into one spot within the woodtreating chemicals tank farm area to facilitate containment and minimize the risk of off-site migration.

Time has now retained SRH Associates to identify available alternatives to destroy or immobilize the PCP contaminated soil and is presently evaluating additionally generated data regarding groundwater quality and soil contamination.

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Adsorption Onto Polymers or Activated Carbon

Should contaminating PCP, at some point, be removed from the soil by soil washing, thermal extraction or other processes, final treatment of the recovered wastes will be required. Although not a destructive process, sorption of the recovered PCP onto carbon or other polymeric substrates utilizing hydrophobic interactions as a sorptive process, will reduce the volume of PCP contaminated material.

Activated carbon and a variety of organic and silicaceous polymeric adsorbents have been utilized to bind PCP and other phenols. The sorptive process, however, is usually reversible under appropriate conditions (usually temperature elevation or through the use of non-polar solvents) and therefore may not be suitable for long term stabilization of PCP wastes under uncontrolled conditions.

These sorbents may be used to concentrate PCP from a waste stream (i.e. soil washing eluates or thermal extraction scrubber liquors) which could then be recycled or disposed of as a non-hazardous waste. The adsorbent may then be regenerated for reuse and the concentrated PCP solutions so generated, collected for disposal by destructive methods such as incineration or chemical decomposition. Such an approach may be a logical consideration for the Time site.

Biodegradation

Biodegradation of man-made compounds has been observed for many years and the results of aerobic sewage treatment systems have been documented in detail. Aerobic landfarming of oily wastes from the petroleum industry has also been in general use for years. Biodegradation occurs under essentially two basic conditions: aerobic (respiratory) and anaerobic (fermentative). Many compounds have been observed to be degraded, either partially or completely to carbon dioxide and water, by one or both of these pathways.

Pentachlorophenol has been observed to undergo degradation by bacteria and fungi. Although PCP degradation has been observed under aerobic conditions, it occurs at a more rapid rate and with fewer complications under anaerobic conditions.

In addition to the biodegradation of pentachlorophenol in soil, it has been documented that fungal enzymes promote the binding of PCP to humic acids in soils, resulting in immobilization of the PCP.

Bench scale studies by SRH Associates scientists have indicated that, under controlled conditions, PCP can be degraded in both aerobic and anaerobic soil environments. Controlling conditions for biodegradation include soil porosity, pH, moisture content, inorganic nutrients (including nitrogen, phosphorus and potassium,

Time is concerned with potential off-site migration of PCP from this source and is determined to eliminate this risk by remediating the site. Due to an existing ban on the land disposal of soil containing pentachlorophenol, excavation and landfilling is not an available remediation alternative (the material at Time has recently been designated by the EPA as RCRA-listed waste F027 vs. its previous U242 designation). Time does not desire to either leave the material in place without corrective action, cap the contaminated area without first eliminating the contamination or excavate and store the waste on site due to the long-term risks associated with these alternatives. Time has performed emergency phase stabilization and containment measures to minimize the risks of contaminant migration.

The following discussion identifies and describes several remedial alternatives which are potentially capable of destroying or immobilizing PCP in sandy soils such as those found at Time. Comments are made regarding soil and groundwater treatment, economics, availability and technical feasibility. This discussion is not intended to represent an indepth feasibility analysis of remediation options, but rather presents a summary review of options which Time may wish to investigate in greater detail.

ALTERNATIVES

The following alternatives were identified during the preliminary evaluation as remedial methods potentially capable of achieving effective results at Time:

Adsorption onto Polymers or Activated Carbon
Biodegradation
Capping in Place
Chemical Reduction
Closure in Place with Monitoring (No Remedial Actions)
Encapsulation
Excavation and Disposal
High Temperature, Catalyzed Oxidation
Incineration
In-Situ Soil Washing and Surface-Mounted Soil Washing
In-Situ Thermal Extraction and Surface-Mounted Thermal Extraction
Sodium Dehalogenation

Of these listed alternatives, excavation and disposal, capping in place, and closure in place are either unavailable due to the regulatory moratorium on landfilling of F027 material, or do not satisfy Time's requirements for long-term risk reduction. The remaining alternatives are discussed below.

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the use of indigenous microorganisms. The effect on the overall cost of the project is similar for both methods. Effective preparations range from $20 to $50 per pound of material. Microbial requirements depend on a variety of soil and waste-specific parameters that have not yet been determined at the site.

Costs not directly associated with the on-site remediation include bench and pilot scale tests, engineering, permitting, chemical, biological and physical analyses, agency negotiations, waste delisting and management. These costs are expected to be similar for all of the alternative technologies evaluated here.

Chemical Reduction

Oxidation and reduction reactions have been utilized to destroy organic wastes under a variety of circumstances. Due to its high degree of chlorination, PCP is not readily oxidized by such mild oxidants as ozone or hydrogen peroxide. Stronger oxidants present such a great hazard in and of themselves as to be unsuitable for treating wastes (See High Temperature Catalyzed Oxidation).

PCP is, however, readily reduced by sodium borohydride solutions. Staiff (1981) and Sweeney (1981) have both demonstrated the use of catalyzed metal powders and/or borohydride solutions in the oxidation of chlorinated aryls. In-situ techniques have been demonstrated, however competition from reducible soil components may severely limit the reaction, requiring retreatment. This soil reduction chemistry must be identified to allow for proper selection and application of reducing agents.

Reduction, either in-situ or in surface-mounted reactors, has realistic potential for remediating the contamination at Time. The low organic content of the naturally occuring sands in the area, their homogeneity, the low trafficability of the soil, and the nature of the contaminants all support this alternative. Bench and pilot analyses would be required to determine the reduction potential and the products of reduction formed by this process. If technically successful, implementation costs should be moderate.

Encapsulation

One method of encapsulation of organic material is through the application of sorbents to the contaminated soil. Sorbents may include carbon granules, polymeric materials or substances in which the waste is soluble. All sorbents must be insoluble in water, inert and not readily degradable in order to achieve long term stabilization of the wastes in question.

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Eh (oxidation reduction potential), microbial populations and PCP concentrations. Elevated concentrations of PCP are inhibitory or toxic to microbial populations, even under conditions of acclimatization.

The application of biodegradation to the treatment of soils from the site is severely limited due to the existence of high concentration material. PCP degradation, even under optimal conditions, ceases when PCP concentrations are in excess of 1000 ppm. Typically 500 ppm is considered the maximum effective limit. Between 500 and 1000 ppm, degredation effectiveness decreases. Since some material at the site contains PCP in excess of 1000 ppm, not all of the material would be considered ammenable to this treatment without significant dilution or pretreatment to reduce the contaminant concentrations. A large amount of the soil contains PCP at low concentrations however and may be treatable if it can be successfully isolated from the high concentration material found nearby.

Biodegradation may be performed either in-situ or in surface-mounted fermentation reactors. Due to the highly permeable soil at Time, the shallow groundwater table and the possible adsorption of PCP in co-contaminating hydrocarbons which tend to immobilize the PCP, in-situ degradation is considered to present an excessive risk of PCP migration to off-site locations. Additionally, generation of anaerobic conditions in sandy soils is highly difficult. Should a biological process be initiated in-situ, significant risk of PCP mobilization through partial decomposition, preferential degradation of stabilizing hydrocarbon absorbents, or bio-emulsification of the PCP could be expected. For these reasons a surface-mounted fermenter would be the preferred method for soil treatment at the site.

A surface reactor may be used to directly treat a soil/water suspension, or may be used to treat extracted and diluted contaminants removed from the soil by other technologies. A surface fermenter allows for control of pH, nutrients, Eh, and other critical parameters, as well as preventing the release and migration of waste or waste products.

Nutrients, pH and Eh control are parameters that are easily controlled once optimal process conditions have been identified by bench and pilot scale studies. Co-metabolities or other nutrient augmentation is also easily regulated. Fermenters capable of handling soils such as those found at Time are commercially available, but may be constructed on site for considerable less cost. The requirements of this equipment vary with the amount of material to be treated, the reaction kinetics and the degree of control required.

Much debate currently exists over the benefits obtained by using PCP acclimated, commercially available bacterial preparations to promote degradation vs. using cultures of indigenous bacteria obtained from the site. There is considerable evidence to support

Incineration

Incineration represents a tested and proven method for the destruction of chlorinated hazardous wastes, including PCP. Several types of incineration capacity exist in the U.S. Ordinary incineration, which is not acceptable for chlorinated organics, does not incorporate the appropriate acid scrubbers needed to produce an acceptable air discharge from wastes such as PCP. High efficiency incinerators, (often referred to as "6 nine" incinerators, based on their destruction and removal efficiencies) are capable of treating pentachlorophenol in high concentrations. Incinerators of this type are available in the U.S. as both fixed and mobile units. However, there is not sufficient capacity at this time in either type of unit, to satisfy domestic demands. Although most incinerators can handle liquids, few are equipped to handle solids such as contaminated soil.

Incineration can easily satisfy Time's objectives of reducing long term risk related to the contamination found on site. However, since no small mobile units are available nearby, Time must either absorb significant mobilization, siting and permitting costs or ship its waste to a fixed unit. The attendant risks in shipping must be weighed against those associated with leaving the soil on site.

The nearest incinerator for solid hazardous wastes such as those at the Time facility, is located in Deer Park, TX and is operated by Rollins Environmental. A primary concern with disposal by this alternative is cost. Rollins current price for incineration of contaminated soils is approximately $0.50 per pound. Based on Time's estimate of 2000 cubic yards of contaminated soil, incineration costs may approach $2.5 million. This figure does not include excavation, shipping and other associated costs. For comparison purposes, this amount is on the order of five times the cost of landfilling, if this alternative were available to Time.

In-Situ Soil Washing and Surface Mounted Soil Washing

Removal of contaminants from soil may be accomplished through extraction with a variety of elutriating solutions. The choice of the proper solution must be based on the physico-chemical nature of the contaminants, the effect of the elutriate on the soil geochemistry and its permeability, plus the method by which the eluted contaminants are to be treated for destruction or disposal. Ordinarily, aqueous solutions of acids, bases, surfactants or other compounds are selected (US EPA, 1982).

The effect of washing contaminated soils with water alone, or with mixtures of non-ionic surfactants was investigated by Science Applications International Corp. Their findings indicate that surfactants greatly increased the effectiveness of soil washing when the contaminant of concern was either PCP or a high boiling

Pentachlorophenol is readily adsorbed by activated carbon granules and is soluble (absorbed) in a variety of organic substances including high molecular weight hydrocarbons such as tar or asphalt. Since both of these materials meet the criteria listed above for acceptable sorbents, they offer a feasible alternative for PCP immobilization. Additionally, both materials are capable of sorbing any petroleum hydrocarbons which may exist in the soil in addition to PCP.

An attractive alternative for immobilization of Time's wastes is the admixing of the PCP contaminated soil with asphalt to form a structurally sound paving material which could then be used to seal the soil surface in the vicinity of the woodtreating chemicals tank farm. This alternative would require an analysis of the leachability of the wastes from the surfacing material and a determination of the structural integrity of the asphalt so produced at various levels of waste incorporation.

High Temperature, Catalyzed Oxidation

PCP is not ordinarily oxidized by readily available, easily handled oxidizers such as ozone or hydrogen peroxide. Although permanganate, dichromate or other strong oxidizers have been reported to successfully oxidize PCP, their cost, side reactions with soil components, and the environmental hazards generated by them restrict their use in treating contaminated soils. Zimpro has developed a process, commonly referred to as wet air oxidation, which has been successful in destroying phenols and other hazardous compounds in aqueous media.

The Zimpro, Wetox and other processes based on this same principle, employ high temperature and elevated pressures in an oxygen enriched aqueous environment to oxidize and thereby destroy hazardous organics. PCP and other extensively chlorinated organics are refractile to this process without the addition of suitable catalysts which can facilitate the dechlorination of these compounds, rendering them retreatable. Once dechlorinated, the resulting intermediates have increased susceptibility to oxidation by the wet air oxidation process and are degraded to either carbon dioxide and water or to non-toxic biodegradable intermediates.

All wet air oxidation processes are provided as packaged systems by the supplier. Included are the reactor, reagents and operators. Additional support and feasibility testing of representative media can ordinarily be negotiated. Cost of the system, which is provided on a lease basis, is variable dependent upon the volume of material to be treated, the size of the required reactor and the type of process necessary.

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submersion and agitation of batches of contaminated soil in large tanks fitted with a filtration stage to separate the cleaned soil from the eluate. This step is usually repeated until a suitable clean-up standard is achieved.

Countercurrent extractors involve the introduction of contaminated soil into an upwardly moving extraction bed while the elutriating solution is introduced at the top of the bed and allowed to migrate downwards. In this latter process, the cleanest soil (already partially extracted) contacts the cleanest solvent just prior to exiting the column at the top. This continuous process has the advantage of generating less spent solvent requiring subsequent treatment than does the batch process. It requires a higher degree of process control but is generally less labor and energy intensive than a batch process. A continuous process also allows for the fitting of a second solvent stage to elute any residual surfactant from the treated soil where water was used.

The cost of soil washing is expected to be moderate, however this process does not address the final destruction and/or disposal of the recoverd solutions. These solutions, containing PCP, water, surfactants, and possibly hydrocarbons, must be treated by incineration, biodegradation, immobilization, recycling or by chemical processes prior to completion of the project. The extraction process and the treatment process should be determined in conjunction with one another in order to maximize their mutual effectiveness.

In-Situ Thermal Extraction and Surface Mounted Thermal Extraction

Thermal extraction processes involve the introduction of heat to the contaminated soil mass to increase the vapor pressure of the contaminants, rendering them sufficiently volatile to allow their recovery as a vapor. As might be expected, these processes work best with relatively volatile contaminants that tend to remain free, rather than binding to soil components. Additionally, the processes work best in friable or loose-grained soils which allow free permeation of the vapors and their subsequent release to the recovery system.

Coia (1985) has presented a system for recovery of volatiles from contaminated soils using an in-situ process. This system consists of a network of thermal injection wells and extraction wells connected to injection and extraction blowers, respectively. Although the system was intended for extraction of TCE from glacial sands, any compound that can be brought to exert a significant vapor pressure can be recovered with this system.

A similar system utilizing a modified drilling rig has been developed by ATW Calweld. This firm, a manufacturer of drilling equipment has modified the kelly of a drilling rig to incorporate several channels which allow the introduction of hot air, steam and various chemicals, if appropriate. The equipment rapidly

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oil fraction. With pentachlorophenol alone, or when used in conjunction with other chlorinated phenols, plain water provided effective washing of the contaminants from a relatively sandy soil (83% sand, 10% silt and clay).

Since the contaminants at Time initially appear to be refractile to natural elution with precipitation or groundwater, surfactants appear to be desirable at this site. The use of alkaline solutions, while ordinarily effective with phenols, may be ineffective at Time due to the possibility of co-contamination with oils or hydrocarbon solvents. Extraction with other hydrocarbon solvents, while likely to effectively extract the contaminating PCP from the soil, will result in the formation of a hydrocarbon contaminated soil requiring an additional purification step.

Two means of applying soil washing methodologies have been identified: in-situ techniques and surface-mounted techniques, (including batch or continuous flow apparatus). In-situ techniques involve the treatment of soil without excavation and provide for the application of the elutriating solvent to the soil surface and recovery of the eluate by using recovery wells in the treatment zone. Surface-mounted systems involve the use of batch extraction tanks or counter-current extraction columns which extract the contaminants under controlled conditions.

In-situ techniques are effective in extracting contaminants only where the soil geology is known to be uniform and where the permeability is high enough to permit adequate percolation of the elutriating solutions through the soil. Additionally, in cases where the distance from the lower limit of the contaminants to groundwater (or alternatively to either a natural or induced low permeability soil layer) is great, excessive amounts of solution are required. Control is reduced and the potential for uncontrolled release of the eluate is great. The technique is well suited for situations where contamination is not generally accessible by ordinary excavation techniques (i.e. below buildings, in developed or heavily utilized areas).

The in-situ process is generally implemented by applying the solution through trickle irrigation or infiltration galleries, and recovering the product through judiciously placed recovery wells. The recovered eluate is treated and, if possible, recycled. A thorough evaluation of all waste components and soil chemistry must be performed to facilitate the selection of a proper surfactant, determine application rates, evaluate recovery potential and to provide information regarding eluate characteristics for the determination of treatment alternatives.

Surface mounted processes are indicated where the distance to groundwater, extraction requirements or heterogeneity of the soil (i.e. channelling, lenses, etc.) require a higher degree of control on the process. In these cases, soil is excavated by suitable procedures and placed into batch or countercurrent continuous extractors. Batch extractors usually involve the

SUMMARY

Twelve alternative processes have been identified for isolation, immobilization, separation and/or destruction of PCP contaminated soil found at Time. The selection of any one or a combination of these alternatives requires additional characterization of the wastes found at the site. Among the additional data that may be required are:

- Adsorption Isotherms of Wastes on Soil and Carbon
- Biodegradability of Waste Constituents (Half-life and Rate Constant)
- Biodegradation Products
- Bioinhibition Threshold Concentration of Waste Constituents
- Characterization of Co-contaminants (if any)
- Climatic Conditions
- Determination of Soil pH
- Determination of Soil Particle Size Distribution
- Groundwater Parameters (Flow Rates, Storage Coefficient)
- Organic Carbon and Octanol/Water Partition Coefficients of Waste Components
- Oxidation/Reduction Potentials of Waste Constituents
- Required Clean-up Levels
- Soil Microflora
- Soil Moisture Content
- Soil Nutrient Concentrations (N, P & K ratios)
- Soil Organic Matter
- Soil Oxygen Concentration
- Soil Permeability
- Soil Temperature
- Surfactant Solvation Efficiency (for Each Waste Constituent)
- Trafficability of Soil and Site
- Waste Constituent Vapor Pressure Curves

While other information may be needed for each specific alternative, some of the above data may also be necessary, depending on method selected.

It should be remembered that separatory procedures such as soil washing or thermal extraction will require additional disposal or destructive treatment processes as a final step. Surface mounted separatory or treatment processes will require excavation, containment and storage steps prior to implementation.

A recommended course of action for the determination and selection of a remedial technique for the Time site involves additional definition of the waste constituents, clarification of soil parameters, further definition of groundwater conditions and determination of site specific conditions listed above. Following

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agitates the soil while applying heat and volatilizes contaminants which are then recovered in a negative pressure hood surrounding the surface of the rig. Contaminant vapors are drawn off to a cyclone and scrubber system. Although the device has only been demonstrated on hydrocarbon spills (gasoline and diesel oil), ATW Calweld suggests that the process is applicable to lower volatility compounds such as pentachlorophenol.

Thermal extraction in surface units has been advanced by several firms. American Toxic Disposal in Waukegan illinois, has operated a 10-ton-per-day unit which has successfully removed PCB's from contaminated soils and sludges. This system has been demonstrated to the EPA and is currently being used to treat material containing PCB's in Gary, Indiana.

As with soil washing techniques, thermal extraction techniques do not destroy contaminants, which must be recovered and treated or immobilized by other techniques. The process does, however, result in a volumetric reduction of the contaminated soil by 10 to 100 fold, allowing consideration of incineration as a final destruction alternative.

Thermal extraction processes are viable candidates for treating Time's contaminated soils since the soil at Time is friable and loose-grained. A preliminary consideration to be addressed before selecting this process is the degree of volatility of the contaminants in the matrix found at Time. Since moisture does not present a major deterrent to thermal processes, saturated material may also be successfully treated.

Sodium Dehalogenation

Both Acurex and the Franklin Institute have developed processes whereby soils are extracted (similar to Soil Washing, above) and subjected to dehalogenation using sodium based proprietary compounds. Although the process has been primarily utilized for PCB destruction, it appears to be ammenable to chlorinated phenols as well.

The Acurex process is less stable and more sensitive to interference from water than is the Franklin Institute process, which uses a specially modified sodium/polyethylene glycol complex. The Franklin Institute process has been applied directly to soils in an in-situ operation.

These procedures have been used primarily in the destruction of PCB oils and have only recently been used to treat contaminated soils. PCP has not been treated by this process. Adaptation to the Time site may be possible but should be pursued only if other demonstrated technologies do not prove successful in pilot demonstrations.

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The actual process consists of the physical excavation of contaminated soil using classical techniques and the temporary storage of the excavated soils on an impervious, protected surface. Material from this location would be transferred to an infeed hopper connected to a primary extractor or soil washer. The soil would be introduced into the lower section of the extractor via a screw feed auger. Once in the extractor, the soil would be agitated and conveyed upwards while extracting solvent [an aqueous solution of nontoxic, nonionic detergents (surfactants)] is introduced into the top of the extractor. The extraction would take place in a countercurrent fashion, producing a cleaned soil product and contaminated elutriate in a continuous process.

Cleaned soil would then be subject to rinsing with clean water in a secondary extractor, operated similarly to the primary extractor, to reduce or eliminate residual surfactant concentrations, allowing the soil to be returned to the site. The contaminated fluids would be stored, tested and treated to effect ultimate disposal. Analytical decision points are noted as diamonds in Figure II-1. There are three. It is possible that surfactant solutions with suitably low or undetectable levels of PCP could be discharged to the sanitary sewer.

The process can easily be modelled in bench scale experiments and the technical feasibility of the process can be accurately determined. The nature and required concentrations of the surfactants, soil retention times, elution rates and contaminant loading factors can all be determined to allow approximation of full scale process operating parameters. Following determination of these parameters, scale up protocols and economic feasibility may accurately be determined.

Soil washing is recommended since it has been successfully applied to soils contaminated with PCP in pilot studies on similar soil types and does not use hazardous materials which may interact with or be retained by the soil. The process should be directed towards a surface, rather than in-situ technology to improve process control and to minimize the chance of uncontrolled releases to the environment. Residual surfactants may be eliminated from the soil using only water, and surfactants can be modified to remove PCP as well as co-contaminating hydrocarbons, which may also be present.

The aqueous extracts so produced may be subjected to a variety of concentrating and destructive steps to remove the entrained PCP and hydrocarbons, placing a wider array of treatment alternatives at Time's disposal.

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these determinations, the specific questions of technical feasibility of the various alternatives listed above can be addressed.

With this information, alternatives may then be selected with a greater degree of confidence and further pursued by performir bench scale tests to evaluate their applicability to the contaminated soils found at Time. Bench scale conditions can then be scaled up to pilot level demonstrations, either on-site or at supplier's test facilities. Finally, these data may then be used to develop and obtain required treatment permits from appropriate State/Federal agencies. The generally accepted approach to selecting an operational treatment procedure is to evaluate the most logical alternative first and if it proves unsatisfactory due to site-specific or economic factors, evaluate the next logical option.

RECOMMENDATIONS

Based on existing information, the following is recommended:

a. Select the "Surface Mounted Soil Washing" technique as the most logical remedial approach.

b. Perform bench scale and pilot level evaluations.

c. Determine necessary destruction steps of recovered extracts.

d. Ascertain technical permitting and economic feasibility of technique for final disposal action.

e. Compare results with repeat step by step examination of next most logical remedial approaches which are: "Surface Mounted Thermal Extraction" and "In-Situ Thermal Extraction".

Bench scale evaluations of a surface mounted, countercurrent soil washing process involve the excavation of contaminated soils, temporary storage of the soils on an impervious slab, extraction of the contaminants with an aqueous solution of nonionic surfactants, removal of the surfactants by countercurrent washing with water, recovery and treatment of the rinsates, their analysis and on-site placement of the purified soils. The contaminated rinsates would then be subjected to a destruction step that can only be determined based on the constituents in the recovered extracts, but may include chemical reduction, incineration, biodegradation or other processes outlined earlier. A schematic drawing of a proposed process is shown in Figure II-1.

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SECTION III

ANALYSIS RESULTS

INTRODUCTION

During August of 1986, Time retained SRH Associates to collect samples of surface and subsurface soil and groundwater from the Time Facility located in Portland, Oregon. The samples were analyzed for pentachlorophenol (PCP) in an effort to further existing data concerning past releases of this chemical from a woodtreating chemicals formulating operation at this site.

Samples of surface soils were collected from an earthen tank farm area located south of the woodtreating chemicals warehouse and from six locations below the concrete floor of the warehouse itself. Additional samples were taken from five other depths below the warehouse floor from the same holes as the surface samples. Groundwater was sampled at seven existing monitoring wells surrounding the woodtreating chemicals area and was analyzed for PCP and pH. Static water levels were determined in these wells and at a monitoring station for the measurement of Willamette River water elevations located on the Northwest Terminal Facility pier.

SURFACE SOIL SAMPLING AND ANALYSIS

Following the contaminated soil relocation to one pile, surface soils were collected from 17 locations in the woodtreating tank farm area. The locations were identical to those sampled by Riedel Environmental Services during initial samplings performed in 1985. Samples were obtained from 2 to 3 inches below the soil surface to reduce the risk of contamination arising during set up procedures at the sample site.

Additionally, six locations inside the warehouse were sampled by coring through the concrete with abrasive saws. The six locations were selected by Time and represent an extension of the triangular sampling grid employed by Riedel in the 1985 study. Samples were obtained from an interval of 3.5 to 5.5 feet below the lower

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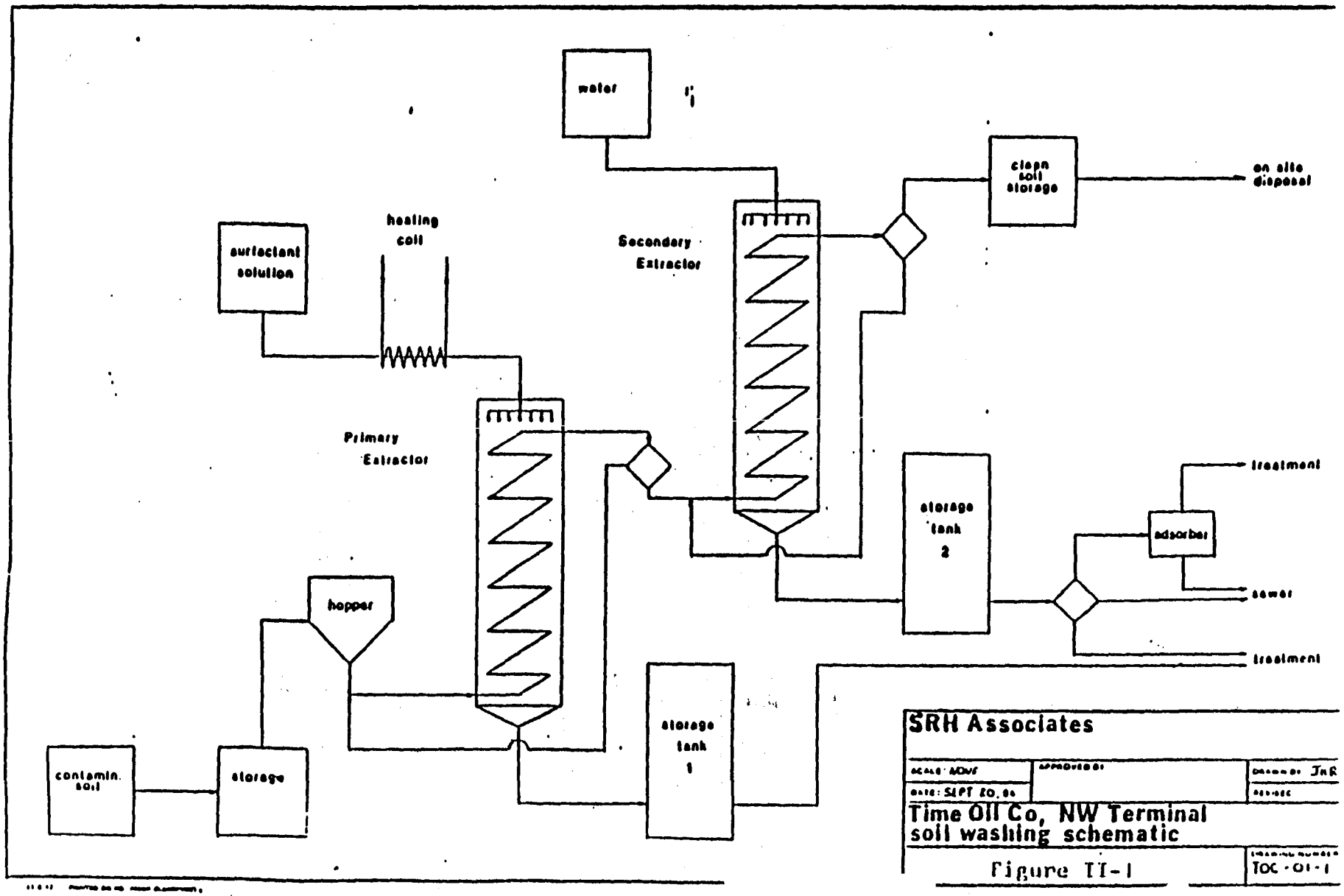

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scale (1" = 20 feet) and can be overlaid on the associated plan drawing of the sampled area. (Figure III-5).

The results indicate that the bulk of the surface contamination exists in a pile of material located in the vicinity of sample point S. Additional contamination is located to the east of point S, continuing to approximately the concrete wall bordering the tank farm on the east. The strong focal point of contamination located at point K has generated a broad area of calculated contamination on the Kriging generated contour maps. Due to the lack of supporting high concentrations of PCP adjacent to point K, it is concluded that this contour is primarily artifactual, generated by the data reducing program in response to the single very high concentration detected at K. It is more likely that K represents a small focus of high concentration, rather than the large area implied by the contours.

Most contamination that had been previously detected to the west of the woodtreating tank farm area appears to have been removed during recent excavation activities performed by Time. This is reflected by the low results found at points M and U.

Two locations beneath the warehouse floor were found to contain low levels of PCP. Borings 1 and 5 contained 5.7 and 1.4 ppm of PCP, respectively. It should be noted, however, that despite stringent efforts to prevent contamination, blowing winds and "dust devils" were noted during sampling and were observed picking up soil from the tank farm area and warehouse floor. Because of these concerns, the low levels noted in these samples are probably a result of field contamination.

SUBSURFACE SAMPLES

Samples were obtained from six depths below the lower surface of the concrete floor in the woodtreating chemicals warehouse. Six locations, determined by Time and located at extensions of the triangular sampling grid developed by Riedel, were sampled. The approximately 6 inch thick concrete floor was cored using an abrasive wheel. Twelve inch diameter holes were cut. The surface of the concrete within a 6 foot radius of the hole was swept clean and covered with .005 inch thick polyethylene film to minimize contamination from residue found in the warehouse.

The upper 2 to 3 inches of soil in the hole was removed to eliminate contamination with cuttings generated during the coring and set up operations. A sample was subsequently obtained using the technique given above, from the exposed surface of the hole. The holes were designated as numbers 1 through 6. The surface sample was collected and held for future analysis.

surface of the concrete using split spoon samplers. The sampling procedure used will be described in the next (Subsurface Samples) part. The selected depth was chosen to position the samples at the same true elevation as the surface samples taken from the tank farm area. Samples of soil from 2 to 6 inches below the lower surface of the concrete floor were obtained and held for possible future analysis.

Samples were obtained using stainless steel sampling spoons which had been previously cleaned with sequential washings of laboratory detergent, tap water, hexane, tap water, trisodium phosphate and sodium carbonate in water, tap water and distilled water (3X). Samples were screened through 0.10 inch stainless steel mesh which had been similarly cleaned. The screened material was allowed to fall directly from the screens into pre-washed 8 ounce glass jars fitted with screw cap closures and teflon liners. The containers had been cleaned to EPA specifications and were not opened prior to receiving the sampled material.

Samples were field logged and containers were marked with the date, time, location, sample code, requested analyses and other relevant data. Lids were replaced with care being taken to ensure that no interference with the hermetic seal occurred. Tamper indicating seals were applied, chain of custody and analysis request forms were completed and the samples placed on ice prior to transport to the laboratory. Samples were delivered to the laboratory within 48 hours of collection in all cases. No preservatives were added to soil samples.

Samples were extracted in the laboratory using method number 3540, Soxhlet Extraction, as described in EPA publication SW 846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. The extract so obtained was analyzed for pentachlorophenol by method 8040, Phenols, as described in EPA publication SW 846. Field and laboratory duplicates were analyzed and spiked sample recovery efficiencies were determined. Laboratory blanks were analyzed. No field blanks of soil were submitted. All quality control results indicated acceptable performance of sampling and analysis.

The results of the surface soil samples are listed, along with the X and Y coordinates of their respective sampling locations, in Table III-1. The coordinates are referred to a temporary bench mark located at the end of a concrete wall at the southeast corner of the woodtreating tank farm area. The coordinates are given in feet. The X axis is aligned in an approximately northeast - southwest plane while the Y axis is aligned in an approximately northwest - southeast plane at at 90° to the X axis.

The results listed in Table III-1 were subjected to Kriging analysis to generate lines of equal concentration (equiconcentration isopleths). A .95 smoothing ratio and a search radius of 213 feet was used for generation of the contours which are shown in Figures III- 1 to III-4. The sample sites and their respective concentrations are indicated. The contours are to

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III-1 through III-4. The data from these analyses have been combined with the results obtained by Riedel at the sample locations labelled J through Z in 1985, for the nominal sampling depths 2, 4, 7 and 12, to generate concentration isopleths at these depths.

The data listed in these tables was analyzed by Kriging analysis according to the procedure given above. The results of the contouring are shown in Figures III-1 through III-4. Figure III-5 shows the sample locations on a plan drawing of the woodtreating chemicals warehouse. Figure III-6 incorporates the X and Y coordinates of the sample locations on this drawing.

The results indicate that contamination is restricted to the woodtreating tank farm area with virtually no contamination being found beneath the central and northern portions of the warehouse. There is significant PCP contamination below the surface of the southwest corner of the warehouse, which appears to be continuous with a vertical column of contamination located immediately adjacent to this area in the tank farm.

Excavations in the woodtreating tank farm area have perturbed the original conditions of the site, and therefore the surface and 2 foot contours are not expected to be representative of conditions existing prior to the movement of soil. This can be seen by the distortion of the vertical column of contamination at the surface and two foot intervals, due to the fact that soil at these sites had been removed and replaced with soils from other areas within the woodtreating tank farm. A computer generated topographic grid net of the woodtreating tank farm and warehouse area can be seen in Figure III-7.

The 4, 7 and 12 foot contours reflect the strong vertical plume of PCP contamination which decreases to about 2000 ppm at the 12 foot depth. A minor lobe of this plume appears to extend to the southeast into the lower corner of the woodtreating tank farm area at or around the seven foot interval. The vertical plume appears to widen and diffuse to the south at the 12 foot contour, presumedly due to the presence of groundwater at or near this sampling depth.

GROUNDWATER ANALYSES

The nine vertical groundwater monitoring points at Time (See Figure I-6, Section I) were measured for static water levels and tested for pH and PCP. The three slant borings located at the southwest corner of the warehouse were not examined. The wells, which had been previously installed by Time employees or other contractors, consist of 1 1/4 and 2 inch (I.D.) stainless steel well points and 2 inch (I.D.) PVC screen and casing.

Following collection of the surface sample, the hole was advanced using a hand operated, 2 1/2 inch (O.D.) continuous flight auger. Samples were obtained at the following intervals below the upper surface of the concrete floor using a 2 inch (O.D.) split spoon sampler:

3.5 to 5.5 feet	(0)
5.5 to 7.5 feet	(2)
7.5 to 9.5 feet	(4)
10.5 to 12.5 feet	(7)
15.5 to 17.5 feet	(12)

Since the upper surface of the concrete floor was 3.5 feet above the surrounding soil surface, the five depths listed above were equivalent to the 0 to 2 foot, 2 to 4 foot, 4 to 6 foot, 7 to 9 foot and 12 to 14 foot intervals sampled in the woodtreating tank farm area by Riedel in 1985.

Samples were taken by removing the drill from the bore hole and inserting the split spoon sampler into the bore hole taking care not to dislodge any material from the surface or walls of the hole. The sampler was driven into the soil using a 20 lb. hammer. Hand drilling and driving of the penetrometer/sampler was required due to the inaccessibility of the site to conventional drill rigs and to the low overhanging roof of the warehouse.

Samples were extruded by gently tapping the soils out of the sampler onto stainless steel screens, which were cleaned as indicated above. The samples were screened, placed into jars, labelled, logged and handled as described above. Samplers were cleaned after each use, using the decontamination procedure described above. The drilling equipment was decontaminated between holes and prior to leaving the site. All decontamination water was impounded in D.O.T. 17 E drums until proper disposal requirements could be established based on analytical results.

During drilling, saturated conditions were encountered at the 12 foot interval in all holes. No groundwater samples were taken from any location. All soil samples consisted of medium grained grey - brown to blue sands. Cobbles were encountered in holes number 1 and 2 at a depth of approximately 3 feet below the floor surface. The cobbles were associated with a minor clay lens approximately 2 inches thick.

Following drilling, holes were abandoned through the addition of bentonite pellets to a depth of 13 feet below the concrete floor. The remainder of the hole was filled with bentonite grout to the surface. The concrete core plugs removed during coring of the warehouse floor were replaced in the hole and bedded with bentonite in accordance with Time's request.

The samples were refrigerated and shipped to the laboratory for PCP analysis as outlined above. The results, together with the X and Y coordinates of the sample points, are presented in Tables

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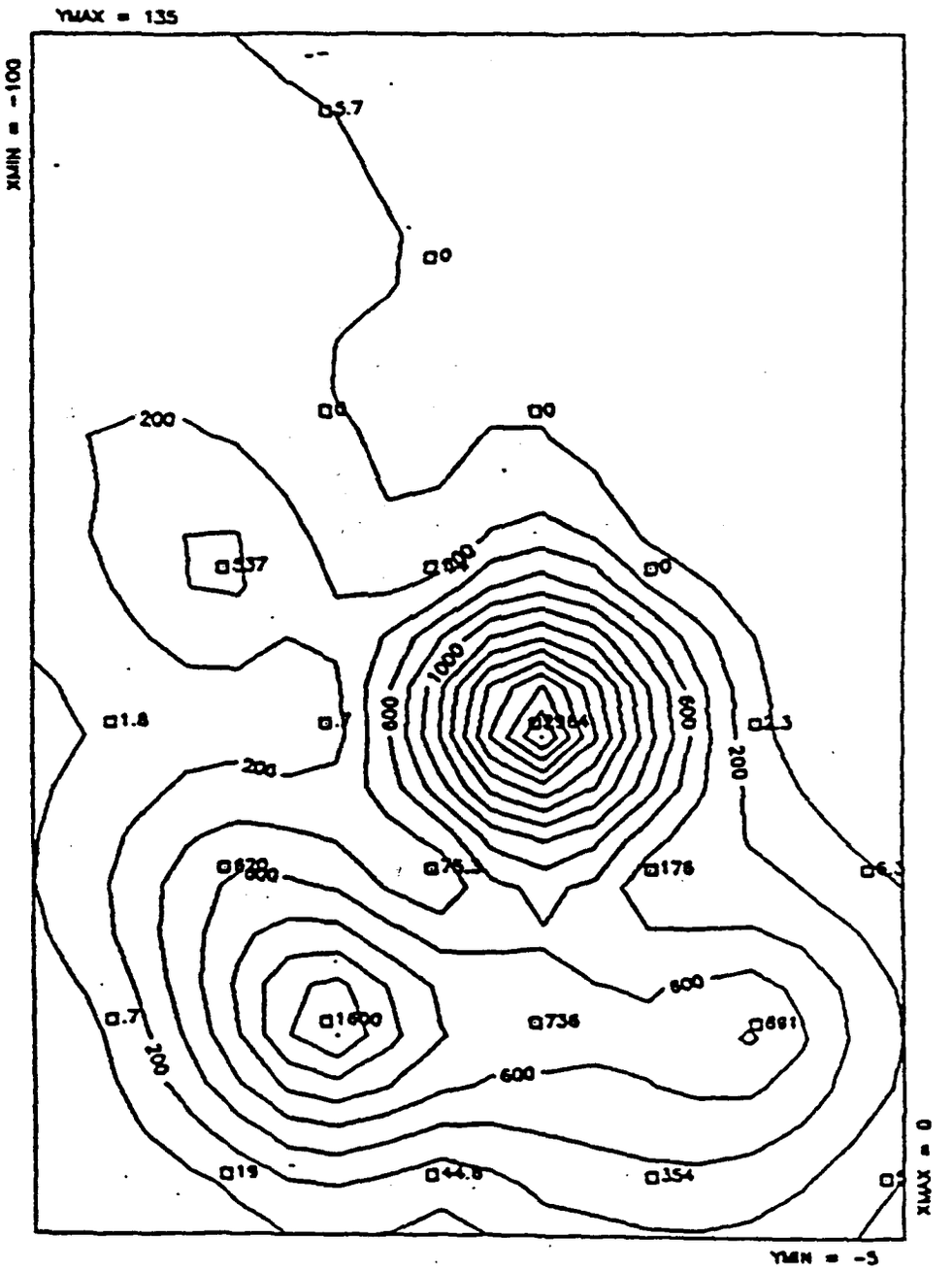
FIGURE III-1



TIME OIL CO. – SURFACE PCP CONTOURS

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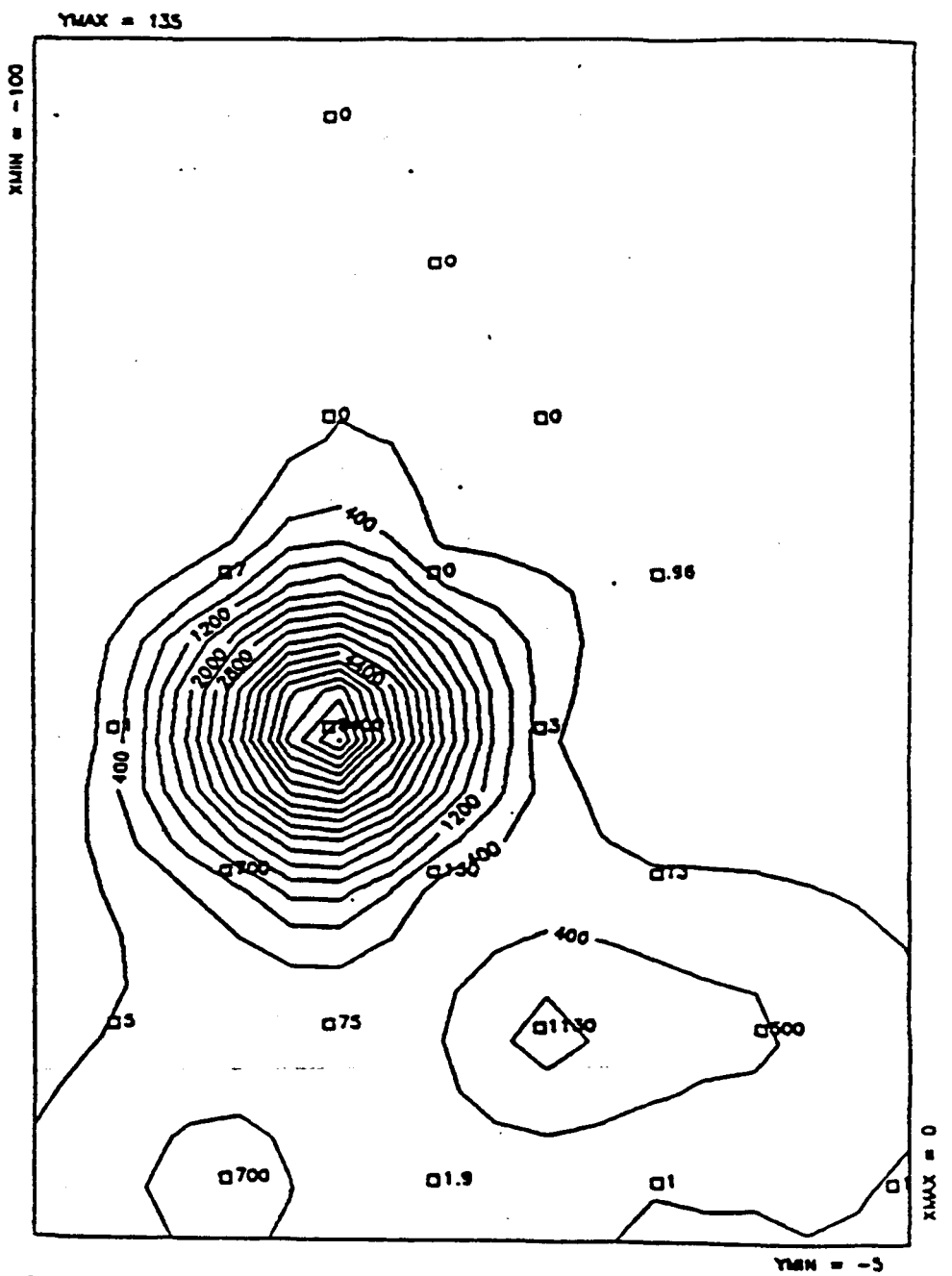
The water level elevations in the wells, labelled A through I, were measured to the nearest .01 foot from the top edge of the casing at a scribed mark located on the north side of the casing. A Fisher M-Scope previously calibrated against a steel tape was used to obtain the measurements. Standing bore volumes of well water were calculated based on these measurements and well construction drawings provided by Time. A measurement of the Willamette River water elevation relative to a mark located by Time on its unloading pier was also taken.

Stainless steel weighted bailers were used to remove at least 4 standing bore volumes of water prior to collecting representative samples of groundwater. The bailers had been previously cleaned by the procedure described above, and were re-cleaned after each well was sampled. The purged water was collected into D.O.T. 17 E drums until proper disposal could be determined based on analytical results.

The samples were dispensed directly from the bailer into two 1 liter amber glass bottles fitted with screw cap closures and teflon liners for PCP analysis. Samples were adjusted to pH 2 with 1:1 Sulfuric Acid in distilled water and checked with pH paper prior to refrigeration and delivery to the lab. Samples for pH analyses were dispensed directly into 250 ml polyethylene wide mouthed bottles without preservatives. pH analyses were performed within 2 hours of sample collection using a silver-silver chloride reference electrode standardized against two NBS traceable reference buffer solutions. Samples were logged, labelled, sealed and transferred to the laboratory within 6 hours of collection. Analyses for PCP were performed as above, except that the sample was not filtered prior to analysis, and was extracted by method 3510, Separatory Funnel Liquid - Liquid Extraction, as described in EPA publication SW 846.

The results of the groundwater investigation are shown in Table III-6. Wells C and G were dry and could not be sampled. The pH ranged from 6.53 to 6.91. The only well showing detectable PCP was well D, in which .044 ppm was detected. Well D is located southeast of the woodtreating chemicals warehouse.

FIGURE III- 3



TIME OIL CO. — 7 FOOT PCP CONTOURS

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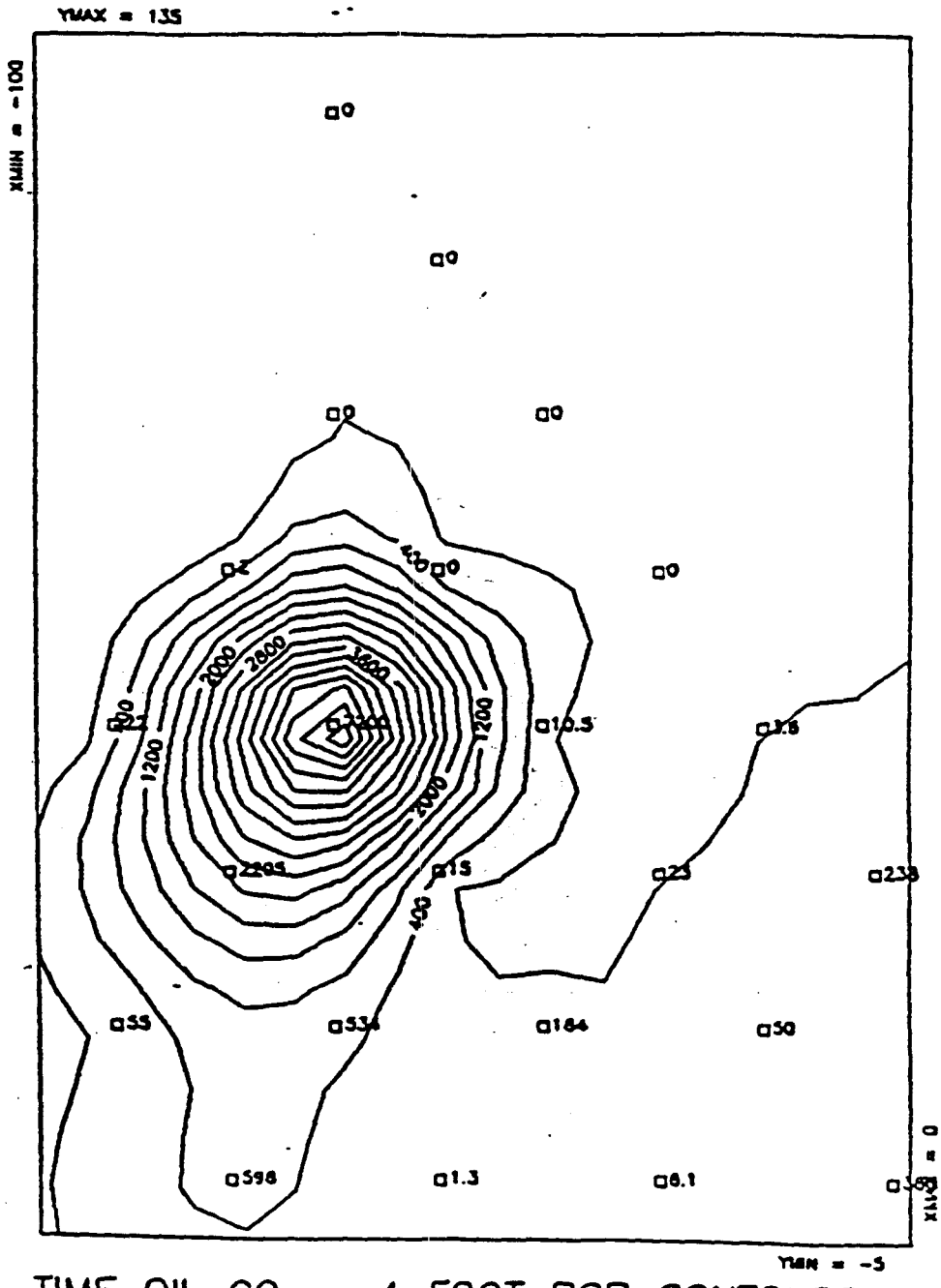
FIGURE III- 2



TIME OIL CO. — 4 FOOT PCP CONTOURS

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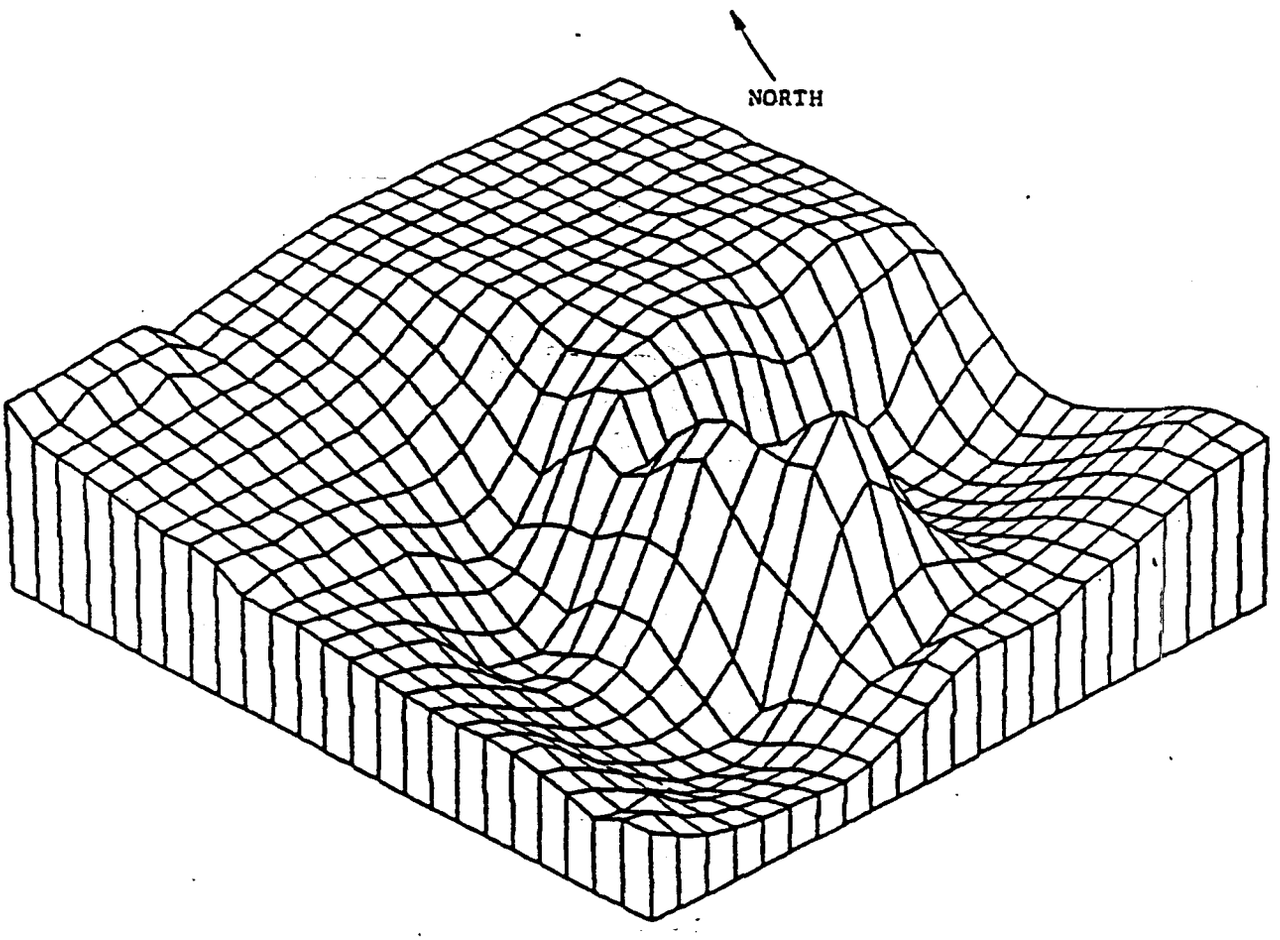
FIGURE III- 7

APPROXIMATE SURFACE TOPOGRAPHY

WOOD TREATING CHEMICALS AREA



TIME OIL CO. - TOPOGRAPHY

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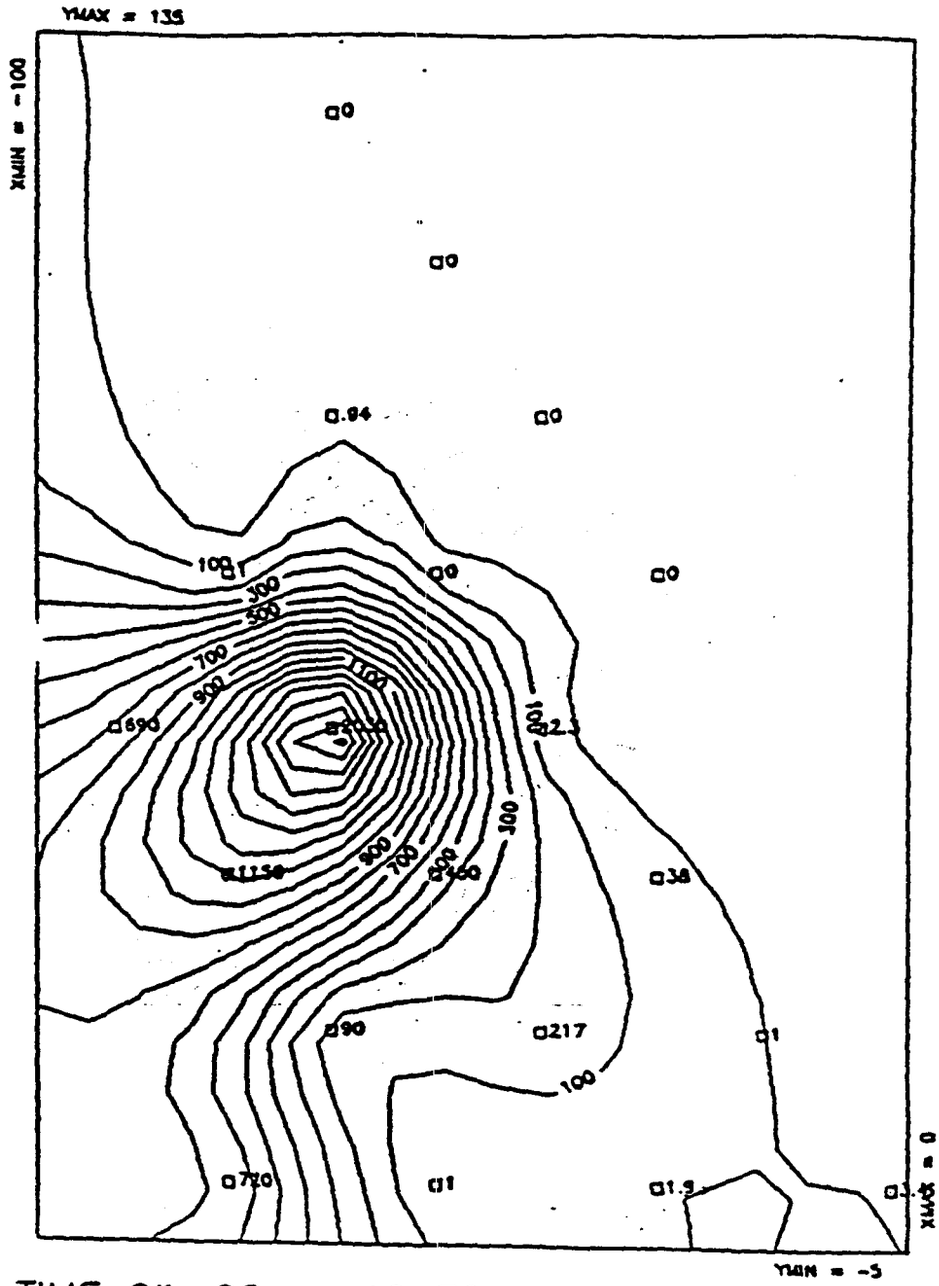
FIGURE III-4



TIME OIL CO. – 12 FOOT PCP CONTOURS

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TABLE III-2

TIME OIL CO.

COORDINATES - 2 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3
K	-42	55	8.8
M	-91	55	87
N	-4	38	3.1
O	-29	38	59
P	-54	38	16
R	-17	20	34
S	-42	20	252
T	-66	20	123
U	-91	20	44
V	-2	2	260
W	-29	2	15
X	-54	2	4.5
Z	-78	73	14
6	-66	91	0
5	-54	73	5.6
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-1

TIME OIL CO.

COORDINATES - SURFACE PCP CONTOUR

CODE	X	Y	[PCP]
J	-17	55	2.3
K	-42	55	1200
L	-66	55	0.7
M	-91	55	1.8
N	-4	38	6.3
O	-29	38	176
P	-54	38	75.3
Q	-78	38	620
R	-17	20	891
S	-42	20	736
T	-66	20	1600
U	-91	20	0.7
V	-2	2	5
W	-29	2	354
X	-54	2	44.5
Y	-78	2	19
Z	-78	73	537
6	-66	91	0
5	-54	73	1.4
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	5.7

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-4

TIME OIL CO.

COORDINATES - 7 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	3
L	-66	55	8400
M	-91	55	1
O	-29	38	13
P	-54	38	130
Q	-78	38	700
R	-17	20	500
S	-42	20	1130
T	-66	20	75
U	-91	20	5
V	-2	2	1
W	-29	2	1
X	-54	2	1.9
Y	-78	2	700
Z	-78	73	7
6	-66	91	0
5	-54	73	0
4	-29	73	0.96
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-3

TIME OIL CO.

COORDINATES - 4 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3.6
K	-42	55	10.5
L	-66	55	7200
M	-91	55	22
N	-4	38	238
O	-29	38	23
P	-54	38	15
Q	-78	38	2205
R	-17	20	50
S	-42	20	184
T	-66	20	534
U	-91	20	55
V	-2	2	380
W	-29	2	8.1
X	-54	2	1.3
Y	-78	2	598
Z	-78	73	2
6	-66	91	0
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-6

TIME OIL CO.

GROUNDWATER ANALYTICAL RESULTS

(AUGUST 29, 1986)

WELL NUMBER	STATIC WATER LEVEL (FT BELOW TOP OF CASING)	pH	[PCP] (ppm)
MW-A	14.06	6.80	N.D.
MW-B	15.07	6.70	N.D.
MW-C	DRY	N.A.	N.A.
MW-D	14.48	6.53	.044
MW-E	15.22	6.54	N.D.
MW-F	15.44	6.57	N.D.
MW-G	DRY	N.A.	N.A.
MW-H	11.28	6.91	N.D.
MW-I	14.75	6.77	N.D.
RIVER	25.70	N.A.	N.A.

NOTES:

[PCP] = CONCENTRATION OF PENTACHLOROPHENOL
ppm = PARTS PER MILLION
N.A. = NOT AVAILABLE
N.D. = NOT DETECTED

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TABLE III-5

TIME OIL CO.

COORDINATES - 12 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	2.3
L	-66	55	2030
M	-91	55	690
O	-29	38	38
P	-54	38	450
Q	-78	38	1150
R	-17	20	1
S	-42	20	217
T	-66	20	90
V	-2	2	3.4
W	-29	2	1.9
X	-54	2	1
Y	-78	2	720
Z	-78	73	1
6	-66	91	0.94
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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GROUNDWATER MONITORING

AT

TIME OIL COMPANY

NORTHWEST TERMINAL

PORTLAND, OREGON

November 5, 1987

Prepared For:

Time Oil Company
2737 West Commodore Way
Seattle, Washington

Prepared By:

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(503) 232-0824

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The samples were dispensed directly from the bailer into two 1 liter amber glass bottles fitted with screw cap closures and teflon liners for PCP analysis. Samples were adjusted to pH 2 with 1:1 Sulfuric Acid in distilled water and checked with pH paper prior to refrigeration and delivery to the lab. Samples for pH analyses were dispensed directly into 250 ml polyethylene wide mouthed bottles without preservatives. All samples were logged, labelled, sealed and transferred to the laboratory within 6 hours of collection.

pH analyses were performed within 2 hours of sample collection using a silver - silver chloride reference electrode standardized against two NBS traceable reference buffer solutions. PCP analyses were performed by first extracting the samples in the laboratory using method 3510, Separatory Funnel Liquid - Liquid Extraction, as described in EPA publication SW 846. The extract was then analyzed for PCP by method 8040, Phenols, as described in EPA publication SW 846. Field duplicates and laboratory and field blanks were analyzed. All quality control results indicated acceptable performance of sampling and analysis.

SAMPLE ANALYSIS

On August 20, a PCP concentration of 2300 ppb was detected in Well B. Well B was re-sampled on October 16 at which time a concentration of 1000 ppb was detected. No contamination has been observed in Wells A, D, F, H, and I. Wells C, E, and G were dry and could not be sampled. The locations of the wells are shown in Figure 1. The results of the groundwater investigation are summarized in Table 1.

RECOMMENDATIONS

- Define the rate and extent of contaminated groundwater migration by drilling 2 - 4 lateral downgradient wells near Well B.

- Pursue the remediation plan outlined in our October 1, 1986 correspondence to you. This plan included:

  a) Selecting the "Surface Mounted Soil Washing" technique as the most logical remedial plan.
  b) Performing bench scale and pilot level evaluations.
  c) Determining necessary destruction steps of recovered extracts.
  d) Ascertaining technical permitting and economic feasibility of technique for final disposal action.

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INTRODUCTION

SRH Associates collected groundwater samples on August 20 and October 16, 1987, from Time Oil Co.'s Northwest Terminal Facility located in Portland, Oregon. The samples were analyzed for pentachlorophenol (PCP) in an effort to further existing data concerning past releases of this chemical from a wood treating chemicals formulating operation at this site.

The groundwater was sampled at nine existing monitoring wells surrounding the wood treating chemicals area and was analyzed for PCP and pH. Static water levels were determined in these wells and at a monitoring station for the measurement of Willamette River water elevations located on the Northwest Terminal facility's unloading pier.

GROUNDWATER SAMPLING

Nine vertical groundwater monitoring points at Time were measured for static water levels and tested for pH and PCP. The wells had been previously installed by Time employees or other contractors and consisted of 2 inch and 1 1/4 inch (I.D.) PVC screen or stainless steel drive points and PVC casing.

The water level elevations in the wells were measured to the nearest 0.01 foot from the top edge of the casing at a scribed mark located on the north side of the casing. A Fisher M-Scope previously calibrated against a steel tape was used to obtain the measurements. Standing bore volumes of well water were calculated based on these measurements and construction drawings provided by Time. A measurement of the Willamette River water elevation relative to a mark located by Time on its unloading pier was also taken.

Stainless steel weighted bailers were used to remove at least 4 standing bore volumes of water prior to collecting representative samples of groundwater. The bailers had been previously cleaned with sequential washings of laboratory detergent, tap water, hexane, tap water, trisodium phosphate and sodium carbonate in water, tap water, and distilled water (3X). The bailers were recleaned after each well was sampled and new, clean strings were attached. The purged water was collected into D.O.T. 17 E drums until proper disposal could be determined based on analytical results.

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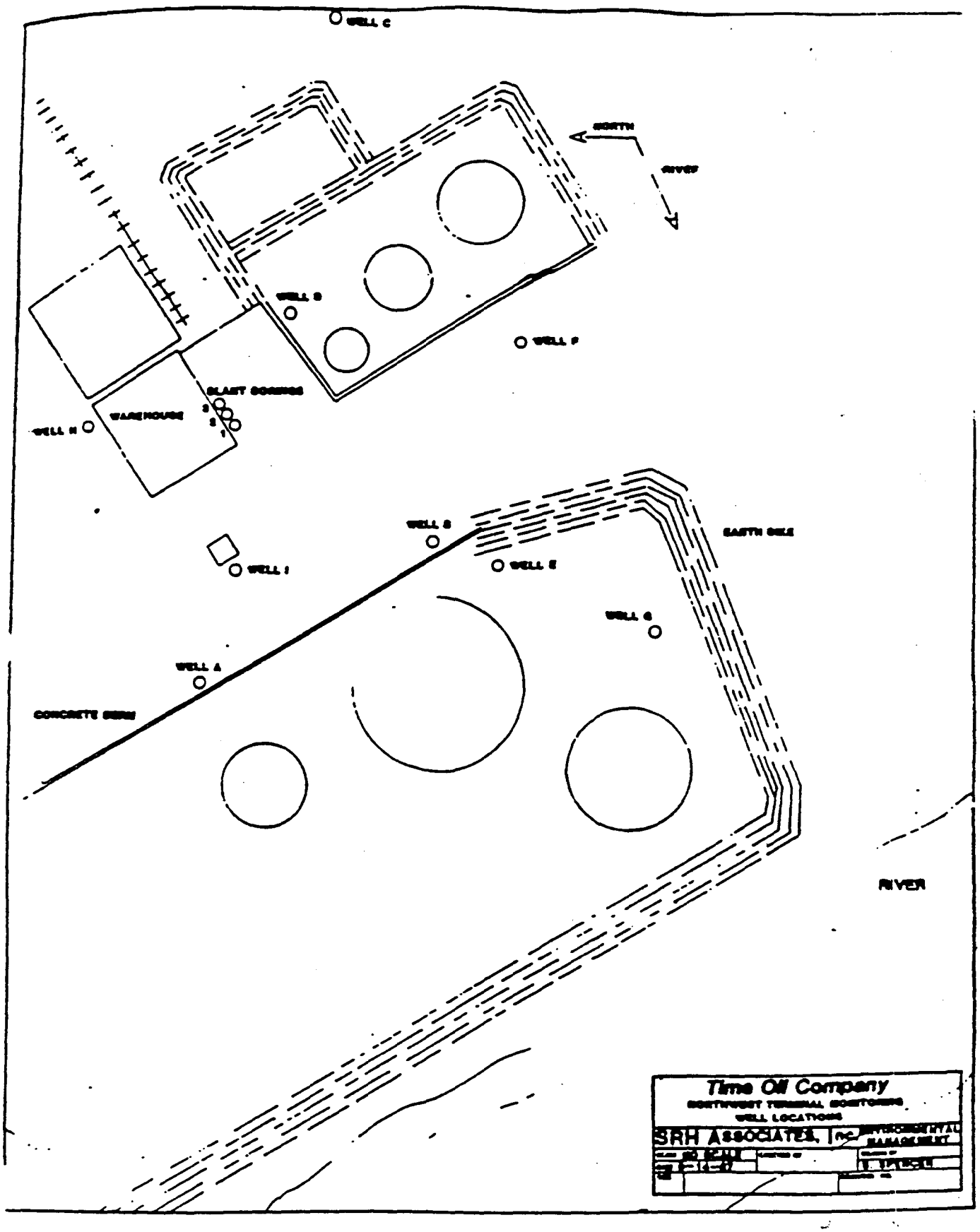

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TOLS003765

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e) Comparing results with repeat step by step examination of next most logical remedial approaches which are: "Surface Mounted Thermal Extraction" and "In-Situ Thermal Extraction".

- Evaluate the vertical gradient of groundwater flux in an uncontaminated zone immediately adjacent to the soil pile by installing one well cluster with multiple completion depths.

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BZTO104(e)040587

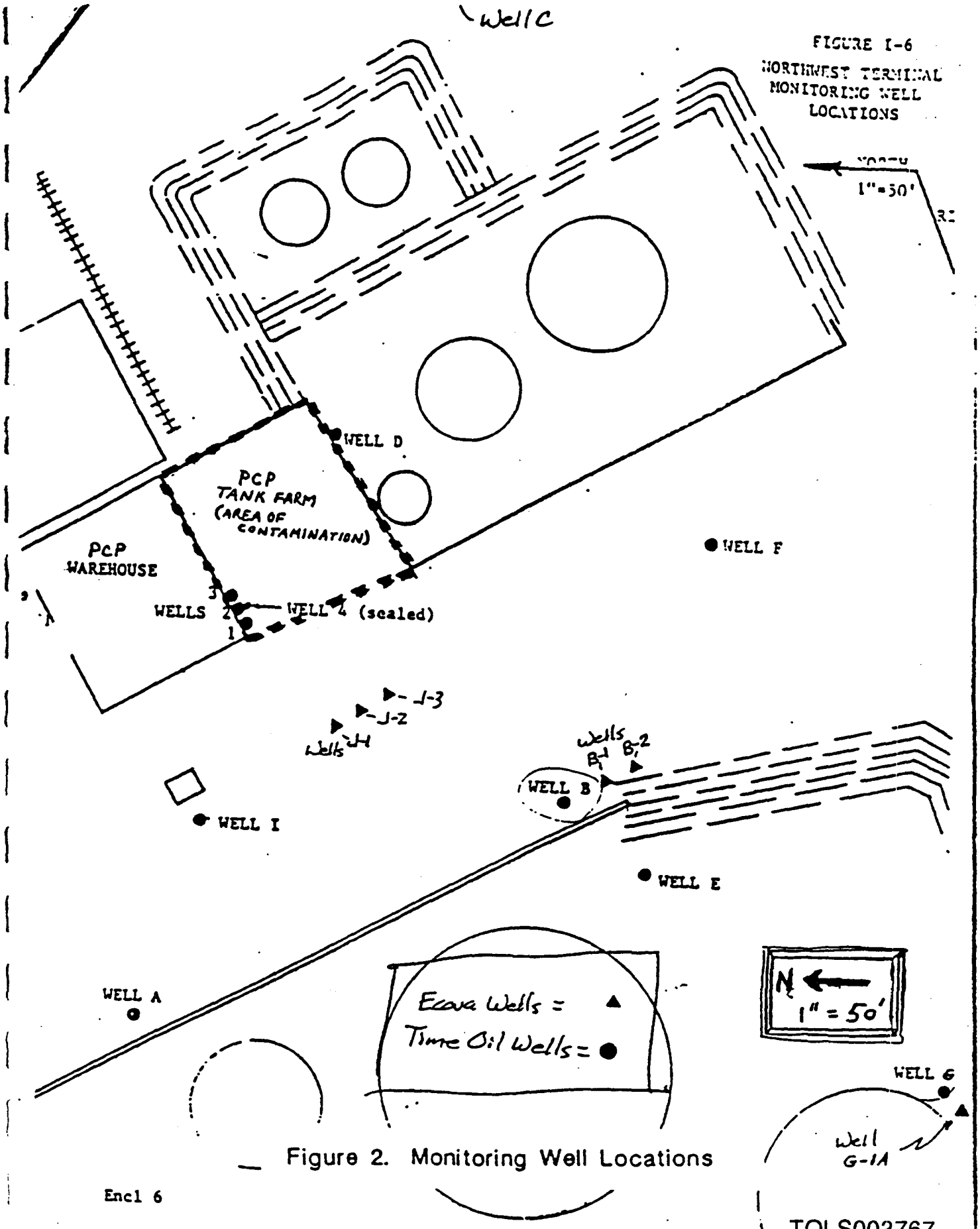

Figure 2. Monitoring Well Locations

Encl 6

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TABLE 1 - GROUNDWATER SAMPLE RESULTS

Sample	ug/l PCP (1)	ug/l PCP (2)	pH	Depth to Water, Ft*		Static Water Level (ft. MSL) ** (1)	Static Water Level (ft. MSL) ** (2)
MW-A	<20	NA	6.61	13.78	14.74	83.36	82.40
MW-B	2300	1000	6.57	14.79	15.54	82.04	81.29
MW-C				(Dry)			
MW-D	<20	NA	6.60	14.29	15.24	83.64	82.69
MW-E				(Dry)			
MW-F	<20	NA	6.43	15.27	16.02	82.70	81.95
MW-G				(Dry)			
MW-H	<20	NA	6.64	13.78	12.10	83.71	82.65
MW-I	<20	NA	6.38	14.57	15.23	83.43	82.77
River				25.67	24.67		

(1) As measured on 8/20/87

(2) As measured on 10/16/87

* Distance from well stickup (or pier reference point) to water.

** Relative to TBM established by TOC

NA = Not Analyzed

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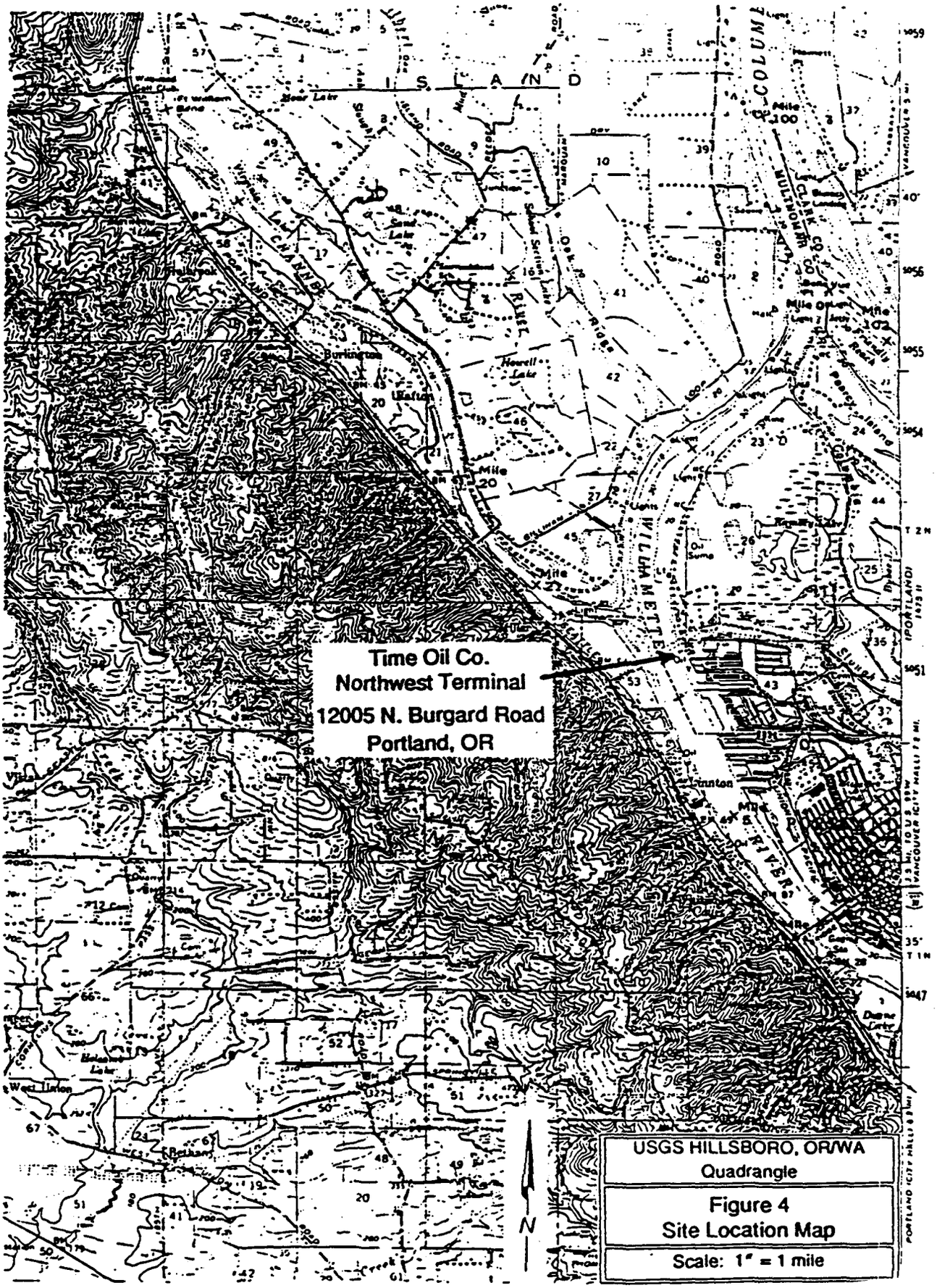

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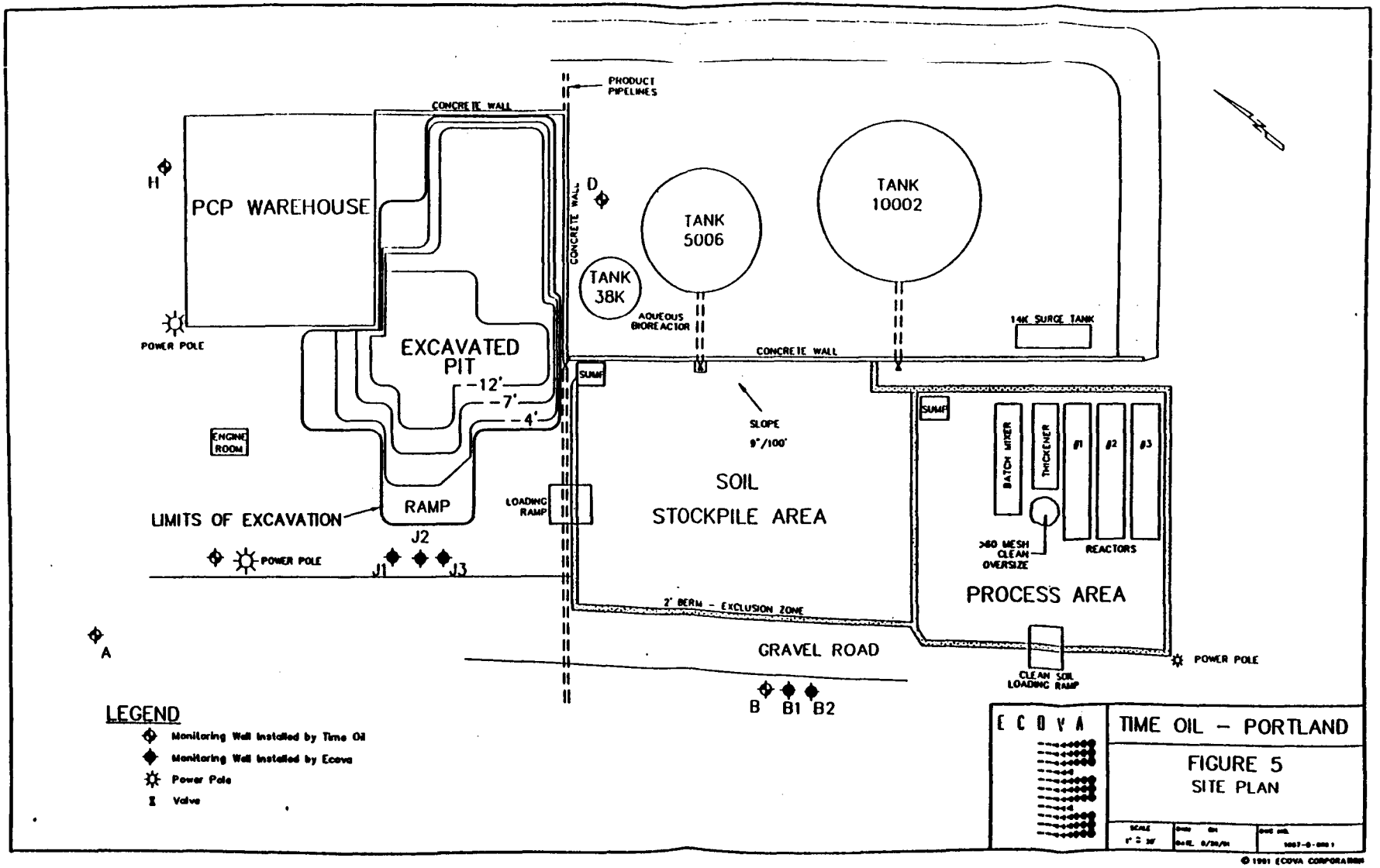
BZTO104(e)040591



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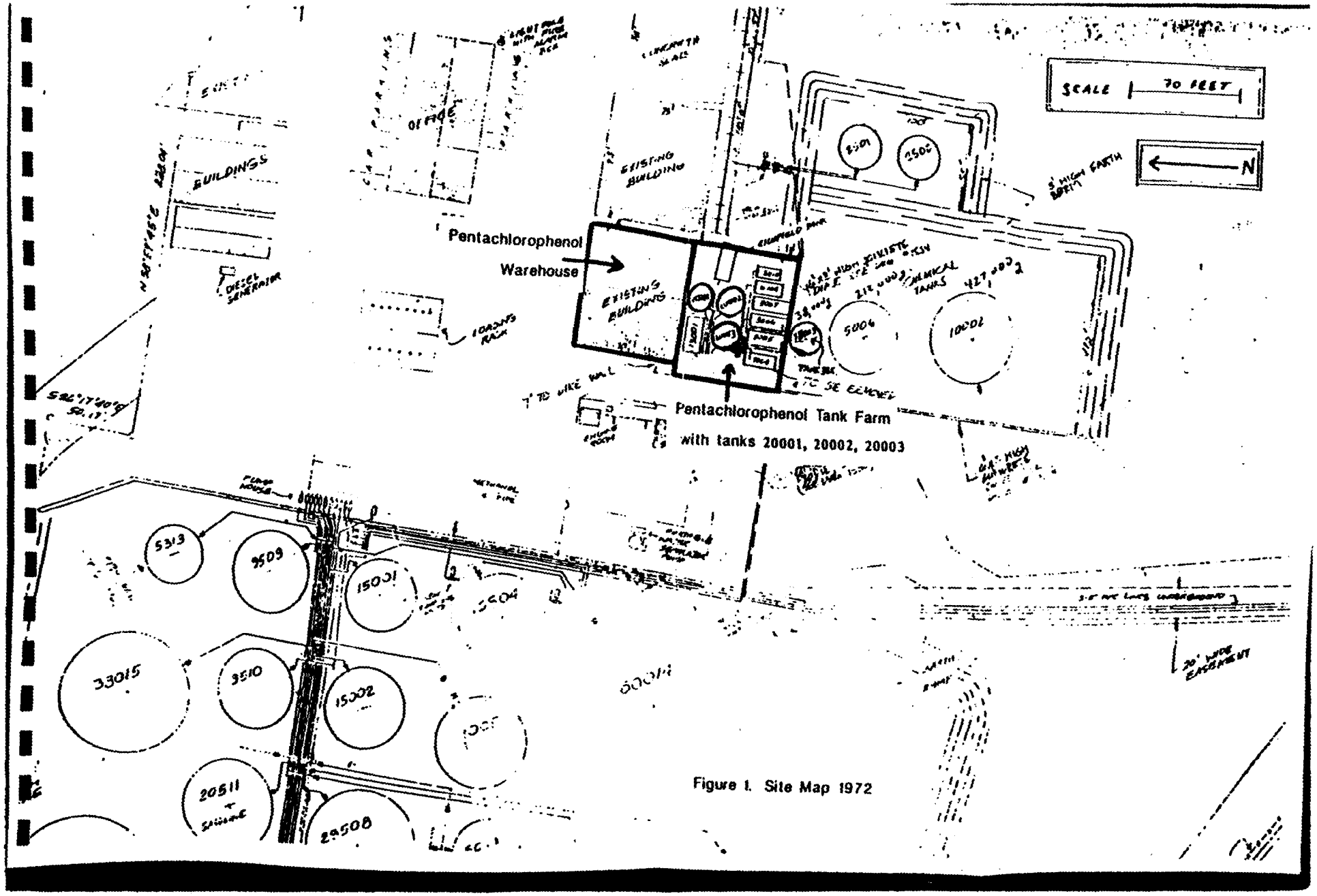


Figure 1. Site Map 1972

TOLS003771

Wood Treating Chemicals

A complete line of high quality wood preservative chemicals for:

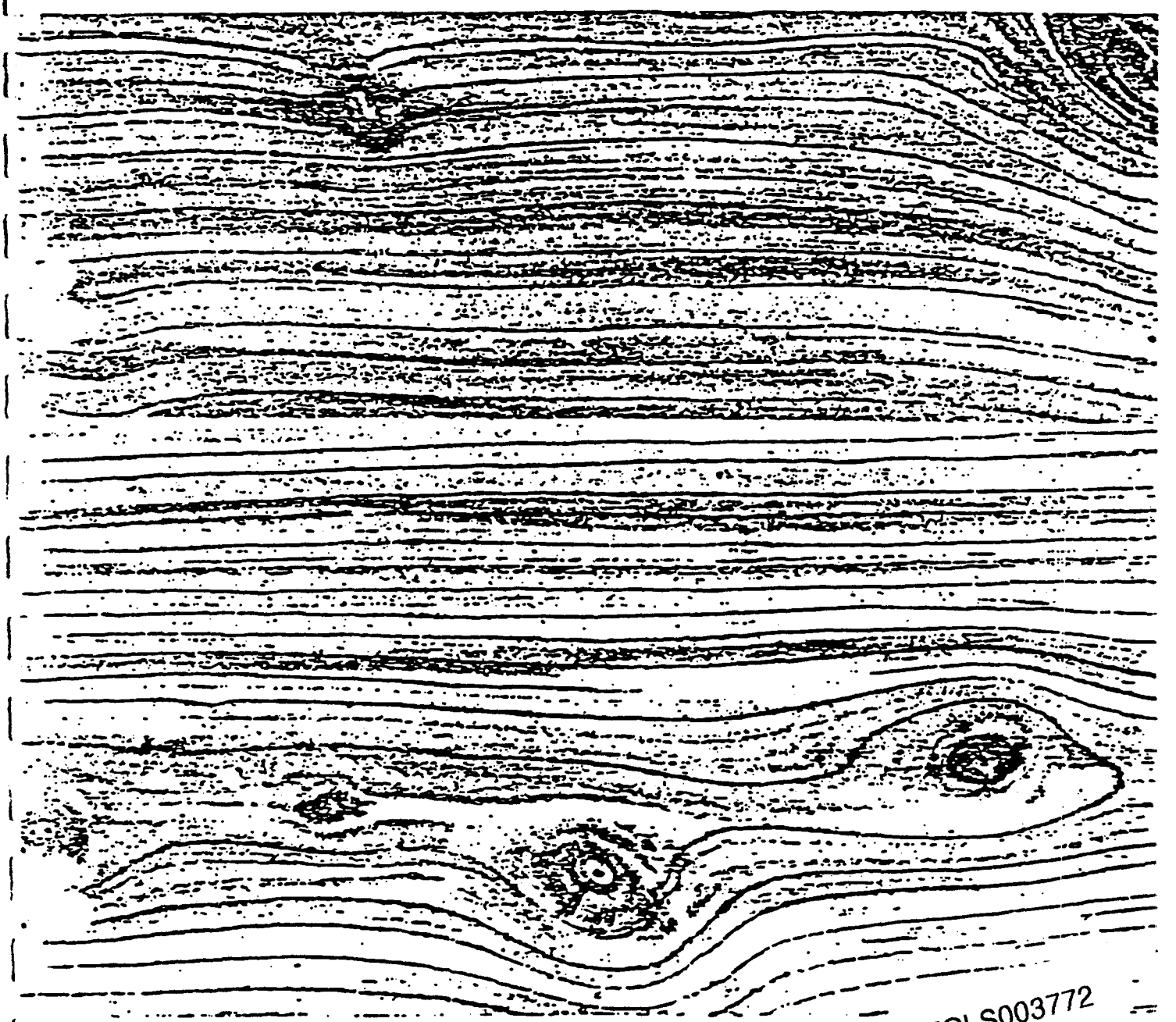
Lumber Industry

Industrial Products

Utility Industry

Commercial Wood Preserving Industry

KOPPERS



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BZTO104(e)040593

Lumber Industry Chemicals

End Coatings

End Sealer. A fast-drying heavy wax emulsion, provides maximum protection for green lumber against end splitting and checking while drying during seasoning. Available in clear and a number of colors. Do not freeze.

End Spray 400 Green and Red. Pigmented color concentrate for application to lumber ends and plywood edges to give uniform color coating to enhance the product appearance. Water reducible—do not freeze. Can be applied to wood by brush or spray. Normally applied at ratio of 1 gallon 400 End Spray to 7-12 gallons of water, depending on the desired color intensity.

Wood Seal Wax. A light-lemon color, highly refined wax end sealer free of oil and tackiness. Provides maximum protection for green lumber against end splitting and checking during seasoning. Do not freeze.

Sap Stain Control

Liquid Azide 200. A 200-1 concentrate chemical specially designed to prevent "enzymatic brown stain" on sugar pine. Can be used alone or with other sap stain control chemicals adaptable for mixing with proportioning equipment.

Liquid Noxtane® SS-1. A specially formulated sapstain chemical concentrate for the prevention of blue stain end mold in lumber operations of southern and western wood species. Can be mixed with automatic proportioning equipment. Dilute before use either 100 to1, 66 to 1 or 50 to 1 depending on stain hazard.

Super Noxtane®. A dry powder. General purpose chemical to control sap stain and mold in freshly cut lumber. Buffered for dip tank use or used at double strength in spray systems.

Liquid Noxtane® 1. Liquid sapstain control chemical concentrate dilutable at a rate of 80 to1 or 50 to1, depending on stain hazard. Liquid Noxtane 1 contains sodium pentachlorophenate and sodium metaborate mixed in a water-organic hydrocarbon solvent system.

Dimension Lumber Protection

Lumbrella® Coating. A specially formulated weather protective coating. Provides water repellency and dimensional stability. Replaces paper wrap in protecting quality lumber from sawmill to building site or lumber yard. Available in clear, yellow, brown and redwood colors. Dilutable in water in accordance with the recommended mixtures.

Timbertreat™ Chemicals—Concentrate. Protects freshly cut logs and lumber against insect attack. Dilutes at a rate of one gallon to 160 gallons of water, specific protection against Ambrosia and Lyctus beetles. Active ingredient—Gamma Isomer of BHC.

Dowicide G-ST Beads—Sodium Pentachlorophenate. A water soluble fungicide for control of sap stain on lumber when used with buffering agents.

Industrial Products

Penta Stain® Coating. A top quality, quickly penetrating outdoor wood stain, containing 5% pentachlorophenol by weight. Also, contains quality resins to give good water repellency. Available in nine basic colors which can be intermixed by the buyer for wider color selection.

Penta Wood Preservative—Concentrate (East of the Rockies). A concentrated solution of pentachlorophenol to be diluted with fuel oil, kerosene, range oil, or diesel fuel. Contains 41% technical pentachlorophenol. Use on wood in contact with ground or other severe exposure applications.

Timbertox 40 Preservative—Concentrate (West of the Rockies). A concentrated solution of pentachlorophenol to be diluted with fuel oil, kerosene, range oil, or diesel fuel. Contains 40.5% technical pentachlorophenol. Use on wood in contact with ground or other severe exposure applications.

Penta Wood Preservative—Ready-to-Use. A clear, ready-to-use liquid containing 5% pentachlorophenol by weight. Solvents used are residual in the wood and do not provide a paintable surface. Use on wood in contact with ground or other severe exposure applications.

Woodtox® Preservative—Ready-to Use. A clear water repellent preservative. Use on wood where cleanliness and paintability are desired. Contains 5% pentachlorophenol by weight.

Woodtox® Preprime Preservative. A high quality water repellent preservative for treatment of millwork prior to factory paint priming. Available as a 1:4 concentrate or a ready-to-use solution. Meets National Woodwork Manufacturers Association Standards for water repellency and preservative effectiveness.

TOLS003773

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Woodtox® 140 Preservative. An economical water repellent preservative for dip treatment of millwork, boxes and pallets. Available in a 1:4 concentrate or ready-to-use solution. Meets Federal Specification TT-W-572B and National Woodwork Manufacturers Association Standards for water repellency and preservative effectiveness.

Woodtox® 152 Preservative—Ready-to-Use. Water repellent wood preservative with dark brown color added. For treatment of wood parts used in truck or wagon body construction, other miscellaneous fabricated lumber items.

Coppertreat® 00 Preservative. Copper naphthenate specially formulated to meet MIL-W-18142B, Amendment 3. Assay 2% copper metal by weight in ready-to-use solution. Use on wood in contact with ground or other severe decay hazard areas.

Utility Industry Chemicals

Pole-Life.® Ready-to-use, grease-like penetrating coating for ground line remedial treatment of standing poles, poles to be relocated, or poles stored for prolonged periods. Can also be used to treat piling cut-offs. Conforms to Bell Laboratories Specification for C Wood Preservative. There are two formulations: one contains 15% Sodium Fluoride and the other containing 15% Sodium Borate, in addition to 10% penta and 15% creosote.

Pole-Treat® 15. A preservative grease for use in ground line remedial treatment of standing poles, relocated poles held too long in storage, piling cut-offs, and other wood maintenance uses. Contains 15% pentachlorophenol and 15% creosote.

Tritox. Tritox Preservative Paste is a ready-to-use, grease-like preservative for remedial treatment of standing poles, relocated poles, poles stored too long, and piling cut-offs. It has a combination of oil soluble and water soluble preservative materials. The mixture of preservatives (10% penta, 35% creosote, 40% sodium fluoride) provides the combined preservative effect considered more effective by some authorities than a single preservative. The water soluble salts are considered necessary by many people for fast penetration results in poles with high moisture content.

Woodtreat® AA Preservative. A paste-like, tan colored emulsion preservative for remedial treatment of dry wood in buildings and structures. This product is useful for the treatment of gains and holes made in poles after treatment that expose untreated wood such as pile cut-offs; for treatment of bridge timbers and other uses where a "loading" of preservative is desired. This product contains 10% pentachlorophenol.

Groundline Treating Accessories. Kraft Paper and dating tags and nails, are available as accessories to groundline products.

Commercial Wood Preserving Industry

Prilled and Block Monsanto Pentachlorophenol. Highly toxic to fungi, termites, many forms of bacteria. Use for pressure and thermal treatment of utility transmission poles, fence posts, guard rails, timber and other industrial wood products. Meets American Wood Preservers' Specification and Fed. Spec. TT-W-570.

Flocculating Agents. WTC-71 and WTC-74 are products designed for the treatment of oil in water emulsions to allow the removal of oil, wood extractives and suspended solids from effluents found in recovery and waste disposal systems, wood treating plant operations.

WTC 7-11 Emulsion Prevention Aid. This product is designed to prevent the formation of oil-water emulsions in penta solutions used in pressure treating. It is added in small quantities to the treating solution.

WR-340. Straw-colored liquid containing a blend of resins and solvents. Combined with pentachlorophenol and mineral spirits, it produces a paintable preservative water-repellent solution.

Timbertox D-5. 5% penta in petroleum solvent which meets AWPA Standard P-9 hydrocarbon solvent Type A. Dark amber color solution.

LST Cosolvent II. Anti-blooming additive and co-solvent for light solvent pentachlorophenol solutions. Meets AWPA Standard P-9 for hydrocarbon solvent Type C cosolvent system.

Petroset II. This product is a blend of solubilizers, inhibitors and anti-oxidants designed to prevent the oxidation, sludging, polymerization, and darkening of pentachlorophenol solutions employed in thermal or pressure treating or Boulton drying of wood poles, piling, and lumber. This product is oil soluble and water insoluble.

TOLS003774

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BZTO104(e)040595

Woodtox® Pre-Prime

Ready-to-Use

Specialty Wood Chemicals Group
Forest Products Division
Koppers Company, Inc.
5137 Southwest Avenue
St. Louis, Missouri 63110
Telephone: 314—772-2200

Product Description	Woodtox Pre-Prime Ready-to-Use is a liquid water repellent chemical. This water repellent wood preservative has been specially formulated for treatment of millwork prior to factory or field priming. Woodtox Pre-Prime Ready-to-Use meets National Woodwork Manufacturers Association (NWMA) standards.
Physical Description	Clear, light amber colored solution.
Penta Content	5.2% by weight technical pentachlorophenol meeting Federal Specification TT-W-570. Contains minimum of 154 gm of penta/gallon as determined by AWPA A-5, Section 5 method.
Flash Point	Minimum 100°F. (Tag Closed Cup) (Typical).
Dilution Data	DO NOT DILUTE. This is a 5% Ready-to-Use solution.
Swellometer Efficiency	Meets or exceeds NWMA Swellometer test of 60% minimum.
Paintability	Woodtox Pre-Prime has been specially formulated for maximum compatibility with paint primer and finish coatings applied at the factory. The mineral spirits carrier may be "trapped" when sash parts are bulk stacked or bundled too tightly and dip treated; doors or plywood flat stacked is another problem. However, where there is free air circulation to volatize the light solvent from the wood surfaces, Woodtox Pre-Prime open tank treated millwork, lumber or plywood can usually be finished within 24-60 hours after treatment.
Corrosion	Contains corrosion inhibitor to aid in the prevention of color formation in shipping containers or storage tanks, and to minimize corrosion and/or discoloration of metal fasteners.
Storage Precautions	None, other than to keep out water. Stable over the normal range of storage conditions.
Uses of WOODTOX PRE-PRIME Ready-to-Use	Woodtox Pre-Prime is used for the treatment of sash and other millwork to meet the Seal of Approval program of the NWMA for a preservative water repellent (IS-4). It is also useful for the treatment of other wood products where the benefits of a preservative and water repellent solution are desired that will help control stain, decay (rot), termites, and other wood boring insects; that will not cause grain raising, and that will leave the wood paintable.

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TOLS003775

BZTO104(e)040596

Treating Data	Woodtox Pre-Prime may be applied by the vacuum, immersion, brush, or spray methods. The effectiveness of the treatment is in proportion to the distribution and retention of solution in the treated item.
Safe Handling of Pentachlorophenol Solutions	See Koppers Company, Inc. Bulletin — "Safety Measures & Precautions for Handling Solutions Containing Pentachlorophenol".
Packaging	Bulk — 4,000 to 10,000 gallon tank cars; or in minimum tariff tank truck transports. Also available in 5 gallon and 55 gallon drums.
Shipping Classification	Chlorinated phenol petroleum solution — Wood Preservative Liquid, Not Exceeding 5% of chlorinated phenol by weight.
Production points and shipping points	St. Louis, Missouri, Portland, Oregon

KOPPERS
Chemicals and Coatings

The information given herein is based on our experience, represents our best judgment in the matter, and is intended to be helpful. But we cannot assume responsibility for any loss or accident that may result from its use.

Woodtox is a registered trademark of Koppers Company, Inc.

FP-879
October, 1976

Litho in U.S.A.

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TOLS003776

BZTO104(e)040597

WOOD TREATING CHEMICALS DEPT.
KOPPERS COMPANY, INC.
5137 SOUTHWEST AVENUE, ST. LOUIS, MISSOURI 63110
314-772-2200

PRODUCT INFORMATION DATA

WOODTOX* PRE-PRIME CONCENTRATE

October 1, 1969

Trade Name	Penta water repellent preservative concentrate
Wood Treating Name	Woodtox* Pre-Prime Concentrate
Chemical Name	Penta water repellent preservative concentrate
Description	Clear, medium amber color solution
Penta Content	21.2% by weight technical pentachlorophenol meeting Federal Specification TT-W-570
Non-Volatile Content	53.0% by weight
Specific Gravity	0.9784 at 15.5 deg. C. (typical)
Weight per Gallon	8.15 pounds at 15.5 deg. C. (typical)
Pour Point	Plus 18 deg. F.
Flash Point	100 deg. F. (Tag. Closed Cup) (minimum)
Dilution Instructions	Woodtox* Pre-Prime concentrate is readily miscible with mineral spirits or other light petroleum solvents without heat or special agitation. To cut back to the normal 5% pentachlorophenol ready-to-use strength, one gallon or part by volume of the concentrate should be diluted with four gallons or parts by volume of mineral spirits to make five gallons of Woodtox* Pre-Prime. Heavier petroleum solvents than mineral spirits are not recommended as diluents since paintability of the treated wood would be affected. Federal Specification TT-T-0291a, Grade 1, or ASTM Standard D-235-39 can be used for procurement of a suitable mineral spirits diluent. A distillation range of 330 to 385 deg. F. for this type of light petroleum solvent is typical of current refinery production, but in many areas and for a small price differential LEP mineral spirits with an end point as low as 350 deg. F. is readily available. The LEP mineral spirits is also readily miscible with Woodtox* Pre-Prime concentrate and the speed upon drying of the treated wood may be as much as 25%. Xylol and other lighter solvents are not recommended.

*Trade Mark Registered U. S. Patent Office

TOLS003777

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WOODTOX* PRE-PRIME CONCENTRATE

Swellometer Efficiency	This concentrate, when properly diluted, will make a water repellent solution having a swellometer efficiency of 60% minimum.
Paintability	The ready-to-use solution made with this concentrate dries to a firm film and contains a minimum of paraffin or other water repellent ingredients that tend to interfere with paintability. The length of time that should elapse between the time the wood is treated and the time that paint, varnish, or other finishes are applied depends upon how soon the excess mineral spirits used as a carrier can get out of the wood. The mineral spirits carrier may be "trapped" when sash parts are bulk stacked or bundled too tightly and dip treated; doors and plywood flat stacked are another problem. However, where there is free air circulation to volatilize the light solvent from the wood surfaces, Woodtox* Pre-Prime open tank treated millwork, lumber, or plywood can usually be finished within 48 to 72 hours after the treatment. Woodtox* Pre-Prime Concentrate meets paintability tests or standards of Federal Specification TT-W-00572a, the NWMA, and CS 262-63.
Storage Precautions	Some sedimentation may occur after long standing, but this is relatively insignificant on a weight basis and should not reduce the efficiency of the product after dilution. This concentrate thickens when exposed to low temperature, but returns to normal fluidity when stored at ordinary room temperatures. Containers should be thoroughly agitated before removing contents when temperature of the concentrate is below 40 deg. F.
Safe Handling of Pentachlorophenol	See Wood Treating Chemicals Co. Bulletin 1049 entitled "Safety Measures and Precautions for Handling Solutions Containing Pentachlorophenol."
Packaging	5 gallon and 55 gallon drums, and bulk shipments in tank cars
Shipping Class	Wood Preservative, Liquid NOIBN
Production Points	Saint Louis, Missouri and Portland, Oregon
›ing Points	Saint Louis, Missouri and Portland, Oregon

Printed in U. S. A.

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TOLS003778

BZTO104(e)040599

Woodtox® 140 Ready-to-Use
Liquid Water Repellent Solution

Product Data

Specialty Wood Chemicals Group
Forest Products Division
Koppers Company, Inc.
5137 Southwest Avenue
St. Louis, Missouri 63110
Telephone: 314—772-2200

Product Description	Woodtox 140 Ready-to-Use is a liquid water repellent solution. This water repellent wood preservative has been specially formulated for the treatment of ammunition boxes, millwork and other exterior wood. Woodtox 140 meets NWMA Standards and Federal Specification TT-W-572B.
Physical Description	Clear, light amber colored solution.
Penta Content	5.2% by weight technical pentachlorophenol meeting Specification TT-W-570.
Flash Point	Minimum 100°F (Tag Closed Cup)
Dilution Data	DO NOT DILUTE. This is a 5% Ready-to-Use solution.
Swellometer Efficiency	Meets or exceeds NWMA Swellometer test of 60% efficiency.
Paintability	Woodtox 140 Ready-to-Use has been formulated for good compatibility with most finishes, including those used for finishing by the millwork industry.
Corrosion	Contains corrosion inhibitor to aid in the prevention of color formation in shipping containers or storage tanks, and to minimize corrosion and/or discoloration of metal fasteners.
Storage Precautions	None other than to keep out water. Stable over the normal range of storage conditions.
Uses of Woodtox 140 Ready-to-Use	Woodtox 140 Ready-to-Use is used for the treatment of ammunition boxes, millwork and exterior wood, where the benefits of a preservative and water repellent solution are desired that will help control stain, decay (rot), termites, and other wood boring insects; that will not cause grain raising, and that will leave the wood still paintable.
Treating Data	Woodtox 140 Ready-to-Use may be applied by conventional methods such as vacuum, immersion, brush, etc. The effectiveness of the treatment is in proportion to the distribution and retention of solution in the treated item.

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Safe Handling of Pentachlorophenol Solutions	See Koppers Company, Inc., Wood Treating Chemicals Dept. Bulletin — "Safety Measures & Precautions for Handling Solutions Containing Pentachlorophenol". Do not use this product indoors.
Packaging	Bulk — 4,000 to 10,000 gallon tank cars; or in minimum tariff tank truck transports. Also available in 5 gallon and 55 gallon drums.
Shipping Classification	Chlorinated phenol petroleum solution — Wood Preservative Liquid, Not Exceeding 5% of chlorinated phenol by weight.
Product Points and Shipping Points	St. Louis, Missouri Warehouse Portland, Oregon

Koppers Company, Inc.
Pittsburgh, Pa. 15219

KOPPERS
Chemicals and Coatings

The information given herein is based on our experience, represents our best judgement in the matter, and is intended to be helpful. But we cannot assume responsibility for any loss or accident that may result from its use.

Woodtox is a registered trademark of Koppers Company, Inc.

WOL-15
October, 1976

Litho in U.S.A.

32319

TOLS003780

BZTO104(e)040601

Woodtox® 140 Concentrate

Water Repellent Pentachlorophenol Preservative

Specialty Wood Chemicals Group
Forest Products Division
Koppers Company, Inc.
5137 Southwest Avenue
St. Louis, Missouri 63110
Telephone: 314—772-2200

Product Description	Woodtox 140 — Concentrate is a water repellent pentachlorophenol preservative.
Physical Description	Clear — Reddish-Amber colored solution.
Penta Content	22.0% by weight Technical Pentachlorophenol meeting Federal Spec. TT-W-570.
Specific Gravity	.959 at 15.5°C (60°F.) (Typical)
Weight per Gallon	7.99 lbs. at 15.5°C (60°F.) (Typical)
Pour Point	−1°C (30°F.)
Flash Point	43°C (110°F.) (Typical)
Dilution Data	Before using, dilute at the ratio of one part this product to four parts by volume of a mineral spirits, naphtha, or equivalent solvent weighing not more than 6.46 lbs/gal. to make a ready-to-use solution containing not less than 5.2% Technical Pentachlorophenol by weight. The diluent should have an end point no greater than 360°F. for quick drying and paintability. Agitate thoroughly before using. It is recommended that the solvent used should be L.A. Rule 66 exempt.
Swellometer Efficiency	Woodtox 140 Concentrate when diluted at the rate of one to four as suggested above and with a suitable mineral spirits will exceed swellometer efficiency of 60%.
Storage Precautions	As Woodtox 140 Concentrate is made with technical grade materials, upon long standing some sedimentation may occur. This sedimentation is relatively insignificant on a weight basis and does not reduce the efficiency of the product after dilution. This concentrate increases in viscosity when exposed to low temperatures, but returns to normal fluidity if stored or used at ordinary room temperatures.

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TOLS003781

BZTO104(e)040602

Use Data	This concentration is to be used for the preparation of a ready-to-use solution which conforms to NWMA IS-4 and Federal Specification TT-W-572B when diluted according to label directions.
Safe Handling of Pentachlorophenol	For additional information see: "Safety Measures & Precautions for Handling Solutions Containing Pentachlorophenol".
Packaging	55 gallon drums, 5 gallon drums and tank cars.
Shipping Classification	Wood Preservative, NOI LIQUID OR PASTE
Production Point	St. Louis, Missouri Portland, Oregon
Shipping Point	St. Louis, Missouri Portland, Oregon

Koppers Company, Inc.
Pittsburgh, Pa. 15219

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Chemicals and Coatings

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WOL-14
October, 1978

Litho in U.S.A.

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TOLS003782

BZTO104(e)040603

WOOD TREATING CHEMICALS CO.

5137 Southwest Avenue / St. Louis, Missouri 63110 / 314 PR 2-2200

PRODUCT INFORMATION DATA

Sheet No. 125
March 15, 1967

WR CONCENTRATE 340

Trade Name	Water Repellent Concentrate
Wood Treating Name	WR CONCENTRATE 340
Chemical Name	Same as Trade Name
Description	Straw colored liquid containing the proper blend of water repellents and co-solvents so that when blended with Monsanto Penta and with mineral spirits, meeting specifications indicated below, a non-blooming, paintable preservative water repellent solution will result which will meet the requirements of Federal Specification TT-W-572 and AWPI Standard LP-3.
Penta Content	None
Specific Gravity	0.889 at 15.5° C. (60° F.) (typical)
ight per Gallon	7.49 pounds at 15.5° C. (60° F.) (typical)
Pour Point	65° F. (approximate for homogeneity)
Flash Point	105° F. minimum - Tag. Closed Cup
Mixing Data	The following mixing instructions are given in units of 405 lbs. of WR CONCENTRATE 340 as that is the weight of the concentrate packed in 55-gallon drums:

WR CONCENTRATE 340	405 pounds
Monsanto Technical Penta	200 pounds
Mineral Spirits (500 Gals.)	3241 pounds

This will yield 566 gallons of water repellent solution containing 5% by weight of Pentachlorophenol if the Mineral Spirits has a weight of 6.5 lbs. per gallon which is typical. Weight of treating solution will be approximately 6.80 pounds per gallon. The volume yield will vary with the weight of the Mineral Spirits or equivalent light petroleum solvent used.

See Wood Treating Chemicals Company Bulletin 1108 and 1513

TOLS003783

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	for typical specifications for a suitable Mineral Spirits.
Mixing Procedure	Mixing will be facilitated by bringing the WR CONCENTRATE 340 to a temperature of 65° F., or higher, to insure homogeneity and to facilitate removal from drums or to pump from tank cars or storage tanks. In blending, first add Mineral Spirits or equivalent light petroleum solvent to the blending tank. Heat to 90° F., or higher; then add the WR CONCENTRATE 340 and before adding penta. Mix thoroughly and then add the Monsanto Penta. Mix until dissolved. Agitation and/or heating while mixing the penta will greatly hasten the rate of solution.
Treating Data	See Wood Treating Chemicals Co. Bulletin #1513 entitled "Pressure Treatment with Penta Water Repellent Preservative."
Safe Handling of Penta and Penta Solutions	See Wood Treating Chemicals Co. Bulletin #1049 entitled "Safety Measures And Precautions For Handling Solutions Containing Pentachlorophenol."
'ackaging	8,000 gallon tank cars 6,000 gallon tank cars 4,000 gallon tank cars 55-gallon open-head drums (net 405 pounds)
Shipping Classification	Wood Preservative Liquid, N.O.I.
Production Point	St. Louis, Missouri
Shipping Point	St. Louis, Missouri

Printed in U.S.A.

TOLS003784

32319

BZTO104(e)040605

Timbertox 40
Penta Wood Preservative Concentrate

Product Data

Specialty Wood Chemicals Group
Forest Products Division
Koppers Company, Inc.
5137 Southwest Avenue
St. Louis, Missouri 63110
Telephone: 314—772-2200

Product Description Timbertox 40 Penta Wood Preservative Concentrate contains pentachlorophenol and solvents. This product was designed as a freight saving method of supplying pentachlorophenol so that ready-to-use penta solutions could be prepared with locally available diluents and without the necessity of heat or special mixing equipment.

Physical Description Timbertox 40 penta wood preservative concentrate is a clear-dark amber colored solution.

Penta Content 40.5% by weight technical pentachlorophenol meeting federal specification TTW-570.

Specific Gravity 1.12 at 15.5°C (60°F.) (Typical)

Weight per Gallon 9.32 lb./gallon at 15.5°C (60°F.) (Typical)

Pour Point Below –26°C (15°F.)

Flash Point 85°C (185°F.) (Typical)

Dilution Data The amount of diluent used with this concentrate depends upon the concentration of penta desired in the ready-to-use solution and on the weight per gallon of the diluent. Furthermore, the choice of diluent depends upon the end use for the diluted material. It should be recognized that if light oils such as mineral spirits are used as a diluent, the penta may bloom (crystallize on the surface of the wood). Any oil with over 50% of its distillation range falling under 500°F. will probably allow blooming.

Since a 5.2% solution is generally desired for wood preservation the following formulation will show how much diluent oil is required:

$$\frac{\text{\% active ingredient in concentrate} \quad \text{Minus} \quad \text{\% active ingredient desired}}{\text{\% of active ingredient desired}} \times$$

$$\frac{\text{Weight of concentrate per gallon}}{\text{Weight of solvent per gallon}} = \text{Gallons of solvent desired.}$$

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Dilution Data (Continued) Using the foregoing formula as an example, and using a fuel oil weighing 7.0 pounds per gallon, to make a 5.2% ready-to-use solution would require:

$$\frac{40.5 \cdot 5.2}{5.2} \times \frac{9.32}{7.0} = 9.04 \text{ gallons of oil}$$

Timbertox 40 penta wood preservative concentrate is made with technical grade materials; therefore, when this concentrate is diluted with certain low aromatic petroleum products, a slight sedimentation in the finished solution may appear. This sedimentation is relatively insignificant on a weight basis, and if it is detrimental it can be removed by filtration or by settling for 48 hours and drawing it off the bottom of the container.

Uses Follow detailed instructions on the label for the use of Timbertox 40 penta wood preservative concentrate in wood preservation, and termite control.

Storage Timbertox 40 penta wood preservative concentrate has a very good low temperature stability. Its viscosity increases as the temperature decreases, and it finally becomes so viscous that it will not pour. Upon return to room temperature it again becomes fluid. If it is known that it has been chilled to, or near, the solidification point, it is always good practice to agitate the container (roll the drums) to insure uniformity of product each time before any product is withdrawn from the container.

Safe Handling For additional information please see Koppers bulletin titled "Safety Measures and Precautions for Handling Solutions Containing Penta-chlorophenol".

Packaging 55 gallon drums and bulk shipment in tank trucks.

Shipping Classification Wood Preservative NOI Liquid or Paste

Production and Shipping Point Portland, Oregon

Koppers Company, Inc.
Pittsburgh, Pa. 15219
KOPPERS
Chemicals and Coatings

The information given herein is based on our experience, represents our best judgment in the matter, and is intended to be helpful. But we cannot assume responsibility for any loss or accident that may result from its use.

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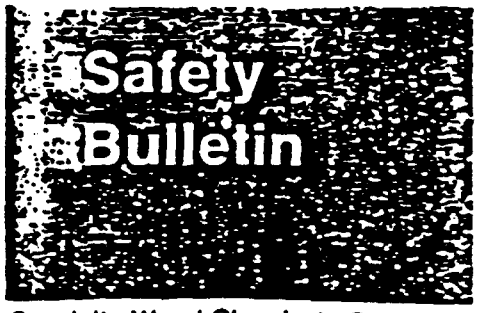
Safety Measures and Precautions for Handling Solutions Containing Pentachlorophenol



Specialty Wood Chemicals Group
Forest Products Division
Koppers Company, Inc.
5137 Southwest Avenue
St. Louis, Missouri 63110
Telephone: 314—772-2200

All users of Koppers pentachlorophenol solutions should give careful attention to these safe handling instructions to avoid unnecessary exposure that might cause skin irritation or other health hazards.

Chemicals which are sufficiently toxic to control various wood degrading organisms and insects may generally be considered as substances which should be handled with due care to avoid irritation or other harmful effects to human beings and to prevent contamination of food stuffs. Although millions of pounds of pentachlorophenol has been sold since its commercial manufacture was started in the United States in 1936, and billions of pounds of penta solutions have been used, occasionally troubles arise because of the improper handling of the dry chemical or solution. The purpose of this bulletin is to give information that will help prevent health hazards and to also suggest action to be taken if the product has caused a health hazard.

For toxicological information on pentachlorophenol crystals, or prills, refer to Monsanto Chemical Company — Technical Bulletin No. IC/PS-3 titled "Handling Precautions for Penta and Santobrite".

fe Handling Penta Formulations

In general, there are two types of penta formulations, Concentrates and 5% Ready-to-Use Solutions. Most of these solutions contain alcohols and/or aromatic petroleum oils as the solvents and carriers, and these materials as well as the penta can cause health problems if not handled properly.

The greatest chance for harmful amounts of penta formulations to get into the body is through the skin. Of course, swallowing could occur, but this is rare. The oils and solvents used to dissolve penta are usually nasal or respiratory irritants, so they also often cause sneezing, coughing or eye irritation; so a person tends to get out of the areas causing these health discomforts. The chief method of body damage is apt to come from the solutions that get on the skin. Since individuals vary considerably as to their susceptibility to skin irritation, no set rules can be devised, but a very simple rule can be followed: Keep the solutions off the skin, and if they get on the skin wash them off with soap and water. Do not allow the solutions to saturate clothing and then continue to wear such contaminated clothing.

Koppers sells a number of penta formulations under such trademarks as Woodtox®, Timbertox®, Woodtreat® and Liquid Noxtane® to name some of the most common ones. These materials may be for use as preservatives in or on wood, as termite control materials, or for the control of other insects or fungi. Safe handling data can be divided into two parts — health and use practices.

Health and First Aid Measures in Connection With The Use of Penta Formulations

Users of any of Koppers formulations should give careful consideration to the safety measures and precautions given on the label for each product. Since these products are registered with the EPA under the Federal Insecticide, Fungicide and Rodenticide Act, the labels on each package must carry an approved caution statement. (Since penta is not defined as a highly toxic poison, the skull and cross bones marking is not required. This marking is a DOT requirement but is not required on EPA registered labels.) The precaution on any Penta containing product contains in essence all or some part of the following information, depending upon the product:

> Do not breathe vapor. Do not get in eyes, on skin or on clothing. Keep away from foodstuffs, children, pets and livestock. If swallowed, induce vomiting by administering emetic — call a physician. To remove from skin, wash with plenty of soap and warm water. Flammable — keep away from fire and flame.

Solutions of pentachlorophenol are irritating to the skin of most individuals and will be absorbed on contact, and if repeated contacts occur, the rate of absorption varies depending on the solvent used and the individual's susceptibility. Some

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of the lighter petroleum solvents are irritating to the skin with or without an admixture of pentachlorophenol to the oil solution. ...wever, the safety and comfort of ...e worker handling pentachloro- ...henol solution such as Woodtox, ...mbertox, Woodtreat or Liquid Noxtane will be assured if he follows such precautionary measures as his particular application makes necessary. These measures will vary from simple washing of the hands with soap and water at the completion of the handling operations to the wearing of protective garments and accessories for a workman continually on duty at a treating tank is subject to possible contact with the preservation formulations. Rubber gloves and protective clothing should be worn when handling the freshly treated wood.

Safe handling measures may be summarized briefly:

DO NOT SWALLOW

Solutions containing penta should ...t be taken internally. They ...hould not be placed so that ...ildren or animals will get into ...nem, and opened or discarded containers should not be left where the contents could cause a health hazard. If any penta solution is swallowed, vomiting should be induced by administering mustard and water, and a physician should be called.

PROTECT EYES, NOSE AND THROAT

Formulations containing penta should not be used in enclosed areas without adequate ventilation. Eyes should be protected from splash, drip or spray by the use of goggles. If any penta solutions get into the eyes, flood the eyes with water (do not rub the material into the eyes!), and if irritation continues after thorough bathing of the eyes, call a physician. Workmen handling penta solutions should be taught to cleanse the face and hands promptly after working with penta formulations to avoid having the material get in or on sensitive body parts or be absorbed by the skin.

DO NOT GET ON SKIN

Pentachlorophenol solutions are irritating to the skin of most individuals. Whether the irritation comes from the carriers or the penta is immaterial – penta formulations should not be left in contact with the skin. Long exposures or frequent short contacts can result in Penta being absorbed through the skin. This hazard can be avoided by the use of synthetic rubber gloves and/or other protective garments.

IT IS EASIER TO AVOID TROUBLE THAN CORRECT IT

Commercial wood treating plants, formulations manufacturers, and termite and other pest control operators are accustomed to handling chemicals and formulations of them, and usually take precautions to protect themselves, their workmen and their clients. The above precautionary measures are reviewed in order to help maintain the good records that have accompanied the successful use of penta formulations.

Simple precautions as given above include washing the exposed body parts with soap and water at the completion of a handling operation and the wearing of adequate protective garments. Clothing that becomes contaminated with solutions containing penta should be changed to avoid skin contamination.

Washing with soap and water should be routine practice before eating, drinking or smoking and at the close of the working period. It may be advisable at other times, under particular conditions, and should always be practiced in cases of contact. The secret of safe handling of penta preparation is simply to avoid direct physical contact with them.

PRECAUTIONS RELATIVE TO THE USE OF PENTA FORMULATIONS

Besides health hazards, there are problems that can arise because of the misuse of penta formulations. Know your product! Know what it was designed to be used for, and read the directions for use on the label. It is a violation of Federal Law to use any EPA registered product in a manner inconsistent with its labeling.

Wood preservations formulations can affect subsequent paint coats, therefore select the proper formulations and use them properly.

Termite control or wood preservation solutions containing penta can kill vegetation unless properly used. They may also impart odors. Follow the manufacturer's recommendations for use. Pentachlorophenol is toxic to fish, therefore, do not dispose of near water drainage to streams or bodies of water. Consult the label for pesticide disposal and container disposal directions.

Free access of air should be provided for all surfaces of wood after its treatment with pentachlorophenol solutions and before the wood is used so that the preservation liquids will not be on the wood surfaces when the wood is put in use.

...odtox, Timbertox, Woodtreat and Noxtane are registered trademarks of Koppers Company, Inc.

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Litho in U. S. A. October, 1976

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Oil-Penta

1. Fire Hazards: This solution will burn if exposed to an open flame. Tanks or lines must be thoroughly cleaned before burning or welding may take place. Clean up spills promptly and observe good housekeeping practices.

   The location and operation of fire fighting equipment should be known to all employees. Definite procedures to be followed in case of a fire should be prepared and posted.

2. Personnel Hazards: Oil-Penta will cause skin irritation on contact. Oil-Penta solutions are more hazardous than penta alone.

3. Protective Equipment: Wear rubber gloves and goggles when handling Oil-Penta solutions. Rubber overshoes should be worn when foot contamination is possible.

4. First Aid: Eye Contact: Flush the eye with water and see a physician immediately.

   Skin Contact: Wash the affected area with soap and water. Launder clothing before re-use. Discard contaminated shoes.

See Pentachlorophenol.

Pentachlorophenol (Penta)

1. Fire Hazards: None

2. Personnel Hazards:

   A. *Do not swallow.* Penta should not be taken internally. If it is accidentally swallowed, either as a solid or in solution, vomiting should be induced by administration of mustard and water, or other emetic, and a physician should be called.

   B. *Protect eyes, nose, throat.* Penta dust is irritating to the mucous membranes of the eyes, nose and throat It may provide violent sneezing and coughing when inhaled. For prolonged exposure to the dust, a respirator or a folded gauze should be worn over the nose and mouth. The eyes should be protected by goggles. Indoors a forced-draft ventilating system is highly desirable. The worker should be taught to wash his face and hands promptly of any penta dust since this might later find its way into sensitive regions such as the eyes, or be absorbed by the skin.

   C. *Do not inhale vapors.* Penta formulations should not be breathed or allowed to contact mucous membranes of the eyes, nose, throat or skin. Where formulations are being used in weed control work, for example, the worker's respiratory system should be fully protected from inhalation of the spray and his body protected with suitable clothing.

   D. *Avoid skin contact.* Both the solid penta and its solutions are irritating to the skin of most individuals. They may be absorbed if contact is prolonged beyond five to ten minutes, or if repeated contacts occur for shorter periods.

3. Protective Equipment: Wear gloves whenever handling penta, penta solutions or penta treated wood. Wear goggles whenever there is the possibility of penta or penta solutions coming in contact with the eye. Wear a face mask when handling dry penta to prevent inhalation of the dust.

   Wear protective garments and accessories. Clothing which becomes wet with penta preparations should be promptly changed for clean items since skin absorption can take place even from diluted solutions.

   Finally, washing with soap and water should be routine practice before eating, drinking or smoking and at the close of the working period. The secret of safe handling of penta preparations is simply to avoid direct physical contact.

4. First Aid: For external exposure, wash affected area with soap and water. For internal exposure, induce vomiting if conscious. Contact a physician at once.

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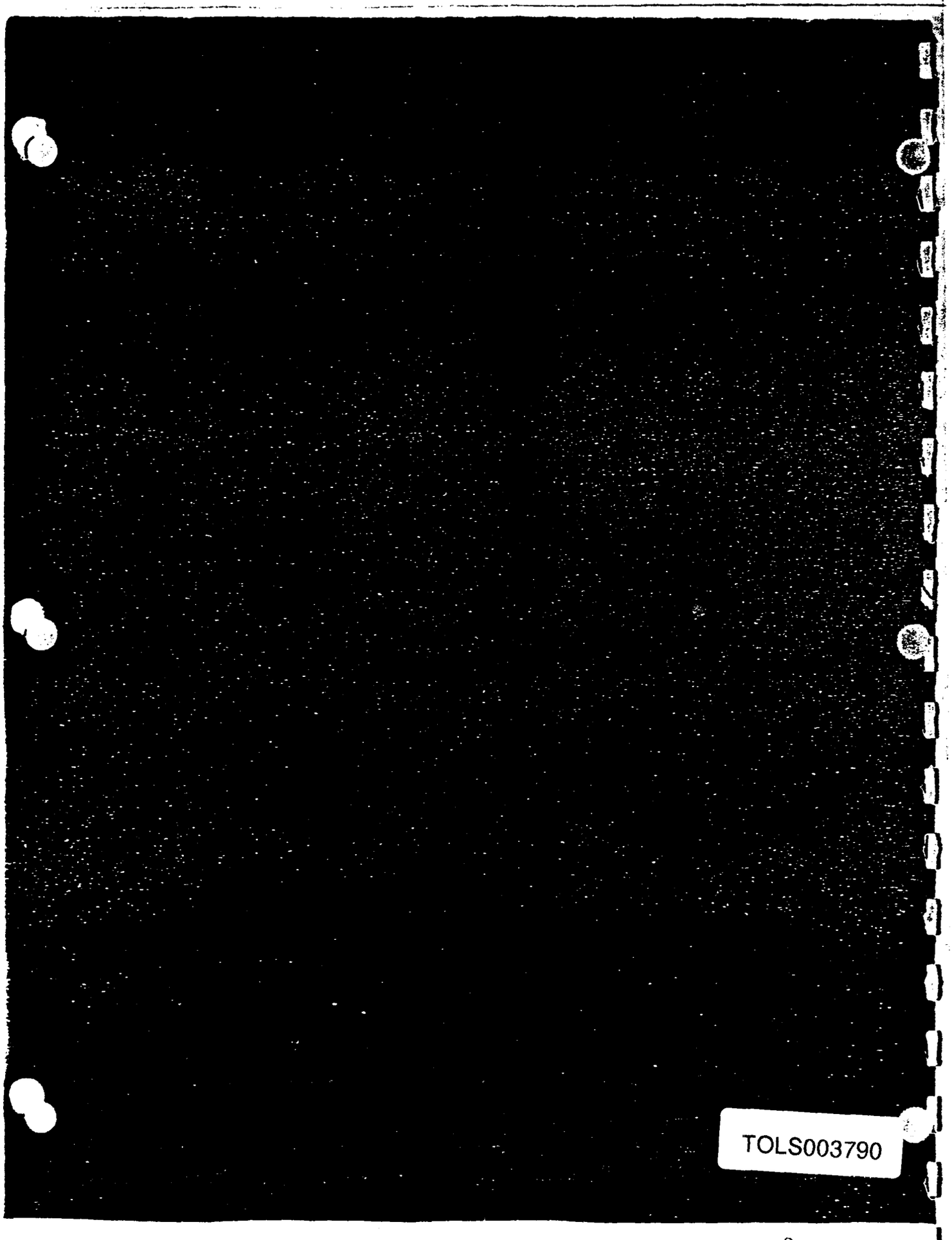

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PROCEDURES FOR ENTERING AND CLEANING TANKS AND OTHER ENCLOSED SPACES

A. Responsibility

Responsibility for safety rests with the SUPERVISOR at all times. This responsibility covers conditions of work for contractors' employees, workmen from other divisions, and his own men. He must make sure that adequate steps have been taken to eliminate or control the hazards. He must also make sure that all personnel understand the nature of such hazards which remain and the precautions to follow.

B. Description

"Enclosed spaces" is defined as, but not limited to, the following:

1. Enclosures with limited access openings for personnel, such as closed storage tanks, tank cars, process vessels (usually with only a man-hole for entering).
2. Tanks, pits, tubs, vaults, vessels, or other confined spaces with one side open to the air but so deep as to require entrance and aid of an assistant in case of emergency.
3. Confined spaces, such as ventilation or exhaust ducts, sewers, underground utility tunnels or pipelines.

C. Hazards

The hazards commonly encountered are:

1. Toxic vapors in fatal concentrations. This may result from known material in the tank, by gradual release from sludge or scale, or by leakage from interconnected systems due to failure to blank off or disconnect pipelines or ducts.
2. Inflammable gases, with potential of fire or explosion.
3. Lack of oxygen, causing asphyxiation. This may result from chemicals absorbing or replacing oxygen in the tank air, or from inert gas often used to exclude oxygen to reduce the possibility of explosions. Air in clean tanks closed for an extended period may become deficient in oxygen because of rusting (or oxidation) of the metal of the tank. Improper or inadequate ventilation during tank work may also result in a lack of oxygen.
4. Electric shock from portable lights, tools, or associated electrical equipment.
5. Injury from mechanical equipment such as mixers, conveyors, etc., that are inadvertently activated.
6. Bodily injury from direct contact with corrosives or dermatitis-producing chemicals.
7. Physical hazards such as slipping, falling, and falling objects.
8. Burns resulting from accidental opening of a steam valve in a line which has not been blanked off or disconnected.

D. Procedures

The hazards inherent in tank entry can be avoided or overcome if the following principles are applied properly each and every time a tank is entered.

No one is to be allowed to enter a treating cylinder, work tank or mix tank which has contained Cellon solution without prior permission from the Manager of Plant Operations, Manager of Engineering or the Division Safety Director. This permission may be requested verbally but written confirmation is to be made. At the conclusion of the project, a written report will be made to the Division Safety Director including the following information:

1. Description of the work done.
2. Names of employees involved.
3. Total exposure time of each employee.
4. Personal protective equipment that was used.
5. Any other pertinent comments or occurrences.

Provisions for bathing or showering must be provided. The use of the bathing facility is mandatory at the end of the shift or the finish of the job, whichever comes first.

1. Pre-Planning and Education

Survey all tanks requiring entry. Evaluate the hazard potential. All concerned should agree to the detailed standards and procedures established. Be sure everyone understands exactly what is meant.

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be fully alerted both as to fundamentals and specific requirements. There should be appropriate follow-up to insure that the system is being followed exactly. It is not sufficient merely to set standards; follow-up is necessary for full compliance. Close liaison and job planning between various groups such as production and maintenance is essential. Have specific instructions and a pertinent check list printed on a permit which must be displayed at the job site.

2. Preparation of Tank

A. Cleaning: According to the nature of the product, clean and void the tank of residual product by hot or cold water flush, by steaming, by chemical neutralization or by air purge. Harmful vapors should be vented safely to the outdoors.

If the tank is steamed, allow it to cool before entry. Do not steam below liquid surfaces in tanks being cleaned. Non-miscible solvents sometimes stratify and bump out at almost explosive pressures due to the difference in boiling point temperatures between the water layer and the solvents.

After the material in the tank has been evacuated to a safe point of discharge, the sludge or incrustation should be removed, to the greatest degree, by operation from outside of the tank. If the tank contained radioactive materials, ascertain in the type and magnitude of radioactivity remaining after cleaning. A time limit for exposure may then be established. Protective clothing and respiratory protection should not be used as a substitute for cleaning and ventilating. Except in extreme emergency-for example, saving of a life-no one should enter a tank containing a flammable atmosphere or one which because of oxygen deficiency or contamination may be so immediately harmful as to prevent escape from the tank in case of failure of the respiratory equipment.

be thoroughly ventilated. Make sure that the mechanical exhaust ventilation is arranged to avoid recirculation of contaminated air. After the tank is cleaned and ventilated, keep the mechanical exhaust ventilation equipment operating to provide secondary protection in case of accidental introduction of harmful chemicals; to remove contamination that may be produced by work in the tank such as welding and cutting, painting, coating; and to cool the tank and improve working conditions.

Should decontamination involve flammable liquids, vapors, gases, or dusts, all sources of ignition should be eliminated. For example, to eliminate any accumulation of static electricity and prevent autogenous ignition of flammables which may be in the tank, steam should be introduced at relatively low pressure and velocity. Steam lines should be electrically bonded to the tank if it contains any flammable material.

C. Isolation: The tank should be completely isolated from all other systems and equipment. For example, lines connected to the tanks should be physically disconnected and blanked off. Positive and adequate measures must be taken to prevent harmful material-solid, liquid, or vapor-from entering the tank while workmen are inside or after cleaning. This work should be coordinated with cleaning operations to prevent re-contamination. In all cases where lines have contained hazardous fluids or inert gas, or where they contain fluids at high pressures or temperatures, the lines should be physically disconnected by removal of valves, spool pieces, or expansion joints, and blank flanges placed in the lines. Exceptions to normal blanking procedure, such as bleeder valves tagged in the open position, should be approved only

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by qualified supervision. Exceptions should be made only when thoroughly justified and not as a matter of expediency. In these cases, adequate alternative measures must be taken to protect the worker.

Experience has shown that valves although closed, may leak dangerous liquid or gas. This will require either disconnecting, capping, or blanking all service, process, vent, or overflow lines on a given unit to prevent entrance of material by leakage through (or accidental opening of) a valve. This should include steam connections to a jacket. In case of welding on the wall between the inner tank and jacket, it should also include water, brine, or air lines to the jacket. Open ends of disconnected lines should be blanked or capped to prevent any flow from the disconnected end of the line entering a tank opening or draining onto assistants on the outside. Blanks should be installed as close to the tank as practicable to prevent drainage from trapped sections. Drains or overflow lines should be disconnected or blanked if they extend into a sewer from which steam or fumes could be conducted back to the tank, or if they connect to other equipment or extend to a remote location. All blanks should be of materials which are not susceptible to corrosion by the chemicals to which they are exposed with different types adequately identified. Blanks should be of such thickness and tensile strength as to satisfy the maximum pressure which may be imposed upon them without distortion or failure.

D. Lock Out.(See MCA Safety Guide No. 8- Electrical Switch Lock-Out Procedure.) Line-disconnect switches supplying power to any mechanical apparatus in the tank such as mixers, conveyors, etc. should be tagged and locked in the "off" position. It is not adequate to lock a push button station as it still may be possible to energize the circuit. The key should be kept by the man in the tank, and he alone should be authorized to unlock the switch and remove the tag on completion of the job. Where more than one man is exposed, each should place his own lock on the switch. In certain cases it may be advisable, as further protection, to have a plant electrician pull the line fuses in the electrical circuit involved or take other positive steps to guard against accidental energization. Where there is a line shaft, the belt or chain drive should be removed or similar positive measures provided, such as mechanical latches.

E. Testing: If the tank has held any flammable or harmful product before flushing; if it contains any residue or sludge which may release flammable or harmful gases or vapors; or if oxygen deficiency or excess is suspected or even possible, a test of the atmosphere in the tank should be made immediately before entering and before performing any hot work such as the lighting of torches. Presence of flammable or toxic vapors, excess oxygen or oxygen deficiency should be determined by direct reading instruments or chemical analysis. Single-fluid instruments which absorb both oxygen and carbon dioxide should not be used for oxygen determination. Interim tests of the atmosphere in the tank should be made as often as necessary while the work is in progress. Continuous sampling and analysis with automatic alarm may be indicated.

3. Issuance of Safety Work Permit for Entry

The Safety Work Permit is authorization and approval in writing. It serves as a method of formalizing agreed upon procedures. It is also a check list to insure that all existing hazards are considered, evaluated, and correct protective measures taken.

No employee should enter any tank without reporting to and securing

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visor. The supervisor in turn secures entry approval from the supervisor to whom the tank is assigned. The tank supervisor should then discuss the project in detail with those entering the tank. He should review the hazards of the product or other materials to which they may be exposed and furnish all the safety information he may be able to provide. Then supervisors of the men involved should review and complete the permit form jointly. Appropriate supervisors must be certain by personal investigation, immediately before entry and before signing the permit, that the entry and its incidental work will be safe. If a pause of appreciable duration occurs during the carrying out of a job, the site must be re-investigated by the authorized signer before the job can be allowed to resume. Commencement of a new shift should always require re-investigation and a new permit. No permit should be valid except for the job, location, persons, and time specified.

E. Precautions

1. Tools

Hand tools should be clean, in good condition, and selected carefully according to the uses intended. Spark-resistant hand tools are preferred where a possibility of flammable vapors or gases exists unless the area is well wetted down with water. Portable power tools and equipment should be clean and in good condition. Electrical tools and equipment (such as hand lamps and extension cords) should be grounded. If the tank is a "Hazardous Location" under the definitions of the National Electrical Code, it should be of the explosion proof type. If any Class I exposure (also Class II in dangerous flammable dust concentrations) it may be found preferable to use air-operated power tools. Even in these circumstances, careful thought must be given to the possibility of fire or explosion arising from struck sparks, overheating of the tool (as in drilling), electrostatic generation from discharge of compressed air, or other mechanical sources. The use of low voltage (32 volts or less) lighting and e-

minimize [illegible] possible hazard of electric shock.

Ladders used in tanks should be lashed at the top, and, if possible, at the bottom. Employees performing electrical welding in tanks should be provided and required to use rubber blankets and such other personal protective equipment as may be required. Welding and cutting torches must not be taken into the tank until ready to be used. They must be removed from the tank immediately after use. Cylinders of oxygen or other gas should never be taken into tanks, and should be turned off at the cylinder valve when not in use.

Special signs posted near the tank help keep unnecessary people away. They insure that potentially harmful operations will not be started independently nearby. And they help guide rescuers should they be necessary.

2. Personal Protective Equipment

Proper protection may range from complete coverage suits to chemical goggles, hard hats, gloves, and safety shoes.

Employees should never unduly expose the skin when working in tanks. They should wear full coverage of clothing at all times. When burning or welding is done inside a tank, supervision should consider the use of flame-proofed clothing by the employees involved. Working bareheaded, with shirt sleeves rolled up, or in an undershirt is considered hazardous.

Certified breathing air, from self-contained units, central systems such as cylinders of air, or suitable compressors should be supplied if a safe atmosphere cannot be guaranteed and if there is any possibility of air contamination or if there is oxygen deficiency while employees are within an enclosed vessel. The use of canister type masks (which operate on the principle of chemical absorption of mechanical filtration) may not afford adequate protection and should,

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therefore, not be used.

Equipment should bear Bureau of Mines approval. It should be suited specifically to the type of exposure and protect against the worst condition that might be encountered. For specifically recommended protection refer to MCA Chemical Safety Data Sheets or another authoritative source. The best type of respiratory protection should be ascertained in advance according to the specific exposure involved.

3. Emergency and Rescue

Where the potential exposure in the tank is acute, or requires an employee to wear respiratory protection, or rescue may be difficult, a body harness with lifeline must be provided. It is good practice to use a body harness for any vessel entry work. A safety harness or safety coveralls with a built-in harness and lifeline shall be used when tank space permits the safe emergency removal of personnel by standby manual personnel without requiring entry of the tank.

When the tank space does not meet this requirement a specific procedure for the rescue of personnel must be developed in the pre-planning stage of the tank entry work. It must be made a specific part of the Safety Work Permit. In some cases it is advisable to have a block and tackle positioned on a tripod or otherwise fastened above the manhole. For obvious reasons, manholes large enough to accommodate the man and his safety gear should be provided, such as a 24" diameter for circular ones. If manholes are smaller than 20" in the largest dimension, wrist harnesses often are practical. The free end of the lifeline should be secured to a fixed object. It should be attended by an observer who will keep the man in the tank always within his vision. The observer may pass tools. He must have no other job which will take his attention away from the man in the tank; which will interfere with his attempts to withdraw the victim by use of the lifeline; or which will require his leaving the vicinity of the tank for any time whatever.

In case of emergency, the outside observer must never enter the tank until he is relieved at his post. It is his job to summon aid immediately (various alarms, such as a whistle, may be used); to attempt to remove the victim by use of the lifeline, and to perform all other necessary rescue functions from outside. Upon the arrival of help, he may enter the tank for rescue work only when he is assured that his outside assistance is adequate. Such safety observers should be well trained in basic First Aid principles, such as rescue breathing techniques. Rescuers entering tank must be protected with the safety facilities required by the situation, i.e., lifeline and harness, and proper personal protective equipment. For rescue purposes at least one unit of self-contained breathing equipment should be located outside and convenient to the tank together with harness, rope, and such other emergency equipment as may be indicated. It is better to have too much equipment at the job site than too little-too late! Where hazardous chemicals may be contacted in the course of tank work or where the possibility of fire is involved, a charged hose line with spray nozzle should be available nearby. The number of men in a tank, particularly at the time of burning or welding, must be reduced to the absolute minimum necessary for the work itself.

The supervisors concerned must be trained to be on the alert, before and during the job to detect and correct immediately new and different hazards or to stop the work until the new hazards are corrected.

F. Cleaning Tanks Containing Flammable Materials

1. General Precautions

A. Workmen must be familiar with fire and accident prevention regulations and comply with them in every respect. These regulations cover fire, explosion, as-

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phyxiation, and possible poisoning from toxic material.

B. Before tank cleaning operations are started, all sources of ignition such as open fires, trucks, automobiles, etc., must be removed or eliminated from the vicinity. Wind and weather conditions must be considered. Work must not be started if the wind might carry highly inflammable vapors into an area where they could create a fire hazard. No matches or lighters may be carried, and smoking must be strictly prohibited.

C. Workmen will be provided with proper equipment, including suitable clothing, proper eye or face protection, tools, safety belts, safety lines, and fresh air hose masks when required. The foreman should see that the equipment is of proper type, clean, and in good condition, and that the workmen are properly instructed in its use.

D. Workmen are not permitted to enter tanks until the tank has been tested and it is definitely determined that the vapor concentration has been reduced to the point where there is no danger. At all times flammable or toxic mixtures must be assumed to be present until tests have been proven otherwise.

NOTE: Tank vapor concentrations should be tested with an approved gas detector only such as the EXPLOSIMETER. See Proper Operation of Explosimeters.

E. While working in the tanks, the atmosphere inside must be rechecked periodically for dangerous vapor mixtures.

REMEMBER: Combustible mixtures may again be formed through admission of flammable vapors or liquids from other sources such as an unblanked line or connection, a break in the tank bottom, sludge, sediment, sidewall scale, etc.

F. Workers must always have a clear path of escape from the tank. They should bear in mind that they may have to use it in a hurry. Ladders should be used when a tank must be entered from above. They should be left secure until the last man is out the tank.

G. A safety man (commonly called "fire watch") must be outside the tank anytime anyone is inside. In case of an emergency, the safety man must not enter the tank until he secures more help.

H. Where lights are needed, use only lights approved for combustible atmospheres by Underwriters Laboratories.

I. Where power tools are used to clean tanks, extreme care must be exercised to keep from damaging or marring the tank.

J. Goggles must be worn when cutting rivets, scraping scale, operating power tools, and digging residue with a pick or shovel.

K. Where gas or vapor may be present and where a spark may cause ignition, use tools and equipment of non sparking material such as wood, fiber, bronze or beryllium copper.

L. Steam lines, if used for heating and ventilating the tank, must be grounded to the tank shell to prevent static accumulation.

M. Hot work (welding, riveting, etc.) shall be permitted in tanks only after the tanks are reasonably clean and tests have determined it to be free of flammable and toxic mixtures.

N. If a possibility of an oxygen deficiency exists in a tank, blow fresh air into it. When a tank has been closed for some time, rusting (oxidation) of the tank metal or materials in the tank may cause a deficiency. In that case, no one may enter the tank without a supplied air hose mask before the tank has been properly ventilated. Do not use Canste masks where there is a

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possible oxygen deficiency.

O. Tank workers overcome by vapors must be removed to fresh air immediately and artificial respiration administered until breathing resumes. Call a doctor at once and keep the resuscitated man quiet and warm until breathing and circulation become normal.

P. Report all injuries to your foreman immediately.

Q. A work order must be properly authorized before work of any kind is performed where there is a possible explosive vapor concentration.

R. Adequate fire fighting equipment must be on hand for any fire which may result from any phase of the tank cleaning operation. OBSERVE THE PLANT FIRE RULES.

S. When the tank is clean, care must be exercised to see that all foreign material such as tools, pieces of pipe, etc., are removed from the tank before it is placed back in service.

2. Proper Use of Fresh-Air Hose Masks:

When fresh-air hose masks are used, the following safety precautions must be observed:

A. Approved fresh-air hose masks and lifelines must be worn by men entering tanks unless ventilation has reduced flammable vapors to 0.1%.

B. The mask must be thoroughly inspected and found to be in safe operating condition before using.

C. Hats or caps should be removed. The mouth shall be cleared of tobacco, etc., before adjusting mask to the head.

D. All fittings on the hose and mask must be tight. There should be no leaks around the face piece.

E. The air intake to the hose leading to the mask must be kept in fresh uncontaminated air.

F. Any person wearing the gas mask must be under constant observation by another man while he is in the tank. Two or more men should be available to aid in his rescue should he become unconscious.

G. If a workman is overcome by vapors, he must be removed to fresh air immediately. Artificial respiration must be administered until he resumes breathing.

H. A doctor must be called at once. The resuscitated man must be kept quiet and warm until breathing and circulation have become normal.

I. When it is necessary for the rescuer to go inside the tank, the rescuer first must get help and then equip himself with adequate respiratory protection before entering the tank.

J. Gas-mask face pieces must be cleaned and sterilized after use and put into condition for use again.

K. Workmen are not permitted to enter tanks containing toxic or inflammable mixtures without the expressed permission of the plant superintendent or a supervisor delegated by him.

L. All injuries must be reported to your foreman immediately.

3. Proper Operation of Explosimeters:

The individual making tests with the Explosimeter must be thoroughly familiar with the instrument and be satisfied that it is in proper working order. The following recommendations should be observed to insure proper operation of the Explosimeter:

A. The batteries in the Explosimeter should be replaced monthly with fresh batteries, or more often if used frequently.

B. The instrument should be checked before it is used by placing the open end of the sample line into the neck of a bottle containing benzol. (CAUTION: Do not allow the open end of the sample

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TOLS003797

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benzol. The aspirator bulb should be squeezed until the instrument definitely shows an explosive material. The sample line should then be removed to normal atmosphere and the instrument purged, by squeezing the aspirator, until the needle goes back to zero.

C. After checking the Explosimeter, the needle is again adjusted to zero, by means of the rheostat, and the tank is then tested.

D. Tank tests should not be made in the presence of steam.

E. After testing the tank, the Explosimeter should be again recalibrated and rechecked by sampling the benzol bottle.

4. Tank Preparation:

A. Contents of the tank must be pumped out as completely as possible through the regular pump-out line. When desirable, water can be added to raise the liquid level to the pump suction to remove additional or possibly all of the liquid contents.

B. Supply lines and swing lines must be thoroughly washed out and either blanked off close to the tank with slip blanks between flanges, or disconnected and provided with bull plugs or blank flanges. Do not rely on valves for positive shutoff.

C. The tank must be purged of all toxic or explosive vapors before workmen may enter the tank to remove residue, perform repair work, etc.

D. Preparing Underground Storage Tanks:

This type of vessel requires extra care to prevent leakage of flammable liquids or vapors from the outside ground area into the tank after it has been tested and found vapor-free. Lines into or from the tank should be isolated so that vapors cannot drift into the area or into the tank.

for shore tanks are not applicable for tank barges. Such vessels are all subject to the regulations of the U.S. Coast Guard for tank vessels.

F. Preparing Tank Cars:

The material in tank cars can be divided roughly into two divisions; those containing oils such as creosote, etc., and those containing the heavier material such as tars, pitches, etc.

The cars containing oils should be thoroughly steamed. Then the steam should be shut off; the tank car should be permitted to cool; it should be ventilated, and gas tests should be made.

Tank cars, which have been used for tar or similar material, should be ventilated for at least five hours before gas tests are made. Steaming should be used if desirable.

G. Tank cars must be steamed clean when welding and cutting operations are done inside the car. When welding is performed on the outside of the car, the tank should be live steamed for 20 minutes and steam should be left in car while welding.

H. A safety man must be placed in attendance until the operation is proven safe.

I. When the cars are not provided with a permanent inside ladder, a removable ladder must be used. It should be a well constructed, light metal ladder that will extend from the bottom of the car into the dome. However, it should not protrude through the hole in the dome of the car. This would not allow a man to enter through the dome into the car.

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5. Ventilating

Before workmen enter tanks, satisfactory ventilation must be established in the tank. Quite often natural ventilation is not satisfactory. This is true in underground storage tanks and tank cars which normally are equipped with one opening. Therefore, the use of wind sails, steam or air operated exhausters, or electrically driven blowers may be required. Air movers or exhausters should be bonded to the tank and all electric motors must be spark-proof.

Additional ventilation may be obtained in tank cars by the use of water. With a "bare-back" shell car, water may be sprayed on the outside of the car. With an insulated car, cold water may be sprayed on the inside of the car shell, or the car filled with cold water and then drained. Cold water running through steam coils in the cars will considerably reduce the temperature in the car.

6. Sweetening Tanks

After a tank has been purged and tested to be free of all dangerous gas, some plants have distributed slaked lime on the remaining residue (before workmen enter the tank) with good results. The slaked lime tends to rid the tank of undesirable odors. It has also been found desirable to add lime to the water when boiling out tanks.

7. Cylinder Entry

A. Entry of a cylinder is prohibited until the bridge rail has been removed or the track taken out of service by posting signs or blue flags.

B. The door secured to prevent closure.

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KOPPERS
Chemicals and Coatings

MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-005-4)

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

Specialty Wood Chemicals

DATE OF PREP.
May 25, 1977

Section I — PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Koppers Company., Inc., Wood Treating Chemicals Dept.
EMERGENCY TELEPHONE NO.: 314/772-2200
STREET ADDRESS: 3137 Southwest Avenue
CITY, STATE, AND ZIP CODE: St. Louis, Missouri 63110
MANUFACTURER'S CODE IDENTIFICATION:
PRODUCT CLASS: Wood Preservative (Water Repellent)
TRADE NAME: Woodtox Preprime T-RTU

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/m³	REMARKS
Pentachlorophenol	5		0.5	
Mineral Spirits	85	500	2000	

Section III — PHYSICAL DATA

BOILING RANGE @ 760 mm Hg: 300-700°F
FREEZING POINT: < -10°F
PERCENT VOLATILE BY VOLUME: 85
VAPOR PRESSURE AT 20° C: mineral spirits 2mm; pentachlorophenal <1mm
SPECIFIC GRAVITY (H₂O = 1): .908
EVAPORATION RATE (BUTYL ACETATE = 1): slower than ether
VAPOR DENSITY: heavier than air
SOLUBLE IN WATER - % WT.: Insoluble
APPEARANCE AND ODOR: Amber; mild solvent odor

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)	FLAMMABLE LIMITS	LEL	UEL
115°F	mineral spirits	0.7	6.0

EXTINGUISHING MEDIA: Class B Extinguisher, Water fog, foam, CO_2, Dry Chemical

UNUSUAL FIRE AND EXPLOSION HAZARDS: NA

SPECIAL FIRE FIGHTING PROCEDURES: Wear full protection clothing. Do not allow any exposed body surfaces. Toxic vapors given off from a fire. Use self-contained breathing apparatus. Burning may produce hydrochloric acid, carbon monoxide.

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MATERIAL SAFETY DATA SHEET

Section V — HEALTH HAZARD DATA

EXPOSURE LIMIT VALUE
ee Section II

EFFECTS OF OVEREXPOSURE
ing, coughing, irritation of nose, throat, eyes, respiratory difficulty. This product
etabolic stimulant, causes hyperthermia.

EMERGENCY AND FIRST AID PROCEDURES
case of inhalation, remove to fresh air. In case of eye contact, flush eyes with water
or at least 15 minutes. Get medical attention. Wash off skin immediately. If swallowed,
induce vomiting by sticking finger down throat or giving mustard, soapy, or strong salty
water. AVOID ASPIRATION. Repeat until vomit is clear. Get medical attention.

Section VI — REACTIVITY DATA

STABILITY (Check One)			CONDITIONS TO AVOID
	☐	UNSTABLE	Keep contents and freshly treated articles away from flame, food,
	☒	STABLE	and living plants.

INCOMPATABILITY (Materials to avoid)
xidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS
O, CO_2, HCL, Phenolics

HAZARDOUS POLYMERIZATION (Check One)			CONDITIONS TO AVOID
	☐	MAY OCCUR	
	☒	WILL NOT OCCUR	

Section VII — SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
e sources of ignition. Avoid contact, avoid breathing vapors, Use protective mea-
outlined in Section VIII below. Absorb spills with an absorbant such as Speedi-Dry
sed clay. Large spills can be diked and pumped into a waste container. See
ection IX below.

WASTE DISPOSAL METHOD
Disposal must be carried out in accordance with local, state and federal regulations.
Pentachlorophenol is toxic to fish. Do not dispose near water drainage to streams or
odies of water. Bury absorbant material in an approved chemical landfill, or high
temperature incineration may be used. Do not incinerate closed containers.

Section VIII — SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)
. S. Bureau of Mines approved organic vapor and particulate matter masks (Type BE)

VENTILATION			
	LOCAL EXHAUST To control vapors to concentrations below TLV in Section II.		SPECIAL
	MECHANICAL (General)		OTHER

PROTECTIVE GLOVES	EYE PROTECTION
Rubber gloves	Chemical goggles

OTHER PROTECTIVE EQUIPMENT

Section IX — SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
ore in closed, properly labeled containers. Avoid prolonged and/or repeated breathing
of mist, vapors, or substantially saturated atmosphere. Avoid contact with skin. Wear
approved goggles. Do not atomize. Use only in well ventilated area. Keep contents and
treated articles away from flame, food and living plants.

OTHER PRECAUTIONS
Do not take internally. Wash contaminated clothing before reusing. Discard contaminated
shoes. Approved (USBM) respirators can be used if oxygen level above 16% and vapor con-
centration below 2%, otherwise use self-contained units. Do not use when temperature
exceeds 120°F. If spilled, blot up with an absorbant material such as Speedi-Dry absorbant.
a processed clay sold by Mineral & Chemicals Co., Edison, N.J.

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KOPPERS
Chemicals and Coatings

MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-005-4)

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

Specialty Wood Chemic

DATE OF PREP.
May 25, 1977

Section I — PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Koppers Company, Inc., Wood Treating Chemicals Dept.

EMERGENCY TELEPHONE NO.: 314/772-2200

STREET ADDRESS: 5137 Southwest Avenue

CITY, STATE, AND ZIP CODE: St. Louis, Missouri 63110

MANUFACTURER'S CODE IDENTIFICATION:

PRODUCT CLASS: Wood Preservative (Conc.)

TRADE NAME: Woodtox Preprime Conc. T

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/m³	REMARKS
Pentachlorophenol	22.5		0.5	
Solvents	70	500		
Ketone Mixture	<5	50	230	suggested

Section III — PHYSICAL DATA

BOILING RANGE (760 mm Hg): 175-700

FREEZING POINT: 10-15°F

PERCENT VOLATILE BY VOLUME: 75

VAPOR PRESSURE AT 20° C: Pentachlorophenol < 1mm

SPECIFIC GRAVITY (H_2O = 1): .97

EVAPORATION RATE (BUTYL ACETATE = 1): slower than ether

VAPOR DENSITY: > 4.7

SOLUBLE IN WATER - % WT.: Insoluble

APPEARANCE AND ODOR: Amber; mild solvent odor

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): 120°

FLAMMABLE LIMITS: mineral spirits — LEL: 0.7 — UEL: 6.0

EXTINGUISHING MEDIA: Class B Extinguisher, Water fog, foam, CO_2, Dry Chemical

UNUSUAL FIRE AND EXPLOSION HAZARDS: N. A.

SPECIAL FIRE FIGHTING PROCEDURES: Wear full protection clothing. Do not allow any exposed body surfaces. Toxic vapors given off from a fire. Use self-contained breathing apparatus. Burning may produce hydrochloric acid, carbon monoxide.

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MATERIAL SAFETY DATA SHEET

Section V — HEALTH HAZARD DATA

EMERGENCY LIMIT VALUE
ee :tion II

EFFECTS OF OVEREXPOSURE
: ;ing, coughing, irritation of nose, throat, eyes, respiratory difficulty. This product
: netabolic stimulant, causes hyperthermia.

olvents: irritating to eyes and mucous membranes. Inhalation may cause headache
rowsiness, and nausea.

EMERGENCY AND FIRST AID PROCEDURES
n case of inhalation, remove to fresh air. In case of eye contact, flush eyes with water
or at least 15 minutes, Get medical attention. Wash off skin immediately. If swallowed,
nduce vomiting by sticking finger down throat or giving mustard, soapy, or strong salty
:ater. AVOID ASPIRATION. Repeat until vomit is clear. Get medical attention.

Section VI — REACTIVITY DATA

ABILITY (Check One)	[ ]	UNSTABLE	CONDITIONS TO AVOID: Keep contents and freshly treated articles away from flame, food,
	[X]	STABLE	and living plants.

INCOMPATABILITY (Materials to Avoid)
Oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS
CO, CO_2, HCL, Phenolics

HAZARDOUS POLYMERIZATION (Check One)	[ ]	MAY OCCUR	CONDITIONS TO AVOID
	[X]	WILL NOT OCCUR	

Section VII — SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Re /e sources of ignition. Avoid contact, avoid breathing vapors. Use protective mea-
s outlined in Section VIII below. Absorb spills with an absorbant such as Speedi-Dry
pr essed clay. Large spills can be diked and pumped into a waste container. See
Section IX below.

WASTE DISPOSAL METHOD
Disposal must be carried out in accordance with local, state and federal regulations.
Pentachlorophenal is toxic to fish. Do not dispose near water drainage to streams or
bodies of water. Bury absorbant material in an approved chemical landfill, or high
temperature incineration may be used. Do not incinerate closed containers.

Section VIII — SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify Type)
U.S. Bureau of Mines approved organic vapor and particulate matter masks (Type BE)

VENTILATION	LOCAL EXHAUST: To control vapors to concentrations below TLV in Section II.	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES: Rubber gloves
EYE PROTECTION: Chemical goggles
OTHER PROTECTIVE EQUIPMENT

Section IX — SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Store in closed, properly labeled containers. Avoid prolonged and/or repeated breathing
of mist, vapors, or substantially saturated atmosphere. Avoid contact with skin. Wear
approved goggles. Do not atomize. Use only in well ventilated area. Keep contents and
ly treated articles away from flame, food and living plants.

OTHER PRECAUTIONS
ot take internally. Wash contaminated clothing before reusing. Discard contaminated
shoes. Approved (USBM) respirators can be used if oxygen level above 16% and vapor con-
centration below 2%, otherwise use self-contained units. Do not use when temperature
exceeds 120°. If spilled, blot up with an absorbant material such as Speedi-Dry
absorbant, a processed clay sold by Mineral & Chemicals Co., Edison, N.J.

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TOLS003803

BZTO104(e)040624

KOPPERS
Chemicals and Coatings

MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-005-4)

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

Specialty Wood Chemical

DATE OF PREP.: May 25, 1977

Section I — PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Koppers Company, Inc., Wood Treating Chemicals Dept.

EMERGENCY TELEPHONE NO.: 314/772-2200

STREET ADDRESS: 5137 Southwest Avenue

CITY, STATE, AND ZIP CODE: St. Louis, Missouri 63110

MANUFACTURER'S CODE IDENTIFICATION:

PRODUCT CLASS: Wood Preservative (Water Repellent)

TRADE NAME: Woodtox 140T - Ready to Use

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/m³	REMARKS
Pentachlorophenol	5		0.5	
Mineral Spirits	85	500	2000	

Section III — PHYSICAL DATA

BOILING RANGE 760 mm Hg: 300-700

FREEZING POINT: < -10°F

PERCENT VOLATILE BY VOLUME: 85%

VAPOR PRESSURE AT 20° C: mineral spirits 2mm; pentachlorophenol < 1mm

SPECIFIC GRAVITY (H₂O = 1): .837

EVAPORATION RATE (BUTYL ACETATE = 1): slower than ether

VAPOR DENSITY: heavier than air

SOLUBLE IN WATER - % WT.: Insoluble

APPEARANCE AND ODOR: Amber; mild solvent odor

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): 104° F PMCC (Mineral Spirits)

FLAMMABLE LIMITS: mineral spirits — LEL: 0.7 — UEL: 6.0

EXTINGUISHING MEDIA: Class B: Water Fog, Alcohol Foam, CO_2, Dry Chemical

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

SPECIAL FIRE FIGHTING PROCEDURES: Wear full protection clothing. Do not allow any exposed body surfaces. Toxic vapors given off from a fire. Use self-contained breathing apparatus. Burning may produce hydrochloric acid, carbon monoxide.

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TOLS003804

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TABLE 1 - GROUNDWATER SAMPLE RESULTS

Sample	ug/l PCP (1)	ug/l PCP (2)	pH	Depth to Water, Ft* (1)	Depth to Water, Ft* (2)	Static Water Level (ft. MSL) ** (1)	Static Water Level (ft. MSL) ** (2)
MW-A	<20	NA	6.61	13.78	14.74	83.36	82.40
MW-B	2300	1000	6.57	14.79	15.54	82.04	81.29
MW-C				(Dry)			
MW-D	<20	NA	6.60	14.29	15.24	83.64	82.69
MW-E				(Dry)			
MW-F	<20	NA	6.43	15.27	16.02	82.70	81.95
MW-G				(Dry)			
MW-H	<20	NA	6.64	13.78	12.10	83.71	82.65
MW-I	<20	NA	6.38	14.57	15.23	83.43	82.77
River				25.67	24.67		

(1) As measured on 8/20/87

(2) As measured on 10/16/87

* Distance from well stickup (or pier reference point) to water.

** Relative to TBM established by TOC

NA = Not Analyzed

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Century Testing Laboratories, Inc.

RECEIVED
MAY 22 1986

May 21, 1986

John Ruddick
Century Environmental Sciences
One S. W. Columbia, Suite 1222
Portland, OR 97258

Dear John:

Here are the Penta results from Time oil:

CES #	Pentachlorophenol conc. ug/l (ppb)
WP-B	2.6
MW-4"	6.1
WP-E	<1.0
WP-F	1.4

If you have any questions, please phone.

Sincerely,

CENTURY TESTING LABORATORIES, INC.

Walter F. Burns

Walter F. Burns
Organic Chemistry Supervisor

WFB:lk

P.O. BOX 1174 • BEND, OR 97709 • (503) 382-6432
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TABLE III-5

TIME OIL CO.

COORDINATES - 12 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	2.3
L	-66	55	2030
M	-91	55	690
O	-29	38	38
P	-54	38	450
Q	-78	38	1150
R	-17	20	1
S	-42	20	217
T	-66	20	90
V	-2	2	3.4
W	-29	2	1.9
X	-54	2	1
Y	-78	2	720
Z	-78	73	1
6	-66	91	0.94
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-6

TIME OIL CO.

GROUNDWATER ANALYTICAL RESULTS

(AUGUST 29, 1986)

WELL NUMBER	STATIC WATER LEVEL (FT BELOW TOP OF CASING)	pH	[PCP] (ppm)
MW-A	14.06	6.80	N.D.
MW-B	15.07	6.70	N.D.
MW-C	DRY	N.A.	N.A.
MW-D	14.48	6.53	.044
MW-E	15.22	6.54	N.D.
MW-F	15.44	6.57	N.D.
MW-G	DRY	N.A.	N.A.
MW-H	11.28	6.91	N.D.
MW-I	14.75	6.77	N.D.
RIVER	25.70	N.A.	N.A.

NOTES:

[PCP] = CONCENTRATION OF PENTACHLOROPHENOL
ppm = PARTS PER MILLION
N.A. = NOT AVAILABLE
N.D. = NOT DETECTED

TOLS003808

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TABLE III-3

TIME OIL CO.

COORDINATES - 4 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3.6
K	-42	55	10.5
L	-66	55	7200
M	-91	55	22
N	-4	38	238
O	-29	38	23
P	-54	38	15
Q	-78	38	2205
R	-17	20	50
S	-42	20	184
T	-66	20	534
U	-91	20	55
V	-2	2	380
W	-29	2	8.1
X	-54	2	1.3
Y	-78	2	598
Z	-78	73	2
6	-66	91	0
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

TABLE III-4

TIME OIL CO.

COORDINATES - 7 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	3
L	-66	55	8400
M	-91	55	1
O	-29	38	13
P	-54	38	130
Q	-78	38	700
R	-17	20	500
S	-42	20	1130
T	-66	20	75
U	-91	20	5
V	-2	2	1
W	-29	2	1
X	-54	2	1.9
Y	-78	2	700
Z	-78	73	7
6	-66	91	0
5	-54	73	0
4	-29	73	0.96
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-1

TIME OIL CO.

COORDINATES - SURFACE PCP CONTOUR

CODE	X	Y	[PCP]
J	-17	55	2.3
K	-42	55	1200
L	-66	55	0.7
M	-91	55	1.8
N	-4	38	6.3
O	-29	38	176
P	-54	38	75.3
Q	-78	38	620
R	-17	20	891
S	-42	20	736
T	-66	20	1600
U	-91	20	0.7
V	-2	2	5
W	-29	2	354
X	-54	2	44.5
Y	-78	2	19
Z	-78	73	537
6	-66	91	0
5	-54	73	1.4
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	5.7

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-2

TIME OIL CO.

COORDINATES - 2 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3
K	-42	55	8.8
M	-91	55	87
N	-4	38	3.1
O	-29	38	59
P	-54	38	16
R	-17	20	34
S	-42	20	252
T	-66	20	123
U	-91	20	44
V	-2	2	260
W	-29	2	15
X	-54	2	4.5
Z	-78	73	14
6	-66	91	0
5	-54	73	5.6
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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SAMPLE POINT COORDINATES

FIGURE III- 6

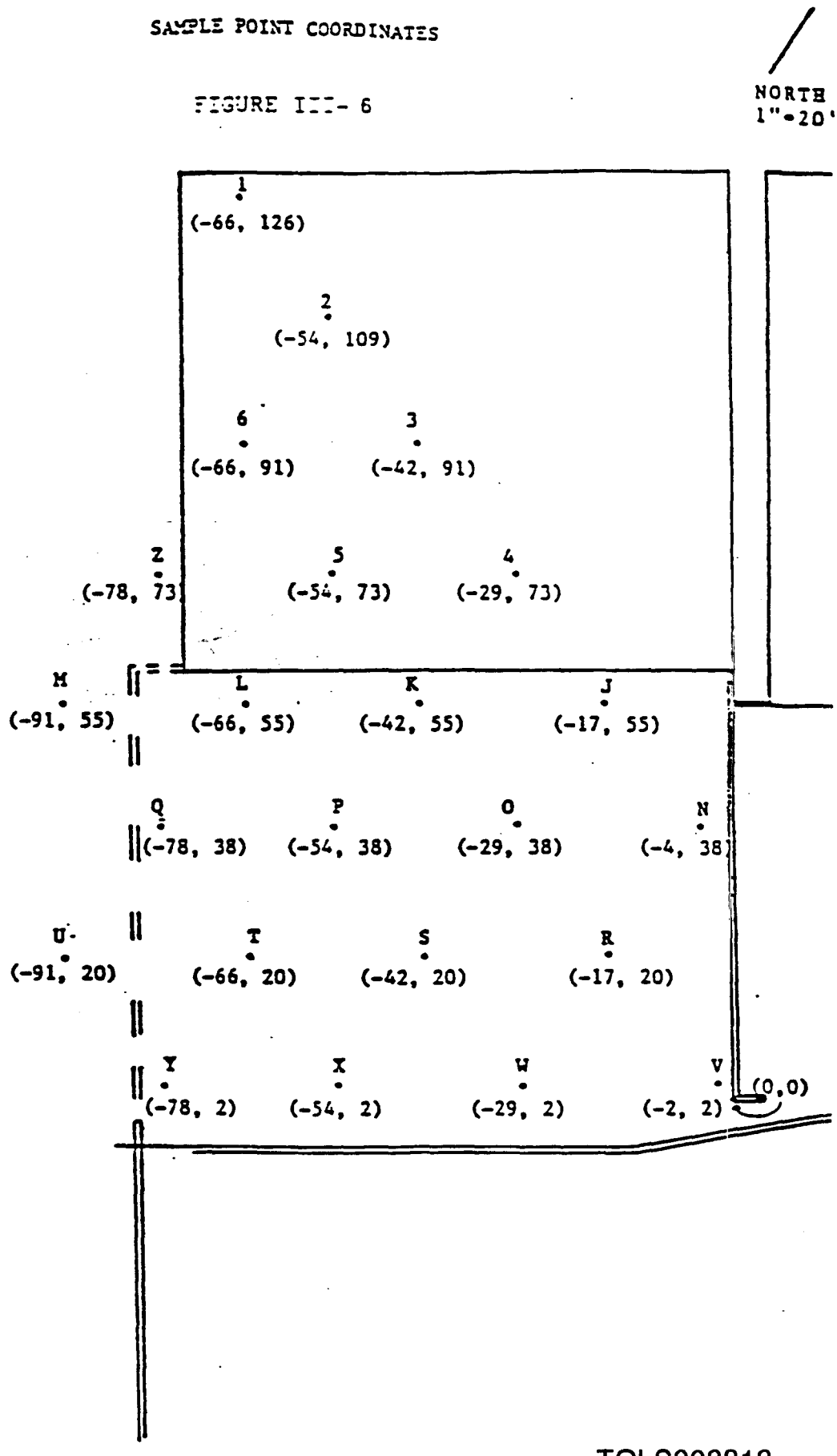

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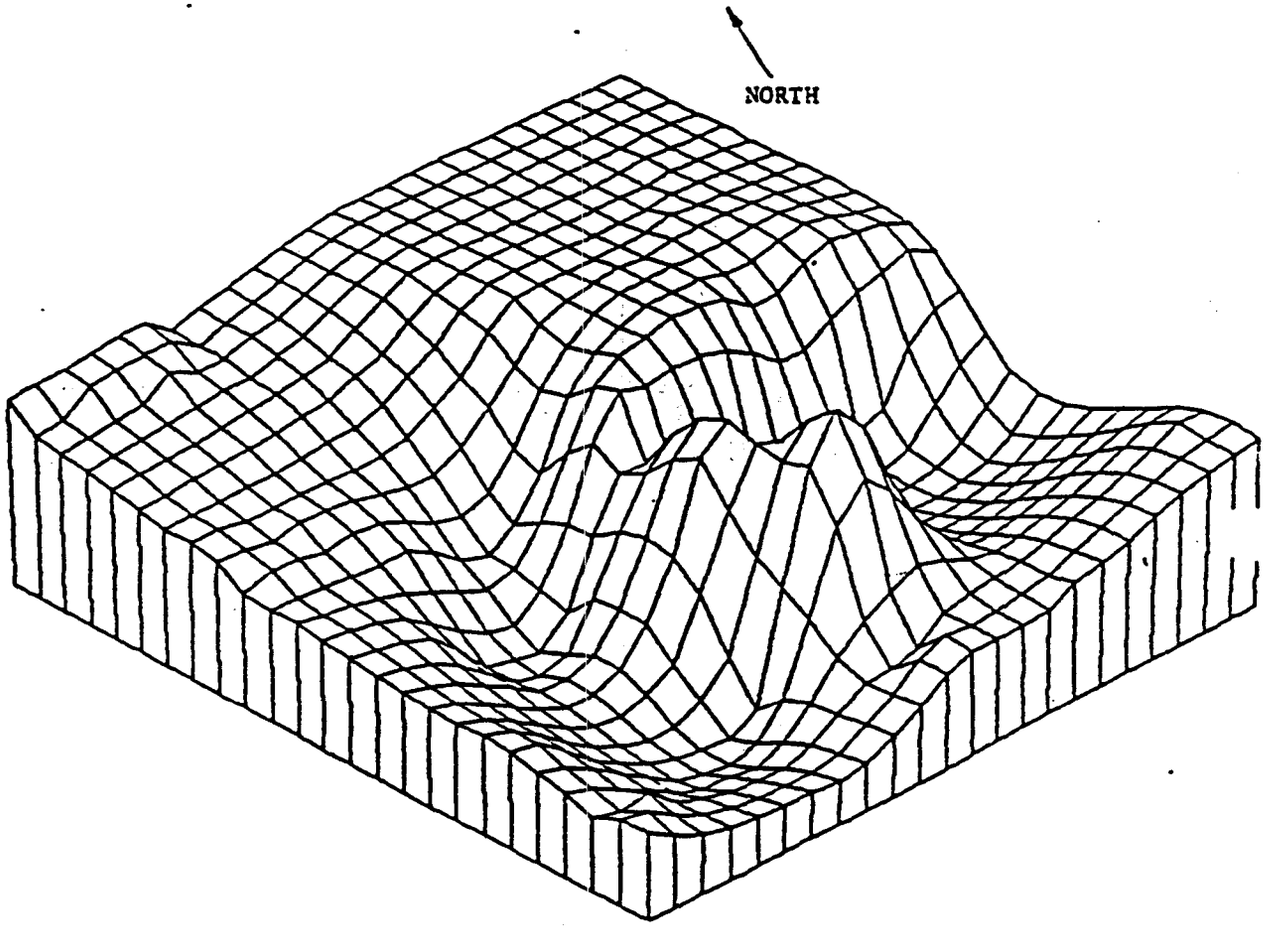
FIGURE III- 7

APPROXIMATE SURFACE TOPOGRAPHY

WOOD TREATING CHEMICALS AREA



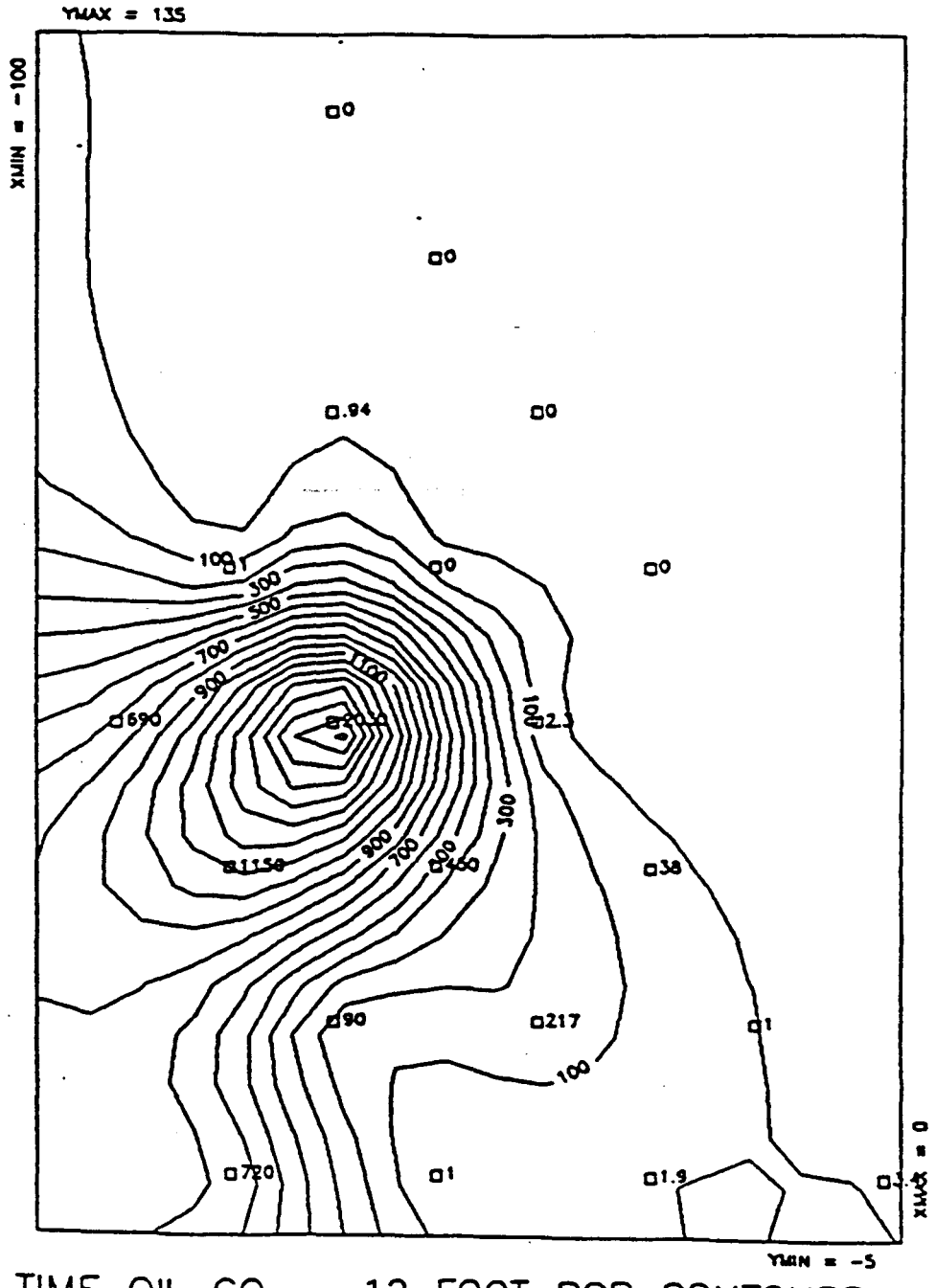
TIME OIL CO. - TOPOGRAPHY

TOLS003814

32319

BZTO104(e)040635

FIGURE III-4



TIME OIL CO. – 12 FOOT PCP CONTOURS

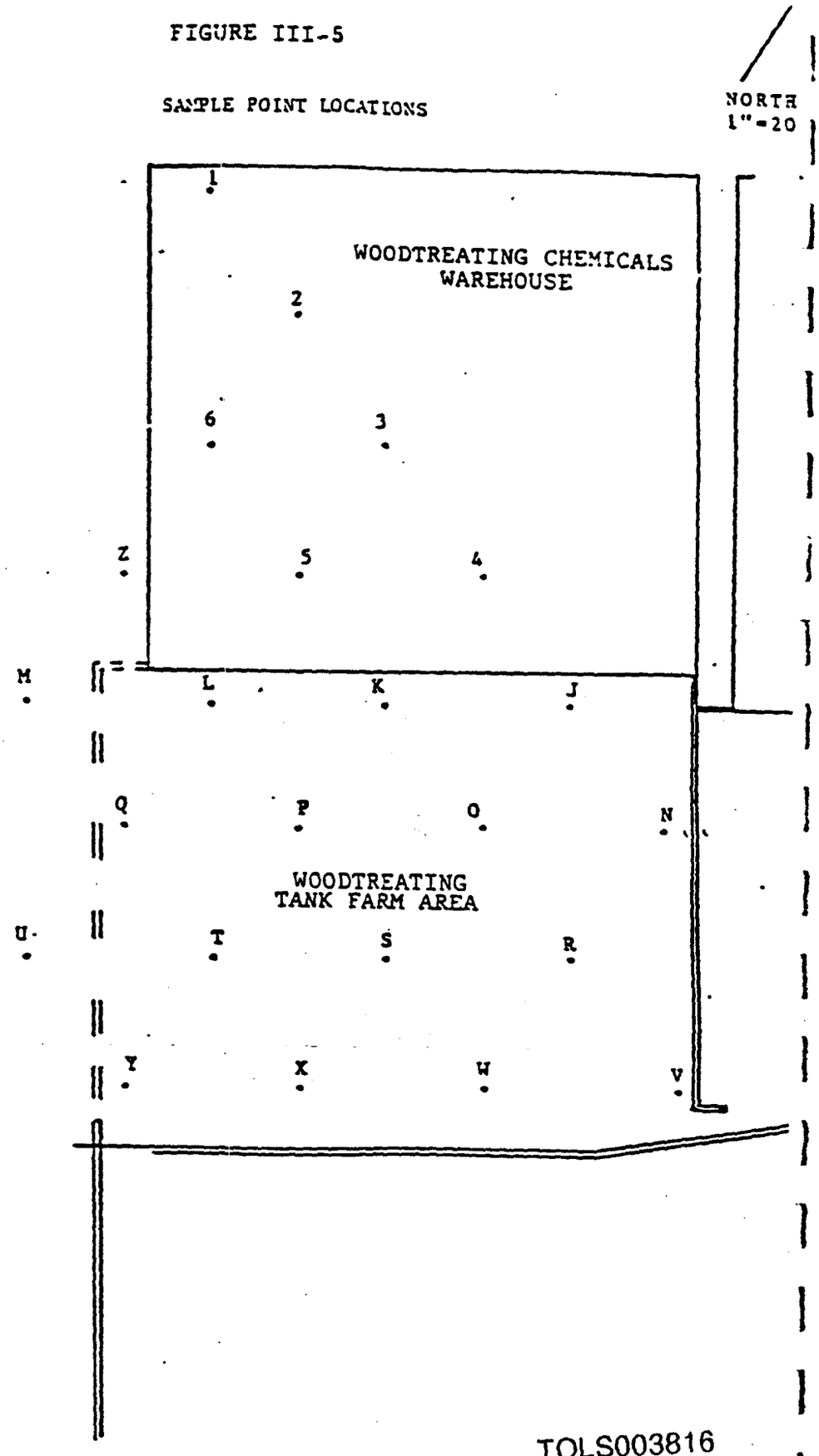
TOLS003815

32319

BZTO104(e)040636

FIGURE III-5

SAMPLE POINT LOCATIONS

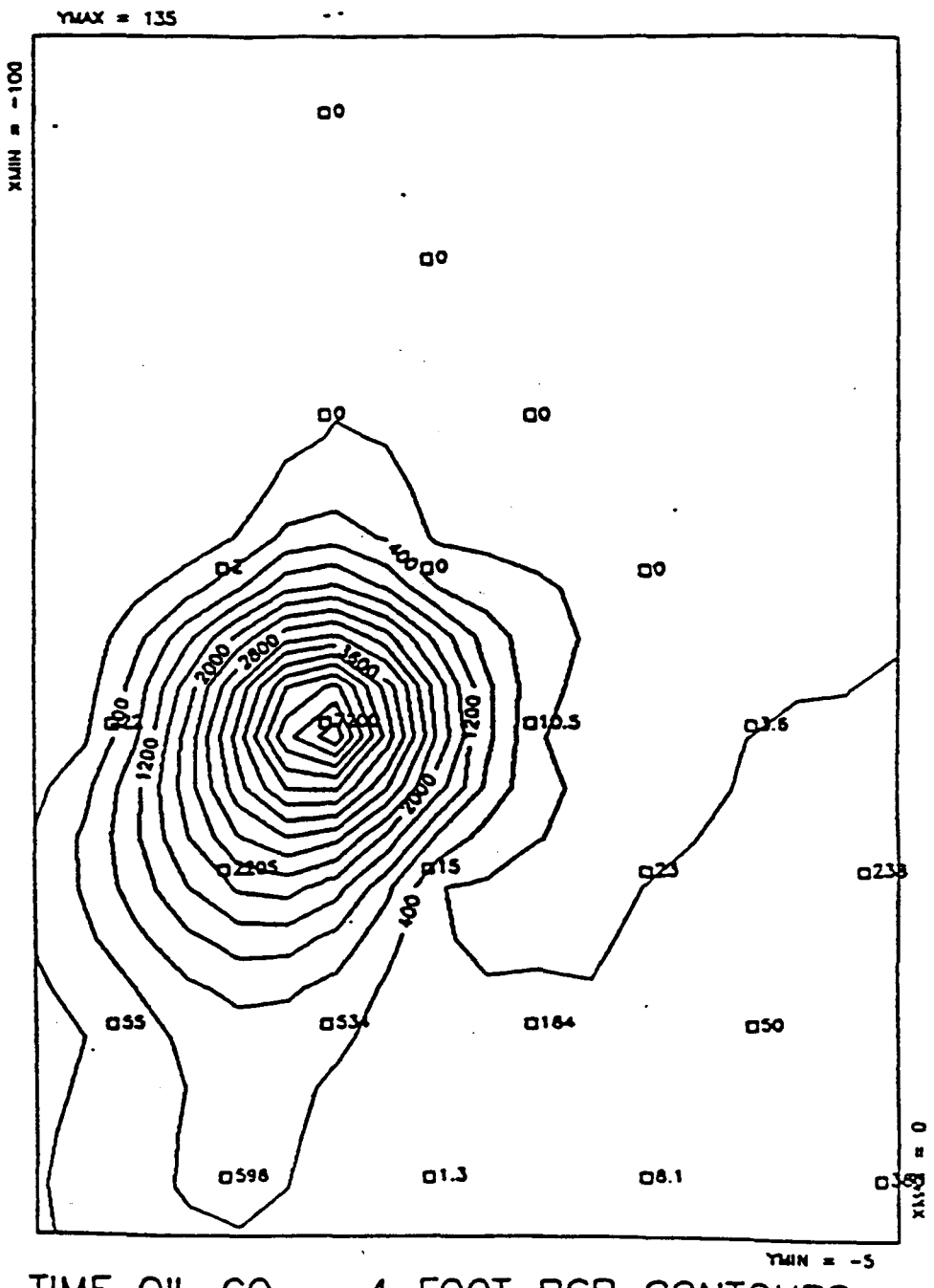


TOLS003816

32319

BZTO104(e)040637

FIGURE III- 2



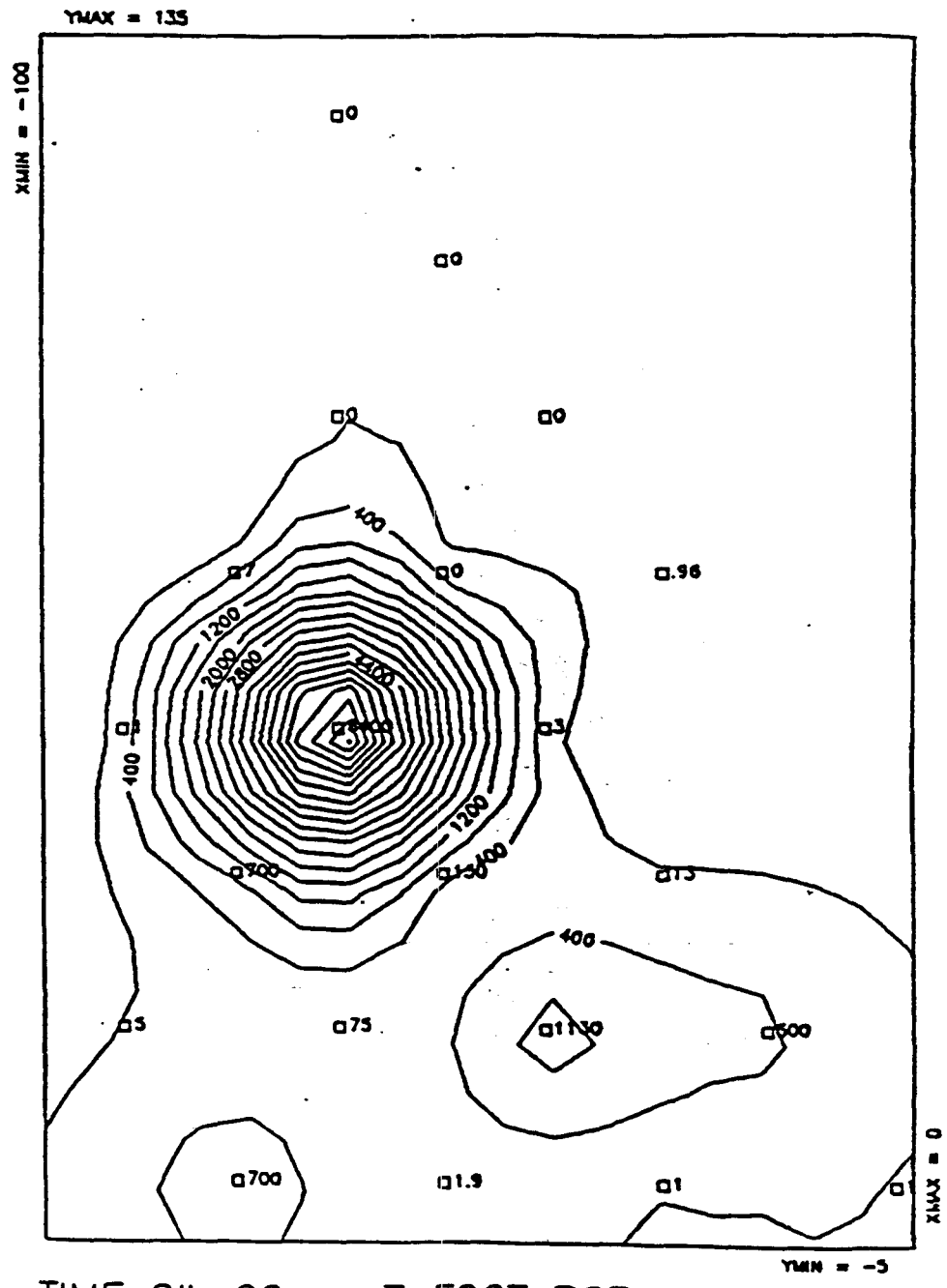
TIME OIL CO. – 4 FOOT PCP CONTOURS

TOLS003817

32319

BZTO104(e)040638

FIGURE III- 3



TIME OIL CO. — 7 FOOT PCP CONTOURS

TOLS003818

32319

BZTO104(e)040639

TABLE IVF

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Preliminary Surface Composites

Area	PCP (mg/kg)
A	660
D	860
G	17

TOLS003819

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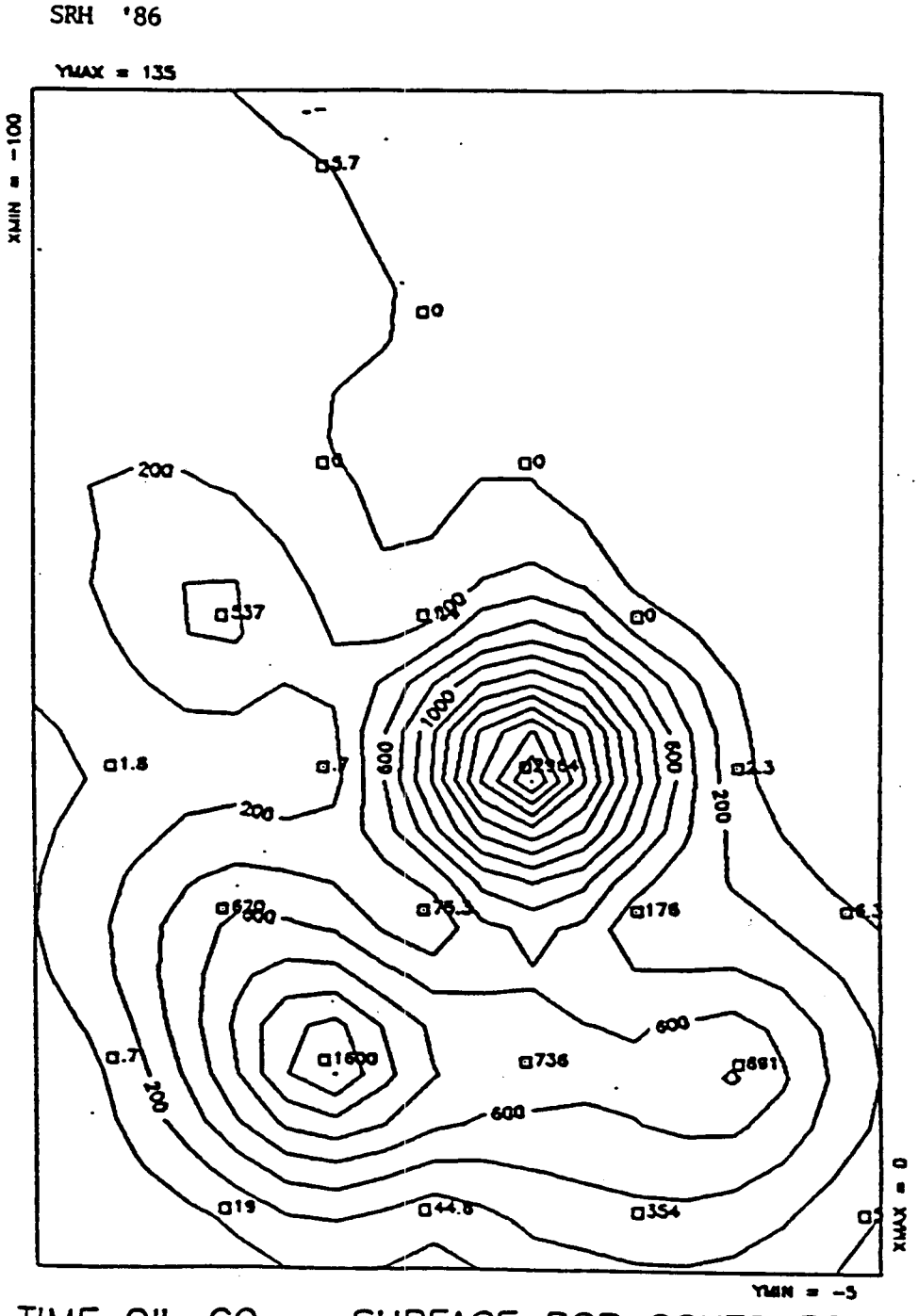
BZTO104(e)040640

FIGURE III-1



TIME OIL CO. – SURFACE PCP CONTOURS

TABLE IVD

TIME OIL CO. - PORTLAND, OREGON

Pentachlorophenol in Soil

7 Foot Contour Data

CORE #	COORDINATES X	COORDINATES Y	CONCENTRATION mg/kg
J	142.5	161	(NA)
K	117.5	161	3
L	92.5	161	8400
M	67.5	161	1
N	155	143	(NA)
O	130	143	13
P	105	143	130
Q	80	143	700
R	142.5	125	500
S	117.5	125	1130
T	92.5	125	75
U	67.5	125	5
V	155	107	1
W	130	107	1
X	105	107	1.9
Y	80	107	700
Z	80	179	7

TOLS003821

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TABLE IVE

TIME OIL CO. - PORTLAND, OREGON

Pentachlorophenol in Soil

12 Foot Contour Data

CORE #	COORDINATES		CONCENTRATION
	X	Y	mg/kg
J	142.5	161	NA
K	117.5	161	2.3
L	92.5	161	2030
M	67.5	161	690
N	155	143	NA
O	130	143	38
P	105	143	450
Q	80	143	1150
R	142.5	125	1
S	117.5	125	217
T	92.5	125	90
U	67.5	125	NA
V	155	107	3.4
W	130	107	1.9
X	105	107	1.0
Y	80	107	720
Z	80	179	1.0

TOLS003822

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BZTO104(e)040643

TABLE IVB

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Two Foot Contour Data

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	3
K	117.5	161	8.8
L	92.5	161	N/A
M	67.5	161	87*
N	155	143	3.1
O	130	143	59
P	105	143	16
Q	80	143	N/A
R	142.5	125	34
S	117.5	125	252
T	92.5	125	123
U	67.5	125	44
V	155	107	260
W	130	107	15
X	105	107	4.5
Y	80	107	N/A
Z	80	179	14*

N/A = Not Available
* = Data points omitted from contouring program to reduce extrapolation error

TOLS003823

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TABLE IVC

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Four Foot Contour Data

Core #	Coordinates X	Y	Concentration Mg/Kg
J	142.5	161	3.6
K	117.5	161	10.5
L	92.5	161	7200
M	67.5	161	22
N	155	143	238
O	130	143	23
P	105	143	15
Q	80	143	2205
R	142.5	125	50
S	117.5	125	184
T	92.5	125	534
U	67.5	125	55
V	155	107	380
W	130	107	8.1
X	105	107	1.3
Y	80	107	598
Z	80	179	2

TOLS003824

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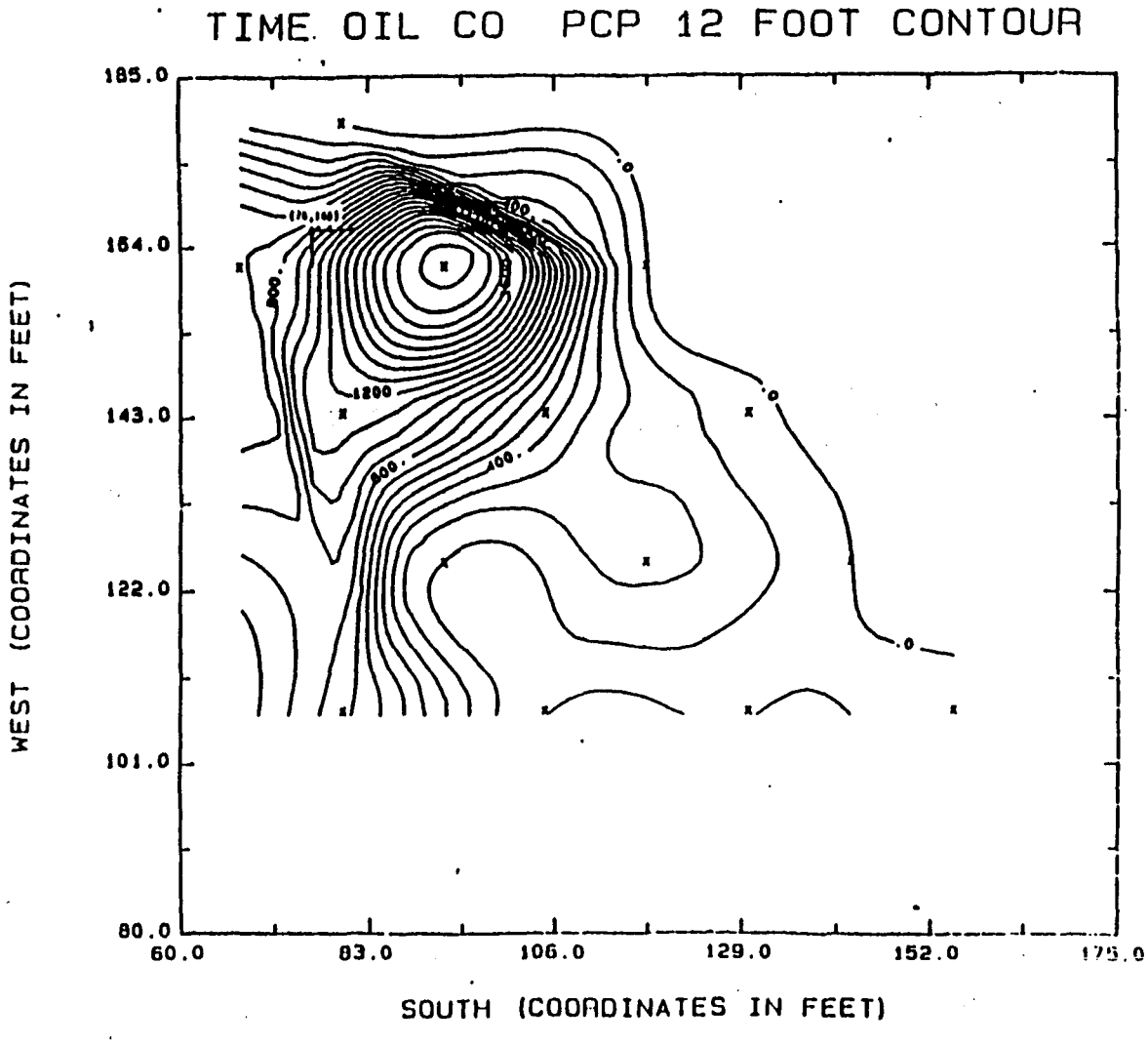
FIGURE 2E



TOLS003825

BZT0104(e)040646

TABLE IVA
TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Surface Contour Data

Sample #	Coordinates X	Coordinates Y	Concentration Mg/Kg
1	81	171	13500
2	71	171	29
3	71	161	500
4	71	151	5450
5	71	141	5560
6	71	131	8760
7	71	121	4870
8	71	111	92
9	71	101	20
10	81	181	16
11	71	181	7
12	61	181	9
13	61	171	95
14	61	161	175
15	61	151	18
16	61	141	229
17	61	131	88
18	61	121	6
19	61	111	3
20	61	101	2.5
21	61	91	5.2
37	81	95	857
38	91	96	1130
39	101	97	17
40	111	98	3.5
41	121	98	3.1
42	131	99	3.2
43	141	100	2.4
44	151	100	1.8
45	161	101	171
46	71	84	3
47	81	85	3.6
48	91	86	6.1
49	121	87	3.2
50	131	88	1.5
51	141	89	2.3
52	151	90	1.7
53	161	91	1.9
54	171	92	1.2

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	1400
K	117.5	161	N/A
L	92.5	161	N/A
M	67.5	161	4720
N	155	143	4280
O	130	143	3000
P	105	143	N/A
Q	80	143	N/A
R	142.5	125	1712
S	117.5	125	522
T	92.5	125	123
U	67.5	125	26550
V	155	107	317
W	130	107	3385
X	105	107	N/A
Y	80	107	N/A
Z	80	179	21

N/A = Not Available

TOLS003826

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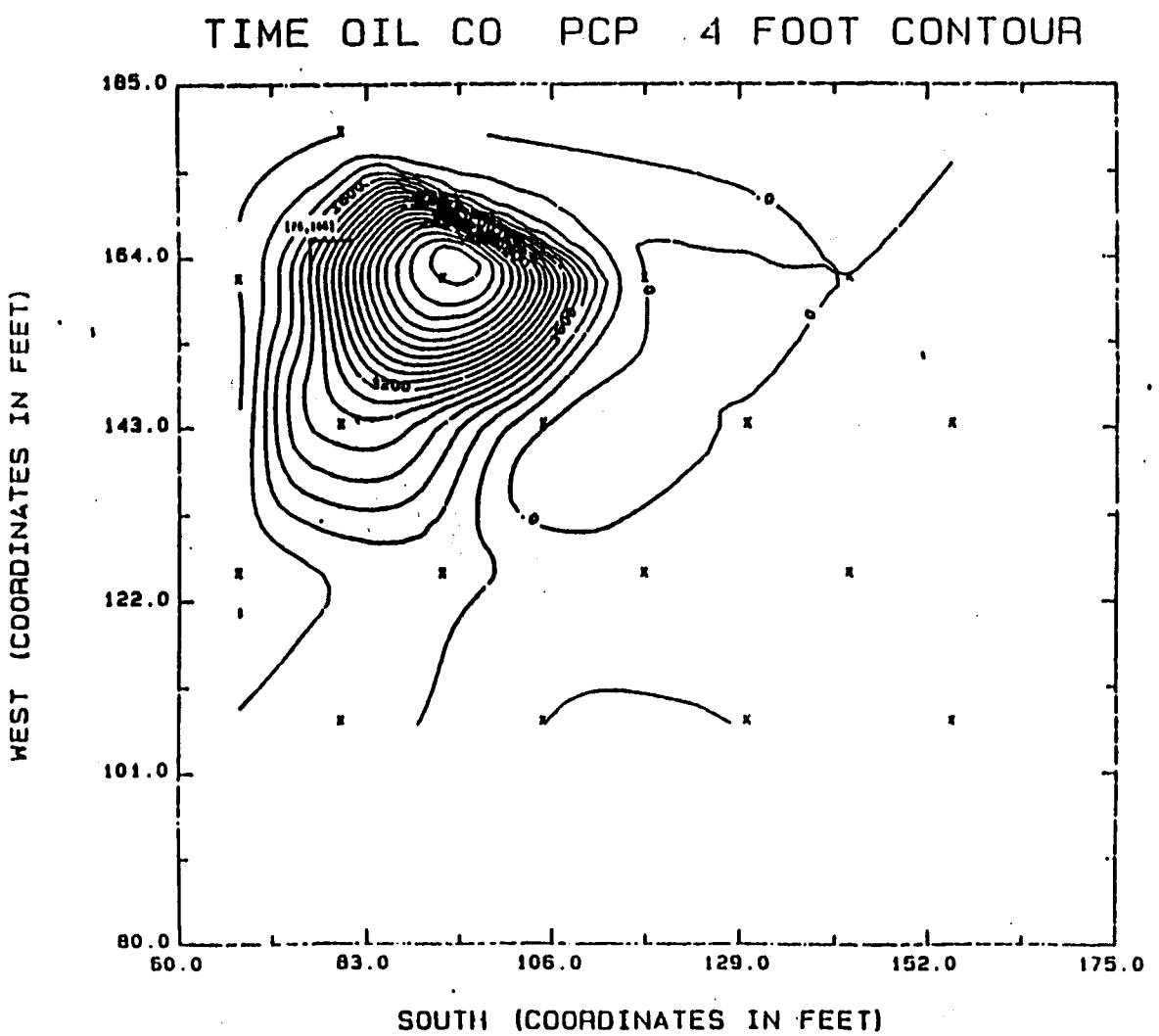
FIGURE 2C



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TOLS003827

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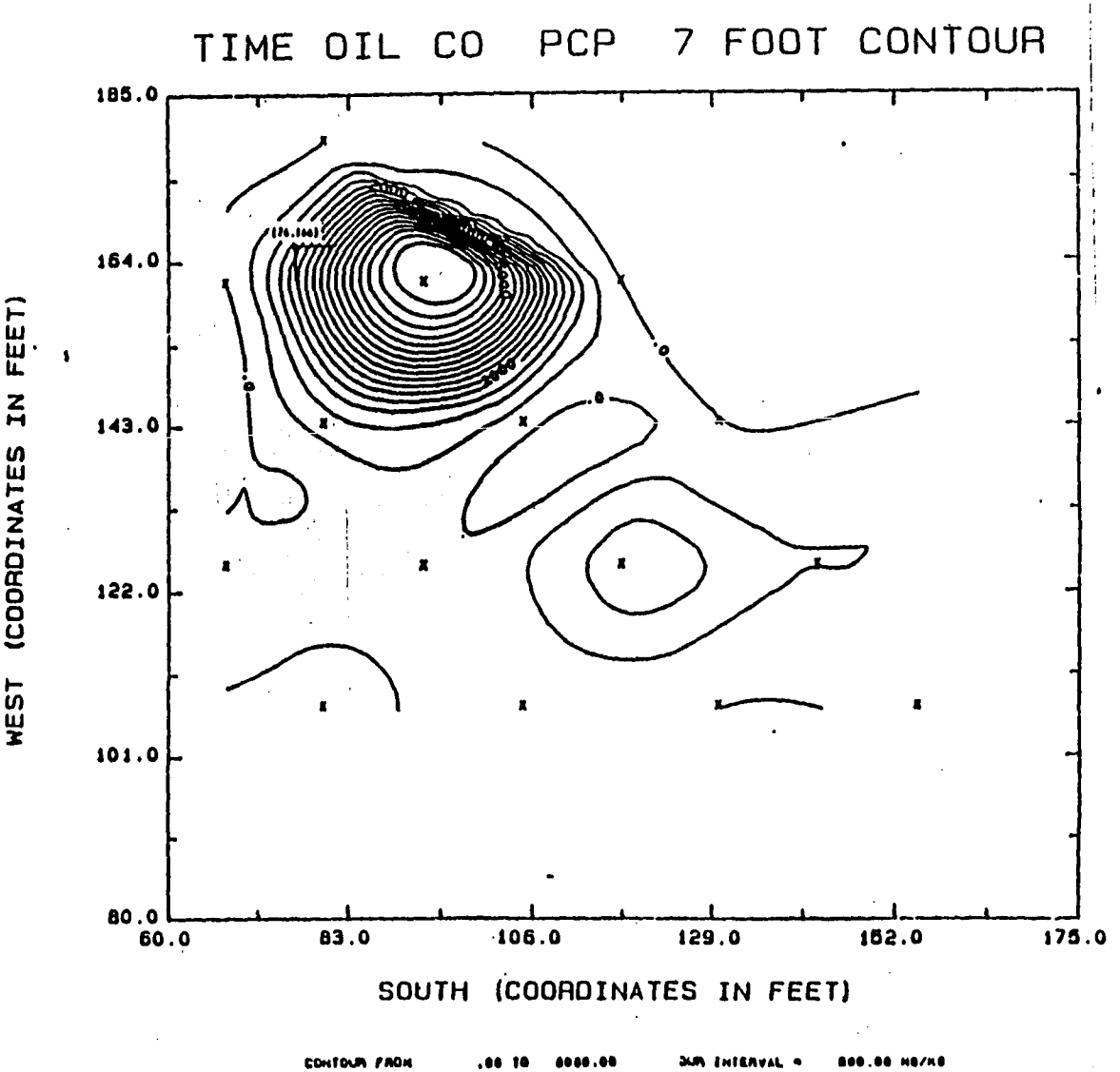
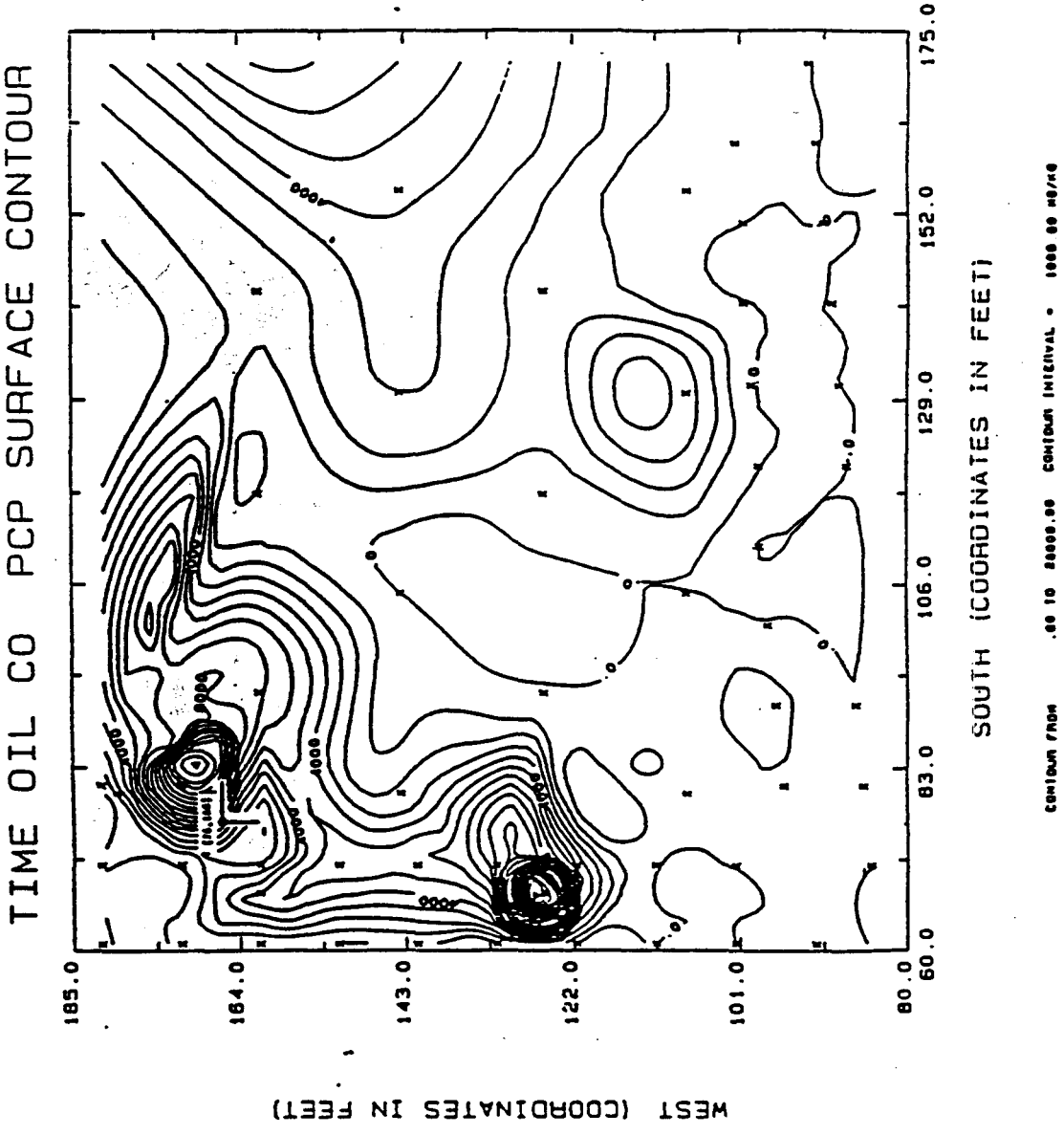
FIGURE 2 D



TOLS003828

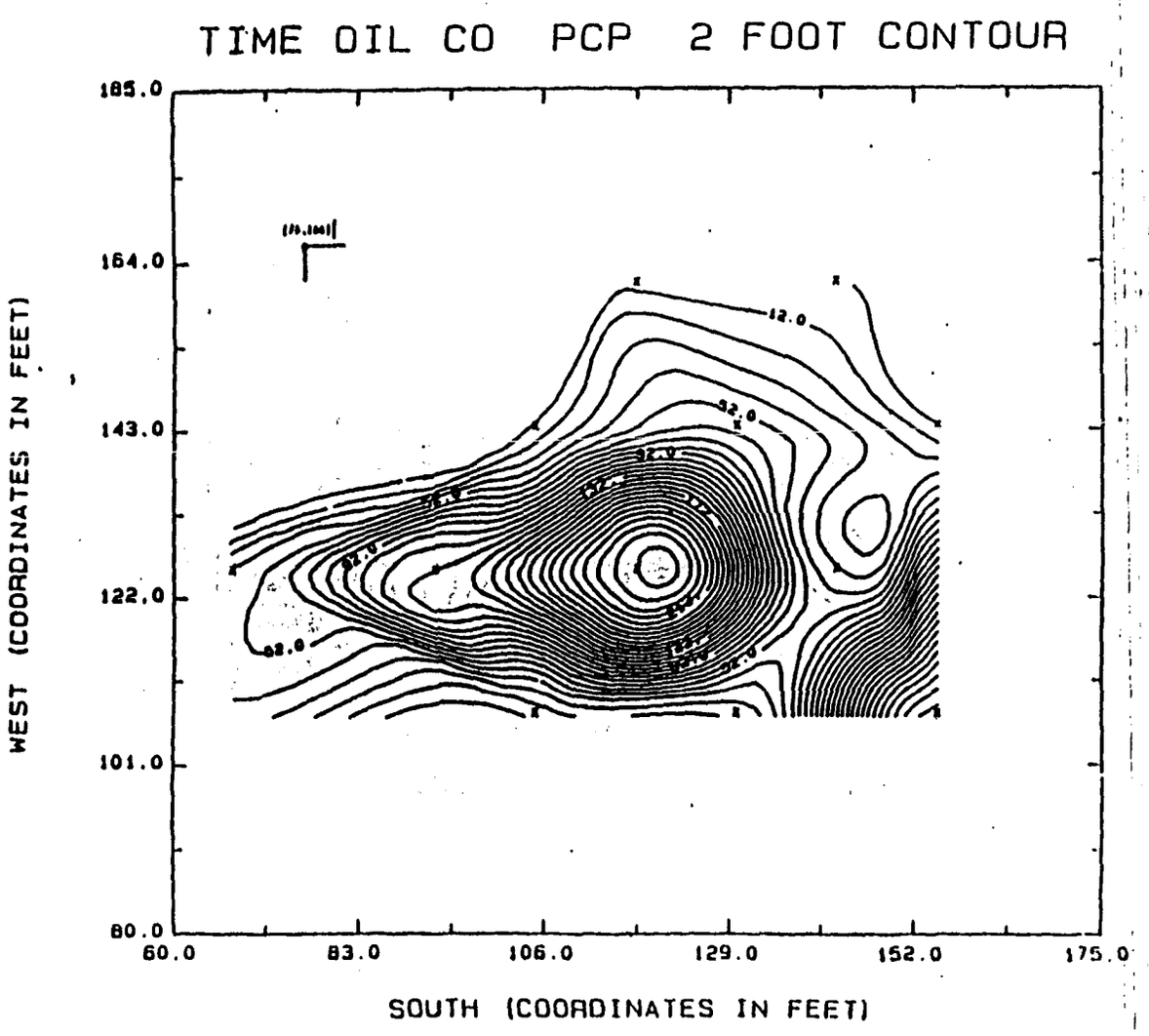
BZTO104(e)040649

FIGURE 2A:


TIME OIL CO PCP SURFACE CONTOUR
185.0
164.0
143.0
122.0
101.0
80.0
175.0
152.0
129.0
106.0
83.0
60.0
WEST (COORDINATES IN FEET)
SOUTH (COORDINATES IN FEET)

32319

FIGURE 2B



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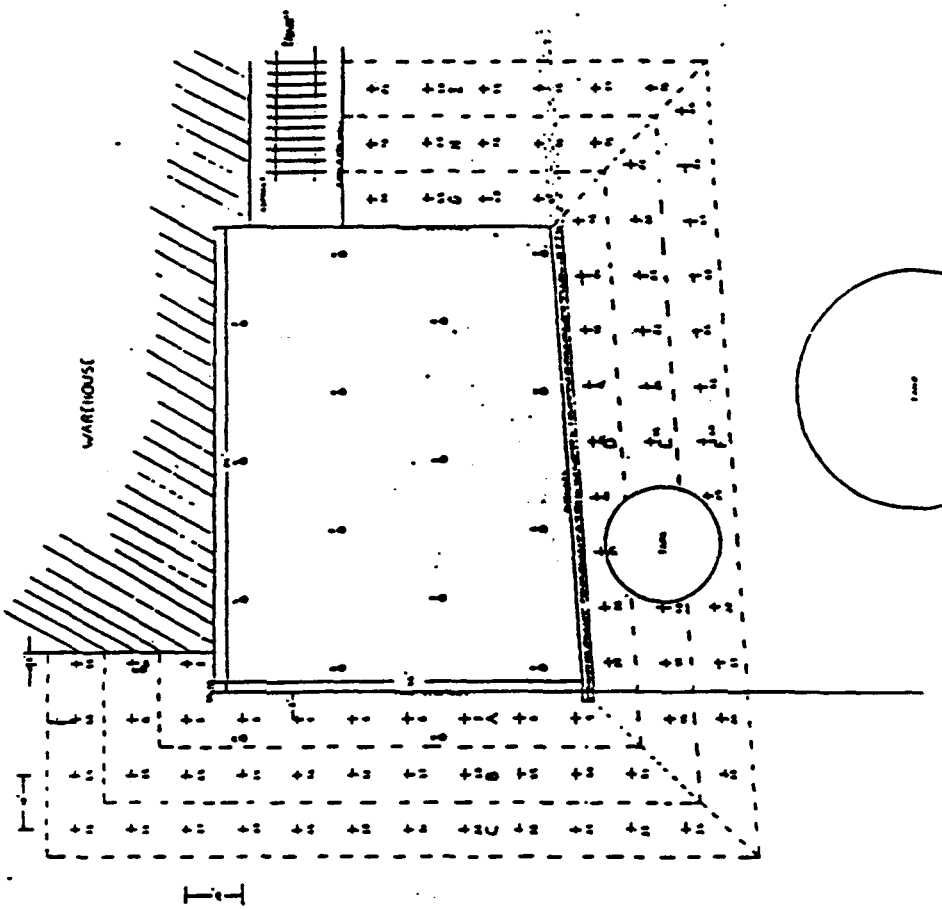

FIGURE 1

32319

TOLS003832

2

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NALCO CHEMICAL COMPANY
2901 BUTTERFIELD ROAD • BROOK, ILLINOIS 60521

MATERIAL SAFETY DATA SHEET

Product 6SJ-743

SECTION 6 – REACTIVITY DATA

Stability: Stable ☐ Unstable ☒ Conditions to Avoid

Materials to Avoid

Hazardous Decomposition Products: Unburned hydrocarbons

Hazardous Polymerization: Will Not Occur ☒ May Occur ☐ Conditions to Avoid

SECTION 7 – SPILL OR LEAK PROCEDURES

Steps to Take in Case Material is Released or Spilled: Contain with absorbent material. Use detergent and water to relieve slippery conditions.

Waste Disposal Method: Complete combustion

SECTION 8 – SPECIAL PROTECTION INFORMATION

Type of Respiratory Protection Required: Organic canister may be used

Ventilation: Local Exhaust ☒; Mechanical (General) ☐; Special (Specify) ; Other (Specify)

Protective Gloves: Rubber Eye Protection: Goggles

Other Protective Equipment: Impervious apron, eye wash fountains

SECTION 9 – SPECIAL PRECAUTIONS

Handling and Storage Precaution: Handle in adequately ventilated areas. Do not store near open flame.

TOLS003833

Other Precautions: Avoid prolonged inhalation of fumes. Avoid eye and skin contact. Do not take internally. Launder contaminated clothing before reuse.

Prepared By: [signature] Title: Toxicology & Industrial Hygiene Consultant Date: 2/76

Similar to Form OSHA-20 EMERGENCY TELEPHONE NUMBER – (312) 332-3560

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TOXICOLOGICAL & HANDLING INFORMATION

PETROLEUM PRODUCTS

Edwin Cooper, Inc.
1700 South Second Street
St. Louis, Missouri 63104
(314) 421-3930

1. Product Name — HITEC E515

2. Chemical and Physical Properties:

a) Specific gravity	.87	
b) Vapor pressure (mm Hg)	NA	
c) Boiling point, °F	NA	
d) Flash point, °F	150	
e) Water solubility	Practically insoluble	
f) Hazardous polymerization	☐ Yes	☒ No
g) Stable	☒ Yes	☐ No
h) Shock sensitive	☐ Yes	☒ No

3. Physiological Properties:

a) Acute oral toxicity (LD50 if available): Oral MLD (rats) 25000-30,000 mg/Kg

b) Local effects on eyes: Slight irritant

c) Local effects on skin: Slight irritant

d) Absorption through skin: MLD (rabbits) 35-40,000 mg/Kg.

e) Inhalation effects (vapors or dust): NA

4. First Aid Treatment:

a) Skin contact: Wash thoroughly with soap and water.

b) Eye contact: Flush with copious quantities of water and consult physician immediately.

c) Ingestion: Induce vomiting and consult physician immediately.

5. Protective Equipment:
Normal usage requires: Gloves and protective face shield or goggles

NAME: David Firth
TITLE: Plant Chemist
DATE: 7/27/72

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MATERIAL SAFETY DATA SHEET

NALCO CHEMICAL COMPANY
1601 BUTTERFIELD ROAD
OAK BROOK, ILLINOIS 60521

Product 6SJ-743

Trade Name NALCO 6SJ-743 Formula No.

Synonyms Polyester

Chemical Family Organic

SECTION 2 – HAZARDOUS INGREDIENTS

MATERIAL OR COMPONENT	%
Butanol	10
Toluene	8

SECTION 3 – PHYSICAL PROPERTIES

Boiling Point, 760 MM HG	Melting Point
Specific Gravity (H_2O=1) .952 @ 60°F	Vapor Pressure
Vapor Density (Air=1)	Solubility in H_2O, % By Wt. Insoluble
% Volatiles By Vol.	pH (1% of solution) 6-8

Appearance and Odor: Dark reddish-black liquid with slight alcohol odor

SECTION 4 – FLAMMABILITY AND EXPLOSIVE PROPERTIES

Flash Point (Test Method): 105°F PMCC

Flammable Limits in Air, % By Vol.	Lower		Upper	

Extinguishing Media: Foam, CO_2, dry chemical

Special Fire Fighting Procedures: Fight as any hydrocarbon type fire

Unusual Fire and Explosion Hazard: May evolve toxic NO_2 fumes

SECTION 5 – HEALTH HAZARD DATA

Threshold Limit Value: None established for product. Butanol - skin (ceiling) 50 ppm. Toluene - Skin 100 ppm

Effects of Overexposure: May cause cornea and skin irritation. Prolonged inhalation may result in nausea, headaches and dizziness. Narcosis may develop.

EMERGENCY AND FIRST AID PROCEDURES

Eyes: Flush with water for 15 min. Call a physician.

Skin: Wash with soap and rinse with plenty of water.

Ingestion: Do not induce vomiting. Give water or milk. Call a physician.

Inhalation: Remove to fresh air.

TOLS003835

FORM 567 (7/73) (Continued on Reverse Side)

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Bureau of Labor Standards

MATERIAL SAFETY DATA SHEET

SECTION I

6/2/75

MANUFACTURER'S NAME: Union Oil Company of California	EMERGENCY TELEPHONE NO.: (213) 486-7600
ADDRESS (Number, Street, City, State, and ZIP Code): Union Oil Center, 461 So. Boylston Ave., Los Angeles, California 90017	
CHEMICAL NAME AND SYNONYMS: N. A.	TRADE NAME AND SYNONYMS: Aristowax
CHEMICAL FAMILY: Hydrocarbon	FORMULA: Petroleum Wax

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
Product not hazardous as defined by Sections 1501.2, 1502.2, 1503.2 of the Code of Federal Regulations.		

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	over 600°	SPECIFIC GRAVITY (H_2O=1)	0.9
VAPOR PRESSURE (mm Hg.)	N. A.	PERCENT VOLATILE BY VOLUME (%)	N. A.
VAPOR DENSITY (AIR=1)	N. A.	EVAPORATION RATE (_____=1)	N. A.
SOLUBILITY IN WATER	Insoluble		
APPEARANCE AND ODOR	Water-white, odorless		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): 490°F typical ASTM D 92 COC, Flash Point	FLAMMABLE LIMITS: N. A.	Lel	Uel

EXTINGUISHING MEDIA: Foam, Carbon Dioxide, Dry Chemical, Vaporizing Liquid Type Extinguishers

SPECIAL FIRE FIGHTING PROCEDURES: None

UNUSUAL FIRE AND EXPLOSION HAZARDS: Combination with paper, cloth, or wood wastes will increase flammability.

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SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
100 ppm (ACGIH)

EFFECTS OF OVEREXPOSURE
to vapor might affect central nervous system and cause respiratory irriration.

EMERGENCY AND FIRST AID PROCEDURES
Skin contact - Wash with soap and water. An emollient cream or lotion is beneficial. Eye contact - Wash with plenty of water for five minutes. Inhalation - Provide fresh air and rest. Ingestion: Do no induce vomiting; call a physician.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*
Avoid strond oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide is burned with insufficient air.

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Avoid open flame. Provide adequate ventilation. Collect and dispose of all spilled liquid.

WASTE DISPOSAL METHOD
Use the same precautions for disposal as you would for kerosene. Espesol 310-66 (Mineral Spirits) is a combustible hydrocarbon and will burn if ignited.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
In inadequarely ventilared space, use self-contained breathing apparatus

VENTILATION	LOCAL EXHAUST To a fire-safe area.	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES Recommended.	EYE PROTECTION Recommended.

OTHER PROTECTIVE EQUIPMENT
As required to avoid wetting clothes.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Handle as a combustible liquid.

OTHER PRECAUTIONS

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II. Physical Properties

Boiling Point (°F)	302-370°F	Melting Point (°F)		Solubility: Miscible with hydrocarbons; insoluble in water.
Vapor Pressure (mm Hg & temp)	6 mm Hg @ 100°F	Specific Gravity (H_2O = 1)	0.78	Appearance, Color, Odor, etc.: Colorless liquid
Molecular Weight	139 (avg.)	Percent Volatile by Volume (%)	99%+	
Vapor Density (air = 1)	4.8	Evaporation (BuAc = 1)	0.24	Other: Viscosity – <32 SUS @ 77°F

TOLS003838

...ve information is based on data available to us and is believed to be correct. However, NO WARRANTY of MERCHANTABILITY, FITNESS for ...r any other warranty is expressed or to be implied regarding the accuracy of these data, the results to be obtained from the use thereof, the ...s connected with the use of the material, or that any such use will not infringe any patent. Since the information contained herein may be applied ...r conditions beyond our control and with which we may be unfamiliar, we do not assume any responsibility for the results of its use. This information is furnished upon the condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

PER-527 (05-5-74)

32319

BZTO104(e)040659

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved OMB No. 44-R1367

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME: Charter International Oil Company	EMERGENCY TELEPHONE NO.: AC 713 / 923-1651
ADDRESS (Number, Street, City, State, and ZIP Code): P. O. Box 5008; Houston, TX 77012	Medical Emergency No.: AC 713 / 225-0463
CHEMICAL NAME AND SYNONYMS: Aliphatic Petroleum Hydrocarbons	TRADE NAME AND SYNONYMS: Espesol 310-66 (Short Range Mineral Spirits)
CHEMICAL FAMILY: Aliphatic Petroleum Hydrocarbons	FORMULA: ———

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS Espesol 310-66	100	100ppm	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.) ASTM D-86°F	310/347	SPECIFIC GRAVITY (H_2O=1)	0.7669
VAPOR PRESSURE (mm Hg.) @60°F/100°F	2.0/8.5	PERCENT, VOLATILE BY VOLUME (%)	100%
VAPOR DENSITY (AIR=1)	4.73	EVAPORATION RATE (___ n-BuAc =1)	0.22
SOLUBILITY IN WATER	Negligible		
APPEARANCE AND ODOR: Water White Liquid; mild aliphatic hydrocarbon odor.			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	LEL	UEL
TCC °F 100		1.1	6.0

EXTINGUISHING MEDIA
(1) Mechanical Foam, (2) Dry Chemical, (3) Water Fog, (4) CO_2

SPECIAL FIRE FIGHTING PROCEDURES
A straight water stream would spread oil fires.

UNUSUAL FIRE AND EXPLOSION HAZARDS
A vapor accumulation would flash and/or explode if ignited. Flash 100°F.

(Continued on reverse side)

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TOLS003839

BZTO104(e)040660

C Emergency and First Aid Procedures

Eye Contact	Flush eyes with fresh water for at least 15 minutes. If irritation persists get medical attention.
Skin Contact	Use good personal hygiene practices while working with this material. Wash contaminated clothing before reuse.
Inhalation	If there are signs or symptoms of overexposure to mist or vapor of this material (as described in Section B - Systemic Effects), move the individual to an uncontaminated area. If breathing has stopped, apply artificial respiration. Get medical attention immediately.
Ingestion	If this material is swallowed and aspirated, chemical pneumonitis may result. If swallowed, DO NOT induce vomiting; get medical attention immediately.

D Special Protection Information

Eye Protection	Avoid eye contact with this material. If the conditions or frequency of use increase the danger of exposure, eye contact can best be avoided by wearing chemical-safety goggles.
Respiratory Protection	The vapor or mist concentrations of this material must be kept below applicable standards (see Section B - TLV). If this cannot be achieved, the use of an approved respirator for organic vapor and mist, supplied-air or self-contained breathing equipment is recommended.
Skin Protection	Avoid prolonged or frequently repeated skin contact with this material. If the conditions or frequency of use increase the danger of exposure, skin contact can best be avoided by wearing impervious neoprene or rubber gloves.
Ventilation	Use adequate ventilation to keep the vapor or mist concentrations of this material below applicable standards.
Other	If eye or skin contact with this material can occur, washing facilities for eyes and skin should be available nearby.

E Fire Protection Information

Flash Point (test method)	(TCC)100°F	Flammable Limits (by volume in air)	lower limit		upper limit		
Autoignition Temperature	610°F	Extinguishing Media	CO_2, Dry Chemical, Foam, Water Spray				
Special Fire Fighting Procedures	For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Read the entire Bulletin.						

F. Reactivity Data

Stability (thermal, light, etc.)	Stable	X	Conditions to Avoid	
	Unstable			
Incompatibility (materials to avoid)	May react with strong oxidizing materials.			
Hazardous Decomposition Products	Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.			
Hazardous Polymerization	May Occur		Conditions to Avoid	
	Will not Occur	X		

G. Environmental Protection

Environmental Impact	Certain geographical areas have air pollution restrictions concerning the use of thinners and solvents in work situations where the material would be released into the atmosphere. Air pollution regulations should be studied to determine if this material is exempt in that area where it is to be used.
Precautions if Material is Released or Spilled	Eliminate all sources of ignition in vicinity of spill or released vapor. Clean up spills as soon as possible, observing precautions in Section D. Absorb large spills with absorbent clay, diatomaceous earth or other suitable material. A fire or vapor hazard may exist since these cleanup materials will only absorb liquids and will not absorb the vapor.
Waste Disposal Methods	Place contaminated material in disposable containers and bury in an approved dumping area.

H. Special Precautions

Handling and Storing	READ AND OBSERVE PRECAUTIONS ON PRODUCT LABEL Keep away from heat or open flame. KEEP OUT OF REACH OF CHILDREN.

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SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
Not established.

EFFECTS OF OVEREXPOSURE
Prolonged contact may cause skin irritation. Repeated contact may result in skin sensitization in susceptible individuals. High vapor concentrations may cause mucous membrane and respiratory tract irritation.

EMERGENCY AND FIRST AID PROCEDURES
Skin Contact: Flush affected areas thoroughly with water.
Eye Contact: Irrigate with water for 15 minutes and get medical attention.
Inhalation: Remove to fresh air.

SECTION VI REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
UNSTABLE		
STABLE	X	

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	Will Not Occur	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Soak with absorbent material and incinerate.

WASTE DISPOSAL METHOD
Incinerate

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)
Vapor at elevated temperatures.

VENTILATION		
LOCAL EXHAUST	X if needed to control	SPECIAL
MECHANICAL (general)	X	OTHER

PROTECTIVE GLOVES X
EYE PROTECTION

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid eye contact and prolonged or repeated skin contact. Avoid inhalation of vapor.

OTHER PRECAUTIONS

TOLS003842

ECP 2070-2

32319

Material Information Bulletin
Environmental Health & Toxicology

Chevron

Warning Statement	Name
DANGER! HARMFUL OR FATAL IF SWALLOWED COMBUSTIBLE	CHEVRON 325 SOLVENT

A. Typical Composition

	%
Paraffins (incl. naphthenes)	96%
Aromatics C_8^+	4%

B. Physiological Effects and Health Information

Threshold Limit Value (TLV)	The suggested TLV is 250 ppm (Parts of vapor per million parts of air) for a daily 8-hour exposure. No OSHA exposure standard has been established for this material.
Eye Irritation	This material is not a primary eye irritant. However, minor irritation may be noted following contact. Application of the material into the eyes of rabbits produced a slight degree of membrane irritation.
Skin Irritation	This material may cause skin irritation on prolonged or frequently repeated contact. Application of the material onto the skin of rabbits produced a moderate degree of erythema and edema. The primary irritation score was 3.7 on a scale of 0 to 8. Prolonged or frequently repeated skin contact may cause the skin be become dry or cracked from the defatting action of the material.
Systemic Effects	From the results of animal studies, this material is not expected to be toxic by ingestion or by skin contact. The acute oral LD_{50} for rats was greater than 15.3 g/Kg, and the acute dermal LD_{50} for rabbits was greater than 19.1 g/Kg. Prolonged exposure to high vapor concentrations of this material may cause signs and symptoms of central nervous system depression such as, headache, dizziness, loss of appetite, weakness, and loss of coordination. Affected persons normally experience complete recovery when removed from the exposure area. Aspiration of the liquid can lead to chemical pneumonitis.

TOLS003843

Chevron Environmental Health Center/225 Bush Street, San Francisco, CA 94104
J. A. Spence, Ph. D. Reference Phone Number (415) 232-1514, Ext. 4178 or 2027

(Approved by U.S. Department of Labor, "Essentially similar to Form OSHA 20, Material Safety Data Sheet")
Rev. No. 47 - 1975

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BZTO104(e)040664

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	Not established.
EFFECTS OF OVEREXPOSURE	May cause skin irritation or allergic skin reaction.
EMERGENCY AND FIRST AID PROCEDURES	Skin contact: wash thoroughly with soap and water.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	Not applicable.

INCOMPATIBILITY (Materials to avoid)	Oxidizing materials can cause a vigorous reaction.
HAZARDOUS DECOMPOSITION PRODUCTS	As with any other organic material, combustion will produce carbon dioxide and probably carbon monoxide.

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	Will Not Occur	
	X	Not applicable.

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Eliminate all ignition sources. Flush spill away with water spray. Small spills may be collected with absorbent material.
WASTE DISPOSAL METHOD	Incineration. Observe all Federal, state, and local laws concerning health and environment.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)	An appropriate NIOSH-approved respirator for organic vapor should be worn if needed.			
VENTILATION	LOCAL EXHAUST	As needed to control mist or vapor.	SPECIAL	None known to Eastman.
	MECHANICAL (general)	Recommended.	OTHER	None known to Eastman.
PROTECTIVE GLOVES	Should be worn.	EYE PROTECTION	Safety glasses should be worn in any type of industrial operation.	
OTHER PROTECTIVE EQUIPMENT	Eye bath; safety shower.			

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Avoid prolonged or repeated contact with skin. Use with adequate ventilation.
OTHER PRECAUTIONS	Good industrial hygiene practice should be followed which includes preventing eye contact, minimizing skin contact, and minimizing inhalation of mists and vapors. No eye hazard known to Eastman; however, any material gotten into the eye should be washed out immediately and medical attention obtained if symptoms persist after washing. Hazardous residue may remain in "empty" package; do not reuse or alter package without proper industrial cleaning.

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees.

EASTMAN KODAK COMPANY
APPROVED BY U.S. DEPARTMENT OF LABOR
"ESSENTIALLY EQUIVALENT" TO FORM OSHA-20

MATERIAL SAFETY DATA SHEET

SECTION I

PRODUCT NAME: Solvent KB-3	SIZE:
CHEMICAL NAME: Mixed Aliphatic Ketones	
FORMULA: Mixture	
MANUFACTURER: Marketed by Eastman Chemical Products, Inc.	
ADDRESS: Kingsport, Tennessee 37662	
FOR INFORMATION ON HEALTH HAZARDS CALL: Area 615-247-0411 Ext. 3613	
FOR OTHER INFORMATION CALL: Ext. 3103	SIGNATURE AND DATE: Information effective as of May, 1975

SECTION II HAZARDOUS INGREDIENTS OF MIXTURES

PRINCIPAL HAZARDOUS COMPONENT (S)	%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	Approx. 175°C	SPECIFIC GRAVITY (H_2O=1)	Approx. .863
VAPOR PRESSURE (mm Hg.)		PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____=1)	
SOLUBILITY IN WATER	Slightly soluble in water		
APPEARANCE AND ODOR	Dark liquid - solvent odor		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	155°F C.O.C.	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA	Water, CO_2, Dry Chemical			
SPECIAL FIRE FIGHTING PROCEDURES	None			
UNUSUAL FIRE AND EXPLOSION HAZARDS	None			

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ECP 2070-4

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SECTION V HEALTH HAZARD DATA

EMERGENCY FIRST AID

EFFECTS OF OVEREXPOSURE

CHRONIC AND FIRST AID PROCEDURES

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY (Materials to avoid) Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Adsorb on clay, sawdust or filter-cel

WASTE DISPOSAL METHOD

Incinerate or dispose of in sanitary landfill according to local or state regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES | EYE PROTECTION

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

OTHER PRECAUTIONS

TOLS003846

. the information and recommendations set forth herein are believed be accurate as of the date hereof, MONSANTO COMPANY MAKES NO WARRANTY ITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

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EASTMAN KODAK COMPANY
APPROVED BY U.S. DEPARTMENT OF LABOR
"ESSENTIALLY SIMILAR" TO FORM OSHA-20

ECP 2079-1F (8-79)

MATERIAL SAFETY DATA SHEET

SECTION I

PRODUCT NAME:	Solvent B-11	SIZE:	--
CHEMICAL NAME:	Mixture		
FORMULA:	Mixture		
MANUFACTURER:	Marketed by Eastman Chemical Products, Inc.		
ADDRESS:	Kingsport, Tennessee 37662		
FOR INFORMATION ON HEALTH HAZARDS CALL:	Monday thru Friday, 8 a.m.-5 p.m. (Eastern), (615) 247-0411, Ext. 3613; all other times (615) 247-0411, Ext. 4666.		
FOR OTHER INFORMATION CALL:	Same number as above Extension 5831	INFORMATION EFFECTIVE AS OF:	February, 1980

SECTION II HAZARDOUS INGREDIENTS OF MIXTURES

PRINCIPAL HAZARDOUS COMPONENT (S)	%	TLV (Units)
None known to Eastman.		

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	Approx. 275-330°F (135-166°C)	SPECIFIC GRAVITY (H_2O = 1)	0.87-0.91 @ 20°/20°C
VAPOR PRESSURE (mm Hg.)	Not applicable.	PERCENT VOLATILE BY VOLUME (%)	Not applicable.
VAPOR DENSITY (AIR = 1)	Not applicable.	EVAPORATION RATE (__ __ . _ = 1)	Not applicable.
SOLUBILITY IN WATER	Negligible.		
APPEARANCE AND ODOR	Yellow to dark brown liquid; slightly unpleasant odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	215°F (102°C) COC	FLAMMABLE LIMITS Not applicable.	Lel	Uel
EXTINGUISHING MEDIA	Foam, Water spray, Dry chemical, CO_2			
SPECIAL FIRE FIGHTING PROCEDURES	Wear self-contained breathing apparatus and protective clothing to prevent contact with skin or eyes.			
UNUSUAL FIRE AND EXPLOSION HAZARDS	None known to Eastman.			

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IX SPECIAL PRECAUTIONS

CAUTIONARY TATEMENTS

Keep out of reach of children. Avoid prolonged and/or repeated breathing of vapors or dust. Avoid contact with skin. Keep contents and freshly treated articles away from flame, food, and living plants. Do not use contaminated sawdust for animal bedding.

THER HANDLING AND ORAGE REQUIREMENTS

Store in closed, properly labeled containers.
Do not reuse containers. Drums should be returned to drum reconditioner.
Bags should be buried in sanitary landfill. Bags should be stored out of weather. Shelf life indefinite under good storage conditions.

XTIONAL REGULATORY CONCERNS

ERAL:

FDA

USDA

CPSC

TSCA IS THIS PRODUCT, OR ALL ITS INGREDIENTS, BEING CERTIFIED FOR INCLUSION ON THE TOXIC SUBSTANCES CONTROL ACT INVENTORY OF CHEMICAL SUBSTANCES? As a registered pesticide, this product exempt

OTHER EPA { FWPCA / FIFRA

STATE

Water quality, Air quality and Health Departments in some states.

PREPARED BY I. M. Montgomery

TITLE: General Sales Manager

COMPANY: Koppers Company, Inc.

ADDRESS: 5137 Southwest Avenue
St. Louis, Missouri 63110

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BZTO104(e)040669

rm Approved OMB
. 44-81387
--oval Expires:
..ly 30, 1972

U.S. DEPARTMENT OF LABOR

Form No. OSHA-20
May, 1971

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME: MONSANTO COMPANY	EMERGENCY TELEPHONE NO.
ADDRESS (Number, Street, City, State, and ZIP Code): 800 North Lindbergh Boulevard, St. Louis, Missouri 63166	
CHEMICAL NAME AND SYNONYMS:	TRADE NAME AND SYNONYMS: MONSANTO HEAVY OXO [illegible] (HOE
CHEMICAL FAMILY: OXO ALCOHOL HIGH BOILERS	FORMULA:

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.) @ 20 mm Hg	290	SPECIFIC GRAVITY (H_2O=1) @ 25/25°C	0.857
VAPOR PRESSURE (mm Hg.)	<0.1	PERCENT VOLATILE BY VOLUME (%)	NA
VAPOR DENSITY (AIR=1)	NA	EVAPORATION RATE (=1)	< 1
SOLUBILITY IN WATER %	<0.1		

APPEARANCE AND ODOR: Clear, straw-colored liquid; mild characteristic odor

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): COC - 305°F	FLAMMABLE LIMITS	Lel	Uel

EXTINGUISHING MEDIA: Dry powder, CO_2, Foam, Fog

SPECIAL FIRE FIGHTING PROCEDURES:

UNUSUAL FIRE AND EXPLOSION HAZARDS:

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V HEALTH HAZARD INFORMATION

HEALTH HAZARD DATA	HAZARD CLASSIFICATION	BASIS FOR CLASSIFICATION	SOURCE
ROUTES OF EXPOSURE INHALATION	TLV 0.5 mg/cu. M Skin Notation		ACG, IH 29 CFR Part 1
SKIN CONTACT	(Mild) Sensitizer		16CFR 1500.3 (C)(5)
SKIN ABSORPTION	Toxic	200 < LD < 1000 mg/kg	ANSI Z-129.1 1976
EYE CONTACT	Mild Irritant		
INGESTION	Toxic	50 < LD_{50} < 500 mg/kg	ANSI Z-129.1 1976

EFFECTS OF OVEREXPOSURE

ACUTE OVEREXPOSURE: Sneezing, irritation of nose, throat, eyes, respiratory difficulty liver damage.
Hyperthemia, Liver, Kidney failure and death.

CHRONIC OVEREXPOSURE: Penta is expelled quite rapidly in sub acute doseages and chronic exposure over prolonged periods can lead to liver & kidney failure and death.

EMERGENCY AND FIRST AID PROCEDURES

EYES: Rinse eyes with clean water and apply eye ointment to prevent infection and ease irritation.

SKIN: Wash with plenty of soap and water.

INHALATION: Remove patient from source.

INGESTION: Induce vomiting by drinking mustard or salt water or finger in throat. Avoid Aspiration.

NOTES TO PHYSICIAN

This product is a metabolic stimulant. Causes hyperthemia treat symtomatically.

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VI REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY

Stable at temperatures < 310°C.

PATIBILITY

Dissolves in alkaline solution

HAZARDOUS DECOMPOSITION PRODUCTS

CO, CO_2, HCL and phenolics

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

Will not occur.

VII DISPOSAL, SPILL OR LEAK PROCEDURES

AQUATIC TOXICITY (E.G. 96 HR TLM):

Highly toxic to fish, especially sensitive species such as trout. Safe at 0.05 ppm in water

WASTE DISPOSAL METHOD

Disposal must be carried out in accordance with local, state, and Federal regulations. Do not incinerate closed containers. Do not dispose near water drainage to stream or bodies of water. Bury in sanitary landfill and high temperature incineration (870°C Min.

S TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Wet down spilled material to prevent dusting and sweep up and dispose in approved manner. Avoid contact, avoid breathing vapors.

NEUTRALIZING CHEMICALS

None.

VIII SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS

Not requiredin storage areas. In work areas use solvent type dust collectors. Maintain level below the TLV.

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

Rubber Gloves, Chemical Goggles,

RESPIRATORY (SPECIFY IN DETAIL)

Bureau of Mines approved respirator (Type BE) Approved organic vapor and particulate r

EYE

Chemical Goggles

OVES

Rubber, Neoprene

OTHER CLOTHING AND EQUIPMENT

Clean clothing fully covering body changed at least daily if in contact with penta.

Discard contaminated shoes.

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PENTACHLOROPHENOL

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	0.5 mg/cu.m.
EFFECTS OF OVEREXPOSURE	Sneezing, coughing, irritation of nose, throat, eyes, respiratory difficulty, liver damage.
EMERGENCY AND FIRST AID PROCEDURES	Wash off immediately with soap and water. Change out of contaminated clothing. If accidentally swallowed, cause vomiting and refer to physician for systematic treatment.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	x	
INCOMPATABILITY (Materials to avoid)	None		
HAZARDOUS DECOMPOSITION PRODUCTS	CO, CO_2, HCl, Phenolics		
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	x	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Sweep up and dispose of in approved chemical landfill in accordance with local and state regulations.
WASTE DISPOSAL METHOD	Bury in chemical landfill

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)	Bureau of Mines dust respirator		
VENTILATION	LOCAL EXHAUST	To control dust (or vapors if in solution)	SPECIAL
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES	Rubber	EYE PROTECTION	Chemical goggles
OTHER PROTECTIVE EQUIPMENT	Do not wear contaminated clothing.		

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Keep off skin. Keep away from mouth. Avoid dust, vapor, mist (inhalation). Wear approved goggles
OTHER PRECAUTIONS	

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MATERIAL SAFETY DATA SHEET

I PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Monsanto Industrial Chemical Co	REGULAR TELEPHONE NO. / EMERGENCY TELEPHONE NO.: 314-694-1000
ADDRESS: 800 North Lindbergh Blvd., St. Louis, Missouri 63166	
TRADE NAME: Pentachlorophenol	
SYNONYMS: Penta, Technical Penta, PCP	
SHIPPING NAME[1]: DOT: Not Restricted	
IATA: Not Restricted	

II HAZARDOUS INGREDIENTS[2]

MATERIAL OR COMPONENT	CAS NO.	%	HAZARD DATA
Pentachlorophenol (and other chlorinated phenols)		96	29 CFR Part 1910 40 CFR Part 129

III PHYSICAL DATA

BOILING POINT, 760 MM HG	310°C (Decomp.)	MELTING POINT	174°C Min.
SPECIFIC GRAVITY (H_2O = 1)	1.8500	VAPOR PRESSURE	0.00011 mm Hg. @ 20°C
VAPOR DENSITY (AIR = 1)	Nagative	SOLUBILITY IN H_2O, % BY WT	14 ppm @ 20°C
% VOLATILES BY VOL.	Negative	EVAPORATION RATE (BUTYL ACETATE = 1)	<1
APPEARANCE AND ODOR	Brown Solid Chlorophenolic Odor	Ph (AS IS) Ph (1% SOLN.)	Ka = 10^{-5} NA

IV FIRE AND EXPLOSION DATA

FLASH POINT (TEST METHOD)	Negative	AUTOIGNITION TEMPERATURE	Negative
FLAMMABLE LIMITS IN AIR, % BY VOL.	Negative	LOWER	UPPER
EXTINGUISHING MEDIA	Water, Fog, Foam, CO_2		
SPECIAL FIRE FIGHTING PROCEDURES	Wear full protection clothing. Do not allow exposed body surfaces. Toxic vapors given off from a fire. Use self-contained breathing apparatus. Blanket with extinguishing media.		
UNUSUAL FIRE AND EXPLOSION HAZARD	When subjected to high temperatures it decomposes to hydrochloric acic and water. Highly toxic gases (Chlorides and Chlorine) can be evolved when burned.		

1. See references 1 and 2 2. See instructions and references 1 to 8.

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SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	LD_{oo} ~ 29 mg/Kg man, LD_{50} ~ 146 mg/Kg Rats.
EFFECTS OF OVEREXPOSURE	Acute poisoning is marked by weakness, convulsion and collapse.

EMERGENCY AND FIRST AID PROCEDURES

EXTERNAL: Eyes-Immediately flush with copious quantities of clear water until physician arrives. Skin-Remove contaminated clothing; wash with copious amounts of soap and water. INTERNAL: Call a physician or poison Control Center immediately. CONTAMINATED CLOTHING: Thoroughly wash before re-use.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID: Decomposes at high temperatures; avoid exposure to temperatures above 300° C.
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*: Dissolves in alkaline solutions

HAZARDOUS DECOMPOSITION PRODUCTS: Acid fumes containing organic chlorides

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Wet down spilled material to prevent dusting

Sweep up and put back into container.

WASTE DISPOSAL METHOD

Take to chemical disposal area and cover with dirt.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: Wear air purifying respirator for dust and vapors.

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

Rubber gloves required.

Full safety goggles recommended.

PROTECTIVE GLOVES	EYE PROTECTION

OTHER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid puncturing container.

Avoid temperatures above 300° C.

OTHER PRECAUTIONS

KEEP OUT OF REACH OF CHILDREN

Form OSHA-20

This information is furnished without warranty, representation, inducement or license of any kind, except that it is accurate to the best of Reichhold Chemicals, Inc.'s knowledge, or obtained from sources believed by Reichhold Chemicals, Inc. to be accurate, and Reichhold Chemicals, Inc. does not assume any legal responsibility for use or reliance upon same. Customers are encouraged to conduct their own tests. Before using any product, read its label.

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TOLS003854

BZTO104(e)040675

Form Approved
Budget Bureau No. 44-R1367
Approval Expires April 30, 1978

Form No. LSB-005
May 77

U.S. DEPARTMENT OF LABOR

WORKPLACE STANDARDS ADMINISTRATION

Bureau of Labor Standards

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME: MONSANTO COMPANY	EMERGENCY TELEPHONE NO.: (314) 694-1000
ADDRESS (Number, Street, City, State, and ZIP Code): 800 NORTH LINDBERGH BLVD., St. Louis, Mo. 63166	
CHEMICAL NAME AND SYNONYMS: Pentachlorophenol	TRADE NAME AND SYNONYMS: PENTA
CHEMICAL FAMILY: Phenol	FORMULA: C_6Cl_5OH

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°C) °C at 760 mm	310 (decomp)	SPECIFIC GRAVITY (H_2O=1)	>1
VAPOR PRESSURE (mm Hg) at 50°C	<1mm	PERCENT VOLATILE BY VOLUME (%)	N.A.
VAPOR DENSITY (AIR=1)	N.A.	EVAPORATION RATE (BUAC = 1)	<1
SOLUBILITY IN WATER at 25°C Negligible	16ppm		
APPEARANCE AND ODOR: Brown solid, characteristic odor			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): N.A.		FLAMMABLE LIMITS: N.A.	LEL / UEL
EXTINGUISHING MEDIA: Water fog, foam, CO_2			
SPECIAL FIRE FIGHTING PROCEDURES: N.A.			
UNUSUAL FIRE AND EXPLOSION HAZARDS: N.A.			

TOLS003855

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MATERIAL SAFETY DATA SHEET

Section V — HEALTH HAZARD DATA

...SHOLD LIMIT VALUE
Not defined

...OF OVEREXPOSURE
Not defined

...RGENCY AND FIRST AID PROCEDURES
Not defined

Section VI — REACTIVITY DATA

...BILITY (...k One)	☐ UNSTABLE	CONDITIONS TO AVOID: Avoid excessive heat and strong oxidizers.
	XXX STABLE	

...COMPATABILITY (materials to avoid)
Avoid strong oxidizers.

...RDOUS DECOMPOSITION PRODUCTS

...ARDOUS ...YMERIZATION (...eck One)	☐ MAY OCCUR	CONDITIONS TO AVOID
	XX WILL NOT OCCUR	under normal operating conditions.

Section VII — SPILL OR LEAK PROCEDURES

...PS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Handle as an oil spill.

...E DISPOSAL METHOD
Incineration.

Section VIII — SPECIAL PROTECTION INFORMATION

...IRATORY PROTECTION (specify type)

...TILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL (general) X	OTHER

...OTECTIVE GLOVES
Impervious Material

...YE PROTECTION
Face mask or safety goggles.

...R PROTECTIVE EQUIPMENT
Impervious outer clothing.

Section IX — SPECIAL PRECAUTIONS

...CAUTIONS TO BE TAKEN IN HANDLING AND STORING
...ndard Precautions should be observed when handling materials of this type.
...o not store at temperatures above 150°F.

...CAUTIONS
...prolonged or repeated contact with the skin.

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BZTO104(e)040677

Occupational Safety and Health Administration

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME: REICHHOLD CHEMICALS, INC.	EMERGENCY TELEPHONE NO.: (206) 572-5600
ADDRESS (Number, Street, City, State, and ZIP Code): 2340 Taylor Way (P. O. Box 1482), Tacoma, Wa. 98401	
CHEMICAL NAME AND SYNONYMS: Pentachlorophenol	TRADE NAME AND SYNONYMS: RCI 49 - 162 Pentachlorophenol
CHEMICAL FAMILY: Chlorinated phenols	FORMULA: C_6Cl_5OH

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	309° C.	754° F.	SPECIFIC GRAVITY (H_2O=1)	1.86@25° C.
VAPOR PRESSURE (mm Hg.)	0.00011 20° C. (68° F.)		PERCENT, VOLATILE BY VOLUME (%)	Negative
VAPOR DENSITY (AIR=1)		------	EVAPORATION RATE (. . . . . =1)	Negative
SOLUBILITY IN WATER	14 ppm at 68° F.			
APPEARANCE AND ODOR	Hollow shot or solid blocks Buff colored			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): >300° C. Tagged closed cup	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA: Foam, water or carbon dioxide			
SPECIAL FIRE FIGHTING PROCEDURES: Blanket with foam, water or carbon dioxide			
UNUSUAL FIRE AND EXPLOSION HAZARDS: When subjected to high temperatures, decomposes. Decomposed products are acidic and corrosive. Volatile in steam.			

(Continued on reverse side)

32319

TOLS003857

BZTO104(e)040678

MATERIAL SAFETY DATA SHEET

Section V—HEALTH HAZARD DATA

LIMIT VALUE
tion II

EFFECTS OF OVEREXPOSURE
, coughing, irritation of nose, throat, eyes, respiratory difficulty. This product
metabolic stimulant, causes hyperthermia.

vents: irritating to eyes and mucous membranes. Inhalation may cause headache,
siness, and nausea.

EMERGENCY AND FIRST AID PROCEDURES
case of inhalation, remove to fresh air. In case of eye contact, flush eyes with water
at least 15 minutes. Get medical attention. Wash off skin immediately. If swallowed,
ce vomiting by sticking finger down throat or giving mustard, soapy, or strong salty
.er. AVOID ASPIRATION. Repeat until vomit is clear. Get medical attention.

Section VI—REACTIVITY DATA

TY (One)	☐ UNSTABLE	CONDITIONS TO AVOID: Keep contents and freshly treated articles away from flame, food
	☒ STABLE	and living plants.

STABILITY (Materials to avoid)
dizing agents

HAZARDOUS DECOMPOSITION PRODUCTS
O, CO_2, HCL, Phenolics

ARDOUS MERIZATION (One)	☐ MAY OCCUR	CONDITIONS TO AVOID
	☒ WILL NOT OCCUR	

Section VII—SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
e sources of ignition. Avoid contact, avoid breathing vapors. Use protective mea-
outlined in Section VIII below. Absorb spills with an absorbant such as Speedi-Dry
ocessed clay. Large spills can be diked and pumped into a waste container. See
tion IX below.

WASTE DISPOSAL METHOD
Disposal must be carried out in accordance with local, state and federal regulations.
ntachlorophenol is toxic to fish. Do not dispose near water drainage to streams or
dies of water. Bury absorbant material in an approved chemical landfill, or high
emperature incineration may be used. Do not incinerate closed containers.

Section VIII—SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)
. S. Bureau of Mines approved organic vapor and particulate matter masks (Type BE)

VENTILATION	LOCAL EXHAUST: To control vapors to concentrations below TLV in Section II.	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES: Rubber gloves	EYE PROTECTION: Chemical goggles

OTHER PROTECTIVE EQUIPMENT

Section IX—SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
ore in closed, properly labeled containers. Avoid prolonged and/or repeated breathing
of mist, vapors, or substantially saturated atmosphere. Avoid contact with skin. Wear
pproved goggles. Do not atomized. Use only in well ventilated area. Keep contents and
ly treated articles away from flame, food and living plants.

OTHER PRECAUTIONS
not take internally. Wash contaminated clothing before reusing. Discard contaminated
shoes. Approved (USBM) respirators can be used if oxygen level above 16% and vapor concentration below 2%, otherwise use self-contained units. Do not use when temperature exceeds 120°F. If spilled, blot up with an absorbant material such as Speedi-Dry absorbant, processed clay sold by Mineral & Chemicals Co., Edison, N.J.

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TOLS003858

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Chemicals and Coatings

MATERIAL SAFETY DATA SHEET

(Approved by U.S. [illegible] Form [illegible])

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON

DATE OF ISSUE: December 13, 1976

Section I — PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Koppers Company, Inc. - Wood Treating Chemicals Dept.

EMERGENCY TELEPHONE NO.: 314-772-2200

STREET ADDRESS: 5137 Southwest Avenue

CITY, STATE, AND ZIP CODE: St. Louis, Missouri 63110

MANUFACTURER'S CODE IDENTIFICATION:

PRODUCT CLASS:

TRADE NAME: PETROSET II

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/m³	REMARKS
No hazardous ingredients as defined in section 0.57 of the regulations promulgated under Public Law 85-742 and incorporated in MIL - Standard - 1341A and Fed. Standard 313 o. U.S. Department of Labor definition 29CFR 1501.2(S).				

Section III — PHYSICAL DATA

BOILING RANGE 760 mm Hg	Not defined	FREEZING POINT	Not defined
PERCENT VOLATILE BY VOLUME	Not defined	VAPOR PRESSURE AT 20° C	Not defined
SPECIFIC GRAVITY (H_2O = 1)	1.03	EVAPORATION RATE (BUTYL ACETATE = 1)	Not defined
VAPOR DENSITY	Not defined	SOLUBLE IN WATER - % BY	Not defined

APPEARANCE AND ODOR: Dark Liquid

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)	FLAMMABLE LIMITS	LEL	UEL
(COL) 375° F.	Not defined		

EXTINGUISHING MEDIA: CO_2, Dry Chemical, Foam

UNUSUAL FIRE AND EXPLOSION HAZARDS: CO, Oxides of sulfur, Barium and Calcium may be formed

SPECIAL FIRE FIGHTING PROCEDURES:

TOLS003859

32319

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Section V — HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
ne established: See Section II

EFFECTS OF OVEREXPOSURE
mild skin and eye irritant. Inhalation: nose irritation, drowsiness, loss of
ousness

EMERGENCY AND FIRST AID PROCEDURES
h affected area with water, use soap or mild detergent. If swallowed, DO NOT induce
niting. For inhalation exposure, remove to fresh air. If breathing has stopped, use
icial respiration. Get Medical attention.

Section VI — REACTIVITY DATA

ITY	☐ UNSTABLE	CONDITIONS TO AVOID
One)	☒ STABLE	

STABILITY (Materials to avoid)
id oxidizers and sources of igniting.

HAZARDOUS DECOMPOSITION PRODUCTS
c gases and vapors (such as CO) released in fire.

ODOUS ERIZATION	☐ MAY OCCUR	CONDITIONS TO AVOID
One)	☒ WILL NOT OCCUR	

Section VII — SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
up spill or leaks on absorbant paper; burn paper in incinerator; absorb in vermiculite.

WASTE DISPOSAL METHOD
eration is best method, or absorb in vermiculite and dispose in landfill. Do not
aminate water.

Section VIII — SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)
ecessary <200 ppm Organic vapor canister gas mask; self-contained or supplied air respirator.

LOCAL EXHAUST		SPECIAL
MECHANICAL (General)	XX	OTHER

PROTECTIVE GLOVES
per gloves

EYE PROTECTION
Chemical goggles (splash safety)

OTHER PROTECTIVE EQUIPMENT

Section IX — SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
d skin contact. Avoid prolonged breathing of vapors. Do not use near a source of
on. Avoid contamination of feed or food stuffs. Store in tightly closed containers in a
location. Ventilated area.

OTHER PRECAUTIONS
aminated clothing before reuse. Do not reuse containers. Read label thoroughly,
product is to be mixed with other toxic materials.

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KOPPERS
Chemicals and Coatings

MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-005-4)

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

Specialty Wood Chem

DATE OF PREP.: May 25, 1977

Section I — PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Koppers Company, Inc., Wood Treating Chemicals Dept.

EMERGENCY TELEPHONE NO.: 314/772-2200

STREET ADDRESS: 5137 Southwest Avenue

CITY, STATE, AND ZIP CODE: St. Louis, Missouri 63110

MANUFACTURER'S CODE IDENTIFICATION:

PRODUCT CLASS: Wood Preservative (concentrate)

TRADE NAME: Timbertox 40 Concentrate

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/m³	REMARKS
Pentachlorophenol	40		0.5	
Ketone Mixture	40	80	230	suggested
Hydrocarbon Solvent	20	500		

Section III — PHYSICAL DATA

BOILING RANGE @ 760 mm Hg: 175+	FREEZING POINT: >-10°F
PERCENT VOLATILE BY VOLUME: 60	VAPOR PRESSURE AT 20° C: pentachlorophenol < 1mm
SPECIFIC GRAVITY (H₂O = 1): 1.12	EVAPORATION RATE (BUTYL ACETATE = 1): slower than ether
VAPOR DENSITY: heavier than air	SOLUBLE IN WATER - % WT.: Insoluble

APPEARANCE AND ODOR: Dark; mild solvent odor

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)	FLAMMABLE LIMITS	LEL	UEL
> 100° F	Mineral spirits	0.7	6.0

EXTINGUISHING MEDIA: Class B Extinguisher. Water fog, foam, CO_2, Dry Chemical

UNUSUAL FIRE AND EXPLOSION HAZARDS: Ketone vapors can form explosive vapors at elevated temperatures. Control all ignition sources when in use. Ketone vapors are heavier than air.

SPECIAL FIRE FIGHTING PROCEDURES: Wear full protection clothing. Do not allow any exposed body surfaces. Toxic vapors given off from a fire. Use self-contained breathing apparatus. Burning may produce hydrochloric acid, carbon monoxide.

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TOLS003861

BZTO104(e)040682

MATERIAL SAFETY DATA SHEET

Section V — HEALTH HAZARD DATA

LIMIT VALUE
ction II

OVEREXPOSURE
g, coughing, irritation of nose, throat, eyes, respiratory difficulty. This product
metabolic stimulant, causes hyperthermia.
tvents: dizziness, narcosis at high exposure levels

NCY AND FIRST AID PROCEDURES
ase of inhalation, remove to fresh air. In case of eye contact, flush eyes with water
at least 15 minutes. Get medical attention. Wash off skin immediately. If swallowed,
ice vomiting by sticking finger down throat or giving mustard, soapy, or strong salty
er. AVOID ASPIRATION. Repeat until vomit is clear. Get medical attention.

Section VI — REACTIVITY DATA

ITY			CONDITIONS TO AVOID
One)	☐	UNSTABLE	Keep contents and freshly treated articles away from flame, food,
	☒	STABLE	and living plants.

STABILITY (Materials to avoid)
dizing agents
OUS DECOMPOSITION PRODUCTS
O, CO_2, Phenolics

OUS MERIZATION			CONDITIONS TO AVOID
One)	☐	MAY OCCUR	
	☒	WILL NOT OCCUR	

Section VII — SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
e sources of ignition. Avoid contact, avoid breathing vapors. Use protective mea-
utlined in Section VIII below. Absorb spills with an absorbant such as Speedi-Dry
cessed clay. Large spills can be diked and pumped into a waste container. See
tion IX below.

DISPOSAL METHOD
isposal must be carried out in accordance with local, state and federal regulations.
ntachlorophenol is toxic to fish. Do not dispose near water drainage to streams or
ies of water. Bury absorbant material in an approved chemical landfill, or high
mperature incineration may be used. Do not incinerate closed containers.

Section VIII — SPECIAL PROTECTION INFORMATION

ATORY PROTECTION (specify type)
ormally not needed; USBM approved organic vapor and particulate matter masks (type BE)

LATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL (General)	OTHER

TECTIVE GLOVES	EYE PROTECTION
Rubber gloves	Chemical goggles

PROTECTIVE EQUIPMENT

Section IX — SPECIAL PRECAUTIONS

UTIONS TO BE TAKEN IN HANDLING AND STORING
re in closed, properly labeled containers. Avoid prolonged and/or repeated breathing of
ist, vapors, or substantially saturated atmosphere. Avoid contact with skin. Wear ap-
oved goggles. Do not atomize. Use only in well ventilated area. Keep contents and
v treated articles away from flame, food and living plants.

AUTIONS
.. take internally. Wash contaminated clothing before reusing. Discard contaminated
es. Approved (USBM) respirators can be used if oxygen level above 16% and vapor
oncentration below 2%, otherwise use self-contained units. Do not use when temperature
ceeds 120°F. If spilled, blot up with an absorbant material such as Speedi-Dry absorbant,
processed clay sold by Minerals & Chemical Co., Edison, N. J.

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TOLS003862

BZTO104(e)040683

Chemicals and Coatings

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-005-4)

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

Specialty Wood Chem

DATE OF PREP.: June 3, 1977

Section I — PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Koppers Company, Inc., Wood Treating Chemicals Dept.

EMERGENCY TELEPHONE NO.: 314/772-2200

STREET ADDRESS: 5137 Southwest Avenue

CITY, STATE, AND ZIP CODE: St. Louis, Missouri 63110

MANUFACTURER'S CODE IDENTIFICATION:

PRODUCT CLASS: Water Repellent

TRADE NAME: WR 340 CONCENTRATE

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/m³	REMARKS
Ketone Mixture	95	200	700	These are sug ted levels onl

Section III — PHYSICAL DATA

BOILING RANGE (1 mm Hg): 216°F

FREEZING POINT:

PERCENT VOLATILE BY VOLUME: 95%

VAPOR PRESSURE AT 20° C:

SPECIFIC GRAVITY (H_2O = 1):

EVAPORATION RATE (BUTYL ACETATE = 1): Slower than ether

VAPOR DENSITY:

SOLUBLE IN WATER - % WT.: < 5%

APPEARANCE AND ODOR:

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): 185°F PMCC

FLAMMABLE LIMITS: Lower: 15,000 ppm

LEL:

UEL:

EXTINGUISHING MEDIA: Dry Chemical, CO_2, Alcohol foam

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

SPECIAL FIRE FIGHTING PROCEDURES: Self-contained breathing apparatus with a full facepiece operated in the pressure demand (positive pressure) mode.

TOLS003863

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BZTO104(e)040684

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: March 13, 1991
Date Submitted: March 4, 1991
Project: 03-123 N.W. Terminal, P.O. #17241

RESULTS OF ANALYSES OF THE WATER SAMPLES FOR PCP (PENTA)
Results Reported as mg/L (ppm)

Sample #	PCP (PENTA) (ppm)
3123-0227-MW-K	<1
3123-0227-MW-I	<1
3123-0227-MW-H	<1
3123-0228-MW-L	<1
3123-0228-MW-J1	60
3123-0228-MW-J2	1
3123-0228-MW-J3	<1
3123-0228-MW-B1	<1
3123-0228-MW-B2	1
3123-0228-MW-M	4
3123-0227-MW-G	1
Quality Assurance	
Method Blank	<1
3123-0228-MW-M (Duplicate)	1
3123-0228-MW-M (Matrix Spike) Spiked @ 5 ppm Percent Recovery	135%
3123-0228-MW-M (Matrix Spike Duplicate) Spiked @ 5 ppm Percent Recovery	210%

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TOLS003864

BZTO104(e)040685

TIME OIL CO.
SUMMARY OF FIELD AND ANALYTICAL RESULTS
GROUNDWATER SAMPLING AND ANALYSIS

Sampling procedures meet EPA Pub. SW846.
Time Oil groundwater samples were analyzed by GC/MS using EPA Method.
The submitted sample from well No. 4 contained an insufficient amount of material for analysis.

WELL NO.	STATIC WATER LEVEL (FEET) (5-28-86)	FIELD Ph	PENTACHLOROPHENOL mg/L (ppm) (1)	STATIC WATER LEVEL (6-5-86)
A	13.17	6.56	N.D.	12.15
B	13.16	6.29	N.D.	13.18
D	12.52	6.49	N.D.	12.65
E	13.65	7.70	N.D.	13.75
F	13.90	6.73	N.D.	13.93
H	9.31	6.32	N.D.	9.46
I	12.89	5.74	.0022	13.02
QA/QC (Duplicate B)			N.D.	
Field Blank			N.D.	
2	15.00			15.11
River	18.52			14.54

NOTE: (1) Samples collected on May 28, 1986;
Laboratory analysis reported on June 9, 1986.
Detection Limit of 002 ppm.

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TOLS003865

TABLE III-6

TIME OIL CO.

GROUNDWATER ANALYTICAL RESULTS

(AUGUST 29, 1986)

WELL NUMBER	STATIC WATER LEVEL (FT BELOW TOP OF CASING)	pH	[PCP] (ppm)
MW-A	14.06	6.80	N.D.
MW-B	15.07	6.70	N.D.
MW-C	DRY	N.A.	N.A.
MW-D	14.48	6.53	.044
MW-E	15.22	6.54	N.D.
MW-F	15.44	6.57	N.D.
MW-G	DRY	N.A.	N.A.
MW-H	11.28	6.91	N.D.
MW-I	14.75	6.77	N.D.
RIVER	25.70	N.A.	N.A.

NOTES:

[PCP] = CONCENTRATION OF PENTACHLOROPHENOL
ppm = PARTS PER MILLION
N.A. = NOT AVAILABLE
N.D. = NOT DETECTED

TOLS003866

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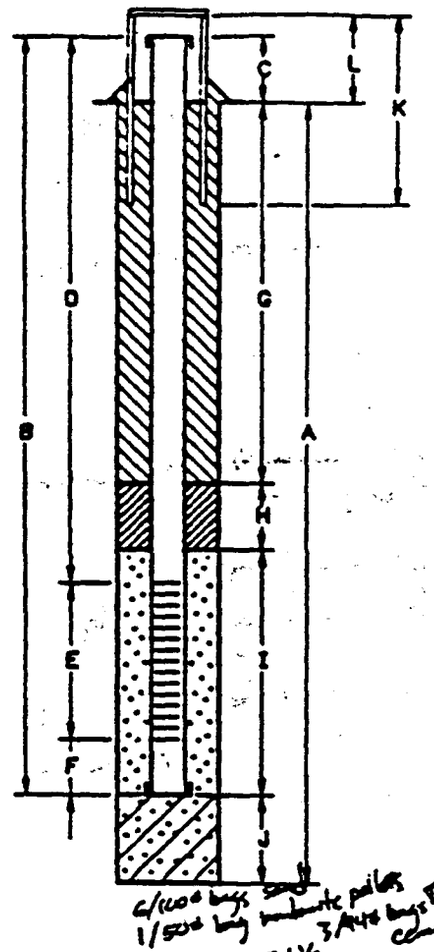
BZTO104(e)040687

...COMPLETION FORM

DRILLING METHOD Hollow Stem Auger DATE 11-30-88

WELL COMPLETION

TOP OF CASING ELEVATION _____



A	BORING DEPTH	21½	FT.
	BORING DIAMETER	14	IN.
B	WELL DEPTH	20½	FT.
C	WELL STICKUP	16"	FT.
D	BLANK INTERVAL ½ FT. TO 10½ FT.		
	BLANK DIAMETER	4	IN.
E	SCREEN INTERVAL 10½ FT. TO 20½ FT.		
	SCREEN DIAMETER Sch 40 4		IN.
	TYPE/SLOT SIZE 0.01		
F	SILT TRAP LENGTH NA		FT.
G	WELL SEAL		FT.
	MATERIAL: Type I-II Cement		
H	BENTONITE SEAL 5 FT. TO 5½ FT.		
I	SANDPACK 5½ FT. TO 20½ FT.		
	TYPE/SIZE #8 Aqua		
J	BOTTOM SEAL FT. TO FT.		
	MATERIAL: None		
K	PROTECTIVE CASING	4	FT.
	W/ LOCKING CAP STICKUP	18"	FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____

0	Asphalt	Road gravel, minor brown organic-rich fine to med sand
5		Dk gray to brown-gray fine to med sand; minor rk frags & rounded pebbles; sediments are poorly graded; material is damp.
		Same; strong petroleum odor from 8-10'
10		Same; mod. strong petroleum odor
15		Same; mod. petroleum odor
20		Same
		Gray-brown, silt to very fine sand; contains minor organic debris SM
25		Total depth = 21½' bgs
30		
40		
45		
50		

Time Oil Co.

JOB NUMBER 821401 WELL/BORING NUMBER B-1

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST

ECOVA

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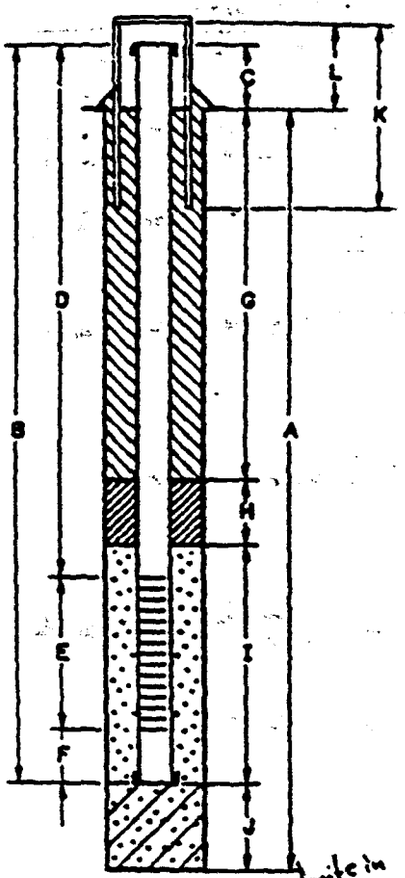
TOLS003867

BZTO104(e)040688

DRILLING METHOD Hollow Stem Auger 9¼" ID - 14" OD DATE 11-30-88

WELL COMPLETION

TOP OF CASING ELEVATION _____

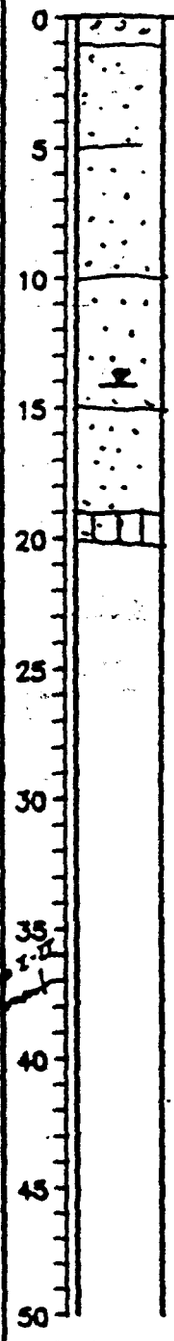


2/50# bags bentonite in mud mixture
3/100# bags Type I-II Cement

A BORING DEPTH _____ FT.
BORING DIAMETER _____ IN.
B WELL DEPTH _____ FT.
C WELL STICKUP _____ FT.
D BLANK INTERVAL ___ FT. TO ___ FT.
BLANK DIAMETER _____ IN.
E SCREEN INTERVAL ___ FT. TO ___ FT.
SCREEN DIAMETER _____ IN.
TYPE/SLOT SIZE _____
F SILT TRAP LENGTH _____ FT.
G WELL SEAL _____ FT.
MATERIAL: _____
H BENTONITE SEAL ___ FT. TO ___ FT.
I SANDPACK ___ FT. TO ___ FT.
TYPE/SIZE _____
J BOTTOM SEAL ___ FT. TO ___ FT.
MATERIAL: _____
K PROTECTIVE CASING _____ FT.
W/ LOCKING CAP
L STICKUP _____ FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____



- Road gravel & dark brown, fine to med sand
- Dk grey to brown-grey, fine to med. sand; minor rk frags & rounded pebbles; sediment is damp.
- Same; at ~7-8' depth, picks up strong sour petroleum odor.
- Same; less sour, more distinct petroleum odor
- Same
- Grey-brown, silt to very fine sand with minor organic debris
- Total depth = 20' bgs
  Cave at 12' when augers pulled
- Conductor casing in hole from 1-20' bgs
  - Casing is 19' long & bottom is resting in silt unit

ECOVA

Time Oil Co

JOB NUMBER 821401 WELL/BORING NUMBER B-2

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST DML

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TOLS003868

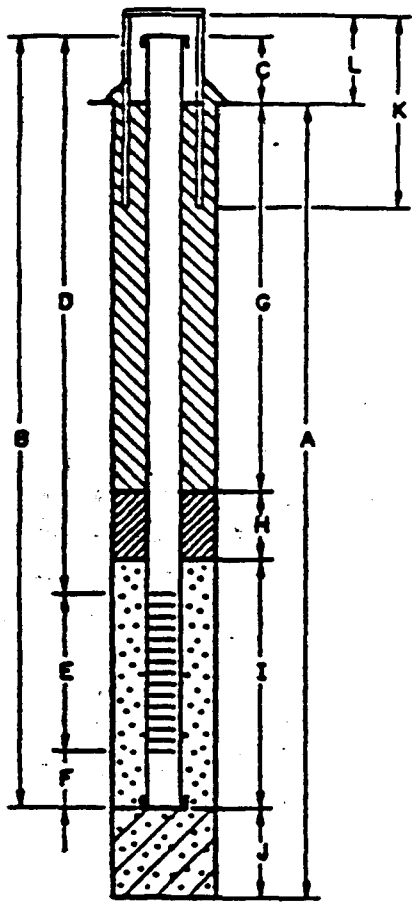
BZTO104(e)040689

WELL COMPLETION FORM

DRILLING METHOD Hollow Stem Auger DATE 12-1-88

WELL COMPLETION

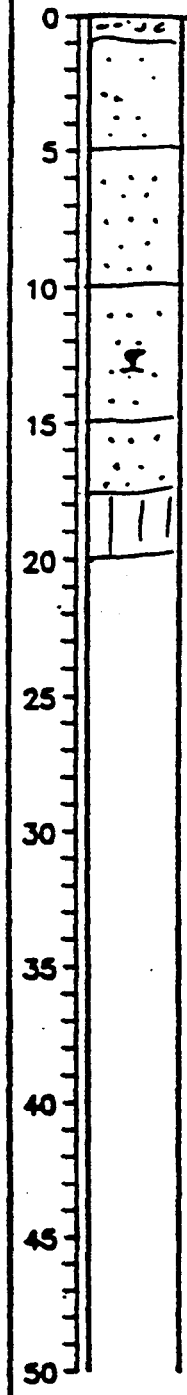
TOP OF CASING ELEVATION _____



A BORING DEPTH _____ FT.
BORING DIAMETER _____ IN.
B WELL DEPTH _____ FT.
C WELL STICKUP _____ FT.
D BLANK INTERVAL ___ FT. TO ___ FT.
BLANK DIAMETER _____ IN.
E SCREEN INTERVAL ___ FT. TO ___ FT.
SCREEN DIAMETER _____ IN.
TYPE/SLOT SIZE _____
F SILT TRAP LENGTH _____ FT.
G WELL SEAL _____ FT.
MATERIAL: _____
H BENTONITE SEAL ___ FT. TO ___ FT.
I SANDPACK ___ FT. TO ___ FT.
TYPE/SIZE _____
J BOTTOM SEAL ___ FT. TO ___ FT.
MATERIAL: _____
K PROTECTIVE CASING _____ FT.
W/ LOCKING CAP
L STICKUP _____ FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____



- Mainly coarse sand gravel
- Mix of grey-brown to brown, fine to med sand, minor pebbles & rock frags; sediment is damp
- Same; sediments have moderate sour-petroleum odor
- Same; moderate sour-petroleum odor; sediments are predominantly grey in color
- Same to about 17½', then encounter
- grey silt to very fine sand with minor flecks of brown organic matter

Total depth = 20' bgs
- hole caved to 10' bgs

2/50# bags bentonite in reaming mud mix (100 gal)
3/[illegible] bags Type I-II cement

Time Oil Co.

JOB NUMBER C21401 WELL/BORING NUMBER J-2

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST PML

ECOVA

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\STD\F30F

TOLS003869

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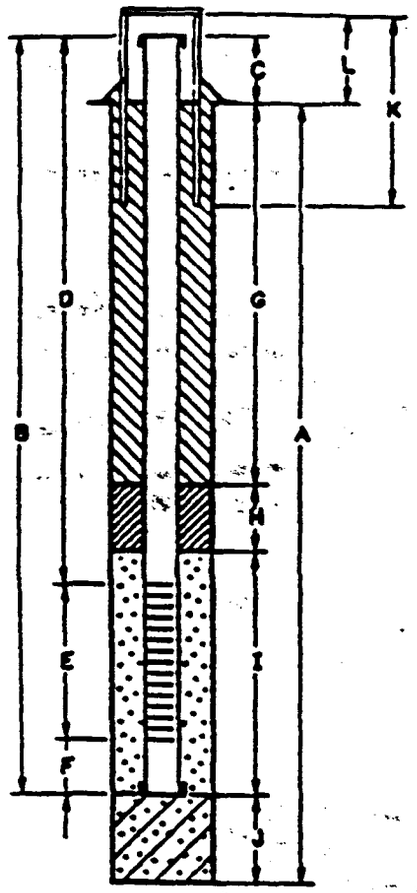
BZTO104(e)040690

WELL COMPLETION FORM

DRILLING METHOD Cable-Tool DATE 1-3-89

WELL COMPLETION

TOP OF CASING ELEVATION _____



A BORING DEPTH 40½" FT.
BORING DIAMETER 8 IN.
B WELL DEPTH 41'11" FT.
C WELL STICKUP 1'5" FT.
D BLANK INTERVAL ___ FT. TO ___ FT.
BLANK DIAMETER ___ IN.
E SCREEN INTERVAL 30 FT. TO 40 FT.
SCREEN DIAMETER 4 IN.
TYPE/SLOT SIZE .20"
F SILT TRAP LENGTH 6" FT.
G WELL SEAL 20 FT.
MATERIAL: Portland Cement
H BENTONITE SEAL 20 FT. TO 22½ FT.
I SANDPACK 21½ FT. TO 40 FT.
TYPE/SIZE Aqua 8
J BOTTOM SEAL ___ FT. TO ___ FT. None
MATERIAL: ___
K PROTECTIVE CASING 4 FT.
W/ LOCKING CAP
L STICKUP 1'8" FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____

0
5
10
15
20
25
30
35
40
45
50

Continuation or deepening of previous drilling to 20' bgs on 12-1-88.

Mixture of silt & sand. Drilling action of cable tool served to churn sediments & mix them thoroughly. Through column, from 20-40', was very wet & sloppy (runny) mix of grey, fine to med. sand, and silt was lost from boring. From 20-30', clumps of s. were avoided. But from 30-40, the mix was of runny milkshake consistency.

Total depth = 40'

Time Oil Co.

JOB NUMBER 821401 WELL/BORING NUMBER 1-2

DRAWN ___ APPROVED ___ DATE ___ ENGINEER/GEOLOGIST/HYDROLOG. DML

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FIGURE I-4

BORING LOG WELL 4

Depth in Feet.	Soil Description
0 - 1-1/2	Light brown gravelly sand, moderately compacted, moist (shovel sample)
3-1/2 - 5	Dark brown gravelly sand, moderately compacted, moist, split spoon sample (S.S. sample)
8-1/2 - 10	Light brown gravelly sand, in contact with blue gray gravelly sand, moderately compacted, moist (S.S. sample)
10 - 13	Gravelly sand
13-1/2 - 15	Light blue gray gravelly sand, moderate compaction, saturated (S.S. sample)
15 - 18-1/2	Gravelly sand
18-1/2 - 20	Light blue gray gravelly silty sand with a clay lens, moderately compacted, saturated (S.S. sample)
20 - 23-1/2	Gravelly silty sand with clay lens
23-1/2 - 25	Light gray gravelly silty fine sand with minor clay lens, moderately compacted, saturated (S.S. sample)
25 - 28-1/2	Fine sand
28-1/2 - 30	Light gray medium to fine sand, 3-1/2" thick clay lens, saturated (S.S. sample)
30 - 32-1/2	Medium to fine sand with clay lenses
32-1/2 - 35	Light gray medium to fine sand, minor clay lenses, saturated (S.S. sample)
35 - 37-1/2	Medium to fine grained sand
37-1/2 - 39	Light gray medium to fine sand (S.S. sample)
39 - 42-1/2	Light gray medium to fine sand
42-1/2 - 45	Light gray medium sand grading to fine sand with depth, minor clay lens (S.S. sample)
45 - 47-1/2	Fine sand, saturated
47-1/2 - 49	Light gray sandy silt grading to light gray silty fine sand (S.S. sample)

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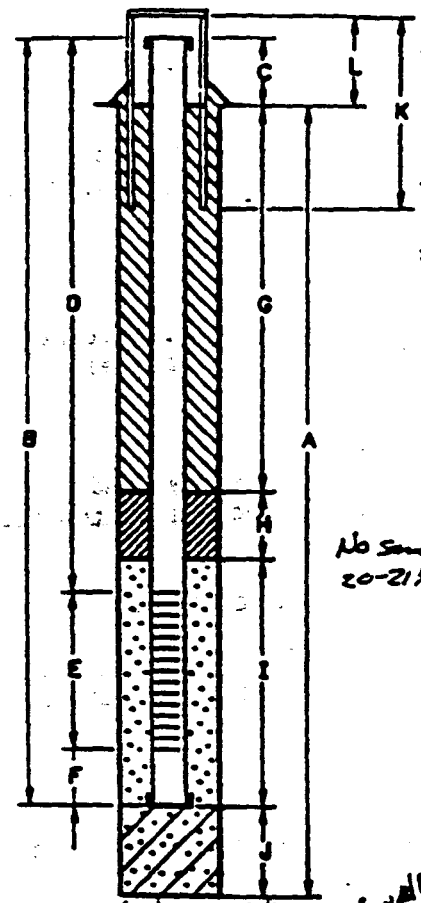
DRILLING METHOD Hollow Stem Auger DATE 11-29-88

WELL COMPLETION

TOP OF CASING ELEVATION _____

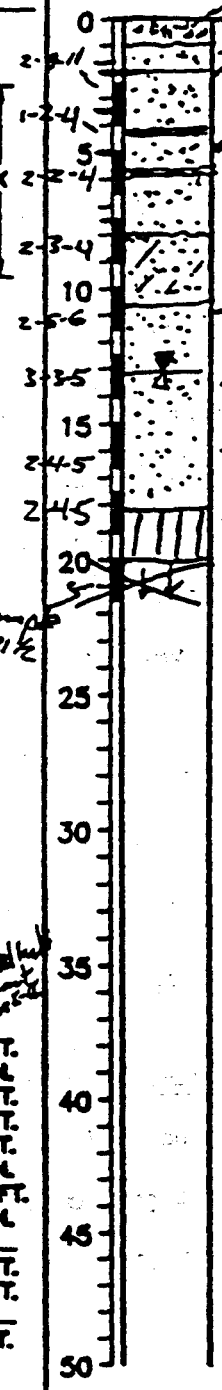


6/100# bags - Sand
1/50# bag - bentonite pellets
3/94# bags Low alkali cement Type I-II

A BORING DEPTH 20 FT.
BORING DIAMETER 14" IN.
B WELL DEPTH 20 FT.
C WELL STICKUP 19" FT.
D BLANK INTERVAL 0 FT. TO 10 FT.
BLANK DIAMETER 4 IN.
E SCREEN INTERVAL 10 FT. TO 20 FT.
SCREEN DIAMETER 4 IN.
TYPE/SLOT SIZE slotted .002"
F SILT TRAP LENGTH N/A FT.
G WELL SEAL 7 FT.
MATERIAL: Type I-II cement
H BENTONITE SEAL 7 FT. TO 8½ FT.
I SANDPACK 8½ FT. TO 20 FT.
TYPE/SIZE 8-Aqua
J BOTTOM SEAL N/A FT. TO ___ FT.
MATERIAL: _____
K PROTECTIVE CASING 4 FT.
W/ LOCKING CAP
L STICKUP 20" FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____



Lt brown to greenish-grey, med to fine mixed sand; minor rock frags of basalt; gully poor grading; slightly damp

Same; 6" section shows dk grey staining of sands; sand emits a mild sour, acrid odor; sand is damp

Same; more stained sand; odor more pronounced; sand damp

Same; half of interval is orderer stained sand; remaining sand also emits sour odor.

Same fine to med. sand; sour odor giving way to petroleum (diesel) odor; sand is wet

Same fine to med. sand; still emits petroleum odor

Grey to grey brown silt to very fine sand; still emits petroleum odor; minor flecks of brown organic debris.

Total depth = 20' bgs

Time Oil Company

JOB NUMBER 821401 WELL/BORING NUMBER J-1

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST DML

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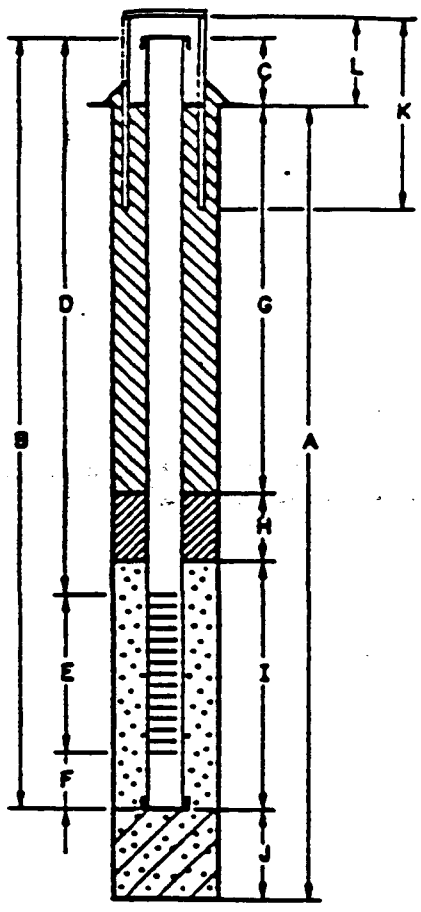
WELL COMPLETION FORM

DRILLING METHOD Hollow Stem Auger DATE 12-1-88

WELL COMPLETION

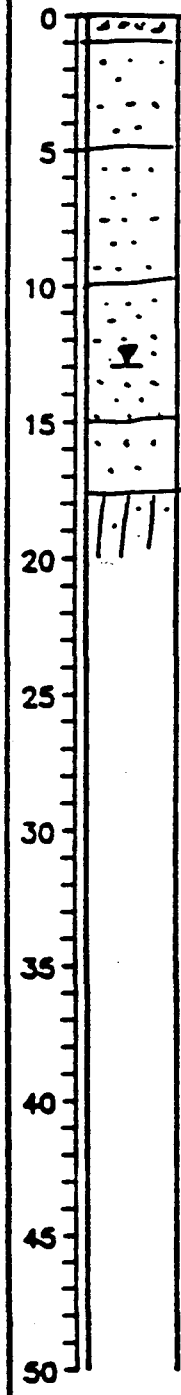
P OF CASING ELEVATION _____



A BORING DEPTH _____ FT.
BORING DIAMETER _____ IN.
B WELL DEPTH _____ FT.
C WELL STICKUP _____ FT.
D BLANK INTERVAL ___ FT. TO ___ FT.
BLANK DIAMETER _____ IN.
E SCREEN INTERVAL ___ FT. TO ___ FT.
SCREEN DIAMETER _____ IN.
TYPE/SLOT SIZE _____
F SILT TRAP LENGTH _____ FT.
G WELL SEAL _____ FT.
MATERIAL: _____
H BENTONITE SEAL ___ FT. TO ___ FT.
I SANDPACK ___ FT. TO ___ FT.
TYPE/SIZE _____
J BOTTOM SEAL ___ FT. TO ___ FT.
MATERIAL: _____
K PROTECTIVE CASING _____ FT.
W/ LOCKING CAP
STICKUP _____ FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____



Mainly coarse road gravel

- Mixture of grey brown to brown, fine to med sand; minor pebbles & rock frags; sediment is damp.
- Same; moderate sour-petroleum odor in sediment
- Same; moderate to strong odor
- Same; moderate to strong odor
- Gray silt to very fine sand; contains minor flecks of brown fibrous organic matter

Total depth = 20' bgs

2/50# bags bentonite in reaming mud mix (100 gal)

3/100# bags Type I-II cement

Top-off batch:
1/100# bag cement

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Time Oil Co

JOB NUMBER 821401 WELL/BORING NUMBER 1-3

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST DHL

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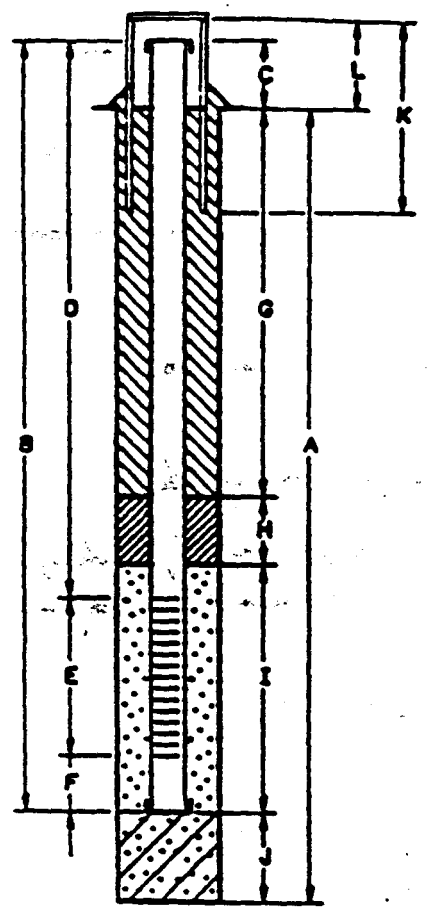
BZTO104(e)040694

DRILLING METHOD Cable Tool DATE 1-4&5-89

WELL COMPLETION

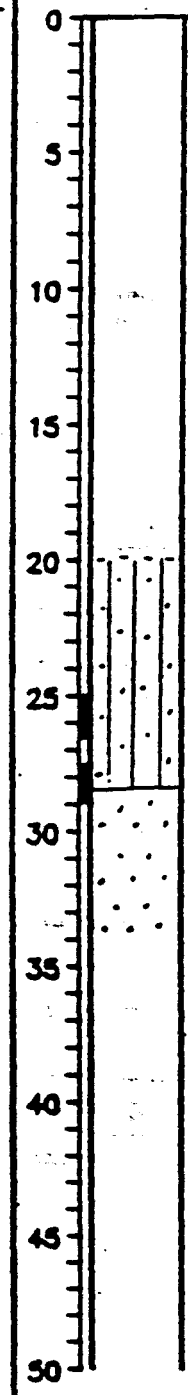
TOP OF CASING ELEVATION _____



A BORING DEPTH 33'6" FT.
BORING DIAMETER 8" IN.
B WELL DEPTH 35'1" FT.
C WELL STICKUP 19" FT.
D BLANK INTERVAL ___ FT. TO 28 FT.
BLANK DIAMETER 4" IN.
E SCREEN INTERVAL 28 FT. TO 33 FT.
SCREEN DIAMETER 4" IN.
TYPE/SLOT SIZE 0.020
F SILT TRAP LENGTH 6" FT.
G WELL SEAL 19'6" FT.
MATERIAL: Portland Cement
H BENTONITE SEAL 19'6" FT. TO 27 FT.
I SANDPACK 27 FT. TO 33'6" FT.
TYPE/SIZE Aqua 8
J BOTTOM SEAL None FT. TO ___ FT.
MATERIAL: None
K PROTECTIVE CASING 4' FT.
W/ LOCKING CAP
L STICKUP 22" FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____



This work represents deepening of J-3 & installation of well. J-3 was drilled to 20' & reamed to accept 10" steel casing on 12-1-88.

Grey sandy silt w/ brown streaks of organic material. Slight petroleum odor.

Grey, fine to med. sand.

Total depth = 33'6"

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Time Oil Co

JOB NUMBER 821401 WELL/BORING NUMBER J-3

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST DML

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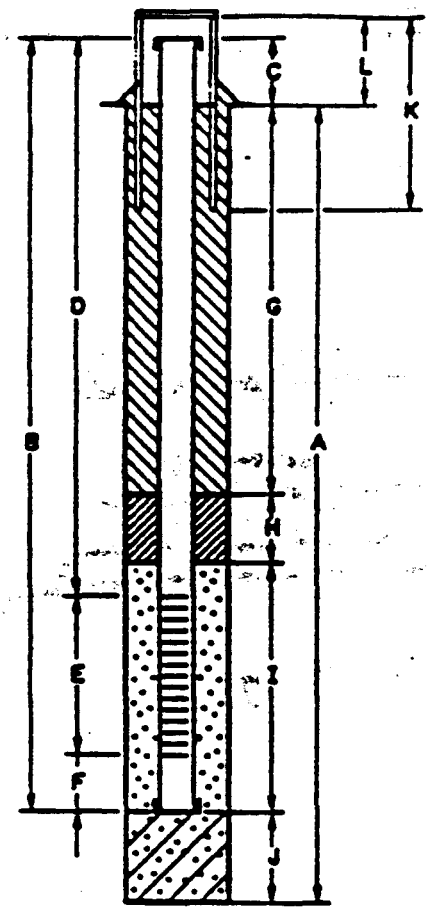
DRILLING METHOD Cable Tool DATE 1-5-89

WELL COMPLETION

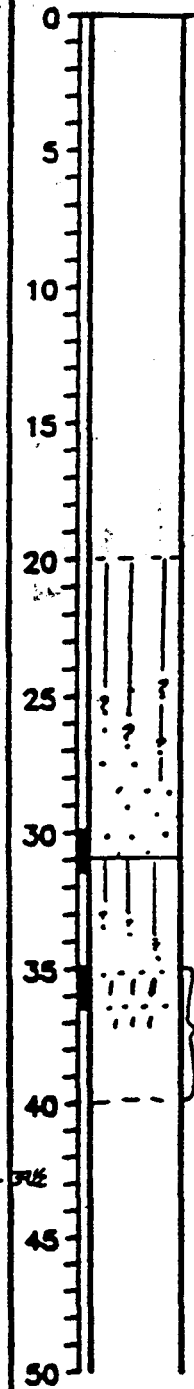
TOP OF CASING ELEVATION _____



A	BORING DEPTH	40'	FT.
	BORING DIAMETER	8"	IN.
B	WELL DEPTH	41'9"	FT.
C	WELL STICKUP	21"	FT.
D	BLANK INTERVAL	FT. TO 15	FT.
	BLANK DIAMETER	4"	IN.
E	SCREEN INTERVAL	15 FT. TO 35	FT.
	SCREEN DIAMETER	0.020 S	IN.
	TYPE/SLOT SIZE	4" AMP	
F	SILT TRAP LENGTH	6"	FT.
G	WELL SEAL	20'	FT.
	MATERIAL:	Portland Cement	
H	BENTONITE SEAL	20 FT. TO 27	FT.
I	SANDPACK	27 FT. TO 14	FT.
	TYPE/SIZE	#2 Lane B	
J	BOTTOM SEAL	FT. TO	FT.
	MATERIAL:	None	
K	PROTECTIVE CASING W/ LOCKING CAP	4	FT.
L	STICKUP	24"	FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____



This work is deepening and installation of well in B-2. B-2 was drilled to 20' & reamed to 10". 20', 10" steel conductor casing was installed & cemented

Grey, silt & sand layers. Specific composition not known.

Grey, interbedded silts & sands. Beds 6" to 2 1/4" thick.

Total depth = 40' bgs

Time Oil Co

JOB NUMBER 821401 WELL/BORING NUMBER B-2

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST DML

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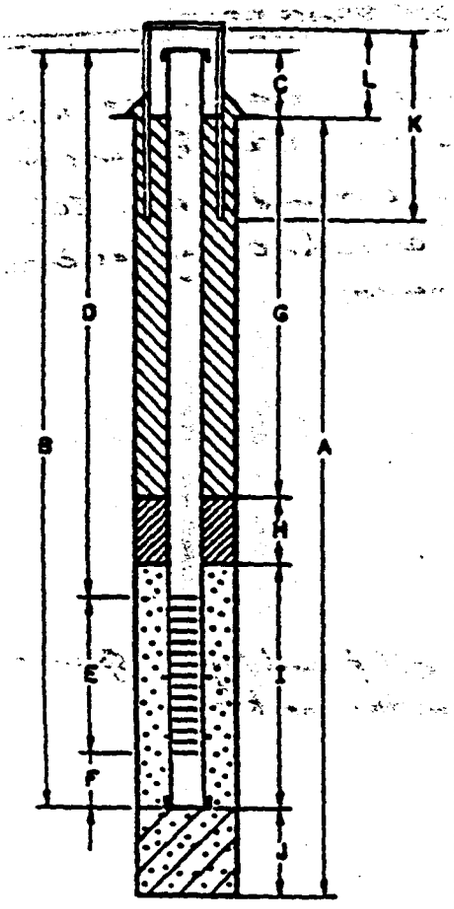
DRILLING METHOD Hollow Stem Auger DATE 11-29-88

WELL COMPLETION

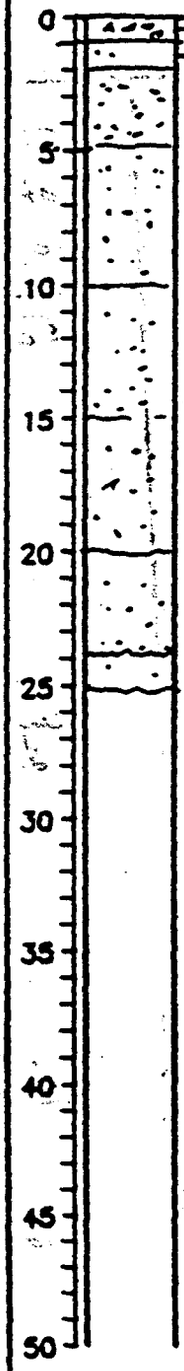
TOP OF CASING ELEVATION _____



A BORING DEPTH _____ FT.
BORING DIAMETER _____ IN.
B WELL DEPTH _____ FT.
C WELL STICKUP _____ FT.
D BLANK INTERVAL ___ FT. TO ___ FT.
BLANK DIAMETER _____ IN.
E SCREEN INTERVAL ___ FT. TO ___ FT.
SCREEN DIAMETER _____ IN.
TYPE/SLOT SIZE _____
F SILT TRAP LENGTH _____ FT.
G WELL SEAL _____ FT.
MATERIAL: _____
H BENTONITE SEAL ___ FT. TO ___ FT.
I SANDPACK ___ FT. TO ___ FT.
TYPE/SIZE _____
J BOTTOM SEAL ___ FT. TO ___ FT.
MATERIAL: _____
K PROTECTIVE CASING _____ FT.
W/ LOCKING CAP
L STICKUP _____ FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____



Coarse gravel fill
Dark brown silty sand w/ abundant root material & other organic debris
DK Grey to brown, fine to medium sand, minor rock frags & pebbles

Same

Same

Same; some slight petroleum odor

Same; distinct to strong petroleum odor
- thin seam of brown organic silt & sand - considerable organic (plant) debris

Total depth = 25' bgs

Time Oil Company

JOB NUMBER 021401 WELL/BORING NUMBER G-1

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST DML

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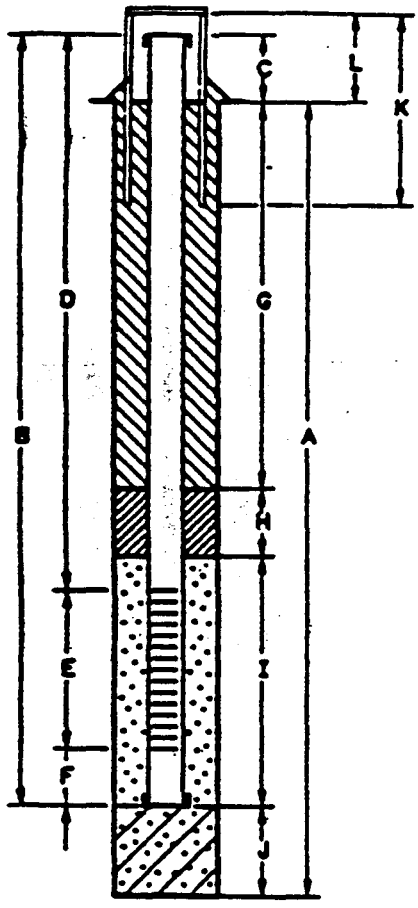
TOLS003876

BZTO104(e)040697

DRILLING METHOD Hollow Stem Auger DATE 12-2-88

WELL COMPLETION

TOP OF CASING ELEVATION _____



A	BORING DEPTH	35	FT.
	BORING DIAMETER	6	IN.
B	WELL DEPTH	35	FT.
C	WELL STICKUP	1 ft 4"	FT.
D	BLANK INTERVAL	0 FT. TO 25	FT.
	BLANK DIAMETER	2	IN.
E	SCREEN INTERVAL	25 FT. TO 35	FT.
	SCREEN DIAMETER	2	IN.
	TYPE/SLOT SIZE	0.02"	
F	SILT TRAP LENGTH	NA	FT.
G	WELL SEAL	22	FT.
	MATERIAL:	Bentonite Pellets Type II cement	
H	BENTONITE SEAL	22 FT. TO 24	FT.
I	SANDPACK	24 FT. TO 35	FT.
	TYPE/SIZE	8 Aqua	
J	BOTTOM SEAL	FT. TO	FT.
	MATERIAL:		
K	PROTECTIVE CASING W/ LOCKING CAP	4'	FT.
L	STICKUP	14"	FT.

GEOLOGIC LOG

GROUND SURFACE ELEVATION _____

0 (0.00) – Crushed road gravel & thin, brown organic-rich sand.

– Dark gray to gray-brown, fine to medium sand with minor pebbles & rock fragments; sediments are damp.

5 – Same

10 – Same

15 – Same; slight petroleum odor evident

20 – Same; moderate petroleum odor; water encountered ~ 23'

25 – Spoonsample shows 2 thin beds of gray silt to very fine sand – max thickness of 3".

30 – Same fine to med. sand

35 – Grey, silt to very fine sand – to 36½' thickness not known. Some silt on auger flights in 20-25' interval

40 Total Depth = 35'

45 2½/100# bags 8 Aqua sand
4/100# bags Type I-II cement

Top off wells – another:
4/100 # bags Type I & II cement

50

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Time Oil Co

JOB NUMBER 821401 WELL/BORING NUMBER S-1A

DRAWN APPROVED DATE ENGINEER/GEOLOGIST/HYDROLOGIST DMI

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Toxicity and Persistence Evaluation

The following guidance is based on the "Uncontrolled Hazardous Waste Site Ranking System, A Users Manual", originally published in the July 16, 1982, Federal Register (40 CFR, Part 300, Appendix A). This document should be consulted for a thorough explanation of the toxicity/persistence evaluation.

Toxicity and Persistence have been combined in the matrix below because of their important relationship. To determine the overall value for this combined factor, evaluate each factor individually as discussed below. Match the individual values assigned with the values in the matrix for the combined rating factor. Evaluate the toxicity and persistence of several of the most hazardous substances at the facility independently and enter only the highest score in the matrix below:

	Value for Persistence			
Value for Toxicity	0	1	2	3
0	0	0	0	0
1	3	6	9	12
2	6	9	12	15
3	9	12	15	18

Persistence of each hazardous substance is evaluated on its biodegradability as follows:

Substance	Assigned Value[1]
Easily biodegradable compounds	0
Straight chain hydrocarbons	1
Substituted and other ring compounds	2
Metals, polycyclic compounds and halogenated hydrocarbons	3

Toxicity of each hazardous substance being evaluated is given a value using the rating scheme of Sax [2] or the National Fire Protection Association (NFPA) [3]. Assign a value as follows:

Toxicity	Assigned Value
Sax level 0 or NFPA level 0	0
Sax level 1 or NFPA level 1	1
Sax level 2 or NFPA level 2	2
Sax level 3 or NFPA level 3 or 4	3

[1] JRB Associates, Inc., Methodology for Rating the Hazard Potential for Waste Disposal Sites, May 5, 1980.

[2] Sax, N.I., Dangerous Properties of Industrial Materials, Van Nostrand Rheinhold Company, New York, 4th Edition, 1975.
Sax, N.I., Dangerous Properties of Industrial Materials, Van Nostrand Rheinhold Company, New York, 5th Edition, 1979.

[3] National Fire Protection Association. National Fire Codes, Vol. 13, No. 49, 1977.

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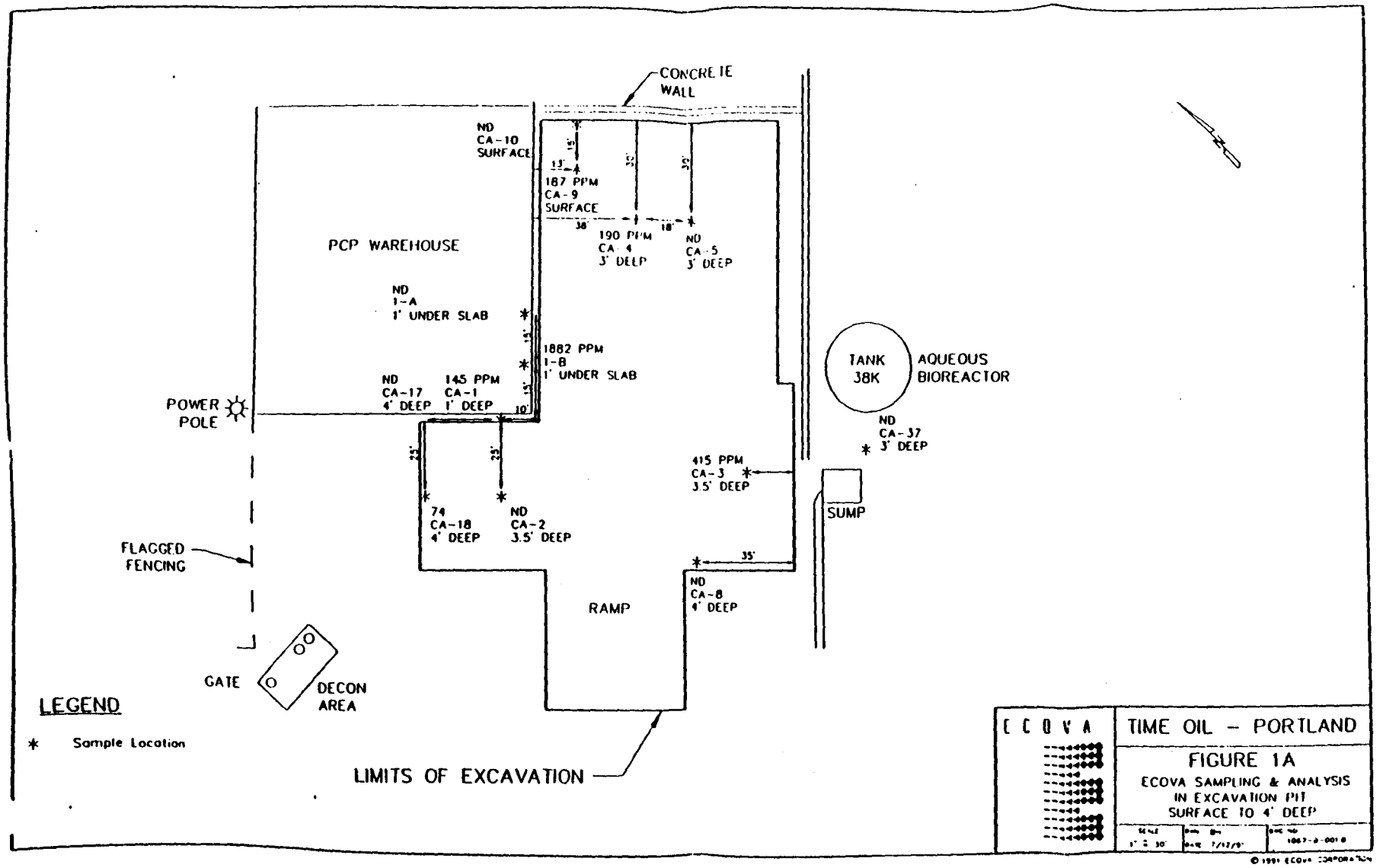

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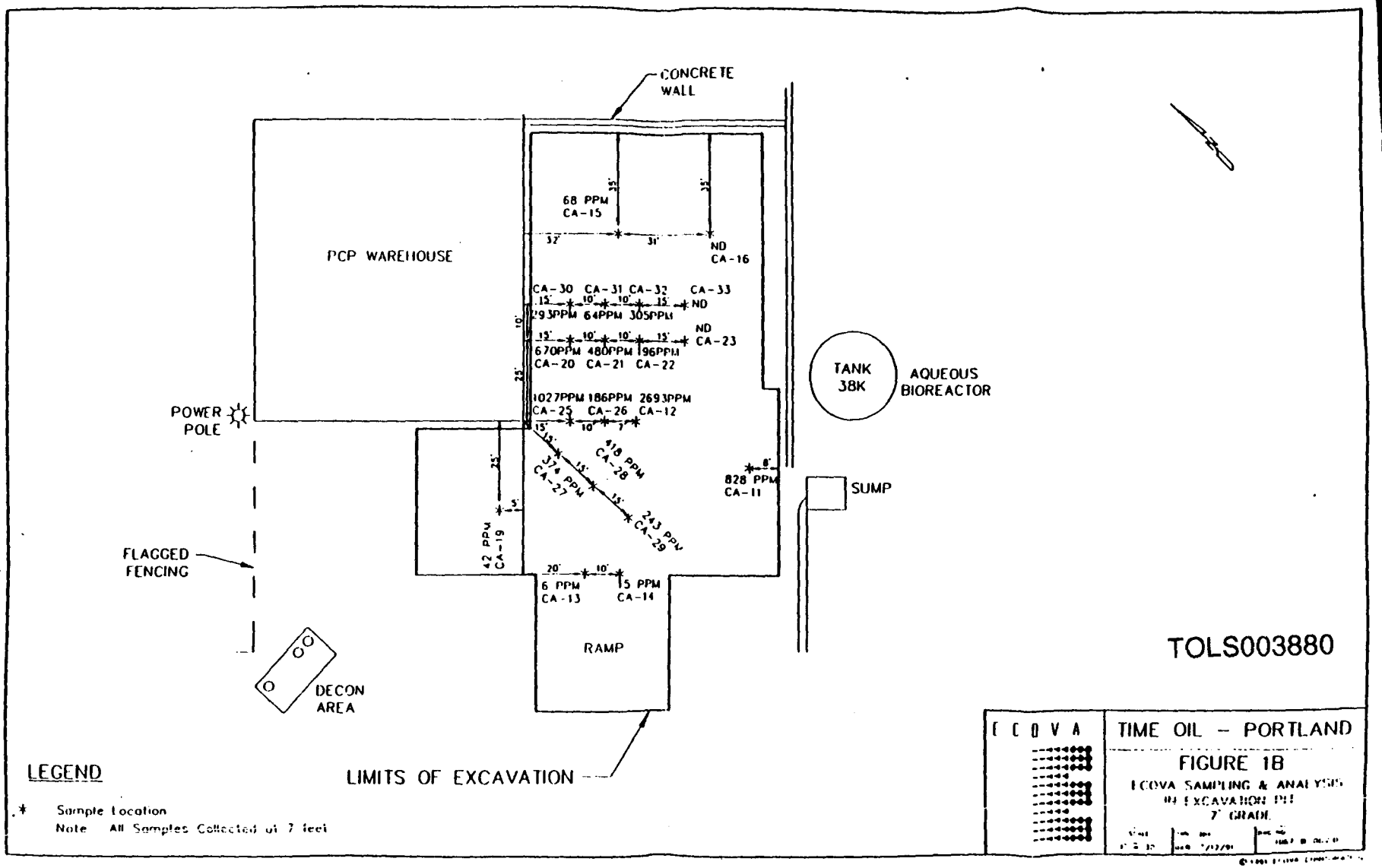

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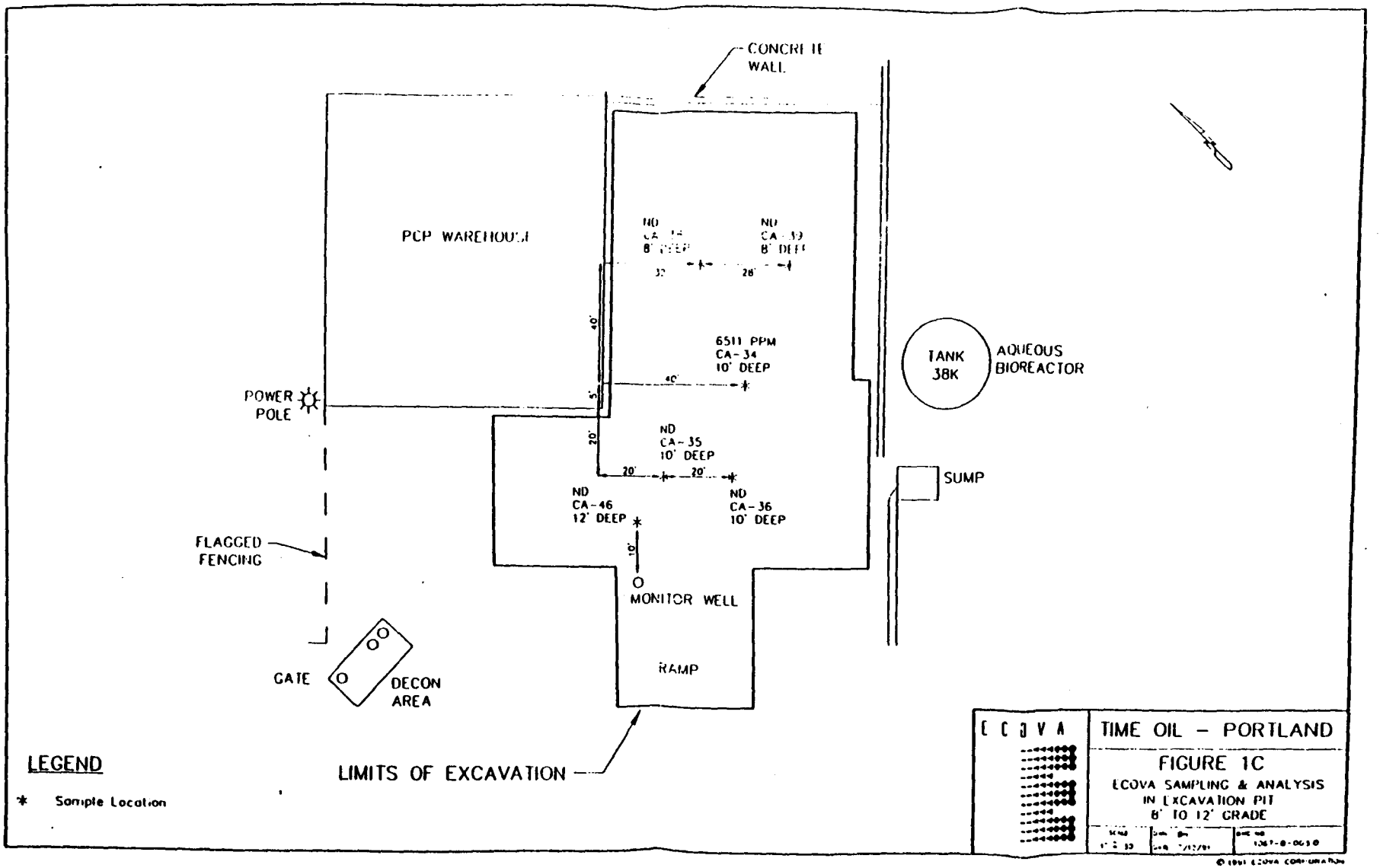

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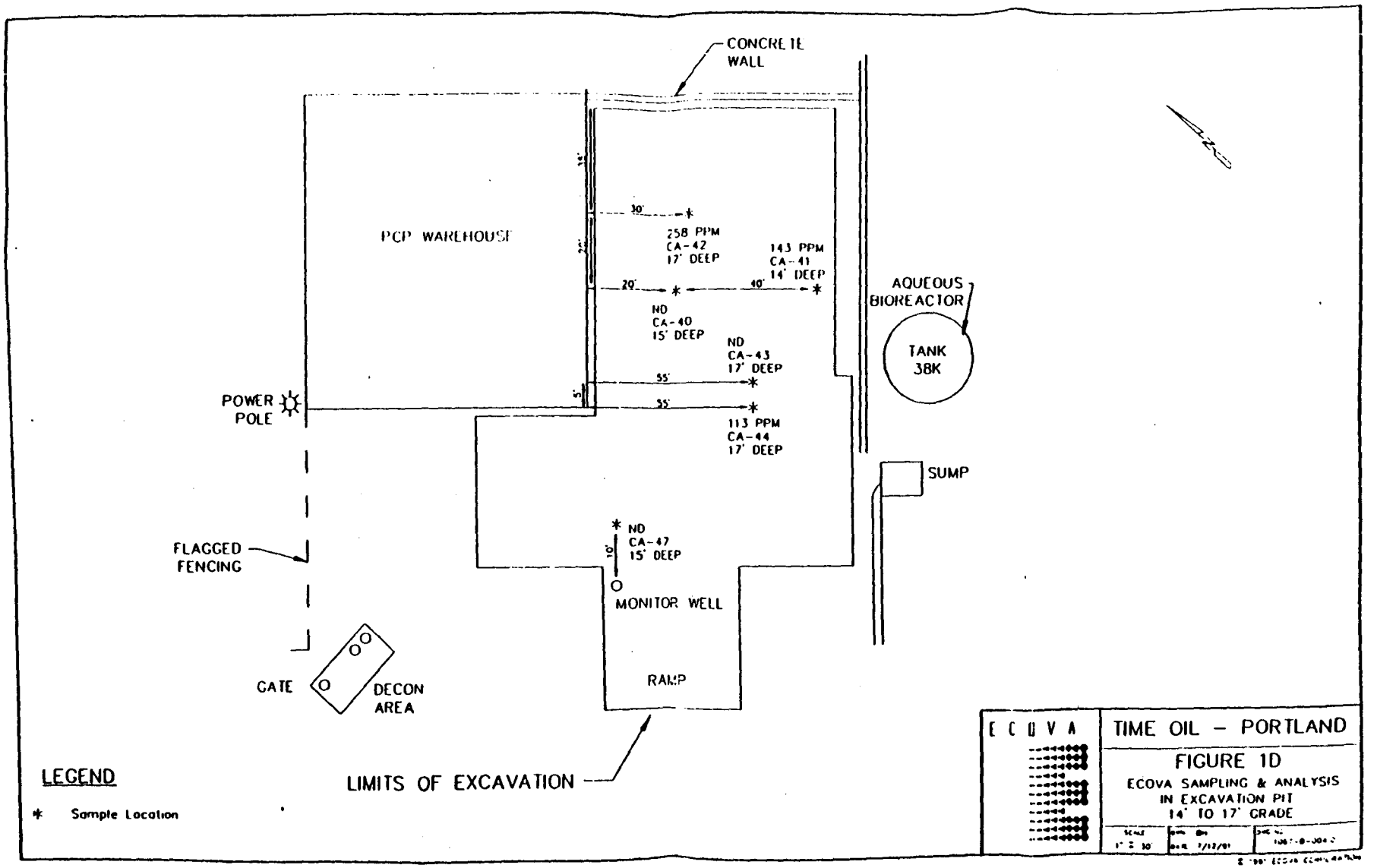

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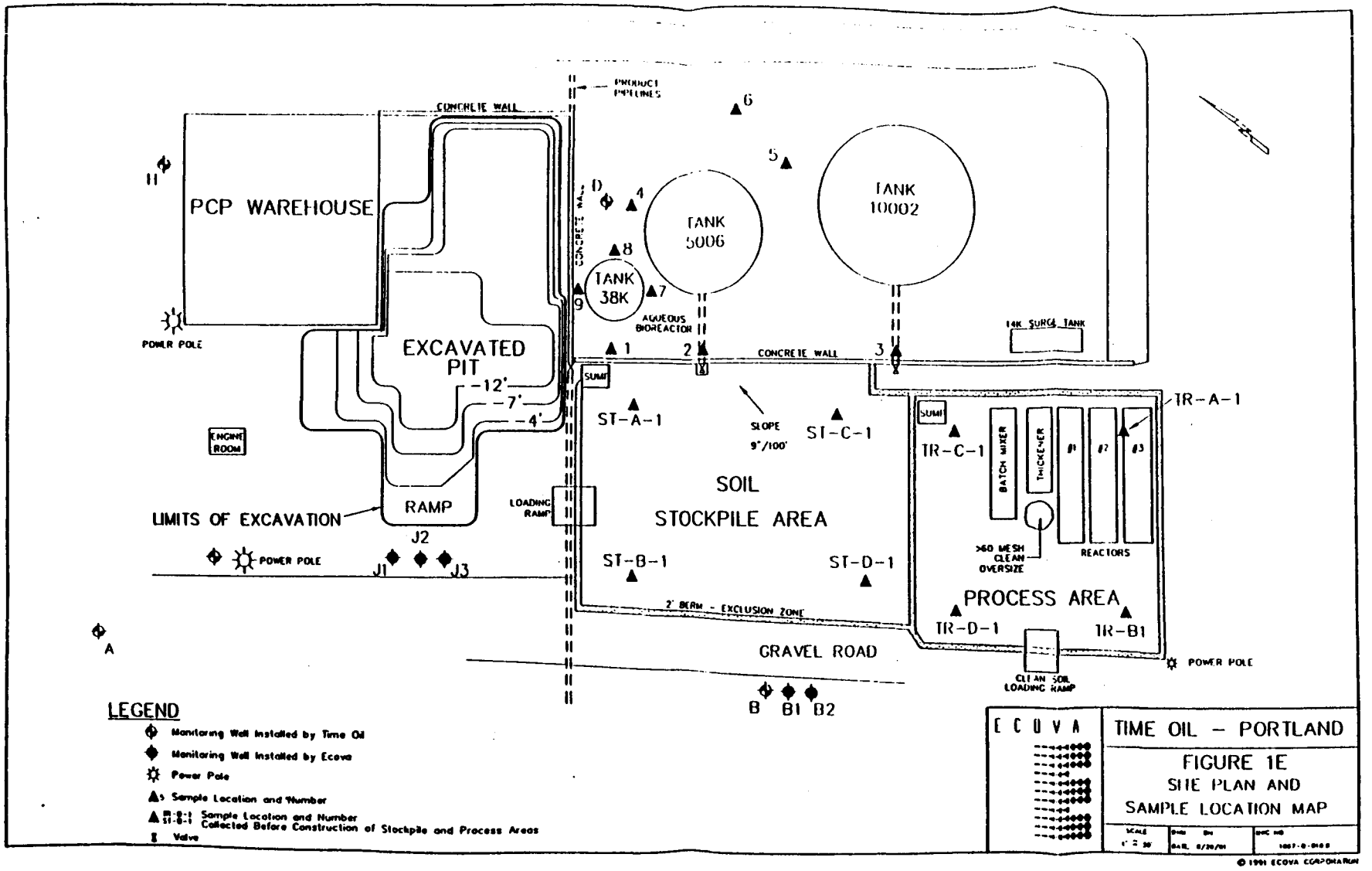

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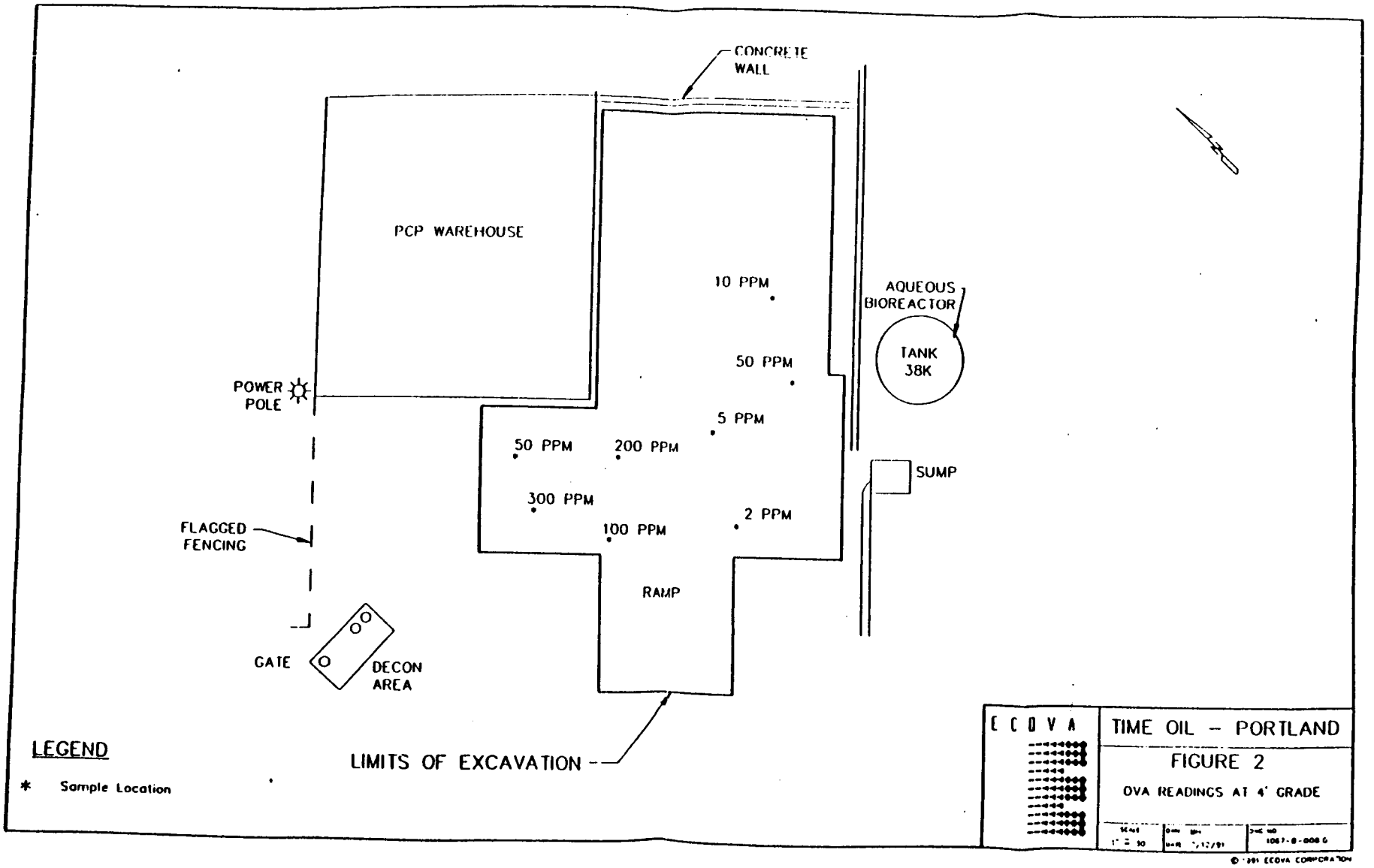
BZTO104(e)040705



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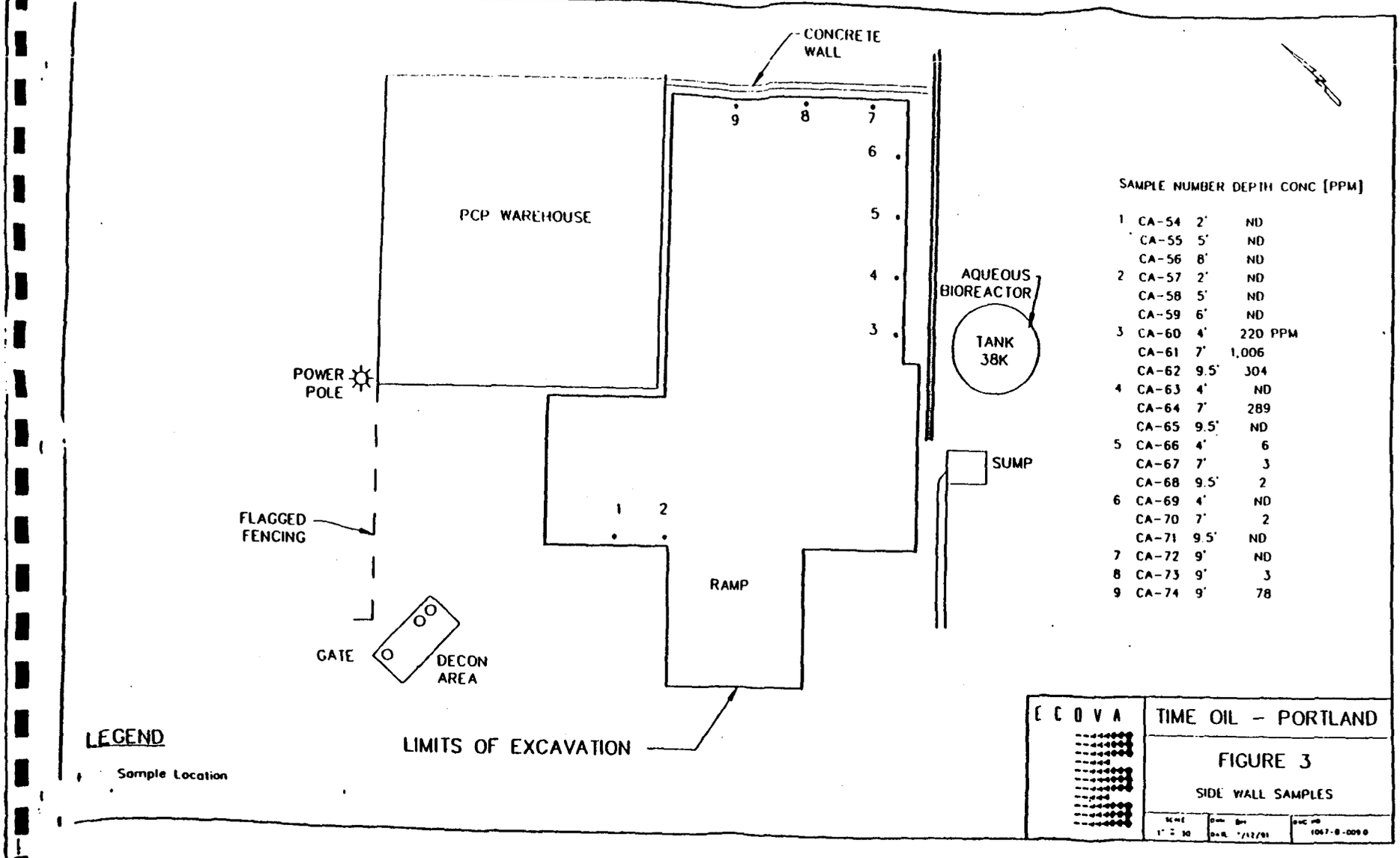

SAMPLE NUMBER DEPTH CONC [PPM]

1	CA-54	2'	ND
	CA-55	5'	ND
	CA-56	8'	ND
2	CA-57	2'	ND
	CA-58	5'	ND
	CA-59	6'	ND
3	CA-60	4'	220 PPM
	CA-61	7'	1,006
	CA-62	9.5'	304
4	CA-63	4'	ND
	CA-64	7'	289
	CA-65	9.5'	ND
5	CA-66	4'	6
	CA-67	7'	3
	CA-68	9.5'	2
6	CA-69	4'	ND
	CA-70	7'	2
	CA-71	9.5'	ND
7	CA-72	9'	ND
8	CA-73	9'	3
9	CA-74	9'	78

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TIME OIL – PORTLAND

FIGURE 3

SIDE WALL SAMPLES

BZTO104(e)040706

TOLS003885

32319

KOPPERS
Chemicals and Coatings

MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-005-4)

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

Specialty Wood Chemi

DATE OF PREP.
May 25, 1977

Section I — PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: Koppers Company., Inc., Wood Treating Chemicals Dept.

EMERGENCY TELEPHONE NO.: 314/772-2200

STREET ADDRESS: 5137 Southwest Avenue

CITY, STATE, AND ZIP CODE: St. Louis, Missouri 63110

MANUFACTURER'S CODE IDENTIFICATION:

PRODUCT CLASS: Wood Preservative (Water Repellent)

TRADE NAME: Woodtox 140T (Concentrate)

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/m³	REMARKS
Pentachlorophenol	22		0.5	
Mineral Spirits	20-30	500	2000	

Section III — PHYSICAL DATA

BOILING RANGE (760 mm Hg): 300 - 700

FREEZING POINT: 10-15°F

PERCENT VOLATILE BY VOLUME: 30

VAPOR PRESSURE AT 20° C: mineral spirits 2mm; pentachlorophenol <1mm

SPECIFIC GRAVITY (H₂O = 1): .97

EVAPORATION RATE (BUTYL ACETATE = 1): slower than ether

VAPOR DENSITY: heavier than air

SOLUBLE IN WATER - % WT.: Insoluble

APPEARANCE AND ODOR: Amber; mild solvent odor

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): 104°F PMCC (mineral spirits)

FLAMMABLE LIMITS: mineral spirits — LEL: 0.7; UEL: 6.0

EXTINGUISHING MEDIA: Class B Extinguisher, Water fog, foam, CO_2, Dry Chemical

UNUSUAL FIRE AND EXPLOSION HAZARDS: NA

SPECIAL FIRE FIGHTING PROCEDURES: Wear full protection clothing. Do not allow any exposed body surfaces. Toxic vapors given off from a fire. Use self-contained breathing apparatus. Burning may produc hydrochloric acid, carbon monoxide.

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MATERIAL SAFETY DATA SHEET

Section V — HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
ection II.

EFFECTS OF OVEREXPOSURE
ıg, coughin, irritation of nose, throat, eyes, respiratory difficulty. This product
netabolic stimulant, causes hyperthermia.

EMERGENCY AND FIRST AID PROCEDURES
ase of inhalation, remove to fresh air. In case of eye contact, flush eyes with water
r at least 15 minutes. Get medical attention. Wash off skin immediately. If swallowed,
nduce vomiting by sticking finger down throat or giving mustard, soapy, or strong salty
er. AVOID ASPIRATION. Repeat until vomit is clear. Get medical attention.

Section VI — REACTIVITY DATA

			CONDITIONS TO AVOID
ITY (One)	[ ]	UNSTABLE	Keep contents and freshly treated articles away from flame,
	[X]	STABLE	food, and living plants.

INCOMPATABILITY (Materials to avoid)
idizing agents

HAZARDOUS DECOMPOSITION PRODUCTS
O, CO_2, HCL, Phenolics

			CONDITIONS TO AVOID
ZARDOUS MERIZATION (One)	[ ]	MAY OCCUR	
	[X]	WILL NOT OCCUR	

Section VII — SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
e ve sources of ignition. Avoid contact, avoid breathing vapors. Use protective mea-
outlined in Section VIII below. Absorb spills with an absorbant such as Speedi-Dry
essed clay. Large spills can be dike and pumped into a waste container. See
tion IX below.

WASTE DISPOSAL METHOD
isposal must be carried out in accordance with local, state and federal regulations.
entachlorophenol is toxic to fish. Do not dispose near water drainage to streams or
dies of water. Bury absorbant material in an approved chemical landfill, or high
mperature incineration may be used. Do not incinerate closed containers.

Section VIII — SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)
.S. Bureau of Mines approved organic vapor and particulate matter masks (Type BE)

VENTILATION	LOCAL EXHAUST To control vapors to concentrations below TLV in SectionII.	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES Rubber gloves	EYE PROTECTION Chemical goggles

OTHER PROTECTIVE EQUIPMENT

Section IX — SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
tore in closed, properly labeled containers. Avoid prolonged and/or repeated breathing
f mist, vapors, or substantially saturated atmosphere. Avoid contact with skin. Wear
pproved goggles. Do not atomize. Use only in well ventilated area. Keep contents and
ly treated articles away from flame, food and living plants.

OTHER PRECAUTIONS
: take internally. Wash contaminated clothing before reusing. Discard contaminated
oes. Approved (USBM) respirators can be used if oxygen level above 16% and vapor con-
centration below 2%, otherwise use self-contained units. Do not use when temperature
exceeds 120°F. If spilled, blot up with an absorbant material such as Speedi-Dry absorbant
processed clay sold by Mineral & Chemicals Co., Edison, N. J.

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GENERATOR'S WASTE MATERIAL PROFILE SHEET

E13588

A GENERAL INFORMATION

GENERATOR NAME: Time Oil Co.
TRANSPORTER: Gresham Transfer Inc.
FACILITY ADDRESS: 12005 N. Burgard Rd. Portland, OR
TRANSPORTER PHONE: (503) 255-7900
GENERATOR USEPA I.D.: O R D 0 0 9 5 9 7 5 4
GENERATOR STATE I.D.:
TECHNICAL CONTACT: John P. Denham
TITLE: Environmental Manager
PHONE: (206) 285-2400
NAME OF WASTE: PCP contaminated soil
PROCESS GENERATING WASTE: Clean up of contaminated site at 12005 N. Burgard Road

B PHYSICAL CHARACTERISTICS OF WASTE

COLOR
ODOR: ☐ NONE ☐ MILD ☐ STRONG DESCRIBE
PHYSICAL STATE @ 70°F: ☒ SOLID ☐ SEMI SOLID ☐ LIQUID ☐ POWDER
LAYERS: ☐ MULTILAYERED ☐ BI-LAYERED ☒ SINGLE PHASED
FREE LIQUIDS: ☐ YES ☒ NO VOLUME
pH: ☐ < 2 ☐ 2-5 ☐ 5-10 ☒ 7 ☐ 10-12.5 ☐ > 12.5 ☐ EXACT
SPECIFIC GRAVITY: ☐ < .8 ☐ .8-1.0 ☒ 1.1-1.2 ☐ EXACT ☐ 1.3-1.4 ☐ 1.5-1.7 ☐ > 1.7
FLASH POINT: ☐ < 70°F ☐ 70°F-100°F ☐ 101°F-139°F ☐ 140°F-200°F ☐ > 200°F ☒ NO FLASH ☐ EXACT ☐ CLOSED CUP ☐ OPEN CUP

C CHEMICAL COMPOSITION (TOTALS MUST ADD TO 100%)

ntaminated soil	
pentachlorophenol	.1820
tetrachlorophenol	.0071
trace amounts of other	
chlorinated chemicals less than	.0001
Non-contaminated soil	99.812

D METALS ☐ TOTAL (PPM) ☐ EPA EXTRACTION PROCEDURE (mg/L)

ARSENIC (As)	-0-	SELENIUM (Se)	-0-
BARIUM (Ba)	-0-	SILVER (Ag)	-0-
CADMIUM (Cd)	-0-	COPPER (Cu)	-0-
CHROMIUM (Cr)	-0-	NICKEL (Ni)	-0-
MERCURY (Hg)	-0-	ZINC (Zn)	-0-
LEAD (Pb)	-0-	THALLIUM (Tl)	-0-
CHROMIUM HEX (Cr + 6)	-0-		

E OTHER COMPONENTS - TOTAL (PPM)

CYANIDES	-0-	PCB'S	-0-
SULFIDES	-0-	PHENOLICS	-0-

F SHIPPING INFORMATION

D.O.T. HAZARDOUS MATERIAL? ☒ YES ☐ NO
PROPER SHIPPING NAME: Waste pentachlorophenol mixture
HAZARD CLASS: ORM-E ID NO: NA 2020 RQ: 10 lbs
METHOD OF SHIPMENT: ☐ BULK LIQUID ☒ BULK SOLID ☐ DRUM (TYPE/SIZE)
ANTICIPATED VOLUME: GALS 260 CUBIC YARDS OTHER
PER: ☒ ONE TIME ☐ WEEK ☐ MONTH ☐ QUARTER ☐ YEAR ☐

G HAZARDOUS CHARACTERISTICS

REACTIVITY: ☒ NONE ☐ PYROPHORIC ☐ SHOCK SENSITIVE ☐ EXPLOSIVE ☐ WATER REACTIVE ☐ OTHER
OTHER HAZARDOUS CHARACTERISTICS: ☒ NONE ☐ RADIOACTIVE ☐ ETIOLOGICAL ☐ PESTICIDE MANUFACTURING WASTE ☐ OTHER
USEPA HAZARDOUS WASTE? ☒ YES ☐ NO
USEPA HAZARDOUS CODE(S): U242
STATE HAZARDOUS WASTE? ☒ YES ☐ NO
STATE CODE(S): U 242

H SPECIAL HANDLING INFORMATION

TOLS003888

☐ ADDITIONAL PAGES ATTACHED

I HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN THIS AND ALL ATTACHED DOCUMENTS IS COMPLETE AND ACCURATE AND THAT ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED

AUTHORIZED SIGNATURE TITLE DATE

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E13588

WASTE PROFILE SHEET CODE

CERTIFICATION OF REPRESENTATIVE SAMPLE

GENERAL DIRECTIONS: IN ORDER TO DETERMINE WHETHER WE CAN ACCEPT THE SPECIAL WASTE DESCRIBED IN THE ABOVE NUMBERED PROFILE SHEET, WE MUST OBTAIN A REPRESENTATIVE SAMPLE OF THE WASTE. WE WILL ANALYZE THE SAMPLE TO VERIFY THE INFORMATION YOU HAVE PROVIDED US, SO IT IS PARTICULARLY IMPORTANT THAT THE SAMPLE BE TRULY REPRESENTATIVE. IN MOST CIRCUMSTANCES YOU WILL BE OBTAINING THE SAMPLE. HOWEVER, IN THOSE CASES IN WHICH WE OBTAIN THE SAMPLE, WE MUST ASK THAT ONE OF YOUR EMPLOYEES BE PRESENT TO DIRECT THE PARTICULAR SOURCE TO BE SAMPLED AND TO WITNESS THE SAMPLING. IN SUCH CASE, YOUR EMPLOYEE MUST SIGN THIS CERTIFICATION AS A WITNESS.

THIS CERTIFICATION MUST BE RETURNED, WITH THE REPRESENTATIVE WASTE SAMPLE, TO:

THE UNDERSIGNED CERTIFIES THAT HE/SHE OBTAINED A REPRESENTATIVE SAMPLE OF THE WASTE MATERIAL DESCRIBED IN THE "GENERATOR'S WASTE MATERIAL PROFILE SHEET" ABOVE REFERENCED, AND THAT THE FOLLOWING REPRESENTATIONS ARE TRUE AND CORRECT:

1. HOUR AND DATE OF SAMPLING: 0930 Hours, February 19, 1985
2. SOURCE FROM WHICH SAMPLE TAKEN: 12005 N. Burgard Road, Portland Oregon, pentachlorophenol area shown on attached plot plan.
3. EQUIPMENT AND SAMPLING METHOD USED: Shovel and can used. Surface, one foot and two foot representative samples obtained, mixed together and placed in can.
4. AMOUNT OF SAMPLE OBTAINED: One (1) gallon.
5. TYPE OF CONTAINER INTO WHICH SAMPLE WAS PLACED: New one gallon paint can.
6. THE SAMPLING EQUIPMENT USED, AND THE CONTAINER INTO WHICH THE SAMPLE WAS PLACED, WERE THEMSELVES UNCONTAMINATED BEFORE USE. Yes.
7. AT THE TIME OF SAMPLING I AFFIXED A LABEL TO THE CONTAINER IN THE FOLLOWING FORM WITH THE FOLLOWING INFORMATION (FILL IN THIS PORTION, INCLUDING YOUR SIGNATURE, JUST AS IT APPEARS ON THE LABEL YOU PREPARED):

GENERATOR: Time Oil Co.
WASTE NAME: Pentachlorophenol mixture.
SAMPLE HOUR/DATE: 0930 Hours, Feb. 19, 1985
PROFILE SHEET CODE: E 13588
SAMPLER SIGNATURE: Neil E. Wallis

WITNESS VERIFICATION: I WAS PERSONALLY PRESENT DURING THE SAMPLING DESCRIBED; I DIRECTED THE WASTE SOURCE TO BE SAMPLED; AND I VERIFY THE INFORMATION ABOVE NOTED.

WITNESS: John H. Somes
SIGNATURE: John H. Somes
TITLE: General Manager
EMPLOYER: North West Vacuum Truck Service
DATE: February 19, 1985

SAMPLER NAME: Neil E. Wallis
SIGNATURE: Neil E. Wallis
TITLE: Terminal Manager
EMPLOYER: Time Oil Co.
DATE: February 19, 1985

LABORATORY REVIEW OF SAMPLING PROTOCOL

BASED UPON MY REVIEW OF THE ABOVE PROFILE SHEET, I CONCLUDE THAT THE ABOVE METHODOLOGY IS:

☐ ADEQUATE FOR YIELDING A REPRESENTATIVE SAMPLE.
☐ INADEQUATE FOR THE REASONS NOTED HEREON.

DATE:
LAB MGR:

FORM WM-51 (Rev 8/83)
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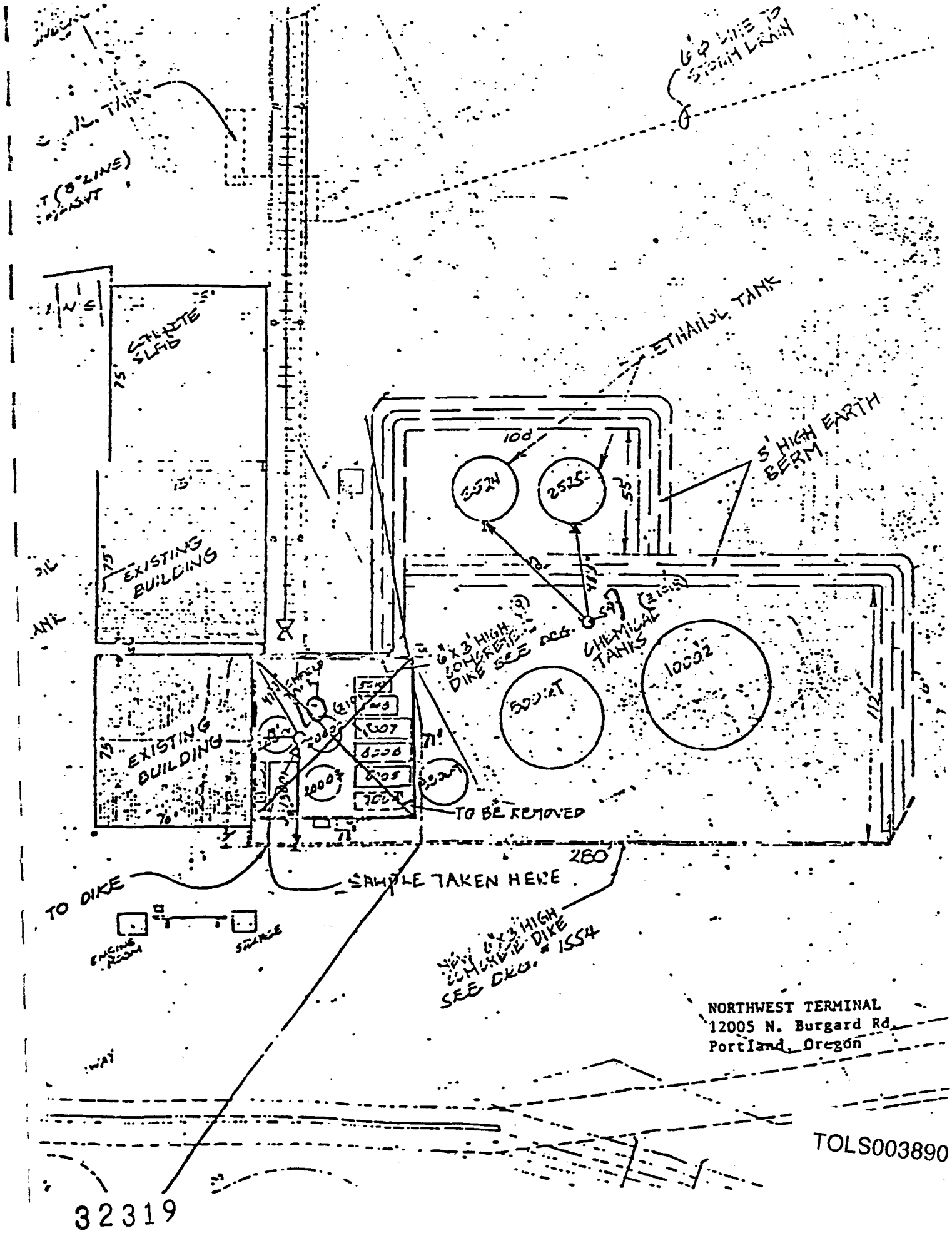
ETHANOL TANK
5' HIGH EARTH BERM
EXISTING BUILDING
EXISTING BUILDING
CONCRETE SLAB
CHEMICAL TANKS
6'X3' HIGH CONCRETE DIKE SEE DRG.
TO BE REMOVED
SAMPLE TAKEN HERE
TO DIKE
ENGINE ROOM
SPRINKLER
6'X3' HIGH CONCRETE DIKE SEE DRG. 1554
NORTHWEST TERMINAL
12005 N. Burgard Rd.
Portland, Oregon
TOLS003890
32319
BZTO104(e)040711

DATE: 03 JAN 85

LAB #: 84-1020
ITEM #: 10
SAMPLE: 21017

LEGAL

ACID EXTRACTABLES
METHOD 625
EXTRACTED BY RCRA METHOD 3540

AMOUNT MG/KG	PARAMETER
<1	PHENOL
<1	2-CHLOROPHENOL
<1	2-NITROPHENOL
<1	2,4-DIMETHYLPHENOL
<1	2,4-DICHLOROPHENOL
<1	4-CHLORO-3-METHYLPHENOL

AMOUNT MG/KG	PARAMETER
<1	2,4,6-TRICHLOROPHENOL
<1	2,4-DINITROPHENOL
<1	4-NITROPHENOL
<1	2-METHYL-4,6-DINITROPHENOL
1020	PENTACHLOROPHENOL
71	TETRACHLOROPHENOL **

** REPORTED AS
2,3,4,6-TETRACHLOROPHENOL

BASE/NEUTRAL EXTRACTABLES
METHOD 625

AMOUNT MG/KG	PARAMETER
<1	BIS(2-CHLOROETHYL) ETHER
<1	1,3-DICHLOROBENZENE
<1	1,4-DICHLOROBENZENE
<1	1,2-DICHLOROBENZENE
<1	HEXACHLOROETHANE
<1	N-NITROSO-DI-N-PROPYLAMINE
<1	NITROBENZENE
<1	ISOPHORONE
<1	BIS(2-CHLOROETHOXY) METHANE
<1	1,2,4-TRICHLOROBENZENE
<1	NAPHTHALENE
<1	HEXACHLOROBUTADIENE
<1	HEXACHLOROCYCLOPENTADIENE
<1	2-CHLORONAPHTHALENE
<1	ACENAPHTHYLENE
<1	DIMETHYLPHTHALATE
<1	2,6-DINITROTOLUENE

AMOUNT MG/KG	PARAMETER
<1	ACENAPHTHENE
<1	2,4-DINITROTOLUENE
<1	FLUORENE
<1	DIETHYLPHTHALATE
<1	N-NITROSODIPHENYLAMINE
<1	4-BROMOPHENYL PHENYL ETHER
<1	HEXACHLOROBENZENE
<1	PHENANTHRENE
<1	ANTHRACENE
<1	DIBUTYL PHTHALATE
<1	FLUORANTHENE
<1	PYRENE
<1	BUTYL BENZYL PHTHALATE
<1	BENZ(A)ANTHRACENE
<1	CHRYSENE
<1	3,3'-DICHLOROBENZIDINE
<1	BIS(2-ETHYLHEXYL) PHTHALATE
<1	BENZ(A)PYRENE

TOLS003891

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BZTO104(e)040712

PHONE 285-2400
CABLE ADDRESS: TIMOIL
(FAX) 206-283-8036

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

TIME OIL CO.

2737 WEST COMMODORE WAY
P.O. BOX 24447

SEATTLE, WA 98199-1233
SEATTLE, WA 98124-0447

March 17, 1993

Ms. Susan Keith
Geraghty & Miller, Inc.
8330 - 154th Ave. NE
Redmond, Washington 98052

RE: Request for Proposal
Time Oil Co. Northwest Terminal Project
12005 North Burgard, Portland, OR 97203

Dear Ms. Keith:

Thank you for submitting your Statement of Qualifications in response to the Time Oil Co. request dated January 15, 1993. We have received and reviewed all the submittals and are pleased to inform you that your firm has been selected as a short list finalist. To make the final selection, we are requesting that a proposal be submitted which describes your firm's approach to conducting the scope of work outlined below.

Site background was provided in the Request for Qualifications document. Additional site background is contained in the documents attached to this RFP.

PROJECT GOALS

Our goals will be to continue working with the Oregon Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA) to bring the soil pile storage into compliance, limit the scope of the investigation to the penta contaminated areas and to establish a risk based, achievable cleanup level considered protective to both the environment and human health. Time's ultimate goal is to pursue innovative and cost effective remediation of the site in a manner that will minimize long term liability.

SCOPE OF WORK

For the purposes of this proposal, assume that the scope of work involves only engineering and site investigation at the former penta mixing facility at Time's Northwest Terminal and no other sites at the terminal. To date, DEQ has only required the evaluation and design of a RCRA storage facility for the soil pile, leaving many issues to be addressed. Your insight in anticipating future requirements and directing the project is sought.

The scope of work outlined below includes what we feel to be a minimum number of tasks necessary to complete the project. With adequate justification, you are invited to add or delete tasks.

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Task 1 - Meetings: Regulatory and Planning

The selected consultant will assist Time in its continuing negotiations with DEQ. These meetings will be aimed at presenting and negotiating cost effective,

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attainable objectives for the storage issues, site assessment and eventual cleanup level negotiations. These meetings will set the stage for much of the project.

For the purposes of scoping this task the following two subtasks are suggested:

a. To prepare for anticipated meetings the consultant will review existing data and identify data gaps in the work performed to date. Time Oil project files in the Seattle office will be made available for review.

b. Include sufficient time for a kick-off meeting with Time at our Seattle offices. Assume that three meetings will be attended with Time staff in Seattle to prepare for the DEQ meetings, and that two meetings will be attended with DEQ at its offices in Portland. The consultant will prepare necessary agenda and presentation documents, take detailed notes of the DEQ meeting and prepare meeting minutes for submittal to Time.

Task 2 - <u>RCRA Storage Unit</u>

During a meeting held February 16, 1993, DEQ required that Time prepare a plan for proper storage of the soil pile within 6 months. The plan must include engineering and design of an on-site RCRA Storage Facility or Containment Building for the soil pile.

A storage unit which meets the design and construction requirements of RCRA must be selected, designed, and constructed at the Northwest Terminal facility. The unit(s) must be designed for indefinite storage of the excavated soil pile and possibly water contaminated with an F027 listed waste. Present storage requirements will be for approximately 3,000 yd^3 of soil, additional soil may be generated during assessment and cleanup. In addition, you will be required to review the requirements for treatment, storage, monitoring and disposal of penta contaminated water presently stored on site. Approximately 500,000 gallons of water have been collected from run-off, pump tests and decommissioning of the slurry reactors.

For this task, the selected consultant will:

- review current storage of each penta contaminated media at the site;
- identify a minimum of two alternative storage unit options for each media;
- evaluate and recommend to Time appropriate options for each media and provide preliminary cost estimates and permitting requirements for each option within two (2) months of authorization to proceed on contract;
- proceed with design and permitting of the unit selected by Time Oil;
- finish and submit draft design within three (3) months of receipt of authorization to proceed on this contract;
- final draft design for submittal to DEQ by August 31, 1993.

Final deliverables for this task will include an engineer's cost estimate for the construction of a RCRA storage unit(s) for each media. After final selection and regulatory approval of the storage unit design, you will prepare a complete set of design (P&ID) drawings and specifications, that can be used to solicit bids from construction firms. Submit a minimum of three copies for review, approval and permitting.

Task 3 - RFI Site Characterization

Feedback from our meetings and those with DEQ and EPA will guide the direction of the RFI Site Characterization. Based upon the outcome of the meetings, an initial Draft Work Plan will be prepared for Time's review which will detail the RFI studies to be performed. Please describe in detail the proposed approach to conducting the RFI studies. Minimum requirements of the site characterization will include the following subtasks:

- surface and subsurface soil sampling in the areas of the site not previously excavated or sampled and other areas identified during review of files;
- installation of additional groundwater monitoring wells, based on review of existing well placement and completion depths;
- aquifer characterization and groundwater monitoring to evaluate site hydrogeology and potential contaminant migration;
- groundwater modeling as needed to assist with remedial design;
- review contaminant chemistry.

Significant data has been collected on the distribution of penta throughout the mixing area, however, characterization of penta carrier agents and other chemicals used in the mixing process will be required. This sub-task will identify and define the distribution of contaminants of concern for the risk assessment. Analysis of soil and groundwater for volatile organics and confirmation sampling of soil for dioxins and furans may be required. Please review the data presented in the SOQ request and RFP, and suggest an approach for performing the characterization of the unknown woodtreating chemical constituents. The volume and expense of analytical testing anticipated for this project will require the competitive bidding of analytical work.

Workplan Preparation and Implementation: To complete the assessment of contaminant distribution at the site, additional soil and groundwater sampling will be performed by conducting the field program described in the Final Work Plan. Prior to implementation of the of the Work Plan, you will submit a cost proposal for the implementation. Time Oil Site Assessment Guidelines and Cost Estimating Sheet are attached as an example of the format expected for all cost proposals. Elements of the Work Plan will include, at a minimum:

- Site background information
- Goals and objectives of the RFI/CMS investigation
- Provide detail of sampling methodology; map showing the proposed sampling locations; provide a table showing analyses to be performed.
- Field Standard Operating Procedures (SOPs)
- Description of deliverables from the investigation
- Health & Safety Plan
- Schedule of Project Activities and Milestones

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Task deliverables will include:

- initial Draft Work Plan	for Time's review	3 copies
- Draft Work Plan	for Time and DEQ review	6 copies
- draft Final Work Plan	for Time for comments.	3 copies
- Final Work Plan	to Time and DEQ	6 copies
- Cost proposal	for Time's review	3 copies

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RFI Site Characterization report summarizing work performed will include preliminary draft, draft, and final report. Three copies of the preliminary draft and six copies of draft and final reports will be submitted.

Task 4 - Risk Assessment

A cursory risk analysis has been performed for the site; however, after determining the complete list of contaminants of concern and the lateral and horizontal extent of contaminants, a more thorough risk assessment may be necessary to evaluate what cleanup levels will be adequately protective of human health and the environment. The risk assessment will serve as a tool in the negotiation of cleanup levels to be applied at this site.

Deliverables for this task will include a preliminary draft, draft, and final risk assessment report that summarizes work performed. Three copies of the preliminary draft and six copies of draft and final reports will be submitted.

PROJECT MANAGEMENT REQUIREMENTS

The project schedule will be driven by continuing negotiations with DEQ and EPA and Time's desire to keep one step ahead of them. Time will be required to submit a status letter to DEQ on April 30, 1993 (to be completed by Time staff). Selection and design of proposed storage facilities are to be presented to DEQ on August 31, 1993 (to be completed by the consultant).

Although your company has proposed a project team in your SOQ, we request that you provide a project team organizational chart. If your team is to be significantly modified, please provide rational for your changes. Also provide a brief description of the responsibilities of each of the key project team members and an estimate of their involvement (time) on the project.

Monthly budget tracking will be required for the duration of the project. The summary must be keyed to the tasks outlined in the Scope of Work (example attached). At a minimum, the summary must reflect the budgeted amount, the committed costs, the estimate to complete and the cash flow total for the prior month. These reports will be prepared and keyed to the monthly invoices and must include detailed subcontractor (committed) costs and work completed to date. A project status report must accompany the monthly budget report which will include the following items:

1. Summary of work performed during the previous month;
2. Discussion of problems encountered and steps taken to resolve them;
3. Work to be performed during the next month;
4. Information from or action by Time Oil needed to continue work;
5. Updated schedule showing scheduled activity and project milestones;

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PROPOSAL FORMAT

Please prepare the proposal following the format described below:

1. Transmittal Letter
2. Section A - Scope of Work
3. Section B - Project Staff (If revised from SOQ please justify revisions)
4. Section C - Schedule (Breakdown activities within each task)
5. Section D - Cost Proposal by task and subtask (Must include labor hour estimates, hourly rates, fee schedule, subcontractor estimates, expense detail, Proposal Worksheet, etc.)

Our goal is to receive proposals for the selection and design of storage facilities and the characterization of the site. We realize firm estimates for tasks 3 and 4 may be difficult at this time; however, please consider all of the information provided in the request for SOQ and attachments to the RFP. Explore the probable scenarios and conditions which may be encountered at this facility and provide contingencies for them in your proposal.

Please limit proposals to 40 pages or less, which includes all text, graphics, tables, and personnel biographies. Please do not use type fonts for text smaller that 10 points. Please submit 3 copies of your proposal.

A copy of Time Oil's standard contract is attached. Any questions or concerns about items contained in this contract should be discussed in Section D of the Proposal. Please note: maximum 10% subcontractor handling charges.

Based on our evaluation of the proposals, Time will select not more than three (3) companies to be interviewed. The interview will be held at Time's offices and will last approximately one (1) hour. Your senior project team members will be required to attend the interview. Discussions will be limited to this project and your proposal.

EVALUATION CRITERIA

The proposals will be ranked in part on demonstrated understanding of the issues and the possibilities of applied solutions. The following criteria will be used in making the final selection:

1. Project team qualifications and experience with RCRA issues, permitting, RFI/CMS process, regulatory negotiations and storage unit design;

2. Proposed technical approach including: innovativeness, thorough review of the data provided, soundness of methods, alternatives which may save time/cost; All aspects of your proposal will be evaluated by these measures.
   - Quality of written materials submitted; and
   - Responsiveness to requested items.

3. Cost effectiveness in approach and management of the project will receive significant consideration. Cost estimate must be detailed as possible;

4. Quality of oral presentation of proposal.

SCHEDULE

The current anticipated schedule for selection of the consultant is as follows:

Receipt of Questions by FAX	March 30 (close of business)
Response to Questions	April 1
Receipt of Proposals	April 8 (close of business)
Oral Presentations	April 19
Consultant Selection	April 23
Kick-off Meeting	April 26
Draft facility design to Time	July 26
Submission of facility design to DEQ	August 31

With completion of this systematic program, cleanup goals which are technically achievable and which are protective of present and future public health, safety, and welfare in the environment can be established. A successful site cleanup program which employs permanent, cost effective technologies can then be implemented.

As stated in the Request for Qualifications, this project is very important to Time. Project execution within schedule, work product quality requirements, and budget will be critical. Time expects that the selected consultant will give this work high priority within their organization.

Thank you for your efforts to date and continued interest in working with Time Oil Co. We are looking forward to reviewing your proposal. If you have any questions please call; my direct line is (206) 286-6443, or FAX (206) 285-7833.

Sincerely,

Kevin M. Murphy
Senior Environmental Specialist

Attachments: Site Maps, Assessment Guideline,
Contract, Cost Analyses Format,
Proposal Worksheet, Preliminary Assessment Data

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BZTO104(e)040718

PRELIMINARY ASSESSMENT / DATA EVALUATION AND PROPOSED REMEDIATION PLAN FOR PENTACHLOROPHENOL CONTAMINATED SOIL AT:

TIME OIL CO.

NORTHWEST TERMINAL
12005 NORTH BURGARD ROAD
PORTLAND, OREGON

VOLUME III - WORK PLAN

ECOVA Corporation
18640 NE 67th Court
Redmond, WA 98052

Project No. 1067

December, 1991

ECOVA

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TOLS003898

BZTO104(e)040719

Work Plan
for
Soil and Groundwater Remediation
Time Oil Northwest Terminal
Portland, Oregon

to

TIME OIL COMPANY

Submitted by:

ECOVA CORPORATION
3820 159th Avenue NE
Redmond, Washington 98052
Project Number: 821401

September 12, 1988

TOLS003899

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BZTO104(e)040720

NONDISCLOSURE STATEMENT

The following information, furnished in connection with the Preliminary Work Plan for Soil and Groundwater Remediation, Time Oil Northwest Terminal, Portland, Oregon, specifically identified in Section 2.2 - Conceptual Engineering Design, 4 - Project Costs, Appendix C - Ecova PCP Research, and Appendix D - Analytical Data Report of this Work Plan, constitutes trade secrets or confidential commercial and financial information which the Offeror believes to be exempt from disclosure. The Offeror requests that this information not be disclosed to the public, except as may be required by law. The Offeror requests that this information not be used in whole or part by Time Oil for any purpose other than to evaluate the Work Plan, except that if a contract is awarded to the Offeror as a result of or in connection with the submission of the Work Plan, Time Oil shall have the right to use the information to the extent provided in the contract.

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1. INTRODUCTION

Ecova Corporation was retained by Time Oil Company to develop a Preliminary Work Plan for remediating soil and groundwater contaminated with pentachlorophenol (PCP) at its "Northwest Terminal" in Portland, Oregon. This work plan outlines the approach that Ecova proposes to follow in conducting the work, including design and installation of the slurry/liquid treatment facilities, biodegradation of PCP contamination, dewatering of the slurries after treatment, and final disposal of treated soil and groundwater. The work plan also addresses Ecova's participation in support of regulatory agency approval of the remediation plan. Included in this work plan are descriptions of the individual tasks to be performed, the management team assigned to carry out the project activities (Section 3.0), the project schedule showing task duration and milestones (Section 4.0), and the project costs provided in Section 5.0.

1.1 SITE BACKGROUND

Time Oil operates a petroleum products terminal in Portland, Oregon, that provides tank storage facilities for its products as well as custom storage for outside customers. Until recently, Time Oil also operated a PCP mixing facility at the Northwest Terminal to produce products for a woodtreating chemicals manufacturing and distributing firm. Operations included melting blocks of virgin PCP, mixing with mineral spirits, and repackaging the mixture for shipment. Operations were discontinued at the plant several years ago.

During the time of plant operation, soils beneath and nearby the processing units became contaminated with the PCP product, especially around the drum or tank loading area near the woodtreating chemicals warehouse. Since the decommissioning of the plant, all of the PCP processing units have been removed.

Time Oil has conducted a number of investigations of the extent of PCP contamination in the soils surrounding the facility and in downgradient groundwater. As a result of their confirmation of the presence of PCP in these media, Time Oil retained Ecova to study the information available and to develop this preliminary work plan for cleanup actions. At present, there is no active enforcement action being taken relative to the site by any regulatory agency.

1.2 SITE CHARACTERISTICS

The site is located on the northern bank of the Willamette River, in the city of Portland, Oregon. The layout of the site is illustrated in Figure 1-1, Site Layout. Time Oil has identified approximately 2,700 cubic yards of soil with PCP contamination exceeding 500 ppm. From information provided by Time Oil, concentrations of PCP have ranged to 8400 ppm in the soil around the loadout area near the southern corner of the warehouse for the plant. Concentrations declined rapidly a few feet away from the "hot spot", generally decreasing to concentrations of under 1500 ppm which is approximately the average concentration reported by Time Oil.

Soil type is generally mixed sands, silts and gravels normally associated with a former river channel environment. Little clay appears to be present near the surface, although lenses may occur at depth. With little clay present, the PCP tends to be mobile, migrating downward into the soil vadose zone and entering the groundwater underlying the site, some 18 to 20 ft below ground level.

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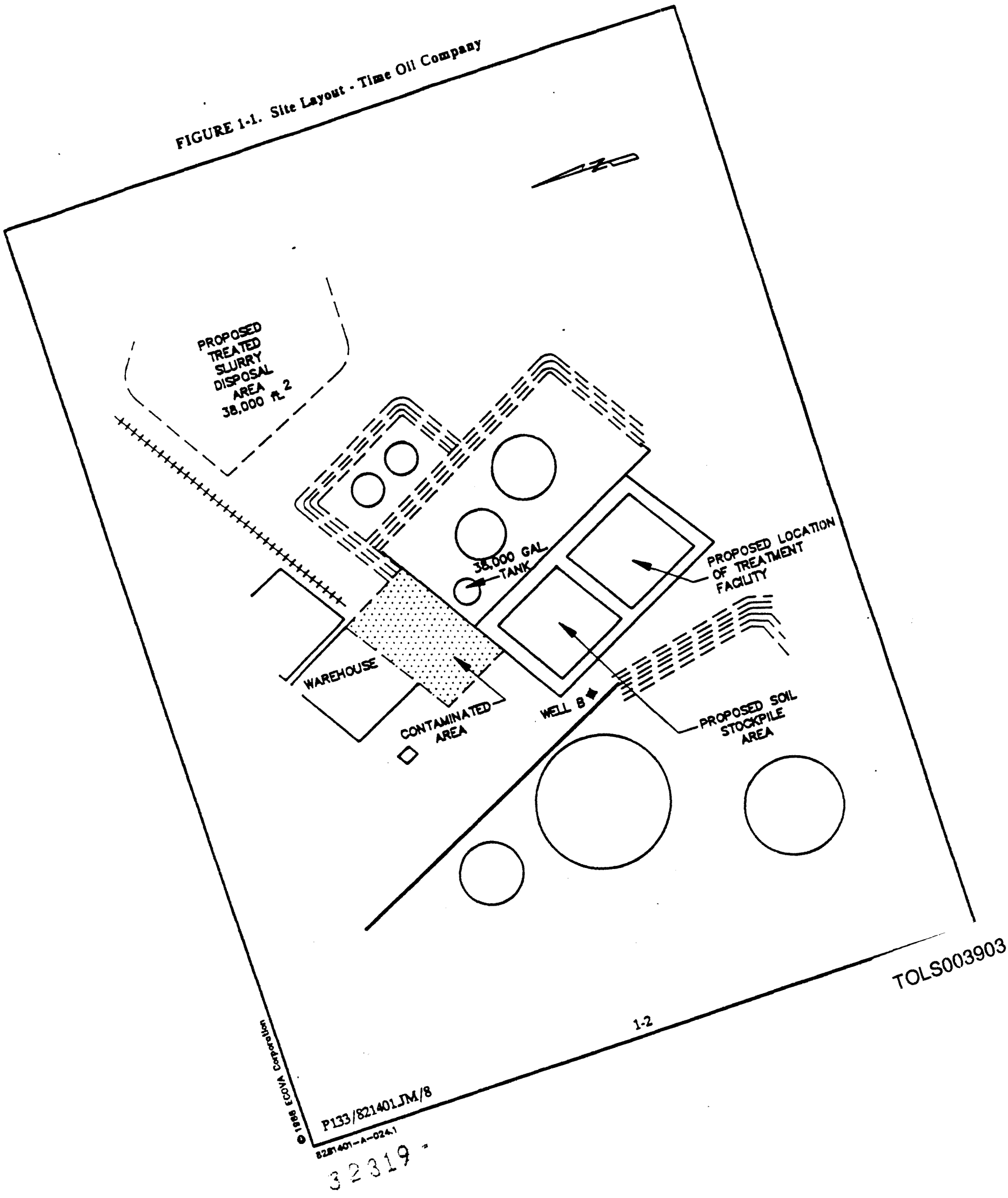
FIGURE 1-1. Site Layout - Time Oil Company



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As a confirmation of the levels of PCP in the site soils, Ecova conducted a sampling of the pile on July 29, 1988. Analyses of these samples were conducted by Ecova Analytical Services (EAS). The results of these analyses are presented in Table 1-1. These data confirm the levels of PCP reported by Time Oil and also confirm that there are significant variations in PCP concentrations within the pile of contaminated soil.

A background soil sample was collected from the site as a check for background concentrations of PCP. This soil sample was a composite collected from several locations around the terminal property. The analysis of the sample suggests that it is representative of PCP concentrations in soils surrounding the site. A sample of groundwater was taken from Well B at the site which did not show PCP contamination. However, analytical problems relating to poor spike and surrogate recoveries indicate a need to re-extract and reanalyze.

TABLE 1-1. Pentachlorophenol (PCP) Concentrations in Soil Samples

Sample	Concentration (ppm)
W-1	250
E-1	2000
S-1	2.2
N-1	720
Composite	680
Background	0.131

In addition to the sampling data, other information on PCP was examined. Time Oil has provided Ecova with exceptionally detailed in-house soil boring and groundwater data indicating the distribution of PCP in the soils around the site. Ecova has reviewed this information carefully to determine the following:

1) The volume of soil to be excavated
2) The approach for conducting the excavation
3) The average PCP concentration in the excavated soil.

The results of this investigation, included in Appendix A, Soil Boring Analysis, indicate that approximately 3440 bank cubic yards of soil, containing an average of 668 ppm of PCP would have to be removed. Soil within each soil horizon sampled that will need to be excavated is illustrated on the PCP concentration plots given in Appendix illustrations A-1 through A-4. The average concentration of 668 ppm is consistent with the composite sample shown in Table 1-1. This data will be included in the system design basis parameters presented in Section 2.2, Conceptual Engineering Design.

Since the soil boring study was conducted, Time Oil has had earthmoving equipment push the surface contaminated soils into a pile over the hot spot in the approximate center of the former plant site. This resulted in covering the most contaminated soils while achieving a degree of mixing of the

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different contamination levels. While the boring data and excavation approach outlined in Appendix A do not reflect the current location of contaminated soil at the surface or ground level, the data is taken to be representative of PCP contamination distribution at depth.

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2. SCOPE OF WORK

2.1 OVERVIEW

Ecova has developed a remediation program incorporating physical, chemical, and biological treatment technologies aimed at eliminating the PCP contaminants in the soil and groundwater. Contaminants will be separated from the soil media and biodegraded in solution to complete mineralization until the target levels are achieved.

The goal of this program has been to develop a cost-effective remediation strategy based upon biological degradation technologies which will reduce the PCP concentration to the levels acceptable to the appropriate regulatory agency, which is assumed to be Oregon Department of Environmental Quality (ODEQ). The program has been developed considering the following objectives:

- o Optimize the chemical and biological degradation of the PCP through use of soil slurry technologies;
- o Develop flexible remediation options that can treat both contaminated soil and groundwater;
- o Minimize the potential for migration of contaminants beyond the treatment area;
- o Develop options that can be implemented and completed in timely manner.
- o Use, to the extent practicable, Time Oil resources available on-site;

The proposed treatment program is conceptually illustrated in Figure 2-1, Work Breakdown Structure. As shown in this figure, work on the project will commence immediately upon receiving authorization to proceed. Work will start with the engineering design and procurement of equipment needed for remediation. Time Oil will secure approval of the treatment program by ODEQ. Ecova will support Time Oil in its negotiations with ODEQ as directed by Time Oil's project manager and outlined in Section 2.3.2, Regulatory Authorization.

Following completion of the engineering of the treatment system and regulatory authorization, Ecova will mobilize to the Portland site and commence construction activities. While the treatment system is being constructed, the contaminated soil will be completely excavated and stockpiled on a plastic liner. The excavation will then be filled with borrow material obtained from the land treatment area.

Upon completion of construction of all of the treatment facilities, the treatment system will be operated on a batch basis until the stockpiled soil has been fully treated. Groundwater will be pumped by the groundwater extraction system and treated at the plant until the negotiated target cleanup concentrations have been reached. With completion of all treatment operations, the system will be decommissioned and the site cleaned of any remaining trash and debris. Removal of the treatment equipment units will proceed as discussed in Section 2.3.7, Demobilization.

As shown in Figure 2-1, an onsite worker health and safety program will be implemented and conducted throughout the remediation program.

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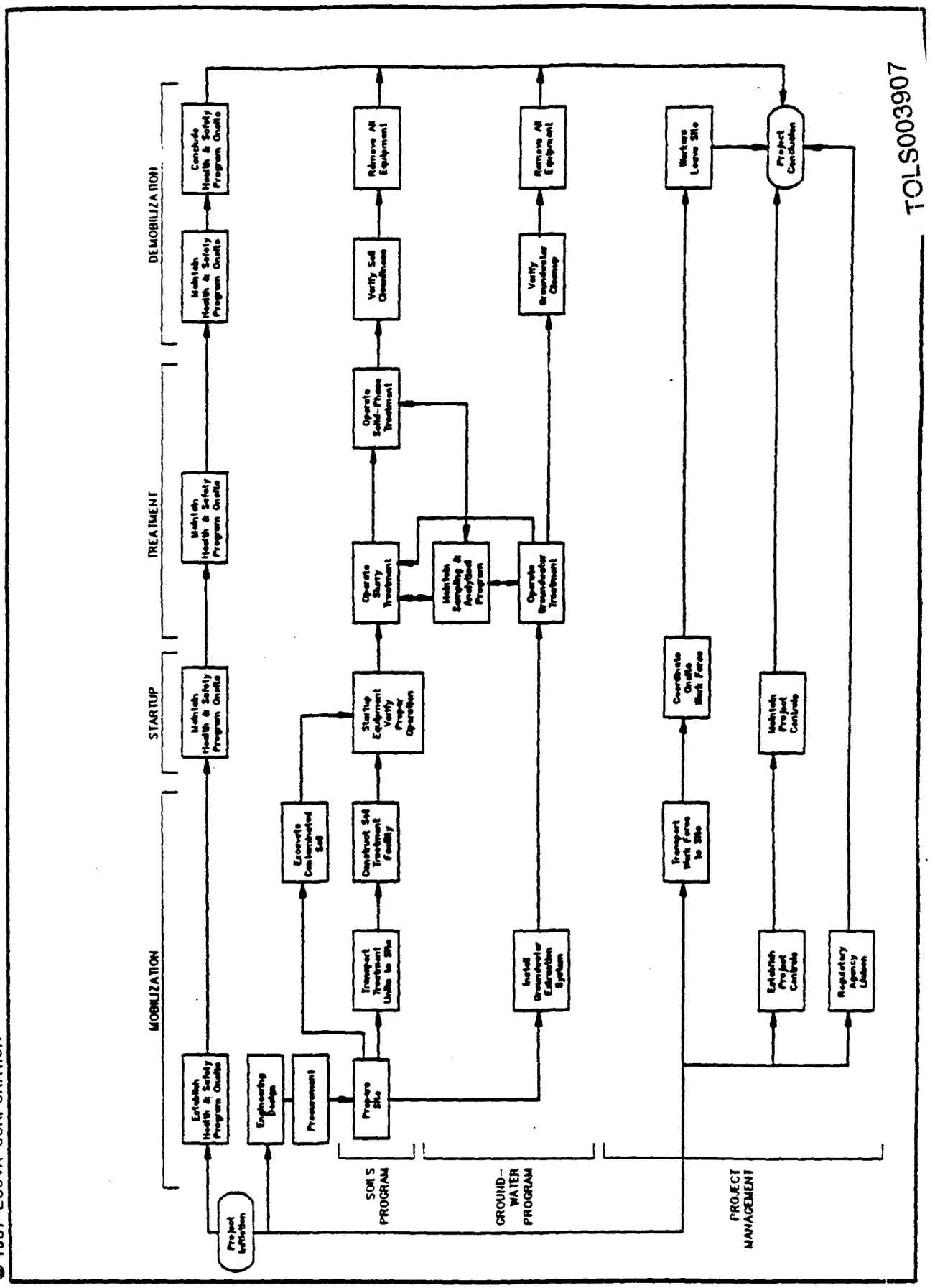
FIGURE 2-1. Work Breakdown Structure



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The conceptual engineering design of the treatment system proposed for the remediation project is discussed below, followed by a detailed discussion of each task in the program.

2.2 CONCEPTUAL ENGINEERING DESIGN

Ecova has prepared a conceptual engineering design which fulfills the program objectives discussed in the overview. Figures 2-2, Block Flow Diagram, and 2-3, Process Flow Diagram, illustrate this design for the onsite treatment system at the Time Oil Northwest Terminal site for complete remediation of the PCP contamination present in soils and groundwater.

Initial design parameters were determined from the data provided by Time Oil and Ecova treatability test results as presented in Appendixes A, B, C, and D. A summary of the primary design parameters is detailed in Table 2-1.

TABLE 2-1. Design Basis Parameters For Soil Bioslurry Treatment System Time Oil Company

Assumed Parameters

Contaminated Soil to be Treated:	3440 cubic yards
Percentage Oversize (20 mesh):	15%
Average PCP Concentration:	680 ppm, dry soil
Slurry Solids Percentage:	35%
Contaminant Half Life:	1.4 days
Slurry Tank Volume (2 units):	50,000 gallons
Number of Batches:	32
Soil Treated Per Batch Cycle:	108 cu.yd.
Mixer Horsepower Requirements:	1.0 hp/1000 gals
Solid Phase Treatment/Disposal Area Size:	8,000 square feet
Depth of Solid Phase:	2.5 feet

	Target Cleanup Criteria (PCP Concentration in Dry Soil)		
Derived Parameters	500 ppm	100 ppm	50 ppm
Reactor Retention Time:	0.6 days	3.9 days	5.3 days
Batch Cycle Time:	Continuous	5.0 days	7.0 days
Approx. Treatment Duration:	46 days	160 days	224 days

As discussed in the Introduction a composite PCP concentration of 680 ppm was obtained from the July samples obtained by Ecova from the site. In examining the soil boring data and interpretation provided by Time Oil, we conclude that this concentration is approximately equal to the average concentration that would be obtained from a blended feedstock made up from stockpiled soil following the plan shown in Appendix A, Soil Boring Analysis. The average concentration is the key parameter in the design basis since this value determines the feed rate to and residence time in the bioreactors. The quantity of contaminated soil present determines the capacity of bioreactor needed, the length of time needed for treatment given the average concentration and degradation rate, and the size of land treatment/disposal area needed.

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FIGURE 2-2. Block Flow Diagram

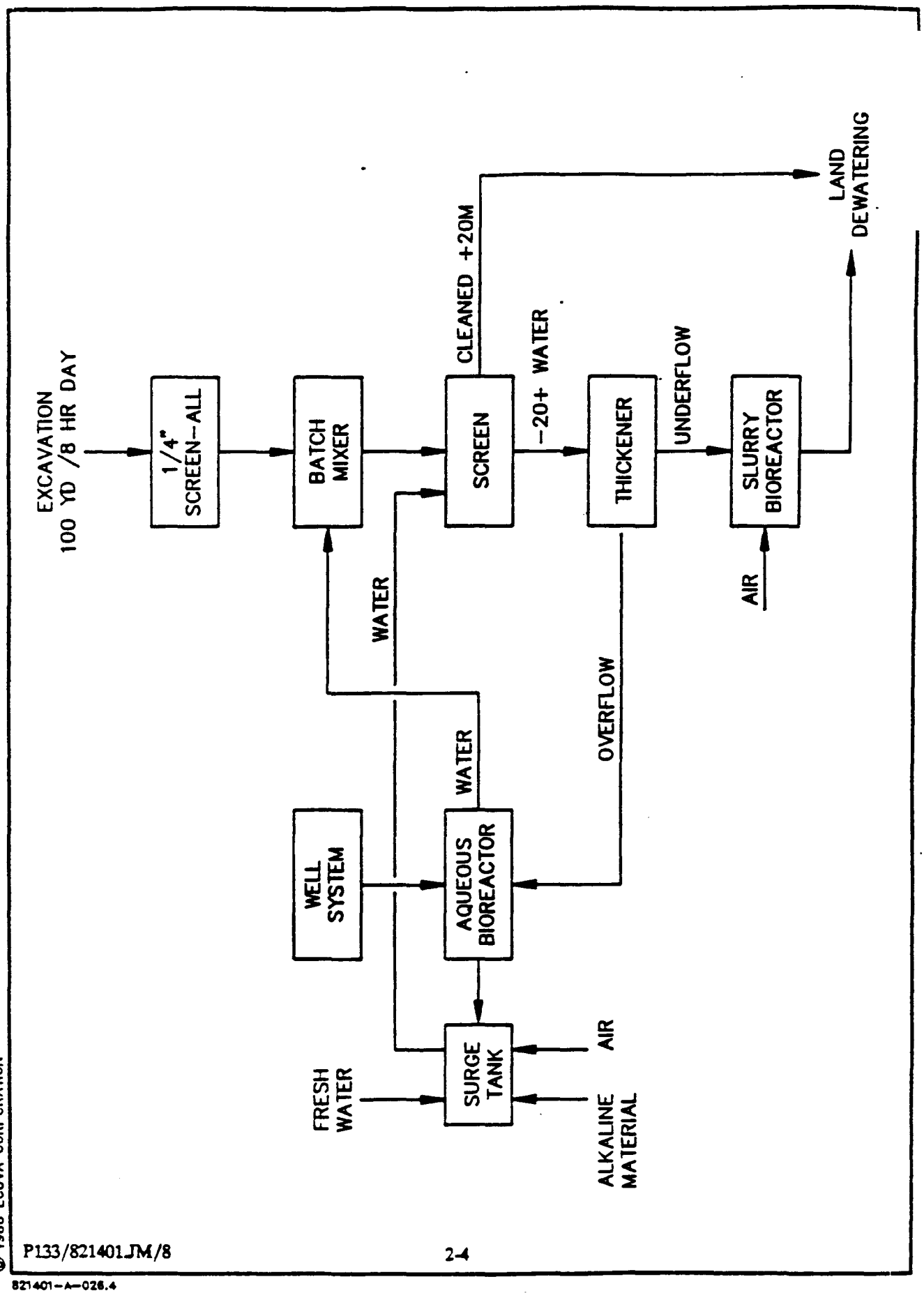

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FIGURE 2-3. Process Flow Diagram

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The treatment system consists of the following major subsystems as discussed in detail below:

- o Excavation/Screening/Stockpiling Operation
- o Batch Mixer Unit and Feed Hopper/Conveyor
- o Shale Shaker Screen Unit
- o Thickener Unit
- o Slurry Bioreactor Unit
- o Groundwater Extraction System
- o Aqueous Bioreactor Unit
- o Liquid Surge Tank
- o Solid Phase Treatment/Land Disposal Unit
- o Miscellaneous Pumps, Piping, Etc.

2.2.1 EXCAVATION/SCREENING/STOCKPILING OPERATION

To halt the migration of PCP contamination from the contaminated soil into the groundwater and to provide a blended feedstock for the treatment operation, Ecova will excavate and remove the contaminated soils. The contaminated soils will then be screened, blended and stockpiled until the slurry treatment system is ready to accept them as feed material. Excavation will follow the plan developed during the engineering phase as previously described.

During construction of the treatment system the contaminated soil will be completely excavated, screened to minus 0.25 inch to remove construction debris or other oversize material, and stockpiled on a bermed plastic liner. The pile will be covered with polyethylene sheeting until reclaim operations for input to the treatment system commence. This step will result in a prepared and blended feedstock for the treatment system. The stockpile will also provide containment for rainfall runoff to prevent any further contaminant migration.

Removal operations will be performed with two pieces of standard earthmoving equipment: a three cubic yard front end loader (wheeled) and a backhoe. Soil will be removed until soils that are not contaminated (through testing) are encountered or until the groundwater table is reached. The threshold criteria used to distinguish contaminated from uncontaminated soils will be established by agreement with ODEQ and Time Oil before excavation commences.

The removed soils will be passed over a coarse screen located in the excavation area. A two-stage Read Screen-All unit equipped with minus 2 inch and minus 0.25 inch screens will be used to remove construction debris, gravel and other oversize material. In Ecova's experience, this is an essential step to minimize downstream operating problems that oversize debris can cause for materials handling equipment such as pumps, conveyors and mixers. Oversize materials can be directly disposed in the solid phase treatment/disposal area or can undergo additional washing in the batch mixer to remove surface PCP contamination which might be present.

Screened soil will be placed in lifts on a stockpiled area lined with a 12 mil polyethylene plastic liner. A low earthen berm will surround the stockpile to contain any contaminated rainfall runoff and a plastic lined sump area will be provided to catch and accumulate water. Any water captured will be pumped into the recovered groundwater storage tank. An equipment decontamination area will be included within the bermed, lined area to provide for cleaning of the earthmoving equipment after excavation of the contaminated soil is complete. A steamcleaner will be used to assure that decontamination is thorough. Decontamination fluids accumulated in the sump will be treated in the treatment system after startup.

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Blending the excavated soil is important since the boring data indicate that there are significant hot spots. If these hot spots were to be fed into the bioreactor, they could result in the kill-off the microorganisms and severely disrupt the biodegradation process. Blending assures a slurry feedstock very close to the overall average PCP concentration. The screening operation will achieve some blending of the contaminated soil. Distributed placement of the soils in the stockpile area will also facilitate the blending operation.

After placement in the stockpile, the soil will be covered by six mil polyethylene plastic sheeting to control airborne dust emissions during storage. The sheeting will be carefully weighted to prevent damage by the high winds occurring periodically in the Willamette River valley.

The excavation will be backfilled with borrow material obtained on-site. Borrow material will be obtained from the decontaminated slurry disposal landfill area (solid phase treatment), the construction of which shall be phased to coincide with the excavation operations.

2.2.2 BATCH MIXER UNIT AND FEED HOPPER/CONVEYOR

The first step in the treatment process operation will be to reclaim from the stockpile and feed the blended soil into a hopper/conveyor and into the batch mixer unit. In the batch mixer, the soil is tumbled to break up lumps and sprayed with water to form a thin slurry. Coarse screening of the feed material will have already been performed during the excavation, so the primary purpose of the batch mixer is to form the thin slurry for further screening in the shale shaker screen. Makeup water will come from the aqueous bioreactor tank with alkaline adjustment to raise the soil pH from around 5 to approximately 7.2 prior to feeding into the next units.

The batch mixer unit is a rotating drum unit that has low energy requirements, and is inexpensive to operate, reliable, and commonly available. The unit is portable and requires no concrete foundations for mounting. The unit will only be operated while charging the slurry bioreactor with a new batch of feed.

2.2.3 SHALE SHAKER SCREEN UNIT

After formation of the thin slurry, additional fine screening of the material will take place in the shale shaker unit mounted above the thickener tank. A shale shaker screen is a multideck, vibrating box screen used extensively in the oil drilling industry to remove rock and gravel from drilling muds. These have several screen decks which will successively remove oversize material from 0.25 to 0.033 inch (standard 20 mesh screen). Minus 20 mesh particle size is optimum for maintaining a thick slurry with minimum mixer horsepower requirements and no sanding/settling problems. The unit discharges into the thickener tank.

Oversize screened material is expected not to be contaminated, and therefore would be disposed directly in the solid-phase treatment land disposal area.

2.2.4 THICKENER UNIT

Finely screened thin slurry from the shale shaker screen is thickened by removing excess water up to the necessary density for feed to the slurry bioreactor. The design basis density is 35 percent solids which is an optimum slurry density for the type of soils found at the site. Overflow clarified water

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is pumped to the aqueous bioreactor unit; underflow thickened slurry is pumped to the slurry bioreactor units.

The Ecova thickener unit is a rectangular box tank that operates under a zone gravitational settling regime. The unit is fed from one end and overflows from the opposite end. Thickened slurry is withdrawn from the bottom of the tank. The unit is a 15,000-gallon, transportable, modular steel tank that is mobilized to the site on a self-loading flatbed trailer. It requires no concrete foundation, normally being placed for operation on an asphalt or gravel pad. The unit comes equipped with plumbing and liquid pump for transport of the clarified liquid.

2.2.5 SLURRY BIOREACTOR UNIT

The Ecova Slurry Bioreactor unit is also a rectangular box tank that is equipped with three electric motor-driven slow speed mixer units. The mixer blades provide agitation to keep the slurry in suspension, well mixed and operating under aerobic conditions. Additionally, the unit is equipped with air sparge to provide oxygen in solution.

Like the thickener unit, the bioreactor unit is a transportable, modular steel tank that is mobilized to the site on a self-loading flatbed trailer. Nominally, the unit has approximately a 25,000 gallon capacity. It also requires no concrete foundation, normally being placed for operation on an asphalt or gravel pad.

Consideration was given to modifying the existing 38,000-gallon steel tank located at the site. While this is potentially feasible because the tank appears to be structurally sound, there are a number of possible complications that could make this conversion more costly than mobilizing a modular tank. The tank was engineered for holding oil or water liquids rather than high density slurries. This would undoubtedly reduce the capacity of the tank to that comparable to a standard Ecova bioreactor unit. The capital cost of modifying this tank is probably not warranted when the duration of operation is to be short (a few months). Finally, the unknown condition of the steel wall introduces some risk for slurry application. Therefore, an additional Ecova bioreactor will be mobilized.

2.2.6 GROUNDWATER EXTRACTION SYSTEM

In a separate letter dated August 11, 1988, Ecova proposed a program to install additional monitoring wells at the site. If appropriate, these wells could be used as groundwater extraction wells. The proposed program also included an evaluation of the overall groundwater situation and subsequent design of the extraction system for recovery of PCP contaminated groundwater. Pending additional study of the extent of groundwater contamination, the needed rate of groundwater pumping, and installation of any additional recovery wells or trenches, detailed design of the groundwater treatment component of this scope of work is not possible.

However, the soil treatment system uses extensive quantities of water for slurry makeup and therefore large quantities of contaminated groundwater can simultaneously be treated in the slurry bioreactors, if available. It is likely that groundwater extraction and treatment may continue after completion of soil treatment. Therefore provisions for continued groundwater treatment have been included in the conceptual design.

It is recommended that the groundwater study program proceed as quickly as possible to gather the needed data on quantities and contaminant concentrations.

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2.2.7 AQUEOUS BIOREACTOR UNIT

A provision for an aqueous bioreactor unit has been included in the conceptual design of the treatment system. There are several purposes for inclusion of this unit. First, the unit provides overflow capacity for storing water from the thickener unit. Overflow water from the thickener will have solubilized some PCP from the slurried soil and the bioreactor unit will provide capacity for treating this flow. Second, the unit provides additional bioreactor capacity for treating both overflow water and extracted groundwater. Groundwater would be pumped directly to this unit. Liquid bioreactors are capable of higher rates of degradation for PCP than are slurry- or solid-phase treatment operations. Third, the bioreactor unit will serve as a source of decontaminated recycle water and biomass for fresh slurry makeup when preparing another batch for the slurry bioreactor. Further, since the treatment of groundwater may need to continue after completion of the soil treatment phase, this bioreactor unit will provide the capacity.

The aqueous bioreactor will be constructed from the 38,000 gallon tank currently on site. Modifications necessary to convert the tank to this service include: 1) Thorough cleaning and patching as needed; 2) Equipping the tank for compressed air sparge; 3) Modifying the piping to allow connection to the rest of the treatment system and pumps; and 4) Flow and level control instrumentation. Overflow from this tank will be sent to the surge tank for temporary storage.

2.2.8 LIQUID SURGE TANK

Provision has been included for an additional surge tank which will primarily be used to temporarily contain excess water which may accumulate in the system, such as during the rainy season, when higher groundwater extraction rates are needed, or if there are restrictions on fresh makeup water availability during the summer dry season.

Currently we anticipate this tank to consist of one of the existing horizontal tanks located on site (formerly buried gasoline tanks). These tanks are the approximate capacity needed and appear to be in adequate shape. Capacity needed for the surge tank is expected to be between 5000 to 10,000 gallons. Modifications include flushing, leak repair, and piping connection. These horizontal tanks will have to be moved from their present location to allow construction of the treatment system. The tank selected for service as the surge tank will be relocated onto a gravel pad which will serve as a supporting foundation.

2.2.9 SOLID PHASE TREATMENT/LAND DISPOSAL UNIT

After each batch of soil has finished slurry treatment, the bioreactors will be emptied via pumping through a pipeline to the solid-phase treatment/land disposal unit that is located north of the treatment system. This unit will consist of an excavation of approximately 38,000 square feet of clean soil to a depth of 2.5 ft. As discussed previously, clean soil from this excavation will be used as borrow material for filling the contaminated excavation near the warehouse at the site.

This unit will not be lined with either a clay or membrane liner. By not using a lining, excess water from the treated slurry disposal will percolate into the groundwater up-gradient from the contaminated site carrying PCP-degrading microorganisms into the contaminated area. This also serves to eliminate excess decontaminated water from the system. However, decanted water forming on the surface of the impoundment may be pumped back into the surge or aqueous bioreactor tanks, if needed.

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2.2.10 MISCELLANEOUS PUMPS, PIPING, ETC.

Other equipment will be needed to fill out the necessary equipment list for operation of the treatment system. Included on this list are:

- o Piping to connect the processing units and pumps to each other;
- o Slurry and liquid pumps needed to move the materials through the piping and treatment units;
- o Air compressor to provide for bioreactor air sparging;
- o Leased earthmoving equipment for excavation and reclaiming operations;
- o Office and Lab trailer;
- o Gravel as a base for under the processing units;
- o Plastic liner for the stockpile only (12 mil black polyethylene proposed)
- o Clean sand to protect the liner during stockpile construction;
- o Electrical materials needed to provide electrical service to the treatment units;
- o Small hand tools;
- o Personal protective equipment including coveralls, gloves, etc.

2.3 WORK PROGRAM

Following the development of the conceptual treatment system as previously discussed, a planned program for implementing the installation and operation of this system onsite was prepared and as discussed below as illustrated in Figure 2-1, work breakdown structure.

2.3.1 TASK ONE - TREATMENT SYSTEM DESIGN

Upon authorization to proceed, Ecova will refine the conceptual engineering design as discussed in Section 2.2. The site will be surveyed by an Oregon licensed surveyor to provide an accurate base map. The engineering effort will focus primarily upon the civil design and construction of the materials handling, treatment and disposal subsystems for the soil slurry system.

The excavation plan will be prepared in detail for:

1) Removal of the contaminated soil including special operating considerations for shoring around the warehouse foundations to prevent structural damage;
2) Materials handling including screening, blending, and transport operations;
3) Layout and design of the stockpile area including the runoff water sump, berms, and liner;
4) Removal and construction of the solid phase treatment/disposal area; and
5) Backfilling sequence for borrow material.

Design drawings will be prepared showing the equipment layout, cut and fill locations, and other information needed in the engineering effort.

2.3.2 TASK TWO - SECURING REGULATORY AUTHORIZATION

As the engineering design work progresses, it is assumed that Time Oil will conduct negotiations with ODEQ to secure approval of the treatment program. Ecova anticipates providing support to Time Oil in this effort in the form of professional consulting services, attending meetings with ODEQ, preparing and revising any needed submittal documents, etc. This support will be performed

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as directed by Time Oil on a time and material basis. It is impossible to adequately anticipate the necessary level of effort required in negotiating with ODEQ.

We propose that Ecova services for this activity be provided on a change order basis. As an activity is identified that needs services provided by Ecova, a short change order would be prepared by the Ecova Project Manager and sent by facsimile for review and approval by Time Oil. This change order would provide a short description of the specific service requested, the anticipated costs (not to exceed) to perform this activity, and the expected schedule. Change Orders such as these typically do not exceed one page in length and represent modifications to the contracted work. A copy of the change order would be signed by the Time Oil Project Manager and returned to Ecova which would authorize the work. A separate breakout of costs for this element would be provided on the invoice from Ecova. Using this system, Time Oil has full control of any time and material costs that are outside the contract scope.

Securing regulatory approval is a milestone in the remediation program since mobilization and construction of treatment equipment should not commence until all regulatory constraints have been identified.

2.3.3 TASK THREE - MOBILIZATION AND CONSTRUCTION

With a final engineering design, an approved work plan, and equipment procured, Ecova will mobilize its construction and installation team to the Portland site to build the treatment systems. The mobil office/lab trailer will be set up. The treatment units will be mobilized by truck to the site and assembled. Gravel pads will be laid for placement of the tanks and treatment units. Piping and electrical connections will be made. Modifications to the 38,000 gallon tank needed to convert it to aqueous bioreactor service will be made. Connection to utilities will be made.

Again, activities under this task would be sequenced to coincide with Task Four, Excavation of Contaminated Soil, so that the stockpile of contaminated soil is ready when the treatment system is ready to commence operations.

2.3.4 TASK FOUR - EXCAVATION OF CONTAMINATED SOIL

Task Four will consist of the activities previously described in the Excavation/Screening/Stockpiling Operation in the Conceptual Engineering Design.

2.3.5 TASK FIVE - STARTUP AND SHAKEDOWN

Upon completion of the installation of all processing equipment and construction of the disposal area, startup and shakedown of the treatment system will commence. Since the treatment operations are expected to be operated in batch mode, careful monitoring of several initial batches will be followed to insure that biological activity is progressing as expected and that optimum biodegradation rates are obtained. During the first batch, an acclimated culture is being built up from the Ecova proprietary strain which will provide the optimum PCP biodegradation. After initial culture development, subsequent batches will be inoculated with the initial culture during recharge of the bioreactors.

Startup and shakedown operations are expected to occur over approximately a one month period (two to four batches).

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2.3.6 TASK SIX - TREATMENT OPERATIONS

After establishment of an acclimated culture and verification of complete biodegradation, treatment operations can proceed on a routine basis. As each batch completes the treatment cycle, the slurry reactors will be emptied and recharged with a fresh soil slurry. Treated slurry will be pumped to the disposal landfill area. Sequential batches will be run until the stockpile has been completely treated.

The biotreatment system will operate in largely unattended operation mode during each batch. Ecova will rely upon Time Oil personnel onsite to periodically monitor the rotating and moving equipment in the process for normal operation. In this manner, the system will not have to be continuously manned, with subsequent cost savings to Time Oil. (In the event of equipment failure, an Ecova maintenance team would be mobilized to correct the problem.) The Ecova operations team will mobilize to Portland after completion of the biotreatment process for each batch. The operations team for routine batch reactor operation will consist of two Ecova technicians from the Redmond office.

After arriving at the site, the operations team will check out the operating equipment and commence pumping the treated slurry out of the bioreactors into the landfill disposal (solid phase treatment) area.

2.3.7 TASK SEVEN - DEMOBILIZATION

At the completion of all treatment activities, the treatment system will be decommissioned and the site cleaned of all trash. All decontaminated materials placed in the disposal area will be levelled and dewatered.

As part of this work plan, we propose that all equipment owned by Ecova be allowed to remain on site after completion of the treatment activities (without imposition of a storage charge by Time Oil) until such time as it becomes necessary to mobilize it to another project site. This period would not exceed one year. By allowing storage of our equipment, Ecova is able to pass along the savings in demobilization charges to Time Oil which would otherwise be incurred. Demobilization charges would be incurred by the next project for which the equipment is used.

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PROJECT NO. 821401
CLIENT : TIME OIL COMPANY
LOCATION : PORTLAND - OREGON
FILENAME: TOSCH50

ECOVA CORPORATION
SEPTEMBER - 1986

PROJECT SCHEDULE
TIME OIL COMPANY
50 PPM CLEANUP STANDARD

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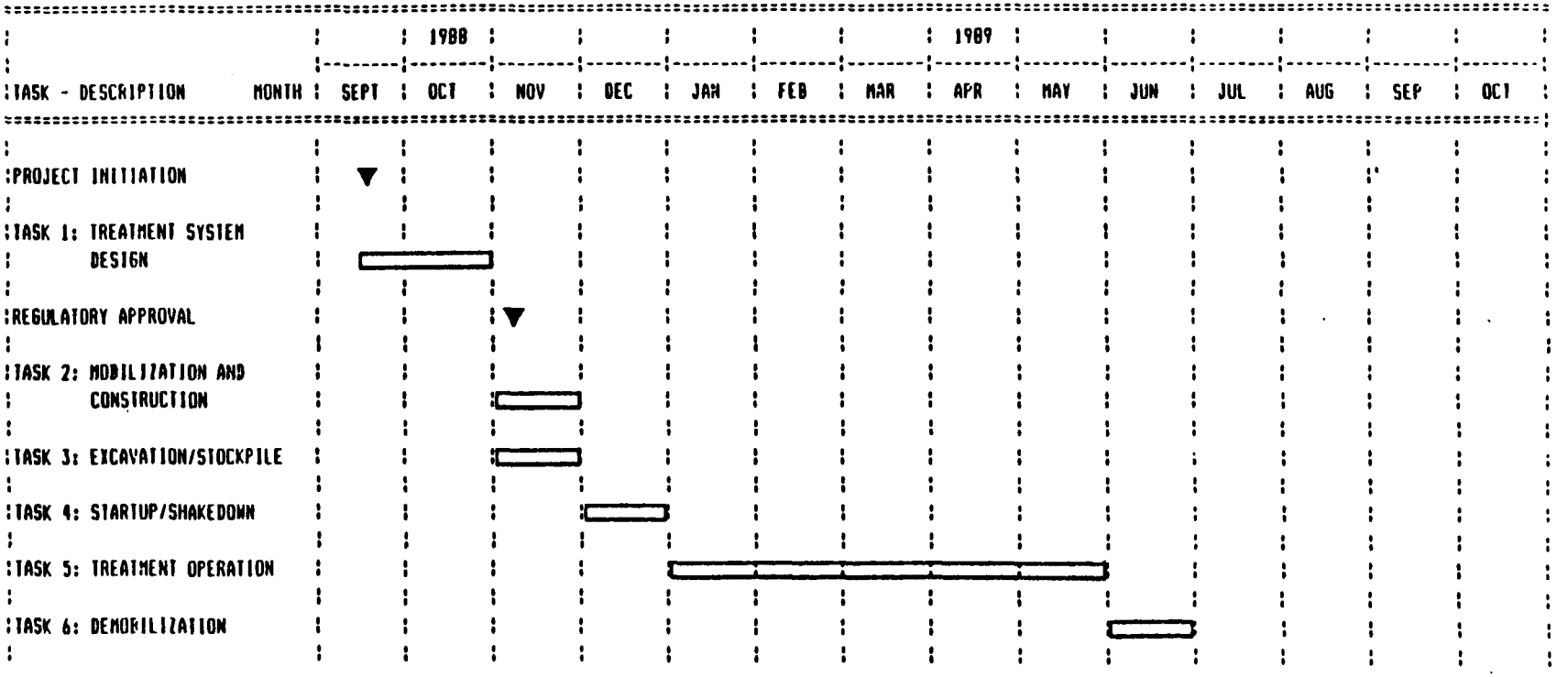
PROJECT NO. 821401
CLIENT : TIME OIL COMPANY
LOCATION : PORTLAND - OREGON
FILENAME: TOSCH100

ECVA CORPORATION
SEPTEMBER - 1988

PROJECT SCHEDULE
TIME OIL COMPANY
100 PPM CLEANUP STANDARD



ASSUMPTIONS: 3440 CUBIC YARDS OF CONTAMINATED MATERIALS AND 100 MG/kG (PPM) CLEANUP STANDARD.

LEGEND : PLANNED DURATION
MILESTONE

TOLS003919

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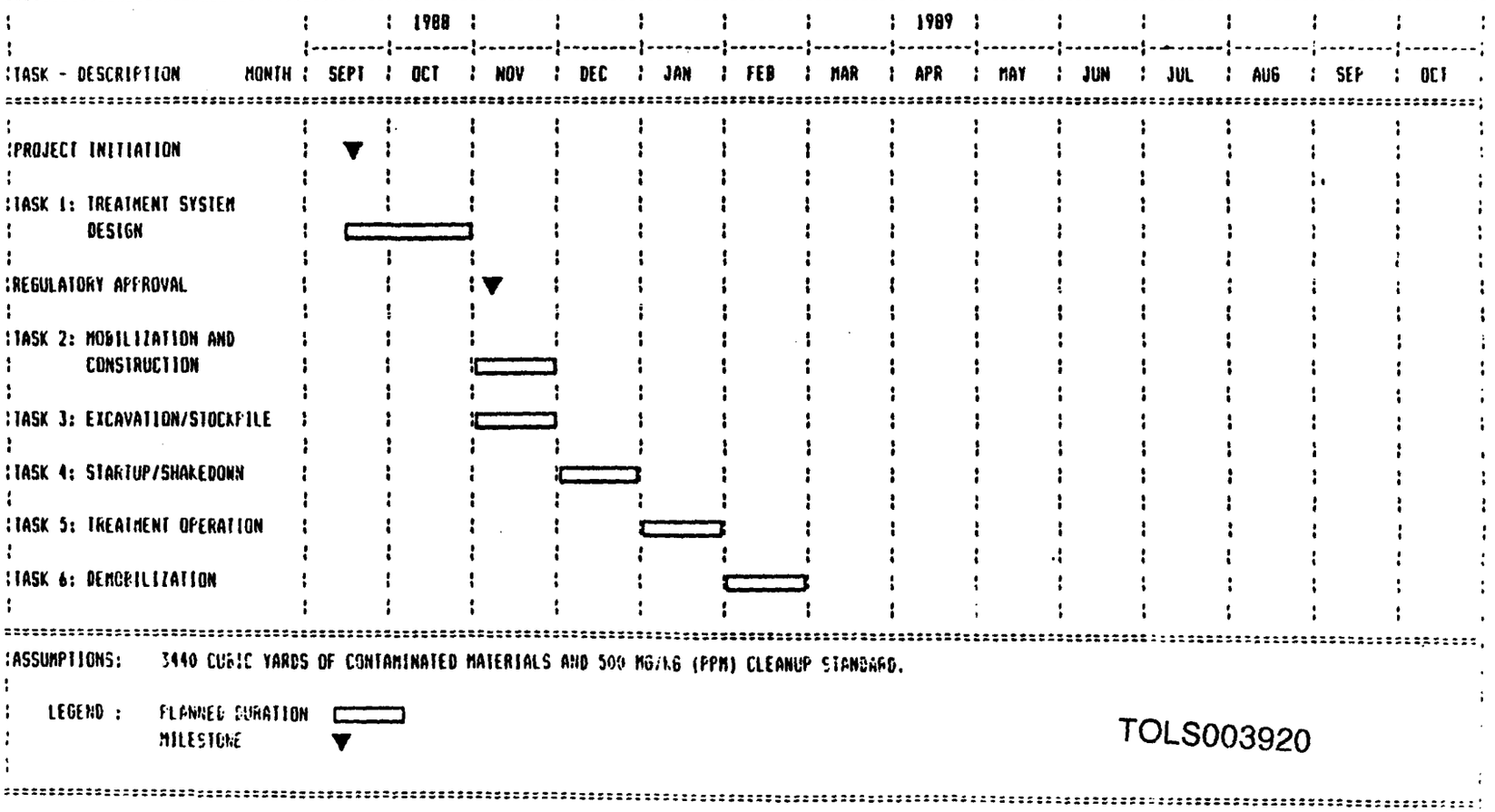
P133/821401.JM/8

PROJECT NO. 821401
CLIENT : TIME OIL COMPANY
LOCATION : PORTLAND - OREGON
FILENAME: TOSCH500

ETOWN CORPORATION
SEPTEMBER - 1988

PROJECT SCHEDULE
TIME OIL COMPANY
500 PPM CLEANUP STANDARD



ASSUMPTIONS: 3440 CUBIC YARDS OF CONTAMINATED MATERIALS AND 500 MG/KG (PPM) CLEANUP STANDARD.

LEGEND : PLANNED DURATION
MILESTONE

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4. PROJECT COSTS

Costs have been estimated for the remediation program and are presented in Table 4-1. As requested by Time Oil Company, costs have been prepared for each cleanup scenario 500 ppm, 100 ppm, and 50 ppm.

Costs were developed based on remediating 3440 cubic yards of contaminated soil Cost have also been provided in Table 4-1 for treating additional soil in excess of the 3440 cubic yards, should such soil be identified. All costs were developed based on a starting assumption of 680 ppm PCP from the blended stockpile. This assumption is based on soil samples obtained by Ecova and upon our evaluation of the soil boring data provided by Time Oil. Obviously the total volume of soil needing treatment (and hence total costs) will be affected by cleanup levels mandated by ODEQ.

Included in the cost basis are engineering design, mobilization; excavation, blending and stockpiling of contaminated soil; construction and startup of treatment facilities; soil treatment; and equipment decontaminantion after treatment.

Costs have not been included for negotiations and document preparation to secure ODEQ approval. As discussed in the text, these costs would be charged on a time and materials basis with an accompanying approved Change Order.

Additionally, costs do not include demobilization of the treatment equipment. As discussed in Section 2.3.7, Task Seven-Demobilization, Time Oil will provide storage for this equipment for up to one year in lieu of demobilization costs.

TABLE 4-1. Project Costs for Cleanup Levels (50,100 + 500 ppm)
Time Oil Site Remediation - Portland, Oregon

Activity	50 ppm	100 ppm	500 ppm
Total Project Costs	$ 348,839	$ 311,538	$ 220,265
Total Onsite Treatment Costs per cubic yard	101	91	64
Additional Treatment and Excavation Costs per cubic yard	66	55	30

Assumptions:

1. Based on 3440 cubic yards of PCP contaminated soil
2. Based on a starting assumption of 680 ppm from the blended stockpile
3. Based on a half-life of 1.4 days
4. For 50 and 100 ppm cleanup levels, operation is based on using two bioreactors operating on batch mode. For a 500 ppm cleanup level, operation is based on using one big reactor fed continuously.

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5. PROJECT MANAGEMENT

5.1 PROJECT ORGANIZATION AND PERSONNEL

Ecova has assembled an experienced project team to manage the onsite cleanup of soil and groundwater at the Time Oil Northwest Terminal site. Team members represent the engineering and scientific disciplines necessary to accomplish the goals of the project.

Technical responsibility for engineering, scientific and professional disciplines will rest with lead engineers and scientists. Key team members and their responsibilities are summarized below. The project organization is illustrated in Figure 5-1. Full resumes are provided in Appendix B.

Mark Anderson, Sr. Project Manager, will oversee all project efforts. He has over 13 years of project management and engineering experience in the hazardous waste industry with extensive experience managing the cleaning of soil and groundwater. As Project Manager, Mr. Anderson will direct all aspects of day-to-day management on technical, business, contractual, and administrative issues. Mr. Anderson will ensure that personnel and resources are available and fully utilized. He will analyze project requirements and maintain an up-to-date status of each phase of the project. Mr. Anderson will manage field, engineering and laboratory activities. He will be responsible for ensuring project safety and reporting contractual data in support of all project requirements. Mr. Anderson will be Time Oil's day-to-day point of contact.

Robert Scheck, Director Engineering, will oversee all engineering aspects of this project. His qualifications include 20 years of engineering process design and management. For this project he will analyze parameters for treatment system, manage the system operations, design efforts, and oversee the transfer of engineering parameters to the field. Mr. Scheck has designed soil and groundwater remediation systems of similar size and complexity to that at Time Oil in accordance with federal, state, and local regulations.

John Hancock, Project Engineer, will design the soil treatment system. He will also be responsible for the preparation of engineering cost and manpower estimates. Mr. Hancock is a petroleum engineer and chemist who specializes in the design and maintenance of fluid systems adapted for soil and groundwater treatment.

Jeffrey Powell, Field Engineer, will supervise the fabrication, installation, and operation of the soil and groundwater treatment systems. He will modify any Time Oil equipment that will be used in the treatment program, direct the work of the field crews, and provide onsite equipment maintenance support. Mr. Powell has nine years of experience in field equipment fabrication, startup, and operation.

John Kinsella, Vice President, Geosciences and Field Operations, will support this project by serving as the groundwater recovery expert. He will manage the integration of the site groundwater recovery system into the soil treatment program. Mr. Kinsella has conducted numerous similar site remediation projects. He is also experienced in permit applications for groundwater restoration programs and negotiation with federal, state, and local agencies.

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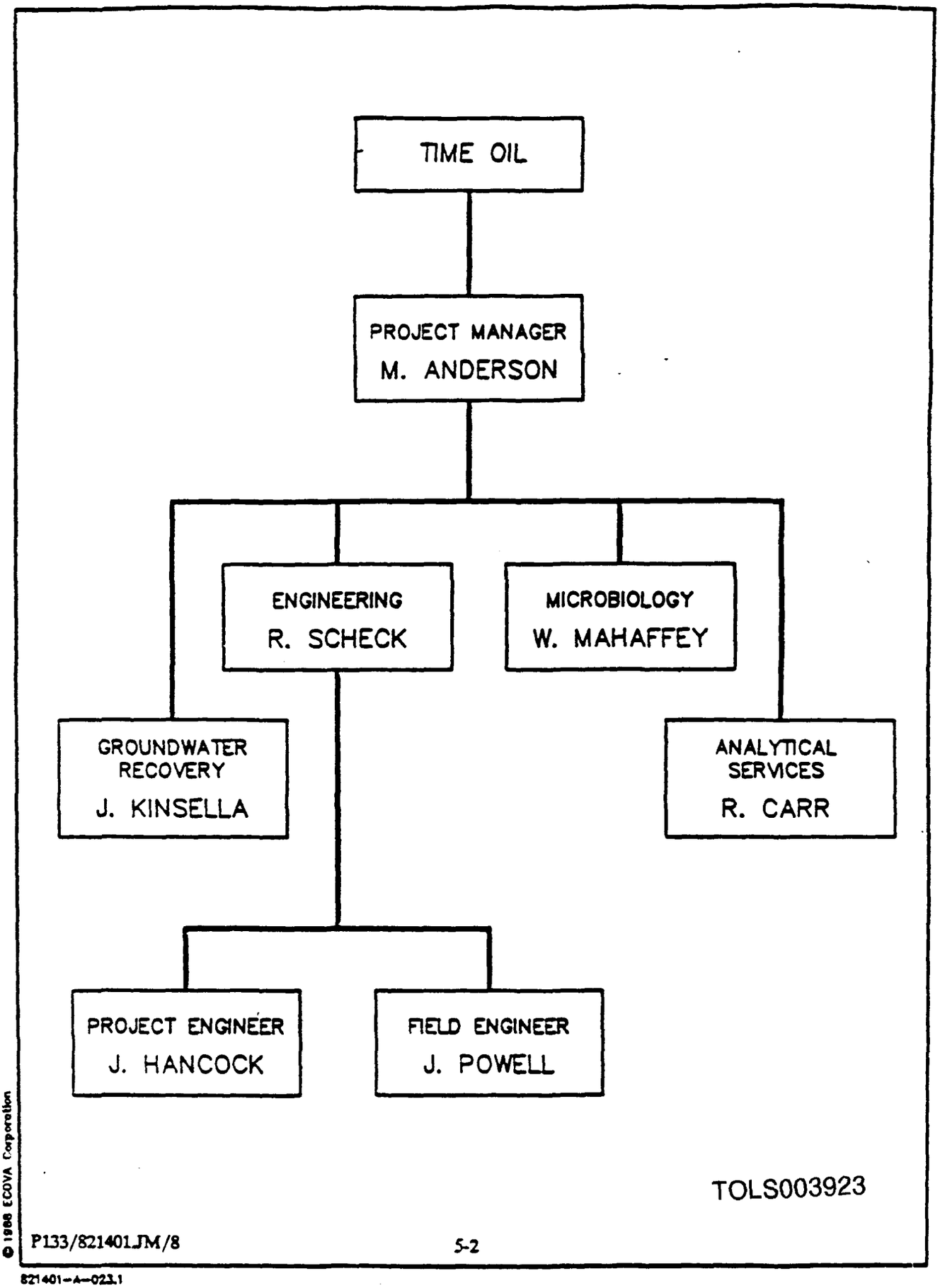
FIGURE 5-1. Project Organization



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William Mahaffey, Ph.D., Project Scientist, will direct the operations of biological processes in the field, interpret microbiological data, and determine all microbiological operating parameters. Dr. Mahaffey specializes in microbial biochemistry and has 10 years' experience in biological degradation of organic chemicals. He has extensive experience in the biodegradation of pentachlorophenol, petroleum hydrocarbons, chlorinated compounds, and other contaminants. Dr. Mahaffey is responsible for research efforts involving the isolation and enrichment of microorganisms collected from the field for use in promoting biodegradation.

Rod Carr, Director of Analytical Services, will coordinate the services provided by Ecova's analytical chemistry laboratory. Mr. Carr has 20 years of experience in managing laboratory facilities, and manages the Ecova analytical laboratory in Redmond, Washington.

5.2 SUPPORT SERVICES

The project team will receive full support from the Ecova corporate headquarters in Redmond, Washington. Corporate accounting, administration, and personnel functions will provide administrative support to the project throughout its duration. The Redmond headquarters will also serve as a source of scientific and engineering expertise to the project. Ecova is a complete hazardous waste research center and maintains ongoing waste remediation development work. Ecova's analytical laboratory, technology development laboratories, and engineering design and fabrication capabilities will support all aspects of the project. Corporate support services are described below.

5.2.1 RECORDS MANAGEMENT

Written documentation prepared during the course of the project will be clearly marked with the date and project number. Originals of all reports and correspondence will be kept in the central project file. All files generated as a result of this project will be available for review by Time Oil. Records originated during the course of the project will be controlled and retained in the project central files, laboratory files, and the Ecova corporate permanent storage files, as appropriate. Proprietary information will be marked "CONFIDENTIAL" and distribution will be limited.

5.2.2 MICROBIOLOGY

The Ecova Microbiology Group conducts research concerning interactions of microorganisms with ecological processes and environmental pollutants in complex ecosystems. The group consists of a nationally recruited scientific staff with training in molecular biology, microbial ecology, microbial genetics, plasmid ecology, microbial biochemistry, and environmental chemistry. The group's research and development interests are focused on the application of the mechanisms of biodegradation on toxic and hazardous waste.

Research and development of treatment processes is conducted at the Ecova Technology Development Center in Redmond, Washington. This facility contains a number of highly specialized laboratories that occupy 16,000 square feet of a 40,000 square feet building of which Ecova Corporation is the sole occupant. The facility was designed specifically to meet the needs of a large capacity research, development, and analytical program.

Ecova's research and development program is designed to respond to client research needs through practical application of innovative, independent investigations to complex problems. The group has a highly specialized group of scientists who work closely with research associates and environmental

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engineers assigned to other groups within the company. This group will be available to provide technical and scientific advice to the project team.

5.2.3 ENGINEERING

Waste treatment processes and facilities are designed by registered professional engineers assigned to the Engineering Group. In-house staff expertise includes environmental, chemical, civil, mechanical, electrical, and construction engineering disciplines.

Ecova engineers work closely with the firm's geologists, microbiologists, chemists, and regulatory affairs specialists in the design of treatment systems. They also assist in system fabrication, installation, startup, and operation. The firm's Fabrication Engineering group constructs the specialized treatment equipment and facilities that are typically not available "off the shelf" and is responsible for onsite installation and maintenance.

5.2.4 ANALYTICAL SERVICES

Ecova Analytical Services (EAS) is a full-service analytical laboratory specializing in the chemical analysis of environmental and hazardous waste samples. The laboratory is approved for work by the U.S. EPA under the Contract Lab Program (CLP) and by the U.S. Army Corps of Engineers. It currently provides comprehensive environmental analytical services to government and commercial clients and supports all Ecova remediation projects.

EAS is staffed with highly qualified and experienced chemists. All laboratory personnel are experienced in analyzing toxic and hazardous waste samples. Through this experience, EAS provides clients with accurate, consistent, and reliable analytical services and reporting. Procedures, methods, and practices meet or exceed standards for environmental samples established by U.S. Environmental Protection Agency. In addition to standard analyses, the laboratory develops, validates, and performs custom analyses as required to meet a client's needs.

5.2.5 QUALITY ASSURANCE/QUALITY CONTROL

Ecova has a comprehensive Quality Assurance/Quality Control Program, which provides for uniformity and control of services. This program includes defined policies for:

- Sampling and sampling control (chain-of-custody)
- Laboratory procedures
- Analytical services
- Preparation of calculations, drawings, and reports
- Control of computer data reduction software including verification and data management
- Peer review
- Personnel quality assurance/quality control responsibilities
- Preparation and control of quality assurance documents
- Personnel training
- Record preparation, collection and maintenance

6. EXPERIENCE

The bioremediation system proposed for cleanup of the Time Oil Company Site was developed within Ecova's ongoing hazardous waste treatment research and development program. This section provides an overview of Ecova's development of the bioremediation techniques and the constituents that can be treated. This section is followed by Ecova project summaries of site remediations that are similar in size and complexity to the Time Oil site.

6.1 TECHNOLOGY DEVELOPMENT AND CAPABILITIES

Ecova's corporate policy is to develop and deliver multiple processes for the treatment of hazardous waste, based on an understanding of the science behind the process. In bioremediation this involves an application of microbiological research and development with environmental and hydrogeological engineering. Ecova is the only commercial company with this level of expertise. Microbiologists at Ecova have determined the limiting physiological and environmental factors affecting the rate and extent of biodegradation of pentachlorophenol. This knowledge will be incorporated into the remediation of the Time Oil site.

The bioremediation operating parameters to be used at the Time Oil site incorporate processes developed for the biological remediation of pentachlorophenol, creosote, and other wood treating wastes developed by Ecova. This technology was developed during a 20-month treatment study Ecova conducted on behalf of a client responsible for the cleanup of a wood treating site, an NPL site in the Western United States (detailed on page 7-5). Ecova's work determined operating parameters, rates, and cleanup levels for a full-scale remediation program incorporating slurry-phase and other bioremediation processes. Research and development work from this project including data demonstrating the complete mineralization of pentachlorophenol is also included in Appendix C.

The slurry-phase bioremediation techniques to be used at the Time Oil site were first used by Ecova at a client site in North Dakota in which more than 10,000 cubic yards of soil contaminated with high concentrations of chlorinated pesticides (up to 13,000 ppm 2,4-D) were remediated using both slurry- and solid-phase systems. On this project, three slurry-phase bioreactor units, each capable of treating 26,000 gallons of fluid, were mobilized to the site. Material was withdrawn from a stockpile of highly contaminated soil and placed in a trommel unit that slurried the soil and separated out stones and rubble. The slurry was then pumped into the bioreactors for treatment. This project is described more fully on page the following page.

Since this initial application, Ecova developed modifications to the slurry systems for the handling of petroleum-contaminated soil and hydrocarbon sludges, including those contaminated with penta-chlorophenol.

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6.2 REFERENCES

The following client references are provided from projects of scope and size similar to that at Time Oil. Full descriptions of these projects are provided on pages 6-3 to 6-8.

6.2.1 WOOD TREATING WASTE BIOREMEDIATION DEVELOPMENT

Ecova conducted a 20-month treatment study to develop advanced biological treatment techniques for the cleanup of pentachlorophenol and other wood treating wastes at a Superfund site in the western United States. The program encompassed basic laboratory research, bench-scale work, systems design, and follow-on field pilot demonstrations.

Client Reference:

Mr. Keith Piontek
CH2M Hill
P.O. Box 22508
Denver, Colorado
(303) 771-0900

6.2.2 SOIL ENHANCED SLURRY-PHASE BIOREMEDIATION

Ecova managed soil and groundwater cleanup at a site in North Dakota that was contaminated as a result of a fire at a chemical storage facility. Slurry and solid-phase treatment technologies were used to treat more than 10,000 cubic yards of soil contaminated with chlorinated pesticides within a two-month time frame. A groundwater pump and treat system was implemented to remediate contaminated groundwater.

Client Reference:

Mr. Rick Anderson
Westchem Agricultural Chemicals
P.O. Box 31772
Billings, Montana
(406) 245-4171

6.2.3 CONTAMINANT VOLATILIZATION/BIOREMEDIATION

At a Superfund site in California, Ecova operated a groundwater decontamination system that removed both chlorinated hydrocarbons and soluble organics. A two-step process employing air stripping in conjunction with a bioreactor was implemented. A bench-scale model of the treatment system was developed to evaluate and define the operating parameters of the treatment system.

Client Reference:

Mr. Dan McCaskill
Sr. Vice President
Van Waters & Rogers
2600 Campus Drive
San Mateo, California
(408) 435-8700

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IN SITU PROCESS DEVELOPMENT PROGRAM FOR WOOD TREATING WASTE

PROJECT LOCATION:	NPL Site - Wyoming
CLIENT:	Confidential
INDUSTRY:	Transportation (Railroad)
CONTAMINANTS:	Pentachlorophenol, Polynuclear Aromatic Hydrocarbons

PROBLEM:

A former railroad tie-treating plant has been named to the NPL list due to significant creosote contamination. The 100-acre plus hazardous waste site holds creosote-contaminated soil and groundwater in unlined surface impoundments containing approximately 1 million cubic feet of waste. Pentachlorophenol (PCP) was found to be in excess of 150 ppm, significantly above the acceptable limit. The client is looking for an alternative to incineration.

SOLUTION:

Ecova Corporation was hired to conduct a 20-month treatability study and process development program to develop advanced in situ treatment techniques for this site. The study is designed to determine the rate and ultimate cleanup levels achievable with a full-scale bioremediation program. Currently in the final phases of the program, Ecova has successfully proven and demonstrated that the wastes can be bioremediated and PCP can be reduced to 2 ppm. The study included basic laboratory research and bench-scale work systems design. The contamination remediation techniques examined are:

- Surface and subsurface soil bioremediation techniques
- Soil wash leachate and groundwater treatment evaluation

Laboratory bench-scale studies, begun in the fall of 1986, include a thorough analysis of site soils and a series of micro column studies to determine the increased effectiveness of enhanced in situ biotreatment techniques. Bacterial formulations capable of recolonizing waste soils and degrading residual contaminants are being tested extensively. Soil microcosm studies are also being undertaken to evaluate the effectiveness of bacterial and nutrient systems on target contaminants degradation and the conditions that promote biodegradation.

Comprehensive pilot demonstrations, planned to begin after completion of the bench-scale work, will verify the effectiveness of the treatment techniques and will provide design criteria, schedule, and budget for full-scale field work. The pilot demonstration will also verify the results of the micro column studies under actual field conditions.

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REMEDIATION OF HYDROCARBON-CONTAMINATED GROUNDWATER

PROJECT LOCATION:	California
CLIENT:	Confidential
INDUSTRY:	Chemical Solvent Manufacturer
CONTAMINANTS:	Chlorinated Hydrocarbons and Soluble Organics, Aromatic Compounds, Ketones, Alcohols, and Glycols

PROBLEM:

Underground storage tanks containing chemical solvents have contributed to large-scale groundwater contamination with chlorinated hydrocarbon and soluble organic materials. An existing air stripping system was not effective in bringing the groundwater into compliance limits. The National Priority List site is subject to cleanup standards and discharge limits as *established by the regional office of the U.S. EPA and the California Regional Water Quality Control Board.*

SOLUTION:

Ecova Corporation was contracted to operate a groundwater decontamination system using a two-step process employing air stripping in conjunction with a bioreactor system. This system, currently in operation by the client, combines physical and biological technologies to remove a complex mix of contaminant from site groundwater. The site is a chemical blending, storage, and distribution facility. Groundwater and soil investigations conducted previously revealed that the groundwater beneath the facility was contaminated with volatile organic compounds (VOCs) and soluble organic compounds including chlorinated hydrocarbons, aromatic compounds and various ketones, alcohols, and glycols. Ecova designed and constructed a bench-scale air stripper and conducted biological treatability studies in the corporate laboratories using water from the site. These preliminary tests provided essential information for design of the full-scale treatment system, such as expected stripping efficiency and biodegradation rates. the laboratory study also developed the microbial inoculum used in the full-scale field bioreactor.

The treatment system includes seven groundwater recovery wells and a hydraulic control system, an air stripper to remove VOCs of low solubility, and a biological treatment system to remove soluble organic compounds. The air stripper is a 35-ft high column with internal packing that increases air-to-liquid surface contact. Contaminated groundwater enters the top of the unit and forms a cascading film as it drops through the packing material. Simultaneously, air is blown upward from the bottom of the columns, thus "stripping" volatile hydrocarbon molecules from the water. The air stripper has a working capacity of 50 gallons per minute (gpm).

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Following removal of the volatile organics, groundwater is transferred to the bioreactor for degradation
of the soluble organics. The bioreactor is a 10,000-gallon tank seeded with a microorganism/nutrient inoculum specifically acclimated to biodegrade the remaining soluble organic contaminants. The bioreactor contains an agitator to provide aeration and instrumentation for monitoring contaminant levels and biodegradation. Ecova met with California regulatory agencies to gain approval of system design and achievable treatment levels.

The system initially operated on a batch discharge basis; the effluent was collected in tanks and discharged to the storm sewer only after sampling confirmed that all discharge requirements were met (chlorinated hydrocarbons <5 ppb and soluble organics <1 ppm). The system was put on continuous discharge to the storm sewer under a NPDES permit in July 1987, after sample results proved that contaminant levels were consistently reduced below discharge limits at a process flow rate of 18 gallons per minute.

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BIOREMEDIATION OF SOIL AND GROUNDWATER

PROJECT LOCATION:	North Dakota
CLIENT:	Confidential
INDUSTRY:	Agricultural Chemical Distribution
CONTAMINANTS:	Pesticides - 2,4-D, Alachlor, Trifluralin, Carbofuran, MCPA

PROBLEM:

On April 7, 1987, a warehouse fire at a major agricultural distributorship ignited stored pesticides, completely destroying the facility. Firefighters responding to the scene used water to extinguish the flames, spreading pesticides into the surrounding soil, groundwater and a nearby creek.

SOLUTION:

Ecova Corporation managed soil and groundwater bioremediation at the site. The remediation program involved extensive material handling, soil and material segregation, and the use of several biological techniques. Ecova designed and constructed a five-acre, clay-lined treatment bed at the site, and also delivered mobile bioslurry and liquid-phase bioremediation units to the treatment location. Contaminated soil from the burn site and along the length of the contaminated creek was excavated and transported to the treatment location. The soil was tested for contaminant levels, separated according to the extent of contamination, and prepared for treatment by the removal of rocks and debris.

Solid-phase treatment of approximately 12,000 cubic yards of less contaminated soil (containing less than 200 ppm of contaminants) was performed on the 5-acre, lined treatment bed. The soil was processed daily and a microbial inoculum was applied to assist the biological breakdown of the contaminants.

A mobile soil slurry bioreactor system was used to treat soils with contamination exceeding 200 ppm. This process consisted of aerobic treatment of soil mixed with water in 26,000 gallon bioreactor tanks. The slurry mixture was inoculated with pesticide-degrading bacteria and with nutrients that optimize the ability of bacteria to degrade the contaminants. The microbial inoculum and nutrient additions were developed in Ecova's corporate laboratories. Some groundwater was treated by pumping from subsurface contaminated areas and using it as makeup water in the soil biotreatment processes.

Groundwater was treated with innovative in situ bioremediation techniques which reduced the treatment time in half. An upgradient injection gallery was established to flush treated water and nutrients, as required, through the contaminated plume. Downgradient recovery wells and trenches recover treated groundwater. During treatment, the groundwater was monitored to guard against off-

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site migration. During the winter of 1987, more than five million gallons of groundwater was treated. The site has been restored to its original condition and a site closure plan prepared in accordance with appropriate regulations.

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APPENDIX A. Soil Boring Analysis

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Soil Boring Analysis

Key information in the design and operation of any remediation program is the amount of contaminated material present to be treated and the level of contamination. To assess this information for the Time Oil site in Portland, Oregon, several sources of information were assessed. First, Ecova obtained samples of the contaminated soil for laboratory analysis. This data is reported in Appendix B, and indicates that an expected wide variation in PCP concentrations was observed with up to 2000 ppm PCP detected. We recognize that the soils with the highest PCP levels were deliberately buried to minimize exposure. The composite PCP concentration reported was 680 ppm.

Next, soil boring information provided by Time Oil was reviewed and analyzed. This detailed information provides PCP concentration for four vertical levels at each boring location within the sample grid. The reported levels were surface, and 4 ft, 7 ft, and 12-ft below grade. The bottom level is near the groundwater table.

Soil boring PCP concentration data also show wide variation, with hot spot concentrations of up to 8400 ppm. Determining average PCP concentrations within soil that shows nearly three orders of magnitude variation in concentration is a difficult task. It is clear from the data that much of the soil is well below 1000 ppm. Time Oil has estimated that the average concentrations may approximate 1500 ppm for the 2700 cubic yards that they estimate would be removed in excavating soil containing over 500 ppm.

Ecova used the Golden Software program SURFER to plot PCP concentrations for each soil boring horizon sampled by Time Oil. These plots agreed very well with similar plots provided by Time Oil. Using these plots, a hypothetical excavation (or "mine") plan was prepared to determine quantities of soil that would need to be removed and the overall PCP concentration in the excavated soil. These plots are illustrated in Appendix figures C-1 through C-4. The excavation plan was developed from the 12-ft plot and extended upward through the next three layers to remove the minimum amount of soil exceeding 500 ppm. The plot for the 12-ft horizon was assumed to be representative of soil in a layer from 12 ft below grade upward to 9.5 ft. The plot for 7 ft was assumed to represent soil in the 9.5 to 5.5 ft layer. The plot for 4' was assumed to represent soil in the 5.5 to 2 ft layer. Finally, the surface plot was assumed to represent the 2' to the surface layer.

The area of the "mine plan" contours for each layer were planimetered to determine area and subsequent volume of soil. Based upon this calculation, approximately 3440 cubic yards of contaminated soil must be excavated.

Next, the "volume" under the PCP concentration surface to the zero ppm level was determined using the SURFER volume calculation subroutine for each layer. Dividing that "volume" by the number of cubic yards within that layer yields the average PCP concentration for the soil within that layer. Calculating an average weighted by the amount of soil in each layer, the final average PCP concentration in the excavated soil was estimated to be 668 ppm. This agrees well with the composite analytical result and appears reasonable from close examination of the data.

Several points were observed in this study that are important to note. First, the depth of contaminated soil was assumed to be 12 ft. In actuality, the depth of contamination should extend deeper to the water table, especially in the area of the hot spots. This could increase the volume of soil that needs to be excavated by a considerable margin.

Second, the assumption was used that only soil exceeding 500 ppm would be excavated. From the soil boring data, the 500 ppm concentration isopleth was not completely contained in the plots at the 4 ft, 7 ft or the 12 ft depths. The cause of this was that PCP concentrations in the boring on the southern edge of the grid exceeded

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500 ppm. This is especially important at the 12-ft depths since a much larger volume of soil must be excavated above this layer to get access to the lower layer. Since the 500 ppm contour was not bounded within the soil boring data, the exact quantity of soil exceeding 500 ppm cannot accurately be determined.

Finally, the use of a 500 ppm cutoff limit for PCP contamination may be considerably higher than that allowable by a regulatory agency. If a lower cutoff concentration were to be used, excavated soil volumes could be greatly increased.

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FIGURE A-1.
APPENDIX A-1. Excavation Plan 0-2' Depth

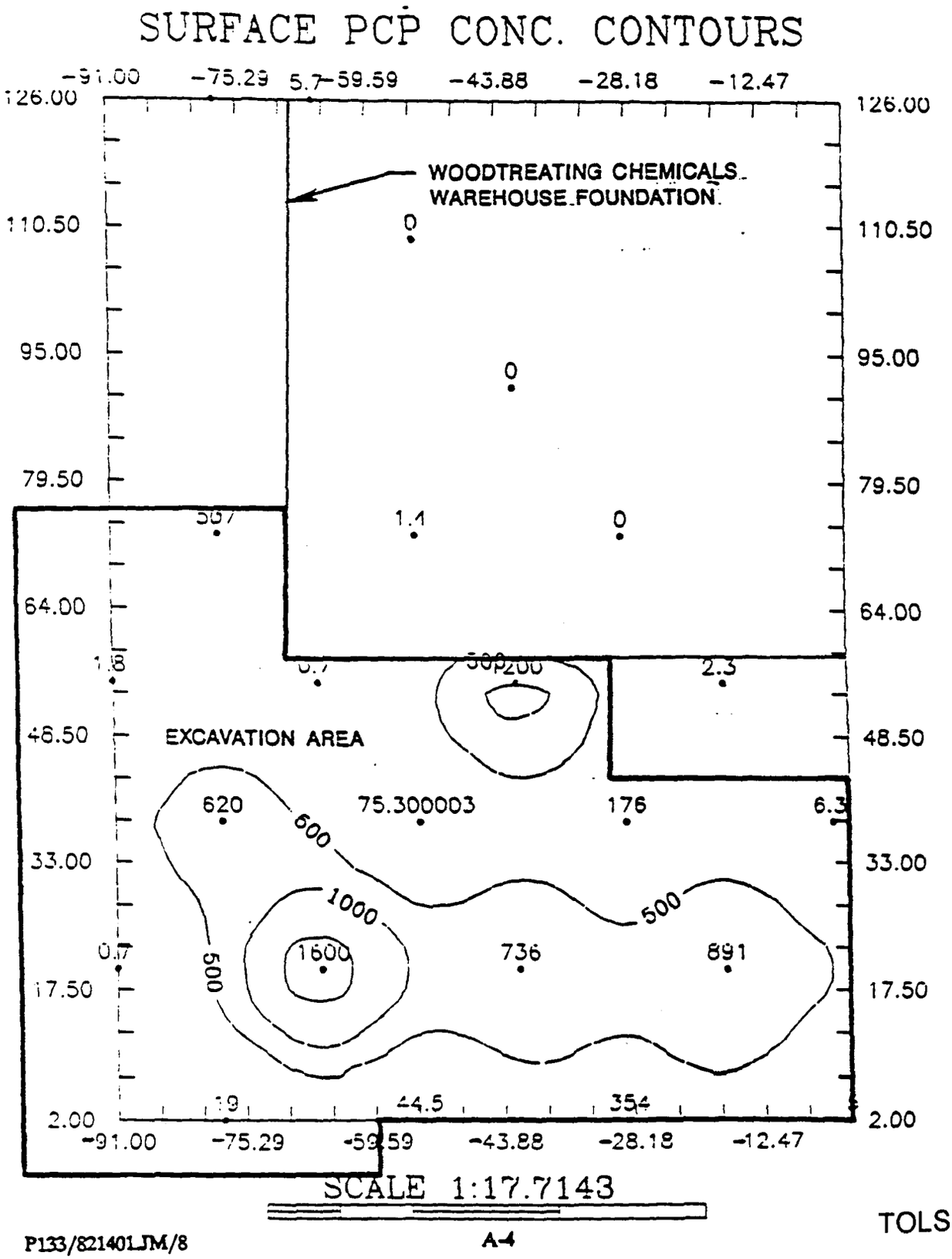

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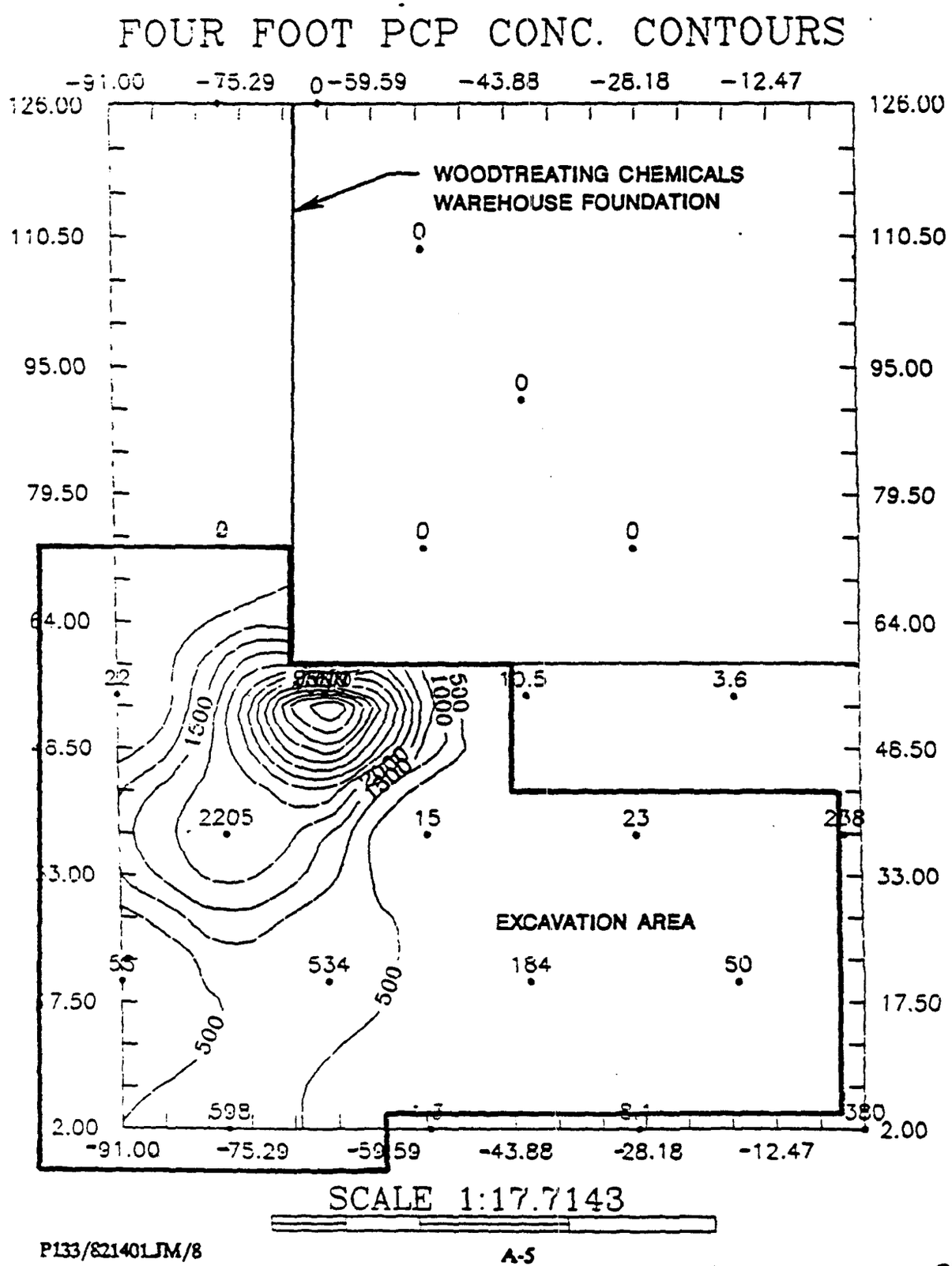
FIGURE A-2.
APPENDIX A-2. Excavation Plan 2'-5-1/2' Depth



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A-5

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FIGURE A-3.
APPENDIX A-3. Excavation Plan 5-1/2'-9-1/2' Depth

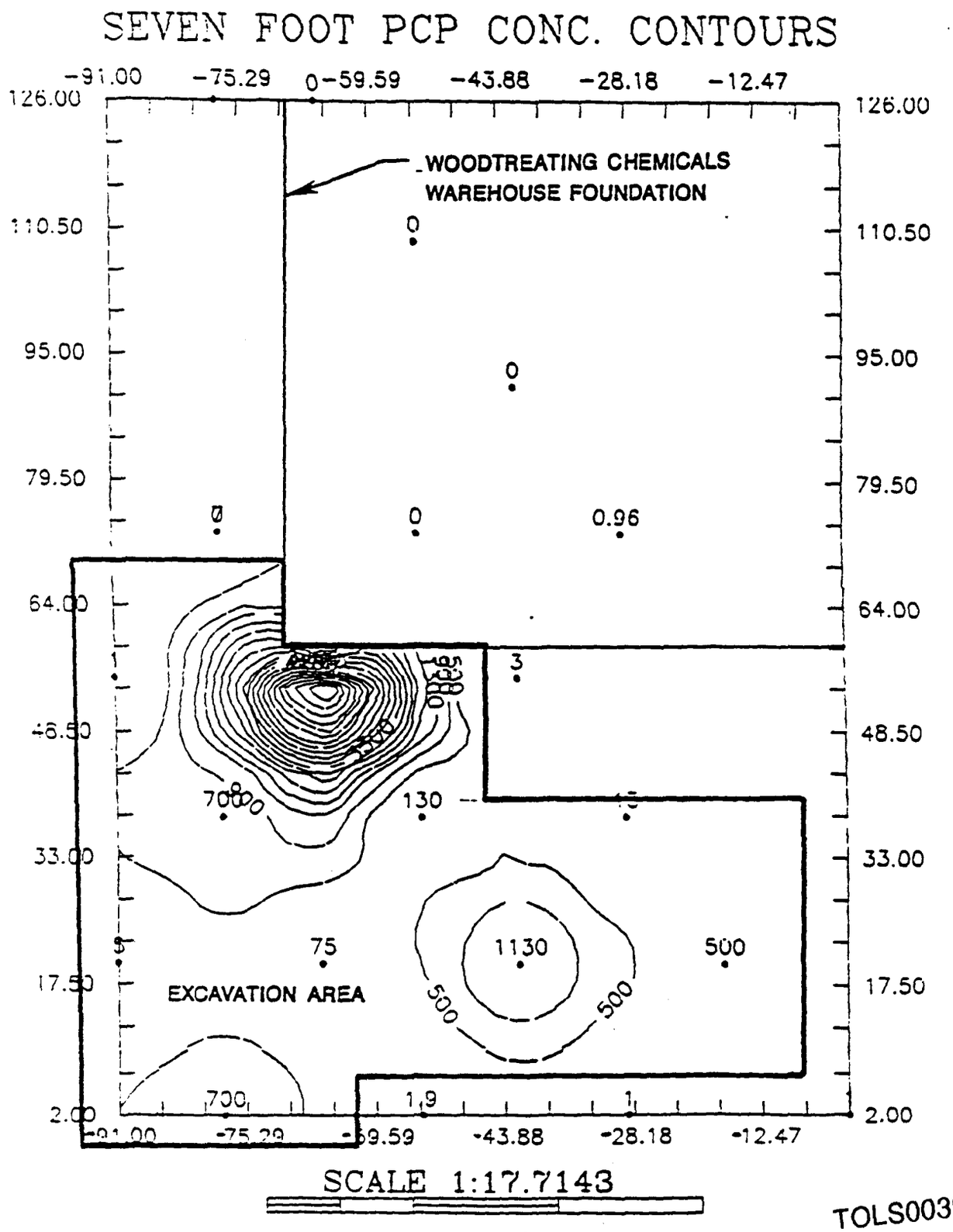

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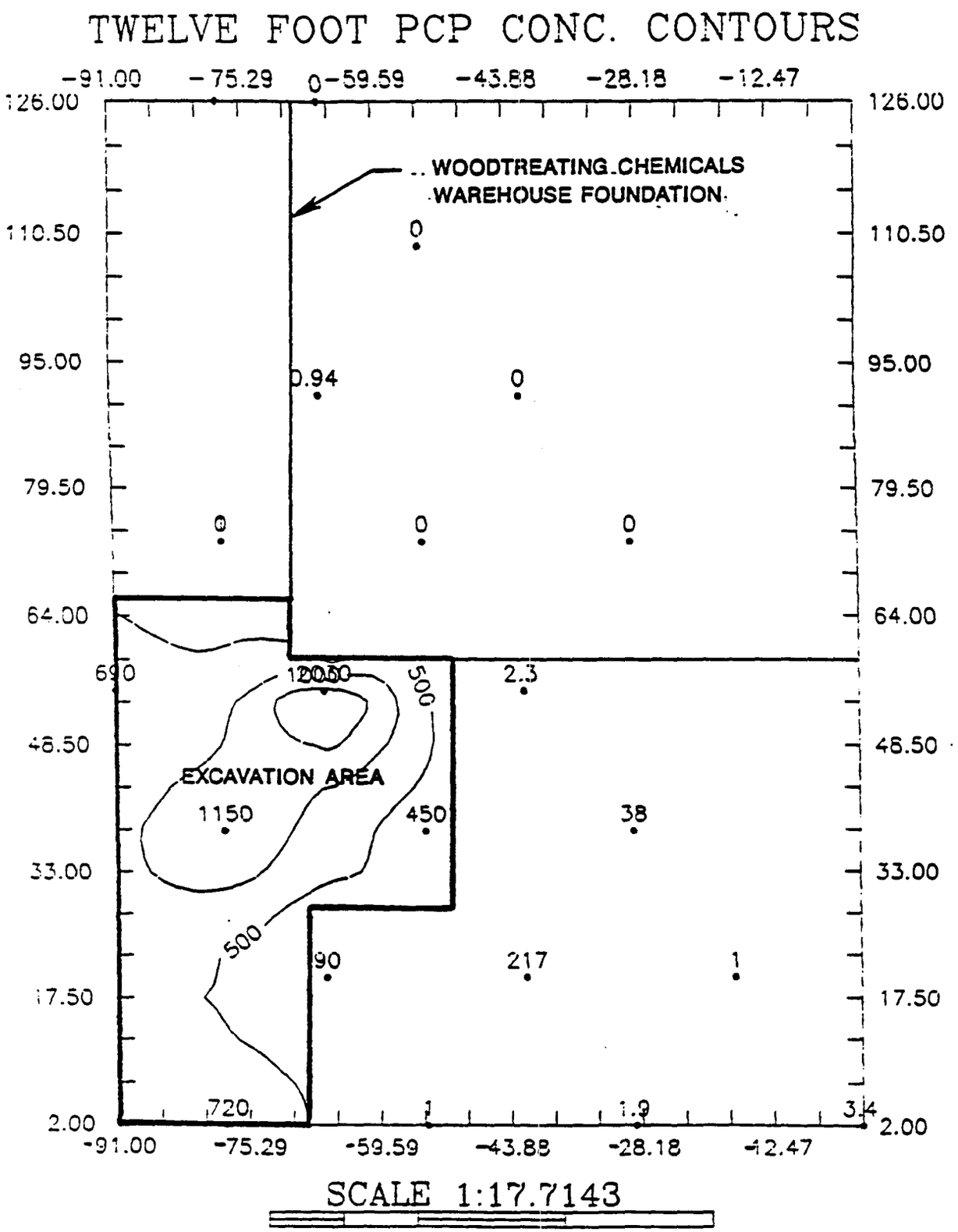
FIGURE A-4.
APPENDIX A-4. Excavation Plan 9-1/2'-12' Depth



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SOIL BORING ANALYSIS

TIME OIL - PORTLAND,OR
PROJECT NO. 82140
SEPTEMBER 1982
SOIL BORING ANALYSIS

PLANIMETER CALCS.-CONTOURS

CONTOUR MAP NAME	AREA (FT^2)	VOLUME (FT^3)	VOLUME (YD^3)
SURFACE	2851.4	5702.9	211.2
4 FOOT	1932.5	6413.6	237.5
7 FOOT	3017.6	12070.4	447.1
12 FOOT	2293.6	11418.0	422.9
SUM	9985.1	35604.8	1318.7

PLANIMETER CALCS.-MINE PLAN

DEPTH PROFILE (FT)	AREA (FT^2)	VOLUME (FT^3)	VOLUME (YD^3)
0 - 2	9557.5	19114.9	708.0
2 - 5.5	9584.7	30046.4	1112.8
5.5 - 9.5	7068.8	28275.2	1047.2
9.5 - 12	3082.1	15410.2	570.7
SUM	29293.0	92846.7	3438.8

CONCENTRATION VOLUME/LEVEL

DEPTH PROFILE (FT)	0 - 2	2 - 5.5	5.5 -9.5	9.5 - 12
VOLUME CALC				
TRAP. RULE	370536.4	643602.9	758709.3	567716.0
SIMPSON'S RULE	349529.5	622479.8	779037.7	523789.1
3/8 SIMPS. RULE	356926.3	621843.4	754541.9	536940.5
AVERAGE	359030.4	629308.7	767096.0	542815.2
SDEV	10710.0	12383.0	11831.0	22545.0
YARDS OF SOIL	708.0	1112.8	1047.2	570.7
PPM/YD^3	507.1	565.5	732.5	951.1
	359030.4	629308.7	767096.0	542815.2

AVERAGE CONC./YD^3: 668.3 PPM

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APPENDIX B. Resumes

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MARK W. ANDERSON
Project Manager

Mr. Mark Anderson has over 13 years of experience with project management, environmental engineering and permitting assistance in waste management for manufacturing, chemical, petroleum, and state agency clients in the western United States and Alaska. As a project manager for Ecova, Mr. Anderson is responsible for overseeing the design and construction of onsite treatment systems and provides day-to-day management of their operation. He also provides the main point of contact for clients and is responsible for analyzing the requirements and status of field operations, site construction, laboratory support, and project safety.

Education and Affiliations:

M.B.A., Oklahoma City University, Oklahoma City, Oklahoma (High honors)
B.S., Environmental Engineering, Montana College of Mineral Science & Technology, Butte, Montana, 1978
B.S., Atmospheric Science, University of California, Davis, California, 1973
P.E. No. 13740, State of Oklahoma

Corporate Experience:

1988 - Present	Ecova Corporation	Senior Project Manager
1985 - 1988	Dames & Moore, Inc.	Senior Project Manager
1981 - 1985	Kerr McGee Corp.	Senior Staff Engineer
1980 - 1981	Camp Dresser & McKee	Program Manager
1978 - 1980	Consolidated Cooper Co.	Director of Environmental Affairs
1974 - 1977	ASARCO, Inc.	Station Chief

Related Project Experience

- Project Manager for the cleanup of diesel-contaminated soil at a former service station site in Tacoma, Washington.
- Project Manager of the Remedial Investigation/ Feasibility Study (RI/FS) for a Superfund site (battery recycling facility and secondary lead smelter) in Portland, Oregon. Work included preparation of work plans; agency presentation and negotiations; sampling of wastes, surface and subsurface soil, groundwater, surface water, sediment and ambient air; identification and evaluation of appropriate remedial technologies which included conducting fixation/solidification tests of wastes and contaminated soils for inorganic contaminants; drilling of groundwater monitoring wells; and hydrogeologic modelling.
- Project Manager for the clenaup of perchloroethylene contaminated soil using a 13-well extraction and treatment system.
- Project Manager for an environmental audit of two aluminum master alloy manufacturing facilities in the States of Washington and Kentucky.

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- Project Manager for a study to develop treatment, storage, and disposal alternatives for radioactive mixed wastes from active generating facilities at the Hanford Site, Richland, Washington. Work included identifying waste streams, assessing TSD technologies, and estimating costs for recommended alternatives.

- Project Manager of a site study and feasibility analysis of a proposed gravel quarry and landfill operation in King County, Washington. Work included geological evaluation of the site and identification of permitting requirements.

- As Project Engineer, evaluated wastewater treatment plant performance at the Boeing Corporation facility at Auburn, Washington.

- As Environmental Engineer, assessed air, water, and hazardous waste compliance problems for chemical manufacturing plants in California, New Mexico, Idaho, Nevada, Mississippi, and Alabama; coal mining operations in Wyoming and Illinois; oil refineries in Oklahoma, Louisiana, California, and Texas; gas processing plants in Oklahoma, Texas, and North Dakota; nonferrous metal mining and smelting plants in Arizona and Montana; and nuclear facilities in New Mexico and Oklahoma.

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ROBERT SCHECK
Engineering Manager

Robert Scheck has over 20 years of engineering and related experience with over 15 years of specialized experience in the environmental field, including hazardous waste treatment, air correction/flue gas desulfurization, and resource recovery. Mr. Scheck's management experience includes process design, technical management, construction management, and staff supervision.

Education and Affiliations:

B.S., Professional Degree in Extractive Metallurgy, Colorado School of Mines, 1967
Business Management Program, Alexander Hamilton Institute

American Institute of Chemical Engineers
American Institute of Mining Engineers

Corporate Experience:

1986 - Present	Ecova Corporation	Director of Engineering
1986 - 1986	Morrison-Knudsen Engineers	Process Design Manager
1982 - 1984	Sterns Catalytic Corp.	Project Manager
1967 - 1982	Sterns Roger Corp.	Project Manager/Project Engineer

Related Project Experience

- Engineered a transportable slurry bioreactor system to remediate 1,000 yards of 2,4-D-contaminated soil. Horizontal reactors incorporated agitators, air spargers, interconnecting piping, and transfer/recirculation slurry pumps, and can be operated in series, parallel, batch, or continuously.

- Designed granular activated carbon (GAC) absorption system to treat 100 GPM of 2,4-D-contaminated groundwater. Units incorporated programmable logic controls, alarm auto dialing, filtration, ozonation, GAC, and surge tankage. Units contain 3,000 lb of GAC in a transportable and explosion-proof container.

- Performed technical management and supervision on a CERCLA project of approximately $1 billion. Contaminants included nerve agents, pesticides, unexploded ordnance, heavy metals, miscellaneous organics, and fluoride in the groundwater. Initiated and coordinated remedial action planning which included groundwater treatment, incineration, landfill, and demolition.

- Designed groundwater intercept system and prepared well water pump specifications for multiple pumps. Considered water hammer, incorporated freeze protection down to -50°F, and automatic drainage in case of power outage.

- Coordinated a team investigation of hydrocarbon and TCA contamination of a shallow aquifer. The investigation continued with a feasibility study indicating bioreclamation to be the technology of choice. Work also included evaluation of a leaking underground storage tank.

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- Developed data base for the several thousand incidents of spills, releases, and discharges for the last 40 years over a 25-square-mile site. With consultants, developed a system for ranking the hazardous substances based on their hazardous nature and the specifics of the site.

- Performed a feasibility study to remove chlorinated hydrocarbons from an aquifer and soils for a chemical plant. Detailed the groundwater intercept systems, GAC/air stripper, facility demolition, and soil decontamination.

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JOHN P. HANCOCK
Project Engineer

John Hancock is a project engineer specializing in the design of remediation systems for the cleanup of soil and groundwater contaminated with hazardous waste.

Education:

B.S., Petroleum Engineering, University of Tulsa, 1987
B.S., Chemistry, Hendrix College, 1979
Engineer-in-Training

Corporate Experience:

1988 - Present	Ecova Corporation	Project Engineer
1986	Conoco, Inc.	Student Engineer
1985	Rio Grande Drilling	Student Engineer
1981 - 1984	Arkansas Highway Dept.	Chemist
1979 - 1981	Arkansas Dept. of Pollution Control and Ecology	Chemist

Related Project Experience:

- Project Engineer for an Ecova mobile treatment system designed to neutralize ash produced at a wood products manufacturing facility. Designed equipment and flow processes; coordinated with field crew during installation and operation; provided troubleshooting expertise.

- Production Engineer responsible for maintaining production of oil and gas wells; maintenance and repair of high pressure pipelines and vessel, rotating equipment, and gas turbines; well testing; supervision and safety of contract employees on offshore platform.

- Drilling Engineer responsible for maintenance of drilling rig, assembly of special drilling tools, maintenance and repair of drilling fluids and high pressure equipment including positive displacement pumps.

- Chemist for quality control analysis of highway construction materials, water quality analysis for environmental projects, training of technicians, identification of general unknowns, physical and chemical testing of paint, extensive use of computer-interfaced analytical instruments (IR, AA, HPLC, UV-VIS).

- Chemist for analysis of high volume particulate air samples, maintenance and calibration of continuous air chemistry monitors (NOx, SOx, HC, ozone), member of emergency response team (UV-VIS, IR, AA, Technician).

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JEFFREY POWELL
Field Engineer

Jeffrey Powell has eight years of experience in process system design, fabrication, startup, and operation. He is responsible for the design and fabrication of biological, chemical, and physical treatment systems and has developed modular pilot systems for onsite use for the remediation of hazardous waste sites. Systems developed by Mr. Powell include a modular fermenter/bioreactor; a pilot air stripper used to test process modifications and to predict cleanup levels achievable in full-scale operations; a modular air management system for an enclosed land treatment area; a bench-scale bioreactor to model energy requirements for a pilot scale bioreactor; and an oil/water separation system for the treatment of groundwater contaminated with diesel fuel. In addition, Mr. Powell is responsible for the installation and maintenance of systems installed onsite.

Education:

Challa Gardens Electrical & Mechanical Technical College, Australia,
Graduated 1965

Corporate Experience:

1986 - Present	Ecova Corporation	Field Engineer
1981 - 1986	Jordon & Ste. Michelle Winery	Production and Maintenance Manager
1978 - 1981	Walter Reynell Winery	Maintenance Manager
1974 - 1978	Lawson & Jones Lithographers	Electrical Foreman
1970 - 1973	Drake & Gorham Construction	Electrical Supervisor
1968 - 1970	O'Donnell & Griffin Contract.	Electrical Foreman

Related Project Experience:

- Managed the Ecova Facilities Engineering Shop. Supervised welders, metal workers, electricians, machinists and technicians in the fabrication of soil slurry systems, portable fermentation units, mobile treatment containers, oil/water separators, and carbon adsorption units.
- Directed construction and maintenance of soil handling and microbiological equipment used to treat soil and groundwater at a Superfund site on the Gulf Coast.
- Coordinated the installation and startup of soil treatment, bioslurry and groundwater treatment systems for the cleanup of a large chemical spill in North Dakota.
- Designed and constructed soil handling equipment, including transportation units, conveyor systems, stackers, auto train loaders, and bucket wheel reclaimers.
- Designed various microbiological systems, including reverse osmosis processes, and computer programs for sequencing production equipment.

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- Managed maintenance of all production equipment including fermentation and production piping, heating, and refrigeration systems.

- Directed maintenance and repair of tanks, piping, conveyor systems, heating and refrigeration systems, and production facilities. Designed and implemented computer program for sequencing production equipment.

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WILLIAM MAHAFFEY, Ph.D.
Project Biochemist

William Mahaffey is a Senior Research Biochemist who specializes in microbial biochemistry. He is responsible for research efforts involving isolation and enrichment of microorganisms for promoting biodegradative abilities. Dr. Mahaffey conducts research on bacteria capable of degrading hydrocarbons, including heavy oils and tars, creosoles, and creosote; solvents; and a variety of other contaminants. He has 12 years of experience in the biodegradation of hazardous wastes.

Education:

Ph.D., Microbial Biochemistry, University of Texas at Austin, 1986
M.S., Microbial Ecology, State University of New York at Brockport, 1978
B.S., Microbiology, State University of New York at Brockport, 1976

Corporate Experience:

1987 - Present	Ecova Corporation	Senior Research Biochemist
1986 - 1987	Phillips Petroleum Co.	Senior Research Chemist
1976 - 1985	University of Texas	Research Assistant; Graduate Research Assistant

Related Project Experience:

- Managed the development of microbiological operating procedures for field implementation in soil and ground water hazardous waste cleanup projects.

- As a Research Biochemist, was responsible for use of chemostats and continuous culture techniques for the isolation of pesticide degrading microorganisms. Studied the effects of chlorinated compounds on microbial metabolism, specifically ketone and pentachlorophenol.

- Developed research program on aromatic hydrocarbon metabolism by bacteria and fungi. Optimized fermentor growth conditions for maximum cell yield and enzymatic activity. Immobilized bacterial cells for biocatalysis. Used halogenated substrate carcinogenic polycyclic aromatic hydrocarbons. Isolated and characterized metabolic intermediates using HPLC, mass spectrometry, UV/VIS and CD spectroscopy, and nuclear magnetic resonance spectroscopy. Maintained laboratory microbial stock culture and metabolite collection.

- Conducted graduate studies involving bacterial metabolism of dibenzothiophene and benz(a)anthracene. Isolated and characterized metabolic intermediates formed by whole cell biotransformation. Purified enzymes and clarified the metabolic pathways for both of the above substrates. Reported on the ring cleavage of a polycyclic aromatic hydrocarbon with more than three rings.

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- As a Staff Research Chemist, studied fermentation process development of genetically engineered yeast for the production of recombinant peptides and proteins. Analytical biochemistry work included characterization of recombinant proteins to determine host modifications or identity with the native protein. Dr. Mahaffey developed analytical techniques for monitoring production of recombinant proteins and peptides.

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JOHN KINSELLA, P.G.
Vice President, Geosciences and Field Operations

As Vice President of Geosciences and Field Operations, Mr. Kinsella directs the activities of the firm's engineers, hydrogeologists, and geophysicists in support of all remediation projects. He has ten years of experience as a professional hydrogeologist, including four years as regional manager of a major consulting firm. He has supervised and designed soil borings, well installations, aquifer tests, and borehole/surface geophysical surveys. Mr. Kinsella has managed Superfund RI/FS and RCRA projects, prepared hazardous and solid waste permit applications, and negotiated settlements for compliance orders.

Health and Safety Training, Hazardous Waste Operations and Emergency Response; 29 CFR 1920.210

Education and Affiliations:

M.Sc., Hydrogeology, University College/London, 1978
B.A., Geology, Trinity College/Dublin, 1977

Professional Geologist (North and South Carolina)
Certified Geologist (U.K.)

Corporate Experience:

1988 - Present	Ecova Corporation	V.P., Geosciences & Field Operations
1984 - 1988	Geraghty & Miller, Inc.	Associate & Office Manager
1981 - 1984	IT Corporation	Project Engineer
1978 - 1981	Thames Water Authority	Assistant Hydrogeologist

Related Project Experience:

- Directed hydrogeologic evaluation of a closed 30 acre RCRA hazardous waste landfill. Defined landfill hydraulic characteristics via a water-balance and tracer methodologies. Lithium, oxygen isotope and barium tracers were used in conjunction with a historical photo search to map contaminant migration pathways and locate boring/well locations.

- Installed shallow and deep monitoring well networks for hazardous waste facility in Emelle, Alabama. Deep wells (950 ft) had unique two-pump system to enable effective purging and sampling.

- Assessed the extent of contamination resulting from the failure of an injection well at a chemical plant in New Orleans, Louisiana. Detailed samples revealed that pressurized contaminants had entered the aquifer at 200 ft below surface and penetrated two shallow water-bearing zones.

- Prepared RCRA Part B closure document for Mississippi wood-treating plant. Also prepared a detailed report on PNA/PAH contaminant migration characteristics for client.

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- Evaluated the rate and extent of BTX contamination from a series of underground tanks at chemical manufacturing facility, Los Angeles, California. Floating free-phase product and dissolved plumes were mapped. Interceptor wells coupled with air stripping/carbon adsorption recommended.

- Defined the rate and extent of organic and inorganic plumes originating from a spill and a closed RCRA landfill at an Illinois facility. The plumes (primarily chloride and VOCs) are moving at a rate of 300 ft/year through glacial gravels. Detailed computer modeling was used to design a 180-gpm recovery well system that discharged to an air stripper/carbon adsorption unit; Illinois EPA approved complete CAP.

- Evaluated the source and extent of soil and groundwater contamination originating from subsurface tanks beneath a New Jersey warehouse.

RODERICK CARR
Director, Analytical Services

Roderick Carr is a laboratory manager with 22 years of experience in technical project management, research and development, and chemical analysis of hazardous materials and wastes. He has published extensively on analytical methods development, specializing in the area of heavy metals. Mr. Carr manages daily laboratory operations for organic and inorganic analyses of wastes, soils, and water.

Education:

M.A.T., Environmental Chemistry Education, Harvard University, 1966.
B.A., Physics/Chemistry Education, The George Washington University, 1965.

Corporate Experience:

1988 - Present	Ecova Corporation	Director, Analytical Services
1985 - 1988	RAMP Corporation	President
1979 - 1985	SCS Engineers	V.P., Pacific Northwest Operations
1976 - 1979	Versar, Inc.	Senior Project Manager
1966 - 1976	U.S. Naval Research Laboratory	Research Chemical Oceanographer

Related Project Experience:

- Managed services for organic and inorganic sample analysis and classical wet chemistry. Managed the development and implementation of analytical services for site investigations and remediation activities. Responsible for the overall direction of laboratory growth, staff development, and regulatory compliance.

- Responsible for daily operation of a trace element analytical laboratory at the U.S. Naval Research Laboratory, Washington, D.C.

- Established a program in priority pollutant analysis for the U.S. Environmental Protection Agency. Managed the utilization of subcontractor laboratories in support of this project.

- Responsible for administration of major projects from design through implementation. Interfaced with state and federal regulatory agencies to establish investigation criteria and guidelines. Developed special or new services for national analytical capabilities.

- Led mercury task force, developed cold-vapor atomic absorption methodology for determining part-per-billion concentrations of mercury directly in seawater.

- Developed methods for concentrating toxic heavy metals for analysis from marine waters.

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- Participated in laboratory studies which followed mercury through the food chain using carrier free radioactive mercury and clean-room procedures.

- Reported directly to CEO for in-house environmental analysis chemical laboratory; managed teams of up to 15 professionals and staff. Provided technical support to EPA in its development of hazardous material regulations such as polychlorinated biphenyls (PCBs).

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APPENDIX C. Ecovn PCP Research

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ISOLATION AND CHARACTERIZATION OF A PENTACHLOROPHENOL-DEGRADING MICROBIAL CONSORTIUM

Andrew J. Strehler, Donald R. Smallbeck, and Derek Ross, Ph.D

Ecova Corporation

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Redmond, Washington 98052

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INTRODUCTION

Pentachlorophenol (PCP) is one of the most widely used biocides in the United States (U.S.). Approximately 2.3 x 10^6 kilograms of PCP are manufactured per year in the U.S., about 80% of which is used as a pesticide by the wood-preserving industry (1). PCP is an inhibitor of oxidative phosphorylation, and is lethal to a wide variety of organisms, both plant and animal (2). Because of its toxicity and recalcitrance in the environment, PCP is considered a serious environmental pollutant, and has been placed on the U.S. Environmental Protection Agency's list of priority pollutants (3).

Ecova Corporation is currently developing bioremediation processes to clean-up contaminated soil and groundwater at a tie-treating plant in the Western United States. The site is 100 acres in size and listed under the Comprehensive Environmental Response and Compensation and Liability Act of 1980. An integral part of developing the bioremediation processes is the development of inocula which can degrade the contaminants present at the site. PCP is one of the major contaminants present at the site (Table 1).

The feasibility of using biological processes to treat PCP-contaminated wastewaters has been the subject of a number of investigations (4-6). Furthermore, Edgehill and Finn have demonstrated that the direct inoculation of PCP-degrading bacteria into PCP-contaminated soil may be a feasible method for minimizing the migration of PCP from wood treating sites into the environment (7). Ecova is performing a laboratory evaluation to assess the existing PCP biodegradation potential at the tie-treating plant, with a view to utilizing the existing PCP biodegradation potential to develop treatment systems to remediate the site. This chapter describes the isolation and partial characterization of a PCP-degrading microbial consortium, which will be used to clean-up PCP-contaminated

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soil and groundwater during the site remediation.

ASSESSMENT OF THE EXISTING PCP BIODEGRADATION POTENTIAL AT THE SITE

The biodegradation of PCP is documented in the literature (1-13). Watanabe (12) and Suzuki (13) isolated Pseudomonas species which could degrade PCP. Crawford and his colleagues have isolated Flavobacterium strains that degrade PCP (2). While Finn and his colleagues have isolated a strain of Arthrobacter (ATCC 33790) which can utilize PCP as a sole source of carbon and energy (6, 11). A microbiological evaluation was performed to determine if PCP-degrading microorganisms were present in contaminated soil and groundwater at the tie-treating plant. Aerobic laboratory culture techniques were used to assess the existing PCP biodegradation potential in soil and groundwater samples removed from the site. Fifty-ml aliquots of basal medium (Table 2) were inoculated with 30% (w/v) or (v/v) of contaminated soil or groundwater, respectively. Inoculated flasks were incubated at 25°C for four weeks on a rotary shaker set at 165 rpm. Contaminant degradation was monitored by gas chromatography/mass spectroscopy (GC/MS) according to EPA method 625.

The microbiological evaluation demonstrated that the site contains microorganisms which can degrade the contaminants present at the tie-treating plant. The PCP biodegradation potential detected at the site was highly variable. The percent biodegradation of PCP ranged from 12% to 84%, with an average value of 63%. The highest PCP biodegradation potential was detected in the saturated soil, while the lowest PCP biodegradation potential was detected within area G at the tie-treating plant (Figure 1, Table 3). The data demonstrated that a significant PCP biodegradation potential does exist at the tie-

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treating plant, but that this potential is not evenly distributed throughout the site.

ISOLATION AND CHARACTERIZATION OF THE PCP-DEGRADING MICROBIAL CONSORTIUM

Description of Continuous Culture Apparatus

The continuous culture apparatus illustrated in Figure 2 was used to isolate the PCP-degrading microbial consortium. The apparatus consisted of a 500-ml glass growth vessel, and 10 liter glass medium and effluent reservoirs. The growth vessel, and medium and effluent reservoirs were wrapped with aluminum foil to prevent photo-decomposition of the PCP. Air was supplied to the growth vessel at a rate of 650 ml min^{-1}, the agitation rate was 250 rpm, and the pH was maintained between 7.3 and 7.5 by the automatic addition of 10% (w/v) potassium hydroxide solution. The continuous culture was routinely operated at ambient temperature, approximately 25°C. At a retention time of 24 hours, the flow rate was 0.347 ml min^{-1}, and the dilution rate was 0.042 $hours^{-1}$. At a retention time of 12 hours, the flow rate and dilution rate were 0.690 ml min^{-1} and 0.083 $hours^{-1}$, respectively.

Isolation of the PCP-Degrading Microbial Consortium

An inoculum was developed from the aerated shake flasks established during the microbial evaluation. The inoculum was added to the 500-ml growth vessel at a concentration of 2% (v/v), which was then immediately operated as a continuous culture. Initially basal medium containing 500 ppm nutrient broth and 10 ppm PCP was added to the growth

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vessel to allow the inoculum to adapt to the PCP. The nutrient broth concentration was then gradually decreased to zero while the PCP concentration was increased to 50 ppm. PCP (Sigma Chemical Company) was supplied as the sodium salt. PCP concentration was measured by UV absorption at 320 nm (11). After 4 weeks of operation the consortium was able to utilize PCP as its sole source of carbon and energy, and greater than 98% of the added PCP was degraded (Table 4).

Influence of PCP Concentration on the Stability of the Microbial Consortium

After the chemostat had stabilized at an influent PCP concentration of 50 ppm, the PCP concentration was increased to 100 ppm and then subsequently to 150 ppm. At all of the PCP concentrations tested, greater than 98% of the added PCP was degraded (Table 5). GC/MS analysis demonstrated that the PCP concentration in the growth vessel was reduced to less than 300 ppb, and no intermediate metabolic products were detected. However, at a PCP concentration of 150 ppm, the chemostat became unstable and breakthrough of PCP occurred. Consequently, the chemostat was routinely operated at a PCP concentration of 100 ppm. Removal efficiencies of greater than 99% were maintained for several months in the continuous culture system, indicating that once established, the microbial consortium was very stable.

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Dechlorination of PCP by the Microbial Consortium

Dechlorination of PCP by the microbial consortium was determined by measuring the chloride concentration in the growth vessel. Chloride concentration was measured by mercuric nitrate titration (14). The microbial consortium completely dechlorinated PCP. Approximately five moles of chloride were released for every mole of PCP degraded (Table 6).

Mineralization of PCP by the Microbial Consortium

Radiotracer techniques were used to demonstrate the mineralization of PCP by the microbial consortium. 5-ml aliquots were removed from the growth vessel and placed in the incubation vessel illustrated in Figure 3. Approximately 0.5 microcuries of uniformly labelled PCP (Pathfinder Laboratories) was added to each sample. Samples were incubated for twenty-four hours at 25°C. After which, 0.5-ml of 1% (v/v) sulfuric acid was added to terminate the reaction and drive carbon dioxide (CO_2) out of solution. The released ^{14}C-labelled CO_2 was trapped on a filter paper wick containing 0.5-ml of phenethylamine, a CO_2 trapping agent. To maximize $^{14}CO_2$ adsorption by the wick, the incubation vessel was gently shaken overnight in a 35°C water bath. The wick was subsequently removed and transferred to a scintillation vial containing 3-ml of Beckman Ready-Safe scintillation cocktail. $^{14}CO_2$ was measured by liquid scintillation counting. ^{14}C-labelled compounds in the aqueous phase were measured by counting a 0.1-ml aliquot of that phase. All experiments were run in replicate. The experiments included acid-killed controls to monitor abiotic affects.

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The radiotracer analysis demonstrated that the consortium mineralized the PCP to carbon dioxide. The average percent mineralization of ^{14}C-labelled PCP to $^{14}CO_2$ was 25% ($n = 5$, $x = 25.3 \pm 1.5$).

Composition of the PCP-Degrading Microbial Consortium

The PCP-degrading microbial consortium consisted of six bacteria. The API Rapid NFT test procedure (15) was used to identify the bacteria to the species level. Five of the isolates were Pseudomonas species, the sixth member of the consortium could not be identified by the API NFT test procedure (Table 7). Pseudomonas species which can degrade PCP have been isolated previously by Watanabe (12) and Suzuki (13).

PCP Degradation by the Microbial Consortium in the Presence of Diesel Fuel

In addition to PCP, the contaminated soil and groundwater at the tie-treating plant contains a wide range of other contaminants, mostly polynuclear hydrocarbons (Table 1). To determine the selectivity of the microbial consortium for PCP, the continuous culture apparatus was operated with 100 ppm of PCP and 1,000 ppm of diesel fuel. Diesel fuel was selected because it is used as a carrier for PCP. The rate of PCP degradation in the presence of diesel fuel was similar to the rate achieved when PCP was supplied as the sole source of carbon and energy. Furthermore, the microbial consortium continued to completely dechlorinate the PCP. (Table 8). The data indicated that the microbial consortium selectively degraded the PCP, even in the presence of more readily utilizable carbon and energy sources. These studies are directly applicable to the development of

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bioremediation systems for the treatment of PCP in complex waste environments.

SUMMARY AND CONCLUSIONS

Continuous culture techniques were used to isolate a PCP-degrading microbial consortium from PCP-contaminated soil and groundwater at a tie-treating plant. The consortium utilized PCP as a sole source of carbon and energy at influent PCP concentrations of up to 150 ppm. However, at a PCP concentration of 150 ppm, the chemostat became unstable, and breakthrough of PCP occurred. Consequently, the chemostat was routinely operated at an influent PCP concentration of 100 ppm. At a concentration of 100 ppm, greater than 99% of the added PCP was degraded. GC/MS analysis demonstrated that the PCP concentration in the growth vessel was reduced to less than 300 ppb, and no intermediate metabolic products were detected. The consortium completely dechlorinated the PCP, five moles of chloride were released per mole of PCP. Radiotracer analysis demonstrated that the consortium mineralized the PCP to CO_2. The microbial consortium consisted of six bacteria, five of which were Pseudomonas species. The consortium selectively degraded PCP, even in the presence of more readily utilizable carbon and energy sources (diesel fuel).

ACKNOWLEDGEMENTS

We thank our colleagues in the Microbiology, Analytical Chemistry, Project Management, and Technical Writing divisions of Ecova Corporation for their contributions to this work.

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13. Suzuki, T. "Metabolism of Pentachlorophenol by a Soil Microorganism," Journal of Environmental Science and Health. 2:113-127 (1977).

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15. API Rapid NFT Identification Codebook (1986).

TOLS003965

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BZTO104(e)040786

Table 1. Concentration of Predominant Site Contaminants

(Location)

Compound	Groundwater	Saturated Soil	Unsaturated Soil	Pond Bottom	Pond Periphery	Area G	Retort Area
			Concentration (ppm)				
Acenaphthene	171	780	2.9	810	130	145	75
Anthracene	57	329	1.7	440	79	99	140
Dibenzofuran	105	445	1.4	310	63	59	27
Fluoranthene	216	903	3.5	1000	380	230	230
Naphthalene	239	1136	2.6	72	ND	11	ND
Pentachlorophenol	39	393	5.2	1300	363	190	234
Phenanthrene	389	1573	7.7	1600	587	320	151
Pyrene	145	680	9.4	670	350	205	230

Notes:

1. Contaminant concentrations were determined by GC/MS according to EPA method 625
2. ND = Not Determined

TOLS003966

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Table 2. Composition of Basal Medium

K_2HPO_4	0.450 grams
$NaH_2PO_4 \cdot 2H_2O$	0.085 grams
$CaSO_4 \cdot 2H_2O$	0.025 grams
$MgSO_4 \cdot 7H_2O$	0.250 grams
$FeSO_4 \cdot 7H_2O$	0.005 grams
$(NH_4)_2SO_4$	0.500 grams
Deionized water	1000 ml
pH	7.3-7.5

TOLS003967

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BZTO104(e)040788

Table 3. Percent Reduction of the Most Abundant Contaminants in Soil and Water Samples

Compound	Groundwater	Saturated Soil	Unsaturated Soil	Pond Bottom	Pond Periphery	Area G	Retort Area	Mean
			(% Reduction)					
Acenaphthene	91	84	85	77	79	73	86	84
Anthracene	86	84	72	96	77	86	90	82
Dibenzofuran	90	84	ND	97	90	95	90	89
Fluoranthene	67	82	51	76	81	61	33	67
Naphthalene	99	97	73	85	ND	79	ND	88
Pentachlorophenol	68	84	55	66	59	12	49	63
Phenanthrene	83	75	80	99	99	95	89	85
Pyrene	78	81	71	57	41	56	48	66

Notes:

1. Aerated shake flasks were incubated at 25°C for four weeks on a rotary shake set at 165 rpm
2. ND = Not Determined.

TOLS003968

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BZTO104(e)040789

Table 4. PCP Degradation by the Microbial Consortium in the Presence of Nutrient Broth

Day	Influent PCP Concentration (ppm)	Effluent PCP Concentration (ppm)	% Reduction
2	50	26	48
6	50	9	82
7	50	<1	>98

Notes:

1. Day refers to number of days after increasing PCP concentration from 10 ppm to 50 ppm
2. Nutrient broth concentration was 500 ppm
3. PCP concentration was measured by UV absorption at 320 nm
4. Retention time was 24 hours
5. Flow rate was 0.347 ml min^{-1}
6. Dilution rate was 0.042 hr^{-1}

TOLS003969

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BZTO104(e)040790

Table 5. PCP Degradation by the Microbial Consortium With PCP as a Sole Source of Carbon and Energy

Influent PCP Concentration (ppm)	Effluent PCP Concentration (ppm)	% Reduction
50	<1	>98
100	<1	>99
150	<1	>99

Notes:

1. PCP concentration was measured by UV absorption at 320 nm
2. Retention time was 12 hours
3. Flow rate was 0.690 ml min^{-1}
4. Dilution rate was 0.083 hr^{-1}

TOLS003970

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BZTO104(e)040791

Table 6. Dechlorination of PCP by the Microbial Consortium with PCP as a Sole Source of Carbon and Energy

Influent PCP Concentration (ppm)	Theoretical Chloride Release (ppm)	Measured Chloride Release (ppm)	Moles of Chloride Released per Mole of PCP
100	66.5	74.0 n = 3 $\bar{x}$ = 74.0 ± 1.1	5.25

Notes:

1. PCP concentration was measured by UV absorption at 320 nm
2. Chloride concentration was measured by mercuric nitrate titration
3. Retention time was 24 hours
4. Flow rate was 0.347 ml min^{-1}
5. Dilution rate was 0.042 hr^{-1}

TOLS003971

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BZTO104(e)040792

Table 7. Composition of PCP-Degrading Microbial Consortium

Pseudomonas aeruginosa
Pseudomonas fluorescens
Pseudomonas stutzeri
Pseudomonas maltophilia
Pseudomonas mendocina
Unidentified Gram-Negative Rod

Note:

Microorganisms were identified with the API Rapid NFT test procedure

TOLS003972

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BZTO104(e)040793

Table 8. Dechlorination of PCP by the Microbial Consortium in the Presence of Diesel Fuel

Influent PCP Concentration (ppm)	Theoretical Chloride Release (ppm)	Measured Chloride Release (ppm)	Moles of Chloride Released per Mole of PCP
100	66.5	65.7 n = 3 $\bar{x}$ = 65.7 ± 1.5	4.75

Notes:

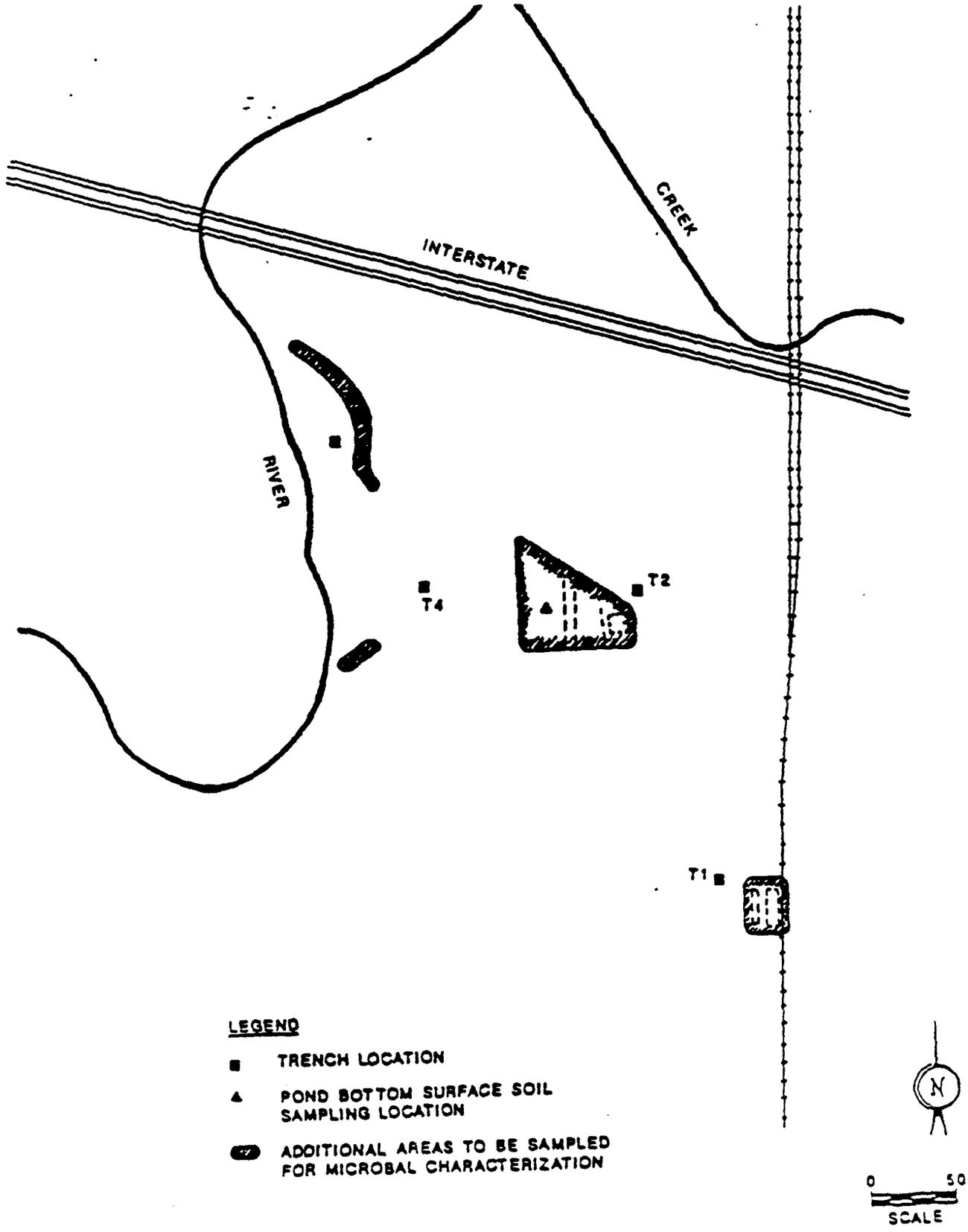
1. PCP concentration was measured by UV absorption at 320 nm
2. Chloride concentration was measured by mercuric nitrate titration
3. Diesel fuel concentration was 1000 ppm
4. Retention time was 24 hours
5. Flow rate was 0.347 ml min^{-1}
6. Dilution rate was 0.042 hr^{-1}

TOLS003973

32319

BZTO104(e)040794

Figure 1. Site Map



TOLS003974

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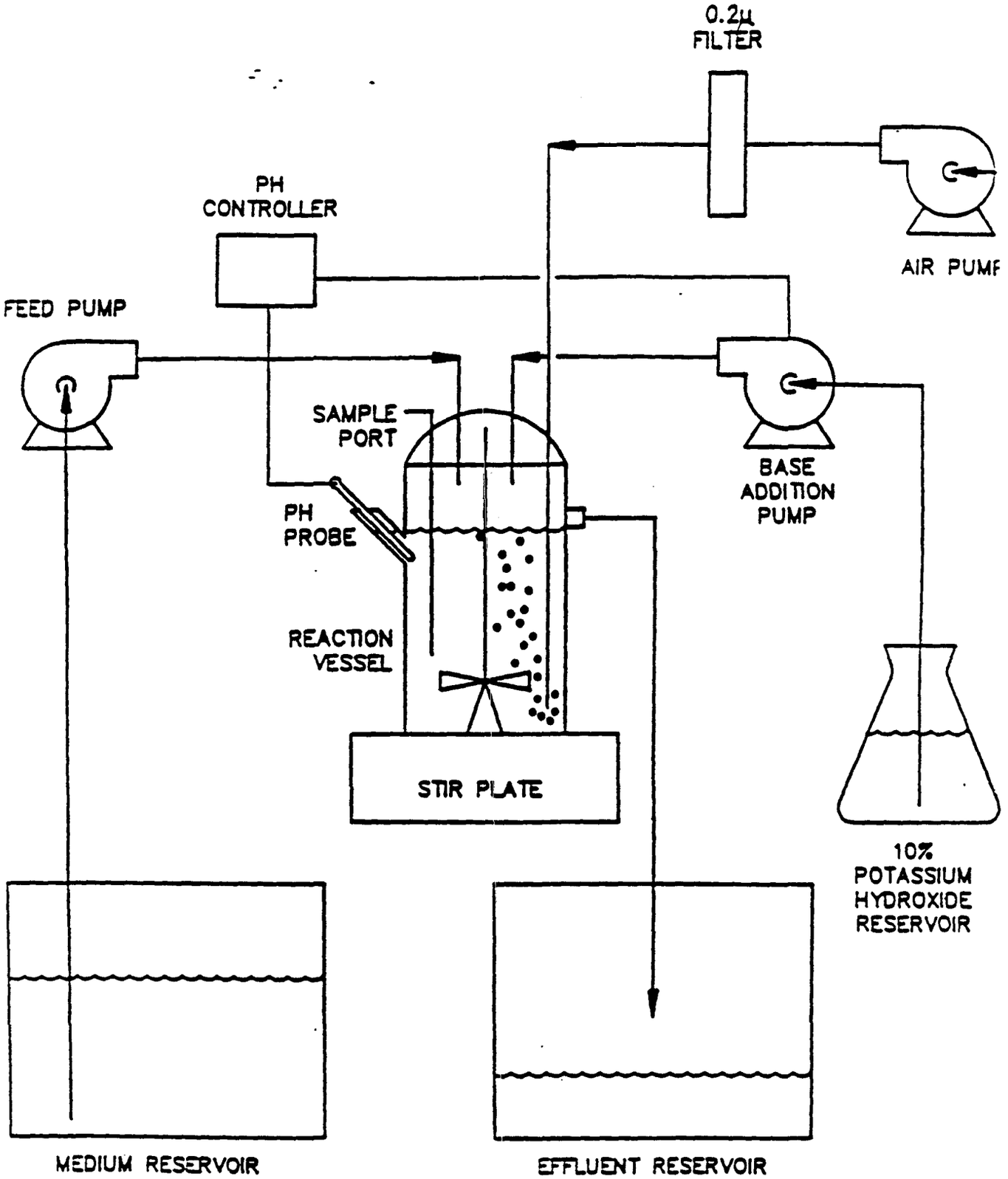
BZTO104(e)040795

Figure 2. Continuous Culture Apparatus



TOLS003975

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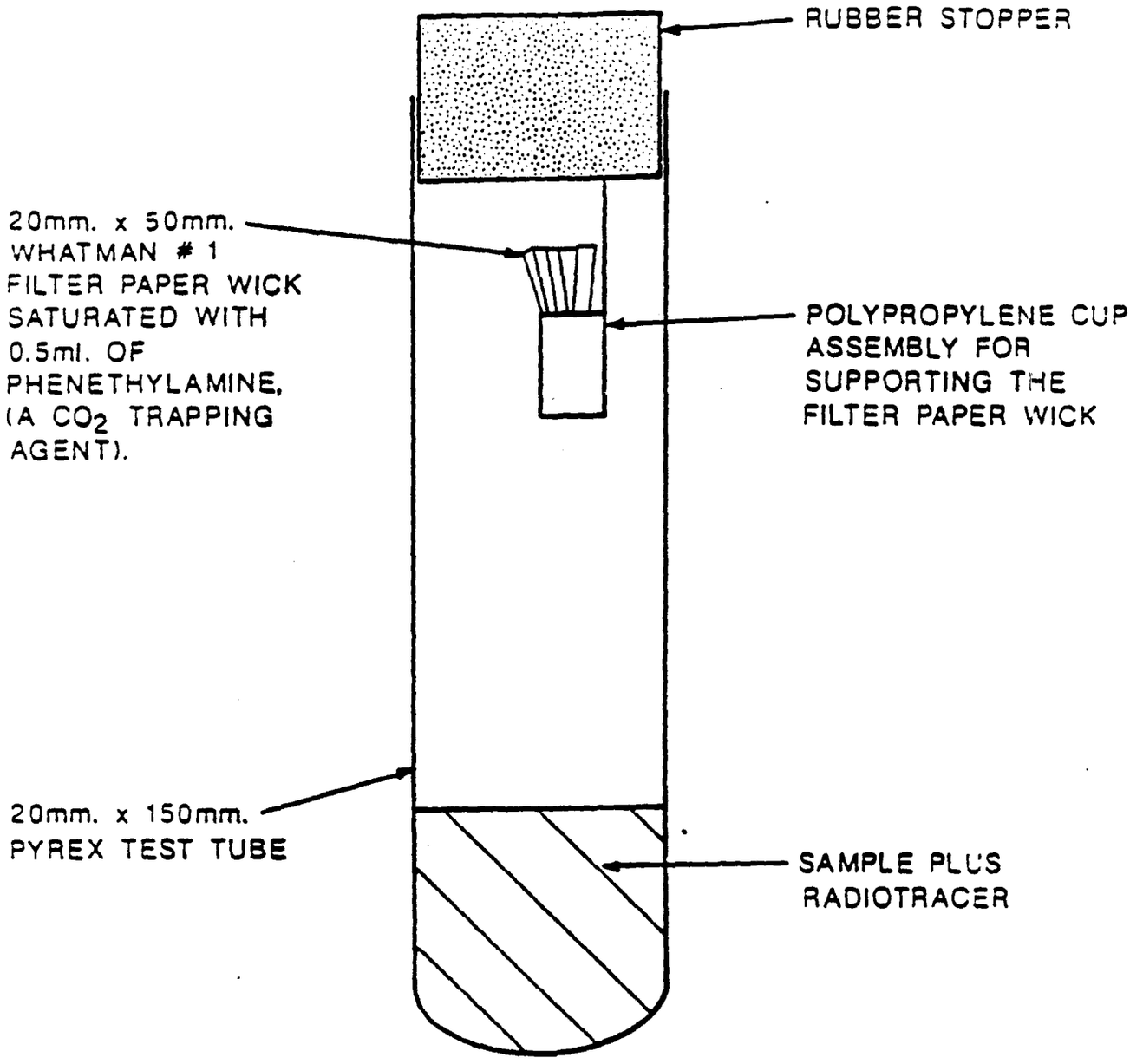
BZTO104(e)040796

Figure 3. Incubation Vessel for Radiotracer Studies



TOLS003976

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BZTO104(e)040797

APPENDIX D. Analytical Data Report

TOLS003977

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BZTO104(e)040798

ECOVA
ANALYTICAL
SERVICES

ANALYTICAL DATA REPORT NARRATIVE

To: B Mahaffey/M Anderson
Project No: 821401

Date: 09/02/88
EAS Batch No: 973

SAMPLE RECEIPT INFORMATION

No. of Samples: 6

Received on: 08/02/88

Comments: None.

DATA & DETECTION LIMIT COMMENTS/ADDITIONAL INFORMATION

None.

Were any Nonconformance Memos submitted for these samples? [x] Yes [ ] No

If yes, explain:

The method blank extracted with water sample EAS 973-01 contained phthalate contamination. There was no sample remaining to re-extract. The concentration for bis(2-ethylhexyl) phthalate in sample EAS 973-01 is considered a qualified value.

Signature: Linda Johansen Date: 9/2/88

68/1401-NAR.973

TOLS003978

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BZTO104(e)040799

ECOVA
ANALYTICAL
SERVICES

Project No: 821401

INORGANIC ANALYSIS REPORT

Customer #	**Background**	**W-1, E-1, S-1, N-1**
EAS #	**973-02**	**973-C**
Sample Descripion	**Background Soil**	**Composite**
Matrix	**Soil**	**Soil**
Date Received	**08/02/88**	**08/02/88**
Date Analyzed		

Parameters			Units
ɔtal Organic Carbon	1060	7090	mg/kg
Nitrate (as NO_3-N)	5.77	4.69	mg/kg
Nitrite (as NO_2-N)	0.13	0.05	mg/kg
Ortho-Phosphorus (as PO_4-P)	28	52	mg/kg

Data Release Authorized: _____ Date: 8-27-88

⁻/1401-IAR.973

TOLS003979

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ECOVA
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SERVICES

DATA REPORTING QUALIFIERS

Project No: 821401

B - Indicates compound was found in the associated blank as well as in the sample.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a target compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

U - Indicates compound was analyzed for but not detected at the given detection limit. The sample quantitation limit was corrected for dilution and for percent moisture, when applicable.

TOLS003980

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BZTO104(e)040801

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Water
Concentration: Low Dilution Factor: 1.0000
Sample wt/vol: 1000 ml
Date Extracted: 08/05/88
Date Analyzed: 8/30/88 14:58

Lab Sample ID: EAS973-01
Customer Sample: Well B
Sample Description: Well B
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/L	
108-95-2	Phenol	10.	U
111-44-4	bis(2-Chloroethyl)ether	10.	U
95-57-8	2-Chlorophenol	10.	U
541-73-1	1,3-Dichlorobenzene	10.	U
106-46-7	1,4-Dichlorobenzene	10.	U
100-51-6	Benzyl alcohol	10.	U
95-50-1	1,2-Dichlorobenzene	10.	U
95-48-7	2-Methylphenol	10.	U
538-32-9	bis(2-chloroisopropyl)ether	10.	U
106-44-5	4-Methylphenol	10.	U
621-64-7	N-Nitroso-di-n-propylamine	10.	U
67-72-1	Hexachloroethane	10.	U
98-95-3	Nitrobenzene	10.	U
78-59-1	Isophorone	10.	U
88-75-5	2-Nitrophenol	10.	U
105-67-9	2,4-Dimethylphenol	10.	U
65-85-0	Benzoic acid	50.	U
111-91-1	bis(2-Chloroethoxy)Methane	10.	U
120-83-2	2,4-Dichlorophenol	10.	U
120-82-1	1,2,4-Trichlorobenzene	10.	U
91-20-3	Naphthalene	10.	U
106-47-8	4-Chloroaniline	10.	U
87-68-3	Hexachlorobutadiene	10.	U
59-50-7	4-Chloro-3-methylphenol	10.	U
91-57-6	2-Methylnaphthalene	10.	U
77-47-4	Hexachlorocyclopentadiene	10.	U
88-06-2	2,4,6-Trichlorophenol	10.	U
95-95-4	2,4,5-Trichlorophenol	50.	U
91-58-7	2-Chloronaphthalene	10.	U
88-74-4	2-Nitroaniline	50.	U
131-11-3	Dimethylphthalate	10.	U
208-96-8	Acenaphthylene	10.	U
99-09-2	3-Nitroaniline	50.	U

C.A.S. Number		ug/L	
83-32-9	Acenaphthene	10.	U
51-28-5	2,4-Dinitrophenol	50.	U
100-02-7	4-Nitrophenol	50.	U
132-64-9	Dibenzofuran	10.	U
121-14-2	2,4-Dinitrotoluene	10.	U
606-20-2	2,6-Dinitrotoluene	10.	U
84-66-2	Diethylphthalate	10.	U
7005-72-3	4-Chlorophenyl-phenylether	10.	U
86-73-7	Fluorene	10.	U
100-01-6	4-Nitroaniline	50.	U
534-52-1	4,6-Dinitro-2-methylphenol	50.	U
86-30-6	N-Nitrososdiphenylamine (1)	10.	U
101-55-3	4-Bromophenyl-phenylether	10.	U
118-74-1	Hexachlorobenzene	10.	U
87-86-5	Pentachlorophenol	50.	U
85-01-8	Phenanthrene	10.	U
120-12-7	Anthracene	10.	U
84-74-2	Di-n-butylphthalate	2.	J
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
85-68-7	Butylbenzylphthalate	10.	U
91-94-1	3,3'-Dichlorobenzidine	20.	U
56-55-3	Benzo(a)anthracene	10.	U
117-81-7	bis(2-Ethylhexyl)phthalate	3.	JB
218-01-9	Chrysene	10.	U
117-84-0	Di-n-octylphthalate	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

(1)-Cannot be separated from diphenylamine

SEMIVOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Soil
Concentration: Low Dilution Factor: 1.0000
Sample wt/vol: 28.95 g Dry Weight
Date Extracted: 08/08/88
Date Analyzed: 8/29/88 17:05

Lab Sample ID: EAS973-02
Customer Sample: Background
Sample Description: Background Soil
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/Kg	
108-95-2	Phenol	350.	U
111-44-4	bis(2-Chloroethyl)ether	350.	U
95-57-8	2-Chlorophenol	350.	U
541-73-1	1,3-Dichlorobenzene	350.	U
106-46-7	1,4-Dichlorobenzene	350.	U
100-51-6	Benzyl alcohol	350.	U
95-50-1	1,2-Dichlorobenzene	350.	U
95-48-7	2-Methylphenol	350.	U
9638-32-9	bis(2-chloroisopropyl)ether	350.	U
106-44-5	4-Methylphenol	350.	U
621-64-7	N-Nitroso-di-n-propylamine	350.	U
67-72-1	Hexachloroethane	350.	U
98-95-3	Nitrobenzene	350.	U
78-59-1	Isophorone	350.	U
88-75-5	2-Nitrophenol	350.	U
105-67-9	2,4-Dimethylphenol	350.	U
65-85-0	Benzoic acid	1700.	U
111-91-1	bis(2-Chloroethoxy)Methane	350.	U
120-83-2	2,4-Dichlorophenol	350.	U
120-82-1	1,2,4-Trichlorobenzene	350.	U
91-20-3	Naphthalene	350.	U
106-47-8	4-Chloroaniline	350.	U
87-68-3	Hexachlorobutadiene	350.	U
59-50-7	4-Chloro-3-methylphenol	350.	U
91-57-6	2-Methylnaphthalene	350.	U
77-47-4	Hexachlorocyclopentadiene	350.	U
88-06-2	2,4,6-Trichlorophenol	350.	U
95-95-4	2,4,5-Trichlorophenol	1700.	U
91-58-7	2-Chloronaphthalene	350.	U
88-74-4	2-Nitroaniline	1700.	U
131-11-3	Dimethylphthalate	350.	U
208-96-8	Acenaphthylene	350.	U
99-09-2	3-Nitroaniline	1700.	U

C.A.S. Number		ug/Kg	
83-32-9	Acenaphthene	350.	U
51-28-5	2,4-Dinitrophenol	1700.	U
100-02-7	4-Nitrophenol	1700.	U
132-64-9	Dibenzofuran	350.	U
121-14-2	2,4-Dinitrotoluene	350.	U
606-20-2	2,6-Dinitrotoluene	350.	U
84-66-2	Diethylphthalate	350.	U
7005-72-3	4-Chlorophenyl-phenylether	350.	U
86-73-7	Fluorene	350.	U
100-01-6	4-Nitroaniline	1700.	U
534-52-1	4,6-Dinitro-2-methylphenol	1700.	U
86-30-6	N-Nitrosodiphenylamine (1)	350.	U
101-55-3	4-Bromophenyl-phenylether	350.	U
118-74-1	Hexachlorobenzene	350.	U
87-86-5	Pentachlorophenol	130.	J
85-01-8	Phenanthrene	86.	J
120-12-7	Anthracene	350.	U
84-74-2	Di-n-butylphthalate	350.	U
206-44-0	Fluoranthene	290.	J
129-00-0	Pyrene	520.	
85-68-7	Butylbenzylphthalate	350.	U
91-94-1	3,3'-Dichlorobenzidine	690.	U
56-55-3	Benzo(a)anthracene	150.	J
117-81-7	bis(2-Ethylhexyl)phthalate	350.	U
218-01-9	Chrysene	280.	J
117-84-0	Di-n-octylphthalate	350.	U
205-99-2	Benzo(b)fluoranthene	200.	J
207-08-9	Benzo(k)fluoranthene	160.	J
50-32-8	Benzo(a)pyrene	170.	J
193-39-5	Indeno(1,2,3-cd)pyrene	150.	J
53-70-3	Dibenzo(a,h)anthracene	350.	U
191-24-2	Benzo(g,h,i)perylene	180.	J

(1)-Cannot be separated from diphenylamine

32319

TOLS003982

BZTO104(e)040803

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Soil
Concentration: Low Dilution Factor: 50.0000
Sample wt/vol: 27.27 g
Date Extracted: 08/08/88
Date Analyzed: 8/31/88 15:07

Lab Sample ID: EAS973-03
Customer Sample: W-1
Sample Description: Soil Pile - Westside
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/Kg	
108-95-2	Phenol	18000.	U
111-44-4	bis(2-Chloroethyl)ether	18000.	U
95-57-8	2-Chlorophenol	18000.	U
541-73-1	1,3-Dichlorobenzene	18000.	U
106-46-7	1,4-Dichlorobenzene	18000.	U
100-51-6	Benzyl alcohol	18000.	U
95-50-1	1,2-Dichlorobenzene	18000.	U
95-48-7	2-Methylphenol	18000.	U
39638-32-9	bis(2-chloroisopropyl)ether	18000.	U
106-44-5	4-Methylphenol	18000.	U
621-64-7	N-Nitroso-di-n-propylamine	18000.	U
67-72-1	Hexachloroethane	18000.	U
98-95-3	Nitrobenzene	18000.	U
78-59-1	Isophorone	18000.	U
88-75-5	2-Nitrophenol	18000.	U
105-67-9	2,4-Dimethylphenol	18000.	U
65-85-0	Benzoic acid	92000.	U
111-91-1	bis(2-Chloroethoxy)Methane	18000.	U
120-83-2	2,4-Dichlorophenol	18000.	U
120-82-1	1,2,4-Trichlorobenzene	18000.	U
91-20-3	Naphthalene	18000.	U
106-47-8	4-Chloroaniline	18000.	U
87-68-3	Hexachlorobutadiene	18000.	U
59-50-7	4-Chloro-3-methylphenol	18000.	U
91-57-6	2-Methylnaphthalene	18000.	U
77-47-4	Hexachlorocyclopentadiene	18000.	U
88-06-2	2,4,6-Trichlorophenol	18000.	U
95-95-4	2,4,5-Trichlorophenol	92000.	U
91-58-7	2-Chloronaphthalene	18000.	U
88-74-4	2-Nitroaniline	92000.	U
131-11-3	Dimethylphthalate	18000.	U
208-96-8	Acenaphthylene	18000.	U
99-09-2	3-Nitroaniline	92000.	U

C.A.S. Number		ug/Kg	
83-32-9	Acenaphthene	18000.	U
51-28-5	2,4-Dinitrophenol	92000.	U
100-02-7	4-Nitrophenol	92000.	U
132-64-9	Dibenzofuran	18000.	U
121-14-2	2,4-Dinitrotoluene	18000.	U
606-20-2	2,6-Dinitrotoluene	18000.	U
84-66-2	Diethylphthalate	18000.	U
7005-72-3	4-Chlorophenyl-phenylether	18000.	U
86-73-7	Fluorene	18000.	U
100-01-6	4-Nitroaniline	92000.	U
534-52-1	4,6-Dinitro-2-methylphenol	92000.	U
86-30-6	N-Nitrosodiphenylamine (1)	18000.	U
101-55-3	4-Bromophenyl-phenylether	18000.	U
118-74-1	Hexachlorobenzene	18000.	U
87-86-5	Pentachlorophenol	250000	
85-01-8	Phenanthrene	18000.	U
120-12-7	Anthracene	18000.	U
84-74-2	Di-n-butylphthalate	18000.	U
206-44-0	Fluoranthene	18000.	U
129-00-0	Pyrene	18000.	U
85-68-7	Butylbenzylphthalate	18000.	U
91-94-1	3,3'-Dichlorobenzidine	37000.	U
56-55-3	Benzo(a)anthracene	18000.	U
117-81-7	bis(2-Ethylhexyl)phthalate	18000.	U
218-01-9	Chrysene	18000.	U
117-84-0	Di-n-octylphthalate	18000.	U
205-99-2	Benzo(b)fluoranthene	18000.	U
207-08-9	Benzo(k)fluoranthene	18000.	U
50-32-8	Benzo(a)pyrene	18000.	U
193-39-5	Indeno(1,2,3-cd)pyrene	18000.	U
53-70-3	Dibenzo(a,h)anthracene	18000.	U
191-24-2	Benzo(g,h,i)perylene	18000.	U

(1)-Cannot be separated from diphenylamine

TOLS003983

32319

BZTO104(e)040804

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Soil
Concentration: Low Dilution Factor: 500.000
Sample wt/vol: 27.57 g
Date Extracted: 08/08/88
Date Analyzed: 8/31/88 16:12

Lab Sample ID: EAS973-04
Customer Sample: E-1
Sample Description: Soil Pile - Eastside
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/Kg	
108-95-2	Phenol	180000	U
111-44-4	bis(2-Chloroethyl)ether	180000	U
95-57-8	2-Chlorophenol	180000	U
541-73-1	1,3-Dichlorobenzene	180000	U
106-46-7	1,4-Dichlorobenzene	180000	U
100-51-6	Benzyl alcohol	180000	U
95-50-1	1,2-Dichlorobenzene	180000	U
95-48-7	2-Methylphenol	180000	U
39638-32-9	bis(2-chloroisopropyl)ether	180000	U
106-44-5	4-Methylphenol	180000	U
621-64-7	N-Nitroso-di-n-propylamine	180000	U
67-72-1	Hexachloroethane	180000	U
98-95-3	Nitrobenzene	180000	U
78-59-1	Isophorone	180000	U
88-75-5	2-Nitrophenol	180000	U
105-67-9	2,4-Dimethylphenol	180000	U
65-85-0	Benzoic acid	910000	U
111-91-1	bis(2-Chloroethoxy)Methane	180000	U
120-83-2	2,4-Dichlorophenol	180000	U
120-82-1	1,2,4-Trichlorobenzene	180000	U
91-20-3	Naphthalene	180000	U
106-47-8	4-Chloroaniline	180000	U
87-68-3	Hexachlorobutadiene	180000	U
59-50-7	4-Chloro-3-methylphenol	180000	U
91-57-6	2-Methylnaphthalene	180000	U
77-47-4	Hexachlorocyclopentadiene	180000	U
88-06-2	2,4,6-Trichlorophenol	180000	U
95-95-4	2,4,5-Trichlorophenol	910000	U
91-58-7	2-Chloronaphthalene	180000	U
88-74-4	2-Nitroaniline	910000	U
131-11-3	Dimethylphthalate	180000	U
208-96-8	Acenaphthylene	180000	U
99-09-2	3-Nitroaniline	910000	U
83-32-9	Acenaphthene	180000	U
51-28-5	2,4-Dinitrophenol	910000	U
100-02-7	4-Nitrophenol	910000	U
132-64-9	Dibenzofuran	180000	U
121-14-2	2,4-Dinitrotoluene	180000	U
606-20-2	2,6-Dinitrotoluene	180000	U
84-66-2	Diethylphthalate	180000	U
7005-72-3	4-Chlorophenyl-phenylether	180000	U
86-73-7	Fluorene	180000	U
100-01-6	4-Nitroaniline	910000	U
534-52-1	4,6-Dinitro-2-methylphenol	910000	U
86-30-6	N-Nitrosodiphenylamine (1)	180000	U
101-55-3	4-Bromophenyl-phenylether	180000	U
118-74-1	Hexachlorobenzene	180000	U
87-86-5	Pentachlorophenol	2000000	
85-01-8	Phenanthrene	180000	U
120-12-7	Anthracene	180000	U
84-74-2	Di-n-butylphthalate	180000	U
206-44-0	Fluoranthene	180000	U
129-00-0	Pyrene	180000	U
85-68-7	Butylbenzylphthalate	180000	U
91-94-1	3,3'-Dichlorobenzidine	360000	U
56-55-3	Benzo(a)anthracene	180000	U
117-81-7	bis(2-Ethylhexyl)phthalate	180000	U
218-01-9	Chrysene	180000	U
117-84-0	Di-n-octylphthalate	180000	U
205-99-2	Benzo(b)fluoranthene	180000	U
207-08-9	Benzo(k)fluoranthene	180000	U
50-32-8	Benzo(a)pyrene	180000	U
193-39-5	Indeno(1,2,3-cd)pyrene	180000	U
53-70-3	Dibenzo(a,h)anthracene	180000	U
191-24-2	Benzo(g,h,i)perylene	180000	U

(1)-Cannot be separated from diphenylamine

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Soil
Concentration: Low Dilution Factor: 1.0000
Sample wt/vol: 27.36 g Dry Weight
Date Extracted: 08/08/88
Date Analyzed: 8/29/88 18:12

Lab Sample ID: EAS973-05
Customer Sample: S-1
Sample Description: Soil Pile - Southside
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/Kg	
108-95-2	Phenol	370.	U
111-44-4	bis(2-Chloroethyl)ether	370.	U
95-57-8	2-Chlorophenol	370.	U
541-73-1	1,3-Dichlorobenzene	370.	U
106-46-7	1,4-Dichlorobenzene	370.	U
100-51-6	Benzyl alcohol	370.	U
95-50-1	1,2-Dichlorobenzene	370.	U
95-48-7	2-Methylphenol	370.	U
7638-32-9	bis(2-chloroisopropyl)ether	370.	U
106-44-5	4-Methylphenol	370.	U
621-64-7	N-Nitroso-di-n-propylamine	370.	U
67-72-1	Hexachloroethane	370.	U
98-95-3	Nitrobenzene	370.	U
78-59-1	Isophorone	370.	U
88-75-5	2-Nitrophenol	370.	U
105-67-9	2,4-Dimethylphenol	370.	U
65-85-0	Benzoic acid	1800.	U
111-91-1	bis(2-Chloroethoxy)Methane	370.	U
120-83-2	2,4-Dichlorophenol	370.	U
120-82-1	1,2,4-Trichlorobenzene	370.	U
91-20-3	Naphthalene	370.	U
106-47-8	4-Chloroaniline	370.	U
87-68-3	Hexachlorobutadiene	370.	U
59-50-7	4-Chloro-3-methylphenol	370.	U
91-57-6	2-Methylnaphthalene	370.	U
77-47-4	Hexachlorocyclopentadiene	370.	U
88-06-2	2,4,6-Trichlorophenol	370.	U
95-95-4	2,4,5-Trichlorophenol	1800.	U
91-58-7	2-Chloronaphthalene	370.	U
88-74-4	2-Nitroaniline	1800.	U
131-11-3	Dimethylphthalate	370.	U
208-96-8	Acenaphthylene	370.	U
99-09-2	3-Nitroaniline	1800.	U

C.A.S. Number		ug/Kg	
83-32-9	Acenaphthene	370.	U
51-28-5	2,4-Dinitrophenol	1800.	U
100-02-7	4-Nitrophenol	1800.	U
132-64-9	Dibenzofuran	370.	U
121-14-2	2,4-Dinitrotoluene	370.	U
606-20-2	2,6-Dinitrotoluene	370.	U
84-66-2	Diethylphthalate	370.	U
7005-72-3	4-Chlorophenyl-phenylether	370.	U
86-73-7	Fluorene	370.	U
100-01-6	4-Nitroaniline	1800.	U
534-52-1	4,6-Dinitro-2-methylphenol	1800.	U
86-30-6	N-Nitrosodiphenylamine (1)	370.	U
101-55-3	4-Bromophenyl-phenylether	370.	U
118-74-1	Hexachlorobenzene	370.	U
87-86-5	Pentachlorophenol	2200.	
85-01-8	Phenanthrene	370.	U
120-12-7	Anthracene	370.	U
84-74-2	Di-n-butylphthalate	370.	U
206-44-0	Fluoranthene	44.	J
129-00-0	Pyrene	80.	J
85-68-7	Butylbenzylphthalate	370.	U
91-94-1	3,3'-Dichlorobenzidine	730.	U
56-55-3	Benzo(a)anthracene	37.	J
117-81-7	bis(2-Ethylhexyl)phthalate	40.	J
218-01-9	Chrysene	82.	J
117-84-0	Di-n-octylphthalate	370.	U
205-99-2	Benzo(b)fluoranthene	50.	J
207-08-9	Benzo(k)fluoranthene	38.	J
50-32-8	Benzo(a)pyrene	370.	U
193-39-5	Indeno(1,2,3-cd)pyrene	370.	U
53-70-3	Dibenzo(a,h)anthracene	370.	U
191-24-2	Benzo(g,h,i)perylene	370.	U

(1)-Cannot be separated from diphenylamine

32319

TOLS003985

BZTO104(e)040806

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Soil
Concentration: Low Dilution Factor: 200.000
Sample wt/vol: 27.72 g Dry Weight
Date Extracted: 08/08/88
Date Analyzed: 8/29/88 20:27

Lab Sample ID: EA5973-06
Customer Sample: N-1
Sample Description: Soil Pile - Northside
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/Kg	
108-95-2	Phenol	72000.	U
111-44-4	bis(2-Chloroethyl)ether	72000.	U
95-57-8	2-Chlorophenol	72000.	U
541-73-1	1,3-Dichlorobenzene	72000.	U
106-46-7	1,4-Dichlorobenzene	72000.	U
100-51-6	Benzyl alcohol	72000.	U
95-50-1	1,2-Dichlorobenzene	72000.	U
95-48-7	2-Methylphenol	72000.	U
638-32-9	bis(2-chloroisopropyl)ether	72000.	U
106-44-5	4-Methylphenol	72000.	U
621-64-7	N-Nitroso-di-n-propylamine	72000.	U
67-72-1	Hexachloroethane	72000.	U
98-95-3	Nitrobenzene	72000.	U
78-59-1	Isophorone	72000.	U
88-75-5	2-Nitrophenol	72000.	U
105-67-9	2,4-Dimethylphenol	72000.	U
65-85-0	Benzoic acid	360000.	U
111-91-1	bis(2-Chloroethoxy)Methane	72000.	U
120-83-2	2,4-Dichlorophenol	72000.	U
120-82-1	1,2,4-Trichlorobenzene	72000.	U
91-20-3	Naphthalene	72000.	U
106-47-8	4-Chloroaniline	72000.	U
87-68-3	Hexachlorobutadiene	72000.	U
59-50-7	4-Chloro-3-methylphenol	72000.	U
91-57-6	2-Methylnaphthalene	72000.	U
77-47-4	Hexachlorocyclopentadiene	72000.	U
88-06-2	2,4,6-Trichlorophenol	72000.	U
95-95-4	2,4,5-Trichlorophenol	360000.	U
91-58-7	2-Chloronaphthalene	72000.	U
88-74-4	2-Nitroaniline	360000.	U
131-11-3	Dimethylphthalate	72000.	U
208-96-8	Acenaphthylene	72000.	U
99-09-2	3-Nitroaniline	360000.	U
83-32-9	Acenaphthene	72000.	U
51-28-5	2,4-Dinitrophenol	360000.	U
100-02-7	4-Nitrophenol	360000.	U
132-64-9	Dibenzofuran	72000.	U
121-14-2	2,4-Dinitrotoluene	72000.	U
606-20-2	2,6-Dinitrotoluene	72000.	U
84-66-2	Diethylphthalate	72000.	U
7005-72-3	4-Chlorophenyl-phenylether	72000.	U
86-73-7	Fluorene	72000.	U
100-01-6	4-Nitroaniline	360000.	U
534-52-1	4,6-Dinitro-2-methylphenol	360000.	U
86-30-6	N-Nitrosodiphenylamine (1)	72000.	U
101-55-3	4-Bromophenyl-phenylether	72000.	U
118-74-1	Hexachlorobenzene	72000.	U
87-86-5	Pentachlorophenol	720000.	
85-01-8	Phenanthrene	72000.	U
120-12-7	Anthracene	72000.	U
84-74-2	Di-n-butylphthalate	72000.	U
206-44-0	Fluoranthene	72000.	U
129-00-0	Pyrene	72000.	U
85-68-7	Butylbenzylphthalate	72000.	U
91-94-1	3,3'-Dichlorobenzidine	140000.	U
56-55-3	Benzo(a)anthracene	72000.	U
117-81-7	bis(2-Ethylhexyl)phthalate	72000.	U
218-01-9	Chrysene	72000.	U
117-84-0	Di-n-octylphthalate	72000.	U
205-99-2	Benzo(b)fluoranthene	72000.	U
207-08-9	Benzo(k)fluoranthene	72000.	U
50-32-8	Benzo(a)pyrene	72000.	U
193-39-5	Indeno(1,2,3-cd)pyrene	72000.	U
53-70-3	Dibenzo(a,h)anthracene	72000.	U
191-24-2	Benzo(g,h,i)perylene	72000.	U

(1)-Cannot be separated from diphenylamine

32319

TOLS003986

BZTO104(e)040807

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Soil
Concentration: Low Dilution Factor: 200.000
Sample wt/vol: 27.48 g Dry Weight
Date Extracted: 08/08/88
Date Analyzed: 8/29/88 21:33

Lab Sample ID: EAS973-C
Customer Sample: W-1, E-1, S-1, N-1
Sample Description: Composite
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/Kg	
108-95-2	Phenol	73000.	U
111-44-4	bis(2-Chloroethyl)ether	73000.	U
95-57-8	2-Chlorophenol	73000.	U
541-73-1	1,3-Dichlorobenzene	73000.	U
106-46-7	1,4-Dichlorobenzene	73000.	U
100-51-6	Benzyl alcohol	73000.	U
95-50-1	1,2-Dichlorobenzene	73000.	U
95-48-7	2-Methylphenol	73000.	U
39638-32-9	bis(2-chloroisopropyl)ether	73000.	U
16-44-5	4-Methylphenol	73000.	U
621-64-7	N-Nitroso-di-n-propylamine	73000.	U
67-72-1	Hexachloroethane	73000.	U
98-95-3	Nitrobenzene	73000.	U
78-59-1	Isophorone	73000.	U
88-75-5	2-Nitrophenol	73000.	U
105-67-9	2,4-Dimethylphenol	73000.	U
65-85-0	Benzoic acid	360000.	U
111-91-1	bis(2-Chloroethoxy)Methane	73000.	U
120-83-2	2,4-Dichlorophenol	73000.	U
120-82-1	1,2,4-Trichlorobenzene	73000.	U
91-20-3	Naphthalene	73000.	U
106-47-8	4-Chloroaniline	73000.	U
87-68-3	Hexachlorobutadiene	73000.	U
59-50-7	4-Chloro-3-methylphenol	73000.	U
91-57-6	2-Methylnaphthalene	73000.	U
77-47-4	Hexachlorocyclopentadiene	73000.	U
88-06-2	2,4,6-Trichlorophenol	73000.	U
95-95-4	2,4,5-Trichlorophenol	360000.	U
91-58-7	2-Chloronaphthalene	73000.	U
88-74-4	2-Nitroaniline	360000.	U
131-11-3	Dimethylphthalate	73000.	U
208-96-8	Acenaphthylene	73000.	U
99-09-2	3-Nitroaniline	360000.	U

C.A.S. Number		ug/Kg	
83-32-9	Acenaphthene	73000.	U
51-28-5	2,4-Dinitrophenol	360000.	U
100-02-7	4-Nitrophenol	360000.	U
132-64-9	Dibenzofuran	73000.	U
121-14-2	2,4-Dinitrotoluene	73000.	U
606-20-2	2,6-Dinitrotoluene	73000.	U
84-66-2	Diethylphthalate	73000.	U
7005-72-3	4-Chlorophenyl-phenylether	73000.	U
86-73-7	Fluorene	73000.	U
100-01-6	4-Nitroaniline	360000.	U
534-52-1	4,6-Dinitro-2-methylphenol	360000.	U
86-30-6	N-Nitrosodiphenylamine (1)	73000.	U
101-55-3	4-Bromophenyl-phenylether	73000.	U
118-74-1	Hexachlorobenzene	73000.	U
87-86-5	Pentachlorophenol	680000.	
85-01-8	Phenanthrene	73000.	U
120-12-7	Anthracene	73000.	U
84-74-2	Di-n-butylphthalate	73000.	U
206-44-0	Fluoranthene	73000.	U
129-00-0	Pyrene	73000.	U
85-68-7	Butylbenzylphthalate	73000.	U
91-94-1	3,3'-Dichlorobenzidine	150000.	U
56-55-3	Benzo(a)anthracene	73000.	U
117-81-7	bis(2-Ethylhexyl)phthalate	73000.	U
218-01-9	Chrysene	73000.	U
117-84-0	Di-n-octylphthalate	73000.	U
205-99-2	Benzo(b)fluoranthene	73000.	U
207-08-9	Benzo(k)fluoranthene	73000.	U
50-32-8	Benzo(a)pyrene	73000.	U
193-39-5	Indeno(1,2,3-cd)pyrene	73000.	U
53-70-3	Dibenzo(a,h)anthracene	73000.	U
191-24-2	Benzo(g,h,i)perylene	73000.	U

(1)-Cannot be separated from diphenylamine

TOLS003987

32319

BZTO104(e)040808

QUALITY CONTROLS

TOLS003988

319

BZTO104(e)040809

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Soil
Concentration: Low Dilution Factor: 10.0000
Sample wt/vol: 30 g
Date Extracted: 08/08/88
Date Analyzed: 8/29/88 15:58

Lab Sample ID: EAS973-00MB
Customer Sample: NA
Sample Description: Method Blank
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/Kg	
108-95-2	Phenol	3300.	U
111-44-4	bis(2-Chloroethyl)ether	3300.	U
95-57-8	2-Chlorophenol	3300.	U
541-73-1	1,3-Dichlorobenzene	3300.	U
106-46-7	1,4-Dichlorobenzene	3300.	U
100-51-6	Benzyl alcohol	3300.	U
95-50-1	1,2-Dichlorobenzene	3300.	U
95-48-7	2-Methylphenol	3300.	U
39638-32-9	bis(2-chloroisopropyl)ether	3300.	U
106-44-5	4-Methylphenol	3300.	U
621-64-7	N-Nitroso-di-n-propylamine	3300.	U
67-72-1	Hexachloroethane	3300.	U
98-95-3	Nitrobenzene	3300.	U
78-59-1	Isophorone	3300.	U
88-75-5	2-Nitrophenol	3300.	U
105-67-9	2,4-Dimethylphenol	3300.	U
65-85-0	Benzoic acid	17000.	U
111-91-1	bis(2-Chloroethoxy)Methane	3300.	U
120-83-2	2,4-Dichlorophenol	3300.	U
120-82-1	1,2,4-Trichlorobenzene	3300.	U
91-20-3	Naphthalene	3300.	U
106-47-8	4-Chloroaniline	3300.	U
87-68-3	Hexachlorobutadiene	3300.	U
59-50-7	4-Chloro-3-methylphenol	3300.	U
91-57-6	2-Methylnaphthalene	3300.	U
77-47-4	Hexachlorocyclopentadiene	3300.	U
88-06-2	2,4,6-Trichlorophenol	3300.	U
95-95-4	2,4,5-Trichlorophenol	17000.	U
91-58-7	2-Chloronaphthalene	3300.	U
88-74-4	2-Nitroaniline	17000.	U
131-11-3	Dimethylphthalate	3300.	U
208-96-8	Acenaphthylene	3300.	U
99-09-2	3-Nitroaniline	17000.	U
83-32-9	Acenaphthene	3300.	U
51-28-5	2,4-Dinitrophenol	17000.	U
100-02-7	4-Nitrophenol	17000.	U
132-64-9	Dibenzofuran	3300.	U
121-14-2	2,4-Dinitrotoluene	3300.	U
606-20-2	2,6-Dinitrotoluene	3300.	U
84-66-2	Diethylphthalate	3300.	U
7005-72-3	4-Chlorophenyl-phenylether	3300.	U
86-73-7	Fluorene	3300.	U
100-01-6	4-Nitroaniline	17000.	U
534-52-1	4,6-Dinitro-2-methylphenol	17000.	U
86-30-6	N-Nitrosodiphenylamine (1)	3300.	U
101-55-3	4-Bromophenyl-phenylether	3300.	U
118-74-1	Hexachlorobenzene	3300.	U
87-86-5	Pentachlorophenol	17000.	U
85-01-8	Phenanthrene	3300.	U
120-12-7	Anthracene	3300.	U
84-74-2	Di-n-butylphthalate	3300.	U
206-44-8	Fluoranthene	3300.	U
129-00-8	Pyrene	3300.	U
85-68-7	Butylbenzylphthalate	3300.	U
91-94-1	3,3'-Dichlorobenzidine	6700.	U
56-55-3	Benzo(a)anthracene	3300.	U
117-81-7	bis(2-Ethylhexyl)phthalate	3300.	U
218-01-9	Chrysene	3300.	U
117-84-0	Di-n-octylphthalate	3300.	U
205-99-2	Benzo(b)fluoranthene	3300.	U
207-08-9	Benzo(k)fluoranthene	3300.	U
50-32-8	Benzo(a)pyrene	3300.	U
193-39-5	Indeno(1,2,3-cd)pyrene	3300.	U
53-70-3	Dibenzo(a,h)anthracene	3300.	U
191-24-2	Benzo(g,h,i)perylene	3300.	U

(1)-Cannot be separated from diphenylamine

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Ecova Corporation
Project Number: 821401
Sample Matrix: Water
Concentration: Low Dilution Factor: 1.0000
Sample wt/vol: 1000 ml
Date Extracted: 08/05/88
Date Analyzed: 8/30/88 12:39

Lab Sample ID: EAS973-00MB
Customer Sample: NA
Sample Description: Method Blank
Date Collected: NA
Time Collected: NA
Date Received: 08/02/88
Data Release Authorized:

C.A.S. Number		ug/L	
108-95-2	Phenol	10.	U
111-44-4	bis(2-Chloroethyl)ether	10.	U
95-57-8	2-Chlorophenol	10.	U
541-73-1	1,3-Dichlorobenzene	10.	U
106-46-7	1,4-Dichlorobenzene	10.	U
100-51-6	Benzyl alcohol	10.	U
95-50-1	1,2-Dichlorobenzene	10.	U
95-48-7	2-Methylphenol	10.	U
39638-32-9	bis(2-chloroisopropyl)ether	10.	U
106-44-5	4-Methylphenol	10.	U
621-64-7	N-Nitroso-di-n-propylamine	10.	U
67-72-1	Hexachloroethane	10.	U
98-95-3	Nitrobenzene	10.	U
78-59-1	Isophorone	10.	U
88-75-5	2-Nitrophenol	10.	U
105-67-9	2,4-Dimethylphenol	10.	U
65-85-0	Benzoic acid	50.	U
111-91-1	bis(2-Chloroethoxy)Methane	10.	U
120-83-2	2,4-Dichlorophenol	10.	U
120-82-1	1,2,4-Trichlorobenzene	10.	U
91-20-3	Naphthalene	10.	U
106-47-8	4-Chloroaniline	10.	U
87-68-3	Hexachlorobutadiene	10.	U
59-50-7	4-Chloro-3-methylphenol	10.	U
91-57-6	2-Methylnaphthalene	10.	U
77-47-4	Hexachlorocyclopentadiene	10.	U
88-06-2	2,4,6-Trichlorophenol	10.	U
95-95-4	2,4,5-Trichlorophenol	50.	U
91-58-7	2-Chloronaphthalene	10.	U
88-74-4	2-Nitroaniline	50.	U
131-11-3	Dimethylphthalate	10.	U
208-96-8	Acenaphthylene	10.	U
99-09-2	3-Nitroaniline	50.	U

C.A.S. Number		ug/L	
83-32-9	Acenaphthene	10.	U
51-28-5	2,4-Dinitrophenol	50.	U
100-02-7	4-Nitrophenol	50.	U
132-64-9	Dibenzofuran	10.	U
121-14-2	2,4-Dinitrotoluene	10.	U
606-20-2	2,6-Dinitrotoluene	10.	U
84-66-2	Diethylphthalate	10.	U
7005-72-3	4-Chlorophenyl-phenylether	10.	U
86-73-7	Fluorene	10.	U
100-01-6	4-Nitroaniline	50.	U
534-52-1	4,6-Dinitro-2-methylphenol	50.	U
86-30-6	N-Nitrosodiphenylamine (1)	10.	U
101-55-3	4-Bromophenyl-phenylether	10.	U
118-74-1	Hexachlorobenzene	10.	U
87-86-5	Pentachlorophenol	50.	U
85-01-8	Phenanthrene	10.	U
120-12-7	Anthracene	10.	U
84-74-2	Di-n-butylphthalate	10.	U
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
85-68-7	Butylbenzylphthalate	10.	U
91-94-1	3,3'-Dichlorobenzidine	20.	U
56-55-3	Benzo(a)anthracene	10.	U
117-81-7	bis(2-Ethylhexyl)phthalate	5.	J
218-01-9	Chrysene	10.	U
117-84-0	Di-n-octylphthalate	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

(1)-Cannot be separated from diphenylamine

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APPENDIX E. Treatment Study Report

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Project No: 821401 September 6, 1988

Client: TIME OIL

Project Title: TREATMENT STUDY OF PCP CONTAMINATED SOILS

To: Mark Anderson

From: Bill Mahaffey

cc: Al Bourquin
John Kinsella

OBJECTIVE:

Time Oil Company has identified a site with extensive pentachlorophenol (PCP) contamination in the soil (up to 8000 ppm). The company has indicated that it has considered investigating soil washing treatment and is seeking cost effective alternative technologies. Ecova has acquired soil samples for evaluating potential treatment technologies which may be applied at the site for subsequently preparing a remediation proposal for the contaminated soils. Candidate technologies which were evaluated were variations of soil slurry biotreatment and soil washing.

SOIL CHARACTERIZATION:

The soil samples acquired from the Time Oil site were sandy in texture. Four individual samples were composited and analyzed. Soils were extracted following EPA standard methodology (Method #720). The PCP concentration in the composited soil was determined to be 680 mg/kg by gas chromatography and mass spectral analysis. Individual soil samples ranged in concentration from 2.2 ppm to 2000 ppm. pH of the composite soil was low.

A. SLURRY TREATMENT:

Composited soil was placed in duplicate flasks at concentrations (weight of soil per slurry weight, w/w) of: 5 %, 15 %, 25 % and 40 % in the appropriate volume of an inorganic nutrient solution. This solution (pH 7.2) contains sufficient levels of nitrogen and phosphorous to sustain microbial growth on the mineralizable carbon in the soil. Soil slurries were placed on a shaker and incubated for one week at constant temperature. After one week, the PCP concentration and pH of the 15 - 40 % slurries were determined. The pH of these slurries had decreased to pH < 6 which may not be conducive to optimal microbial activity. To determine if pH impacted the biodegradation of PCP the pH of the 5 %, 15 % and 40 % soil slurries were readjusted to pH = 7.2. It was determined that 0.01 equivalents of base per kg of soil was required to obtain a pH of 7.2 in the 40 % slurries. The amount of base added to the 15 % and 5% slurries was adjusted accordingly and a pH of 7.2 confirmed by direct measurement. The

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25 % slurries were left unchanged and served as a control. Slurry flasks were incubated on the shaker an additional week and PCP concentrations again determined. No PCP degrading organisms were found in the original soil samples. Therefore an inoculum of proprietary Ecova PCP degrading organisms was added. After four and ten days of incubation following the inoculum addition, PCP levels were once again determined.

PCP ANALYSIS:

To obtain rapid and accurate evaluation of PCP degradation in the slurry evaluations, a UV/Vis spectrophotometric analysis was employed. Aliquots of the aqueous portion of the slurry scanned from 220 nm to 400 nm. PCP concentrations were calculated on the basis of the absorption at 320 nm after subtracting the baseline correction absorption at 360 nm. A standard curve for absorption vs PCP concentration was linear to 1.0 ppm (mg/l). Method interferences are additive for spectrophotometric methods and therefore ND (non detected) means concentrations can be no higher than the detection limit.

RESULTS:

Results of the slurry experiments are summarized in the table below and in the attached figure. As can be seen from the data on the 40 % slurry the UV/Vis method of PCP analysis (248 mg/l) is in very good agreement with the theoretical values calculated from the GCMS analysis of the composited soil (272 mg/l).

PCP Concentration mg/l (% reduction)

SAMPLE	THEORETICAL	7 DAYS	13 DAYS**	17 DAYS	23 DAYS
40 % w/w	272(248)*	276	250(10%)	190(24%)	ND(100%)
25 % w/w @	170	145	130(10%)	--	33(75%)
15 % w/w	102	100	76(24%)	10(86%)	ND(100%)
5 % w/w	34	---	ND	--	ND

* Time 0 PCP concentration of 40 % slurry measured by UV/VIS spectroscop all other values extrapolated from PCP value of 680 ppm in composited soil
** Inoculum added to slurries on Day 13.
@ 25 % slurries pH < 6. Other slurries adjusted to pH = 7.2.
ND - non detected. Detection limit = 1.0 ppm.

Although some reduction may have occurred during the first two weeks, there was little evidence for the existance of any significant biological activity for PCP degradation in the Time Oil soils. Attempts to isolate PCP degrading microbes from the slurries were unsuccessful. A PCP degrading culture from the Ecova culture collection adapted to growth on 1000 mg/l PCP was

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four day period: 86.8% and 24.0% reduction in the 15 % and 40 % w/w slurries respectively. This reduction was complete (100%) after 10 days inoculation in both the 15 % and 40 % slurries. The rates of PCP removal before and after inoculation are the following:

Slurry Concentration	Before Inoculation Rate Constant	T1/2 (Days)	After Inoculation Rate Constant	T1/2 (Days)
40 %	k=0.016	42	k=0.5	1.4
25 % *	k=0.018	38	k=0.137	5.0
15 %	k=0.046	15	k=0.5	1.4

* 25 % slurry pH < 6.0. Other slurries adjusted to 7.2.

Conclusions:

1. The level of natural microbiological PCP degrading activity was low in Time Oil slurries. Based on the rate of PCP removal with the natural microbial population the treatment time would be quite long. There is no indication that target levels of PCP could be achieved using these organisms.

2. The introduction of an inoculum from Ecova's culture collection was effective in enhancing the biological removal of PCP from the soil slurries in four days and was able to reduce the 40 %, 15% and 5 % slurries to non-detectable levels in 10 days post inoculation.

3. Rate of biodegradation is significantly affected by pH. Natural soil pH is quite low and therefore will require adjustment to neutral conditions to accomodate optimum microbial activity.

4. Rate of biodegradation is not affected significantly by slurry concentrations. Engineering constraints on maintaining slurry suspensions are more significant.

5. From a biological perspective slurry treatment is effectively given the proper population of microorganisms is introduced and maintained.

6. The use of a UV/Vis spectrophotometric analysis of PCP is a valid, cost effective method which allows rapid sample turnaround for process monitoring.

B. SOIL WASHING TREATMENT:

After receiving the Time Oil soils it was noted that their sandy texture and low clay content might favor soil washing followed by biological treatment of the leachate. To evaluate

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this alternative a separate composited soil sample was prepared and washed with various volumes of a basic solution. The PCP concentration in this composite was found to be 1180 mg/kg soil. A wash consisted of shaking a mass of soil with a volume of base solution in a ratio of 1:2 (w/v) for 3 minutes. Soil was allowed to gravity settle and the supernatant solution decanted. After several washings, the soil was extracted using standard EPA protocols (Method 720) for PCP extraction. Wash solutions and final soil extracts were evaluated by UV/Vis spectrophotometry which provided a rapid sensitive method for PCP analysis.

Findings: Results are summarized in the table below:

RESIDUAL SOIL PCP CONCENTRATION	
SAMPLE	UV/VIS METHOD*
2 x WASH	210 mg/l
4 x WASH	26 mg/l

* Method involves screening basic aqueous extract of the soil at 320 nm.

It is evident that soil washing would be quite effective at removing most of the residual PCP from the soil. This could be advantageous from a treatment perspective as it is easier to treat a liquid than a soil slurry. Materials handling is easier in that the treatment system can be run with a continuous feed, which may be difficult with a soil treatment system. Also retention times can be reduced considerably. For example Ecova is currently operating a laboratory bioreactor with a microbial population which is capable of growing on 1000 mg/l/day PCP and will tolerate concentrations up to 3000 mg/l/day. If the washing effectively reduces the PCP concentration in the soil to delisting concentrations then this alternative should be evaluated seriously.

CONCLUSIONS:

1. Soil washing can effectively reduce PCP concentrations to low levels.

2. In previous studies, Ecova has demonstrated that wash leachates can be rapidly treated in a continuous feed reactor, with minimal neutralization required.

3. In addition to tankage requirements large quantities of alkali are required for soil washing.

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PCP Reduction
Time Oil Soil Slurries

PHONE 206 624-0900
CABLE ADDRESS TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

PRODUCTS TIME TESTED

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

February 19, 1986

Koppers Company, Inc.
Attn: Donald F. Marion
Forest Products Group
Koppers Building, Room 750
Pittsburgh, PA 15219

Dear Don:

This refers to our mutual problem of pentachlorophenol contamination at 12005 North Burgard Road in Portland Oregon.

During our January 23, 1986 meeting at your offices in Pittsburgh, you mentioned that Koppers would agree to paying half the clean-up costs incurred/committed to date and that further coordination between Koppers and Time would be appropriate for future committments. Time concurs with this approach.

In this light, the below accounting to date will be followed by an invoice two weeks from today unless we hear some objections from you before then.

EXPENDITURES

4/26/85	Chem-Security Systems (Laboratory Analysis of soil sample)	150.00
7/10/85	Northwest Vacuum Truck Service (Relocating 242.76 tons of soil to Arlington)	9,000.00
7/29/85	Chem-Security Systems (Receiving 243.30 tons of soil at Arlington)	27,270.88
8/8/85	Environmental Emergency Services (Obtain and analyze 3 composite samples)	500.00
12/5/85	Environmental Emergency Services (Primary sampling and analysis plus report)	18,741.55
		$55,662.43

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COMMITTMENTS

DEQ per OAR 240-102-065	3,500.00
* Riedel Environmental Services (Amendment 2)	25,000.00 +
	$84,162.43
50% =	$42,081.21

* Name change from Environmental Emergency Services

Should you have any questions regarding the above, please give me a call.

Sincerely,

Robert D. Abendroth
Operations Manager

RDA/ch

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TIME OIL

SITE SPECIFIC

HEALTH AND SAFETY PLAN

Written By: Monica P. Zawistowski

Approved By: Mark A. Adelson
Project Manager

Submitted by:

ECOVA CORPORATION
3820 - 159th Avenue Northeast
Redmond, Washington 98052
(206) 883-1900

December 1988
J.N. 821401

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1.0 HEALTH AND SAFETY PLAN

Ecova has established this Health and Safety Plan (HASP) for all employees engaged in field activities at the Time Oil property in Portland, Oregon. Prior to any work onsite, a copy of this HASP shall be provided to all employees and subcontractors by the project manager. All site work shall be conducted in a safe manner and comply with EPA, OSHA (in particular, 29 CFR part 1910.120), state, and local regulations.

1.1 PURPOSE AND OBJECTIVES

The purpose of this site-specific HASP is to provide guidelines and procedures to ensure the health and physical safety of those persons working at the Time Oil site. While it may be impossible to eliminate all risks associated with site work, the goal is to provide state-of-the-art precautionary and responsive measures for the protection of onsite personnel, the general public, and the environment.

The HASP objectives are as follows:

- Safety of all site personnel
- Protection of the public and the environment
- Adherence to Ecova health and safety policies and procedures

This HASP will be reviewed and the Field Team Review (attachment 1) signed by all site personnel. The HASP will be implemented in the field by the designated Ecova Site Safety Officer.

2.0 SITE BACKGROUND

2.1 SITE HISTORY

Time Oil operates a petroleum products terminal in Portland, Oregon, that provides tank storage facilities for its products as well as custom storage for outside customers. Until recently, Time Oil also operated a PCP mixing facility at the Northwest Terminal to produce products for a wood treating chemicals manufacturing and distributing firm. Operations included melting blocks of virgin PCP, mixing with mineral spirits, and repackaging the mixture for shipment. Operations were discontinued at the plant several years ago.

During the time of plant operation, soils beneath and nearby the processing units became contaminated with the PCP product, especially around the drum or tank loading area near the wood treating chemicals warehouse. Since the decommissioning of the plant, all of the PCP processing units have been removed.

Time Oil has conducted a number of investigations to determine the extent of PCP contamination in the soils surrounding the facility and in downgradient groundwater. As a result of their confirmation of the presence of PCP in these media, Time Oil retained Ecova Corporation to bioremediate the site. At present, there is no active enforcement action being taken relative to the site by any regulatory agency.

2.2 SITE DESCRIPTION

The layout of the site is illustrated in Figure 2-1, Site Layout. Time Oil has identified approximately 3,440 cubic yards of soil with PCP contamination exceeding 500 ppm. From information provided by Time Oil, concentrations of PCP have ranged to 8,400 ppm in the soil around the loadout area near the southern corner of the plant warehouse. Concentrations declined rapidly a few feet away from the "hot spot," generally decreasing to concentrations of under 1,500 ppm which is approximately the average concentration reported by Time Oil.

Soil type is generally mixed sands, silts, and gravels normally associated with a former river channel environment. Little clay appears to be present near the surface, although lenses may occur at depth. With little clay present, the PCP tends to be mobile, migrating downward into the soil vadose zone and entering the groundwater underlying the site, 13 to 20 feet below ground level.

2.3 SITE LOCATION

The Time Oil property is located at 12005 North Burgard Road, Portland, Oregon. The site is bordered to the south by the Willamette River.

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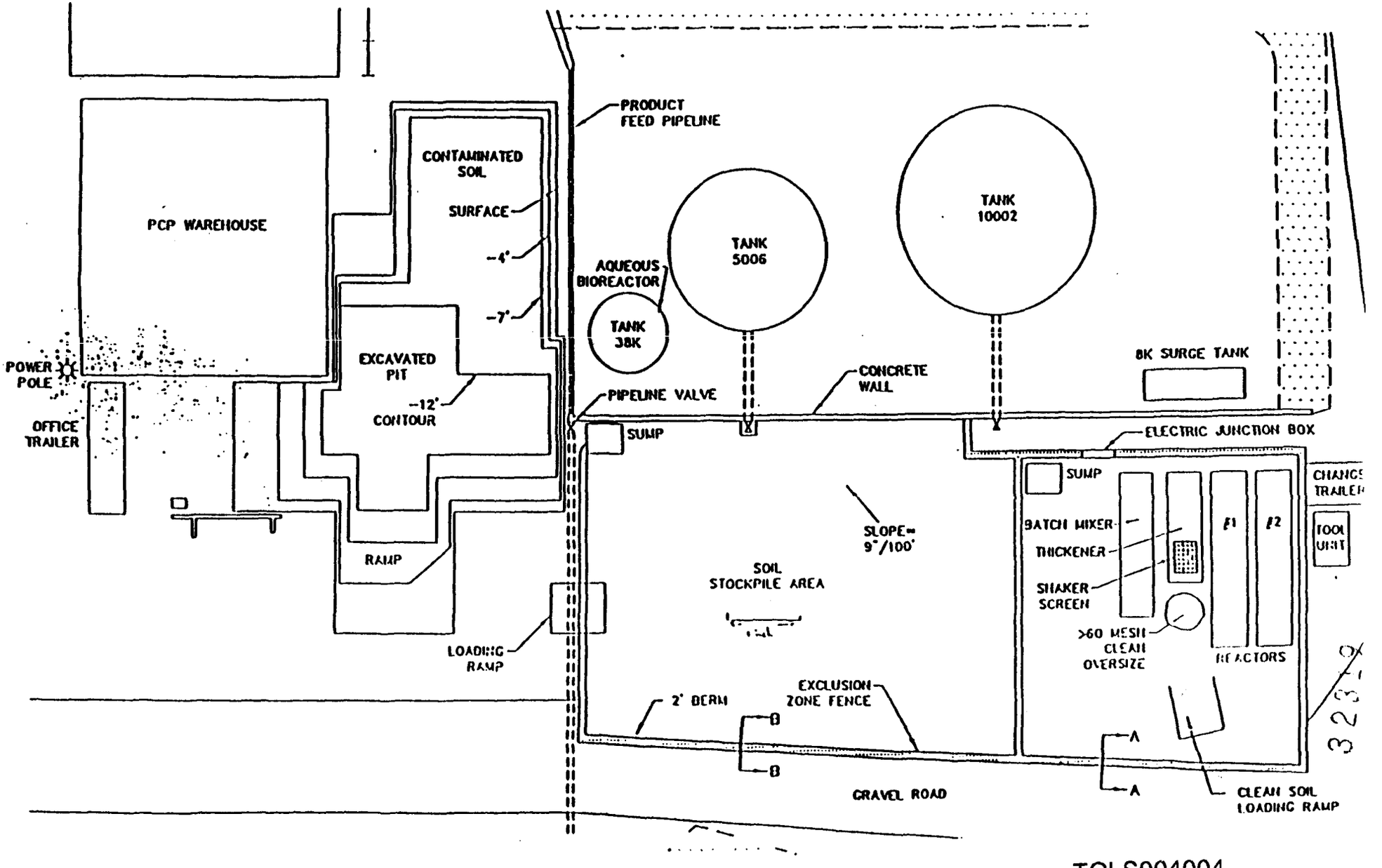
FIGURE 2.1 Site Layout - Time Oil Company



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3.0 RESPONSIBILITIES

3.1 SITE SAFETY OFFICER (SSO)

The SSO, Monica Zawistowski (or designee) will ensure that the HASP is adequate for employee and public protection at the Time Oil site. The SSO has review and approval authority over any changes/modifications to the HASP. The SSO or designee shall be present onsite during all activities where exposure to site contaminants may occur. In addition, the SSO or designee has the authority to stop work if an imminent danger to life or health is detected and to resolve that threat before allowing work to resume.

The SSO or designee is responsible for directing and implementing the HASP and ensuring that all Ecova and subcontractor personnel have been trained in HASP procedures. The SSO or designee will coordinate safety activities with subcontractors and will serve as liaison with public officials who might monitor health and safety activities onsite. The SSO will also ensure that proper protective equipment is available and used in the correct manner, that decontamination activities are carried out correctly, that specific site hazards are noted and accounted for in the Work Plan, and that employees have knowledge of the local emergency medical system.

3.2 PROJECT MANAGER

The Ecova Project Manager, Mark Anderson, is the direct link between Ecova and Time Oil. He is responsible for directing all onsite hazardous waste operations, including the overall implementation of the Health and Safety program. He will select subcontractors that meet Ecova Corporation Health and Safety training and experience guidelines. In addition, the Project Manager is responsible for ensuring that adequate resources and personal protective equipment are allocated for the health and safety of site personnel. The Project Manager is also responsible for ensuring that the SSO is given free access to all relevant site information that could impact health and safety. He will correct conditions or work practices that could lead to employee exposure to hazardous materials. Charles Thames will direct all field activities in Mark Anderson's absence and will have full responsibility for making all onsite decision.

3.3 MEDICAL ASSISTANCE

Patricia Sparks, M.D., Ecova's Occupational Medical Consultant, will be available to answer medical questions and provide guidance in unexpected situations. The Medical Consultant will recommend appropriate medical monitoring for the site team members.

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4.0 EMERGENCY TELEPHONE NUMBERS

Emergency telephone numbers shall be posted onsite and made immediately available at all times. These numbers shall include the following:

Emergency

Fire	911
Ambulance	911
Paramedics	911
Police	911
Emergency Rooms (see Figure 4-1 for Hospital Routes)	
Occupational Physician:	
Dr. P. Sparks; Providence Medical Center	(206) 329-0200
Dr. K. Griffith, St. Vincents (Alternate)	(503) 297-4411
Ecova	(206) 883-1900
Time Oil	(503) 286-1611 or (206) 285-2400

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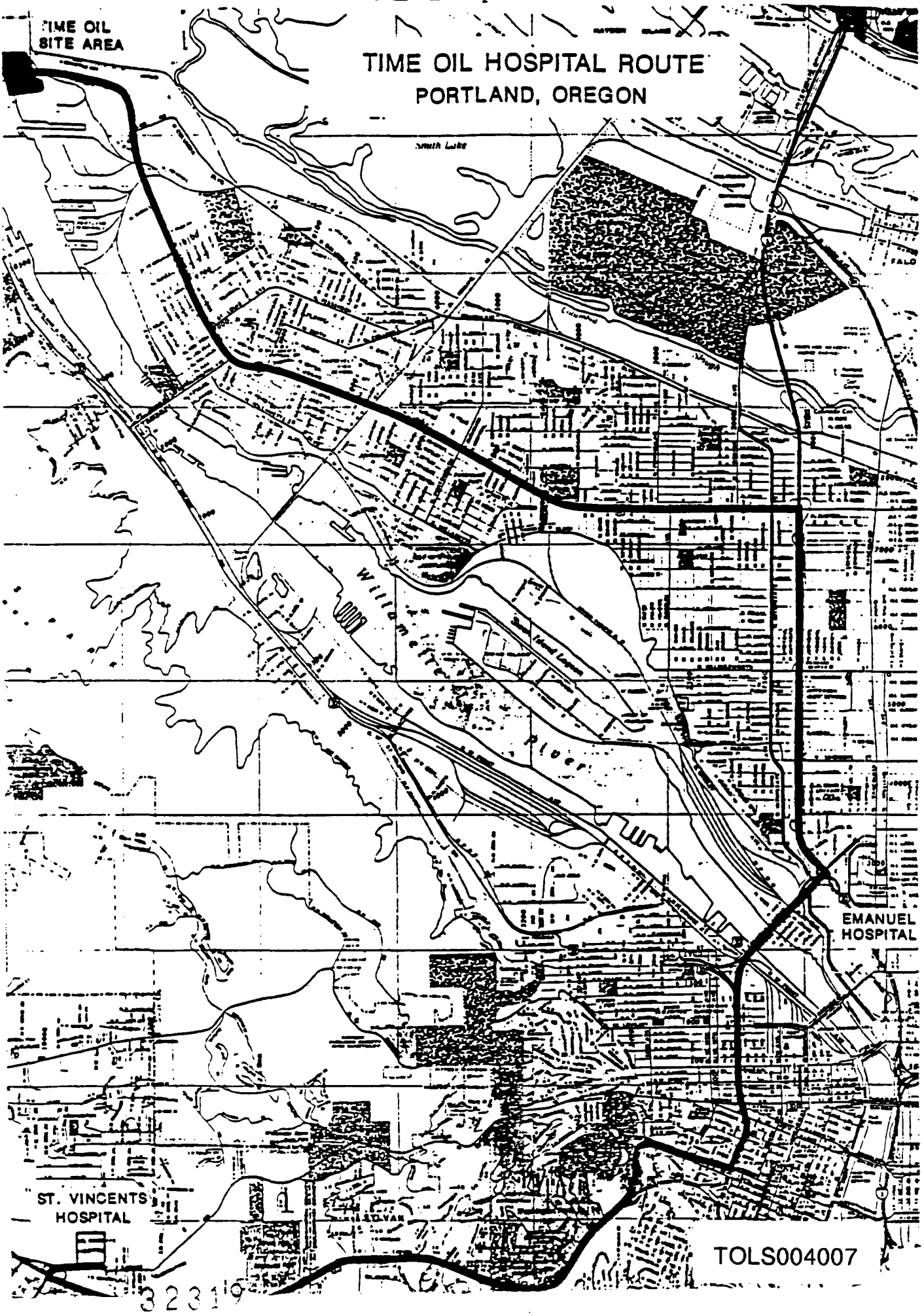
FIGURE 4-1 Hospital Route



5.0 HAZARD ASSESSMENT

This hazard assessment is based on available information concerning chemical and physical hazards known or suspected to be present at the Time Oil site. The potential risks to site workers are evaluated below.

TABLE 5-1. Characteristics of Pentachlorophenol

Chemical Name	PEL (mg/m^3)	IDHL (mg/m^3)	LEL/UEL/fl.pt	MP/BP	Incompatibilities	Routes of Exposure	Target Organs
Penta chlorophenol	0.5	150	Not Combustible	360°F 591°F	Strong oxidizers	Inh Ing Abs Con	Skin, mucous,membrane, respiratory system, CNS, liver cardiovascular system, kidneys, eyes, possible CA
Sodium hydroxide	2.0	250	Not Combustible	590°F 2534°F	Water, acids, flammable liquids, organic halogens metals	Inh Ing Con	Eyes, respiratory system, skin

Definitions

LEL = Lower Explosive Limit
UEL = Upper Explosive Limit
FL.PT = Flash Point
Ca = Carcinogen
MP = melting point
BP = boiling point
Inh = Inhalation
Ing = Ingestion
Abs = Absorption
Con = Skin and Eye Contact

5.1 CHEMICAL EXPOSURE

Site workers may be exposed to hazardous chemicals during field activities. Expected exposure is to contaminated soil. At present, the only potential hazardous compound is Pentachlorophenol (PCP). PCP is a light brown solid material with a pungent odor when hot. Sodium hydroxide will be used onsite during the treatment operation to adjust the pH of the slurry. A condensed description of these chemicals can be found in Table 5-1. In addition, the MSDS for Pentachlorophenol (PCP) and sodium hydroxide are included in this HASP as Attachment 2. Skin absorption is the more significant route of exposure of PCP and sodium hydroxide. Measures shall be taken to eliminate personnel exposure through the use of personal protection equipment when engineering controls are not feasible.

5.2 FIRE AND EXPLOSION

The risk of fire or explosion during site activities are minimal PCP is not combustible. When PCP is heated, highly toxic fumes of Cl are emitted. Sodium hydroxide is very reactive with water and results in the evolution of large quantities of heat. Sodium hydroxide will be added to the slurry in a controlled manner to lessen the chance of fire or explosion. For added security, smoking is not allowed on the site at any time. Fuel refilling will occur away from all flammable materials. In addition, grounding and bonding wires will be utilized when transferring flammable liquids to prevent sparks. If flammable liquids/materials are stored onsite, proper storage techniques will be utilized. Strong oxidizers will also be kept away from the site as much as possible. (Good housekeeping practices will be employed to prevent the chance of fire and/or explosions.)

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5.3 OXYGEN DEFICIENCY

It is not expected that an oxygen-depleted atmosphere will be encountered during site activities. Whenever the risk of encountering an oxygen-depleted atmosphere does exist (confined space entry, for example), precautions will be taken to ensure the safety of all employees. Confined space entries are used only as a last resort, when all other means have been exhausted. Ecova Corporation uses a special permit system for confined space entry, entailing substantial additional employee training and atmospheric monitoring.

5.4 BIOLOGIC HAZARDS

It is not anticipated that poisonous plants or hazardous animals will be encountered during site activities.

5.5 SAFETY HAZARDS

The principal safety hazards will be those associated with the drilling of monitoring wells, the movement of soil and heavy equipment and the operation of remediation equipment. These will be minimized by carefully laying out the site and controlling vehicle movement to avoid collisions. Back-up alarms will be in working order to warn pedestrian workers of moving equipment. All equipment shall have appropriate guards in place.

Additional hazards include slipping on muddy or unstable ground, back strain from lifting heavy objects, and maintenance work on the equipment. These hazards will be controlled by the use of sturdy work boots, training concerning property lifting techniques and lockout/zero mechanical state procedures, respectively. In the event overhead power lines are adjacent to operations involving heavy equipment that may come into contact with the lines, these power lines will be guarded/insulated or turned off. Prior to drilling or excavation activities, a locate service will be consulted to assure that no utilities are in the path of proposed boring or excavating locations.

During evacuation activites, soil will be stockpiled at least two feet from the side of the excavation. When excavating adjacent to buildings, _____ will be used to prevent the building from collapsing. Personnel will not enter the excavation while digging is actively taking place. Prior to entry, the sides of the excavation will be properly shored and braced and a means for easy egress will be provided.

5.6 HEAT/COLD STRESS

Wearing personal protective equipment while conducting site operations puts the individual worker at considerable risk of developing heat-related disorders, collectively called heat stress. Monitoring will be performed by the SSO or designee to avoid a heat stress condition, using both oral temperatures and radial pulse rate for all workers engaging in heavy labor at ambient temperatures over 70°F. Where work is anticipated in cold weather, a similar evaluation of worker health risks will be made. Appropriate warm clothing and heated rest areas will be available if outside temperatures fall below 40°F for more than two hours. (See Section 8.3 Heat/Cold Stress Monitoring for additional information.)

5.7 NOISE

Excess exposure to noise is expected to be minimal during site activities. If noise levels are suspected at levels above 85 decibels (dBa), monitoring will be conducted. In general, excess noise is "suspected" when persons standing next to each other are not audible to each other. Appropriate hearing protection will be used if the noise levels exceed 85 dBa. In addition, ear plugs will be available onsite at all times for worker comfort if desired. A Hearing Conservation Program has been established at Ecova Corporation and is in effect for all site locations.

5.8 ELECTRIC HAZARDS

Various uses of electrical power could exist. As information is acquired, it will be implemented in this HASP. In general, all electrical work, installation and wire capacities shall be in accordance with the provisions of the National Electric code. Power cords will be UL-listed heavy duty and include a grounding prong. Ground fault

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circuit interrupters will be installed by a qualified electrician. If additional lines are installed, they will be covered or elevated to prevent damage which would create a hazard. All power cords and receptacles shall be inspected before use to ensure that the casings are not cracked, grounding prongs are attached and that there are no other visible defects. If any defects are found, the cord, receptacle, or equipment shall be tagged and placed out of use until fixed or disposed of. During heavy equipment maintenance activities, proper lockout procedures will be utilized. The site shall be arranged and equipment chosen to minimize the potential for contact of overhead power lines.

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6.0 HEALTH AND SAFETY TRAINING

This section describes the health and safety training requirements necessary for participating in field operations at the Time Oil site.

6.1 TRAINING REQUIREMENTS

Ecova employees and subcontractors who enter the site will be able to recognize and understand the potential hazards to health and safety associated with the site operations. All employees potentially exposed to hazardous substances will have participated in 40 hours of initial health and safety instruction and three days of actual field experience under the direct supervision of a trained, experienced supervisor. The objectives of Ecova's health and safety training are:

- To make each team member aware of the potential hazards they may encounter
- To provide the knowledge and skills necessary to perform the work with minimal risk to worker health and safety
- To make workers aware of the purpose and limitations of safety equipment
- To ensure that workers can safely avoid or escape from emergencies

Workers exposed to special hazards (i.e., confined spaces) during field operations at the Time Oil site shall receive additional training as determined by the Site Safety Officer. Onsite managers and supervisors shall receive all training required for employees whom they supervise, plus eight additional hours of specialized training on management and supervision of such operations. Prior work experience or training will be acceptable provided that it is equivalent to the training requirements specified above.

Health and Safety Trainers themselves have been trained at a level higher than and including the subject matter to be taught, either through actual course work or field experience. Employees shall not engage in field activities until they are successfully trained and certified by the instructor as having completed the required training. Training records for each individual will be maintained by Ecova Corporation.

6.2 DAILY SAFETY MEETINGS

Site-specific "tailgate" safety briefings (Attachment 3) will be conducted daily by the SSO or designee to discuss the day's operations and to ensure that site personnel have the necessary information to conduct their jobs safely.

TOLS004011

32319

BZTO104(e)040832

7.0 PERSONAL PROTECTIVE EQUIPMENT

This section details the level of personal protection to be used during field operations at the Time Oil site. Appropriate levels of protection have been determined using information detailed in the site hazard assessment. For the most part, the treatment system is a closed system, thus reducing the chance of worker exposure. The most common route of exposure for PCP is skin contact, thus warranting dermal protection. During all field operations, personnel shall wear hardhats, safety glasses, and rubber, steel toe safety boots.

7.1 LEVEL D OPERATIONS

Site personnel will wear at a minimum Level D equipment. Level D protection consists of the general equipment, work overalls, rubberized work gloves, and have available an air purifying respirator (full face) with combination organic vapor high efficiency particulate cartridges. Dust masks may be utilized if their tends to be a "nuisance dust" problem on the site. In addition, dust monitoring devices may be worn during site activities to document personnel exposure. If washable work overalls are worn, they will be laundered after each use and changed at the end of the day or upon significant contamination, whichever occurs first. If work coveralls are worn they will be stored in 55 gallon drums for future disposal (incineration, hazardous waste landfill or industrial landfill).

7.2 LEVEL C OPERATIONS

This may include sampling, equipment maintenance and equipment decontamination operations. Level C protective clothing will consist of general equipment plus full-face air purifying respirators with combination organic vapor high efficiency particulate cartridges (or a half face respirator and splash-proof goggles), work clothes, surgical inner gloves, Nitrile outer gloves, rubber work boots or nuke booties, and saranex-coated tyvek coveralls or tyvek coveralls (dependent on the nature of the soil; wet vs. dry). Full face respirators or the use of goggles with half face respirators have been designated due to the potential for eye damage upon exposure to PCP. The SSO or designee will fit-test all site personnel.

7.3 LEVEL B OPERATIONS

Level B protection is not anticipated for the Time Oil site since the expected levels of PCP contamination is well below the OSHA PEL. Level B consists of all PPE described in Level C Operations with the substitution of a pressure demand SCBA with full face piece for the full-faced, air purifying respirator.

Levels C and D protection will be utilized during initial monitoring well installation and mobilization activities. After gaining additional site experience and data from air/soil sampling, these levels of protection will be re-evaluated to provide sufficient employee protection while maximizing productivity. A situation may be present in which Level C respiratory protection is utilized while Level D clothing is used. Criteria for downgrading personnel protective equipment during field activities will be laboratory results indicating no potential for exposure above the Permissible Exposure Limit (PEL) for any site contaminant. This is further explained in Section 10.2.

TOLS004012

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BZTO104(e)040833

8.0 MEDICAL SURVEILLANCE

A medical surveillance program has been instituted by Ecova Corporation for all employees with potential exposure to hazardous substances. An initial medical examination is given upon initiation of employment, annually thereafter, and upon termination. In addition, site specific monitoring will be established to document exposure for project personnel. The individual (3 maximum) with the greatest chance of long term exposure will be monitored, at the beginning of the project and every three months until project completion, for PCP exposure. Blood samples will be drawn at Dr. Griffith's office in Portland, Oregon, and analyzed by Pacific Toxicology in San Diego, California.

Each team member will have undergone a physical examination prior to site entry in order to verify that he/ she is physically able to use protective equipment (including respirators), work in hot or cold environments, and have no predispositions to occupationally-induced disease. The medical program will also consist of periodic follow-up exams and additional exams as needed to evaluate specific exposures or unexplainable illnesses. The exams will be provided by Dr. Patricia Sparks, who is Board-certified in Occupational Medicine, or an equally qualified alternate.

In addition, local health care providers have been identified in Section 4, Emergency Telephone Numbers, to provide emergency evaluations or care should an overexposure situation or accident occur while at the job site.

TOLS004013

32319

BZTO104(e)040834

9.0 SITE CONTROL

9.1 SITE SECURITY

No one will be allowed to enter the site Exclusion Zones (see below) unless they have been given permission to do so by the Project Manager and SSO, and otherwise follow applicable portions of this HASP.

9.2 SITE WORK ZONES

Three or more work zones will be established at the Time Oil site. These work zones will be determined by the SSO onsite in order to account for wind speed/direction, physical characteristics of the site (i.e. fencing, buildings, etc.), and daily field operations. Each work zone will be clearly delineated and posted. The three work zones will be as follows:

Exclusion Zone. The area(s) which contains, or is suspected of containing hazardous materials, in this case, the initial excavation and treatment areas. The exclusion zone shall be clearly delineated by a "hotline" and posted. Only persons authorized by this HASP may enter the Exclusion Zone.

Contamination Reduction Zone (CRZ). This zone will be established to act as a transition zone for decontamination of equipment and personnel just outside the area of suspected contamination.

Support Zone. The area which is not contaminated. This area will be used to stage clean equipment and other support facilities.

9.3 DECONTAMINATION PROCEDURES

In order to assure that contamination is controlled and not spread from the site, decontamination procedures will be employed for both equipment and personnel.

All decontamination activity will be monitored to assure compliance with the procedures described below.

9.3.1 PERSONNEL

All personnel known to be or suspected of being contaminated with hazardous materials will decontaminate fully before re-entry into the Support Zone. Decontamination will consist of the following steps:

a. Drop equipment on plastic sheet at decontamination area (border of contaminated zone).

b. Wash and rinse outer suits, booties and gloves with TSP solution and brush.

c. Remove outer gloves and nuke booties and deposit in marked container.

d. Remove protective suit and discard into marked container.

e. Remove respirator if worn, remove cartridges and discard, deposit respirator into container for decontamination.

f. Remove inner gloves and discard into container.

g. Wash hands and face.

h. Shower.

Used protective clothing will be packaged in 55-gallon drums for eventual offsite disposal.

TOLS004014

BZTO104(e)040835

Partial decontamination may be necessary or desirable in situations such as: heavy contamination prior to site egress, between sampling locations/collections, changing respirator cartridges, consultation with personnel outside the exclusion zone, or rest breaks to prevent heat stress or physical exhaustion. In such circumstances, field personnel may initiate the following partial decontamination procedures in the CRZ:

- o Drop equipment on plastic sheeting at hot line.
- o Wash and rinse outer gloves, booties, and/or suits depending on the reason for leaving the exclusion zone.
- o Removal of necessary equipment. Note that outer gloves should be removed prior to removing a respirator or protective suit.
- o Perform necessary reason for leaving exclusion zone.
- o Redress prior to entering exclusion zone or continue decontamination if leaving the CRZ.

At no time shall personnel enter the support zone without fully decontaminating.

9.3.2 EQUIPMENT

All equipment must be decontaminated before leaving the Contamination Reduction Zone. Heavy equipment is difficult to decontaminate. The methods generally used are to wash them with high pressure water or steam clean and/ or to scrub accessible parts with a detergent/ water solution under pressure. Particular care must be given to tires, scoops, and other components in possible direct contact with contaminants.

Sampling instruments and other non-disposable equipment should be kept clean in disposable protective covers. Dippers, scoops, and similar devices for solid samples may be placed in plastic bags or metal drums for disposal or later decontamination.

Respirators will be cleaned and maintained after each use.

9.3.3 EMERGENCY DECONTAMINATION

In the event that a seriously injured person is contaminated, the SSO or other site worker will wrap the injured individual in clean plastic sheeting to prevent contamination of the ambulance. Less severely injured individuals will have their protective clothing carefully cut off before transport to the hospital.

9.3.4 DISPOSAL OF WASTE

All unused samples will be returned to the site. Disposable contaminated supplies will be securely drummed onsite, for disposal according to applicable regulations.

9.4 RECORDKEEPING

To assure HASP implementation, many site activities will be documented. These include maintenance of HASP at the site; employee Field Team Review daily safety briefings; site sign-in log; respirator fit test worksheets; health and safety log notes (which include instrument calibration records, sampling data, monitoring results, and incident reports) chemical safety data sheets; and other records identified in the HASP.

TOLS004015

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BZTO104(e)040836

9.5 EMERGENCY RESPONSE PLAN

The HASP provides sufficient information to allow site personnel to respond effectively to any emergencies that might develop. A detailed description of each of the following functions has been included:

- o Pre-emergency planning has been performed during the writing of this HASP
- o Personnel roles and authority
- o Training and communication
- o Emergency recognition and prevention
- o A list of emergency telephone numbers
- o Evacuation routes, places of refuge, and directions to the nearest hospital(s)
- o Site security
- o Emergency decontamination
- o Emergency medical attention

9.6 EMERGENCY FOLLOW-UP AND EVALUATION

The SSO will notify the Ecova Project Manager as soon as possible after an emergency situation has been stabilized. The Project Manager will then notify the Vice President of Operations, appropriate agencies, and client contacts. If an individual is injured, the Project Manager will file an Accident Report with the SSO.

9.7 PROCEDURES FOR REPORTING TO STATE, LOCAL AND FEDERAL AGENCIES

In all cases, the Ecova Project Manager will be notified. He, in turn, will contact the client and any regulatory agencies.

9.8 EMERGENCY EVACUATION PROCEDURES

In the event of a site emergency, all workers at the site will be notified by the SSO or designee to stop work immediately and offer assistance. Those not needed for immediate assistance will decontaminate per normal procedures and leave the site.

9.9 GENERAL SAFE WORK PRACTICES

9.9.1 BUDDY SYSTEM

A minimum of two people in constant communications (either visual or voice) with each other are required to perform work in the exclusion zone.

9.9.2 MINIMIZATION OF CONTAMINATION

Personnel and equipment used in the contaminated area should be minimized, consistent with effective site operations. Only absolutely required samples will be taken back to the laboratory. Contamination will be avoided wherever possible, by not kneeling on contaminated ground, avoiding puddles where possible, and using plastic drop cloths and equipment covers.

9.9.3 SAMPLING PROCEDURES

Standard operating procedures will minimize the risk of personnel exposure to hazardous materials during sampling, packaging, shipping and analysis; and minimize the risk of exposure of others to spilled or residual waste materials.

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9.9.4 SAFETY EQUIPMENT

A first aid kit and fire extinguishers will be available onsite whenever work is being performed. In addition an emergency eyewash and decontamination trailer with showers will be available on site. This equipment will be inspected and/or tested at least monthly and noted in the logbooks. If deficiencies are noted, they will be corrected immediately.

9.9.5 FORBIDDEN ACTIVITIES

a. Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials in any area designated as contaminated.

b. Ignition of flammable liquids or starting open flames.

c. Wearing contact lenses onsite other than in the support zone.

d. Use of non-prescription controlled substances or alcohol on site.

10.0 ENVIRONMENTAL MONITORING PLAN

10.1 HAZARDOUS SUBSTANCES MIGRATION PATHWAYS

This section assesses the pathways along which chemicals could escape site boundaries during field operations in the solid, liquid, or vapor state. Solids would most readily escape only if they were small enough and/or light enough to become airborne. In this case, particles would be distributed in a large area downwind from the site. Measures shall be taken to assure that dust levels are kept to a minimum onsite. Decontamination procedures shall be implemented to prevent chemicals from being carried offsite by either personnel or equipment. In addition, air samples may be collected to determine if such transport is occurring (see Air Monitoring and Sampling, Section 10.2). Vapors may escape when contaminated soil is exposed during land treatment operations. This is highly unlikely due to the physical properties of PCP. Air monitoring will be utilized during field operations to determine if chemicals are being carried offsite. In addition, an action level will be established and used to determine if site activities should cease. It is not anticipated that surface liquids would escape the site boundaries. Measures shall be taken to assure that large amounts of liquids do not flow freely offsite.

10.2 AIR MONITORING AND SAMPLING

Air monitoring and sampling shall be performed to document exposure levels and to assure that all necessary precautions are taken to protect onsite personnel and the general public. Real-time air monitoring and air sampling shall be conducted during site activities that have a high potential for chemical exposure. In general, the following action levels (Section 10.2.1) will be utilized, subject to modification based on site experience or weather conditions. These action levels are based on readings above the daily background level.

10.2.1 AIR MONITORING

Real-time air monitoring will be conducted using a particulate monitor to measure total dust in air levels. A daily background level will be established by averaging three site readings prior to beginning the day's operations. The site action levels will be determined based on the permissible exposure level (PEL) of PCP. Since the instrument reads the total dust level and cannot readily distinguish between compounds, the site action levels will be determined by comparing the PEL and the greatest concentration of PCP obtained in laboratory samples. Measurement of contaminant air concentrations in the breathing zone above one-half the PEL will result in upgrading to Level C protection for individuals working in proximity to the measured concentrations. Measurement of a sustained air concentration equal to the PEL will result in air monitoring downwind from the work site. If the downwind monitoring indicates potential for offsite exposure, work will cease pending re-evaluation of the task with the client.

Action levels have been established using PCP (PEL = 0.5 mg/m^3) as the compound of interest. The quantitative action levels were calculated using the following information:

OSHA PEL	=	0.5 mg/m^3
Max. Soil Concentration	=	8400 mg/kg
Worst Case (Dust Storm)	=	30 mg/m^3

At worst case:

$$\frac{30\ mg}{mg} \times \frac{8400\ mg\ PCP}{10^6\ mg\ soil} = \frac{0.25\ mg\ PCP}{m^3\ air}$$

The action level for upgrading to level C respiratory protection is one half the PEL of PCP (0.25 mg/m^3). The site action level will be a total of 30 mg/m^3 measured on the dust/particulate monitor.

$$R.R. = \frac{Measured}{Actual}$$

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TABLE 10-2. Initial Site Action Levels

Action	Qualitative Levels	Quantitive Levels (measured)
	Monitor	
Level D	0 ppm to 1/2 PEL in BZ	0-29 mg/m^3 in BZ
Upgrade to Level C	at 1/2 PEL in BZ	30 mg/m^3 in BZ
Begin Downwind Air Monitoring	at PEL in BZ	60 mg/m^3
Cease Operations	at PEL (site boundary)	60 mg/m^3 (site boundary)

10.2.2 AIR SAMPLING

Personnel air sampling will be conducted to document personnel exposure during site activities. In addition, environmental air samples will be collected upwind and downwind from the site during initial excavating and remediation activities. These sample analysis will be used to document the possibility of offsite migration of hazardous chemicals. Samples will be collected using cellulose membrane and an impinger solution (Ethylene glycol) in midget impinger bubbler as the sampling media. The pump shall run at 1.5 liters per minute for a total volume of 180 liters (120 minutes). In addition, a bulk sample of soil will be collected in a glass container with a teflon lined cap and sent with the air sampling media. Samples will be sent to Hager Laboratories for analysis of Pentachlorophenol of HPLC method. The sampling method and Hager data sheets are included as attachment 4 and 5 respectively.

10.3 HEAT/COLD STRESS MONITORING

Heat stress monitoring will be conducted by the SSO for individuals engaged in heavy manual labor in Level C/B protection if outside temperatures exceed 70°F. This temperature is lower than the IGCIH levels for continuous work to compensate for wearing protective clothing which impedes sweat evaporation. Oral temperatures will be taken with a clinical thermometer for three minutes. If the worker's temperature exceeds the TLV for a particular work load and work-rest regimen, the next work period will be shortened by one-third. Radial pulse will also be taken for 30 seconds early in each rest period. If the pulse exceeds 110 beats per minute, the next work cycle will be shortened by one-third. The work-rest regimen and heat exposure TLVs will be according to Table 4-3. Workers will not be permitted to continue working if their temperature exceeds 100.4°F.

TABLE 10-3. Work-Rest Regimens and Heat Exposure Threshold Limit Values
(Temp Values given in WBGT)

	Work Load		
Work-Rest Regimen	Light	Medium	Heavy
Continuous	86°F	80.1°F	77°F
75% Work - 25% Rest Each Hour	87.1°F	82.4°F	78.6°F
50% Work - 50% Rest Each Hour	88.5°F	84.9°F	82.2°F
25% Work - 75% Rest Each Hour	90°F	88°F	86°F

TOLS004019

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When impermeable protective clothing is being worn, the baseline work cycle should be adjusted so that the work period is one third less than the level recommended in Table 4-3. If outside temperatures fall below 40°F for two consecutive hours during work, a warm shelter will be provided, and breaks will be taken in that area once every two hours.

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ATTACHMENT 1 - FIELD TEAM REVIEW

TOLS004021

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FIELD TEAM REVIEW AND EMERGENCY DATA

I have read and reviewed the most recent revision _____ (Date)
of the Health and Safety Plan (HASP) for the _____ (Project)
_____ (Site). I understand the information contained
therein and will comply with all aspects of the HASP.

Name: _____

Signature: _____

Date: _____

This information is in case of emergency only:

Social Security #_____

Person(s) to notify in case of Emergency:

_____

Relationship: _____

Daytime Phone #: _____

Name of Physician: _____ Phone #: _____

Medical Coverage: _____

_____

Employee Data of Birth: _____

*Known Allergies: _____

_____

*Known Medical Conditions: _____

_____

*any known allergies or medical conditions that physicians should be made aware of before medical attention is given (i.e. allergic to penicillin).

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ATTACHMENT 2 - PENTACHLOROPHENOL MSDS

TOLS004023

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BZTO104(e)040844

***** IDENTIFIERS *****

NAME [CAS NUMBER]: PENTACHLOROPHENOL [87-86-5]
SYNONYMS: CHEM-TOL; CHLOROPHEN; CRYPTOGIL OL; DOWCIDE 7; DOWICIDE 7; DOWICIDE EC-7; DOWICIDE G; DOW PENTACHLOROPHENOL DP-2 ANTIMICROBIAL; DUROTOX; EP 30; FUNGIFEN; GLAZD PENTA; GRUNDIER ARBEZOL; LAUXTOL; LAUXTOL A; LIROPREM; NCI-C54933; NCI-C55378; NCI-C56655; PCP; PENCHLOROL; PENTA; PENTACHLOORFENOL (Dutch); PENTACHLOROFENOL; PENTACLOROFENOLO (Italian); PENTACHLOROPHENATE; PENTACHLOROPHENOL; 2,3,4,5,6-PENTACHLOROPHENOL; PENTACHLOROPHENOL (DOT); PENTACHLOROPHENOL, DOWICIDE EC-7; PENTACHLOROPHENOL, DP-2; PENTACHLORPHENOL (German); PENTACHLOROPHENOL, TECHNICAL; PENTACON; PENTA-KIL; PENTASOL; PENWAR; PERATOX; PERMACIDE; PERMAGARD; PERMASAN; PERMATOX DP-2; PERMATOX PENTA; PERMITE; PRILTOX; SANTOBRITE; SANTOPHEN; SANTOPHEN 20; SINITUHO; TERM-I-TROL; THOMPSON'S WOOD FIX; WEEDONE; PHENOL, PENTACHLORO-; PCP, PENTA
RTECS NUMBER: SM6300000 FORMULA: C6C15OH CHEMICAL CLASS:

***** PROPERTIES *****

MELTING POINT: 360 F BOILING POINT: 591.9 F
WATER SOLUBILITY: 0.002% @ 30 C
FLASH POINT: N OT COMBUSTIBLE UEL: LEL:
INCOMPATABILITIES: STRONG OXIDIZERS
PHYSICAL DESC: LIGHT-BROWN SOLID WITH A PUNGENT ODOR WHEN HOT

***** TOXICITY DATA *****

SNS OF EXPOSURE: DUST OR VAPOR IRRITATES SKIN AND MUCOUS MEMBRANES, CAUSING COUGHING AND SNEEEZING. INGESTION CAUSES LOSS OF APPETITE, RESPIRATORY DIFFICULTIES, ANESTHESIA, SWEATING, COMA. OVEREXPOSURE CAN CAUSE DEATH. DECREASED URINARY OUTPUT. FEVER. INGESTION CAUSE INCREASE THEN DECREASE OF RESPIRATION, BLOOD PRESSURE, INCREASE BOWEL ACTION, MOTOR WEAKNESS, AND COLLAPSE WITH CONVULSIONS, CAUSES LUNG, LIVER, KIDNEY DAMAGE AND CONTACT DERMATITIS. Source: CSDS, CHRIS
LONG TERM TOXICITY: ACUTE POISONING MARKED BY WEAKNESS AND RESPIRATORY, BLOOD PRESSURE AND URINARY OUTPUT CHANGES - ALSO CAUSES DERMATITIS, CONVULSIONS AND COLLAPSE. CHRONIC EXPOSURE CAN CAUSE LIVER AND KIDNEY INJURY. Source: SAX
MEDICAL COND'T AGG: No data available
TARGET ORGANS: SKIN, MUCOUS MEMBRANE, RESPIRATORY SYSTEM, CNS, CARDIOVASCULAR SYSTEM, LIVER, KIDNEYS. Source: NIOSH
CARCINOGEN: Y-POSSIBLE ANIMAL INDEFINITE Source: NIOSH RTECS
SENSITIZER: No data available
LD50 (mg/Kg): 50 SPECIES: orl-rat

***** REGULATIONS *****

RCLA RQ : 10 POUNDS OR 4.54 KG
A Regs. : Sec. 311 and Sec. 307
CAA : Not regulated by this act
RCRA ID : U242
DOT SHIP NAME : PENTACHLOROPHENOL
DOT ID : NA2020
DOT CLASS : OE.

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TOLS004024

BZTO104(e)040845

OSHA PEL : 0.5 mg/M3 SKIN

********** REGULATORY DATA SUMMARY **********
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CHEMTOX RECORD: 312
NAME: PENTACHLOROPHENOL
CAS NUMBER 87-86-5

THIS SUBSTANCE IS REGULATED BY US DOT
DOT SHIPPING NAME PENTACHLOROPHENOL
DOT ID NUMBER NA2020
DOT GUIDE NUMBER 53
DOT HAZARD CLASS ORM-E

THIS SUBSTANCE IS REGULATED BY US EPA
UNDER RCRA RULES .. WASTE NUMBER U242
Under SARA Title III, Section 313 - Release reporting
UNDER CERCLA RULES WITH 'RQ' OF A or 10 POUNDS
UNDER CWA Section 311

THIS SUBSTANCE IS REGULATED BY OSHA
WITH A PEL OF 0.5 mg/M3 SKIN

IMPORTANT: This compound is a known or suspect CARCINOGEN Source: NIOSH

********** CHEMTOX TRANSPORTATION DATA SUMMARY **********
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DOT SHIPPING NAME: PENTACHLOROPHENOL
DOT ID NUMBER: NA2020
CHEMTOX NAME: PENTACHLOROPHENOL
DOT GUIDE NUMBER: 53
MAJOR HAZARD: TOXIC
FLASH POINT: Not available
AUTOIGNITION TEMPERATURE: Not available
UEL: Not available
LEL: Not available
PHYSICAL DESCRIPTION: LIGHT-BROWN SOLID WITH A PUNGENT ODOR WHEN HOT Source: NIOSH/OSHA Guide
ODOR DETECTION LOWER LIMIT: NO DATA AVAILABLE Source: CHRIS
ODOR DESCRIPTION: PUNGENT TO WEAK Source: CHRIS
PROTECTION SUMMARY: RESPIRATOR FOR DUST; GOGGLES; PROTECTIVE CLOTHING. Source: CHRIS Manual
***** LIMIT EXPOSURE, THIS CHEMICAL IS A CARCINOGEN ***** Source: NIOSH

TOLS004025

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********** SPILL DATA - REACTIVITY SUMMARY **********
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CHEMTOX RECORD NUMBER 312 NAME :PENTACHLOROPHENOL
INCOMPATABILITIES :STRONG OXIDIZERS
REACTIVITY TOWARD WATER :No reaction
REACTIVITY TOWARD COMMON MATERIALS :Not reactive
STABILITY DURING TRANSPORT :Stable
NEUTRALIZING AGENTS :Not applicable
POLYMERIZATION POSSIBILITIES :Doesn't polymerize
NFPA YELLOW CODE :(0) Stable even under fire conditions.

NFPA SPECIAL CODE :None
Source: CHRIS Manual
and NIOSH/OSHA Guide

********** SPILL DATA - TOXICITY SUMMARY **********
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CHEMTOX RECORD NUMBER 312 NAME :PENTACHLOROPHENOL
CONCENTRATION IDLH :150 MG/M3
OSHA PEL :0.5 mg/M3
ACGIH TLV :- ppm SKIN
CARCINOGEN ? :Y-POSSIBLE ANIMAL INDEFINITEN Source:
NIOSH RTECS J

TARGET ORGANS :SKIN, MUCOUS MEMBRANE, RESPIRATORY SYSTEM,
CNS, CARDIOVASCULAR SYSTEM, LIVER, KIDNEYS.
Source: NIOSH

SIGNS OF EXPOSURE. :DUST OR VAPOR IRRITATES SKIN AND MUCOUS
MEMBRANES, CAUSING COUGHING AND SNEEEZING.
INGESTION CAUSES LOSS OF APPETITE, RESPIRATORY
DIFFICULTIES, ANESTHESIA, SWEATING, COMA.
OVEREXPOSURE CAN CAUSE DEATH. DECREASED
URINARY OUTPUT. FEVER. INGESTION CAUSE INCREASE
THEN DECREASE OF RESPIRATION, BLOOD PRESSURE,
INCREASE BOWEL ACTION, MOTOR WEAKNESS, AND
COLLAPSE WITH CONVULSIONS, CAUSES LUNG,
LIVER, KIDNEY DAMAGE AND CONTACT DERMATITIS.
Source: CSDS, CHRIS

NFPA BLUE CODE :(3) Extremely hazardous to health. Full
protection required. No skin surface should
be exposed.

********** CHEMTOX SPILL/DISPOSAL INFORMATION **********
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CHEMTOX RECORD NUMBER 312 NAME :PENTACHLOROPHENOL

DDDDDDDDDDDDDDDDDDDDDDDD NOTIFICATION REQUIREMENTS DDDDDDDDDDDDDDDDDDDDDDDDD

THIS CHEMICAL IS REGULATED UNDER 'CERCLA' ... YOU MUST NOTIFY STATE AND/OR
FEDERAL AUTHORITIES CONCERNING SPILLS OF MORE THAN 10 POUNDS OR 4.54 KG
Source: 40 CFR Part

DDDDDDDDDDDDDDDDDDDDDDDD DISPOSAL METHODS RECOMMENDED DDDDDDDDDDDDDDDDDDDDDDDD

1. As a waste material, this chemical is regulated by US EPA
hazardous waste regulations (RCRA). Its waste designation is U242
Source: 40 CFR Part 26

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CHEMTOX RECORD NUMBER 312 NAME : PENTACHLOROPHENOL

DDDDDDDDDDDDDDDDDDDDDDD CHARACTERISTICS OF THIS CHEMICAL DDDDDDDDDDDDDDDDDD

ODOR DETECTION LIMIT :NO DATA AVAILABLE Source: CHRIS
ODOR DESCRIPTION :PUNGENT TO WEAK

PHYSICAL DESCRIPTION :LIGHT-BROWN SOLID WITH A PUNGENT ODOR WHEN HOT
Source: CHRIS Manual

DDDDDDDDDDDDDDDDDDDDDDD IMMEDIATE HAZARDS AT SITE OF SPILL DDDDDDDDDDDDDDDDDD
(FUNCTION KEYS EXPAND DATA DISPLAY)

FIRE HAZARD (F1) :

REACTIVITY HAZARD (F2) :

TOXICITY HAZARD (F3) :

********** SPILL DATA - FLAMMABILITY SUMMARY **********
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CHEMTOX RECORD NUMBER 312 NAME :PENTACHLOROPHENOL
FLASH POINT (Closed Cup) :Not avaliable
UPPER EXPLOSIVE LIMIT :Not available
LOWER EXPLOSIVE LIMIT :Not available
AUTOIGNITION TEMP :Not available
TOXIC FIRE GASES :Hydrogen chloride and unburned toxic vapors

EPA RED CODE :(0) This material does not readily burn.

Source: CHRIS Manual

********** PHYSICAL DATA SUMMARY **********
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CHEMTOX ID NUMBER	:	312
CHEMTOX NAME	:	PENTACHLOROPHENOL
CAS NUMBER	:	87-86-5
CHEMICAL CLASS	:	
FORMULA	:	C6Cl5OH
MOLECULAR WEIGHT	:	266.32
PHYSICAL DESCRIPTION	:	LIGHT-BROWN SOLID WITH A PUNGENT ODOR WHEN HOT
BOILING POINT	:	591.9 F
MELTING POINT	:	360 F
VAPOR PRESSURE	:	40 MM @ 211 C
WATER SOLUBILITY	:	0.002% @ 30 C
SPECIFIC GRAVITY	:	1.98 @ 22 C
IONIZATION POTENTIAL	:	Not available
FLASH POINT (CC)	:	Not available
UEL	:	Not available
LEL	:	Not available
AUTOIGNITION TEMP	:	Not available

Sources: CHRIS Manual AND NIOSH/OSHA Guide

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********** CHEMTOX REACTIVITY DATA **********
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CHEMTOX RECORD	:312
NAME	:PENTACHLOROPHENOL
CAS NUMBER	:87-86-5
FORMULA	:C6C15OH
CHEMICAL CLASS	:
INCOMPATIBILITIES	:STRONG OXIDIZERS
REACTIVITY TO WATER	:Not reactive, or unknown.
REACTIVITY WITH COMMON MATERIALS	:No reactions of a hazardous nature.
NEUTRALIZATION	:Not applicable.
TOXIC FIRE GASES	:Hydrogen chloride and unburned toxic vapors

Sources: CHRIS Manual
and NIOSH/OSHA Guide

********** CHEMTOX TOXICOLOGICAL DATA **********
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CHEMTOX RECORD	:312
NAME	:PENTACHLOROPHENOL
CAS NUMBER	:87-86-5
IDLH	:150 MG/M3 Source: NIOSH
OSHA DATA	:PEL= 0.5 mg/M3
ACGIH TLV	:- ppm SKIN STEL : 1.5 mg/M3
TARGET ORGANS	:SKIN, MUCOUS MEMBRANE, RESPIRATORY SYSTEM, CNS, CARDIOVASCULAR SYSTEM, LIVER, KIDNEYS. Source: NIOSH
SHORT TERM TOX	:A HUMAN CNS/SKIN IRRITANT. ** Source: SAX
LONG TERM TOX	:ACUTE POISONING MARKED BY WEAKNESS AND RESPIRATORY, BLOOD PRESSURE AND URINARY OUTPUT CHANGES - ALSO CAUSES DERMATITIS, CONVULSIONS AND COLLAPSE. CHRONIC EXPOSURE CAN CAUSE LIVER AND KIDNEY INJURY. ** Source: SAX
MEDICAL CONDITION AGGRAVATED	:No data available
SIGNS/SYMPTOMS	:DUST OR VAPOR IRRITATES SKIN AND MUCOUS MEMBRANES, CAUSING COUGHING AND SNEEEZING. INGESTION CAUSES LOSS OF APPETITE, RESPIRATORY DIFFICULTIES, ANESTHESIA, SWEATING, COMA. OVEREXPOSURE CAN CAUSE DEATH. DECREASED SWEATING, COMA. OVEREXPOSURE CAN CAUSE DEATH. DECREASED URINARY OUTPUT. FEVER. INGESTION CAUSE INCREASE THEN DECREASE OF RESPIRATION, BLOOD PRESSURE, INCREASE BOWEL ACTION, MOTOR WEAKNESS, AND COLLAPSE WITH CONVULSIONS, CAUSES LUNG, LIVER, KIDNEY DAMAGE AND CONTACT DERMATITIS. Source: CSDS, CHRIS
LD50 (mg/Kg)	:50 SPECIES: orl-rat Source: SAX

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********** PERSONNEL PROTECTION SUMMARY **********

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TMTOX RECORD : 312 CAS NUMBER: 87-86-5
NAME : PENTACHLOROPHENOL

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of liquid contact and repeated or prolonged vapor contac
with the skin.

** WEAR EYE PROTECTION TO PREVENT:

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** WORK CLOTHING SHOULD BE CHANGED DAILY:
If there is any possibility that the clothing may be contaminated.

** REMOVE CLOTHING:
Immediately remove non-impervious clothing that becomes contaminated.

** THE FOLLOWING EQUIPMENT SHOULD BE MADE AVAILABLE:
Eyewash,quick drench.

** REFERENCE: NIOSH

RESPIRATOR FOR DUST; GOGGLES; PROTECTIVE CLOTHING.

** REFERENCE: CHRIS MANUAL

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NIOSH RESPIRATION PROTECTION RECOMMENDATIONS
OSHA (PENTACHLOROPHENOL)
5 mg/M3: Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist and fume filter. * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
12.5 mg/M3: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter. * Substance reported to cause eye irritation or damage may require eye protection.
25 mg/M3: Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.
100 mg/M3: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus

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********** SYMPTOMS OF EXPOSURE **********
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CHEMTOX RECORD :312
NAME :PENTACHLOROPHENOL
CAS :87-86-5
GENERAL SYMPTOMS:

DUST OR VAPOR IRRITATES SKIN AND MUCOUS MEMBRANES, CAUSING COUGHING AND SNEEEZING. INGESTION CAUSES LOSS OF APPETITE, RESPIRATORY DIFFICULTIES, ANESTHESIA, SWEATING, COMA. OVEREXPOSURE CAN CAUSE DEATH. DECREASED URINARY OUTPUT. FEVER. INGESTION CAUSE INCREASE THEN DECREASE OF RESPIRATION, BLOOD PRESSURE, INCREASE BOWEL ACTION, MOTOR WEAKNESS, AND COLLAPSE WITH CONVULSIONS, CAUSES LUNG, LIVER, KIDNEY DAMAGE AND CONTACT DERMATITIS. Source: CSDS, CHRIS

********** CHEMTOX ANALYTICAL DATA **********
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CHEMTOX RECORD NUMBER 312 NAME : PENTACHLOROPHENOL

ANALYTICAL METHODS RECOMMENDED BY NIOSH or OSHA

Agency	Reference	Method
NIOSH	4(S297)	HPLC
OSHA	39	HPLC/UV

J.T.Baker
222 Red School Lane Phillipsburg, N.J. 08865
24-Hour Emergency Telephone - (201) 859-2151
Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

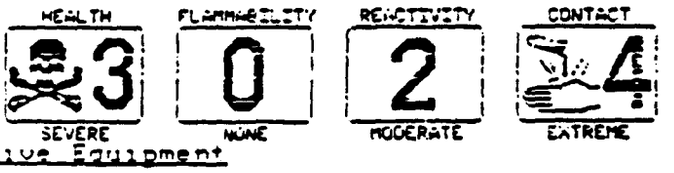
MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT IDENTIFICATION

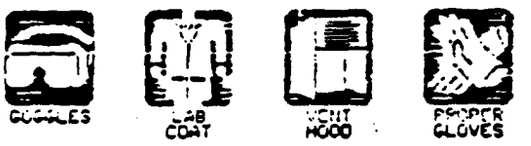
Product Name: Sodium Hydroxide
Formula: NaOH
Formula Wt: 40.00
CAS No.: 01310-73-2
NIOSH/RTECS No.: WB4900000
Common Synonyms: Caustic Soda Sodium Hydrate; Lye
Product Codes: 3730,3722,5312,5104,3729,3734,3726,5045,3728,3723,5022,3736

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA™ System



Laboratory Protective Equipment



Precautionary Label Statements

POISON! DANGER!
CAUSES SEVERE BURNS
MAY BE FATAL IF SWALLOWED

Do not get in eyes, on skin, on clothing.
Avoid breathing dust. Keep in tightly closed container. Use with adequate ventilation. Wash thoroughly after handling.

SECTION II - HAZARDOUS COMPONENTS

Component	%	CAS No.
Sodium Hydroxide	90-100	1310-73-2

SECTION III - PHYSICAL DATA

Boiling Point: 1390°C (2534°F) Vapor Pressure(mmHg): 0
Melting Point: 318°C (604°F) Vapor Density(air=1): N/A

Continued on Page: 2

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SECTION III - PHYSICAL DATA (Continued)

cific Gravity: 2.13 (H_2O=1) Evaporation Rate: N/A (Butyl Acetate=1)

ubility(H_2O): Appreciable (more than 10 %) % Volatiles by Volume: 0

earance & Odor: White, odorless solid (flakes).

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

sh Point: N/A NFPA 704M Rating: 3-0-1

e Extinguishing Media
Use water spray.

sual Fire & Explosion Hazards
Contact with moisture or water may generate sufficient heat to ignite combustible materials.
Reacts violently with water liberating and igniting hydrogen.

SECTION V - HEALTH HAZARD DATA

eshold Limit Value (TLV/TWA): 2 mg/m^3 (ppm)

ects of Overexposure
Ingestion may result in severe intestinal irritation with burns to mouth.
Contact with skin or eyes may cause severe irritation or burns.

rgency and First Aid Procedures
If swallowed, do NOT induce vomiting; if conscious, give large amounts of water. Follow with diluted vinegar, fruit juice or whites of eggs, beaten with water.
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash clothing before re-use.

SECTION VI - REACTIVITY DATA

bility: Stable Hazardous Polymerization: Will not occur

ditions to Avoid: moisture

atibles: water, strong acids, most common metals.

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Continued on Page: 3

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SECTION VII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

J. T Baker Neutracit-2[R] caustic neutralizer is recommended for spills of this product.

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

EPA Hazardous Waste Number: D002, D003 (Corrosive Reactive Waste)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation:	Use general or local exhaust ventilation to meet TLV requirements.
Respiratory Protection:	Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 50 ppm, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.
Eye/Skin Protection:	Safety goggles, uniform, apron, rubber gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA[TM] Storage Color Code: White Stripe

Special Precautions

Keep container tightly closed. Store in corrosion-proof area.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D O T)

Proper Shipping Name	Sodium hydroxide, dry solid
Hazard Class	Corrosive material (solid)
UN/NA	UN1823
Labels	CORROSIVE
Reportable Quantity	1000 LBS.

INTERNATIONAL (I M O)

Proper Shipping Name	Sodium hydroxide, solid

Continued on Page: 4

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION (Continued)

zard Class	8
N/NA	UN1823
bels	CORROSIVE

A = Not Applicable or Not Available

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e information published in this Material Safety Data Sheet has been compiled om our experience and data presented in various technical publications. It is e user's responsibility to determine the suitability of this information for e adoption of necessary safety precautions. We reserve the right to revise aterial Safety Data Sheets periodically as new information becomes available.

-- LAST PAGE --

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ATTACHMENT 3 - TAILGATE SAFETY MEETING

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ECOVA

TAILGATE SAFETY MEETIN

Division/Subsidiary _____ Facility _____

Date _____ Time _____ Job Number _____

Customer _____ Address: _____

Specific Location _____

Type of Work _____

Chemicals Used _____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards _____

Physical Hazards _____

Emergency Procedures _____

Hospital / Clinic _____ Phone ( ) _____ Paramedic Phone ( ) _____

Hospital Address _____

Special Equipment _____

Other _____

ATTENDEES

NAME PRINTED	SIGNATURE

meeting conducted by:

NAME PRINTED _____ SIGNATURE _____

Supervisor _____ Manager _____

TOLS004036

BZTO104(e)040857

ATTACHMENT 4 - SAMPLING METHOD

TOLS004037

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BZTO104(e)040858

Pentachlorophenol

Analyte:	Pentachlorophenol	Method No.:	S297
Matrix:	Air	Range:	0.265-1.130 mg/cu m
OSHA Standard:	0.5 mg/cu m - skin	Precision ($\overline{CV}_T$):	0.072
Procedure:	Filter and bubbler collection, ethylene glycol extraction, HPLC	Validation Date:	12/23/77

1. Principle of the Method

1.1 A known volume of air is drawn through a mixed cellulose ester membrane filter connected in series to a midget bubbler containing 15 ml of ethylene glycol to collect pentachlorophenol.

1.2 The filter and bubbler are disconnected. The filter is removed from the filter holder and added to the bubbler flask.

1.3 Just before analysis, ten milliliters of methanol is added to the bubbler flask. The resulting sample is analyzed by high performance liquid chromatography using a UV detector set at 254 nm.

2. Range and Sensitivity

2.1 This method was validated over the range of 0.2654-1.131 mg/cu m at an atmospheric temperature of 24°C and pressure of 761 mm Hg, using 180-liter samples.

2.2 The upper limit of the range of the method is dependent on the capacity and collection efficiency of the sampling system. The method may be extended to higher values than those tested by dilution of the sample solution.

3. Interferences

3.1 When interfering compounds are known or suspected to be present in the air, such information, including their suspected identities, should be transmitted with the sample.

3.2 Any compound that has the same retention time as pentachlorophenol at the operating conditions described in this method is an interference. Retention time data on a single column cannot be considered proof of chemical identity.

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4. Precision and Accuracy

4.1 The Coefficient of Variation ($\overline{CV}_T$) for the total sampling and analytical method in the range of 0.2654-1.131 mg/cu m was 0.0721. This value corresponds to a standard deviation of 0.036 mg/cu m at the OSHA standard level. Statistical information can be found in Reference 11.1. Details of the test procedures can be found in Reference 11.2.

4.2 A collection efficiency of at least 99% was determined for the collection media (filter and bubbler in series), thus, no significant bias was introduced in the sample collection step. There was also no bias in the analytical method. The average recovery from the filters was 100.9%. The average recovery from samples that were stored eight days was 95.3%. Thus, $\overline{CV}_T$ is a satisfactory measure of both accuracy and precision of the sampling and analytical method.

5. Advantages and Disadvantages of the Method

5.1 Collected samples are analyzed by means of a quick, instrumental method.

5.2 A disadvantage of the method is the awkwardness in using midget bubblers for collecting personal samples. If the worker's job performance requires much body movement, loss of the collection solution during sampling may occur.

5.3 The precision of the method is limited by the reproducibility of the pressure drop across the filter and bubbler. This drop will affect the flow rate and cause the volume to be imprecise, because the pump is usually calibrated for one filter/bubbler combination only.

5.4 The bubblers are more difficult to ship than adsorption tubes or filters due to possible breakage and leakage of the bubblers during shipping.

6. Apparatus

6.1 Filter Units. The filter unit consists of a 37-mm diameter cellulose ester membrane filter (Millipore Type AA or equivalent) with a pore size of 0.80 micrometer, supported by a stainless steel screen on a 37-mm three-piece filter holder. It is important that a stainless steel screen be used since other filter supports may retain part of the vapor.

6.2 Flexible Teflon or polyethylene tubing to connect the holder to the bubbler.

6.3 A glass midget bubbler containing 15 ml of ethylene glycol.

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6.4 Personal Sampling Pump. A calibrated personal sampling pump whose flow can be determined within ±5% is used. The sampling pump is protected from splashover or solvent condensation by a second empty bubbler positioned between the exit arm of the first bubbler and the pump.

6.5 Barometer.

6.6 Thermometer.

6.7 High performance liquid chromatograph capable of UV detection at a wavelength of 254 nm and a sample injection valve with a 20-microliter external sample loop.

6.8 Column (30-cm x 3.9-mm I.D. stainless steel) packed with μBondapak C_{18}. The porous packing material consists of silica particles with a bonded coating of C_{18} organo-silane. This packing can be obtained from Waters Associates, Milford, Massachusetts.

6.9 An electronic integrator or some other suitable method for measuring peak areas.

6.10 Tweezers.

6.11 Microliter syringes, 50 and 100-microliter.

6.12 Volumetric flasks, convenient sizes for preparing standard solutions.

6.13 Pipets, convenient sizes for preparing standard solutions and 10 and 15-ml pipets for measuring the extraction medium.

6.14 Teflon tubing (15-cm long x 7-mm I.D.) or Teflon plugs for sealing the inlet and outlet of the bubbler stem before shipping.

7. Reagents

All reagents used must be ACS reagent grade or better.

7.1 Pentachlorophenol.

7.2 Dowicide EC-7 (purified pentachlorophenol).

7.3 Ethylene glycol.

7.4 Methanol, distilled in glass.

7.5 Isopropanol.

7.6 Water, deionized and distilled.

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8. Procedure

8.1 Cleaning of Equipment. All glassware used for the laboratory analysis should be detergent washed and thoroughly rinsed with tap water and distilled water, and dried.

8.2 Calibration of Personal Sampling Pumps. Each personal sampling pump must be calibrated with a representative filter holder, bubbler and splashover trap in the line to minimize errors associated with uncertainties in the volume sampled.

8.3 Collection and Shipping of Samples

8.3.1 Assemble the filter in the three-piece filter holder and close firmly. The filter is backed up by a stainless steel screen. Secure the filter holder together with tape or shrinkable band.

8.3.2 Pipet 15 ml of ethylene glycol into each midget bubbler, and mark the liquid level. Be sure that the bubbler frit is completely immersed in the ethylene glycol.

8.3.3 Remove the filter holder plugs and attach the outlet of the filter holder to the inlet arm of the midget bubbler using a short piece of flexible polyethylene or Teflon tubing. Connect the outlet arm of the midget bubbler to a second empty bubbler and then to the personal sampling pump, using short pieces of flexible tubing. The bubblers must be maintained in a vertical position during sampling.

8.3.4 Air being sampled should not pass through any hose or tubing before entering the filter holder.

* 8.3.5 A sample size of 180 liters is recommended. Sample at a flow rate of 1.5 liters per minute. The flow rate should be known to within ±5%.

8.3.6 Turn the pump on and begin sample collection. Since it is possible for a filter to become plugged by heavy particulate loading or by the presence of oil mists or other liquids in the air, the pump rotameter should be checked frequently and readjusted as needed. Sampling should be terminated when the rotameter cannot be readjusted.

8.3.7 Terminate sampling at the predetermined time and record sample flow rate, collection time and ambient temperature and pressure. If pressure reading is not available, record the elevation. Also record the type of sampling pump used.

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8.3.8 After sampling, disconnect the filter and bubblers. Remove first the bubbler stem, and remove the filter from the filter holder with clean tweezers and add it to the bubbler. It is necessary to place the filter in the bubbler solution at this time, otherwise loss of pentachlorophenol from the filter by vaporization might occur. Replace the bubbler stem. The inlet and outlet of the bubbler stem should be sealed by connecting a piece of Teflon tubing between them or inserting Teflon plugs in the inlet and outlet. Do not seal with rubber. The splashover trap should have the inlet and outlet of the bubbler stem sealed in a similar manner. The standard taper joint of the bubblers should be taped securely to prevent leakage during shipping.

8.3.9 With each batch or partial batch of ten samples submit one bubbler containing ethylene glycol and a blank filter from the same lot of filters used for sample collection. This filter and bubbler must be subjected to exactly the same handling as the samples except that no air is drawn through them. Label this filter and bubbler as the blank.

8.3.10 The bubblers should be shipped in a suitable container, designed to prevent damage in transit. The samples should be shipped to the laboratory as soon as possible.

8.3.11 Bulk Sample. A bulk sample of the suspected material should be submitted to the laboratory in a glass container closed by a Teflon-lined cap. Label of the bulk sample should match air samples for identification purposes.

8.4 Analysis of Samples

8.4.1 If the sample volume is less than 15 ml, add ethylene glycol until the volume reaches the 15-ml mark. If the sample volume is more than 15 ml, determine the volume and make an appropriate volume correction in the calculations indicated in Section 10.1.

8.4.2 Add 10 ml of methanol to each sample just before analysis and mix the solution gently but thoroughly.

8.4.3 HPLC Conditions. The typical operating conditions for the high pressure liquid chromatograph are:

Column Temperature: Ambient
Column Pressure: 2300 psi
Flow Rate: 1.6 ml/min
Mobile Phase: 60% methanol/40% water (V/V)
Detector: UV photometer at 254 nm
Capacity Ratio: 1.8

TOLS004042

BZTO104(e)040863

8.4.4 Injection. The first step in the analysis is to inject the sample into the high pressure liquid chromatograph. The chromatograph is fitted with a sample injection valve and a 20-microliter sample loop. Flush this loop thoroughly with solvent (300 microliters), then fill the loop with sample solution and inject.

8.4.5 The area of the sample peak is measured by an electronic integrator or some other suitable form of area measurement, and results are read from a standard curve prepared as discussed below.

8.5 Determination of Analytical Method Recovery

8.5.1 Need for Determination. To eliminate any bias in the analytical method, it is necessary to determine the recovery of the compound. The sample recovery should be determined in duplicate and should cover the concentration range of interest. If the recovery is less than 95%, the appropriate correction factor should be used to calculate the "true" value.

8.5.2 Procedure for Determining Recovery. A known amount of the analyte, preferably equivalent to the sample concentration expected, is added to a representative cellulose membrane filter and air-dried. The filter is then immediately placed into 15 ml of ethylene glycol. Prior to analysis, as described in Section 8.4, 10 ml of methanol is added.

For the validation studies conducted to determine the precision and accuracy of this method, an amount of the analyte equivalent to that present in a 180-liter sample at the selected level was used to determine the analytical method recovery. A stock solution containing 10.00 milligrams of pentachlorophenol per millilitar of isopropanol was prepared. Aliquots of 4.5, 9 and 18 microliters were added to the cellulose membrane filters and air-dried to produce samples equivalent to 180-liter collections at 0.5, 1 and 2X the OSHA standard level. The analytical samples were then placed in 15 ml of ethylene glycol and allowed to stand overnight. A parallel blank filter was also prepared except that no sample was added to it. Just prior to analysis, as described in Section 8.4, 10 ml of methanol was added.

The sample recovery equals the average weight in µg recovered from the filter divided by the weight in µg added to the filter, or

$$\text{Recovery} = \frac{\text{Average Weight (µg) recovered - Blank (µg)}}{\text{Weight (µg) added}}$$

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BZTO104(e)040864

The recovery value is used in Section 10.3 if the recovery is less than 95%.

9. Calibration and Standards

A series of standards, varying in concentration over the range corresponding to approximately 0.25 to 3 times the OSHA standard for the sample under study, is prepared and analyzed under the same LC conditions and during the same time period as the unknown samples. Curves are established by plotting concentration in µg/25 ml versus peak area. Note: Since no internal standard is used in this method, standard solutions must be analyzed at the same time as the samples. This will minimize the effect of known day-to-day variations and variations during the same day of the UV detector response.

9.1 Prepare a 10 mg/ml pentachlorophenol stock standard solution by dissolving 100 mg pentachlorophenol in isopropanol and diluting to 10 ml in a volumetric flask.

9.2 From the above stock solution, appropriate aliquots are withdrawn and added to a mixture of 15 ml ethylene glycol and 10 ml methanol. Prepare at least five working standards to cover the range of 22.5-270 µg/25 ml. This range is based on a 180-liter sample. Analyze samples as per Section 8.4.

9.3 Prepare a standard calibration curve by plotting concentration of pentachlorophenol in µg/25 ml versus peak area.

10. Calculations

10.1 Read the weight, in µg/25 ml, corresponding to each peak area from the appropriate standard curve. No volume correction is needed, because the standard curve is based on µg/25 ml of ethylene glycol/methanol and the volume of sample injected is identical to the volume of the standards injected.

10.2 A correction for the blank must be made for each sample.

$$\mu g = \mu g \text{ sample} - \mu g \text{ blank}$$

where:

µg sample = µg found in sample solution

µg blank = µg found in blank solution

10.3 Divide the total weight by the recovery (Section 8.5.2) to obtain the corrected µg/sample.

$$\text{Corrected } \mu g/\text{sample} = \frac{\text{Total Weight}}{\text{Recovery}}$$

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10.4 For personal sampling pumps with rotameters only, the following volume correction should be made:

$$\text{Corrected Volume} = f \times t \left(\sqrt{\frac{P_1}{P_2} \times \frac{T_2}{T_1}} \right)$$

where:

f = sampling flow rate

t = sampling time

P_1 = pressure during calibration of sampling pump (mm Hg)

P_2 = pressure of air sampled (mm Hg)

T_1 = temperature during calibration of sampling pump (°K)

T_2 = temperature of air sampled (°K)

10.5 The concentration of pentachlorophenol in the air sample can be expressed in mg/cu m.

$$\text{mg/cu m} = \frac{\text{Corrected µg (Section 10.3) x 1000 (liters/cu m)}}{\text{Corr. Air Volume Sampled (liters) (Section 10.4)}}$$

11. References

11.1 Documentation of NIOSH Validation Tests, National Institute for Occupational Safety and Health, Cincinnati, Ohio (DHEW-NIOSH-Publication No. 77-185), 1977. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., Order No. 017-033-00231-2.

11.2 Backup Data Report for Pentachlorophenol, prepared under NIOSH Contract No. 210-76-0123.

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ATTACHMENT 5 - HAGER LABORATORIES DATA SHEET

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TOLS004046

BZTO104(e)040867

HAGER
LABORATORIES, INC.
1234 East Grev Avenue
Englewood, Colorado 80111
303 790-2727 800 282-1835
FAX # 303 790-2756

HAGER SERVICE NUMBER _____
(lab use only) IH EN AH AN

YOUR CUSTOMER ID CODE _____
(optional)

Samples Submitted By:

Company Name _____

Address _____

City, State _____

Zipcode _____

Telephone _____

Contact _____
( )Mr ( )Ms ( )Mrs ( )Dr
Please check one

( ) Check here if above info has changed

Invoice Same ( ) or To:

Company Name _____

Address _____

City, State _____

Zipcode _____

Contact _____

Purchase Order # _____

Office Use Only M ( ) A ( )
Prepaid ( ) check # _____

Original of Report Same ( ) or To:

_____

_____

_____

Additional Copy of Report To:

_____

_____

_____

Send mailers ( ), data sheets ( ), labels ( ), Other ( ) _____

Special Instructions

Asbestos Analyses

( ) Standard Service
( ) 48-Hour Rush Service*
( ) 24-Hour Rush Service*
( ) 2-Hour Rush Plus Service*
( ) Phone Results
( ) Special Report Format or Information (see back). May require additional fee.

* Additional Fee

Other Analyses

( ) Standard Service
( ) Rush Service*
( ) Rush Plus Service*
( ) Phone Results
( ) GC/Mass Spectroscopy*
( ) Special Report Format or Information (see back). May require additional fee.

* Additional Fee

Sample Information

TOLS004047

1. Samples were mailed in _____ (number mailers/boxes) on _____ (date)
2. If sampling media is not standard charcoal tube, cellulose or PVC filters please describe _____.
3. If samples for hydrocarbon mixtures (petroleum distillates, Solvesso 100 etc.) or oil mist, a 2-3cc bulk sample is required. This should be sent in a separate mailer. List any bulk sent _____.

TOLL FREE 1-800-282-1835 or inside COLORADO (303) 790-2727

110687

32319

* Please indicate type of turnaround service requested; i.e., Standard, Rush, 48-hour, 24-hour, or 2-hour service.

** Brief Sample Descriptions Alleviate Possible Errors In Reporting

*** When using POVM's we need only the time exposed under "Air volume".

Requested Turnaround Time*	Sample Number(s)**	Date Sampled	Flow Rate X minutes (Air volume)***	Analyze For	Laboratory Use Only

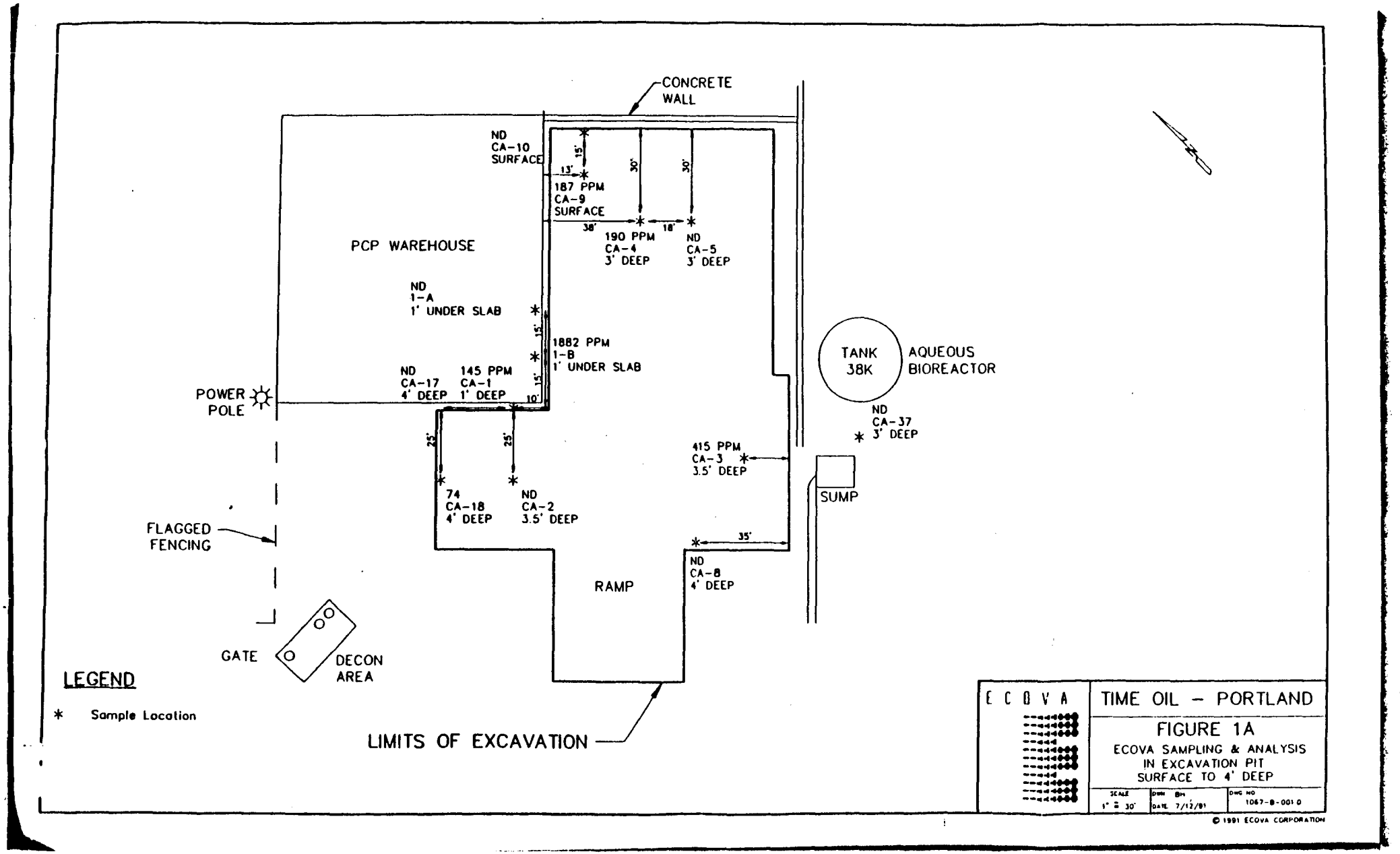
Optional Information
What other compounds, not normally found in the air, may have been present in the sampled air?

If sampling occurred at an altitude greater than 1000 feet AND you would like air volumes to be corrected for altitude, provide sampling altitude here.

ADDITIONAL REPORTING REQUIREMENTS:

TOLS004048

32319

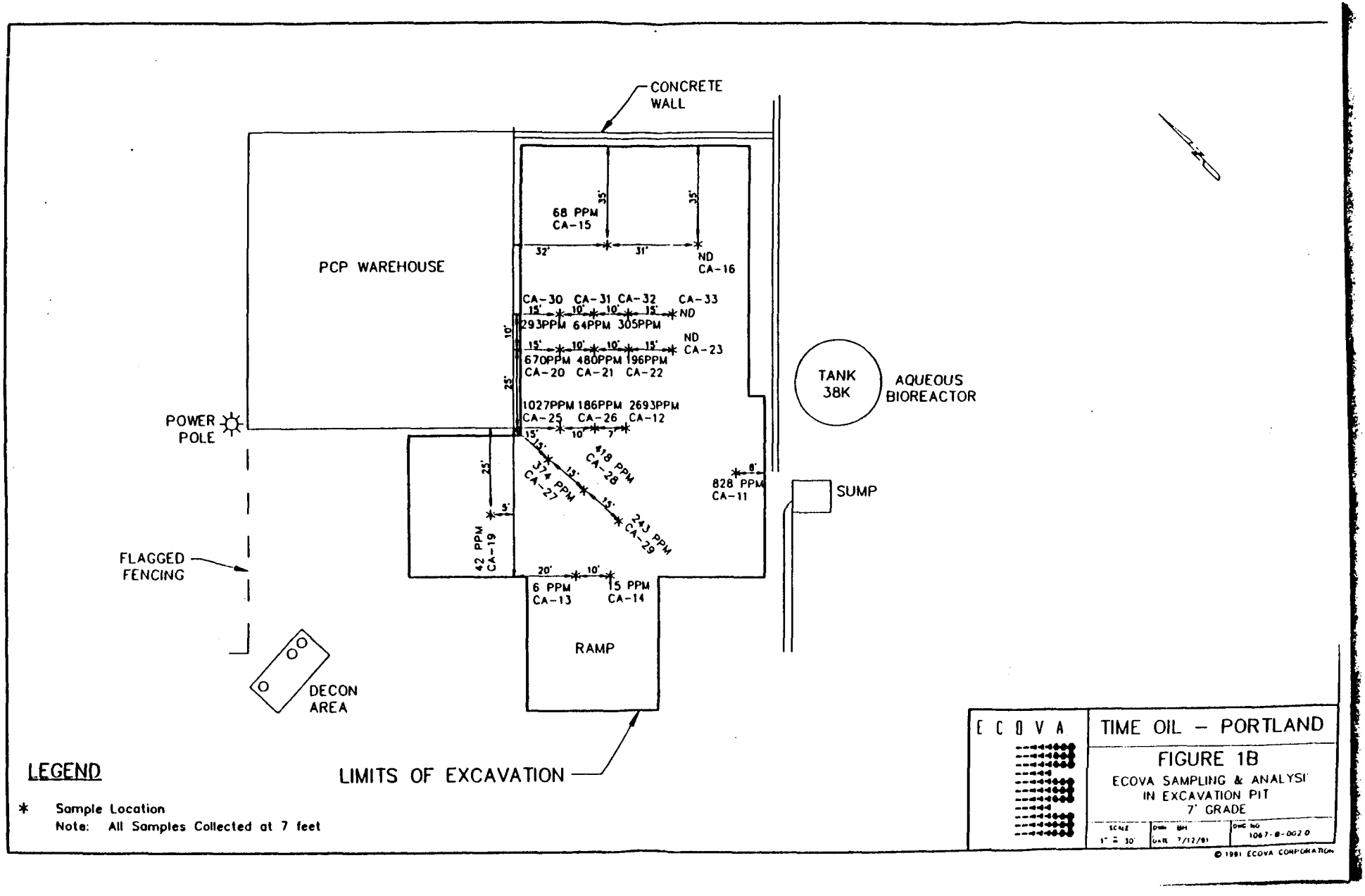


BZTO104(e)040870

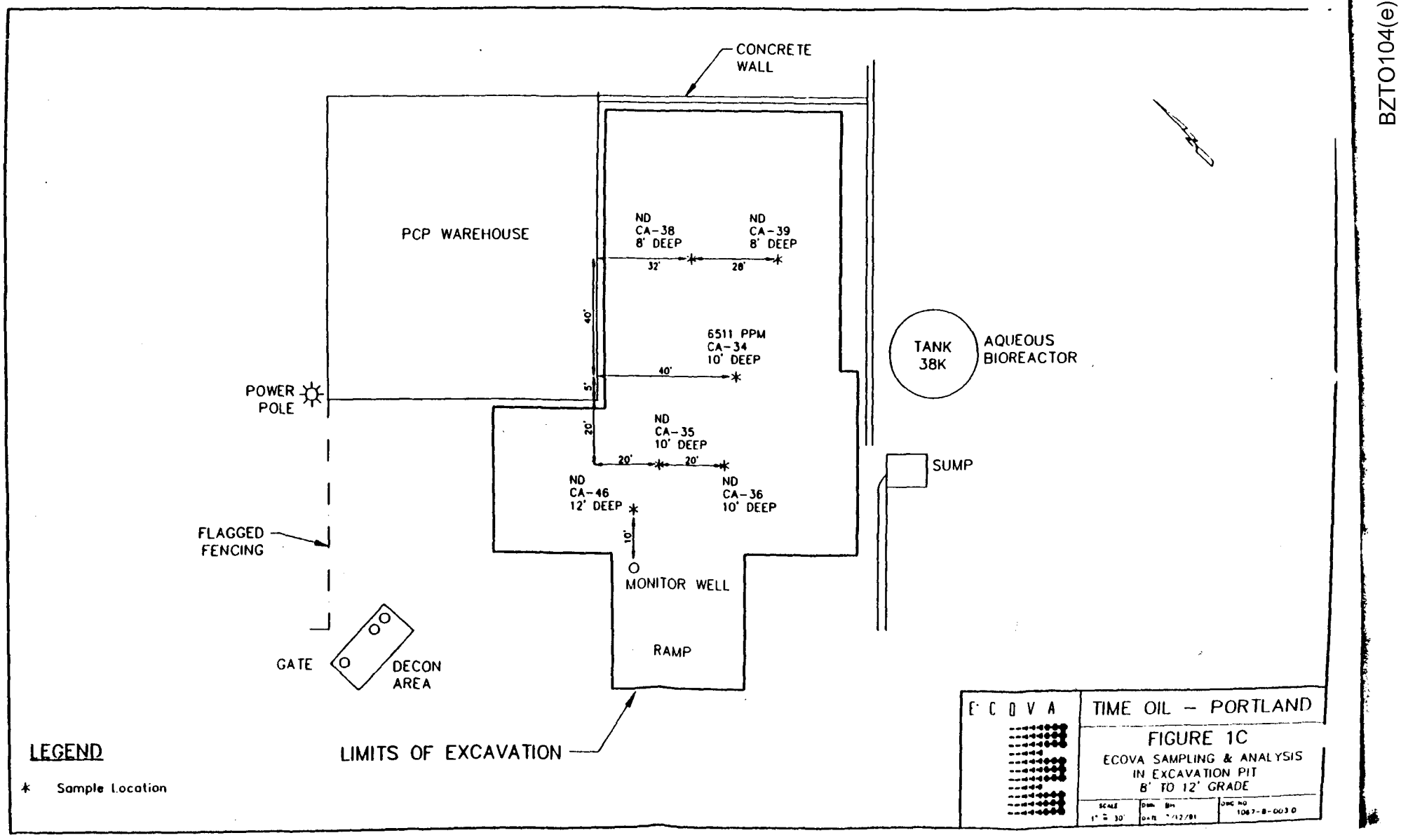
TOLS004049

32319

BZTO104(e)040871



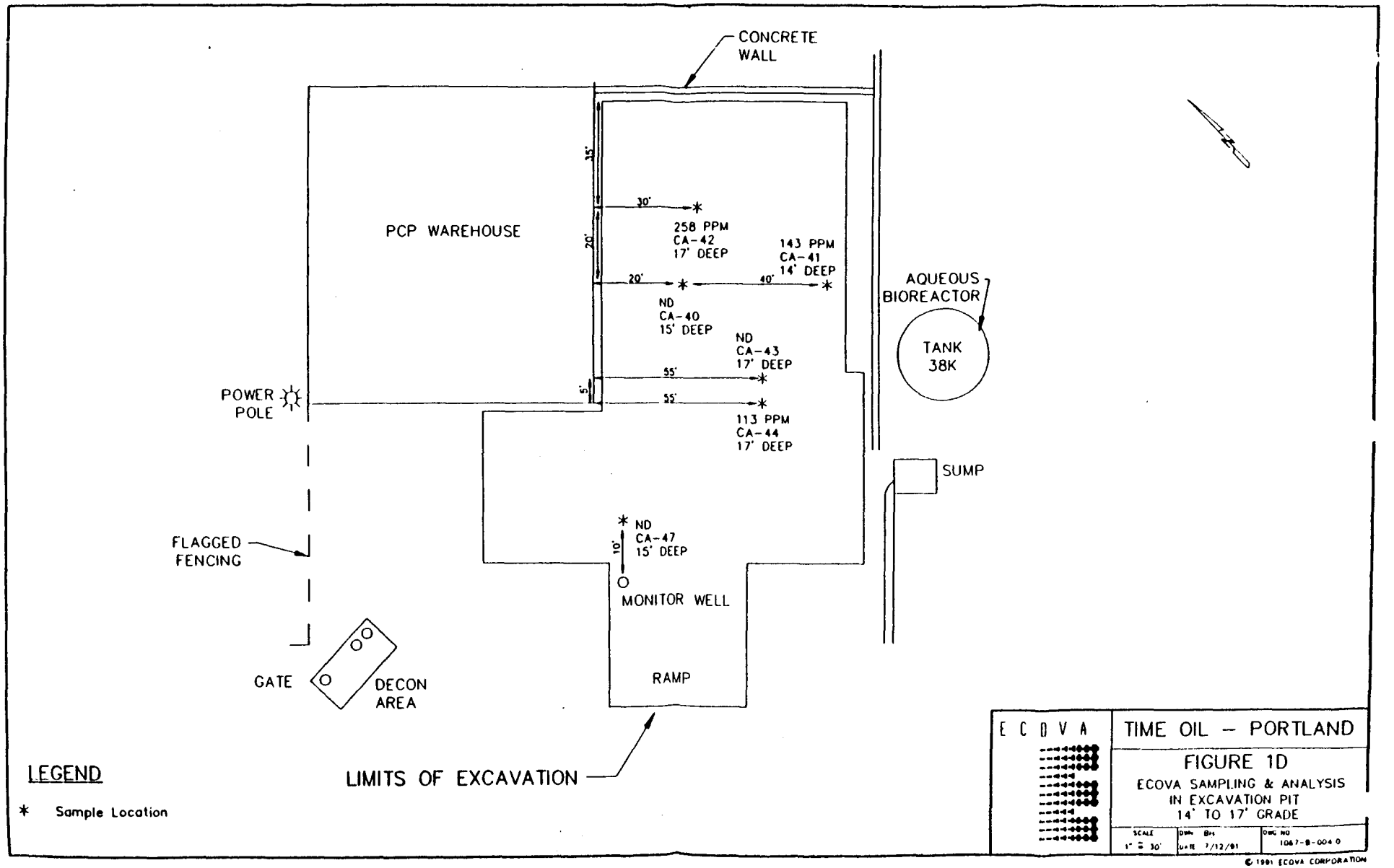
TOLS004050



BZT0104(e)040872

TOLS004051

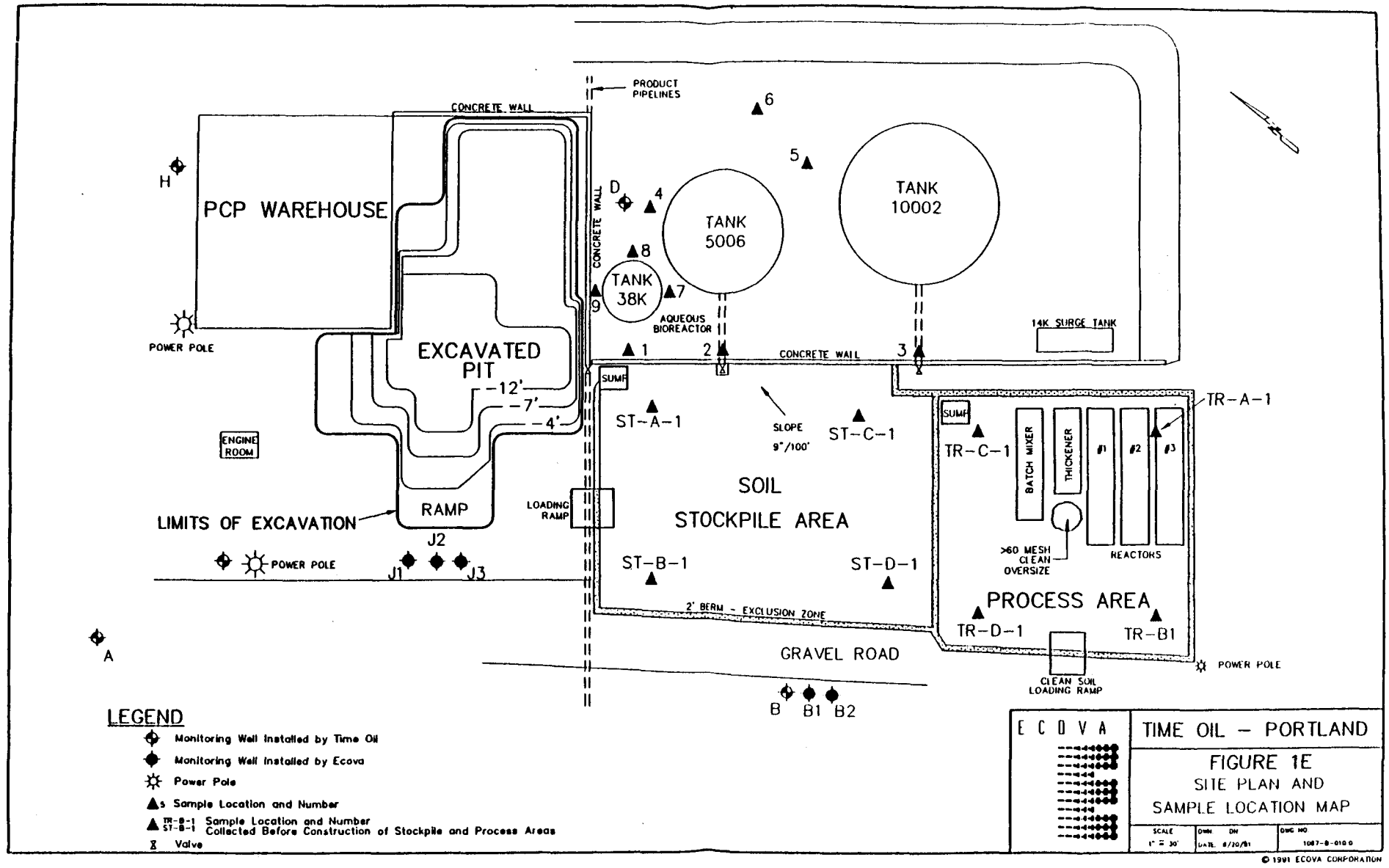
3231



BZT0104(e)040873

TOLS004052

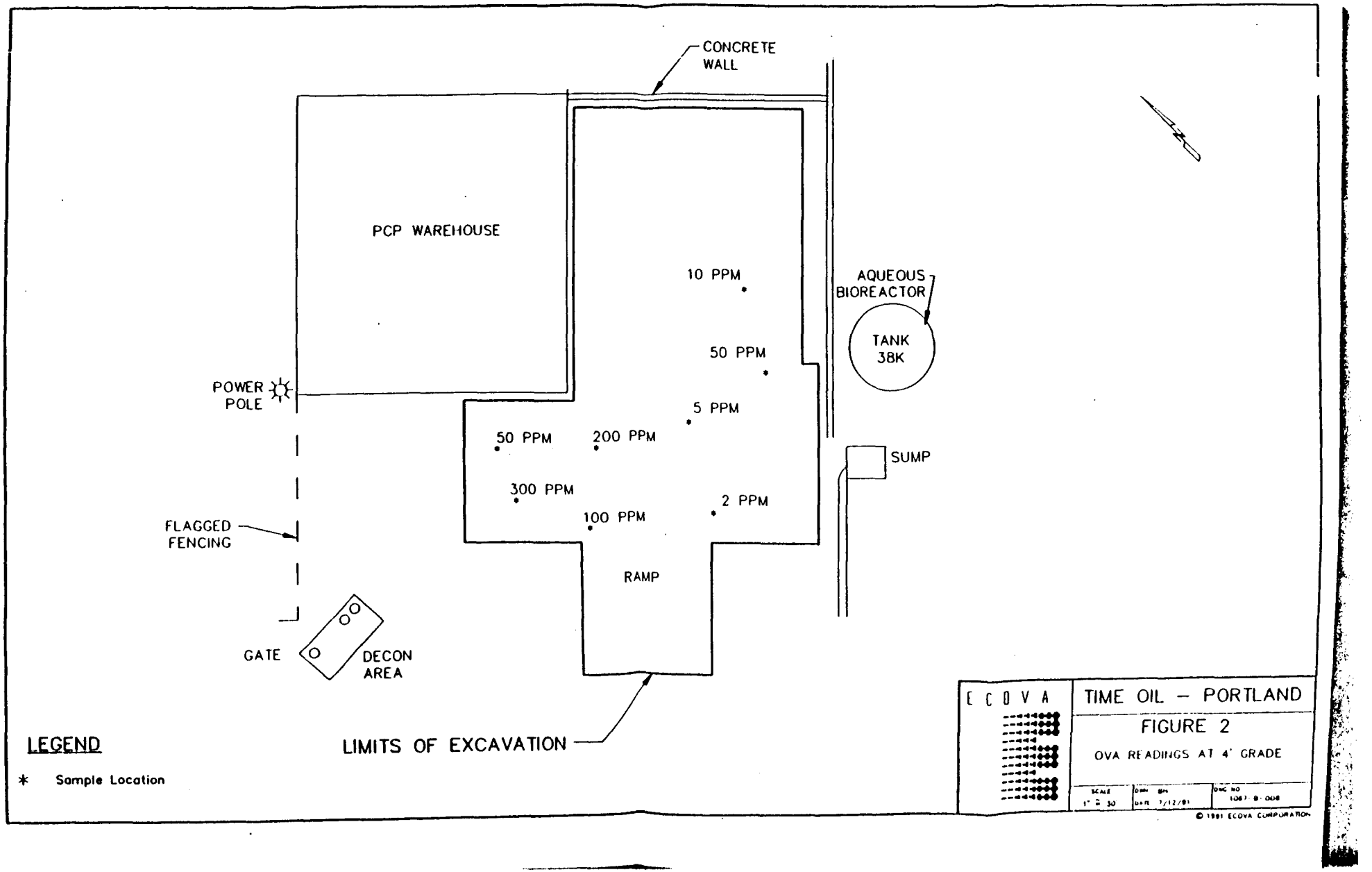
3231-8



BZTO104(e)040874

TOLS004053

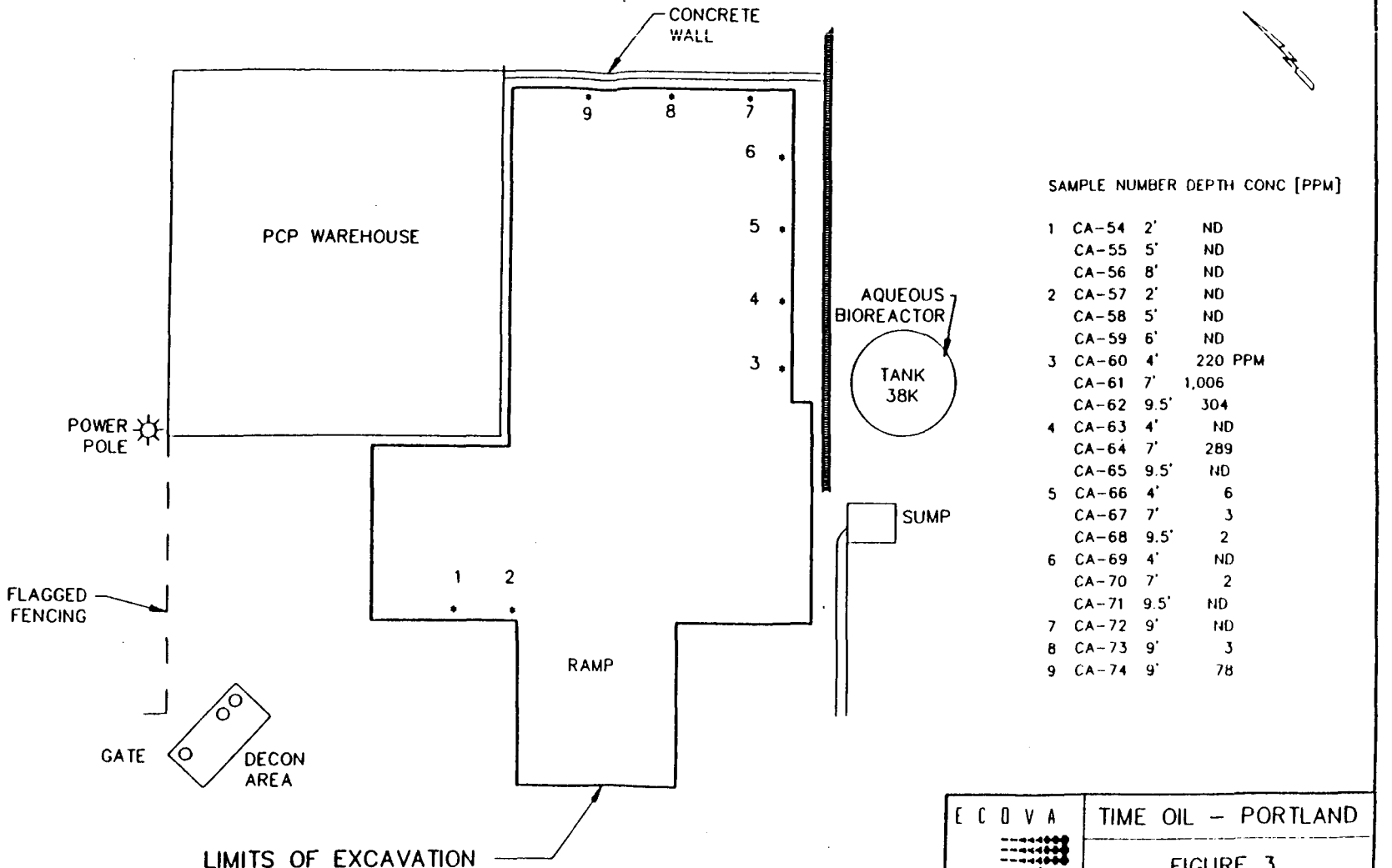
BZTO104(e)040875



TOLS004054

3231-9

BZTO104(e)040876



SAMPLE NUMBER		DEPTH	CONC [PPM]
1	CA-54	2'	ND
	CA-55	5'	ND
	CA-56	8'	ND
2	CA-57	2'	ND
	CA-58	5'	ND
	CA-59	6'	ND
3	CA-60	4'	220 PPM
	CA-61	7'	1,006
	CA-62	9.5'	304
4	CA-63	4'	ND
	CA-64	7'	289
	CA-65	9.5'	ND
5	CA-66	4'	6
	CA-67	7'	3
	CA-68	9.5'	2
6	CA-69	4'	ND
	CA-70	7'	2
	CA-71	9.5'	ND
7	CA-72	9'	ND
8	CA-73	9'	3
9	CA-74	9'	78

LEGEND

Sample Location

E C O V A

TIME OIL – PORTLAND

FIGURE 3

SIDE WALL SAMPLES

SCALE 1" = 30'

DWN BH DATE 7/12/91

DWG NO 1067 B-008 0

TOLS004055

32319

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Name: PNELI Contract: _____.

Lab Code: PNELI Case No.: _____ SAS No.: _____ SDG No.: _____.

Lab File ID: >BF549 DFTPP Injection Date: 10/12/89

Instrument ID: 2 DFTPP Injection Time: 7:06

Mass	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
51	30.0 - 60.0% of mass 198	38.4(	
68	Less than 2.0% of mass 69	0.0	0.0)1
69	Mass 69 relative abundance	51.(	
70	Less than 2.0% of mass 69	.8	1.7)1
127	40.0 - 60.0% of mass 198	40.2	
197	Less than 1.0% of mass 198	0.0	
198	Base Peak, 100% relative abundance	100.	
199	5.0 - 9.0% of mass 198	5.8	
275	10.0 - 30.0% of mass 198	21.9	
365	Greater than 1.00% of mass 198	2.37	
441	Present, but less than mass 443	9.3	
442	Greater than 40.0% of mass 198	57.9(	
	17.0 - 23.0% of mass 442	10.7	18.5)2

1-Value is % mass 69 2-Value is % mass 442

IS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD50	>BF550	10/12/89	7:31
02	EDZ81MSD	>BF551	10/12/89	8:40
03	2067-00MB	>BF552	10/12/89	9:45
04	2070-00[illegible]	[illegible]	[illegible]	10:48
05	2070-01MS	>BF555	10/12/89	12:57
06	2081-[illegible]	>BF556	10/12/89	14:00
07	EDZ80RE	>BF557	10/12/89	15:03
08	2067-02	>BF558	10/12/89	16:05
09	EDZ97	>BF559	10/12/89	17:08
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22ZZ				

TOLS004056

32319

BZTO104(e)040877

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Name: PNELI Contract: _____.

b Code: PNELI Case No.: _____ SAS No.: _____ SDG No.: _____.

b File ID: >BF536 DFTPP Injection Date: 10/11/89

strument ID: 2 DFTPP Injection Time: 7:01

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	40.4(
68	Less than 2.0% of mass 69	0.0 0.0)1
69	Mass 69 relative abundance	48.(
70	Less than 2.0% of mass 69	0.0 0.0)1
127	40.0 - 60.0% of mass 198	45.5
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.
199	5.0 - 9.0% of mass 198	6.7
275	10.0 - 30.0% of mass 198	21.4
365	Greater than 1.00% of mass 198	2.22
441	Present, but less than mass 443	9.1
	Greater than 40.0% of mass 198	58.0(
[illegible]	17.0 - 23.0% of mass 442	10.8 18.7)2

1-Value is % mass 69 2-Value is % mass 442

IS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED	
01	SSTD50	>BF538	10/11/89	8:27	
02	2062-03	>BF543	10/11/89	14:02	
03	SBLK2	>BF544	10/11/89	15:04	
04	~~2[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	needs recent
05	~~2081-03~~	~~>BF546~~	~~10/11/89~~	~~[illegible]~~	
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22ZZ					

32319

TOLS004057

BZTO104(e)040878

58

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Name: PNELI Contract: _____.

Code: PNELI Case No.: _____ SAS No.: _____ SDG No.: _____.

File ID: >BF514 DFTPP Injection Date: 10/10/89

Instrument ID: 2 DFTPP Injection Time: 7:00

Mass	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	39.6(
68	Less than 2.0% of mass 69	0.0 0.0)1
69	Mass 69 relative abundance	52.(
70	Less than 2.0% of mass 69	.7 1.3)1
27	40.0 - 60.0% of mass 198	42.3
97	Less than 1.0% of mass 198	0.0
98	Base Peak, 100% relative abundance	100.
99	5.0 - 9.0% of mass 198	7.1
75	10.0 - 30.0% of mass 198	21.0
65	Greater than 1.00% of mass 198	1.84
41	Present, but less than mass 443	7.1
42	Greater than 40.0% of mass 198	46.9(
43	17.0 - 23.0% of mass 442	8.7 18.6)2

1-Value is % mass 69 2-Value is % mass 442

THE TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD50	>BF515	10/10/89	8:26
02	2062-01	>BF516	10/10/89	9:34
03	2078-01RE	>BF517	10/10/89	10:36
04	2081-00[redacted]	>[redacted]	[redacted]	11:42
05	2062-02	>BF519	10/10/89	12:44
06	208[redacted]	>[redacted]	[redacted]	13:46
07	[redacted]	>[redacted]	[redacted]	15:50
08	208[redacted]	>[redacted]	[redacted]	16:52
09	208[redacted]	>[redacted]	[redacted]	17:54
10	208[redacted]	>[redacted]	[redacted]	18:56
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22ZZ				

don't use, needs reextract

TOLS004058

32319

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Name: PNELI Contract: _____.

Lab Code: PNELI Case No.: _____ SAS No.: _____ SDG No.: _____.

Lab File ID: >BF494 DFTPP Injection Date: 10/09/89

Instrument ID: 2 DFTPP Injection Time: 6:55

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
51	30.0 - 60.0% of mass 198	44.8(	
68	Less than 2.0% of mass 69	0.0	0.0)1
69	Mass 69 relative abundance	57.(	
70	Less than 2.0% of mass 69	.2	.4)1
127	40.0 - 60.0% of mass 198	43.2	
197	Less than 1.0% of mass 198	0.0	
198	Base Peak, 100% relative abundance	100.	
199	5.0 - 9.0% of mass 198	6.5	
275	10.0 - 30.0% of mass 198	21.3	
365	Greater than 1.00% of mass 198	2.12	
441	Present, but less than mass 443	8.4	
442	Greater than 40.0% of mass 198	55.3(	
443	17.0 - 23.0% of mass 442	9.9	17.9)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD50	>BF495	10/09/89	7:13
02	SSTD20	>BF496	10/09/89	8:32
03	SSTD80	>BF497	10/09/89	9:34
04	SSTD120	>BF498	10/09/89	10:36
05	SSTD160	>BF499	10/09/89	11:44
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22ZZ				

TOLS004059

32319

SEMIVOLATILE METHOD BLANK SUMMARY

Lab Name: PNELI_____ Client No.: 891005-10__ _____

Lab Code: PNELI__ Case No.: 2081__ SAS No.: _____ SDG No.: _____

Lab File ID: BF553_____ Lab Sample ID: 2081-00MB2___

Date Extracted: 10/11/89 Extraction: (SepF/Cont/Sonc) SONC

Date Analyzed: 10/12/89 Time Analyzed: 1048____

Matrix: (soil/water) SOIL__ Level: (low/med) LOW___

Instrument ID: GCMS_D__ ____ _

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	T2-2-927-15	2081-02	BF556	10/12/89

COMMENTS:

TOLS004060

FORM IV SV 1/87 Rev.

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SEMIVOLATILE METHOD BLANK SUMMARY

Lab Name: PNELI_____ Client No.: 891005-10__ _____

Lab Code: PNELI__ Case No.: 2081__ SAS No.: _____ SDG No.: _____

Lab File ID: BF518_____ Lab Sample ID: 2081-00MB____

Date Extracted: 10/09/89 Extraction: (SepF/Cont/Sonc) SONC

Date Analyzed: 10/10/89 Time Analyzed: 1141____

Matrix: (soil/water) SOIL__ Level: (low/med) LOW___

Instrument ID: GCMS_D__ ____ _

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	T1-3-926-15	2081-01	BF520	10/10/89
02	T1-3-926-15M	2081-01MS	BF523	10/10/89
03	T1-3-926-15M	2081-01MSD	BF524	10/10/89
04	T3-1-928-15	2081-03	BF525	10/10/89
05	T3-1-928-15D	2081-03DL	BF546	10/11/89

COMMENTS:

TOLS004061

3D

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ame: PNELI Contract: _____.

Code: PNELI Case No.: _____ SAS No.: _____ SDG No.: _____.

trix Spike - Sample No.: 2081-01 Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC	#	QC LIMITS REC.
Phenol	8700.00	0.00	4700.00	54		26- 90
2-Chlorophenol	8700.00	0.00	5300.00	61		25-102
1,4-Dichlorobenzene	4400.00	0.00	2800.00	64		28-104
N-Nitroso-di-n-prop.(1)	4400.00	0.00	2500.00	57		41-126
1,2,4-Trichlorobenzene	4400.00	0.00	3400.00	77		38-107
4-Chloro-3-methylphenol	8700.00	0.00	5800.00	67		26-103
Acenaphthene	4400.00	0.00	2900.00	66		31-137
4-Nitrophenol	8700.00	0.00	6300.00	72		11-114
2,4-Dinitrotoluene	4400.00	0.00	4000.00	91	*	28- 89
Pentachlorophenol	8700.00	3400.00	9800.00	74		17-109
Pyrene	4400.00	0.00	2900.00	66		35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC	#	% RPD	#	QC LIMITS RPD	QC LIMITS REC.
Phenol	8700.00	4300.00	49		10		35	26- 90
2-Chlorophenol	8700.00	4900.00	56		8		50	25-102
1,4-Dichlorobenzene	4400.00	2600.00	59		8		27	28-104
N-Nitroso-di-n-prop.(1)	4400.00	2500.00	57		0		38	41-126
1,2,4-Trichlorobenzene	4400.00	3200.00	73		5		23	38-107
4-Chloro-3-methylphenol	8700.00	5700.00	66		2		33	26-103
Acenaphthene	4400.00	2800.00	64		3		19	31-137
4-Nitrophenol	8700.00	6200.00	71		1		50	11-114
2,4-Dinitrotoluene	4400.00	3800.00	86		6		47	28- 89
Pentachlorophenol	8700.00	8900.00	63		16		47	17-109
Pyrene	4400.00	2600.00	59		11		36	35-142

N-Nitroso-di-n-propylamine

olumn to be used to flag recovery and RPD values with an asterisk
alues outside of qc limits

0 out of 11 outside limits
Recovery: 1 out of 22 outside limits

TOLS004062

ENTS: _____.

_____.

32319

BZTO104(e)040883

2D

SOIL SEMIVOLATILE SURROGATE RECOVERY

Name: PNELI

	EPA SAMPLE NO.	S1 (NBZ)#	S2 (FBP)#	S3 (TPH)#	S4 (PHL)#	S5 (2FP)#	S6 (TBP)#	OTHER	TOT OUT
01	2081-01	72	77	77	74	63	73		0
02	2081-01MS	79	82	77	79	74	81		0
03	2081-01MSD	70	77	74	72	67	78		0
04	2081-02	51	62	74	57	45	81		0
05	2081-03	211 *	89	74	112	111	91		1
06	2081-03DL	237 *	89	78	98	84	80		1
07	2081-00MB	67	74	84	73	63	74		0
08	2070-00MB2	64	60	65	69	58	67		0
09									
10									
11									
12									
13									
14									
15									
16									
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24									
25									
26									
27									
28									
29									
30									

	QC LIMITS
S1 (NBZ) = Nitrobenzene-d5	(23-120)
S2 (FBP) = 2-Fluorobiphenyl	(30-115)
S3 (TPH) = Terphenyl-d14	(18-137)
S4 (PHL) = Phenol-d5	(24-113)
S5 (2FP) = 2-Fluorophenol	(25-121)
S6 (TBP) = 2,4,6-Tribromophenol	(19-122)

\# Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

TOLS004063

32319

SEMIVOLATILE DATA
QC SUMMARY

TOLS004064

32319

BZTO104(e)040885

323319

Sample Label

Proj. Name: _____ #: _____

Date: _____ Time: _____

Sample #: _____ Samplers Initials: _____

Site Comments: _____

_____

Known Hazards: _____

_____

Chain-of-Custody Seal

TOLS004065

CUSTODY SEAL

_____

DATE

_____

SIGNATURE

Ecova

15555 N.E. 33rd
Redmond, WA 98052
(206) 882-4364

BZTO104(e)040886

32319

COVA

REQUEST . OR ANALYSIS

R/A Control No. IV 0977

C/C Control No. _____

PROJECT NAME _____

PROJECT NUMBER _____

PROJECT MANAGER _____

BILL TO _____

PURCHASE ORDER NO. _____

DATE SAMPLES SHIPPED _____

LAB DESTINATION _____

LABORATORY CONTACT _____

SEND LAB REPORT TO _____

DATE REPORT REQUIRED _____

PROJECT CONTACT _____

PROJECT CONTACT PHONE NO. _____

Sample No	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions

TOLS004066

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal _____ Rush _____ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard _____ Flammable _____ Skin Irritant _____ Highly Toxic _____ Other _____ (Please Specify)

SAMPLE DISPOSAL (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client _____ Disposal by Lab _____

FOR LAB USE ONLY

Received By _____ Date/Time _____

WHITE - Ori to accompany samples

BZTO104(e)040887

ECOVA

CHAIN-OF-C[illegible]TODY RECORD

R/A Control No. ____

C/C Control No. 0001924

PROJECT NAME/NUMBER ____ LAB DESTINATION ____

SAMPLE TEAM MEMBERS ____ CARRIER/WAYBILL NO ____

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No

Special Instructions: ____

Possible Sample Hazards: ____

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: ____

   Received By: ____

2. Relinquished By: ____

   Received By: ____

3. Relinquished By: ____

   Received by: ____

4. Relinquished By: ____

   Received By: ____

TOLS004067

WHITE - To accompany samples
YELLOW - Field copy

BZTO104(e)040888

14 were taken at this point and analyzed 828, 2693, 6, and 15 mg/kg respectively. On January 30 two more samples were taken at the 7 foot level, CA-15 and 16, which analyzed 68 mg/kg and Non Detect, respectively. On February 7 samples CA-17, 18, and 19 were collected at the 7 foot level and analyzed Non Detect, 74, and 42 mg/kg respectively.

On February 7, 1989, a matrix of samples was collected at the 7 foot level which indicated persistent contamination, except in the southern border of the excavation. A test excavation of a small area of the pit to the 10 foot level analyzed high (6511 mg/kg) concentrations of PCP. However, excavating the entire pit to the 10 foot level and taking samples CA-35, 36, 37, 38, and 39 showed that contamination was decreasing - all measured Non Detect. Samples taken from depths of 17 feet (CA-42, 43, and 44), 6 feet (CA-45), 12 feet (CA-46), and 15 feet (CA-47) tested 258 mg/kg, Non Detect, 114 mg/kg, Non Detect, Non Detect, and Non Detect, respectively.

These deeper samples (in excess of 13 feet) were below the water table and showed that some contamination may exist in that region. Primarily due to practical considerations of the difficulty of excavating soil below the water table, no excavation was attempted below the water table and vertical excavation was halted.

To verify that horizontal excavation was sufficient, side wall samples were taken in the pit. These were samples CA-54 through CA-74. These samples were taken in the northwest corner of the pit, and south wall and the east wall. No samples were taken near the warehouse because the presence of contaminated soil under the warehouse had been confirmed, but excavation in that direction had been halted in order to avoid structural damage to the building. It is worth pointing out that contaminated soils beneath the warehouse are effectively shielded (capped) from surface water and rain, and the potential for migration of these contaminants is reduced significantly.

All samples taken in the northwest corner (CA-54 through 59) analyzed Non Detect, showing that the limits of contamination in that direction had been reached.

Samples on the east wall tested 78 mg/kg, 3 mg/kg, and Non Detect for samples taken approximately 15, 30, and 45 feet from the warehouse. Excavation in this direction was halted due to the presence of the warehouse, and the concrete retaining wall.

On the south wall, concentrations of 220, 1006, 304, 0, and 289 mg/kg PCP existed in samples CA-60, 61, 62, 63, and 64, respectively. Excavation in this direction was halted primarily due to fear of causing a collapse of Tank 38009, but also due to the concrete retaining wall.

Sampling and analysis indicated that all contaminated material had been removed that would not adversely impact buildings and facilities. For that reason, excavation was halted and backfill with clean soil from another location on site was initiated.

DESCRIPTION OF SAMPLES TAKEN DURING SOIL EXCAVATION

Samples 1 through 6 were surface samples taken on January 10, 1989, around tanks 38009, 5006, and 10002 to the south of the PCP Mixing Area. Tank 38009, at various times, was used for storing PCP solutions. Only samples 1, 2, and 3 contained measureable amounts of PCP (2424, 14.2, and 4.9 mg/kg respectively).

Samples ST-A-1, B-1, C-1, D-1 and TR-A-1, B-1, C-1, D-1 were collected on January 11 to verify soil contamination prior to laying down the tarp which lined the bermed areas. All samples were surface samples and analyzed Non Detect for PCP.

On January 11, 1989 samples were taken from under the PCP Warehouse. These are samples numbered 1-A and 1-B. They were taken at the surface of the soil, but excavated laterally 1 foot under the warehouse. Sample 1-A was Non Detect, and 1-B measured 1882 mg/kg.

On January 16, 1991, in an effort to more clearly define the extent of contamination surrounding Tank 38009, three more surface samples were taken, sample numbers 7, 8, and 9. These samples all analyzed Non Detect for PCP.

On January 19, 1989 excavation of the contaminated soil began. Samples CA-1, 2, and 3 were also collected at that time. CA-1 and 2 were collected to the northwest of the PCP Mixing Area at depths of 1 foot and 3.5 feet respectively, while CA-3 was taken at a depth of 3.5 feet from under the approximate location of the bulkhead which formed the western border of the PCP Mixing Area. These samples contained significant PCP concentrations - 145 mg/kg, Non Detect, and 415 mg/kg for CA-1, 2, and 3 respectively.

Samples CA-4 and 5 were taken on January 22 at a depth of 3 feet from the east end of the contaminated area. Sample 4 contained 190 mg/kg PCP, while CA-5 did not contain detectable amounts.

On January 25 sample CA-8 was collected from the western perimeter of the contaminated area at a depth of 4 feet, and samples CA-9 and 10 were taken from the surface in the northwest corner. CA-8 contained no detectable concentrations of PCP; and when viewed in combination with the analysis of samples CA-2 and ST-B-1, which were also Non Detect, the beginning of a western limit on the area of contamination is apparent. CA-9 contained 3459 mg/kg of PCP and CA-10 was also non detect.

By this time the contaminated soil had been excavated to a depth of 4 feet throughout the area of contamination. An OVA Meter (Organic Vapor Analyzer) was used to measure any vapors given off by the soil at this level. Meter readings indicated that vapors with concentrations from 2 to 50 ppm were being emitted by the soil. This information is shown in Appendix I, Figure 2.

On January 28 the excavation had reached a depth of 7 feet. Samples CA-11, 12, 13, and

CA-70	7' Deep	2
CA-71	9.5' Deep	ND
CA-72	9' Deep	ND
CA-73	9' Deep	3
CA-74	9' Deep	78

CA-38	8' Deep	ND
CA-39	8' Deep	ND
CA-40	15' Deep	ND
CA-41	14' Deep	143
CA-42	17' Deep	258
CA-43	17' Deep	ND
CA-44	17' Deep	114
CA-45	6' Deep	ND
CA-46	12' Deep	ND
CA-47	15' Deep	ND

Excavation Side Wall

CA-54	2' Deep	ND
CA-55	5' Deep	ND
CA-56	8' Deep	ND
CA-57	2' Deep	ND
CA-58	5' Deep	ND
CA-59	6' Deep	ND
CA-60	4' Deep	220
CA-61	7' Deep	1006
CA-62	9.5' Deep	304
CA-63	4' Deep	ND
CA-64	7' Deep	289
CA-65	9.5' Deep	ND
CA-66	4' Deep	6
CA-67	7' Deep	3
CA-68	9.5' Deep	2
CA-69	4' Deep	ND

CA-9	Surface Sample	187
CA-10	Surface Sample	ND
CA-11	7' Deep	828
CA-12	7' Deep	2693
CA-13	7' Deep	6
CA-14	7' Deep	15
CA-15	7' Deep	68
CA-16	7' Deep	ND
CA-17	4' Deep	ND
CA-18	4' Deep	74
CA-19	7' Deep	42
CA-20	7' Deep	670
CA-21	7' Deep	480
CA-22	7' Deep	196
CA-23	7' Deep	ND
CA-24	7' Deep	107
CA-25	7' Deep	1027
CA-26	7' Deep	186
CA-27	7' Deep	374
CA-28	7' Deep	418
CA-29	7' Deep	243
CA-30	7' Deep	293
CA-31	7' Deep	64
CA-32	7' Deep	305
CA-33	7' Deep	ND
CA-34	10' Deep	6511
CA-35	10' Deep	ND
CA-36	10' Deep	ND
CA-37	3' Deep	ND

TOLS004072

ECOVA

a:1067A/TIMEODEQ.P2:dc

32319

BZTO104(e)040893

TABLE 1, APPENDIX I

SAMPLE NUMBER	DEPTH	PENTACHLOROPHENOL CONCENTRATION (parts per million)
1	Surface Sample	2424
2	Surface Sample	14.2
3	Surface Sample	4.9
4	Surface Sample	ND
5	Surface Sample	ND
6	Surface Sample	ND
7	Surface Sample	ND
8	Surface Sample	ND
9	Surface Sample	ND
ST-A-1	Surface Sample	ND
ST-B-1	Surface Sample	ND
ST-C-1	Surface Sample	ND
ST-D-1	Surface Sample	ND
TR-A-1	Surface Sample	ND
TR-B-1	Surface Sample	ND
TR-C-1	Surface Sample	ND
TR-D-1	Surface Sample	ND
1-A	Surface Under Warehouse	ND
1-B	Surface-Under Warehouse	1882
CA-1	1' Deep	145
CA-2	3.5' Deep	ND
CA-3	3.5' Deep	415
CA-4	3' Deep	190
CA-5	3' Deep	ND
CA-8	4' Deep	ND

ECOVA

a:1067A/TIMEODEQ.P2:dc

32319

TOLS004073

BZTO104(e)040894

Initial Calibration Data
HSL Compounds

No: Instrument ID: GC/MS D

L ractor: ECDVA Calibration Date: 10/09/89

Contract No:

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % RSD for CCC is 30.%

	Laboratory ID:	>BF496 RF 20.00	>BF495 RF 50.00	>BF497 RF 80.00	>BF498 RF 120.00	>BF499 RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC	SPCC
C550	2-Fluorophenol	1.38807	1.36030	1.34151	1.26887	1.21069	.763	1.31389	5.527		
C545	Phenol-d5	1.55405	1.59039	1.53236	1.43107	1.37433	.936	1.49644	6.035		
C315	Phenol	2.07490	1.99375	1.82141	1.62292	1.53842	.939	1.81028	12.742	*	
C325	bis(2-Chloroethyl)ether	1.67564	1.62339	1.59300	1.51230	1.48333	.952	1.57753	5.021		
C330	2-Chlorophenol	1.45416	1.52100	1.47090	1.41473	1.35407	.965	1.44297	4.341		
C335	1,3-Dichlorobenzene	1.55356	1.54245	1.48609	1.40642	1.31176	.994	1.46005	6.941		
C340	1,4-Dichlorobenzene	1.56870	1.57729	1.52529	1.36260	1.28648	1.003	1.46406	8.996	*	
C345	Benzyl alcohol	.81822	.96313	.92428	.90607	.91662	1.029	.90566	5.899		
C350	1,2-Dichlorobenzene	1.55089	1.55264	1.48088	1.37163	1.30236	1.048	1.45168	7.670		
C355	2-Methylphenol	1.37305	1.35367	1.32508	1.22971	1.18969	1.054	1.29424	6.204		
C360	bis(2chloroisopropyl)eth	2.82089	2.82858	2.68072	2.54446	2.39804	1.060	2.65454	6.968		
C365	4-Methylphenol	1.39835	1.41507	1.34144	1.26623	1.24455	1.082	1.33313	5.732		
	N-Nitroso-di-n-propylami	1.25651	1.28858	1.25388	1.18372	1.15277	1.089	1.22709	4.604		**
L	Hexachloroethane	.78769	.79148	.73287	.66978	.63592	1.104	.72353	9.624		
L	Nitrobenzene-d5	.42005	.42461	.41358	.39813	.39069	.885	.40941	3.538		
C410	Nitrobenzene	.40934	.39598	.38388	.35749	.34512	.888	.37836	7.044		
C415	Isophorone	.81843	.80638	.79424	.77914	.78785	.927	.79719	1.939		
C420	2-Nitrophenol	.21338	.22372	.23434	.22908	.22608	.939	.22538	3.447	*	
C425	2,4-Dimethylphenol	.36435	.36759	.36125	.35104	.35118	.945	.35987	2.127		
C430	Benzoic acid	-	.15226	.21571	.23386	.21222	.968	.20351	17.423		
C435	bis(2-Chloroethoxy)metha	.52502	.50581	.48406	.45838	.45282	.968	.48498	6.356		
C440	2,4-Dichlorophenol	.30737	.32288	.32348	.31285	.30874	.978	.31506	2.438	*	
C445	1,2,4-Trichlorobenzene	.36212	.35068	.34828	.32752	.31508	.993	.34872	5.578		
C450	Naphthalene	1.14199	1.18428	1.08772	.92685	.88945	1.004	1.01406	18.766		
C455	4-Chloroaniline	.43065	.44716	.43674	.41452	.40538	1.012	.42689	3.951		
C460	Hexachlorobutadiene	.21978	.22648	.19053	.18178	.16959	1.034	.19128	8.583	*	
C465	4-Chloro-3-methylphenol	.37988	.33661	.33576	.32412	.31697	1.091	.33867	2.934	*	
C470	2-Methylnaphthalene	.61641	.59347	.55106	.51915	.49988	1.117	.55598	8.889		
CS25	2-Fluorobiphenyl	1.31476	1.25858	1.16972	1.06114	.98639	.912	1.15611	11.561		
C555	2,4,6-Tribromophenol	.25926	.27923	.30872	.29476	.27944	1.101	.28428	6.538		

RF - Response Factor (Subscript is amount in UG/mL)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

- Percent Relative Standard Deviation

L.. - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

TOLS004074

32319

Initial Calibration Data
HSL Compounds

No: Instrument ID: GC/MS D

.ractor: ECOVA Calibration Date: 10/09/89

Contract No:

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % RSD for CCC is 30.%

	Laboratory ID:	>BF496	>BF495	>BF497	>BF498	>BF499					
	Compound	RF 20.00	RF 50.00	RF 80.00	RF 120.00	RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC	SPCC
C510	Hexachlorocyclopentadien	.37366	.40457	.38865	.36650	.34554	.893	.37579	5.949		**
C515	2,4,6-Trichlorophenol	.36939	.38903	.38257	.37376	.37157	.902	.37726	2.191	*	
C520	2,4,5-Trichlorophenol	-	.41037	.40194	.39067	.33346	.907	.38411	9.038		
C525	2-Chloronaphthalene	1.13949	1.11349	1.05047	.96261	.91838	.926	1.03689	9.167		
C530	2-Nitroaniline	-	.36872	.36593	.35370	.35311	.940	.36036	2.253		
C535	Dimethylphthalate	1.38689	1.40916	1.39107	1.31829	1.26555	.967	1.35419	4.461		
C540	Acenaphthylene	2.02009	1.93463	1.85151	1.71410	1.61950	.980	1.82797	8.875		
C545	3-Nitroaniline	-	.23690	.35358	.35160	.34974	.993	.32295	17.771		
C550	Acenaphthene	1.28043	1.22160	1.12436	1.01558	.94877	1.004	1.11813	12.352	*	
C555	2,4-Dinitrophenol	-	.13125	.15657	.16152	.16241	1.006	.15294	9.601		**
C560	4-Nitrophenol	-	.13514	.14979	.15258	.14979	1.013	.14683	5.382		**
C565	Dibenzofuran	1.59843	1.54776	1.43512	1.33354	1.22925	1.025	1.42882	10.606		
	2,4-Dinitrotoluene	.38889	.42298	.41308	.37848	.36245	1.025	.39314	6.388		
C[illegible]	2,6-Dinitrotoluene	.31807	.33537	.35739	.34128	.33421	.975	.33726	4.200		
	Diethylphthalate	1.50058	1.49542	1.49747	1.39158	1.33999	1.058	1.44498	5.163		
C585	4-Chlorophenyl-phenyleth	.67737	.66096	.59417	.52797	.48096	1.067	.58828	14.325		
C590	Fluorene	1.38197	1.34764	1.18728	1.03899	.94323	1.069	1.17981	16.132		
C595	4-Nitroaniline	-	.23849	.30698	.31008	.30288	1.073	.28955	11.799		
C610	4,6-Dinitro-2-methylphen	-	.14089	.16491	.16198	.15888	.987	.15643	6.862		
C615	N-Nitrosodiphenylamine	.49291	.49689	.47517	.44437	.41258	.918	.46422	7.631	*	
C625	4-Bromophenyl-phenylether	.23459	.23314	.22277	.21185	.20063	.958	.22059	6.543		
C630	Hexachlorobenzene	.31465	.29428	.29274	.26967	.25718	.968	.28569	7.897		
C635	Pentachlorophenol	-	.17724	.18396	.17838	.18212	.985	.18048	1.753	*	
C640	Phenanthrene	1.09778	1.08942	1.08815	.92245	.90838	1.003	1.00528	8.884		
C645	Anthracene	1.09686	1.18835	1.81687	.91945	.84269	1.088	.99524	11.338		
C650	Di-n-butylphthalate	1.42[illegible]	1.44[illegible]	1.31642	1.18145	1.12628	1.064	1.29896	10.978		
C655	Fluoranthene	1.17[illegible]	1.28[illegible]	1.11829	1.00898	.97418	1.133	1.09769	9.382	*	
C330	Terphenyl-d14	1.28[illegible]	1.28[illegible]	1.35717	1.35546	1.35884	.984	1.32611	3.248		
C715	Pyrene	1.77536	1.87693	1.92836	1.92378	1.97586	.893	1.89524	4.025		
C720	Butylbenzylphthalate	.77461	.88843	.90293	.89824	.91387	.945	.87562	6.533		

RF - Response Factor (Subscript is amount in UG/mL)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

. - Percent Relative Standard Deviation

L__ - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

32319

TOLS004075

BZTO104(e)040896

Initial Calibration Data
HSL Compounds

'a: Instrument ID: GC/MS D

·actor: ECDUA Calibration Date: 10/09/89

Contract No:

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % RSD for CCC is 30.%

	Laboratory ID:	>BF496	>BF495	>BF497	>BF498	>BF499					
	Compound	RF 20.00	RF 50.00	RF 80.00	RF 120.00	RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC	SPCC
725	3,3'-Dichlorobenzidine	.22079	.21663	.31817	.39555	.48755	.993	.32774	35.456		
730	Benzo(a)anthracene	1.24780	1.43224	1.47543	1.47364	1.47460	.998	1.42074	6.926		
735	bis(2-Ethylhexyl)phthala	1.00826	1.10600	1.04792	.99152	.92193	1.000	1.01512	6.722		
740	Chrysene	1.18438	1.31092	1.34028	1.36890	1.30584	1.003	1.30206	5.413		
760	Di-n-octylphthalate	1.56262	1.74400	1.78551	1.67380	1.59773	.891	1.67273	5.636	*	
765	Benzo(b)fluoranthene	1.24883	1.34411	1.53032	1.52280	1.52883	.946	1.43498	9.121		
770	Benzo(k)fluoranthene	1.17724	1.22387	1.14791	.95629	.96584	.949	1.09423	11.386		
775	Benzo(a)pyrene	1.09246	1.17875	1.25848	1.19438	1.18731	.992	1.18228	5.014	*	
780	Indeno(1,2,3-cd)pyrene	1.01461	1.12567	1.27507	1.23814	1.23748	1.208	1.17818	9.102		
785	Dibenzo(a,h)anthracene	.79223	.88558	.96469	.96148	.96219	1.212	.91322	8.264		
790	Benzo(g,h,i)perylene	.85572	.94563	1.05765	1.01671	1.02263	1.271	.97967	8.281		

F - Response Factor (Subscript is amount in UG/mL)

$\overline{RT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{F}$ - Average Response Factor

. Percent Relative Standard Deviation

. - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

32319

TOLS004076

BZTO104(e)040897

Continuing Calibration Check
HSL Compounds

: No: | Calibration Date: 10/10/89

.ractor: ECOVA | Time: 08:26

Contract No: | Laboratory ID: >BF515

Instrument ID: GC/MS D | Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 | Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
3350	2-Fluorophenol	1.31389	1.34677	2.50		
3545	Phenol-d5	1.49644	1.50453	.54		
3315	Phenol	1.81028	1.90375	5.16	*	
3325	bis(2-Chloroethyl)ether	1.57753	1.54023	2.36		
3330	2-Chlorophenol	1.44297	1.47968	2.54		
3335	1,3-Dichlorobenzene	1.46005	1.54139	5.57		
3340	1,4-Dichlorobenzene	1.46406	1.52322	4.04	*	
3345	Benzyl alcohol	.90566	.89876	.76		
3350	1,2-Dichlorobenzene	1.45168	1.51414	4.30		
3355	2-Methylphenol	1.29424	1.24989	3.43		
3360	bis(2chloroisopropyl)eth	2.65454	2.54987	3.94		
3365	4-Methylphenol	1.33313	1.35746	1.83		
	N-Nitroso-di-n-propylami	1.22709	1.19636	2.50		**
	Hexachloroethane	.72353	.73934	2.18		
	Nitrobenzene-d5	.40941	.40950	.02		
3410	Nitrobenzene	.37836	.38423	1.55		
3415	Isophorone	.79719	.72207	9.42		
3420	2-Nitrophenol	.22530	.23290	3.37	*	
3425	2,4-Dimethylphenol	.35907	.35375	1.48		
3430	Benzoic acid	.20351	.19338	4.98		
3435	bis(2-Chloroethoxy)metha	.48498	.48056	.89		
3440	2,4-Dichlorophenol	.31506	.32779	4.04	*	
3445	1,2,4-Trichlorobenzene	.34872	.36027	5.74		
3450	Naphthalene	1.01406	1.06679	5.20		
3455	4-Chloroaniline	.42689	.44716	4.75		
3460	Hexachlorobutadiene	.19128	.20978	7.59	*	
3465	4-Chloro-3-methylphenol	.33867	.32531	1.62	*	
3470	2-Methylnaphthalene	.75598	.61517	18.65		
3525	2-Fluorobiphenyl	1.15611	1.32639	14.73		
3555	2,4,6-Tribromophenol	.28428	.26572	6.53		
3510	Hexachlorocyclopentadien	.37579	.40119	6.76		**
3515	2,4,6-Trichlorophenol	.37726	.41088	8.89	*	

RF - Response Factor from daily standard file at 50.00 UG/mL

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

- % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

TOLS004077

22319

BZTO104(e)040898

Continuing Calibration Check
HSL Compounds

No: | Calibration Date: 10/10/89

Contractor: ECDVA | Time: 08:26

Contract No: | Laboratory ID: >BF515

Instrument ID: GC/MS D | Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 | Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
C520	2,4,5-Trichlorophenol	.38411	.43988	14.52		
C525	2-Chloronaphthalene	1.03689	1.13430	9.39		
C530	2-Nitroaniline	.36036	.36067	.09		
C535	Dimethylphthalate	1.35419	1.38432	2.23		
C540	Acenaphthylene	1.82797	2.04699	11.98		
C545	3-Nitroaniline	.32295	.36020	11.53		
C550	Acenaphthene	1.11813	1.23989	10.89	*	
C555	2,4-Dinitrophenol	.15294	.16238	6.17		**
C560	4-Nitrophenol	.14683	.14381	2.05		**
C565	Dibenzofuran	1.42882	1.59225	11.44		
C570	2,4-Dinitrotoluene	.39314	.41490	5.53		
C543	2,6-Dinitrotoluene	.33726	.34265	1.60		
	Diethylphthalate	1.44498	1.47618	2.16		
	4-Chlorophenyl-phenyleth	.58828	.65345	11.08		
C	Fluorene	1.17981	1.29367	9.65		
C595	4-Nitroaniline	.28955	.33510	15.73		
C610	4,6-Dinitro-2-methylphen	.15643	.14715	5.93		
C615	N-Nitrosodiphenylamine	.46422	.50401	8.57	*	
C625	4-Bromophenyl-phenylether	.22059	.23113	4.77		
C630	Hexachlorobenzene	.28569	.28854	1.00		
C635	Pentachlorophenol	.18040	.15933	11.68	*	
C640	Phenanthrene	1.00528	1.07526	6.97		
C645	Anthracene	.99524	1.06883	7.39		
C650	Di-n-butylphthalate	1.29896	1.32264	1.82		
C655	Fluoranthene	1.09769	1.14282	4.11	*	
CS30	Terphenyl-d14	1.32611	1.34282	1.58		
C715	Pyrene	[illegible]	1.87682	.97		
C720	Butylbenzylphthalate	[illegible]	.83631	4.49		
C725	3,3'-Dichlorobenzidine	[illegible]	.54854	67.37		
C730	Benzo(a)anthracene	[illegible]	1.42451	.26		
C735	bis(2-Ethylhexyl)phthal	1.81512	1.82753	1.22		
C740	Chrysene	1.30206	1.34556	3.34		

RF - Response Factor from daily standard file at 50.00 UG/mL

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

% Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

32319

TOLS004078

BZTO104(e)040899

Continuing Calibration Check
HSL Compounds

No: Calibration Date: 10/10/89

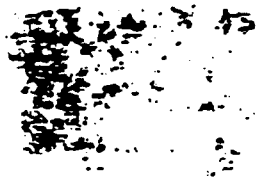
.ractor: ECOVA Time: 08:26

ontract No: Laboratory ID: >8F515

nstrument ID: GC/MS D Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
760	Di-n-octylphthalate	1.67273	1.69816	1.52	*	
765	Benzo(b)fluoranthene	1.43498	1.44988	1.04		
770	Benzo(k)fluoranthene	1.09423	1.14627	4.76		
775	Benzo(a)pyrene	1.18228	1.21397	2.68	*	
780	Indeno(1,2,3-cd)pyrene	1.17818	1.26094	7.02		
785	Dibenzo(a,h)anthracene	.91322	.99610	9.08		
790	Benzo(g,h,i)perylene	.97967	1.05029	7.21		



RF - Response Factor from daily standard file at 50.00 UG/mL

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

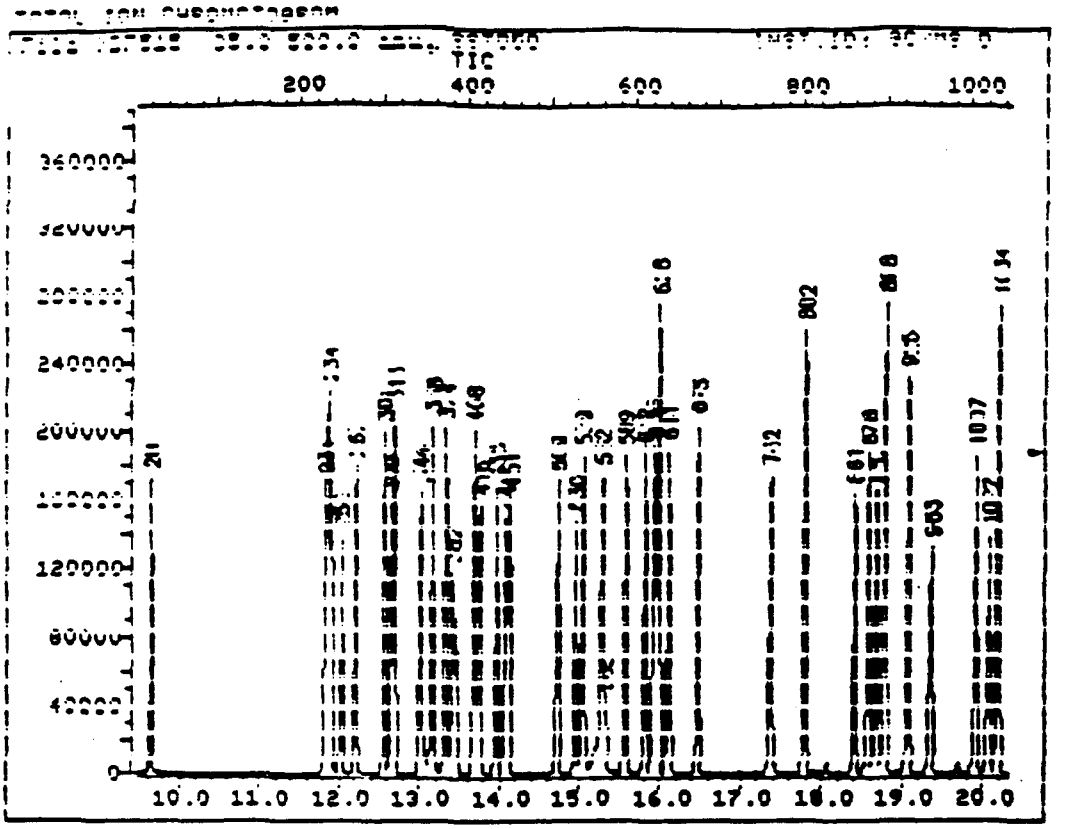
- % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

TOLS004079

32319

BZTO104(e)040900



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Misc: INST.ID: GC/MS D BTL # 1

Id File: ID:EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891109 14:16

Operator ID: SHERRI
Quant Time: 891010 09:22
Injected at: 891010 08:26

TIC page 1 of [redacted]

TOLS004080

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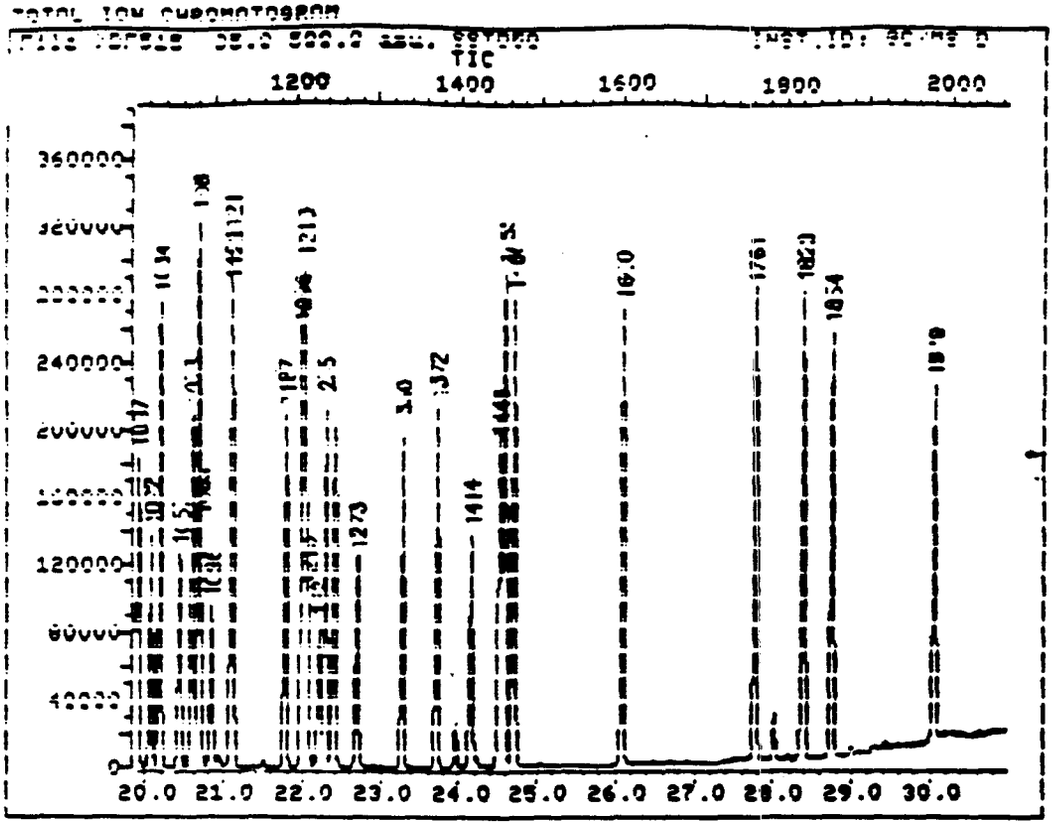
BZTO104(e)040901



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Misc: INST.ID: GC/MS D BTL# 1

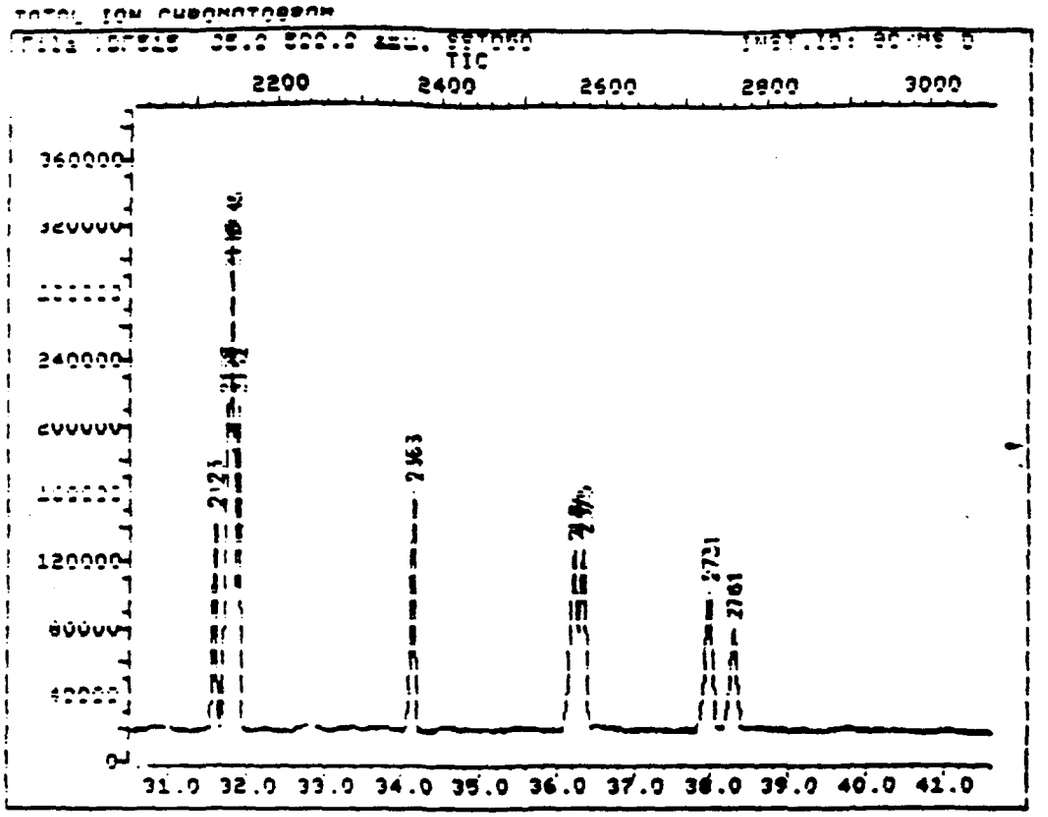
Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891109 14:16

Operator ID: SHERRI
Quant Time: 891010 09:22
Injected at: 891010 08:26

TIC page 2

TOLS004081

32319



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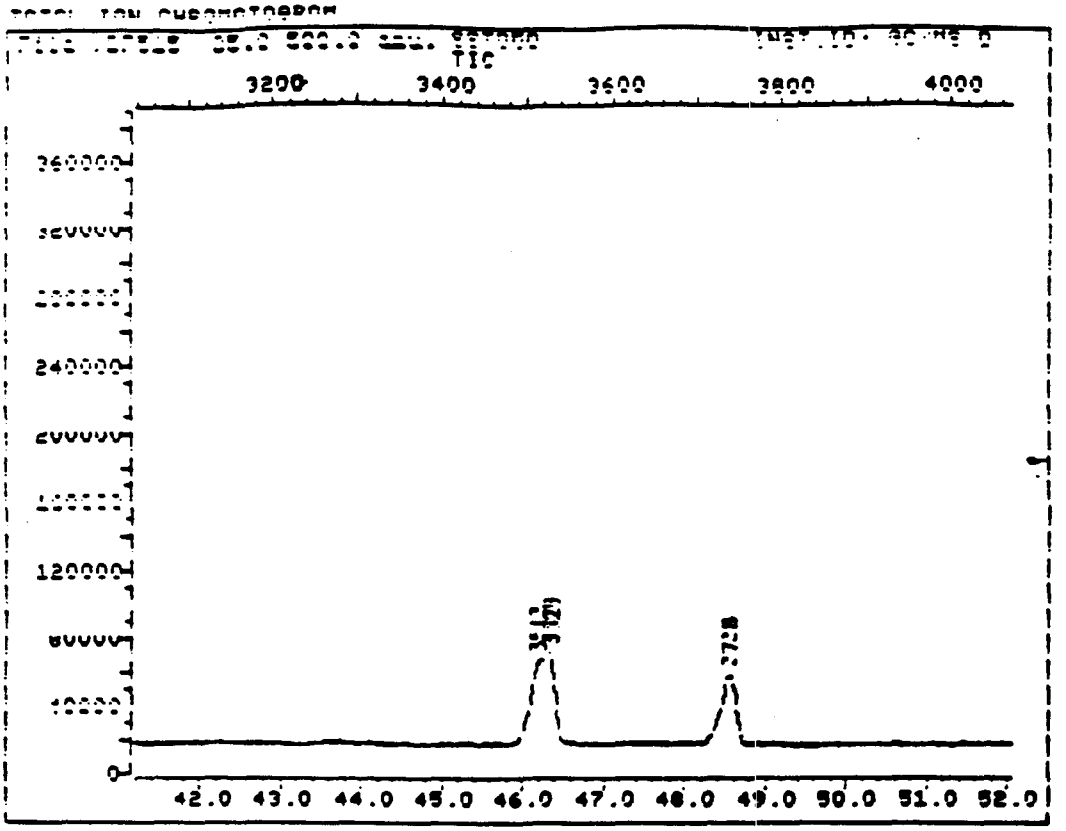
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891109 14:16

Operator ID: SHERRI
Quant Time: 891010 09:22
Injected at: 891010 08:26

TIC page 3

TOLS004082

32319



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Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::RM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891109 14:16

Operator ID: SHERRI
Quant Time: 891010 09:22
Injected at: 891010 08:26

TIC page 4 of [redacted]

TOLS004083

32319

QUANT REPORT

erator ID: SHERRI Quant Rev: 6 Quant Time: 891111 09:22
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ata File: >BF515::D1 Dilution Factor: 1.000000
ame: SSTD50
isc: INST. ID: GC/MS D BTL# 1

D File: ID:EPA::HM
itle: DAILY CALIBRATION STANDARD
ast Calibration: 891009 14:16

		Compound	R.T.	Scan#	Area	Conc	Units	Q
1)	*C130	1,4-Dichlorobenzene-d4	12.65	309	53699	40.00	UG/mL	95
2)	C550	2-Fluorophenol	9.64	20	911410	51.52	UG/mL	83
3)	C545	Phenol-d5	11.84	231	100990	47.94	UG/mL	94
4)	C515	Phenol	11.87	234	12787	48.63	UG/mL	97
5)	C325	bis(2-Chloroethyl)ether	12.03	250	103386	47.34	UG/mL	96
6)	C330	2-Chlorophenol	12.21	267	99322	51.05	UG/mL	89
7)	C335	1,3-Dichlorobenzene	12.57	301	103464	50.51	UG/mL	99
8)	C340	1,4-Dichlorobenzene	12.69	313	102744	49.71	UG/mL	98
9)	C345	Benzyl alcohol	13.01	344	60328	49.58	UG/mL	86
10)	C350	1,2-Dichlorobenzene	13.16	358	101695	49.58	UG/mL	99
11)	C355	2-Methylphenol	13.33	374	83897	46.48	UG/mL	97
12)	C360	bis(2chloroisopropyl)eth	13.41	382	171157	46.70	UG/mL	95
	C365	4-Methylphenol	13.68	408	91118	48.52	UG/mL	91
14)	C370	N-Nitroso-di-n-propylami	13.76	416	80914	46.97	UG/mL	91
15)	C375	Hexachloroethane	13.96	435	49627	48.71	UG/mL	95
16)	*C140	Naphthalene-d8	15.92	623	214485	40.00	UG/mL	85
17)	CS20	Nitrobenzene-d5	14.08	446	111326	47.65	UG/mL	91
18)	C410	Nitrobenzene	14.13	451	104496	47.96	UG/mL	96
19)	C415	Isophorone	14.73	509	196300	45.01	UG/mL	94
20)	C420	2-Nitrophenol	14.95	530	63315	49.78	UG/mL	88
21)	C425	2,4-Dimethylphenol	15.04	539	96169	47.69	UG/mL	89
22)	C430	Benzoic acid	15.51	585	52971	47.94	UG/mL	80
23)	C435	bis(2-Chloroethoxy)metha	15.28	562	130644	47.80	UG/mL	91
24)	C440	2,4-Dichlorophenol	15.56	589	89112	49.84	UG/mL	87
25)	C445	1,2,4-Trichlorobenzene	15.80	612	97941	51.28	UG/mL	98
26)	C450	Naphthalene	15.97	628	291113	48.19	UG/mL	97
27)	C455	4-Chloroaniline	16.11	641	121563	49.87	UG/mL	90
28)	C460	Hexachlorobutadiene	16.46	675	55924	51.43	UG/mL	97
29)	C465	4-Chloro-3-methylphenol	17.36	762	88438	45.84	UG/mL	75
30)	C470	2-Methylnaphthalene	17.48	802	162757	51.22	UG/mL	94
31)	*C150	Acenaphthene-d10	20.60	1073	133938	40.00	UG/mL	94
32)	C525	2-Fluorobiphenyl	18.78	898	222161	53.90	UG/mL	96
33)	CS55	2,4,6-Tribromophenol	22.69	1273	44487	42.46	UG/mL	74
34)	C510	Hexachlorocyclopentadien	18.39	861	67168	54.23	UG/mL	95
35)	C515	2,4,6-Trichlorophenol	18.57	878	68778	53.87	UG/mL	91
36)	C520	2,4,5-Trichlorophenol	18.67	887	73645	52.17	UG/mL	95
37)	C525	2-Chloronaphthalene	19.06	925	189908	51.03	UG/mL	91
	C530	2-Nitroaniline	19.35	953	61185	47.60	UG/mL	87
	C535	Dimethylphthalate	19.91	1007	231767	49.59	UG/mL	78
40)	C540	Acenaphthylene	20.20	1034	342712	52.18	UG/mL	88
41)	C545	3-Nitroaniline	20.44	1057	60306	53.60	UG/mL	76
42)	C550	Acenaphthene	20.69	1081	207586	51.15	UG/mL	94
43)	C555	2,4-Dinitrophenol	20.71	1083	27186	52.24	UG/mL	70

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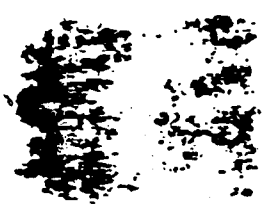
TOLS004084

BZTO104(e)040905

		Compound	R.T.	Scan#	Area	Conc	Units	q
)	C560	4-Nitrophenol	20.84	1096	24077	51.16	UG/mL	[illegible]
45)	C565	Dibenzofuran	21.10	1121	266578	51.53	UG/mL	91
46)	C570	2,4-Dinitrotoluene	21.11	1122	69463	47.11	UG/mL	[illegible]
47)	C543	2,6-Dinitrotoluene	20.07	1022	57368	47.56	UG/mL	75
48)	C580	Diethylphthalate	21.79	1187	247146	48.23	UG/mL	9
49)	C585	4-Chlorophenyl-phenyleth	21.99	1206	109403	48.81	UG/mL	82
50)	C590	Fluorene	22.03	1210	216589	48.24	UG/mL	[illegible]
51)	C595	4-Nitroaniline	22.06	1213	56104	67.05	UG/mL	89
52)	*C160	Phenanthrene-d10	24.51	1448	243355	40.00	UG/mL	[illegible]
53)	C610	4,6-Dinitro-2-methylphen	22.21	1227	44762	48.26	UG/mL	82
54)	C615	N-Nitrosodiphenylamine	22.29	1235	153317	51.21	UG/mL	[illegible]
55)	C625	4-Bromophenyl-phenylether	23.28	1330	70307	51.44	UG/mL	82
56)	C630	Hexachlorobenzene	23.72	1372	82273	48.20	UG/mL	[illegible]
57)	C635	Pentachlorophenol	24.15	1414	48468	45.59	UG/mL	93
58)	C640	Phenanthrene	24.58	1455	327086	51.35	UG/mL	92
59)	C645	Anthracene	24.70	1466	325131	51.36	UG/mL	93
60)	C650	Di-n-butylphthalate	26.09	1600	402339	47.98	UG/mL	83
61)	C655	Fluoranthene	27.77	1761	347640	49.91	UG/mL	98
62)	*C170	Chrysene-d12	31.78	2143	148358	40.00	UG/mL	89
63)	C530	Terphenyl-d14	28.74	1854	249801	50.71	UG/mL	88
64)	C715	Pyrene	28.39	1820	348052	49.40	UG/mL	92
65)	C720	Butylbenzylphthalate	30.05	1979	155091	49.41	UG/mL	89
66)	C725	3,3'-Dichlorobenzidine	31.57	2123	101726	112.26	UG/mL	93
67)	C730	Benzo(a)anthracene	31.73	2138	264171	50.85	UG/mL	88
)	C735	bis(2-Ethylhexyl)phthala	31.80	2145	190553	49.45	UG/mL	9
)	C740	Chrysene	31.88	2152	249531	51.38	UG/mL	85
)	*C175	Perylene-d12	38.29	2761	144746	40.00	UG/mL	91
71)	C760	Di-n-octylphthalate	34.13	2366	307253	49.47	UG/mL	87
72)	C765	Benzo(b)fluoranthene	36.21	2564	262330	52.41	UG/mL	94
73)	C770	Benzo(k)fluoranthene	36.33	2575	207397	44.54	UG/mL	95
74)	C775	Benzo(a)pyrene	37.97	2731	219647	50.72	UG/mL	93
75)	C780	Indeno(1,2,3-cd)pyrene	46.19	3513	228145	55.55	UG/mL	92
76)	C785	Dibenzo(a,h)anthracene	46.35	3528	180227	55.57	UG/mL	93
77)	C790	Benzo(g,h,i)perylene	48.55	3738	190032	56.18	UG/mL	93

* Compound is ISTD



TOLS004085

32319

BZTO104(e)040906

Continuing Calibration Check
HSL Compounds

: Calibration Date: 10/11/89

ractor: ECOVA Time: 08:27

:ract No: Laboratory ID: >BF538

:rument ID: GC/MS D Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 25.%

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
) 2-Fluorophenol	1.31389	1.32001	.47		
; Phenol-d5	1.49644	1.44299	3.57		
; Phenol	1.81028	1.75966	2.80	*	
; bis(2-Chloroethyl)ether	1.57753	1.47045	6.79		
) 2-Chlorophenol	1.44297	1.38217	4.21		
; 1,3-Dichlorobenzene	1.46005	1.55314	6.38		
) 1,4-Dichlorobenzene	1.46406	1.52364	4.07	*	
; Benzyl alcohol	.90566	.85014	6.13		
) 1,2-Dichlorobenzene	1.45168	1.48032	1.97		
; 2-Methylphenol	1.29424	1.21933	5.79		
) bis(2chloroisopropyl)eth	2.65454	2.58753	2.52		
; 4-Methylphenol	1.33313	1.27973	4.01		
N-Nitroso-di-n-propylami	1.22709	1.13836	7.23		**
xachloroethane	.72353	.72231	.17		
Nitrobenzene-d5	.40941	.41803	2.11		
Nitrobenzene	.37836	.39406	4.15		
Isophorone	.79719	.74861	6.09		
2-Nitrophenol	.22530	.23438	4.03	*	
2,4-Dimethylphenol	.35907	.35722	.52		
Benzoic acid	.20351	.17097	15.99		
bis(2-Chloroethoxy)metha	.48490	.47368	2.31		
2,4-Dichlorophenol	.31506	.33428	6.07	*	
1,2,4-Trichlorobenzene	.34072	.37226	9.26		
Naphthalene	1.01406	1.86135	4.66		
4-Chloroaniline	.42689	.44149	3.42		
Hexachlorobutadiene	.19128	.22014	15.14	*	
4-Chloro-3-methylphenol	.33867	.33846	2.36	*	
2-Methylnaphthalene	.59598	.61455	18.53		
2-Fluorobiphenyl	1.15611	1.27125	9.96		
2,4,6-Tribromophenol	.28428	.24422	14.09		
Hexachlorocyclopentadien	.37529	.37597	.05		**
2,4,6-Trichlorophenol	.37726	.40477	7.29	*	

- Response Factor from daily standard file at 50.00 UG/mL

- Average Response Factor from Initial Calibration Form VI

  % Difference from original average or curve

- Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

TOLS004086

32319

BZTO104(e)040907

Continuing Calibration Check
HSL Compounds

· No: | Calibration Date: 10/11/89

ractor: ECDVA | Time: 08:27

ontract No: | Laboratory ID: >BF538

nstrument ID: GC/MS D | Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
520	2,4,5-Trichlorophenol	.38411	.43786	13.99		
525	2-Chloronaphthalene	1.03689	1.12543	8.54		
530	2-Nitroaniline	.36036	.36669	1.76		
535	Dimethylphthalate	1.35419	1.41313	4.35		
540	Acenaphthylene	1.82797	1.99081	8.91		
545	3-Nitroaniline	.32295	.37216	15.24		
550	Acenaphthene	1.11813	1.22826	9.85	*	
555	2,4-Dinitrophenol	.15294	.15830	3.51		**
560	4-Nitrophenol	.14683	.14804	.82		**
565	Dibenzofuran	1.42882	1.56774	9.72		
570	2,4-Dinitrotoluene	.39314	.43998	11.91		
543	2,6-Dinitrotoluene	.33726	.35319	4.72		
	Diethylphthalate	1.44498	1.55870	7.87		
	4-Chlorophenyl-phenyleth	.58828	.63869	8.57		
	Fluorene	1.17981	1.28045	8.53		
595	4-Nitroaniline	.28955	.35406	22.28		
610	4,6-Dinitro-2-methylphen	.15643	.15436	1.32		
615	N-Nitrosodiphenylamine	.46422	.50057	7.83	*	
625	4-Bromophenyl-phenylether	.22059	.22723	3.01		
630	Hexachlorobenzene	.28569	.26857	5.99		
635	Pentachlorophenol	.18040	.15649	13.26	*	
640	Phenanthrene	1.00528	1.08187	7.55		
645	Anthracene	.99524	1.09512	10.04		
650	Di-n-butylphthalate	1.29896	1.39715	7.56		
655	Fluoranthene	1.09769	1.19597	8.95	*	
530	Terphenyl-d14	1.32611	1.38119	1.88		
715	Pyrene	1.89524	1.84038	2.89		
720	Butylbenzylphthalate	.87548	.88698	1.29		
725	3,3'-Dichlorobenzidine	.32774	.34946	6.63		
730	Benzo(a)anthracene	1.42874	1.41365	.50		
735	bis(2-Ethylhexyl)phthala	1.81512	1.89968	8.32		
740	Chrysene	1.30206	1.34327	3.16		

RF - Response Factor from daily standard file at 50.00 UG/mL

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

- % Difference from original average or curve

- Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

32319

TOLS004087

BZTO104(e)040908

Continuing Calibration Check
HSL Compounds

'o: Calibration Date: 10/11/89

ractor: ECOVA Time: 08:27

ontract No: Laboratory ID: >BF538

strument ID: GC/MS D Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
60	Di-n-octylphthalate	1.67273	1.99722	19.40	*	
65	Benzo(b)fluoranthene	1.43498	1.67229	16.54		
70	Benzo(k)fluoranthene	1.09423	1.20303	9.94		
75	Benzo(a)pyrene	1.18228	1.27820	8.11	*	
80	Indeno(1,2,3-cd)pyrene	1.17818	1.21232	2.90		
85	Dibenzo(a,h)anthracene	.91322	.94861	3.88		
90	Benzo(g,h,i)perylene	.97967	.99271	1.33		

- Response Factor from daily standard file at 50.00 UG/mL

- Average Response Factor from Initial Calibration Form VI

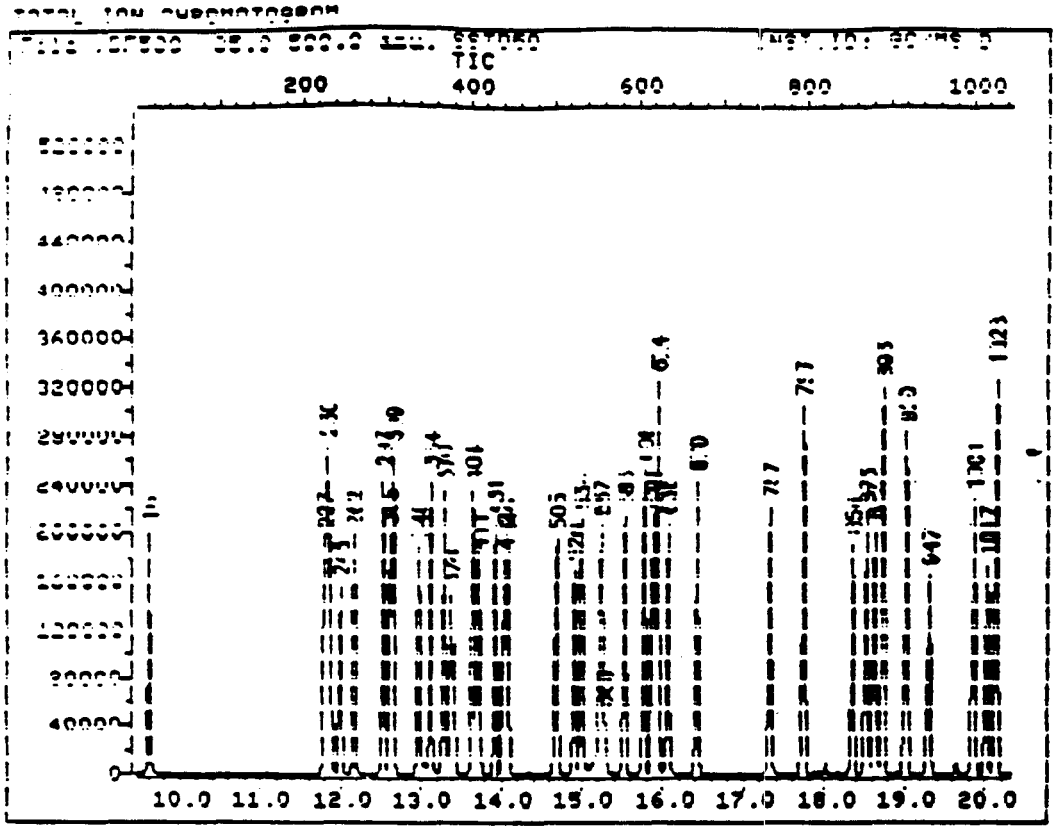
% Difference from original average or curve

- Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

32319

TOLS004088

BZTO104(e)040909



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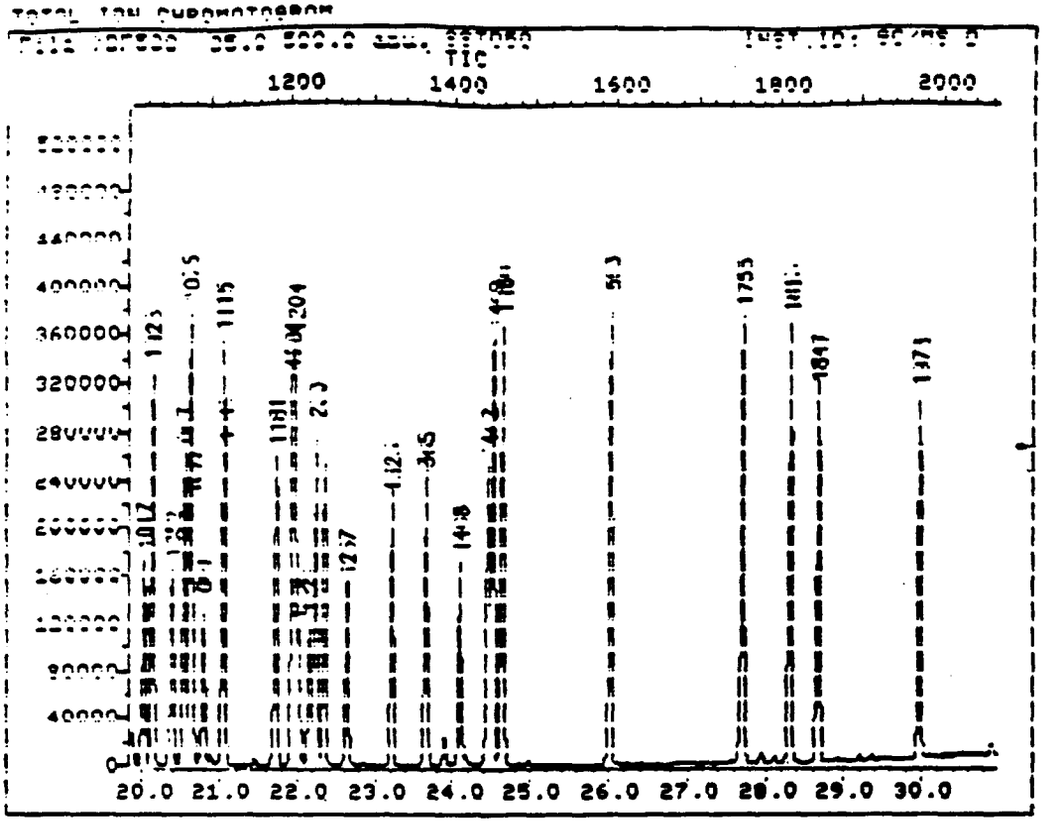
Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

Operator ID: DENNIS
Quant Time: 891011 09:22
Injected at: 891011 08:27

TIC page 1 of 4



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Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

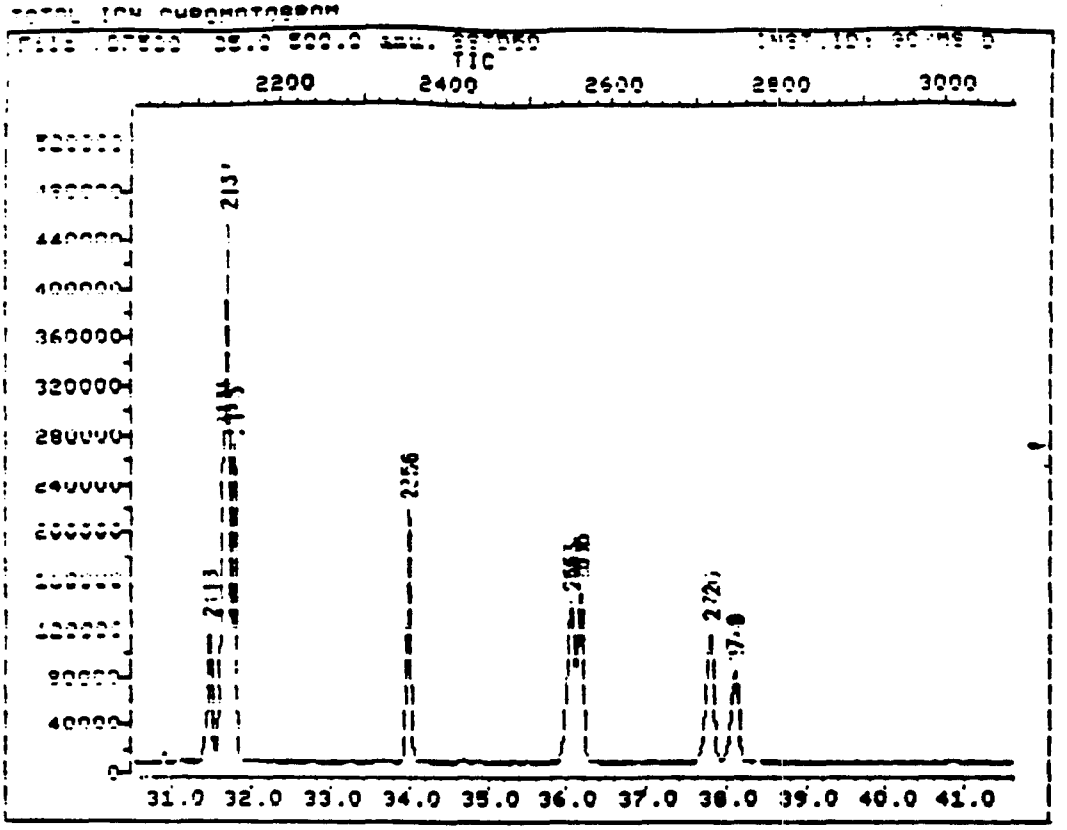
Operator ID: DENNIS
Quant Time: 891011 09:22
Injected at: 891011 08:27

TIC page 2 of 4

TOLS004090

32319

BZTO104(e)040911



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Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

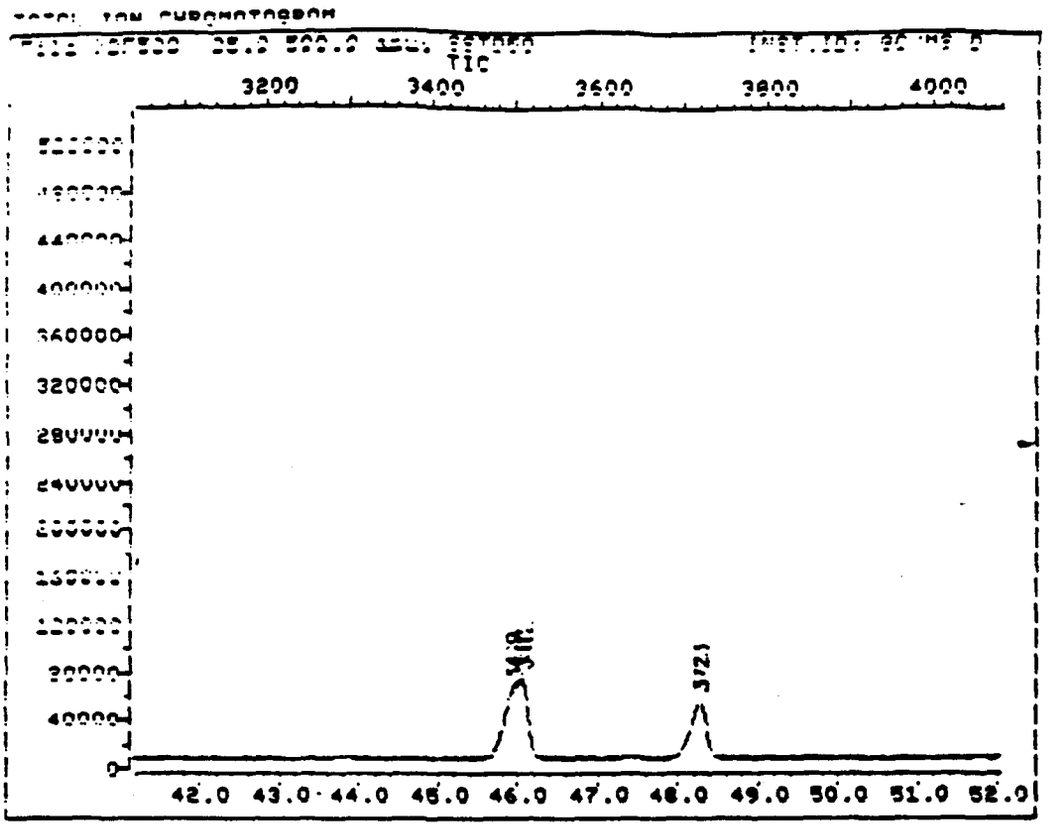
Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

Operator ID: DENNIS
Quant Time: 891011 09:22
Injected at: 891011 08:27

TIC page 3 of 4

32319

TOLS004091



Data File: >BF538::D2 Quant Output File: ^BF538::QT
Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

Operator ID: DENNIS
Quant Time: 891011 09:22
Injected at: 891011 08:27

TIC page 4 of [redacted]

TOLS004092

32319

BZTO104(e)040913

QUANT REPORT

erator ID: DENNIS Quant Rev: 6 Quant Time: 891111 09:2?
utput File: ^BF538::QT Injected at: 891011 08:27
Data File: >BF538::D2 Dilution Factor: 1.0000000
Name: SSTD50
Misc: INST.ID: GC/MS D BIL# 1

ID File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

		Compound	R.T.	Scan#	Area	Conc	Units	q
1)	*C130	1,4-Dichlorobenzene-d4	12.61	305	66277	40.00	UG/mL	94
2)	CS50	2-Fluorophenol	9.61	16	109?58	49.01	UG/mL	81
3)	CS45	Phenol-d5	11.80	227	119546	47.95	UG/mL	94
4)	C515	Phenol	11.83	230	145?81	46.22	UG/mL	99
5)	C325	bis(2-Chloroethyl)ether	12.00	246	121821	47.73	UG/mL	96
6)	C330	2-Chlorophenol	12.17	262	114518	46.71	UG/mL	91
7)	C335	1,3-Dichlorobenzene	12.53	297	128672	50.38	UG/mL	98
8)	C340	1,4-Dichlorobenzene	12.66	309	126228	50.01	UG/mL	99
9)	C345	Benzyl alcohol	12.98	340	70431	47.30	UG/mL	86
10)	C350	1,2-Dichlorobenzene	13.12	354	122659	48.88	UG/mL	9?
11)	C355	2-Methylphenol	13.29	370	101017	48.78	UG/mL	96
?)	C360	bis(2chloroisopropyl)eth	13.37	378	214?67	50.74	UG/mL	9?
	C365	4-Methylphenol	13.64	404	106021	47.14	UG/mL	9.
)	C370	N-Nitroso-di-n-propylami	13.72	411	94?09	47.58	UG/mL	8H
)	C375	Hexachloroethane	13.93	431	59841	48.85	UG/mL	95
16)	*C140	Naphthalene-d8	15.87	618	255?62	40.00	UG/mL	84
17)	CS20	Nitrobenzene-d5	14.04	442	133437	51.04	UG/mL	91
18)	C410	Nitrobenzene	14.08	446	125?86	51.28	UG/mL	9?
19)	C415	Isophorone	14.69	505	238958	51.84	UG/mL	93
20)	C420	2-Nitrophenol	14.91	526	74H16	50.52	UG/mL	9?
21)	C425	2,4-Dimethylphenol	15.00	534	114025	50.49	UG/mL	91
?2)	C430	Benzoic acid	15.27	560	54575	44.21	UG/mL	9?
23)	C435	bis(2-Chloroethoxy)metha	15.24	557	151200	49.28	UG/mL	95
24)	C440	2,4-Dichlorophenol	15.53	585	106678	50.98	UG/mL	81
25)	C445	1,2,4-Trichlorobenzene	15.77	608	118825	51.66	UG/mL	98
26)	C450	Naphthalene	15.93	624	338?H6	49.?5	UG/mL	9?
27)	C455	4-Chloroaniline	16.06	636	140925	49.37	UG/mL	89
28)	C460	Hexachlorobutadiene	16.41	670	70269	53.51	UG/mL	9?
29)	C465	4-Chloro-3-methylphenol	17.32	757	108038	52.02	UG/mL	74
30)	C470	2-Methylnaphthalene	17.73	797	196166	49.95	UG/mL	94
31)	*C150	Acenaphthene-d10	20.55	1067	165494	40.00	UG/mL	98
32)	CS25	2-Fluorobiphenyl	18.73	893	262980	47.92	UG/mL	9?
33)	CS55	2,4,6-Tribromophenol	22.63	1267	50522	45.96	UG/mL	71
34)	C510	Hexachlorocyclopentadien	18.55	856	77777	46.86	UG/mL	96
35)	C515	2,4,6-Trichlorophenol	18.52	873	83734	49.27	UG/mL	96
36)	C520	2,4,5-Trichlorophenol	18.62	882	90579	49.77	UG/mL	9?
37)	C525	2-Chloronaphthalene	19.02	920	232814	49.61	UG/mL	92
	C530	2-Nitroaniline	19.30	947	75857	50.83	UG/mL	8?
?)	C535	Dimethylphthalate	19.86	1001	292331	51.04	UG/mL	76
)	C540	Acenaphthylene	20.14	1028	411833	48.63	UG/mL	8?
41)	C545	3-Nitroaniline	20.39	1052	76988	51.66	UG/mL	75
42)	C550	Acenaphthene	20.63	1075	254?H8	49.53	UG/mL	9?
43)	C555	2,4-Dinitrophenol	20.65	1077	32747	48.74	UG/mL	71

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TOLS004093

BZTO104(e)040914

		Compound	R.T.	Scan#	Area	Conc	Units	Q
	C560	4-Nitrophenol	20.80	1191	318624	51.47	UG/mL	88
45)	C565	Dibenzofuran	21.05	1115	324514	49.23	UG/mL	91
46)	C570	2,4-Dinitrotoluene	21.07	1117	911118	53.02	UG/mL	78
47)	C543	2,6-Dinitrotoluene	20.02	1017	73064	51.54	UG/mL	78
48)	C580	Diethylphthalate	21.23	1181	322444	52.79	UG/mL	97
49)	C585	4-Chlorophenyl-phenyleth	21.93	1200	132124	48.87	UG/mL	84
50)	C590	Fluorene	21.97	1204	264884	49.49	UG/mL	99
51)	C595	4-Nitroaniline	22.01	1208	73244	52.83	UG/mL	90
52)	*C160	Phenanthrene-d10	24.45	1442	310512	40.00	UG/mL	81
53)	C610	4,6-Dinitro-2-methylphen	22.16	1222	59874	52.45	UG/mL	82
54)	C615	N-Nitrosodiphenylamine	22.24	1230	194167	49.66	UG/mL	91
55)	C625	4-Bromophenyl-phenylether	23.21	1323	88140	49.16	UG/mL	81
56)	C630	Hexachlorobenzene	23.65	1365	104176	46.54	UG/mL	97
57)	C635	Pentachlorophenol	24.10	1408	60701	49.11	UG/mL	96
58)	C640	Phenanthrene	24.52	1449	419137	50.27	UG/mL	92
59)	C645	Anthracene	24.64	1460	424785	51.23	UG/mL	93
60)	C650	Di-n-butylphthalate	26.02	1593	541942	52.82	UG/mL	82
61)	C655	Fluoranthene	27.71	1755	463904	52.33	UG/mL	97
62)	*C170	Chrysene-d12	31.70	2137	205160	40.00	UG/mL	91
63)	C530	Terphenyl-d14	28.67	1847	333691	48.30	UG/mL	88
64)	C715	Pyrene	28.31	1813	471965	49.03	UG/mL	91
65)	C720	Butylbenzylphthalate	29.98	1973	227446	53.02	UG/mL	84
66)	C725	3,3'-Dichlorobenzidine	31.48	2116	89620	31.85	UG/mL	95
67)	C730	Benzo(a)anthracene	31.63	2131	362530	49.62	UG/mL	87
	C735	bis(2-Ethylhexyl)phthala	31.70	2137	281993	53.51	UG/mL	99
	C740	Chrysene	31.78	2145	344482	49.91	UG/mL	86
)	*C175	Perylene-d12	38.10	2749	173536	40.00	UG/mL	91
71)	C760	Di-n-octylphthalate	33.99	2356	433237	58.81	UG/mL	85
72)	C765	Benzo(b)fluoranthene	36.05	2553	362754	57.67	UG/mL	97
73)	C770	Benzo(k)fluoranthene	36.18	2565	260961	52.48	UG/mL	95
74)	C775	Benzo(a)pyrene	37.80	2720	277268	52.65	UG/mL	94
75)	C780	Indeno(1,2,3-cd)pyrene	45.94	3499	262977	48.07	UG/mL	92
76)	C785	Dibenzo(a,h)anthracene	46.08	3512	205772	47.62	UG/mL	99
77)	C790	Benzo(g,h,i)perylene	48.28	3723	215339	47.26	UG/mL	91

* Compound is ISTD

TOLS004094

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BZTO104(e)040915

Continuing Calibration Check
HSL Compounds

No: | Calibration Date: 10/12/89

ractor: ECOVA | Time: 07:31

ntract No: | Laboratory ID: >BF550

strument ID: GC/MS D | Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 | Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
50	2-Fluorophenol	1.31389	1.39134	5.90		
45	Phenol-d5	1.49644	1.51388	1.17		
15	Phenol	1.81028	1.97412	9.05	*	
25	bis(2-Chloroethyl)ether	1.57753	1.57252	.32		
30	2-Chlorophenol	1.44297	1.44033	.18		
35	1,3-Dichlorobenzene	1.46005	1.59138	8.99		
40	1,4-Dichlorobenzene	1.46406	1.62206	10.79	*	
45	Benzyl alcohol	.90566	.87389	3.51		
50	1,2-Dichlorobenzene	1.45168	1.53865	5.99		
55	2-Methylphenol	1.29424	1.27898	1.18		
60	bis(2chloroisopropyl)eth	2.65454	2.78303	4.84		
65	4-Methylphenol	1.33313	1.26276	5.28		
	N-Nitroso-di-n-propylami	1.22709	1.15741	5.68		**
	Hexachloroethane	.72353	.76112	5.20		
	Nitrobenzene-d5	.40941	.43284	5.72		
10	Nitrobenzene	.37836	.41364	9.33		
15	Isophorone	.79719	.74663	6.34		
20	2-Nitrophenol	.22538	.23275	3.31	*	
25	2,4-Dimethylphenol	.35907	.36342	1.21		
30	Benzoic acid	.20351	.20991	3.14		
35	bis(2-Chloroethoxy)metha	.48490	.49479	2.04		
40	2,4-Dichlorophenol	.31506	.32082	1.83	*	
45	1,2,4-Trichlorobenzene	.34072	.36491	7.10		
50	Naphthalene	1.01486	1.18629	9.89		
55	4-Chloroaniline	.42689	.44462	4.15		
60	Hexachlorobutadiene	.19128	.20799	8.78	*	
65	4-Chloro-3-methylphenol	.33867	.31463	4.85	*	
70	2-Methylnaphthalene	.59596	.59312	6.68		
25	2-Fluorobiphenyl	1.15611	1.34462	16.31		
55	2,4,6-Tribromophenol	.20828	.21845	25.98		
10	Hexachlorocyclopentadien	.37579	.45969	22.33		**
15	2,4,6-Trichlorophenol	.37726	.40228	6.61	*	

- Response Factor from daily standard file at 50.00 UG/mL

- Average Response Factor from Initial Calibration Form VI

- % Difference from original average or curve

- Calibration Check Compounds (*) SPCC - Systes Performance Check Compounds (**)

TOLS004095

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Continuing Calibration Check
HSL Compounds

n:	Calibration Date: 10/12/89
ractor: ECDVA	Time: 07:31
ntract No:	Laboratory ID: >BF550
strument ID: GC/MS D	Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
20	2,4,5-Trichlorophenol	.38411	.42160	9.76		
25	2-Chloronaphthalene	1.03689	1.16456	12.31		
30	2-Nitroaniline	.36036	.36681	1.79		
35	Dimethylphthalate	1.35419	1.34574	.62		
40	Acenaphthylene	1.82797	2.03156	11.14		
45	3-Nitroaniline	.32295	.34341	6.33		
50	Acenaphthene	1.11813	1.25753	12.47	*	
55	2,4-Dinitrophenol	.15294	.16487	7.80		**
60	4-Nitrophenol	.14683	.12783	12.94		**
65	Dibenzofuran	1.42882	1.59068	11.33		
70	2,4-Dinitrotoluene	.39314	.40507	3.03		
73	2,6-Dinitrotoluene	.33726	.33598	.40		
	Diethylphthalate	1.44498	1.42971	1.06		
	4-Chlorophenyl-phenyleth	.58828	.63589	8.09		
	Fluorene	1.17981	1.33509	13.16		
95	4-Nitroaniline	.28955	.33022	14.05		
00	4,6-Dinitro-2-methylphen	.15643	.15547	.61		
05	N-Nitrosodiphenylamine	.46422	.51184	10.26	*	
25	4-Bromophenyl-phenylether	.22059	.22842	3.55		
30	Hexachlorobenzene	.28569	.25556	10.54		
35	Pentachlorophenol	.18040	.14828	17.81	*	
40	Phenanthrene	1.00528	1.10448	9.87		
45	Anthracene	.99524	1.12187	12.64		
50	Di-n-butylphthalate	1.29896	1.32697	2.16		
55	Fluoranthene	1.09769	1.04882	4.45	*	
60	Terphenyl-d14	1.32611	1.34812	1.66		
65	Pyrene	1.89524	1.92547	1.59		
20	Butylbenzylphthalate	.87562	.83942	4.13		
25	3,3'-Dichlorobenzidine	.32726	.44176	34.79		
30	Benzo(a)anthracene	1.32674	1.34768	5.15		
35	bis(2-Ethylhexyl)phthala	1.81512	1.83181	1.64		
40	Chrysene	1.30206	1.26448	2.89		

- Response Factor from daily standard file at 50.00 UG/mL

- Average Response Factor from Initial Calibration Form VI

  % Difference from original average or curve

- Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

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TOLS004096

BZTO104(e)040917

Continuing Calibration Check
HSL Compounds

No: | Calibration Date: 10/12/89

ractor: ECDVA | Time: 07:31

Contract No: | Laboratory ID: >BF550

Instrument ID: GC/MS D | Initial Calibration Date: 10/09/89

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 25.%

	Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
C760	Di-n-octylphthalate	1.67273	1.91212	14.31	*	
C765	Benzo(b)fluoranthene	1.43498	1.41838	1.16		
C770	Benzo(k)fluoranthene	1.09423	1.33215	21.74		
C775	Benzo(a)pyrene	1.18228	1.23735	4.66	*	
C780	Indeno(1,2,3-cd)pyrene	1.17818	1.14988	2.40		
C785	Dibenzo(a,h)anthracene	.91322	.90776	.60		
C790	Benzo(g,h,i)perylene	.97967	.94077	3.97		

RF - Response Factor from daily standard file at 50.00 UG/mL

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

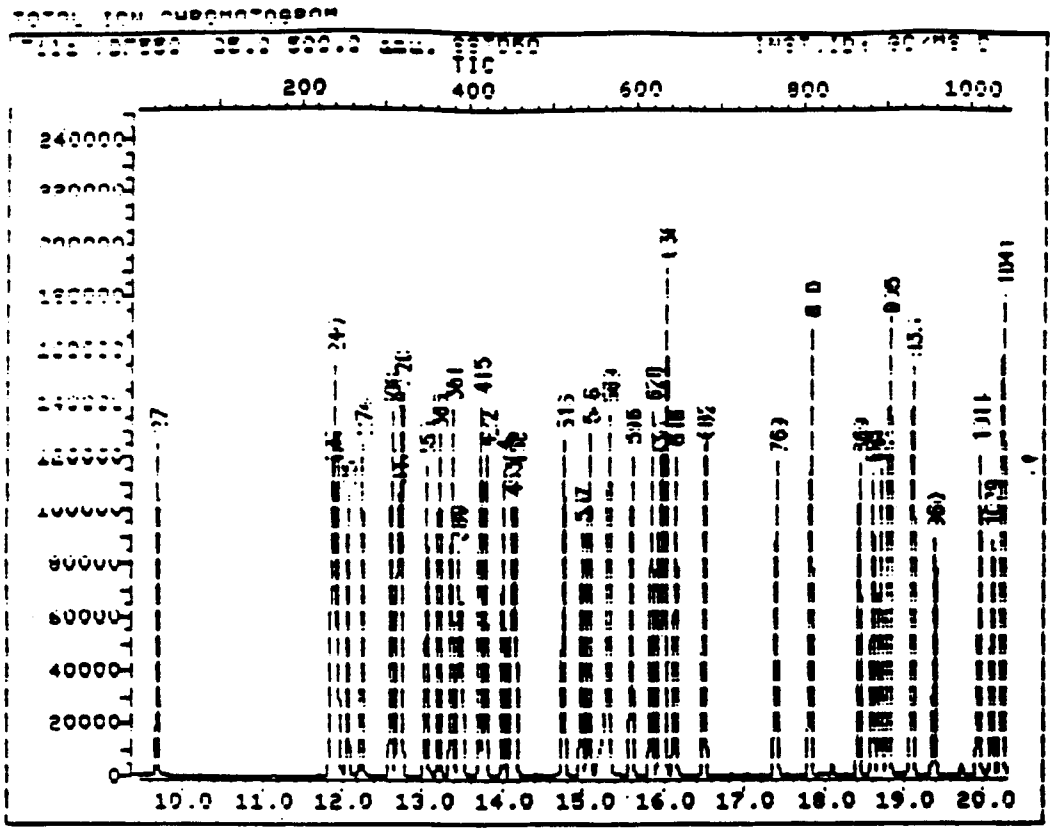
- % Difference from original average or curve

- Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

32319

TOLS004097

BZTO104(e)040918



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Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891011 10:02

Operator ID: SHERRI
Quant Time: 891012 08:26
Injected at: 891012 07:31

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TOLS004098

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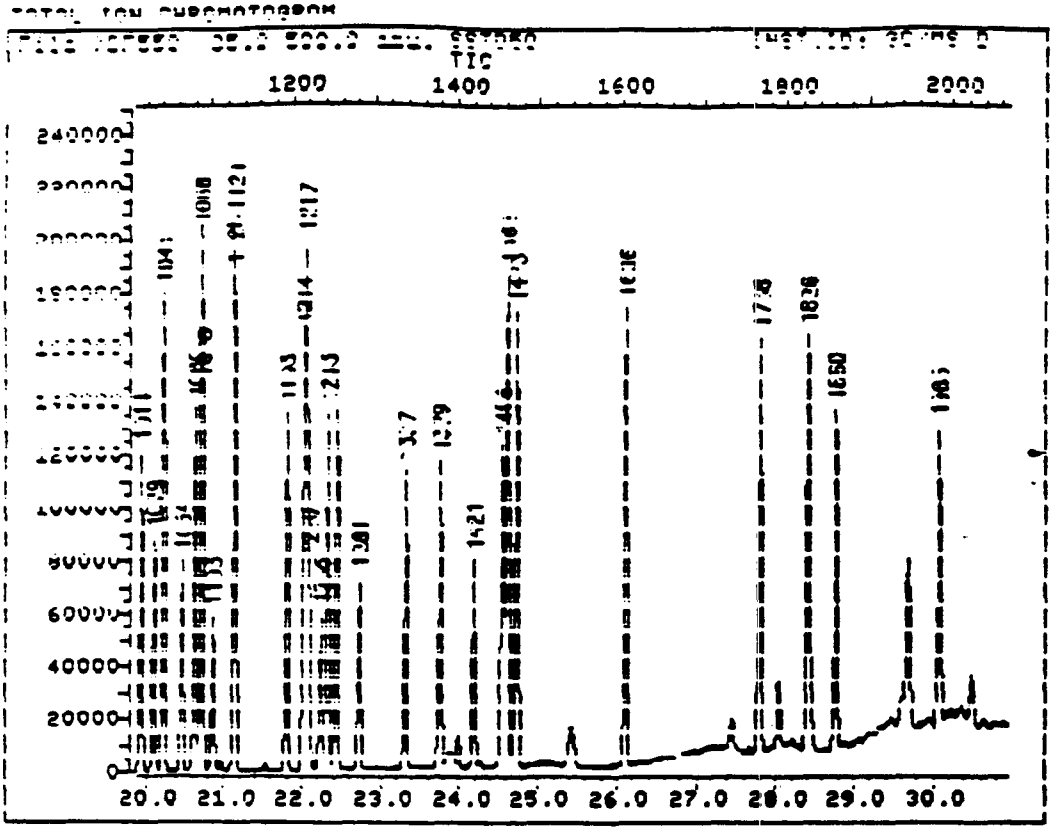

Data File: >BF550::C4 Quant Output File: ^BF550::QT
Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891011 10:02

Operator ID: SHERRI
Quant Time: 891012 08:26
Injected at: 891012 07:31

TIC page 2 of 4

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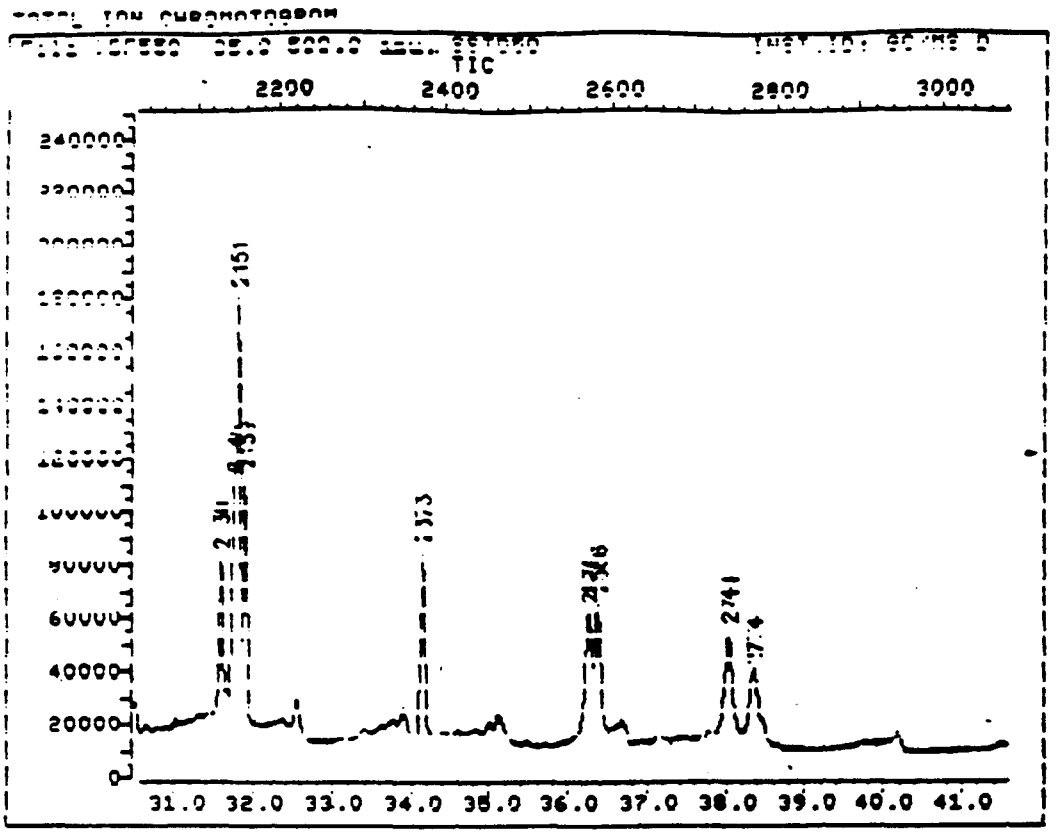

Data File: >BF550::C4 Quant Output File: ^BF550::QT
Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891011 10:02

Operator ID: SHERRI
Quant Time: 891012 08:26
Injected at: 891012 07:31

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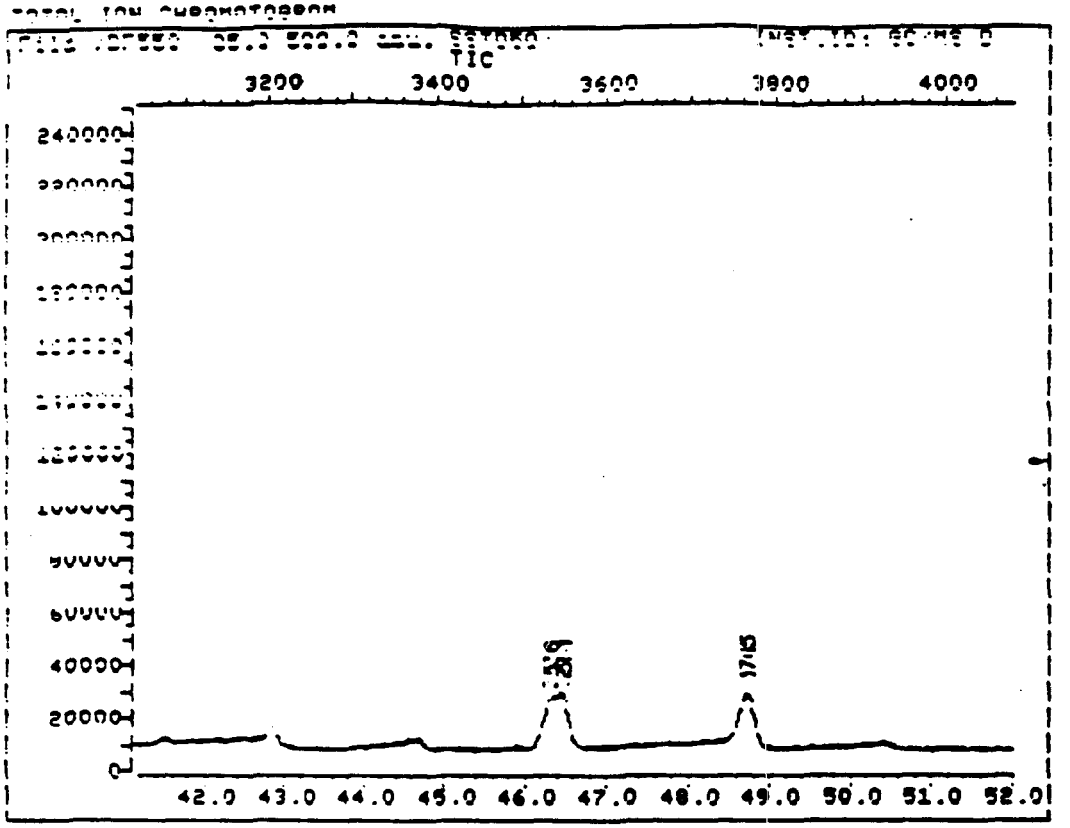
TOLS004100

32319

BZTO104(e)040921



Data File: >BF550::C4 Quant Output File: ^BF550::QT
Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891011 10:12

Operator ID: SHERRI
Quant Time: 891012 08:26
Injected at: 891012 07:31

TIC page 4 of 4

TOLS004101

32319

BZTO104(e)040922

QUANT REPORT

erator ID: SHERRI Quant Rev: 6 Quant Time: 891012 08:24
utput File: ^BF550::QT Injected at: 891012 07:51
Data File: >BF550::C4 Dilution Factor: 1.00000
Name: SSTD50
Misc: INST.ID: GC/MS D BTL# 1

ID File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891011 10:02

		Compound	R.T.	Scan#	Area	Conc	Units	q
1)	*C130	1,4-Dichlorobenzene-d4	12.70	317	34817	40.00	UG/mL	99
2)	CS50	2-Fluorophenol	9.68	27	60553	52.70	UG/mL	85
3)	CS45	Phenol-d5	11.86	237	65886	52.46	UG/mL	94
4)	C315	Phenol	11.90	240	85916	56.09	UG/mL	94
5)	C325	bis(2-Chloroethyl)ether	12.07	257	68438	53.47	UG/mL	98
6)	C330	2-Chlorophenol	12.25	274	62685	52.10	UG/mL	95
7)	C335	1,3-Dichlorobenzene	12.60	308	69259	51.23	UG/mL	99
8)	C340	1,4-Dichlorobenzene	12.73	320	70594	53.24	UG/mL	98
9)	C345	Benzyl alcohol	13.04	350	38033	51.40	UG/mL	86
10)	C350	1,2-Dichlorobenzene	13.19	365	66964	51.97	UG/mL	97
11)	C355	2-Methylphenol	13.36	381	55663	52.45	UG/mL	95
12)	C360	bis(2chloroisopropyl)eth	13.44	389	121121	53.78	UG/mL	96
	C365	4-Methylphenol	13.71	415	54957	49.34	UG/mL	92
	C370	N-Nitroso-di-n-propylami	13.79	422	50472	50.84	UG/mL	85
15)	C375	Hexachloroethane	14.01	443	33125	52.69	UG/mL	95
16)	*C140	Naphthalene-d8	15.95	630	132472	40.00	UG/mL	82
17)	CS20	Nitrobenzene-d5	14.11	453	71674	51.77	UG/mL	90
18)	C410	Nitrobenzene	14.16	458	68495	52.48	UG/mL	99
19)	C415	Isophorone	14.76	516	123634	49.87	UG/mL	92
20)	C420	2-Nitrophenol	14.98	537	38541	49.65	UG/mL	91
21)	C425	2,4-Dimethylphenol	15.08	546	60179	50.87	UG/mL	94
22)	C430	Benzoic acid	15.32	569	34759	61.39	UG/mL	99
23)	C435	bis(2-Chloroethoxy)metha	15.32	569	81932	52.23	UG/mL	97
24)	C440	2,4-Dichlorophenol	15.60	596	53124	48.00	UG/mL	84
25)	C445	1,2,4-Trichlorobenzene	15.85	620	60426	49.01	UG/mL	97
26)	C450	Naphthalene	16.01	636	183190	52.12	UG/mL	95
27)	C455	4-Chloroaniline	16.14	648	73625	50.35	UG/mL	91
28)	C460	Hexachlorobutadiene	16.49	682	34441	47.24	UG/mL	85
29)	C465	4-Chloro-3-methylphenol	17.40	769	52099	46.48	UG/mL	73
30)	C470	2-Methylnaphthalene	17.82	810	98215	48.26	UG/mL	95
31)	*C150	Acenaphthene-d10	20.63	1080	79031	40.00	UG/mL	97
32)	CS25	2-Fluorobiphenyl	18.81	905	132833	52.89	UG/mL	95
33)	CS55	2,4,6-Tribromophenol	22.72	1281	20788	43.08	UG/mL	79
34)	C510	Hexachlorocyclopentadien	18.43	869	45412	61.13	UG/mL	96
35)	C515	2,4,6-Trichlorophenol	18.60	885	39733	49.68	UG/mL	99
36)	C520	2,4,5-Trichlorophenol	18.71	895	41649	48.14	UG/mL	98
37)	C525	2-Chloronaphthalene	19.10	933	115045	51.74	UG/mL	94
	C530	2-Nitroaniline	19.48	960	36237	50.02	UG/mL	85
	C535	Dimethylphthalate	19.94	1014	132944	47.62	UG/mL	79
39)	C540	Acenaphthylene	20.22	1041	200695	51.02	UG/mL	88
41)	C545	3-Nitroaniline	20.46	1064	33925	46.14	UG/mL	88
42)	C550	Acenaphthene	20.71	1088	124230	51.19	UG/mL	98
43)	C555	2,4-Dinitrophenol	20.73	1090	16287	52.07	UG/mL	71

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TOLS004102

BZTO104(e)040923

		Compound	R.T.	Scan#	Area	Conc	Units	q
)	C560	4-Nitrophenol	20.87	1103	12628	44.17	UG/mL	8-
-7)	C565	Dibenzofuran	21.13	1128	157141	50.73	UG/mL	89
46)	C570	2,4-Dinitrotoluene	21.14	1129	40016	46.03	UG/mL	8-
47)	C575	2,6-Dinitrotoluene	20.10	1029	33183	47.55	UG/mL	75
-8)	C580	Diethylphthalate	21.81	1193	141259	45.86	UG/mL	95
49)	C595	4-Chlorophenyl-phenyleth	22.02	1214	62819	49.78	UG/mL	92
50)	C590	Fluorene	22.06	1217	131892	52.13	UG/mL	97
51)	C595	4-Nitroaniline	22.09	1220	32622	46.63	UG/mL	8H
52)	*C160	Phenanthrene-d10	24.55	1456	135195	40.00	UG/mL	84
53)	C610	4,6-Dinitro-2-methylphen	22.24	1235	26266	50.36	UG/mL	85
54)	C615	N-Nitrosodiphenylamine	22.53	1243	86473	51.13	UG/mL	97
55)	C625	4-Bromophenyl-phenylether	23.31	1337	38590	50.26	UG/mL	84
56)	C630	Hexachlorobenzene	23.24	1379	43176	47.58	UG/mL	94
57)	C635	Pentachlorophenol	24.18	1421	25051	47.38	UG/mL	91
58)	C640	Phenanthrene	24.61	1462	186581	51.08	UG/mL	99
59)	C645	Anthracene	24.72	1473	189397	51.18	UG/mL	93
60)	C650	Di-n-butylphthalate	26.11	1606	224183	47.49	UG/mL	83
61)	C655	Fluoranthene	27.80	1768	177191	43.85	UG/mL	96
62)	*C170	Chrysene-d12	31.81	2151	71356	40.00	UG/mL	93
63)	CS30	Terphenyl-d14	28.76	1860	120246	51.80	UG/mL	90
64)	C715	Pyrene	28.41	1826	171742	52.51	UG/mL	92
65)	C720	Butylbenzylphthalate	30.07	1985	74872	47.32	UG/mL	91
66)	C725	3,3'-Dichlorobenzidine	31.59	2130	39403	64.21	UG/mL	8H
67)	C730	Benzo(a)anthracene	31.75	2145	120199	47.66	UG/mL	90
	C735	bis(2-Ethylhexyl)phthala	31.81	2151	92032	46.92	UG/mL	9[illegible]
3	C740	Chrysene	31.90	2159	112778	47.06	UG/mL	8[illegible]
.)	*C175	Perylene-d12	38.35	2724	56189	40.00	UG/mL	92
71)	C760	Di-n-octylphthalate	34.14	2373	134300	47.87	UG/mL	8[illegible]
72)	C765	Benzo(b)fluoranthene	36.26	2575	99622	42.41	UG/mL	94
73)	C770	Benzo(k)fluoranthene	36.38	2586	93565	55.37	UG/mL	96
74)	C775	Benzo(a)pyrene	38.04	2744	86907	48.40	UG/mL	94
75)	C780	Indeno(1,2,3-cd)pyrene	46.32	3536	80763	47.42	UG/mL	91
76)	C785	Dibenzo(a,h)anthracene	46.48	3551	63758	47.85	UG/mL	8[illegible]
77)	C790	Benzo(g,h,i)perylene	48.72	3765	66076	47.38	UG/mL	89

* Compound is ISTD

TOLS004103

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BZTO104(e)040924

8B

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Name: Ecova Corporation

:b File ID (Standard): /BF515 Date Analyzed: 10/10/89

'strument ID: 70 2 Time Analyzed: 8:26

	IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
12 HOUR STD	53699.	12.65	217485.	15.92	133938.	20.60
UPPER LIMIT	107398.		434970.		267876.	
LOWER LIMIT	26849.		108743.		66969.	
EPA SAMPLE NO.						
01 2062-01	48598.	12.64	183952.	15.91	109247.	20.58
2078-01RE	49744.	12.65	154037.	15.90	100660.	20.59
2081-00MB	55824.	12.63	[illegible]	15.90	144897.	20.56
4 2062-02	54685.	12.63	203827.	15.90	112878.	20.57
05 2081-01	57961.	12.63	[illegible]	15.89	140854.	20.56
06 2081-02	63470.	12.63	[illegible]	15.89	161390.	20.56
07 2081-01MS	47851.	12.67	[illegible]	[illegible]	[illegible]	20.60
08 2081-01MSD	53631.	12.64	[illegible]	15.90	134199.	20.58
09 2081-03	37914.	12.63	[illegible]	[illegible]	[illegible]	20.58
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IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

, Column used to flag internal standard area values with an asterisk

TOLS004104

32319

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Name: Ecova Corporation

File ID (Standard): >8F515 Date Analyzed: 10/10/89

Instrument ID: 70 2 Time Analyzed: 8:26

		IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS3(PRY) AREA #	RT
	12 HOUR STD	243355.	24.51	148358.	31.78	144746.	38.29
	UPPER LIMIT	486710.		296716.		289492.	
	LOWER LIMIT	121678.		74179.		72373.	
	EPA SAMPLE NO.						
01	2062-01	177039.	24.51	116867.	31.78	100535.	38.29
02	2078-01RE	152042.	24.50	36780.*	31.85	53195.*	38.46
03	2081-00MB	282024.	24.48	[illegible]	[illegible]	191169.	[illegible]
04	2062-02	158537.	24.49	102644.	31.75	91595.	38.23
	2081-01	242664.	24.48	145922.	31.79	119827.	38.18
06	2081-02	293961.	24.48	201564.	31.73	179006.	38.20
07	2081-01MS	207382.	24.52	147490.	31.75	122979.	38.21
08	2081-01MSD	226736.	24.49	148091.	31.74	123495.	38.19
09	2081-03	228728.	24.51	128508.	31.73	162368.	38.20
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IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

* Column used to flag internal standard area values with an asterisk

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TOLS004105

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SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Name: Ecova Corporation

File ID (Standard): >BF538 Date Analyzed:10/11/89

Instrument ID: 70 2 Time Analyzed: 8:27

	IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
12 HOUR STD	66277.	12.61	255362.	15.87	165494.	20.55
UPPER LIMIT	132554.		510724.		330988.	
LOWER LIMIT	33139.		127681.		82747.	
EPA SAMPLE NO.						
2062-03	58464.	12.62	230350.	15.87	146783.	20.55
02 SBLK2	68682.	12.61	267073.	15.88	177013.	20.54
03 2081-02	66586.	12.61	263391.	15.86	175954.	20.55
04 2081-03	57109.	12.65	230716.	15.90	161126.	20.58
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IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

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TOLS004106

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Name: Ecova Corporation

File ID (Standard): >8F538 Date Analyzed: 10/11/99

trument ID: 70 2 Time Analyzed: 8:27

	IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS3(PRY) AREA #	RT
12 HOUR STD	310312.	24.45	205160.	31.70	173536.	38.10
UPPER LIMIT	620624.		410320.		347072.	
LOWER LIMIT	155156.		102580.		86768.	
EPA SAMPLE NO.						
01 2062-03	220754.	24.47	150223.	31.71	126774.	38.18
2 SBLK2	338105.	24.46	234842.	31.69	195215.	38.13
03 2081-02	329411.	24.46	262894.	31.70	227439.	38.14
4 2081-03	304126.	24.49	225899.	31.72	191392.	38.17
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IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

* Column used to flag internal standard area values with an asterisk

s 1 of 1

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FORM VIII SV-2

TOLS004107

1/87 Rev.

BZTO104(e)040928

8B

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

) Name: Ecova Corporation

) File ID (Standard):)BF550 Date Analyzed:10/12/89

trument ID: 70 2 Time Analyzed: 7:31

	IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
12 HOUR STD	34817.	12.70	132472.	15.95	79031.	20.63
UPPER LIMIT	69634.		264944.		158062.	
LOWER LIMIT	17408.		66236.		39515.	
EPA SAMPLE NO.						
EDZ81MSD	39656.	12.69	155459.	15.95	94660.	20.63
2067-00MB	37573.	12.68	155560.	15.94	96378.	20.61
2070-00MB2	43743.	12.69	177039.	15.94	109052.	20.61
2070-01MS	27985.	12.68	111895.	15.94	68636.	20.61
2081-02	37895.	12.67	149208.	15.94	90898.	20.61
EDZ80RE	38659.	12.68	153523.	15.94	91421.	20.62
2067-02	31913.	12.67	129145.	15.93	82007.	20.61
EDZ97	38809.	12.68	152971.	15.94	91173.	20.62

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

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TOLS004108

BZTO104(e)040929

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

lame: Ecova Corporation

File ID (Standard): >BF550 Date Analyzed: 10/12/89

trument ID: 70 2 Time Analyzed: 7:31

		IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS3(PRY) AREA #	RT
	12 HOUR STD	135155.	24.54	71356.	31.81	56189.	38.35
	UPPER LIMIT	270310.		142712.		112378.	
	LOWER LIMIT	67578.		35678.		28094.	
	EPA SAMPLE NO.						
01	EDZ81MSD	173754.	24.54	113108.	31.79	91056.	38.34
02	2067-00MB	177869.	24.53	109812.	31.79	86247.	38.33
03	2080-00MB2	198898	24.53	129370.	31.79	107016	38.32
04	2070-01MS	120929.	24.53	71278.	31.78	57550.	38.31
05	2081-02	162958	24.52	105143	31.78	87883	38.30
06	EDZ80RE	163870.	24.53	116148.	31.81	109348.	38.38
07	2067-02	150036.	24.53	91588.	31.79	73784.	38.33
08	EDZ97	160645.	24.54	102831.	31.81	91847.	38.38
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IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

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FORM VIII SV-2 TOLS004109 1/87 Rev.

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BZTO104(e)040930

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Pacific Northwest Environmental Lab.
Project Number: 891005-10
Sample Matrix: Soil
Concentration: Low Dilution Factor: 1
Sample wt/vol: 30 g
Date Extracted: 10/09/89
Date Analyzed: 10/10/89

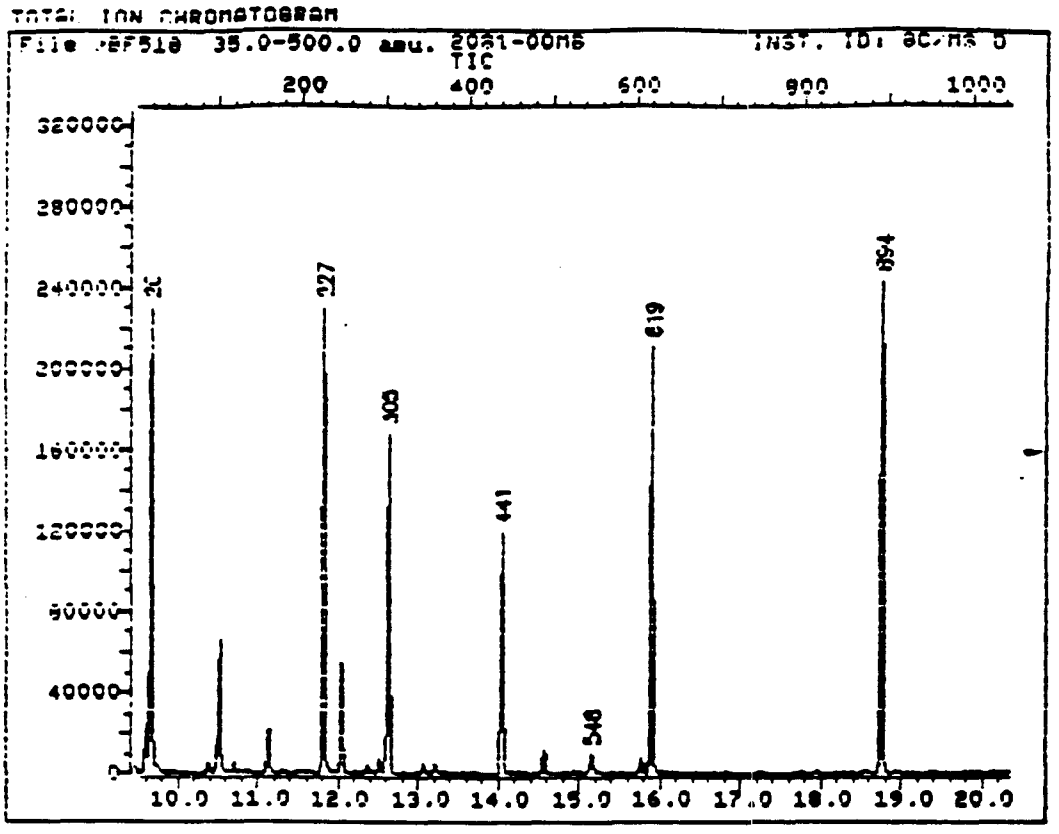
Lab Sample: 2081-00MB
Customer Sample: NA
Sample Description: Method Blank
Date Collected: NA
Time Collected: NA
Date Received: NA
Data Release Authorized:

C.A.S. Number		UG/KG	
95-57-8	2-Chlorophenol	330	U
120-83-2	2,4-Dichlorophenol	330	U
59-50-7	4-Chloro-3-methylphenol	330	U
88-06-2	2,4,6-Trichlorophenol	330	U
95-95-4	2,4,5-Trichlorophenol	1700	U
87-86-5	Pentachlorophenol	1700	U

TOLS004110

32319

BZTO104(e)040931



Data File: >BF518::C1 Quant Output File: ^BF518::QT
Name: 2081-00MB
Misc: INST. ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

Operator ID: SHERRI
Quant Time: 891010 12:37
Injected at: 891010 11:41

TIC page 1 of

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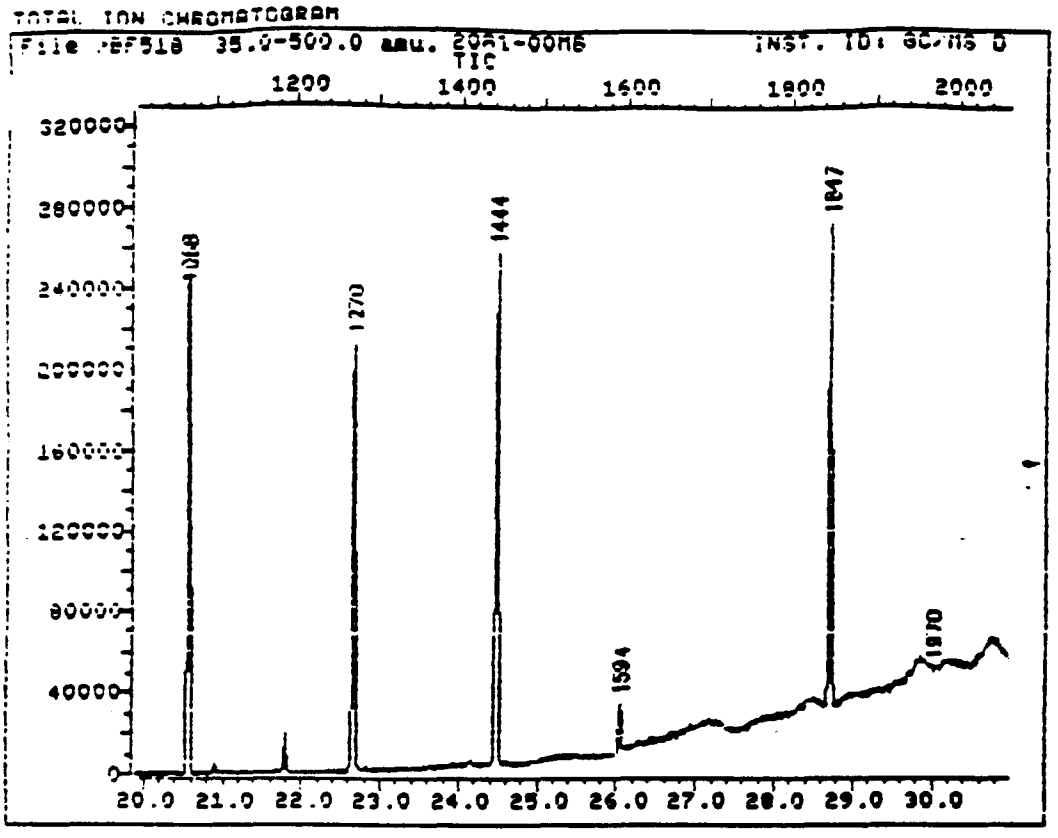
TOLS004111



Data File: >BF518::C1 Quant Output File: ^BF518::QT
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Misc: INST. ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

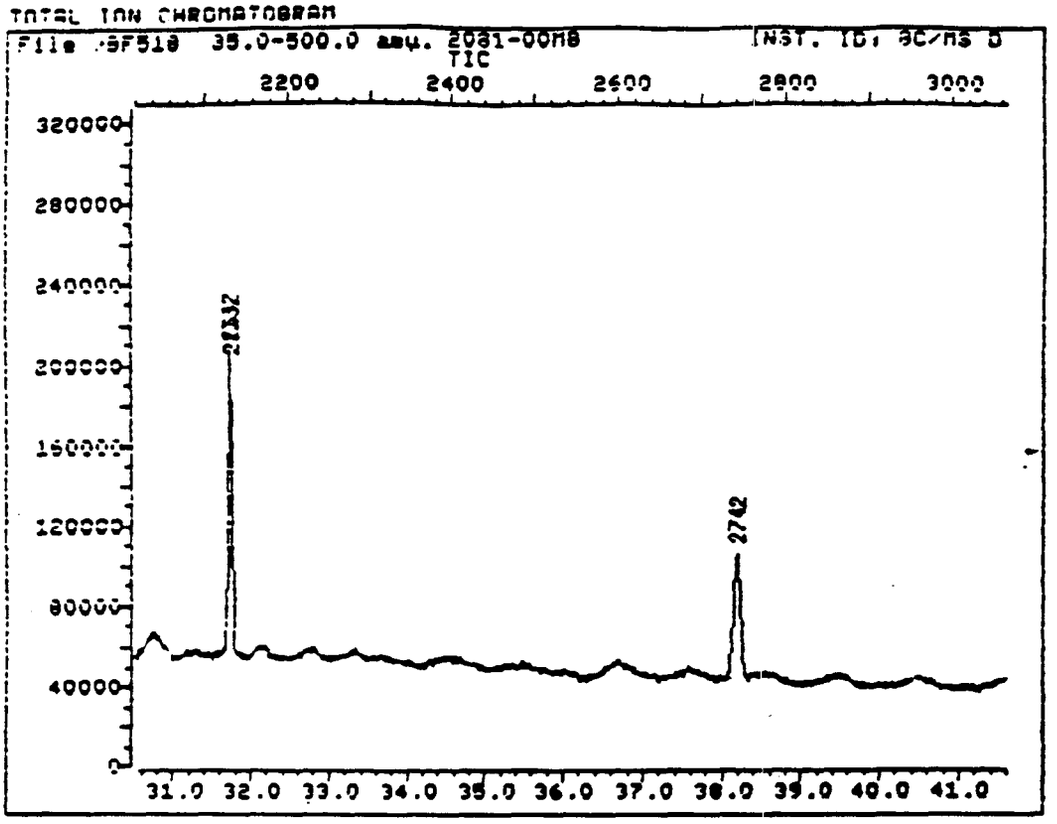
Operator ID: SHERRI
Quant Time: 891010 12:37
Injected at: 891010 11:41

TIC page 2 of 4

TOLS004112

32319

TOTAL ION CHROMATOGRAM



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Name: 2081-00MB
Misc: INST. ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

Operator ID: SHERRI
Quant Time: 891010 12:37
Injected at: 891010 11:41

TIC page 3 of 4

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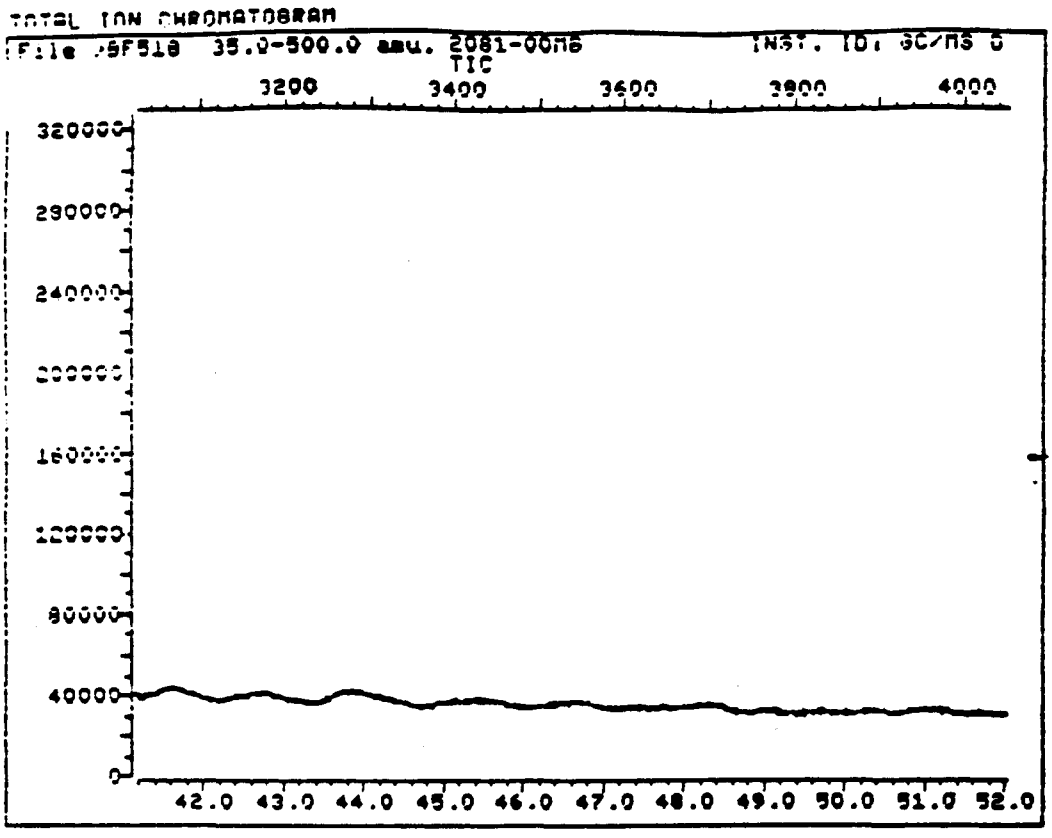
TOLS004113



Data File: >BF518::C1 Quant Output File: ^BF518::QT
Name: 2081-00MB
Misc: INST. ID: GC/MS D BTL# 1

Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

Operator ID: SHERRI
Quant Time: 891010 12:37
Injected at: 891010 11:41

TIC page 4 of 4

TOLS004114

32319

BZTO104(e)040935

QUANT REPORT

erator ID: SHERRI Quant Rev: 6 Quant Time: 891010 12:57
utput File: ^BF518::C3 Injected at: 891010 11:41
ata File: >BF518::C1 Dilution Factor: 1.0000000
ame: 20H1-00MB
isc: INST. ID: GC/MS D Bill# 1

D File: ID:EPA::GM
itle: DAILY CALIBRATION STANDARD
ast Calibration: 891010 09:42

		Compound	Q ion	Scan#	Area	Conc	Units	%
1)	*C130	1,4-Dichlorobenzene-d4	152.0	305	55824	40.00	UG/mL	91
2)	CS50	2-Fluorophenol	112.0	20	117649	62.59	UG/mL	88
3)	CS45	Phenol-d5	99.0	227	153802	73.25	UG/mL	90
6)	*C140	Naphthalene-d8	136.0	619	218728	40.00	UG/mL	85
7)	CS20	Nitrobenzene-d5	82.0	441	74462	33.25	UG/mL	90
12)	C430	Benzoic acid	122.0	648	41159	5.84	UG/mL	97
11)	*C150	Acenaphthene-d10	164.0	1068	144997	40.00	UG/mL	96
12)	CS25	2-Fluorobiphenyl	172.0	894	176850	36.78	UG/mL	99
13)	CS55	2,4,6-Tribromophenol	330.0	1270	71691	24.43	UG/mL	73
12)	*C160	Phenanthrene-d10	188.0	1444	282174	40.00	UG/mL	78
10)	C650	Di-n-butylphthalate	149.0	1594	26788	2.87	UG/mL	83
21)	*C170	Chrysene-d12	240.0	2132	167185	40.00	UG/mL	91
1	CS30	Terphenyl-d14	244.0	1847	236915	42.11	UG/mL	8
)	C735	bis(2-Ethylhexyl)phthala	149.0	2143	15564	5.58	UG/mL	89
1)	*C175	Perylene-d12	264.0	2742	151165	40.00	UG/mL	90

* Compound is ISTD

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TOLS004115

BZTO104(e)040936

SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Pacific Northwest Environmental Lab.
Project Number: 891005-10
Sample Matrix: Soil
Concentration: Low Dilution Factor: 1
Sample wt/vol: 30 g
Date Extracted: 10/11/89
Date Analyzed: 10/12/89

Lab Sample: 2081-00MB2
Customer Sample: NA
Sample Description: Method Blank
Date Collected: NA
Time Collected: NA
Date Received: NA
Data Release Authorized:

C.A.S. Number		UG/KG	
95-57-8	2-Chlorophenol	330	U
120-83-2	2,4-Dichlorophenol	330	U
59-50-7	4-Chloro-3-methylphenol	330	U
88-06-2	2,4,6-Trichlorophenol	330	U
95-95-4	2,4,5-Trichlorophenol	1700	U
87-86-5	Pentachlorophenol	1700	U

TOLS004116

32319

BZTO104(e)040937

Bioremediation of PCP-Contaminated Soil: Bench to Full-Scale Implementation

William R. Mahaffey • Robert A. Sanford

William R. Mahaffey, PhD, is the vice president of technology development for ECOVA Corporation in Redmond, WA. He is a microbial physiologist by training. Robert A. Sanford was formerly a research associate at the same firm. He is currently a graduate student at Michigan State University.

Pentachlorophenol (PCP) is a widely used wood treatment agent and pesticide that is often listed among the contaminants at hazardous waste sites. Bench-scale studies were performed to develop a microbial culture and biodegradative process that could treat PCP at higher concentrations than previously reported. Several substrate formulations and culture techniques were evaluated. Ultimately a "self-feeding" (pH auxostat) continuous culture system (pH auxostat) was used to select for biodegradative activity with PCP as the carbon and energy source. After a period of 50 days, influent PCP concentrations reached 3,500 mg/liter at a dilution rate of 0.066 H^{-1}. Of the total theoretical chloride that could be released from PCP, 99% was detected as free chloride in the reactor effluent. PCP analysis of the effluent verified complete degradation by the microbial consortium. The reactor was converted to a constant PCP feed. At steady state conditions, the dilution rate was 0.05 H^{-1} with an influent PCP concentration of 2,560 mg/liter and a biomass yield of 018 mg (dry weight) per mg of PCP. Mineralization studies performed with the microbial consortium using [U-14C]-PCP indicated that 36.5% of the label was released as 14C-carbon dioxide.

During operations at a PCP-formulating facility, significant quantities of PCP solutions were spilled, resulting in the contamination of an estimated 3,400 cubic yards of soil. Representative soil samples from the site revealed PCP concentrations ranging from 2 mg/kg to 8,000 mg/kg. Several treatability studies were performed to determine the efficacy of a slurry-phase bioremediation process for these soils. Results of the study showed little if any indigenous microbial degradative potential. Inoculation with the PCP-degrading consortium resulted in the degradation of PCP to below detectable levels (<1.0 ppm) as measured by high-pressure liquid chromatography. Data from laboratory treatability studies were used to design and implement the full-scale remediation process. The process involves soil washing to remove PCP from the soils followed by bioremediation of the pregnant wash solution in a slurry-phase bioreactor. The PCP-degrading consortium is grown on site and serves as the inoculum for the full-scale treatment reactors. Results from the field operations during the first two

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indicator. A washed cell suspension from the chemostat was added to provide a cell density of 10^9 cells/ml. Vials were capped and incubated at 20°C for 1 week. The systems were acidified and purged with carbon dioxide free air into a trapping solution of 0.2 N NaOH. After 15 minutes of purging 1.0 ml aliquots of the trapping solution were sampled and added directly to 14 ml of scintillation cocktail (Beckman MP). To be sure that no radiolabeled PCP was present in the carbon dioxide traps, a barium chloride precipitation was performed on aliquots of the trapping solution and residual radioactivity quantitated.

Slurry-phase treatability studies were performed in 250-ml Erlenmeyer flasks containing Bushnell-Haas medium. Slurries are designated on the basis of their percent solids and were prepared at soil/volume ratios of 5%, 15%, 25%, and 40%. Flasks were incubated at 25°C on a rotary shaker in the dark, and duplicate flasks were sacrificed overtime. With the exception of the 25% slurry, the pH of all other slurries was maintained at neutrality (pH 7.5). Inoculation of slurries was made with the chemostat consortium to achieve a cell density of approximately 10-E6 cells/ml.

Soil washing experiments were performed in 250 ml-Erlenmeyer flasks using a 25% (w/v) ratio of solids to wash solution. Various alkaline wash reagents were evaluated. The exact nature of the washing reagent used for this process has been classified as confidential business information at this time. Particle size analysis of site soil was performed using U.S. standard sieves and followed standard method protocol as described in ASTM method D-422.

RESULTS

Bench-Scale Bioreactor Studies

A schematic representation of the bench scale bioreactor is presented in **Figure 1**. PCP was fed to the reactor from a separate feed reservoir to facilitate greater control off the feeding rate. Since PCP is quite soluble under alkaline conditions, it was always added to the reactor in this form. The Bioflo reactor was operated with a number of substrate formulations in an attempt to increase the PCP-degrading biomass by providing cosubstrates. **Table 1** illustrates the various formulations that were utilized. As can be seen in **Figure 2**, each substrate formulation yielded differences in the extent and rate of PCP degradation as evaluated on the basis of dechlorination activity. The results indicate that formulations 1-4 resulted in repression of dechlorination activity as compared to formulations 5 and 6 where PCP was the sole source of carbon.

During the evaluations of the various substrate formulations, it became apparent that as a result of PCP biodegradation five equivalents of HCl could be produced. Therefore the PCP feed was formulated to provide an equimolar amount of NaOH to neutralize the acid formed. It was hypothesized that the addition of PCP based on the production of acid may be an efficient means of regulating the continuous flow process. This was implemented by interfacing PCP addition to a pH controller, which actuates the feed pump when the pH drops below a set point. The addition

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Table 1. Substrate formulations used during bench-scale evaluation.

FORMULATION	REAGENTS	CONCENTRATION
1	PCP	0.04 M
	Sodium acetate	0.05 M
	Peptone (P)	532 mg/liter
	Yeast Extract (Y)	532 mg/liter
	NaOH	0.2 N
2	PCP	0.04 M
	Sodium acetate	0.02 M
	P/Y (1:1)	266 mg/liter
	NaOH	0.2 N
3	PCP	0.04 M
	Sodium acetate	0.025 M
	P/Y (1:1)	266 mg/liter
	NaOH	0.174 N
4	PCP	0.04 M
	Sodium acetate	0.025 M
	P/Y (1:1)	266 mg/liter
	NaOH	0.185 N
5	PCP	0.04 M
	NaOH	0.21 N
6	PCP	0.04 M
	NaOH	0.22 N

feeding" mode substrate formulations 1-3 were evaluated with no apparent enhancement of daily input of PCP (**Figure 4**). On day 23 the NaOH level was reduced to compensate for the amount of base that would be produced as a result of the mineralization of sodium acetate. Apparently this excess of NaOH was enough to cause a reduction in the demand for the alkaline PCP feed. Subsequent to this adjustment, the daily PCP loading rate to the reactor continued to increase for a period of 10 days approaching 3.0 grams per "day." However, it was observed that some breakthrough of PCP to the effluent was occurring. On day 34 an adjustment to increase the NaOH (formulation 4) was required to eliminate the breakthrough of PCP. Stable operation of the reactor was achieved with a processing rate of 2.8 grams of PCP per day. On day 60 the reactor was converted over to operations with PCP as the sole source of carbon and energy (formulations 5 and 6). As a result the daily loading rate of PCP

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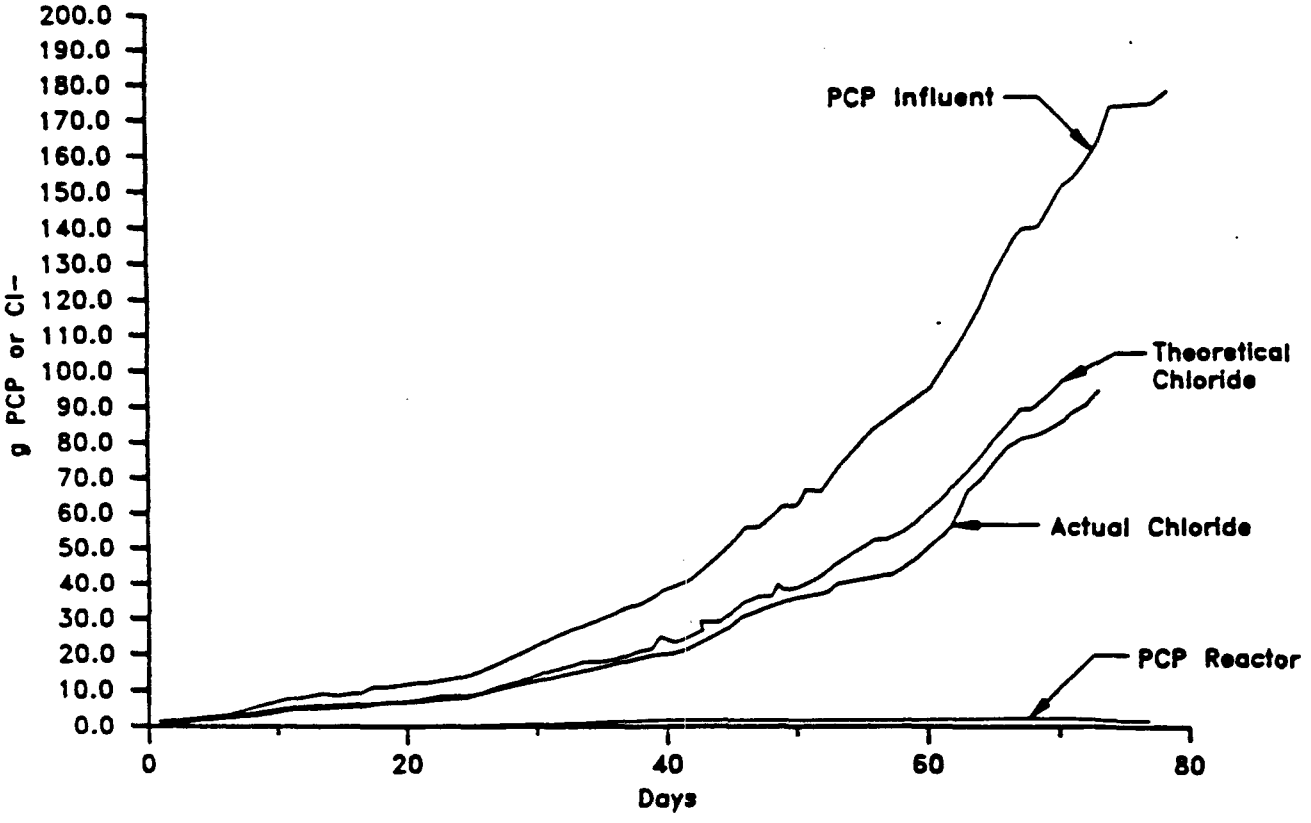
Figure 3. Effects of "self-feeding" operations on the performance of the continuous culture bioreactor in degrading PCP.



to the reactor increased to 3.8 grams/day without any increased breakthrough of PCP to the effluent.

A result of operating the reactor as a "self-feeding" pH auxostat was that as the demand for PCP feed increased the dilution rate increased proportionately. **Figure 5** shows the fluctuations in dilution rate during that period of operation when the reactor was in the self-feeding mode. It is apparent from these data that the reactor efficiency was increasing throughout the study. After 60 days of operation the bioreactor was processing 3.8 grams/1.25 liters at a dilution rate 0.065 or the equivalent of 5.5 grams/day of PCP (Table 2).

During the continuous culture experiments the reactor was converted to operation at continuous influent feed of PCP (2,560 mg/liter) as the sole carbon and energy source. Under these conditions it was necessary to operate at a retention time of 31.45 hours. **Table 3** provides synopsis of the data on critical process parameters at steady state. The population density was measured as total heterotrophic bacteria and averaged $9x10^9$ cells/ml. Attempts to enumerate PCP degraders and selective media (Saber 1985) were unsuccessful. We believe this may be a reflection of the strong

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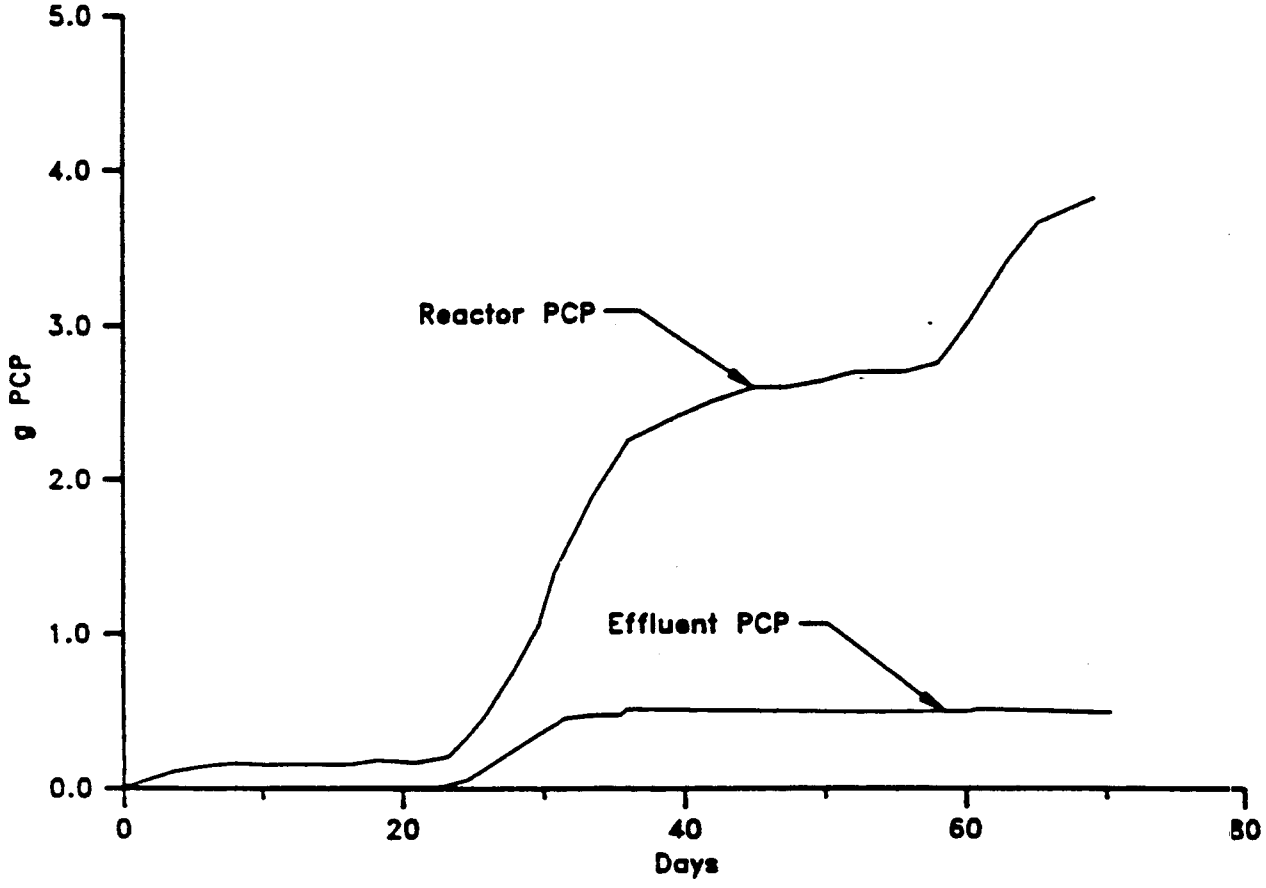
Figure 4. Profile of the total daily PCP load to the bioreactor during optimization of the "self-feeding" process and the breakthrough of PCP in reactor effluents.



Application of the PCP Consortium to a Bioremediation

Site Description and Treatability Testing

Operations at a former PCP-formulating facility resulted in the contamination of an estimated 3,000 cubic yards of site soil. The client assumed a proactive posture and retained ECOVA to evaluate and design a bioremediation program for their site. A biotreatability study was required to convince the client of the feasibility of a bioremediation program specific for PCP. The results of a simple slurry-phase biotreatability study, performed on soils contaminated with high concentrations of PCP, is summarized in **Figure 6**. During the first 2 weeks of the study, there was little if any PCP biodegradation in any of the various slurries tested (e.g., 5%-40% soil solids). On day 13 each of the slurries received an inoculum of the PCP consortium to yield approximately $1x10^8$ cells/ml of slurry. PCP was biodegraded to less than 2.0 mg/liter, with the exception of the 25%

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Table 3. Critical process parameter measurements during steady-state conditions of the bioreactor at a constant influent PCP concentration.

PARAMETER	VALUE
Influent concentration	2560 Mg/liter
Dilution rate (D)	0.032 h-1
Temperature	20.1°C
Cell density[a]	0.66
Total heterotrophs	9.5 x 10^9 cells/ml
Biomass yield per mg PCP[b]	18% (0.18 mg/mg PCP)
Biomass yield per mg/carbon	66% (0.66 mg/mg PCP)
Residual PCP in reactor	ND (0.5 mg/liter)
Residual chloride in reactor	1760 mg/liter
Chloride as % of theoretical	103%
Specific 0_2 uptake rate	0.25 µmoles/min/mg

a Turbidity measurement obtained with a Klett-Summerson colorimeter equipped with a blue filter (330 nm).

b Biomass yields are calculated on a dry-cell-weight basis.

material greater than 60 mesh constitutes approximately 80% of the total soil volume. A soil-washing solution was formulated and found to be highly efficient in removing PCP from the soil particles larger than 60 mesh (**Table 5**).

Site Operations

Based upon the information developed during bench-scale treatability testing, ECOVA has designed and begun the implementation of a full-scale remediation program for PCP-contaminated soils. This program is centered on a combination soil-washing and screening process, which results in the removal of PCP to a cleanup level of 0.5 mg/kg soil. Field data from site operations are presented in **Table 6** along with the laboratory data for comparative purposes. The system is designed to process 15-30 cubic yards of soil a day. The resulting wash solution is a slurry that contains the PCP and the <60-mesh soil particles at approximately a 20% solids loading. This material is subsequently treated in on-site slurry phase bioreactors that have been inoculated with the PCP-degrading consortium. A general schematic of the field operations is presented in **Figure 8**.

During startup of site operations, two 25,000-gallon slurry bioreactors were operated in batch mode in order to demonstrate the utility of

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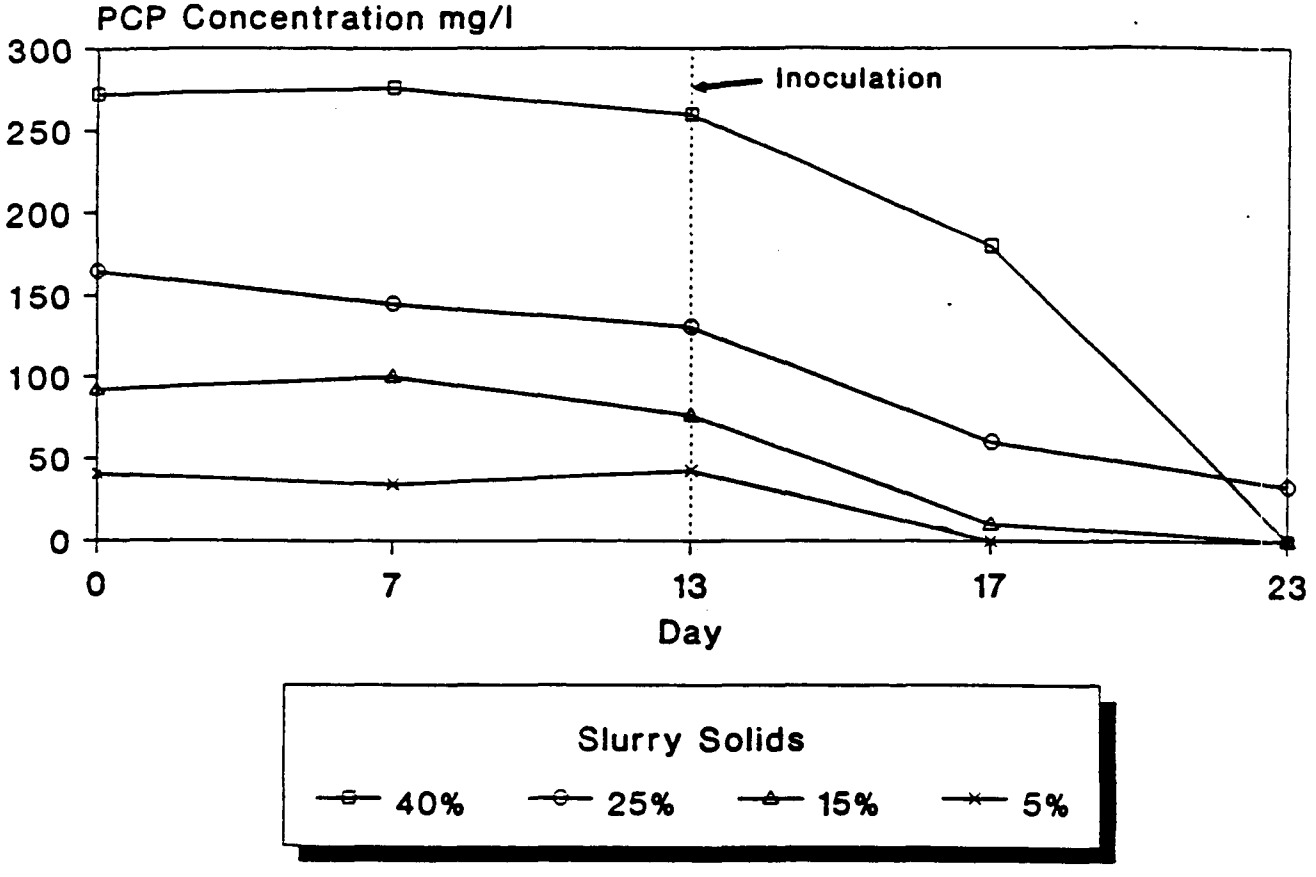
Figure 6. Results of the slurry phase biotreatability evaluation demonstrating the enhanced biodegradation of PCP in contaminated soils by supplementation with a microbial consortium capable of PCP mineralization.



effectively suspended. After charging the reactor with soil and water an oily solvent sheen (mineral spirits) could be detected at the air/slurry interface. Based on the results of a total petroleum hydrocarbon analysis (Infrared method), the levels of hydrocarbon were 15,000 mg/liter, indicating that a hot spot had been excavated from the stockpile. The tank was seeded with an inoculum of the PCP consortium to achieve approximately 10^7 cells/ml of slurry on day 0. During the first 5 days of operation, the aqueous PCP levels were reduced by about 40% (**Figure 11**). However, PCP concentrations on the soil increased threefold, correlated with the loss of solvent from the system. Apparently the solvents serve as a reservoir for PCP that partitions onto the soil particles as the solvent is stripped from the system. Subsequently the PCP on the soil particles was observed to undergo biodegradation. The rates of PCP degradation in this system are much slower than those observed in Tanks 1 and 2. The total treatment time required to achieve the target cleanup level of 0.5 mg/kg was 30 days.

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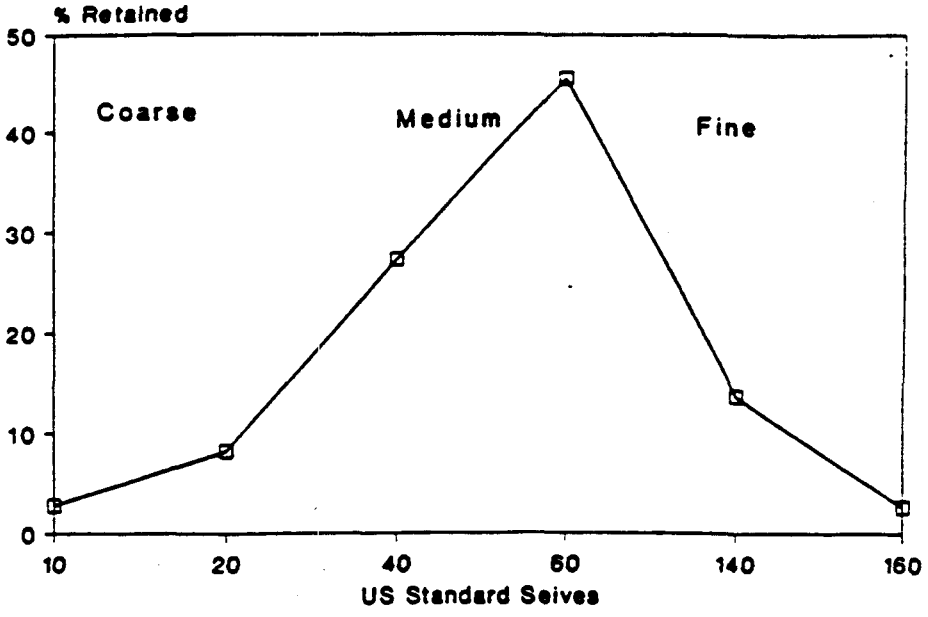
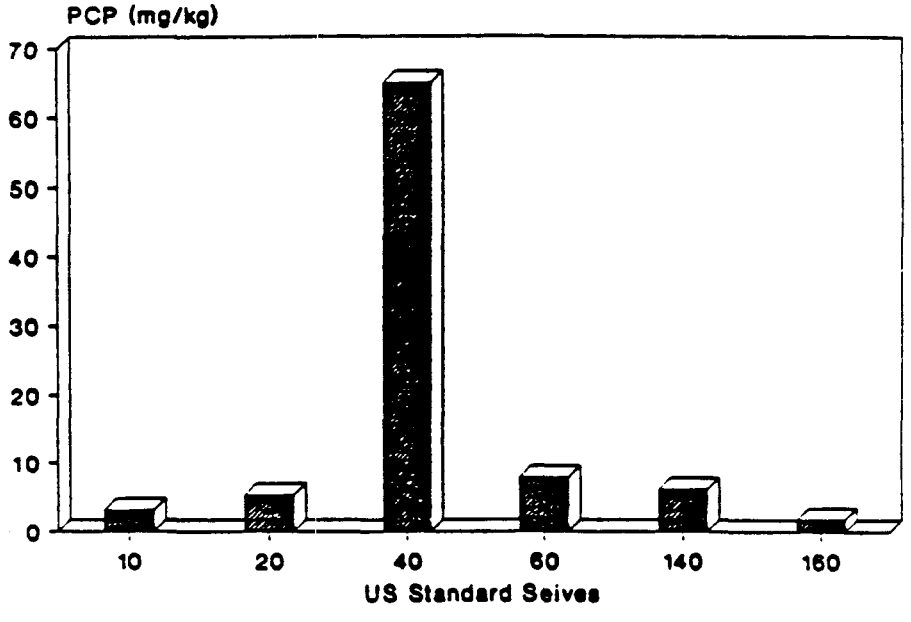
Figure 7. Results of the treatability evaluations to obtain particle size analysis and the distribution of pentachlorophenol in contaminated site soils.





mg/kg. A maximum of 30 cubic yards of soil can be processed daily yielding roughly 900 cubic yards per month. Roughly 80% of this soil volume or 720 cubic yards of clean soil can be discharged directly to a disposal pit without further processing. The remaining 180 cubic yards

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Figure 9. Field data from Tank 1 operations for the bioslurry treatment of solutions generated during soil washing. The system was inoculated with the PCP degrading consortium at time zero to yield approximately 10^7 cells/ml of slurry.

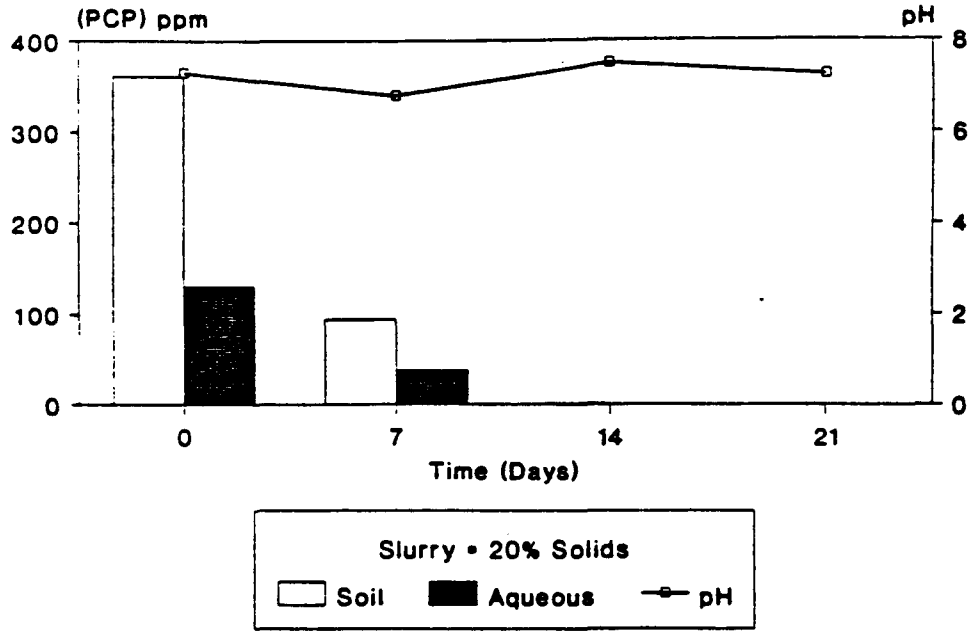
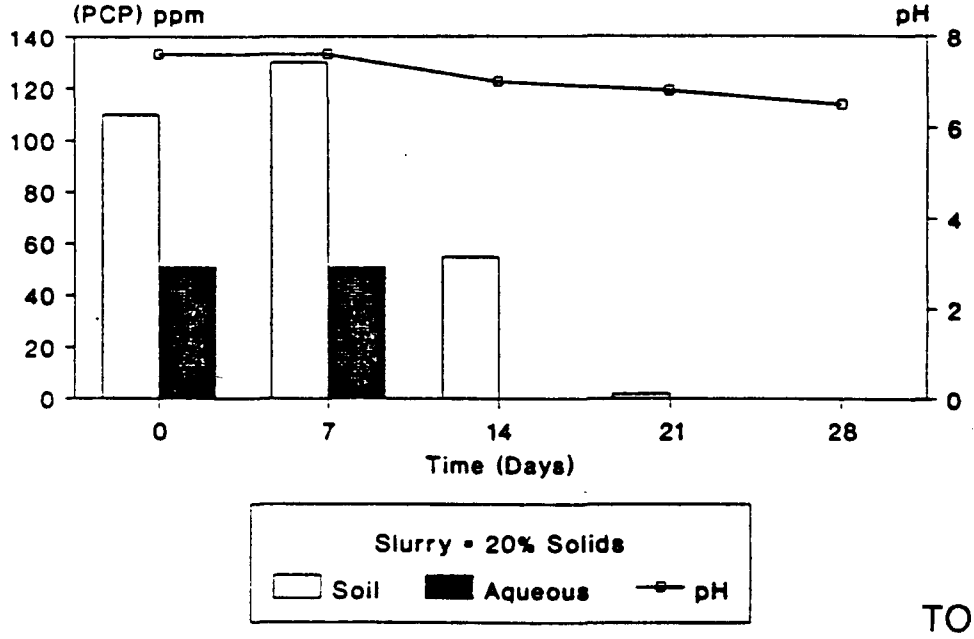


Figure 10. Field data from Tank 2 operations for the bioslurry treatment of solutions generated during soil washing. The system was inoculated with the PCP degrading consortium on day 7 to yield approximately 10^7 cells/ml of slurry.



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of research can there be efficient transfer of new technology to the field of hazardous waste remediation. ■

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ACKNOWLEDGEMENTS

Special thanks to Robert Sanford for his ingenuity in implementing the concept of pH-controlled feeding for the bench scale bioreactor studies. In addition Joanne Chee, Jan Marshall-Knoll, and Kathy Hill have been instrumental in operating and maintaining the PCP bioreactor for well near two years of continuous operation. This has enabled us to develop further our understanding of the microbial consortium. Many thanks to Mark Anderson and John Hancock for the engineering design and Jay Kraft, Dan Schweigel, and Jim Borthen for all their hard work with on-site operations.

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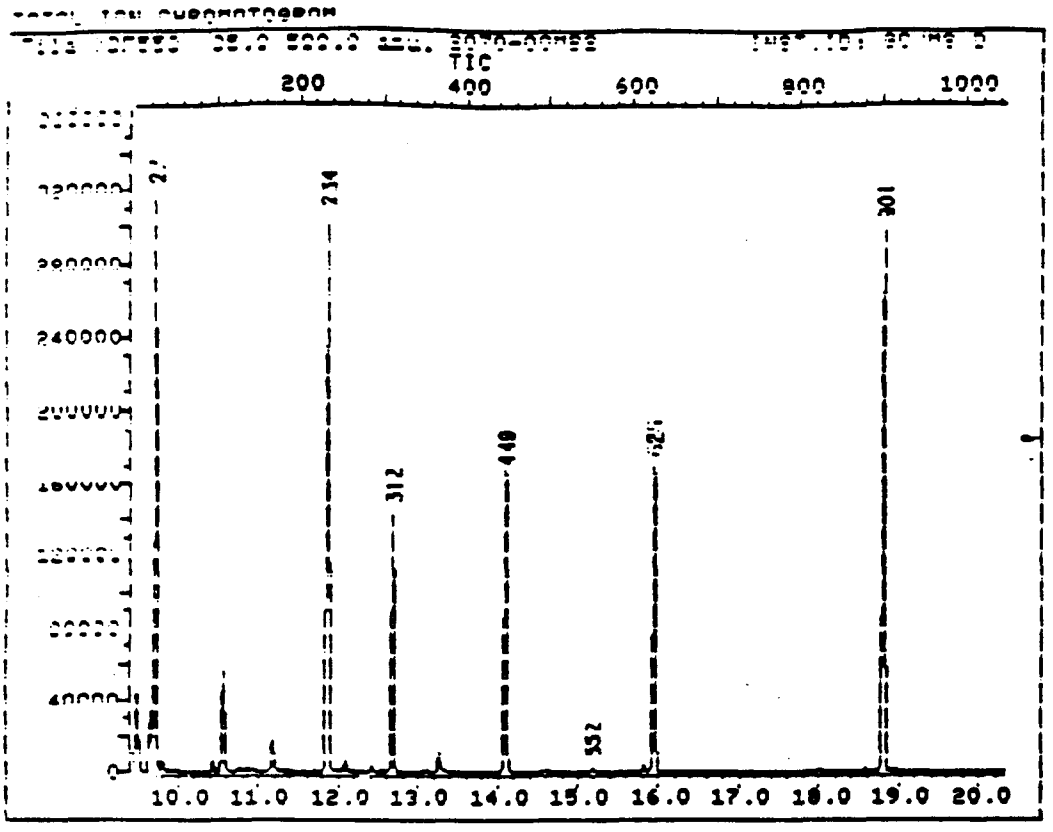

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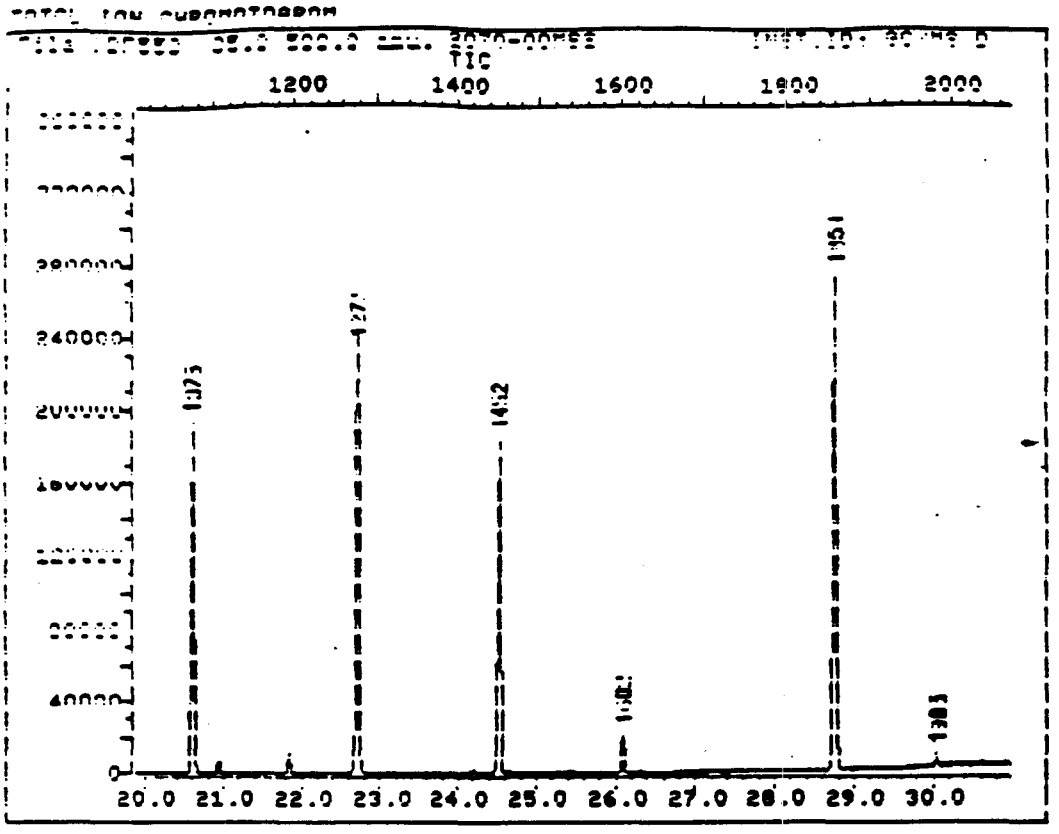

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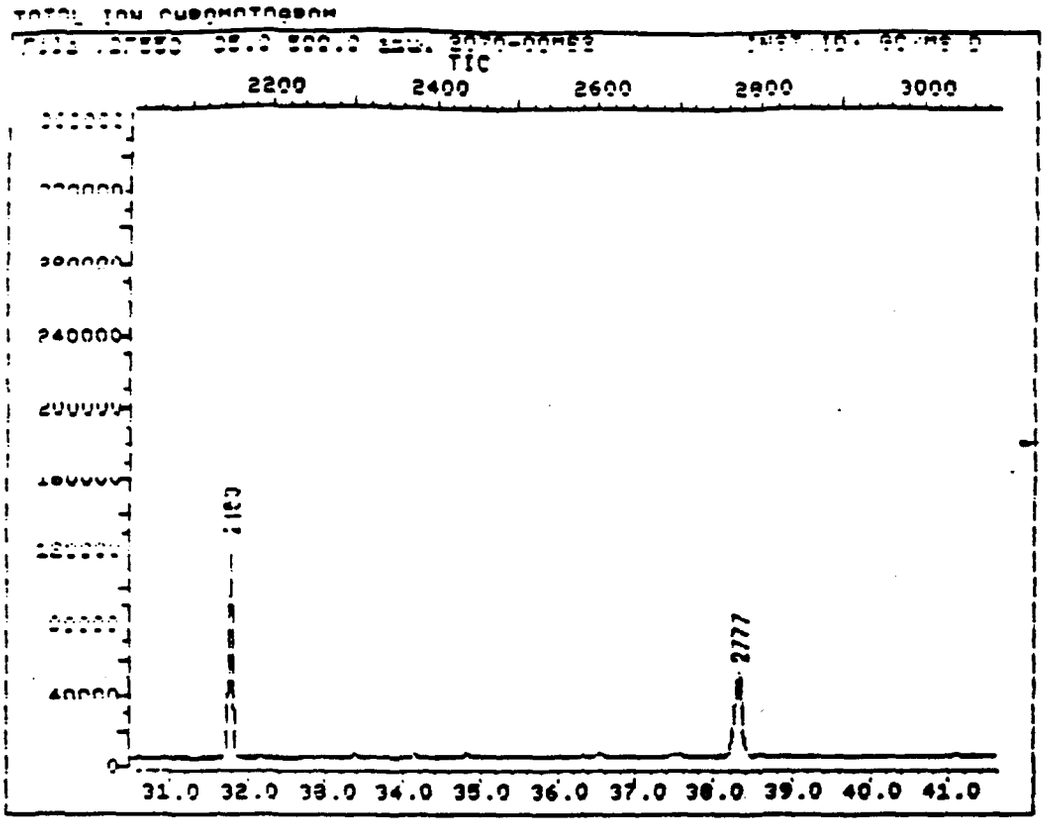

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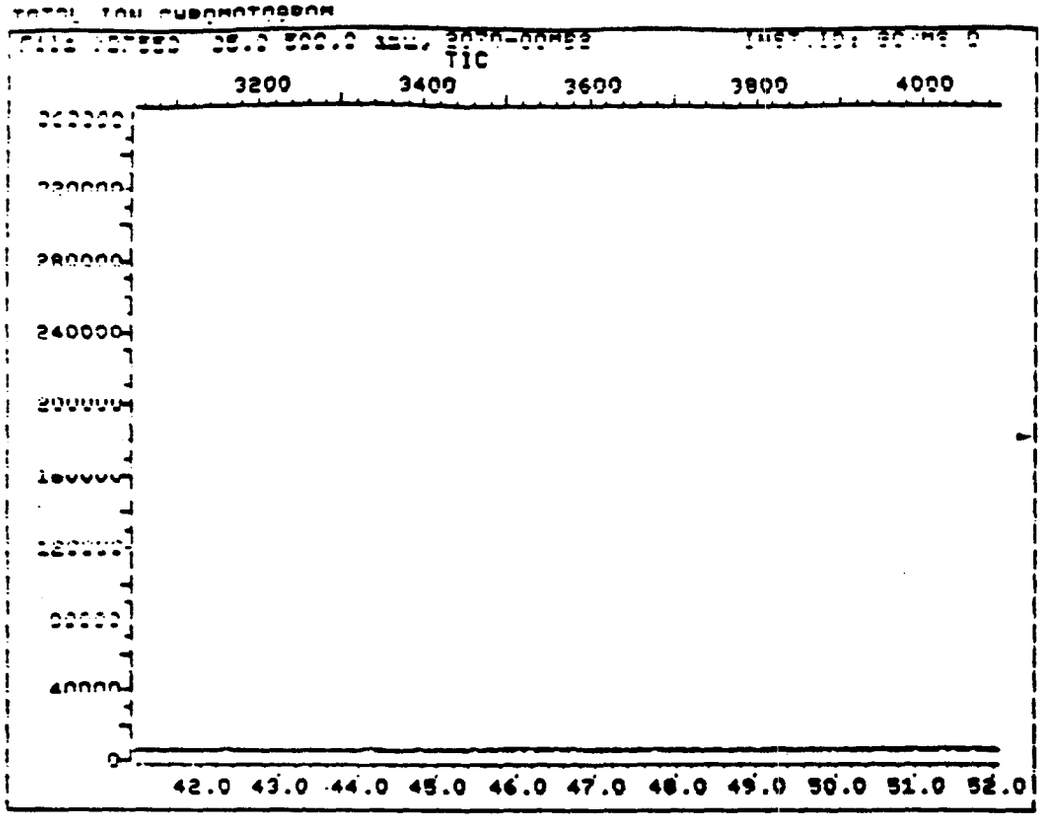

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3)	CS45	Phenol-d5	99.0	234	227723	137.55	UG/mL	99
16)	*C140	Naphthalene-d8	136.0	625	177839	40.00	UG/mL	86
17)	CS20	Nitrobenzene-d5	82.0	449	122637	63.73	UG/mL	96
22)	C430	Benzoic acid	122.0	552	1113	1.19	UG/mL	79
31)	*C150	Acenaphthene-d10	164.0	1075	109052	40.00	UG/mL	97
32)	CS25	2-Fluorobiphenyl	172.0	901	218194	59.52	UG/mL	94
33)	CS55	2,4,6-Tribromophenol	330.0	1277	76944	134.12	UG/mL	77
52)	*C160	Phenanthrene-d10	188.0	1452	198898	40.00	UG/mL	84
60)	C650	Di-n-butylphthalate	149.0	1602	25952	3.93	UG/mL	83
[illegible])	*C170	Chrysene-d12	240.0	2150	129370	40.00	UG/mL	92
	CS30	Terphenyl-d14	244.0	1859	282505	64.79	UG/mL	91
[illegible]	C720	Butylbenzylphthalate	149.0	1983	4591	1.69	UG/mL	95
[illegible])	C735	bis(2-Ethylhexyl)phthala	149.0	2150	6215	1.86	UG/mL	92
70)	*C175	Perylene-d12	264.0	2777	107816	40.00	UG/mL	93

* Compound is ISTD

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SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

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Sample wt/vol: 30g Percent Moisture: 24
Date Extracted: 10/09/89
Date Analyzed: 10/10/89

Lab Sample: 2081-01MS
Customer Sample: T1-3-926-15MS
Sample Description: Sand from Bottom of Pile
Date Collected: 09/26/89
Time Collected: NA
Date Received: 10/06/89
Data Release Authorized:

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120-83-2	2,4-Dichlorophenol	440	U
59-50-7	4-Chloro-3-methylphenol	5800	*
88-06-2	2,4,6-Trichlorophenol	440	U
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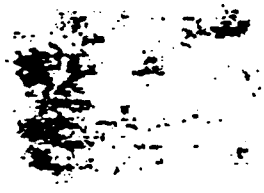

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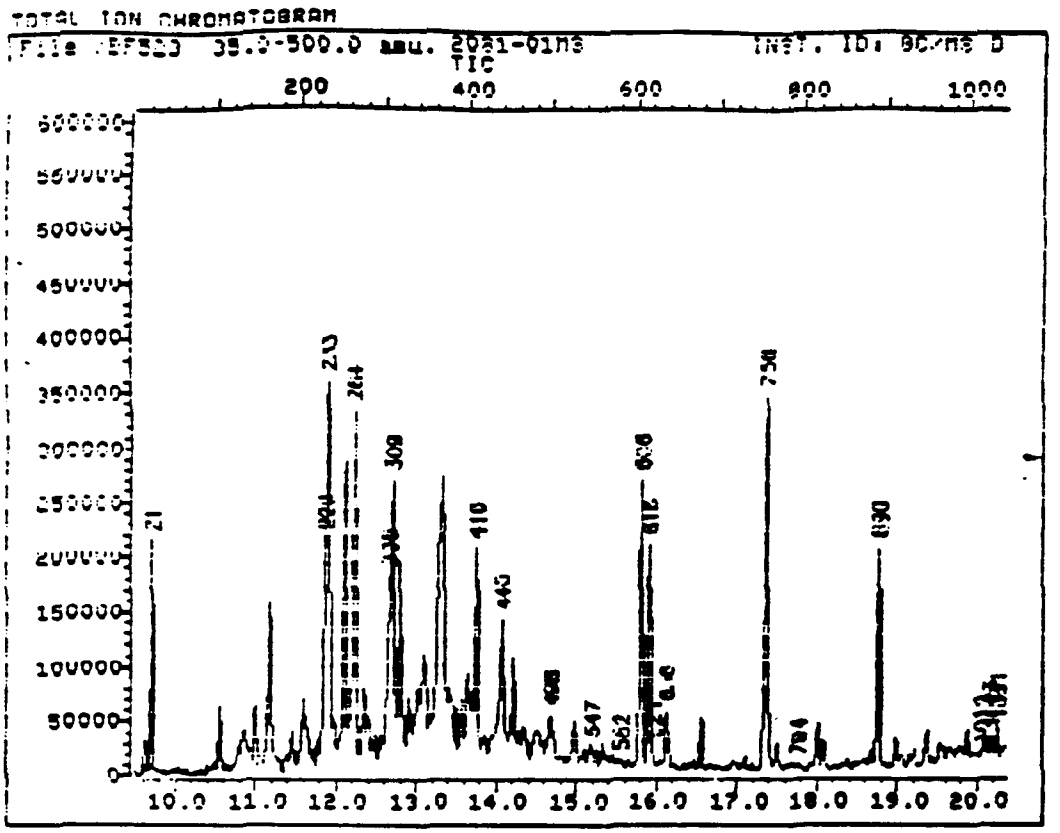

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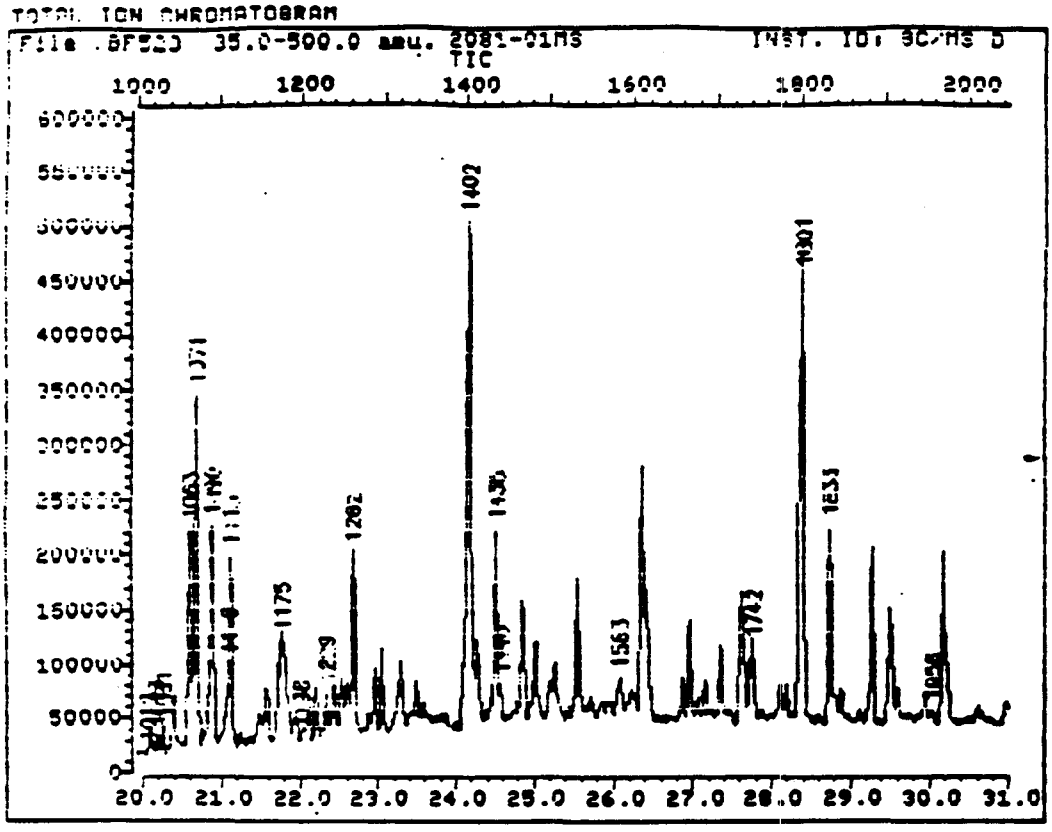

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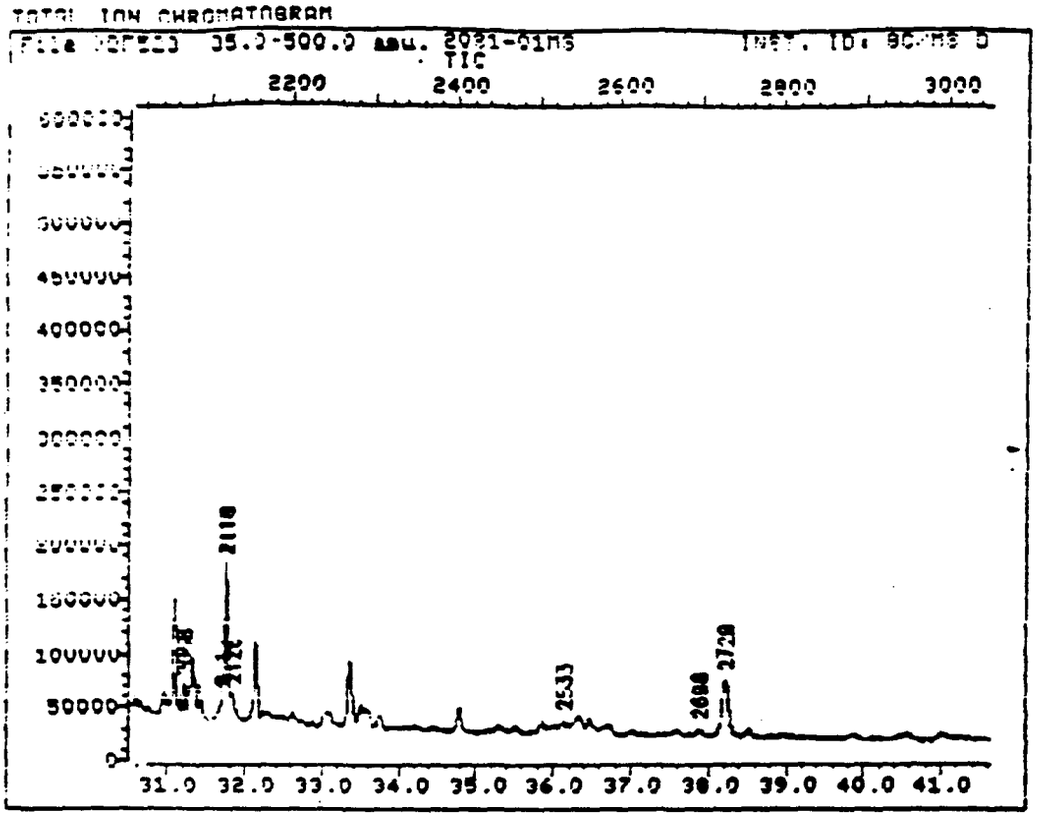

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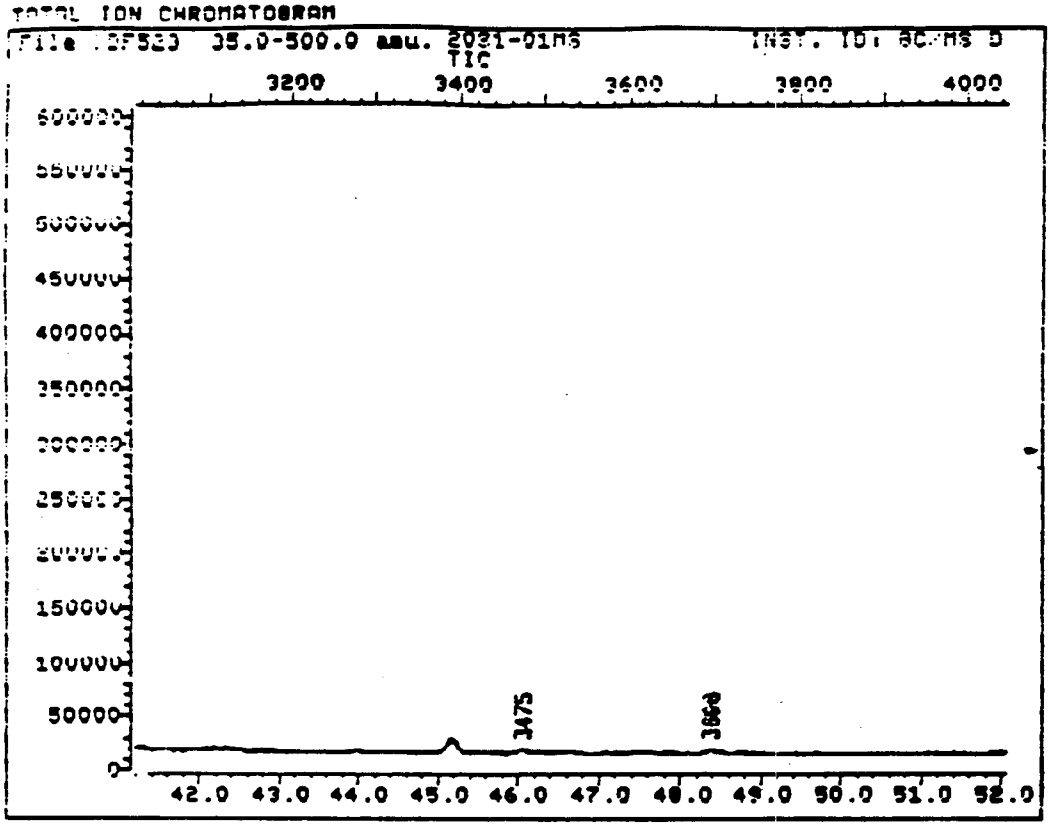

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3)	CS45	Phenol-d5	99.0	229	141662	78.71	UG/mL	96
4)	C315	Phenol	94.0	233	246052	108.04	UG/mL	95
6)	C330	2-Chlorophenol	128.0	264	213802	120.78	UG/mL	87
8)	C340	1,4-Dichlorobenzene	146.0	309	118664	65.12	UG/mL	99
14)	C370	N-Nitroso-di-n-propylami	70.0	410	82322	57.52	UG/mL	85
16)	*C140	Naphthalene-d8	136.0	616	188195	40.00	UG/mL	84
17)	CS20	Nitrobenzene-d5	82.0	440	76117	39.51	UG/mL	90
22)	C430	Benzoic acid	122.0	547	3264	3.59	UG/mL	88
3)	C445	1,2,4-Trichlorobenzene	180.0	606	131636	77.66	UG/mL	95
	C465	4-Chloro-3-methylphenol	107.0	756	203014	132.64	UG/mL	74
)	*C150	Acenaphthene-d10	164.0	1063	119386	40.00	UG/mL	98
2)	CS25	2-Fluorobiphenyl	172.0	890	161688	40.84	UG/mL	94
33)	CS55	2,4,6-Tribromophenol	330.0	1262	64355	81.15	UG/mL	69
42)	C550	Acenaphthene	153.0	1071	243074	65.68	UG/mL	97
44)	C560	4-Nitrophenol	109.0	1090	61829	144.05	UG/mL	78
46)	C570	2,4-Dinitrotoluene	165.0	1113	113870	91.96	UG/mL	66
47)	C543	2,6-Dinitrotoluene	165.0	1016	4231M	4.14	UG/mL	69
52)	*C160	Phenanthrene-d10	188.0	1435	207382	40.00	UG/mL	80
57)	C635	Pentachlorophenol	266.0	1402	184074	222.83	UG/mL	97
58)	C640	Phenanthrene	178.0	1440	36729	6.59	UG/mL	94
60)	C650	Di-n-butylphthalate	149.0	1583	34737	5.07	UG/mL	84
61)	C655	Fluoranthene	202.0	1742	59826	10.10	UG/mL	92
62)	*C170	Chrysene-d12	240.0	2118	147498	40.00	UG/mL	90
63)	CS30	Terphenyl-d14	244.0	1833	191829	38.62	UG/mL	87
64)	C715	Pyrene	202.0	1801	461362	66.66	UG/mL	91
67)	C730	Benzo(a)anthracene	228.0	2113	12757	2.43	UG/mL	84
68)	C735	bis(2-Ethylhexyl)phthala	149.0	2119	20264	5.35	UG/mL	94
69)	C740	Chrysene	228.0	2126	21138	4.26	UG/mL	88
70)	*C175	Perylene-d12	264.0	2729	122579	40.00	UG/mL	91
72)	C765	Benzo(b)fluoranthene	252.0	2533	14592	3.28	UG/mL	83
73)	C770	Benzo(k)fluoranthene	252.0	2540	11717M	3.34	UG/mL	83
74)	C775	Benzo(a)pyrene	252.0	2698	11758	3.16	UG/mL	77
75)	C780	Indeno(1,2,3-cd)pyrene	276.0	3475	9622	2.49	UG/mL	92
77)	C790	Benzo(g,h,i)perylene	276.0	3696	11087M	3.44	UG/mL	88

Compound is ISTD

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SEMI VOLATILE
ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Pacific Northwest Environmental Lab.
Project Number: 891005-10
Sample Matrix: Soil
Concentration: Low Dilution Factor: 1
Sample wt/vol: 30g Percent Moisture: 24
Date Extracted: 10/09/89
Date Analyzed: 10/10/89

Lab Sample: 2081-01MSD
Customer Sample: T1-3-926-15MSD
Sample Description: Sand from Bottom of Pile
Date Collected: 09/26/89
Time Collected: NA
Date Received: 10/06/89
Data Release Authorized:

C.A.S. Number		UG/KG	
95-57-8	2-Chlorophenol	4900	*
120-83-2	2,4-Dichlorophenol	440	U
59-50-7	4-Chloro-3-methylphenol	5700	*
88-06-2	2,4,6-Trichlorophenol	440	U
95-95-4	2,4,5-Trichlorophenol	2200	U
87-86-5	Pentachlorophenol	8900	*

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TOLS004138

BZTO104(e)040959

QUANT REPORT

.erator ID: SHERRI Quant Rev: 6 Quant Time: 891110 1H:5U
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Data File: >BF524::C1 Dilution Factor: 1.000000
Name: 2081-01MSD
Misc: INST. ID: GC/MS 0 BTL# 7

ID File: ID%FPA::5M
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891110 09:42

		Compound	Q ion	Scan#	Area	Conc	Units	q
1)	*C130	1,4-Dichlorobenzene-d4	152.0	310	53631	40.00	UG/mL	94
2)	C550	2-Fluorophenol	112.0	27	120258	66.60	UG/mL	79
3)	C545	Phenol-d5	99.0	234	146065	72.41	UG/mL	94
4)	C515	Phenol	94.0	238	252411	98.88	UG/mL	97
6)	C330	2-Chlorophenol	128.0	269	220809	111.30	UG/mL	87
8)	C340	1,4-Dichlorobenzene	146.0	314	119277	58.40	UG/mL	98
14)	C370	N-Nitroso-di-n-propylami	70.0	415	92211	57.49	UG/mL	88
16)	*C140	Naphthalene-d8	136.0	622	211616	40.00	UG/mL	85
17)	C520	Nitrobenzene-d5	82.0	445	76295	35.22	UG/mL	91
72)	C430	Benzoic acid	122.0	553	5519	5.59	UG/mL	95
5)	C445	1,2,4-Trichlorobenzene	180.0	611	137508	72.15	UG/mL	97
	C465	4-Chloro-3-methylphenol	107.0	761	223170	129.68	UG/mL	73
1)	*C150	Acenaphthene-d10	164.0	1069	134195	40.00	UG/mL	99
)	C525	2-Fluorobiphenyl	172.0	895	171181	38.47	UG/mL	95
1)	C555	2,4,6-Tribromophenol	330.0	1268	69113	77.53	UG/mL	73
42)	C550	Acenaphthene	153.0	1077	264178	63.50	UG/mL	97
44)	C560	4-Nitrophenol	109.0	1096	68248	141.46	UG/mL	81
46)	C570	2,4-Dinitrotoluene	165.0	1119	122482	87.99	UG/mL	69
47)	C543	2,6-Dinitrotoluene	165.0	1018	3724M	3.24	UG/mL	71
52)	*C160	Phenanthrene-d10	188.0	1440	226756	40.00	UG/mL	79
57)	C635	Pentachlorophenol	266.0	1408	184277	204.04	UG/mL	96
60)	C650	Di-n-butylphthalate	149.0	1588	19092	2.55	UG/mL	85
61)	C655	Fluoranthene	202.0	1748	7774	1.20	UG/mL	92
62)	*C170	Chrysene-d12	240.0	2125	149091	40.00	UG/mL	93
63)	C530	Terphenyl-d14	244.0	1839	184987	36.84	UG/mL	87
64)	C715	Pyrene	202.0	1806	416801	59.58	UG/mL	91
68)	C735	bis(2-[illegible]hexyl)phthala	149.0	2125	25750	6.72	UG/mL	93
70)	*C175	Peryl[illegible]12	264.0	2736	123495	40.00	UG/mL	91

* Compound is IST[illegible]

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TOLS004140

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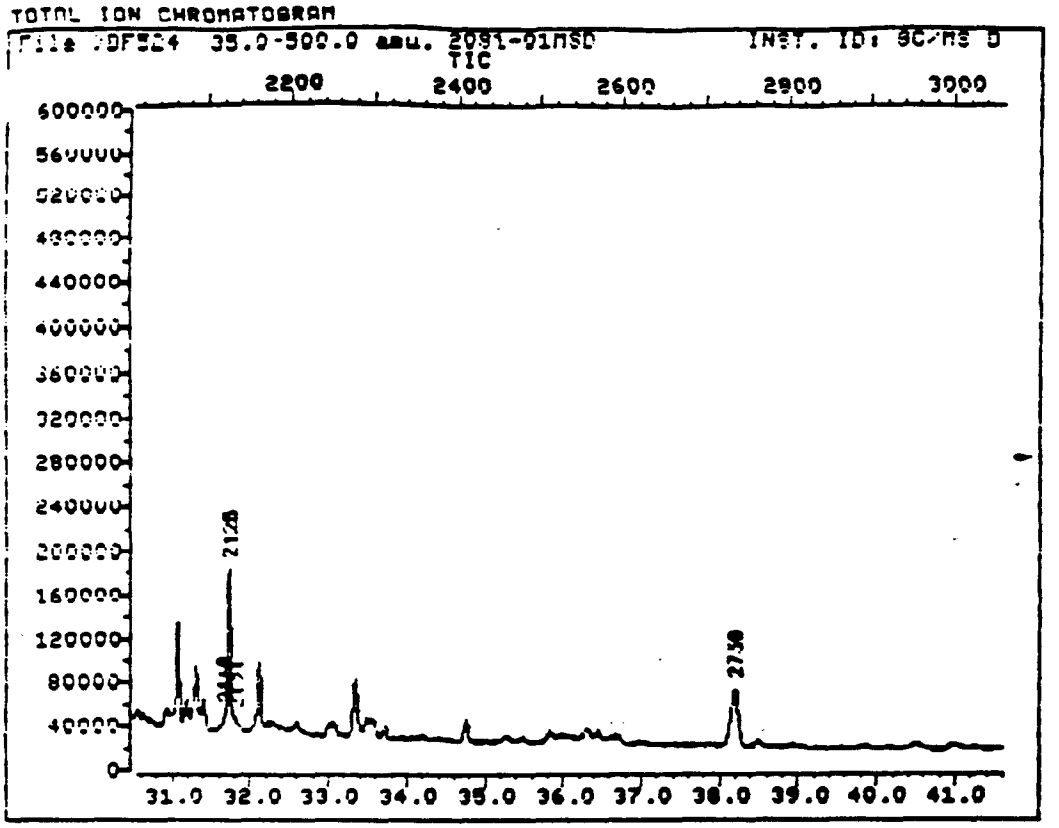

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Id File: ID2EPA::GM
Title: DAILY CALIBRATION STANDARD
Last Calibration: 891010 09:42

Operator ID: SHERRI
Quant Time: 891010 18:50
Injected at: 891010 17:54

TIC page 3 of

TOLS004141

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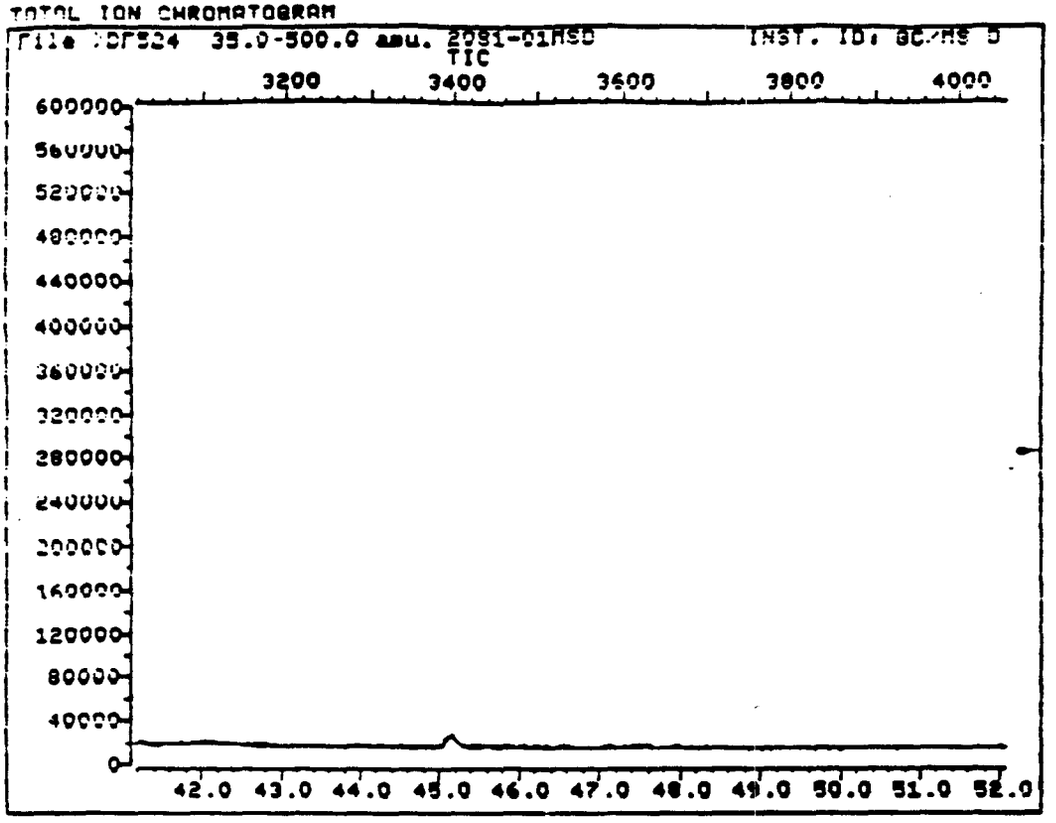
TOTAL ION CHROMATOGRAM



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Id File: ID2EPA::GM
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Last Calibration: 891010 09:42

Operator ID: SHERRI
Quant Time: 891010 18:50
Injected at: 891010 17:54

TIC page 4

TOLS004142

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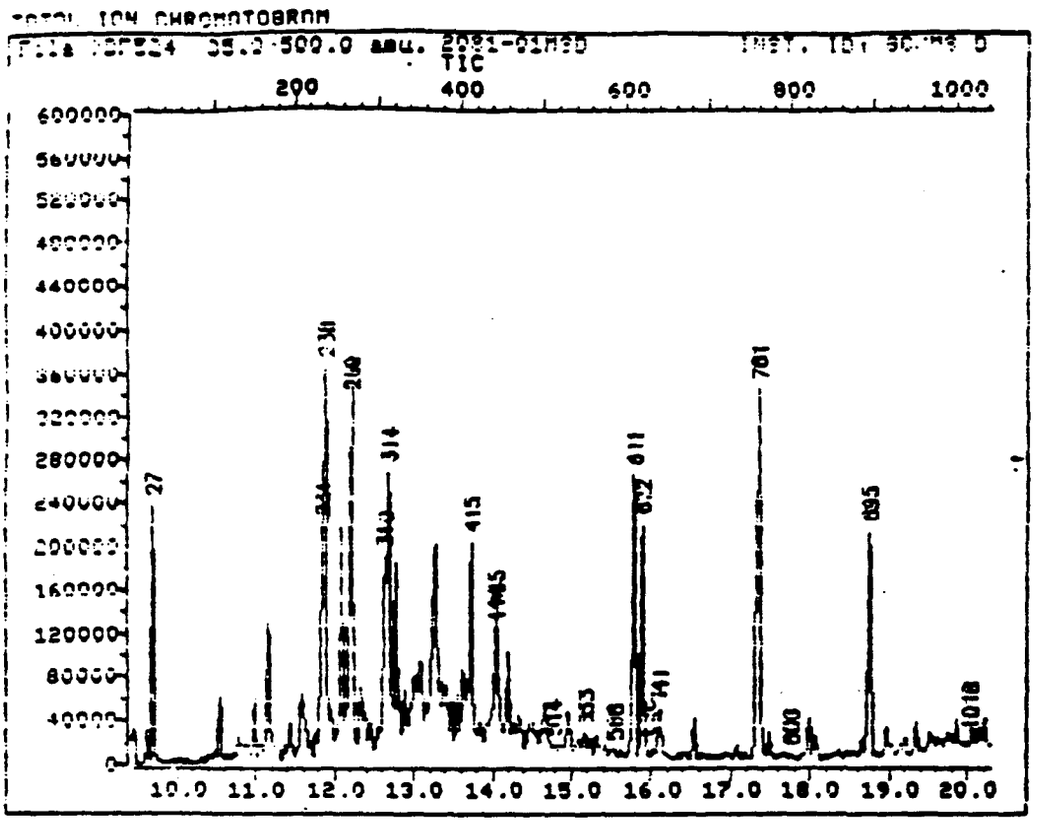

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Operator ID: SHERRI
Quant Time: 891010 18:50
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TIC page 1 of 4

TOLS004143

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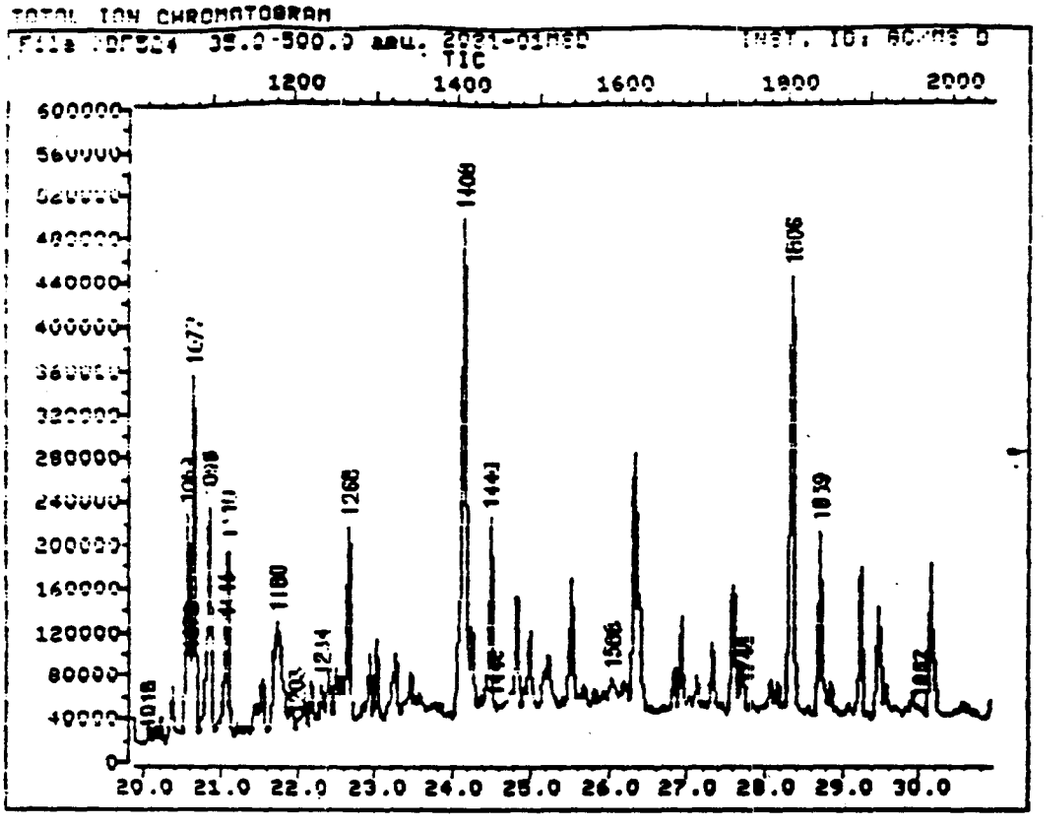
TOTAL ION CHROMATOGRAM



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Last Calibration: 891010 09:42

Operator ID: SHERRI
Quant Time: 891010 18:50
Injected at: 891010 17:54

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Time 2 N

PHONE 285 2400
CABLE ADDRESS TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
LOS ANGELES

TIME OIL COMPANY

2737 WEST COMMODORE WAY
P.O. BOX 24447, TERMINAL STATION

SEATTLE, WASHINGTON 98199-1233
SEATTLE, WASHINGTON 98124-0447

JAN 23 1987

January 14, 1987

Koppers Company Inc.
Attn: J. Sebbens
Koppers Building
Pittsburg, PA 15219

Dear Mr. Sebbens:

Enclosed is copy of the latest (October 1, 1986) update regarding Time/Koppers voluntary efforts to clean up the pentachlorophenol contamination at our Northwest Terminal in Portland, Oregon. The purpose of this paper, in addition to serving as an update for Koppers, is to have data documented by a third party which is suitable to gain approval from necessary regulatory agencies for acceptable remedial actions as next step accomplishment.

Also enclosed is copy of December 19, 1986 proposal and cost estimate by SRH for performance of bench scale evaluations of recommended "soil washing" technique. Request your comments on this matter as soon as possible.

Sincerely,

John P. Denham

John P. Denham
Environmental Manager

Enclosures a/s

JPD/ch

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PENTACHLOROPHENOL

CONTAMINATION

NORTHWEST TERMINAL

TOLS004146

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PENTACHLOROPHENOL

CONTAMINATION

AT

TIME OIL COMPANY

NORTHWEST TERMINAL

12005 NORTH BURGARD ROAD

PORTLAND, OREGON

OCTOBER 1, 1986

PREPARED FOR:

TIME OIL COMPANY
2737 WEST COMMODORE WAY
SEATTLE, WASHINGTON

PREPARED BY:

SRH ASSOCIATES, INC.
123 N.E. THIRD AVENUE, SUITE 230
PORTLAND, OREGON 97232
(503) 232-0824

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EXECUTIVE SUMMARY

On March 1, 1967, Time Oil Co. and Koppers Company entered into an agreement wherein Time would provide certain labor and services connected with the receipt, storage, handling and blending of specified woodtreating products, including pentachlorophenol. All products were owned by Koppers. The site selected for this activity included a warehouse and tank farm on a small (70' x 70') portion of Time's 45 acre Northwest Terminal located at 12005 North Burgard Road in Portland, OR.

The operation started up and continued routinely until January 28, 1981. Time then advised Koppers of its election to terminate the project effective March 31, 1982, the scheduled agreement expiration date. Various in-house inspections had indicated the possibility of soil contamination. Subsequent bioassay tests confirmed the existence of pentachlorophenol in the soil adjacent to the warehouse. Both companies concurred to close the site. Operations ceased. Orderly phase out actions were established and begun.

It is noteworthy that this entire closure effort was jointly planned and undertaken by the two companies to voluntarily correct what both felt may become a future problem.

By February 1985, on hand product inventory had been blended off and shipped out. All tanks and piping had been cleaned, with cleaning wastes being shipped to Arlington. Piping and tanks had been disassembled, removed and scrapped. In short, the site was cleared to ground level.

Soil clean-up began. Following coordination with the DEQ, the Arlington landfill and local contractors, some 242 tons of soil were shipped to Arlington. A sampling matrix was prepared and more than 150 soil samples were collected and analyzed for PCP. Concentration isopleths were generated, which depicted remaining contamination locations and degrees of contamination, the highest of which was 116,000 ppm. Isopleths showed site size had now expanded to about 70' x 140' in area. The concrete wall along the western edge of the site was removed, decontaminated and disposed of to facilitate removal of this newly discovered increased area of soil contamination. To aid in reducing the physical size of this newly defined area, the extremities of site soil were centralized to the one spot having the highest known contaminant concentration. Soil relocation actions were based on previously plotted contour determinations. They were successful in that the area was reduced to about 60' x 60'.

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At the end of 1985, the EPA advised Time that soil contaminated with leaked PCP had been reclassified as hazardous waste (number F027) and that there were currently no hazardous waste facilities in the U.S. that would accept this waste.

Pending resolution of EPA/DEQ acceptable disposal methods for PCP contaminated soil, efforts were directed toward the determination of possible groundwater contamination. Fourteen wells were installed and developed during 1986. Two were subsequently closed due to inefficient operation. Remaining wells have been repeatedly sampled and those samples analyzed for PCP. Concentrations have not exceeded .044 ppm at the highest reading. While well water analysis is scheduled to continue quarterly until the project is completed, to ensure no groundwater migration goes undetected, there appears to be no real groundwater problem.

Since there was no regulatory relief in sight, which would permit off-site disposal of PCP contaminated soil, Time initiated an assessment of on-site remedial alternatives. Recommended actions are:

a. Select the "Surface Mounted Soil Washing" technique as the most logical remedial approach.

b. Perform bench scale and pilot level evaluations.

c. Determine necessary destruction steps of recovered extracts.

d. Ascertain technical permitting and economic feasibility of technique for final disposal action.

e. Compare results with repeat step by step examination of next most logical remedial approaches which are: "Surface Mounted Thermal Extraction" and "In-Situ Thermal Extraction".

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SECTION I

HISTORY

Section I provides a sequential summary of those activities relating to pentachlorophenol (PCP) operations within the Time Oil Company Northwest Terminal located at 12005 North Burgard Road in Portland, Oregon. The information was gathered from Time Oil files at the firm's Seattle headquarters. Data was extracted from reports, memos and other correspondence from Time employees, the Oregon Department of Environmental Quality (DEQ), the US Environmental Protection Agency (EPA) and private consultants.

BACKGROUND

Agreement with Koppers Company, Inc. (1967-1982)

On March 1, 1967, Time Oil Company reached an agreement with the Koppers Company, whereby Time would provide the storage, handling and distribution of Koppers owned specialty woodtreating chemicals, including PCP. The operating area included a warehouse building and an adjacent tank farm area (about 70' x 70') with an earthern surface. This small site was to become known collectively as the woodtreating chemicals area. Early in 1981, Time notified Koppers of their intent to terminate the agreement on March 31, 1982. Time and Koppers jointly agreed to immediately cease all PCP operations at the site, to remove all products, to clean all tanks and pipelines, to remove and dispose of all tanks and pipelines, to effect clean up of whatever contamination existed and to do it all within existing regulatory guidelines.

Various Site Inspections (1971-1984)

A summary of in-house site inspections, over the ten year period (1971-1981), identified the following problems related to the PCP operation.

- No spill control system in warehouse. Spilled liquid was able to run unrestricted through the warehouse area and drain out through doors. Sloping of the warehouse floor and installation of drains was recommended.

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- o Floor of warehouse work area caked with product. Steam cleaning recommended.

- o No warning signs were posted which call attention to hazards in the area where PCP was stored and mixed.

- o Ground near end of pipelines saturated with product to a depth of 12 inches.

During February 1983, Time contracted with the AM-Test Corporation to conduct a fish bioassay test on the site soil. Analysis resulted in a finding of the soil (only) being toxic at the 100 and 1000 ppm levels.

On a subject matter completely unrelated to the pentachlorophenol operation and Time/Koppers planned actions, the DEQ conducted an inspection of the entire Northwest Terminal facility on October 25, 1984. On that date, the DEQ advised their intent to collect soil samples throughout the facility. It is because of this latter DEQ advisory that the following soil test results are included since two samples were taken from the woodtreating chemicals area.

On December 12, 1984, DEQ personnel collected twelve soil samples from the entire facility. Splits of each sample were provided to Time. DEQ analytical results were received by Time on January 24, 1985. The DEQ samples were analyzed for EPA Priority Pollutants and for other substances identifiable through GC/MS scan, with a specific interest in lead content. No samples were found to have lead concentrations above the detection limit. The samples were also analyzed for fourteen pesticides, but no concentrations above the detection limit were found. Non-priority GC/MS scans indicated the presence of low concentrations of petroleum hydrocarbons in three of the twelve samples. In the analysis for EPA Priority Pollutants, ten of twelve samples were found to contain either no concentrations of any organics above the detection limit, or only trace amounts of polynuclear aromatics. One sample, taken from the woodtreating chemicals tank farm, contained 515 ppm of PCP and 12 ppm of tetrachlorophenol (TCP). The second sample from this area contained 1820 ppm of PCP and 71 ppm of TCP.

Sample splits, which had been provided to Time, were then submitted to Coffey Laboratories for analysis in order to confirm DEQ findings. Results of these analyses were received on March 15, 1986 and showed no PCP concentrations higher than 275 ppm. No pentachlorophenol was detected in any sample outside of the woodtreating chemicals area.

INITIAL CLEAN UP EFFORTS

Proposal for Removal of Contaminated Soil (1983)

In October of 1983, pending completion of site tank and pipeline

physical removal, plans were made to excavate and dispose of soil to a depth below that where PCP contamination was found to exist. This was to be a three phase effort, fully coordinated with the DEQ and the disposal facility. Phase I consisted of initial soil removal and its transport to an authorized disposal facility. Phase II involved a thorough investigation to determine the extent of PCP contamination and its degree of concentration. Phase III was to remove and dispose of any remaining soil which was detected, by laboratory analysis, to be contaminated above acceptable limits.

On November 1, 1983, a delay in Phase I of the planned removal occurred because ownership of the hazardous waste facility at Arlington changed and some period of time was needed for the new management to reach full operational status. Further, an agreement from the new owners (Chemical Waste Management) to accept the soil at Arlington prior to any excavation was absolutely essential to ensure that Time did not become classified as a hazardous waste storage facility.

Removal and Disposal of Contaminated Soil (February - June, 1985)

On February 4, 1985, Time reiterated to the DEQ, its intent to excavate PCP-contaminated soil and dispose of it at an approved disposal facility. On February 19, Time executed a contract with Northwest Vacuum Truck Service, Inc. for removal and transport of the contaminated soil. On May 14, the DEQ granted approval for disposal of the PCP-contaminated soil at the Arlington landfill. On June 24, an agreement covering disposal was reached with Chem-Security Systems, Inc., operator of the Arlington facility.

Between June 25 and June 28, 1985, 288 cubic yards (242.76 tons) of soil were removed and shipped to Arlington. The soil was excavated to a depth of 2 to 4 feet below grade in the northwest corner of the woodtreating chemicals tank farm.

Soil Sampling (June - July, 1985)

On June 28, 1985, following completion of contaminated soil excavation, Time retained Riedel Environmental Services to perform sampling and analysis of the remaining soil. Samples of surface soils were initially collected from 22 locations around the perimeter of the woodtreating chemicals tank farm area. Three composite samples were formed and analyzed, showing PCP concentrations of up to 860 ppm. Samples of the soil from 81 individual sample sites surrounding the woodtreating tank farm area were then collected and analyzed for PCP. The results indicated that the contamination was localized to the west and south of the warehouse with little or no contamination occurring to the east of the site.

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Soil was then collected from fourteen locations at depths of 0, 2, 4, 7 and 12 feet below the surface on a triangular grid across the tank farm area. Samples were taken by the split spoon technique using a hollow stem auger drill rig, and analyses were performed in accordance with EPA procedure #8040 (SW-846). Contaminant contour maps were developed from the data which showed a maximum PCP concentration of 26,500 ppm at the surface in the area where the loading of trucks had occurred. This finding of soil contamination caused an increase of the site size to about 70' x 140'. A second focus of contamination was at the southwest corner of the warehouse. The vertical column of contamination at the second location extended to the lowest sampling interval (12-14 feet below the surface), which was noted as being in the saturated zone at the time of sampling. The highest concentration at this depth was 2,030 ppm.

The two focal points of contamination are indicated on the surface contour isopleth map generated by Riedel and presented as Figure I-1 of this report. Figure I-2 indicates the 12 foot contaminant isopleth. (Note: the southwest corner of the warehouse is indicated by the reference mark at coordinates (76,166)).

600 ppm Chlorophenol Toxicity Level Interpretation (June, 1985)

On June 28, 1985, Time received a letter from the DEQ laboratory, concerning previous interpretations by the agency, that 600 ppm of total chlorophenols in soil represented the hazardous waste threshold. This conclusion was based on extraction and bio-toxicity tests peformed by DEQ. The letter stated, however, that this was only used as guidance and did not necessarily reflect specific clean up requirements.

Removal of Concrete Wall (November, 1985)

Time retained Riedel Environmental Services in November, 1985 to remove and decontaminate a concrete wall which stood along the west perimeter of the woodtreating chemicals tank farm area. The intent of the removal of the wall was to allow for easy sample analysis, contaminant containment and future removal of the contaminated soil adjacent to the wall. This project included wall steam cleaning, subsequent testing of the wall for residual PCP and wall demolition following certification of decontamination to background levels of PCP. The wall was broken into pieces by Riedel and disposed of by Time.

Classification of Contaminated Soil as Hazardous Waste (December, 1985)

On December 10, 1985, the EPA Region X office advised Time that soil contaminated with leaked PCP had been reclassified (from U242)

to a hazardous waste bearing number F027. Referring to a moratorium on landfilling of such wastes, the EPA letter stated that at that time there were "no commercial hazardous waste facilities in the United States that would accept waste designated as F027." EPA also suggested that Time consult with the DEQ before continuing with clean-up operations at the site.

Wells 1, 2, 3 and 4 Installation (November, 1985)

Pending resolution of acceptable disposal techniques for contaminated soil containing PCP, Time concentrated on determination of possible groundwater contamination.

In November, 1985, Time again retained Riedel Environmental Services to install four groundwater monitoring wells near the southwest corner of the warehouse building. Wells 1, 2 and 3 were placed in 16-inch (O.D.) 45° slant borings which penetrated soil beneath the building to a vertical depth of 14 feet. Well 4 was installed in a 16-inch (O.D.) vertical hole drilled to a depth of 50 feet. Samples for PCP analysis were taken to advance and further earlier analyses, particularly to determine if contamination existed beneath the woodtreating chemicals warehouse.

Samples from the slant borings indicated PCP concentrations as high as 116,000 ppm at 2.5 to 4 feet below the surface, with surface concentrations ranging from 65.3 to 1,690 ppm. The concentrations generally decreased with depth. The vertical boring (Well #4) showed concentrations descreasing with depth from 574 ppm at 18.5 to 20 feet below the soil surface to a low of 1.59 ppm at 43.5 to 45 feet below the surface. The conclusion of this report was that contamination exists below the southwest corner of the woodtreating warehouse floor, although the horizontal limits of contamination were not definable with the existing data.

Geologic logging of the soil at Well #4 indicated a minor layer of low permeability about 18 to 35 feet below the surface. The well was completed by installing 4-inch PVC well casing and screen to a depth of 40 feet in the 16-inch auger hole and sand packing the well annulus to within 6 feet of the surface. A well construction diagram is shown in Figure I-3. The geologic log of this boring is shown in Figure I-4. A well construction diagram of the slant borings is shown in Figure I-5.

Installation of Well Points (February - May, 1986)

In February, 1986, in order to identify groundwater flow direction and gradient beneath the Northwest Terminal facility, Time installed well points at three locations surrounding the woodtreating chemicals warehouse and tank farm area. Two of the wells (A and B) were installed to a depth of 20 feet. Two wells were installed at a depth of 8 feet at location C (see Figure I-6).

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Water level measurements were taken on nine occasions between February 28 and March 11 in Wells A, B, C_1, C_2 and 4. The data collected indicated an unexpectedly lower water level in well 4 as compared with the other well locations.

To further investigate this unusual circumstance, three additional well points, four observation pits and a river level reference point were installed by Time in late March, 1986. Wells E and F were driven to depths of 20 and 19 feet, respectively, while Well G was driven to a depth of 13 feet where advancement of the point was halted by cobbles. Well C_2 was removed, and Well C_1 was henceforth known simply as Well C. Water levels in Well 4 and Wells A-G were again measured repeatedly over a period of several days. The data confirmed earlier indications that a water table depression existed in the area of Well 4.

A detailed evaluation of the boring log data for Well 4 showed that a series of clay lenses and silty sands had been penetrated by the bore hole between the depths of 18.5 and 35 feet.

Gravelly sand lies above this zone and medium to fine sand predominates below it. The clay lenses appear to have formed a zone of relatively low permeability separating a perched upper water bearing zone from a lower aquifer. This zone of low permeability was apparently breached by the installation of Well 4. The boring was drilled with a 16-inch diameter auger while the well consisted of 4-inch PVC pipe. The annulus was filled with coarse sand, violating the integrity of the low permeability layer and providing a potential pathway for water from the upper perched water bearing zone to flow down the hole to the lower aquifer, creating a depression in the natural groundwater flow. This appeared to have altered the natural direction of groundwater flow (toward the Willamette River) within a zone of influence surrounding Well 4.

Although the observed water table depression could represent a strong, natural vertical gradient in the vicinity of Well 4, the influence of this well on adjacent wells indicated a strong probability of an induced groundwater sink caused by an unsealed annulus of Well 4. This conclusion was reached by Time upon evaluation of the piezometric surface of the perched water, which indicated that wells in close proximity to Well 4 were apparently influenced by Well 4, showing water level depressions, while wells distant from Well 4 were unaffected.

Additional Groundwater Monitoring Wells and Well 4 Abandonment (May, 1986)

At Time's direction, three additional groundwater monitoring wells (D, H and I) were installed by Riedel in early May, 1986. The purpose of these wells was to further define the upper piezometric surface and to obtain data on groundwater quality.

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In an effort to reinstate natural groundwater flow patterns in the area and to eliminate possible intercommunication between upper and lower water bearing zones, Well 4 was removed by overdrilling and the hole sealed on May 14, 1986. Prior to choosing this method of abandonment, Time evaluated several possibilities, including pressure grouting and two different overdrilling processes, with input from Hart Crowser and Associates, Century Environmental Sciences and Riedel.

Groundwater Sampling (April - May, 1986)

Time retained Century Environmental Sciences to perform groundwater sampling and analysis of the wells and well points at the Northwest Terminal facility. In April, 1986, Century measured static water levels in Well 4, in Wells A-C and Wells E-G. These measurements again showed that the water level in Well 4 was lower than in surrounding wells. Samples collected from each well were analyzed and .0061 ppm, .0026 ppm and .0014 ppm of PCP were detected in Wells 4, B and F, respectively.

On May 28, following abandonment of Well 4, a second group of groundwater samples were collected from Wells A, B, D, E, F, H and I. The locations of these wells is indicated in Figure 6. The analytical results showed PCP in a concentration just slightly above the detection level (.0002 ppm) in Well I. Other wells contained no detectable levels of PCP.

Additional Soil and Groundwater Sampling (August, 1986)

In August, 1986, Time retained SRH Associates to perform additional sampling and analysis of soil and groundwater at the Northwest Terminal facility. Based on previous contour map determinations, Time re-graded the surface of the woodtreating chemicals tank farm area, gathering all suspected contaminated surface soil in a centralized area, reducing the area to about 60' x 60'. SRH then collected surface soil samples from the same 14 locations in the tank farm area which had been sampled earlier by Riedel, drilled six holes through the warehouse floor and sampled soil from beneath the building. Samples were collected from the surface of the soil underlying the concrete floor of the warehouse as well as the same five subsurface intervals sampled by Riedel in 1985. These borings were made in an effort to determine the extent of contamination underlying the warehouse.

SRH also collected groundwater samples for PCP analysis and pH, and made measurements of static water levels from all monitoring wells in existence. The results of these analyses are supplied in Section III of this report.

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SUMMARY

During the duration of the agreement between Time and Koppers, pentachlorophenol and probably some tetrachlorophenol were released into the sandy soil adjacent to the woodtreating chemical warehouse. This material may have been released in combination with various hydrocarbon solvents used as a part of the process. The primary cause for these releases appears to have been intermittent spillage from hoses and mixing vessels during end product formulation and transfer operations, rather than a one-time spill event.

Upon investigation of these findings, Time and Koppers terminated their agreement, ceased all pentachlorophenol operations and began clean up operations at the site.

In investigating the extent of soil contamination, Time has obtained assistance from several consulting firms and clean up contractors, and has analyzed sufficient soil samples to determine the vertical and horizontal extent of contamination. The contamination is localized in the northwest corner of the woodtreating chemicals tank farm, with some slight penetration below the warehouse. An estimated 2,000 cubic yards of soil, a portion of which extends down to the first water bearing zone, is contaminated.

Time has installed an extensive water well monitoring network at the site and is continuously acquiring data on the flow directions and rates of flow of the first water bearing zone, as well as on water quality and PCP concentrations. Early data indicates that gross contamination of the groundwater has not occurred outside of the contaminated zone. PCP can barely be detected in wells in, or immediately adjacent to, the contaminant zone. Groundwater flow is generally in the direction of the Willametter River. Vertical gradients in the vicinity of the contaminant zone have not been determined at this time.

Time attempted to minimize the risk of contaminant migration by disposing of some material at Chemical Waste Management's Arlington facility. This effort was thwarted due to a moratorium on landfilling of PCP subsequently disallowing further such disposal. Time has consolidated the bulk of the contaminated soil into one spot within the woodtreating chemicals tank farm area to facilitate containment and minimize the risk of off-site migration.

Time has now retained SRH Associates to identify available alternatives to destroy or immobilize the PCP contaminated soil and is presently evaluating additionally generated data regarding groundwater quality and soil contamination.

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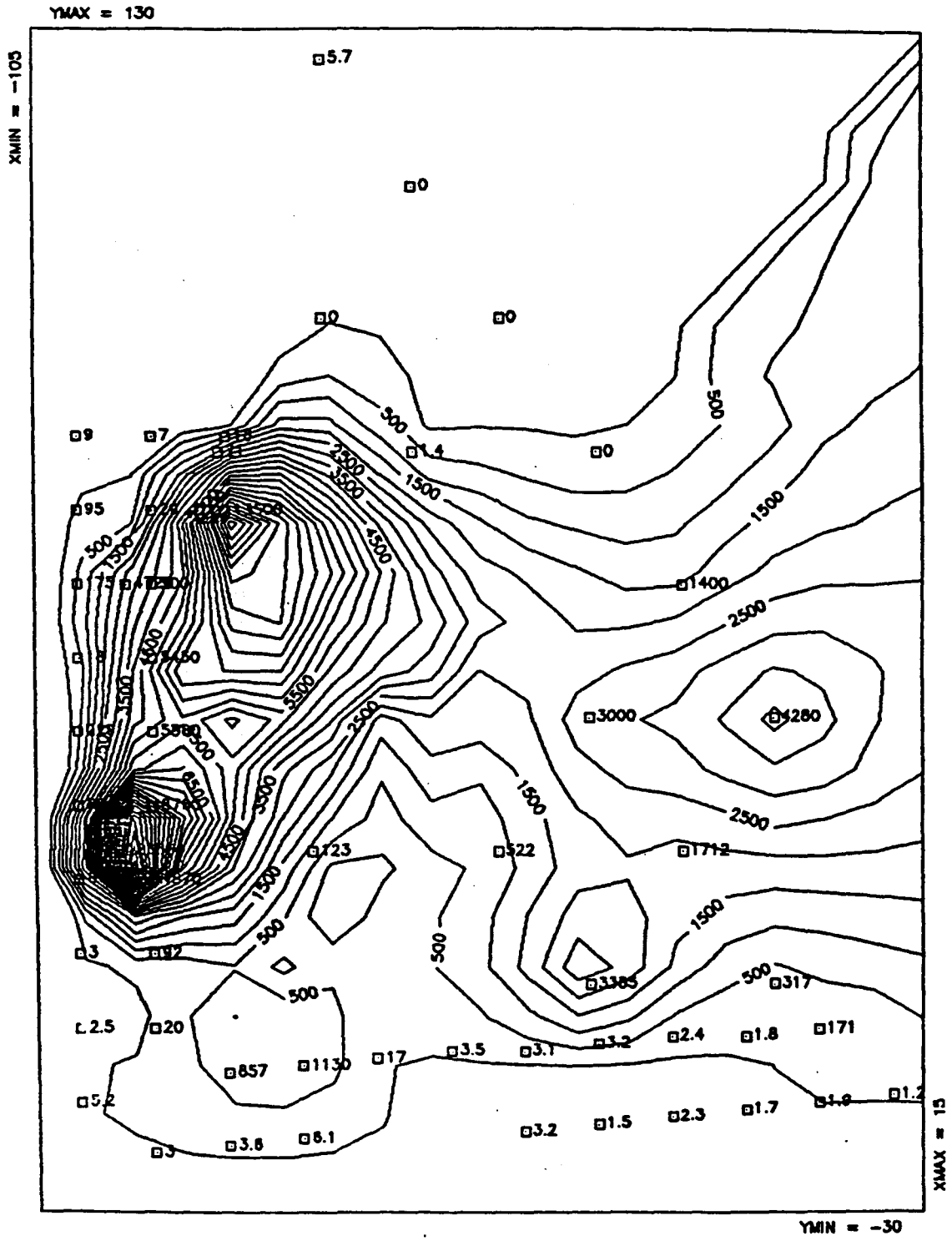
FIGURE I-1



TIME OIL CO – ORIGINAL SURFACE PCP CONTOURS

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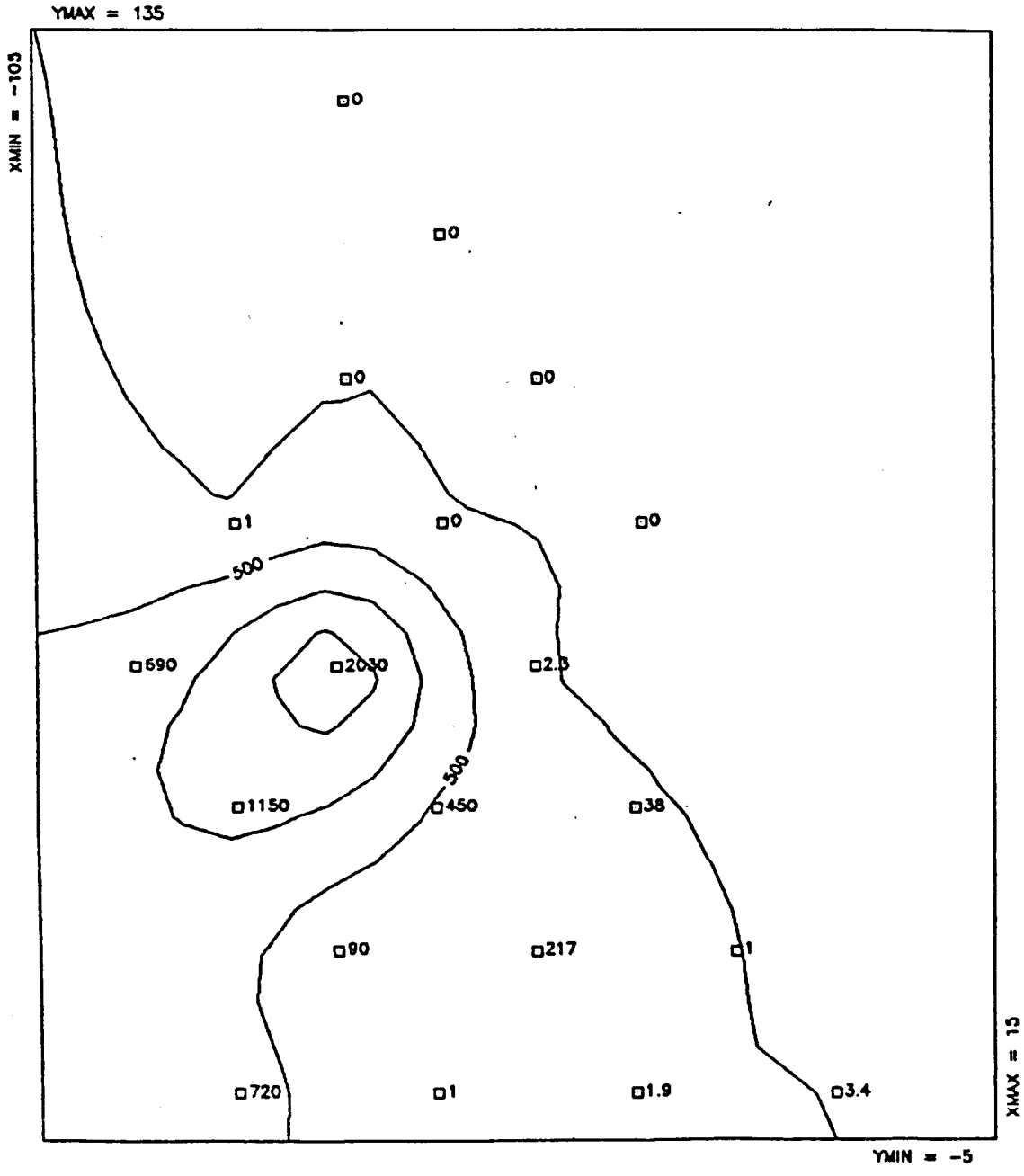
FIGURE I-2



TIME OIL CO – ORIGINAL 12 FOOT PCP CONTOUR

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FIGURE I-3

CONSTRUCTION DIAGRAM FOR

WELL 4

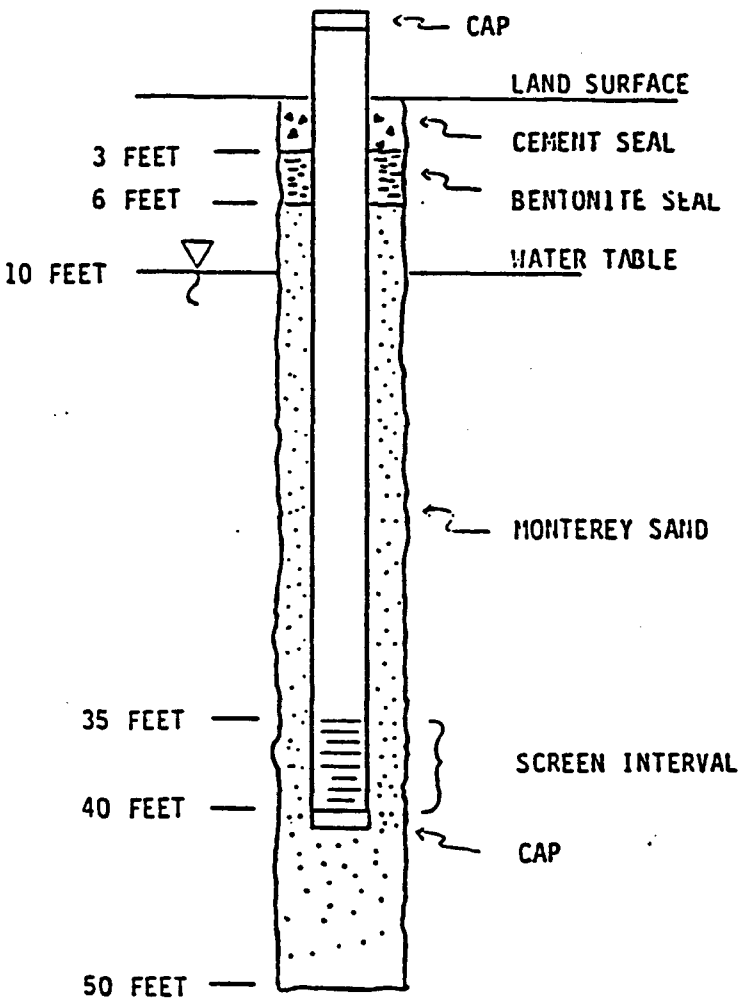

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FIGURE I-4

BORING LOG WELL 4

Depth in Feet	Soil Description
0 - 1-1/2	Light brown gravelly sand, moderately compacted, moist (shovel sample)
3-1/2 - 5	Dark brown gravelly sand, moderately compacted, moist, split spoon sample (S.S. sample)
8-1/2 - 10	Light brown gravelly sand, in contact with blue gray gravelly sand, moderately compacted, moist (S.S. sample)
10 - 13	Gravelly sand
13-1/2 - 15	Light blue gray gravelly sand, moderate compaction, saturated (S.S. sample)
15 - 18-1/2	Gravelly sand
18-1/2 - 20	Light blue gray gravelly silty sand with a clay lens, moderately compacted, saturated (S.S. sample)
20 - 23-1/2	Gravelly silty sand with clay lens
23-1/2 - 25	Light gray gravelly silty fine sand with minor clay lens, moderately compacted, saturated (S.S. sample)
25 - 28-1/2	Fine sand
28-1/2 - 30	Light gray medium to fine sand, 3-1/2" thick clay lens, saturated (S.S. sample)
30 - 32-1/2	Medium to fine sand with clay lenses
32-1/2 - 35	Light gray medium to fine sand, minor clay lenses, saturated (S.S. sample)
35 - 37-1/2	Medium to fine grained sand
37-1/2 - 39	Light gray medium to fine sand (S.S. sample)
39 - 42-1/2	Light gray medium to fine sand
42-1/2 - 45	Light gray medium sand grading to fine sand with depth, minor clay lens (S.S. sample)
45 - 47-1/2	Fine sand, saturated
47-1/2 - 49	Light gray sandy silt grading to light gray silty fine sand (S.S. sample)

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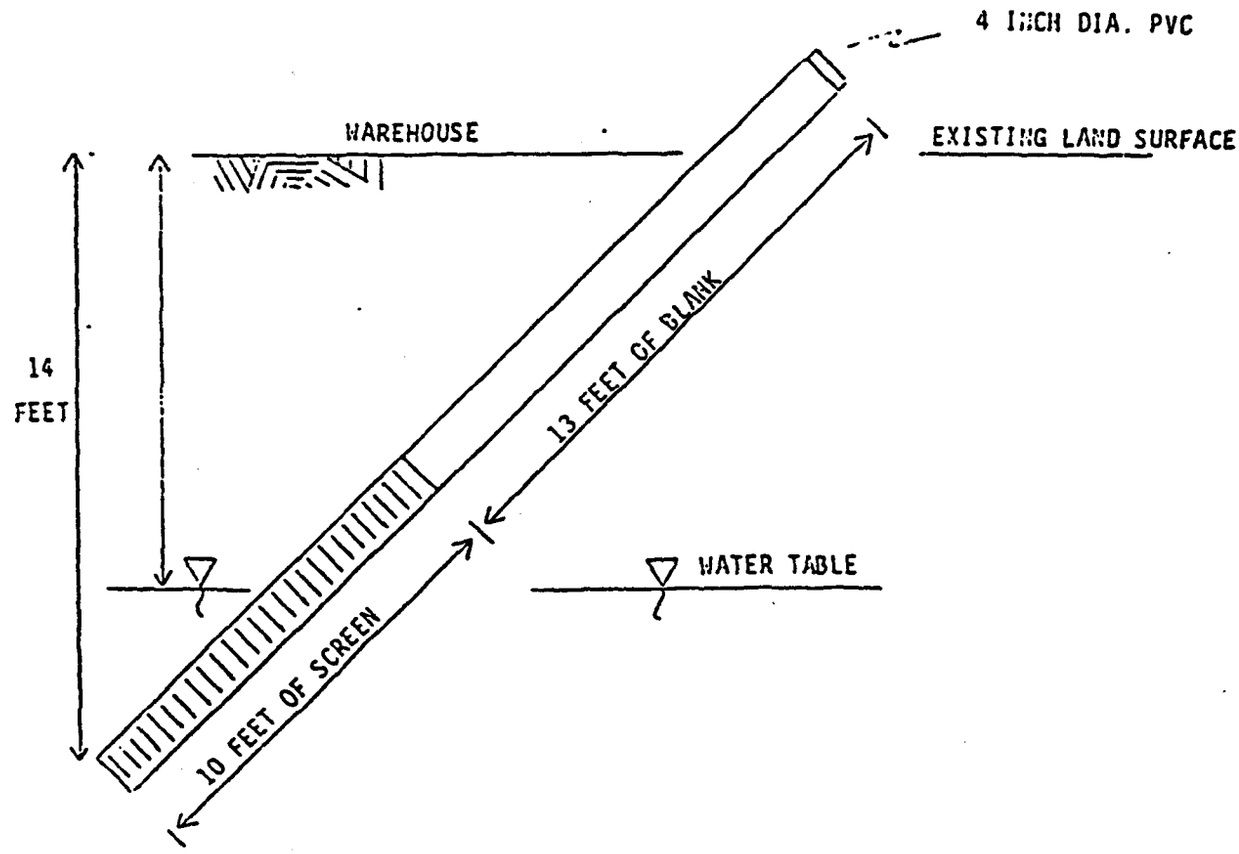
FIGURE I-5

CONSTRUCTION DIAGRAM FOR

WELLS 1, 2 AND 3



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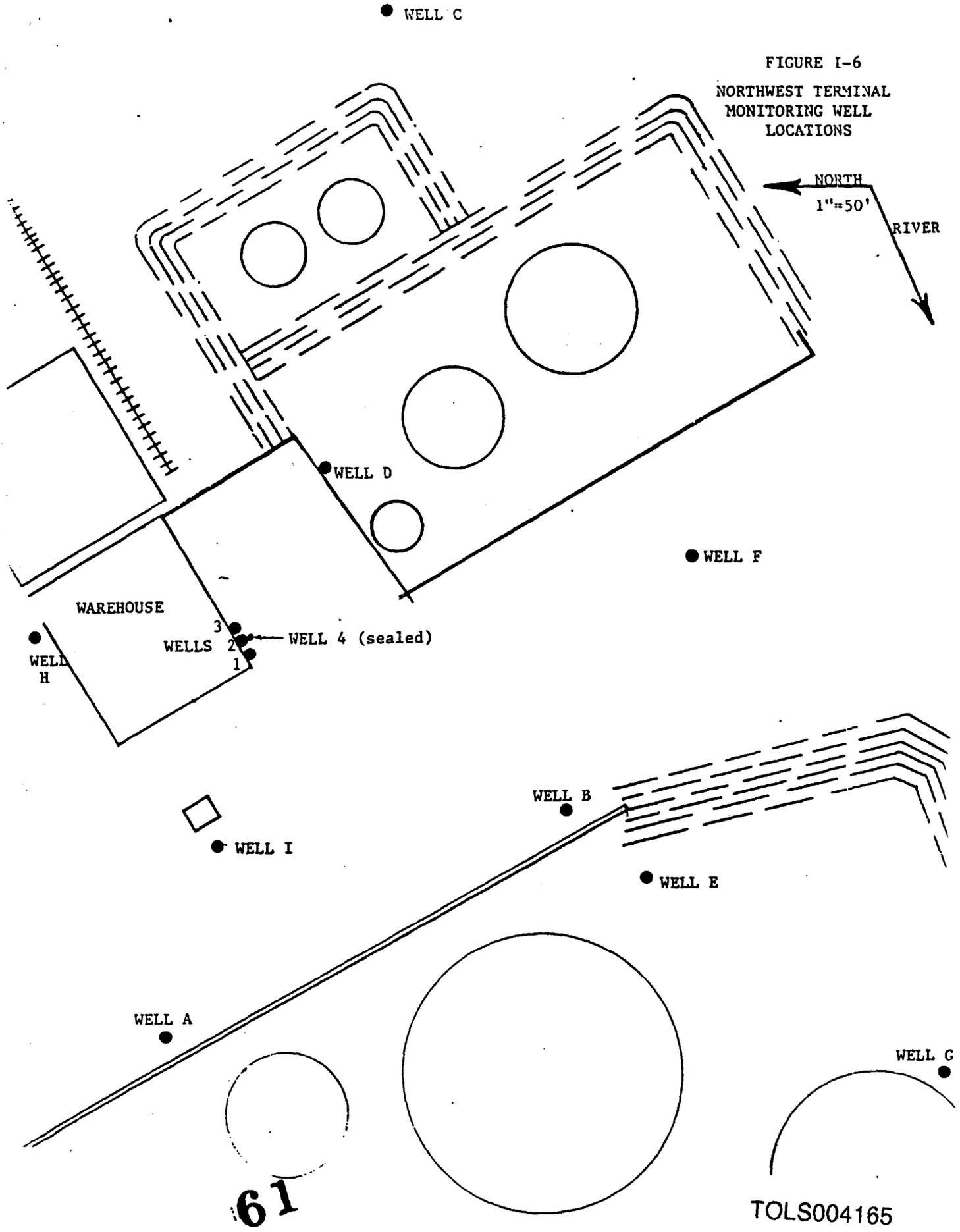

FIGURE I-6

NORTHWEST TERMINAL
MONITORING WELL
LOCATIONS

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SECTION II

REMEDIAL ALTERNATIVE ASSESSMENT

INTRODUCTION

A small portion of Time's 45 acre property at 12005 N. Burgard Road in Portland, Oregon has been identified as being contaminated with pentachlorophenol (PCP). Contamination at this site has been found to extend to approximately 70' x 140' in area and to depths of about 15 feet below the surface in one spot. The site was used for the formulation and storage of woodtreating chemicals under an agreement between Time and Koppers from 1967 until 1982. In addition to pentachlorophenol, a number of hydrocarbon solvents and petroleum products were used in this process.

Concentrations of PCP, ranging from below detectable limits to 116,000 ppm, have been detected in the soil, with concentrations generally decreasing with depth and distance from the southwest corner of the woodtreating chemicals warehouse. Concentration data has been used to generate equiconcentration isopleths which indicate that soil contamination is generally restricted to the upper 3 feet of soil, with the exception of a major vertical column of contamination located at the corner of the warehouse.

Perched groundwater underlies the site at a depth of approximately 13 feet below the surface. This water appears to be continuous with and potentially discharging to, the Willamette River. The surface soil consists predominantly of medium-grained sands with occasional minor clay lenses and/or gravels. The soil is characteristically homogeneous from the surface to the perched water table. A layer of somewhat lower permeability underlies the perched water and consists of silty sands with clay lenses. Fine-grained sands predominate below this layer.

Concentrations of PCP in groundwater below the known contaminated zone have not exceeded .044 ppm. Most wells indicate no detectable concentrations of PCP, and outside of the contaminated zone, concentrations have not exceeded .003 ppm in any well. Contamination does not appear to have migrated extensively from the known contaminated zone. Analyses of groundwater are continuing on a quarterly basis.

A water well monitoring network consisting of shallow wells and well points has been installed to monitor the upper perched water. A total of nine vertical and three slanted (45°) wells have been installed and are regularly sampled for pH and PCP plus being measured for static water levels.

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Time is concerned with potential off-site migration of PCP from this source and is determined to eliminate this risk by remediating the site. Due to an existing ban on the land disposal of soil containing pentachlorophenol, excavation and landfilling is not an available remediation alternative (the material at Time has recently been designated by the EPA as RCRA-listed waste F027 vs. its previous U242 designation). Time does not desire to either leave the material in place without corrective action, cap the contaminated area without first eliminating the contamination or excavate and store the waste on site due to the long-term risks associated with these alternatives. Time has performed emergency phase stabilization and containment measures to minimize the risks of contaminant migration.

The following discussion identifies and describes several remedial alternatives which are potentially capable of destroying or immobilizing PCP in sandy soils such as those found at Time. Comments are made regarding soil and groundwater treatment, economics, availability and technical feasibility. This discussion is not intended to represent an indepth feasibility analysis of remediation options, but rather presents a summary review of options which Time may wish to investigate in greater detail.

ALTERNATIVES

The following alternatives were identified during the preliminary evaluation as remedial methods potentially capable of achieving effective results at Time:

Adsorption onto Polymers or Activated Carbon
Biodegradation
Capping in Place
Chemical Reduction
Closure in Place with Monitoring (No Remedial Actions)
Encapsulation
Excavation and Disposal
High Temperature, Catalyzed Oxidation
Incineration
In-Situ Soil Washing and Surface-Mounted Soil Washing
In-Situ Thermal Extraction and Surface-Mounted Thermal Extraction
Sodium Dehalogenation

Of these listed alternatives, excavation and disposal, capping in place, and closure in place are either unavailable due to the regulatory moratorium on landfilling of F027 material, or do not satisfy Time's requirements for long-term risk reduction. The remaining alternatives are discussed below.

Adsorption Onto Polymers or Activated Carbon

Should contaminating PCP, at some point, be removed from the soil by soil washing, thermal extraction or other processes, final treatment of the recovered wastes will be required. Although not a destructive process, sorption of the recovered PCP onto carbon or other polymeric substrates utilizing hydrophobic interactions as a sorptive process, will reduce the volume of PCP contaminated material.

Activated carbon and a variety of organic and silicaceous polymeric adsorbents have been utilized to bind PCP and other phenols. The sorptive process, however, is usually reversible under appropriate conditions (usually temperature elevation or through the use of non-polar solvents) and therefore may not be suitable for long term stabilization of PCP wastes under uncontrolled conditions.

These sorbents may be used to concentrate PCP from a waste stream (i.e. soil washing eluates or thermal extraction scrubber liquors) which could then be recycled or disposed of as a non-hazardous waste. The adsorbent may then be regenerated for reuse and the concentrated PCP solutions so generated, collected for disposal by destructive methods such as incineration or chemical decomposition. Such an approach may be a logical consideration for the Time site.

Biodegradation

Biodegradation of man-made compounds has been observed for many years and the results of aerobic sewage treatment systems have been documented in detail. Aerobic landfarming of oily wastes from the petroleum industry has also been in general use for years. Biodegradation occurs under essentially two basic conditions: aerobic (respiratory) and anaerobic (fermentative). Many compounds have been observed to be degraded, either partially or completely to carbon dioxide and water, by one or both of these pathways.

Pentachlorophenol has been observed to undergo degradation by bacteria and fungi. Although PCP degradation has been observed under aerobic conditions, it occurs at a more rapid rate and with fewer complications under anaerobic conditions.

In addition to the biodegradation of pentachlorophenol in soil, it has been documented that fungal enzymes promote the binding of PCP to humic acids in soils, resulting in immobilization of the PCP.

Bench scale studies by SRH Associates scientists have indicated that, under controlled conditions, PCP can be degraded in both aerobic and anaerobic soil environments. Controlling conditions for biodegradation include soil porosity, pH, moisture content, inorganic nutrients (including nitrogen, phosphorus and potassium,

Eh (oxidation reduction potential), microbial populations and PCP concentrations. Elevated concentrations of PCP are inhibitory or toxic to microbial populations, even under conditions of acclimatization.

The application of biodegradation to the treatment of soils from the site is severely limited due to the existence of high concentration material. PCP degradation, even under optimal conditions, ceases when PCP concentrations are in excess of 1000 ppm. Typically 500 ppm is considered the maximum effective limit. Between 500 and 1000 ppm, degredation effectiveness decreases. Since some material at the site contains PCP in excess of 1000 ppm, not all of the material would be considered ammenable to this treatment without significant dilution or pretreatment to reduce the contaminant concentrations. A large amount of the soil contains PCP at low concentrations however and may be treatable if it can be successfully isolated from the high concentration material found nearby.

Biodegradation may be performed either in-situ or in surface-mounted fermentation reactors. Due to the highly permeable soil at Time, the shallow groundwater table and the possible adsorption of PCP in co-contaminating hydrocarbons which tend to immobilize the PCP, in-situ degradation is considered to present an excessive risk of PCP migration to off-site locations. Additionally, generation of anaerobic conditions in sandy soils is highly difficult. Should a biological process be initiated in-situ, significant risk of PCP mobilization through partial decomposition, preferential degradation of stabilizing hydrocarbon absorbents, or bio-emulsification of the PCP could be expected. For these reasons a surface-mounted fermenter would be the preferred method for soil treatment at the site.

A surface reactor may be used to directly treat a soil/water suspension, or may be used to treat extracted and diluted contaminants removed from the soil by other technologies. A surface fermenter allows for control of pH, nutrients, Eh, and other critical parameters, as well as preventing the release and migration of waste or waste products.

Nutrients, pH and Eh control are parameters that are easily controlled once optimal process conditions have been identified by bench and pilot scale studies. Co-metabolities or other nutrient augmentation is also easily regulated. Fermenters capable of handling soils such as those found at Time are commercially available, but may be constructed on site for considerable less cost. The requirements of this equipment vary with the amount of material to be treated, the reaction kinetics and the degree of control required.

Much debate currently exists over the benefits obtained by using PCP acclimated, commercially available bacterial preparations to promote degradation vs. using cultures of indigenous bacteria obtained from the site. There is considerable evidence to support

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the use of indigenous microorganisms. The effect on the overall cost of the project is similar for both methods. Effective preparations range from $20 to $50 per pound of material. Microbial requirements depend on a variety of soil and waste-specific parameters that have not yet been determined at the site.

Costs not directly associated with the on-site remediation include bench and pilot scale tests, engineering, permitting, chemical, biological and physical analyses, agency negotiations, waste delisting and management. These costs are expected to be similar for all of the alternative technologies evaluated here.

Chemical Reduction

Oxidation and reduction reactions have been utilized to destroy organic wastes under a variety of circumstances. Due to its high degree of chlorination, PCP is not readily oxidized by such mild oxidants as ozone or hydrogen peroxide. Stronger oxidants present such a great hazard in and of themselves as to be unsuitable for treating wastes (See High Temperature Catalyzed Oxidation).

PCP is, however, readily reduced by sodium borohydride solutions. Staiff (1981) and Sweeney (1981) have both demonstrated the use of catalyzed metal powders and/or borohydride solutions in the oxidation of chlorinated aryls. In-situ techniques have been demonstrated, however competition from reducible soil components may severely limit the reaction, requiring retreatment. This soil reduction chemistry must be identified to allow for proper selection and application of reducing agents.

Reduction, either in-situ or in surface-mounted reactors, has realistic potential for remediating the contamination at Time. The low organic content of the naturally occuring sands in the area, their homogeneity, the low trafficability of the soil, and the nature of the contaminants all support this alternative. Bench and pilot analyses would be required to determine the reduction potential and the products of reduction formed by this process. If technically successful, implementation costs should be moderate.

Encapsulation

One method of encapsulation of organic material is through the application of sorbents to the contaminated soil. Sorbents may include carbon granules, polymeric materials or substances in which the waste is soluble. All sorbents must be insoluble in water, inert and not readily degradable in order to achieve long term stabilization of the wastes in question.

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Pentachlorophenol is readily adsorbed by activated carbon granules and is soluble (absorbed) in a variety of organic substances including high molecular weight hydrocarbons such as tar or asphalt. Since both of these materials meet the criteria listed above for acceptable sorbents, they offer a feasible alternative for PCP immobilization. Additionally, both materials are capable of sorbing any petroleum hydrocarbons which may exist in the soil in addition to PCP.

An attractive alternative for immobilization of Time's wastes is the admixing of the PCP contaminated soil with asphalt to form a structurally sound paving material which could then be used to seal the soil surface in the vicinity of the woodtreating chemicals tank farm. This alternative would require an analysis of the leachability of the wastes from the surfacing material and a determination of the structural integrity of the asphalt so produced at various levels of waste incorporation.

High Temperature, Catalyzed Oxidation

PCP is not ordinarily oxidized by readily available, easily handled oxidizers such as ozone or hydrogen peroxide. Although permanganate, dichromate or other strong oxidizers have been reported to successfully oxidize PCP, their cost, side reactions with soil components, and the environmental hazards generated by them restrict their use in treating contaminated soils. Zimpro has developed a process, commonly referred to as wet air oxidation, which has been successful in destroying phenols and other hazardous compounds in aqueous media.

The Zimpro, Wetox and other processes based on this same principle, employ high temperature and elevated pressures in an oxygen enriched aqueous environment to oxidize and thereby destroy hazardous organics. PCP and other extensively chlorinated organics are refractile to this process without the addition of suitable catalysts which can facilitate the dechlorination of these compounds, rendering them retreatable. Once dechlorinated, the resulting intermediates have increased susceptibility to oxidation by the wet air oxidation process and are degraded to either carbon dioxide and water or to non-toxic biodegradable intermediates.

All wet air oxidation processes are provided as packaged systems by the supplier. Included are the reactor, reagents and operators. Additional support and feasibility testing of representative media can ordinarily be negotiated. Cost of the system, which is provided on a lease basis, is variable dependent upon the volume of material to be treated, the size of the required reactor and the type of process necessary.

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Incineration

Incineration represents a tested and proven method for the destruction of chlorinated hazardous wastes, including PCP. Several types of incineration capacity exist in the U.S. Ordinary incineration, which is not acceptable for chlorinated organics, does not incorporate the appropriate acid scrubbers needed to produce an acceptable air discharge from wastes such as PCP. High efficiency incinerators, (often referred to as "6 nine" incinerators, based on their destruction and removal efficiencies) are capable of treating pentachlorophenol in high concentrations. Incinerators of this type are available in the U.S. as both fixed and mobile units. However, there is not sufficient capacity at this time in either type of unit, to satisfy domestic demands. Although most incinerators can handle liquids, few are equipped to handle solids such as contaminated soil.

Incineration can easily satisfy Time's objectives of reducing long term risk related to the contamination found on site. However, since no small mobile units are available nearby, Time must either absorb significant mobilization, siting and permitting costs or ship its waste to a fixed unit. The attendant risks in shipping must be weighed against those associated with leaving the soil on site.

The nearest incinerator for solid hazardous wastes such as those at the Time facility, is located in Deer Park, TX and is operated by Rollins Environmental. A primary concern with disposal by this alternative is cost. Rollins current price for incineration of contaminated soils is approximately $0.50 per pound. Based on Time's estimate of 2000 cubic yards of contaminated soil, incineration costs may approach $2.5 million. This figure does not include excavation, shipping and other associated costs. For comparison purposes, this amount is on the order of five times the cost of landfilling, if this alternative were available to Time.

In-Situ Soil Washing and Surface Mounted Soil Washing

Removal of contaminants from soil may be accomplished through extraction with a variety of elutriating solutions. The choice of the proper solution must be based on the physico-chemical nature of the contaminants, the effect of the elutriate on the soil geochemistry and its permeability, plus the method by which the eluted contaminants are to be treated for destruction or disposal. Ordinarily, aqueous solutions of acids, bases, surfactants or other compounds are selected (US EPA, 1982).

The effect of washing contaminated soils with water alone, or with mixtures of non-ionic surfactants was investigated by Science Applications International Corp. Their findings indicate that surfactants greatly increased the effectiveness of soil washing when the contaminant of concern was either PCP or a high boiling

oil fraction. With pentachlorophenol alone, or when used in conjunction with other chlorinated phenols, plain water provided effective washing of the contaminants from a relatively sandy soil (83% sand, 10% silt and clay).

Since the contaminants at Time initially appear to be refractile to natural elution with precipitation or groundwater, surfactants appear to be desirable at this site. The use of alkaline solutions, while ordinarily effective with phenols, may be ineffective at Time due to the possibility of co-contamination with oils or hydrocarbon solvents. Extraction with other hydrocarbon solvents, while likely to effectively extract the contaminating PCP from the soil, will result in the formation of a hydrocarbon contaminated soil requiring an additional purification step.

Two means of applying soil washing methodologies have been identified: in-situ techniques and surface-mounted techniques, (including batch or continuous flow apparatus). In-situ techniques involve the treatment of soil without excavation and provide for the application of the elutriating solvent to the soil surface and recovery of the eluate by using recovery wells in the treatment zone. Surface-mounted systems involve the use of batch extraction tanks or counter-current extraction columns which extract the contaminants under controlled conditions.

In-situ techniques are effective in extracting contaminants only where the soil geology is known to be uniform and where the permeability is high enough to permit adequate percolation of the elutriating solutions through the soil. Additionally, in cases where the distance from the lower limit of the contaminants to groundwater (or alternatively to either a natural or induced low permeability soil layer) is great, excessive amounts of solution are required. Control is reduced and the potential for uncontrolled release of the eluate is great. The technique is well suited for situations where contamination is not generally accessible by ordinary excavation techniques (i.e. below buildings, in developed or heavily utilized areas).

The in-situ process is generally implemented by applying the solution through trickle irrigation or infiltration galleries, and recovering the product through judiciously placed recovery wells. The recovered eluate is treated and, if possible, recycled. A thorough evaluation of all waste components and soil chemistry must be performed to facilitate the selection of a proper surfactant, determine application rates, evaluate recovery potential and to provide information regarding eluate characteristics for the determination of treatment alternatives.

Surface mounted processes are indicated where the distance to groundwater, extraction requirements or heterogeneity of the soil (i.e. channelling, lenses, etc.) require a higher degree of control on the process. In these cases, soil is excavated by suitable procedures and placed into batch or countercurrent continuous extractors. Batch extractors usually involve the

submersion and agitation of batches of contaminated soil in large tanks fitted with a filtration stage to separate the cleaned soil from the eluate. This step is usually repeated until a suitable clean-up standard is achieved.

Countercurrent extractors involve the introduction of contaminated soil into an upwardly moving extraction bed while the elutriating solution is introduced at the top of the bed and allowed to migrate downwards. In this latter process, the cleanest soil (already partially extracted) contacts the cleanest solvent just prior to exiting the column at the top. This continuous process has the advantage of generating less spent solvent requiring subsequent treatment than does the batch process. It requires a higher degree of process control but is generally less labor and energy intensive than a batch process. A continuous process also allows for the fitting of a second solvent stage to elute any residual surfactant from the treated soil where water was used.

The cost of soil washing is expected to be moderate, however this process does not address the final destruction and/or disposal of the recoverd solutions. These solutions, containing PCP, water, surfactants, and possibly hydrocarbons, must be treated by incineration, biodegradation, immobilization, recycling or by chemical processes prior to completion of the project. The extraction process and the treatment process should be determined in conjunction with one another in order to maximize their mutual effectiveness.

In-Situ Thermal Extraction and Surface Mounted Thermal Extraction

Thermal extraction processes involve the introduction of heat to the contaminated soil mass to increase the vapor pressure of the contaminants, rendering them sufficiently volatile to allow their recovery as a vapor. As might be expected, these processes work best with relatively volatile contaminants that tend to remain free, rather than binding to soil components. Additionally, the processes work best in friable or loose-grained soils which allow free permeation of the vapors and their subsequent release to the recovery system.

Coia (1985) has presented a system for recovery of volatiles from contaminated soils using an in-situ process. This system consists of a network of thermal injection wells and extraction wells connected to injection and extraction blowers, respectively. Although the system was intended for extraction of TCE from glacial sands, any compound that can be brought to exert a significant vapor pressure can be recovered with this system.

A similar system utilizing a modified drilling rig has been developed by ATW Calweld. This firm, a manufacturer of drilling equipment has modified the kelly of a drilling rig to incorporate several channels which allow the introduction of hot air, steam and various chemicals, if appropriate. The equipment rapidly

agitates the soil while applying heat and volatilizes contaminants which are then recovered in a negative pressure hood surrounding the surface of the rig. Contaminant vapors are drawn off to a cyclone and scrubber system. Although the device has only been demonstrated on hydrocarbon spills (gasoline and diesel oil), ATW Calweld suggests that the process is applicable to lower volatility compounds such as pentachlorophenol.

Thermal extraction in surface units has been advanced by several firms. American Toxic Disposal in Waukegan Illinois, has operated a 10-ton-per-day unit which has successfully removed PCB's from contaminated soils and sludges. This system has been demonstrated to the EPA and is currently being used to treat material containing PCB's in Gary, Indiana.

As with soil washing techniques, thermal extraction techniques do not destroy contaminants, which must be recovered and treated or immobilized by other techniques. The process does, however, result in a volumetric reduction of the contaminated soil by 10 to 100 fold, allowing consideration of incineration as a final destruction alternative.

Thermal extraction processes are viable candidates for treating Time's contaminated soils since the soil at Time is friable and loose-grained. A preliminary consideration to be addressed before selecting this process is the degree of volatility of the contaminants in the matrix found at Time. Since moisture does not present a major deterrent to thermal processes, saturated material may also be successfully treated.

Sodium Dehalogenation

Both Acurex and the Franklin Institute have developed processes whereby soils are extracted (similar to Soil Washing, above) and subjected to dehalogenation using sodium based proprietary compounds. Although the process has been primarily utilized for PCB destruction, it appears to be ammenable to chlorinated phenols as well.

The Acurex process is less stable and more sensitive to interference from water than is the Franklin Institute process, which uses a specially modified sodium/polyethylene glycol complex. The Franklin Institute process has been applied directly to soils in an in-situ operation.

These procedures have been used primarily in the destruction of PCB oils and have only recently been used to treat contaminated soils. PCP has not been treated by this process. Adaptation to the Time site may be possible but should be pursued only if other demonstrated technologies do not prove successful in pilot demonstrations.

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SUMMARY

Twelve alternative processes have been identified for isolation, immobilization, separation and/or destruction of PCP contaminated soil found at Time. The selection of any one or a combination of these alternatives requires additional characterization of the wastes found at the site. Among the additional data that may be required are:

- Adsorption Isotherms of Wastes on Soil and Carbon
- Biodegradability of Waste Constituents (Half-life and Rate Constant)
- Biodegradation Products
- Bioinhibition Threshold Concentration of Waste Constituents
- Characterization of Co-contaminants (if any)
- Climatic Conditions
- Determination of Soil pH
- Determination of Soil Particle Size Distribution
- Groundwater Parameters (Flow Rates, Storage Coefficient)
- Organic Carbon and Octanol/Water Partition Coefficients of Waste Components
- Oxidation/Reduction Potentials of Waste Constituents
- Required Clean-up Levels
- Soil Microflora
- Soil Moisture Content
- Soil Nutrient Concentrations (N, P & K ratios)
- Soil Organic Matter
- Soil Oxygen Concentration
- Soil Permeability
- Soil Temperature
- Surfactant Solvation Efficiency (for Each Waste Constituent)
- Trafficability of Soil and Site
- Waste Constituent Vapor Pressure Curves

While other information may be needed for each specific alternative, some of the above data may also be necessary, depending on method selected.

It should be remembered that separatory procedures such as soil washing or thermal extraction will require additional disposal or destructive treatment processes as a final step. Surface mounted separatory or treatment processes will require excavation, containment and storage steps prior to implementation.

A recommended course of action for the determination and selection of a remedial technique for the Time site involves additional definition of the waste constituents, clarification of soil parameters, further definition of groundwater conditions and determination of site specific conditions listed above. Following

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these determinations, the specific questions of technical feasibility of the various alternatives listed above can be addressed.

With this information, alternatives may then be selected with a greater degree of confidence and further pursued by performing bench scale tests to evaluate their applicability to the contaminated soils found at Time. Bench scale conditions can then be scaled up to pilot level demonstrations, either on-site or at supplier's test facilities. Finally, these data may then be used to develop and obtain required treatment permits from appropriate State/Federal agencies. The generally accepted approach to selecting an operational treatment procedure is to evaluate the most logical alternative first and if it proves unsatisfactory due to site specific or economic factors, evaluate the next logical option.

RECOMMENDATIONS

Based on existing information, the following is recommended:

a. Select the "Surface Mounted Soil Washing" technique as the most logical remedial approach.

b. Perform bench scale and pilot level evaluations.

c. Determine necessary destruction steps of recovered extracts.

d. Ascertain technical permitting and economic feasibility of technique for final disposal action.

e. Compare results with repeat step by step examination of next most logical remedial approaches which are: "Surface Mounted Thermal Extraction" and "In-Situ Thermal Extraction".

Bench scale evaluations of a surface mounted, countercurrent soil washing process involve the excavation of contaminated soils, temporary storage of the soils on an impervious slab, extraction of the contaminants with an aqueous solution of nonionic surfactants, removal of the surfactants by countercurrent washing with water, recovery and treatment of the rinsates, their analysis and on-site placement of the purified soils. The contaminated rinsates would then be subjected to a destruction step that can only be determined based on the constituents in the recovered extracts, but may include chemical reduction, incineration, biodegradation or other processes outlined earlier. A schematic drawing of a proposed process is shown in Figure II-1.

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The actual process consists of the physical excavation of contaminated soil using classical techniques and the temporary storage of the excavated soils on an impervious, protected surface. Material from this location would be transferred to an infeed hopper connected to a primary extractor or soil washer. The soil would be introduced into the lower section of the extractor via a screw feed auger. Once in the extractor, the soil would be agitated and conveyed upwards while extracting solvent [an aqueous solution of nontoxic, nonionic detergents (surfactants)] is introduced into the top of the extractor. The extraction would take place in a countercurrent fashion, producing a cleaned soil product and contaminated elutriate in a continuous process.

Cleaned soil would then be subject to rinsing with clean water in a secondary extractor, operated similarly to the primary extractor, to reduce or eliminate residual surfactant concentrations, allowing the soil to be returned to the site. The contaminated fluids would be stored, tested and treated to effect ultimate disposal. Analytical decision points are noted as diamonds in Figure II-1. There are three. It is possible that surfactant solutions with suitably low or undetectable levels of PCP could be discharged to the sanitary sewer.

The process can easily be modelled in bench scale experiments and the technical feasibility of the process can be accurately determined. The nature and required concentrations of the surfactants, soil retention times, elution rates and contaminant loading factors can all be determined to allow approximation of full scale process operating parameters. Following determination of these parameters, scale up protocols and economic feasibility may accurately be determined.

Soil washing is recommended since it has been successfully applied to soils contaminated with PCP in pilot studies on similar soil types and does not use hazardous materials which may interact with or be retained by the soil. The process should be directed towards a surface, rather than in-situ technology to improve process control and to minimize the chance of uncontrolled releases to the environment. Residual surfactants may be eliminated from the soil using only water, and surfactants can be modified to remove PCP as well as co-contaminating hydrocarbons, which may also be present.

The aqueous extracts so produced may be subjected to a variety of concentrating and destructive steps to remove the entrained PCP and hydrocarbons, placing a wider array of treatment alternatives at Time's disposal.

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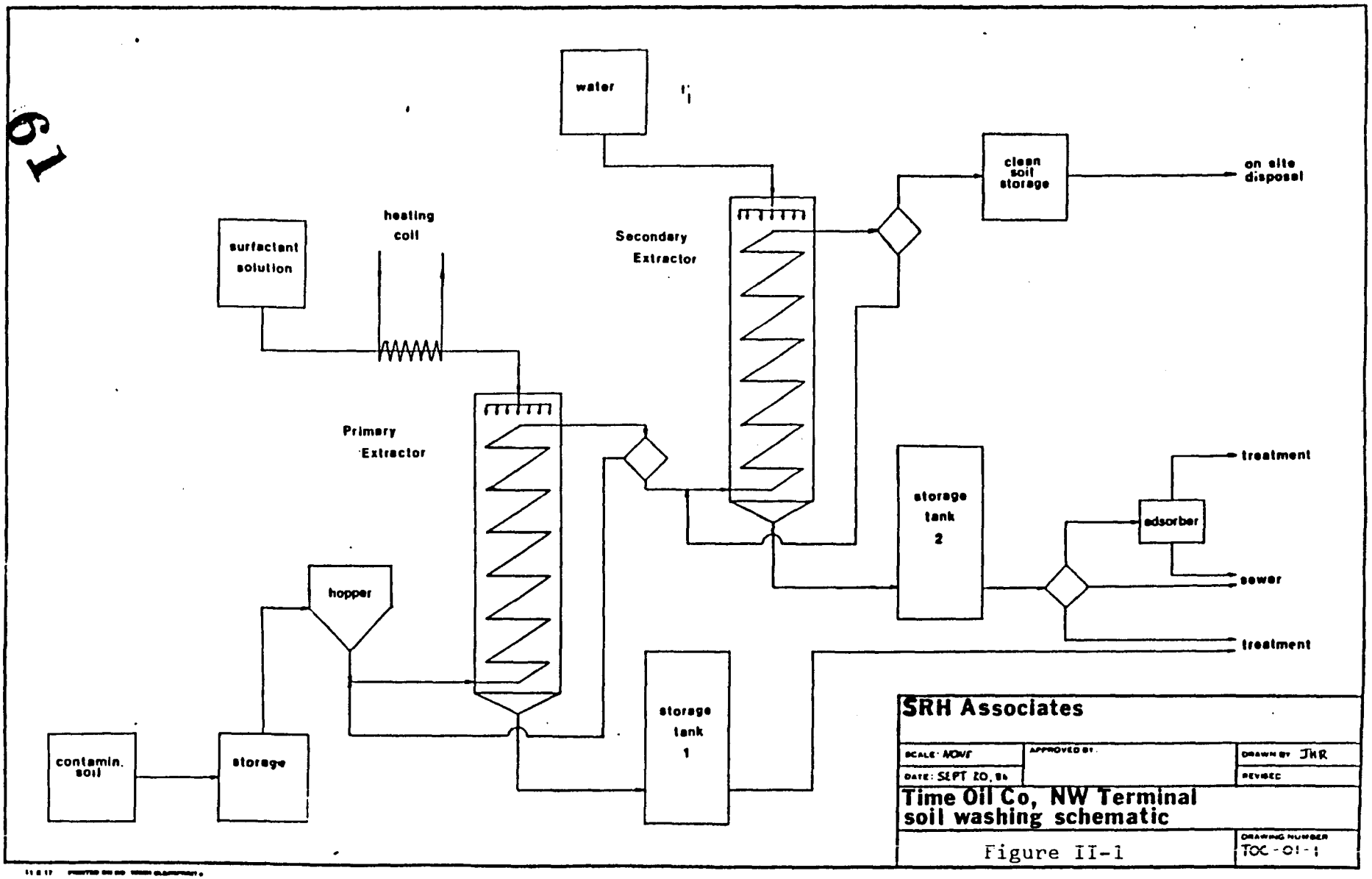

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SECTION III

ANALYSIS RESULTS

INTRODUCTION

During August of 1986, Time retained SRH Associates to collect samples of surface and subsurface soil and groundwater from the Time Facility located in Portland, Oregon. The samples were analyzed for pentachlorophenol (PCP) in an effort to further existing data concerning past releases of this chemical from a woodtreating chemicals formulating operation at this site.

Samples of surface soils were collected from an earthen tank farm area located south of the woodtreating chemicals warehouse and from six locations below the concrete floor of the warehouse itself. Additional samples were taken from five other depths below the warehouse floor from the same holes as the surface samples. Groundwater was sampled at seven existing monitoring wells surrounding the woodtreating chemicals area and was analyzed for PCP and pH. Static water levels were determined in these wells and at a monitoring station for the measurement of Willamette River water elevations located on the Northwest Terminal Facility pier.

SURFACE SOIL SAMPLING AND ANALYSIS

Following the contaminated soil relocation to one pile, surface soils were collected from 17 locations in the woodtreating tank farm area. The locations were identical to those sampled by Riedel Environmental Services during initial samplings performed in 1985. Samples were obtained from 2 to 3 inches below the soil surface to reduce the risk of contamination arising during set up procedures at the sample site.

Additionally, six locations inside the warehouse were sampled by coring through the concrete with abrasive saws. The six locations were selected by Time and represent an extension of the triangular sampling grid employed by Riedel in the 1985 study. Samples were obtained from an interval of 3.5 to 5.5 feet below the lower

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surface of the concrete using split spoon samplers. The sampling procedure used will be described in the next (Subsurface Samples) part. The selected depth was chosen to position the samples at the same true elevation as the surface samples taken from the tank farm area. Samples of soil from 2 to 6 inches below the lower surface of the concrete floor were obtained and held for possible future analysis.

Samples were obtained using stainless steel sampling spoons which had been previously cleaned with sequential washings of laboratory detergent, tap water, hexane, tap water, trisodium phosphate and sodium carbonate in water, tap water and distilled water (3X). Samples were screened through 0.10 inch stainless steel mesh which had been similarly cleaned. The screened material was allowed to fall directly from the screens into pre-washed 8 ounce glass jars fitted with screw cap closures and teflon liners. The containers had been cleaned to EPA specifications and were not opened prior to receiving the sampled material.

Samples were field logged and containers were marked with the date time, location, sample code, requested analyses and other relevant data. Lids were replaced with care being taken to ensure that no interference with the hermetic seal occurred. Tamper indicating seals were applied, chain of custody and analysis request forms were completed and the samples placed on ice prior to transport to the laboratory. Samples were delivered to the laboratory within 48 hours of collection in all cases. No preservatives were added to soil samples.

Samples were extracted in the laboratory using method number 3540, Soxhlet Extraction, as described in EPA publication SW 846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. The extract so obtained was analyzed for pentachlorophenol by method 8040, Phenols, as described in EPA publication SW 846. Field and laboratory duplicates were analyzed and spiked sample recovery efficiencies were determined. Laboratory blanks were analyzed. No field blanks of soil were submitted. All quality control results indicated acceptable performance of sampling and analysis.

The results of the surface soil samples are listed, along with the X and Y coordinates of their respective sampling locations, in Table III-1. The coordinates are referred to a temporary bench mark located at the end of a concrete wall at the southeast corner of the woodtreating tank farm area. The coordinates are given in feet. The X axis is aligned in an approximately northeast - southwest plane while the Y axis is aligned in an approximately northwest - southeast plane at at 90° to the X axis.

The results listed in Table III-1 were subjected to Kriging analysis to generate lines of equal concentration (equiconcentration isopleths). A .95 smoothing ratio and a search radius of 213 feet was used for generation of the contours which are shown in Figures III- 1 to III-4. The sample sites and their respective concentrations are indicated. The contours are to

scale (1" = 20 feet) and can be overlaid on the associated plan drawing of the sampled area. (Figure III-5).

The results indicate that the bulk of the surface contamination exists in a pile of material located in the vicinity of sample point S. Additional contamination is located to the east of point S, continuing to approximately the concrete wall bordering the tank farm on the east. The strong focal point of contamination located at point K has generated a broad area of calculated contamination on the Kriging generated contour maps. Due to the lack of supporting high concentrations of PCP adjacent to point K, it is concluded that this contour is primarily artifactual, generated by the data reducing program in response to the single very high concentration detected at K. It is more likely that K represents a small focus of high concentration, rather than the large area implied by the contours.

Most contamination that had been previously detected to the west of the woodtreating tank farm area appears to have been removed during recent excavation activities performed by Time. This is reflected by the low results found at points M and U.

Two locations beneath the warehouse floor were found to contain low levels of PCP. Borings 1 and 5 contained 5.7 and 1.4 ppm of PCP, respectively. It should be noted, however, that despite stringent efforts to prevent contamination, blowing winds and "dust devils" were noted during sampling and were observed picking up soil from the tank farm area and warehouse floor. Because of these concerns, the low levels noted in these samples are probably a result of field contamination.

SUBSURFACE SAMPLES

Samples were obtained from six depths below the lower surface of the concrete floor in the woodtreating chemicals warehouse. Six locations, determined by Time and located at extensions of the triangular sampling grid developed by Riedel, were sampled. The approximately 6 inch thick concrete floor was cored using an abrasive wheel. Twelve inch diameter holes were cut. The surface of the concrete within a 6 foot radius of the hole was swept clean and covered with .005 inch thick polyethylene film to minimize contamination from residue found in the warehouse.

The upper 2 to 3 inches of soil in the hole was removed to eliminate contamination with cuttings generated during the coring and set up operations. A sample was subsequently obtained using the technique given above, from the exposed surface of the hole. The holes were designated as numbers 1 through 6. The surface sample was collected and held for future analysis.

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Following collection of the surface sample, the hole was advanced using a hand operated, 2 1/2 inch (O.D.) continuous flight auger. Samples were obtained at the following intervals below the upper surface of the concrete floor using a 2 inch (O.D.) split spoon sampler:

3.5	to 5.5	feet	(0)
5.5	to 7.5	feet	(2)
7.5	to 9.5	feet	(4)
10.5	to 12.5	feet	(7)
15.5	to 17.5	feet	(12)

Since the upper surface of the concrete floor was 3.5 feet above the surrounding soil surface, the five depths listed above were equivalent to the 0 to 2 foot, 2 to 4 foot, 4 to 6 foot, 7 to 9 foot and 12 to 14 foot intervals sampled in the woodtreating tank farm area by Riedel in 1985.

Samples were taken by removing the drill from the bore hole and inserting the split spoon sampler into the bore hole taking care not to dislodge any material from the surface or walls of the hole. The sampler was driven into the soil using a 20 lb. hammer. Hand drilling and driving of the penetrometer/sampler was required due to the inaccessibility of the site to conventional drill rigs and to the low overhanging roof of the warehouse.

Samples were extruded by gently tapping the soils out of the sampler onto stainless steel screens, which were cleaned as indicated above. The samples were screened, placed into jars, labelled, logged and handled as described above. Samplers were cleaned after each use, using the decontamination procedures described above. The drilling equipment was decontaminated between holes and prior to leaving the site. All decontamination water was impounded in D.O.T. 17 E drums until proper disposal requirements could be established based on analytical results.

During drilling, saturated conditions were encountered at the 12 foot interval in all holes. No groundwater samples were taken from any location. All soil samples consisted of medium grained grey - brown to blue sands. Cobbles were encountered in holes number 1 and 2 at a depth of approximately 3 feet below the floor surface. The cobbles were associated with a minor clay lens approximately 2 inches thick.

Following drilling, holes were abandoned through the addition of bentonite pellets to a depth of 13 feet below the concrete floor. The remainder of the hole was filled with bentonite grout to the surface. The concrete core plugs removed during coring of the warehouse floor were replaced in the hole and bedded with bentonite in accordance with Time's request.

The samples were refrigerated and shipped to the laboratory for PCP analysis as outlined above. The results, together with the X and Y coordinates of the sample points, are presented in Tables

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III-1 through III-4. The data from these analyses have been combined with the results obtained by Riedel at the sample locations labelled J through Z in 1985, for the nominal sampling depths 2, 4, 7 and 12, to generate concentration isopleths at these depths.

The data listed in these tables was analyzed by Kriging analysis according to the procedure given above. The results of the contouring are shown in Figures III-1 through III-4. Figure III-5 shows the sample locations on a plan drawing of the woodtreating chemicals warehouse. Figure III-6 incorporates the X and Y coordinates of the sample locations on this drawing.

The results indicate that contamination is restricted to the woodtreating tank farm area with virtually no contamination being found beneath the central and northern portions of the warehouse. There is significant PCP contamination below the surface of the southwest corner of the warehouse, which appears to be continuous with a vertical column of contamination located immediately adjacent to this area in the tank farm.

Excavations in the woodtreating tank farm area have perturbed the original conditions of the site, and therefore the surface and 2 foot contours are not expected to be representative of conditions existing prior to the movement of soil. This can be seen by the distortion of the vertical column of contamination at the surface and two foot intervals, due to the fact that soil at these sites had been removed and replaced with soils from other areas within the woodtreating tank farm. A computer generated topographic grid net of the woodtreating tank farm and warehouse area can be seen in Figure III-7.

The 4, 7 and 12 foot contours reflect the strong vertical plume of PCP contamination which decreases to about 2000 ppm at the 12 foot depth. A minor lobe of this plume appears to extend to the southeast into the lower corner of the woodtreating tank farm area at or around the seven foot interval. The vertical plume appears to widen and diffuse to the south at the 12 foot contour, presumedly due to the presence of groundwater at or near this sampling depth.

GROUNDWATER ANALYSES

The nine vertical groundwater monitoring points at Time (See Figure I-6, Section I) were measured for static water levels and tested for pH and PCP. The three slant borings located at the southwest corner of the warehouse were not examined. The wells, which had been previously installed by Time employees or other contractors, consist of 1 1/4 and 2 inch (I.D.) stainless steel well points and 2 inch (I.D.) PVC screen and casing.

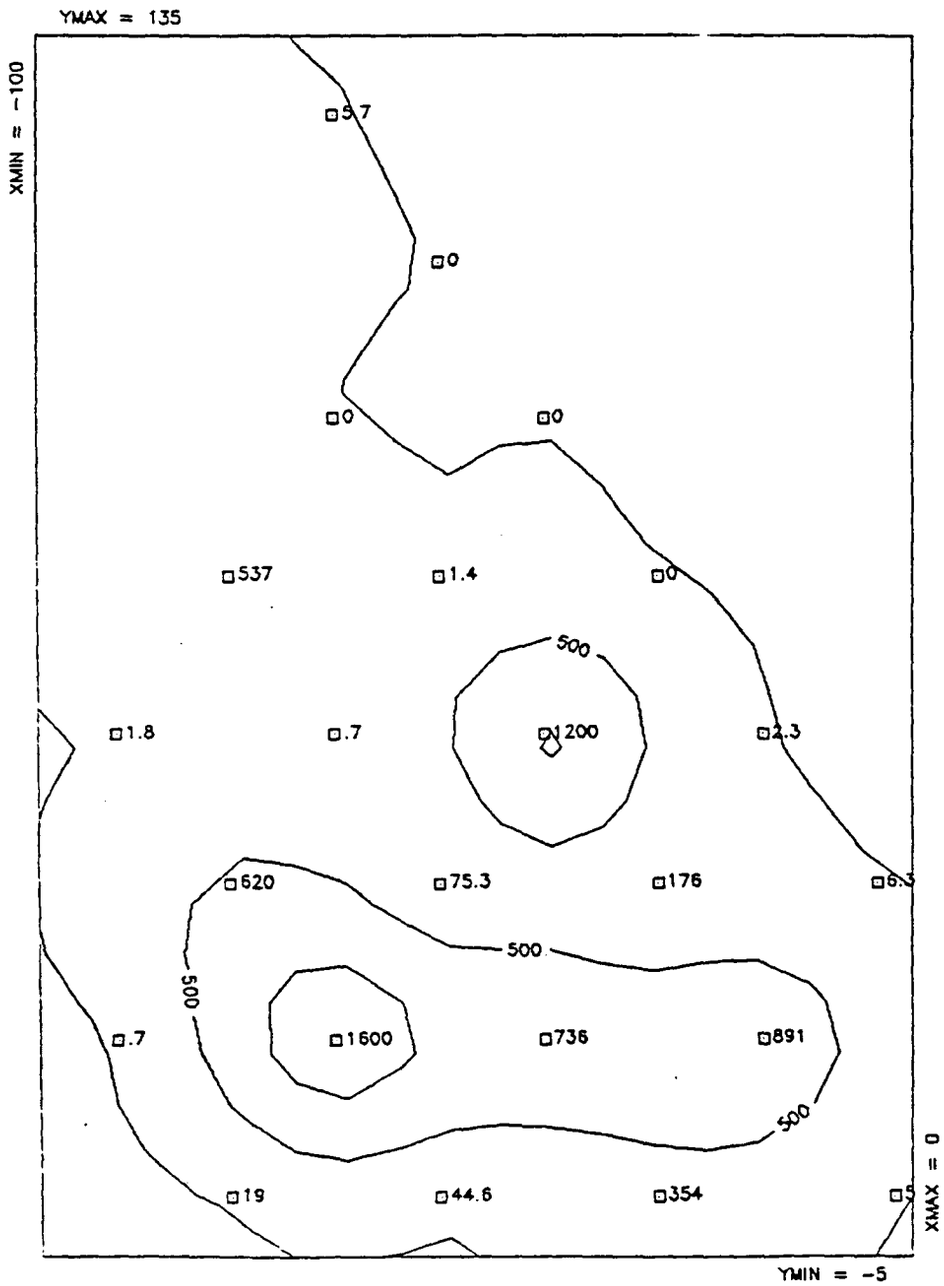
The water level elevations in the wells, labelled A through I, were measured to the nearest .01 foot from the top edge of the casing at a scribed mark located on the north side of the casing. A Fisher M-Scope previously calibrated against a steel tape was used to obtain the measurements. Standing bore volumes of well water were calculated based on these measurements and well construction drawings provided by Time. A measurement of the Willamette River water elevation relative to a mark located by Time on its unloading pier was also taken.

Stainless steel weighted bailers were used to remove at least 4 standing bore volumes of water prior to collecting representative samples of groundwater. The bailers had been previously cleaned by the procedure described above, and were re-cleaned after each well was sampled. The purged water was collected into D.O.T. 17 E drums until proper disposal could be determined based on analytical results.

The samples were dispensed directly from the bailer into two 1 liter amber glass bottles fitted with screw cap closures and teflon liners for PCP analysis. Samples were adjusted to pH 2 with 1:1 Sulfuric Acid in distilled water and checked with pH paper prior to refrigeration and delivery to the lab. Samples for pH analyses were dispensed directly into 250 ml polyethylene wide mouthed bottles without preservatives. pH analyses were performed within 2 hours of sample collection using a silver-silver chloride reference electrode standardized against two NBS traceable reference buffer solutions. Samples were logged, labelled, sealed and transferred to the laboratory within 6 hours of collection. Analyses for PCP were performed as above, except that the sample was not filtered prior to analysis, and was extracted by method 3510, Separatory Funnel Liquid - Liquid Extraction, as described in EPA publication SW 846.

The results of the groundwater investigation are shown in Table III-6. Wells C and G were dry and could not be sampled. The pH ranged from 6.53 to 6.91. The only well showing detectable PCP was well D, in which .044 ppm was detected. Well D is located southeast of the woodtreating chemicals warehouse.

FIGURE III-1



TIME OIL CO - SURFACE PCP CONTOURS

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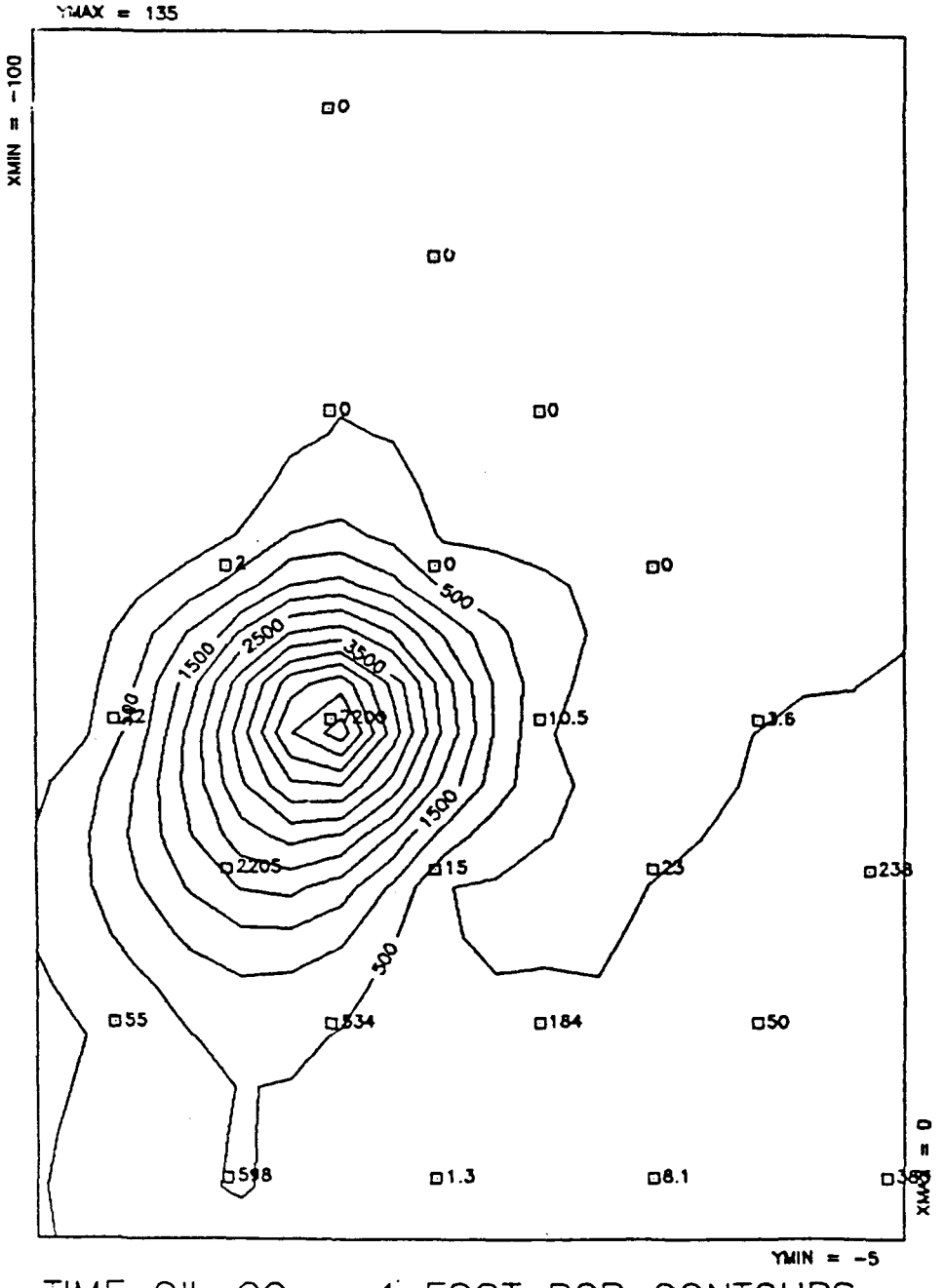
FIGURE III-2



TIME OIL CO – 4 FOOT PCP CONTOURS

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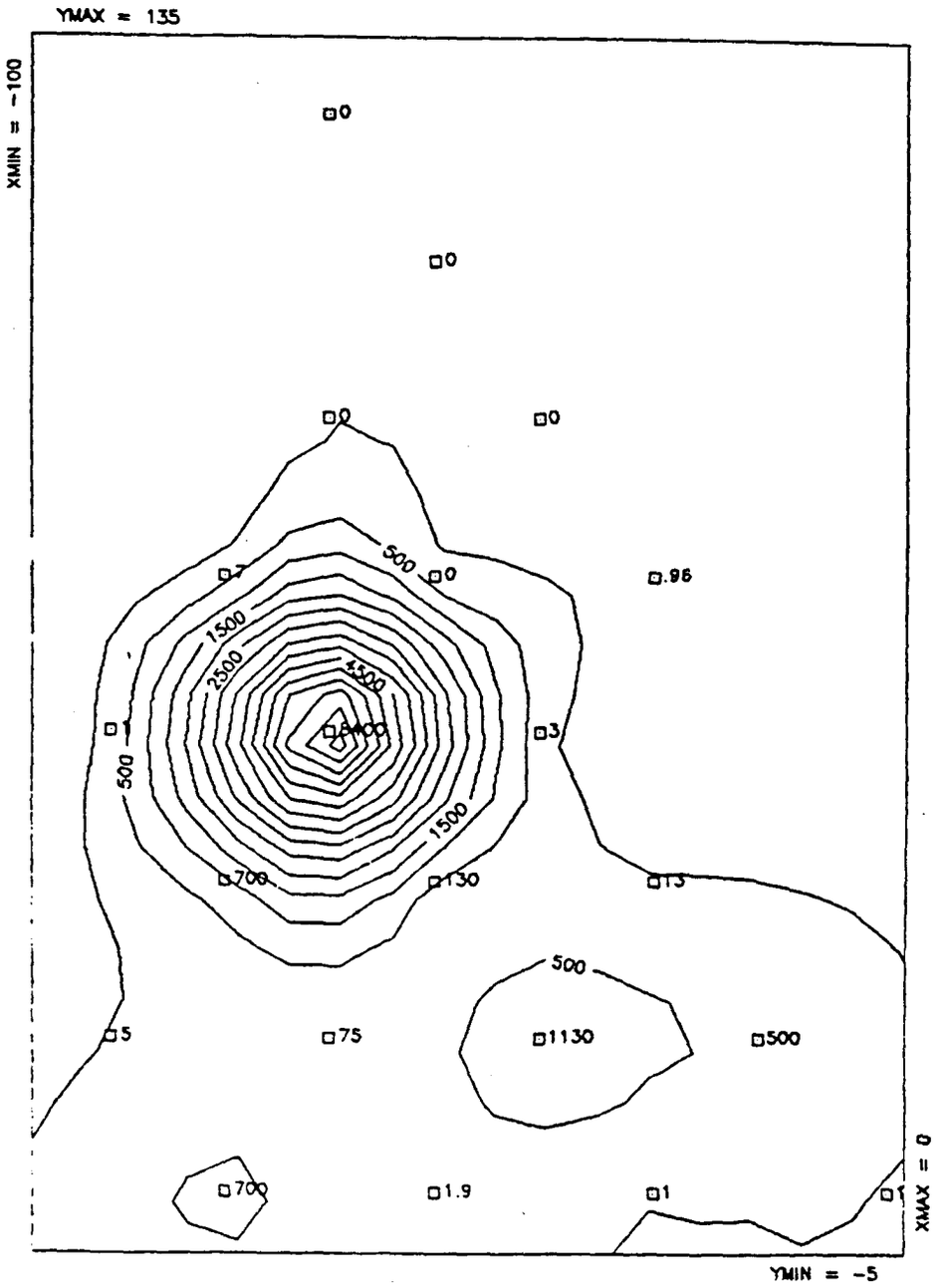
FIGURE III-3



TIME OIL CO – 7 FOOT PCP CONTOURS

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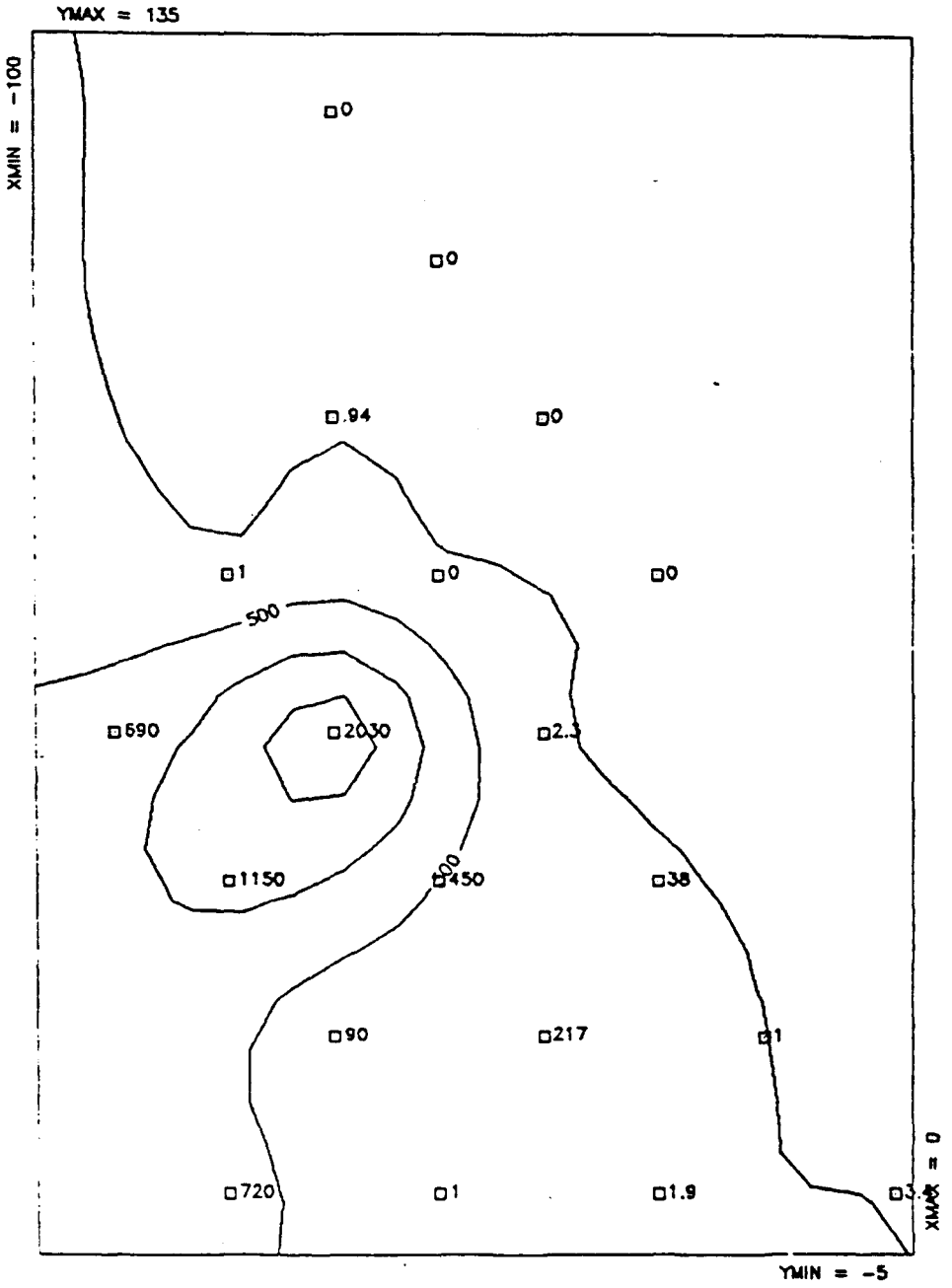
FIGURE III-4



TIME OIL CO - 12 FOOT PCP CONTOURS

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FIGURE III-5

SAMPLE POINT LOCATIONS

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SAMPLE POINT COORDINATES

FIGURE III- 6

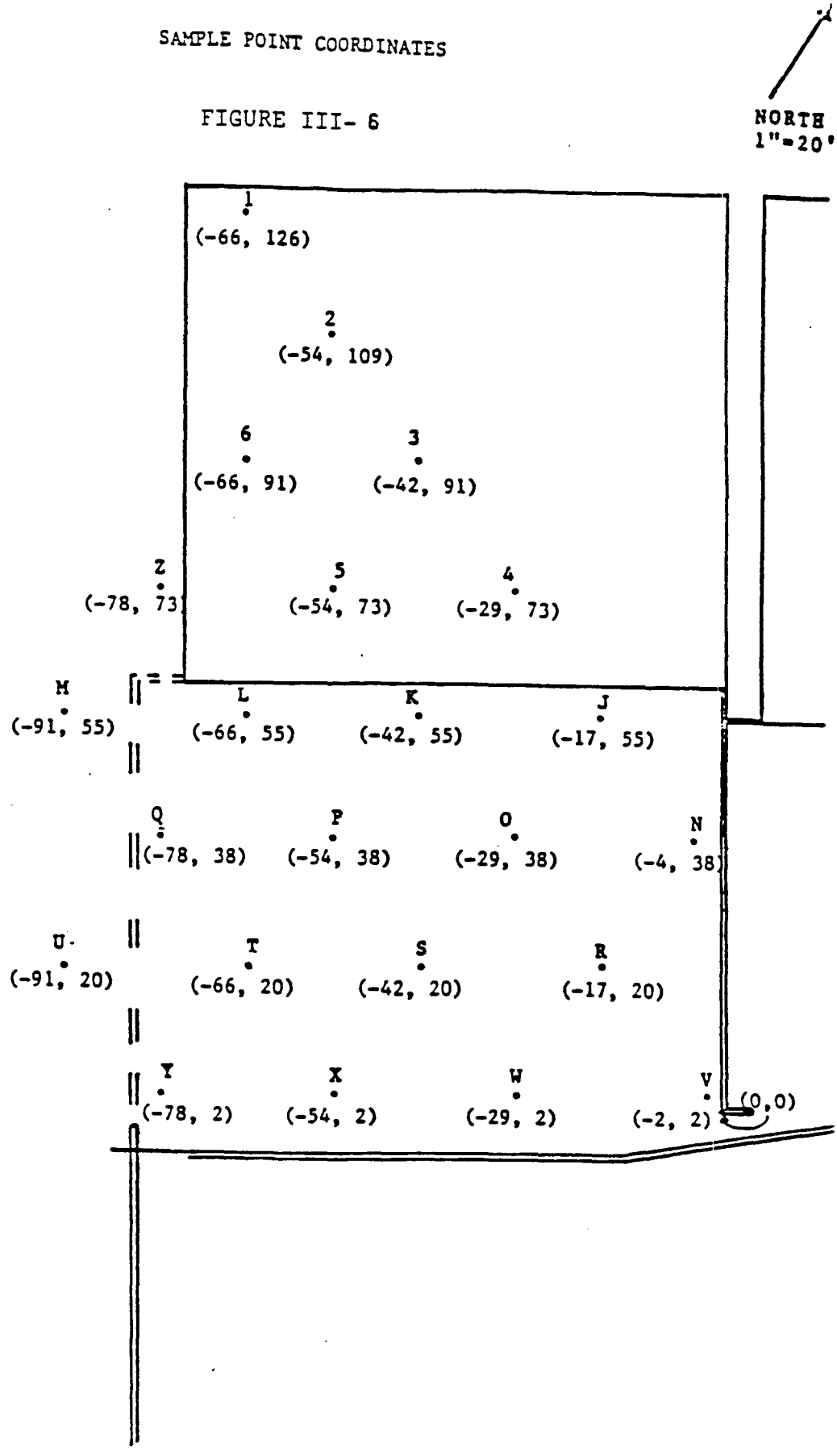

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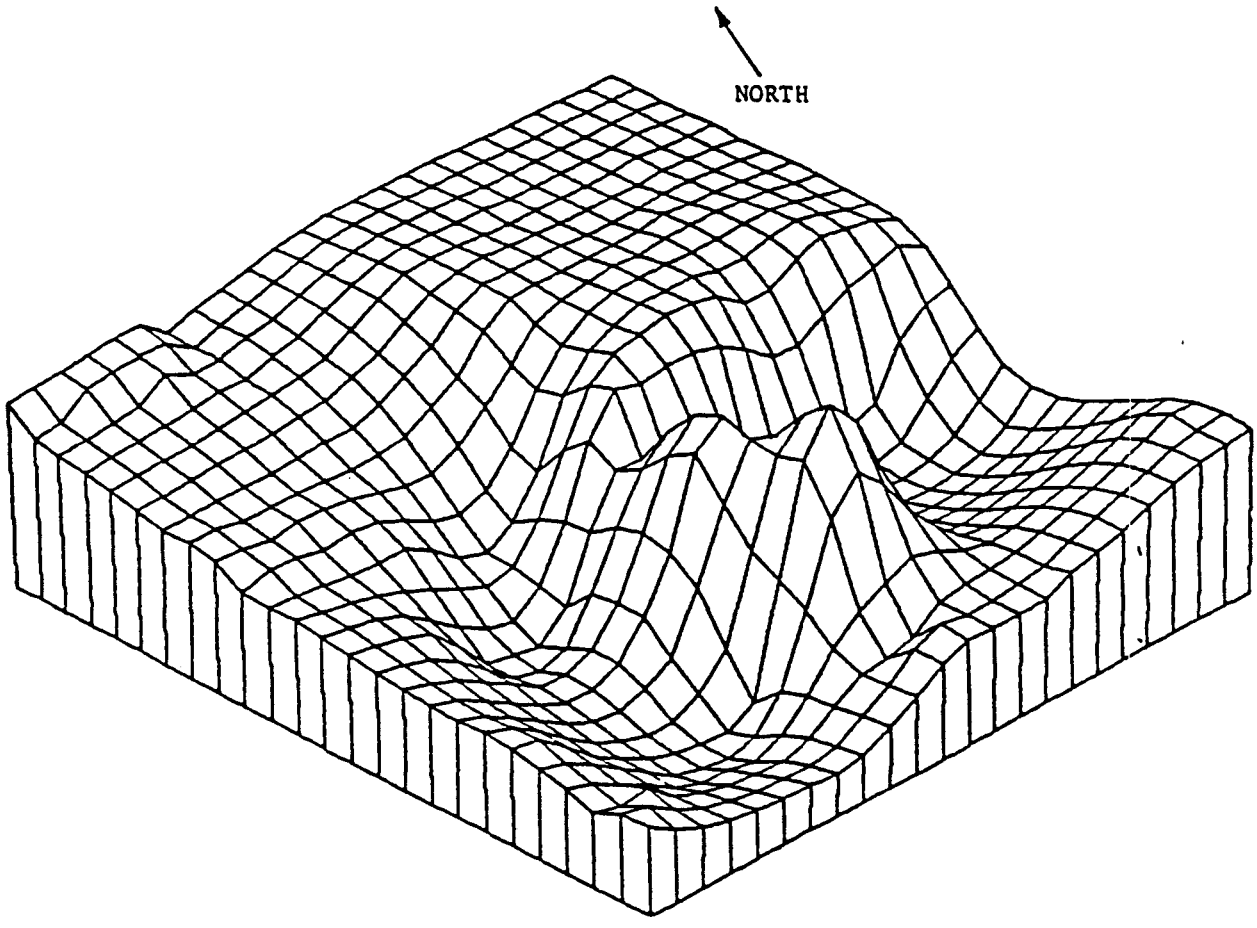
FIGURE III- 7

APPROXIMATE SURFACE TOPOGRAPHY

WOOD TREATING CHEMICALS AREA



TIME OIL CO. - TOPOGRAPHY

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TABLE III-1

TIME OIL CO.

COORDINATES - SURFACE PCP CONTOUR

CODE	X	Y	[PCP]
J	-17	55	2.3
K	-42	55	1200
L	-66	55	0.7
M	-91	55	1.8
N	-4	38	6.3
O	-29	38	176
P	-54	38	75.3
Q	-78	38	620
R	-17	20	891
S	-42	20	736
T	-66	20	1600
U	-91	20	0.7
V	-2	2	5
W	-29	2	354
X	-54	2	44.5
Y	-78	2	19
Z	-78	73	537
6	-66	91	0
5	-54	73	1.4
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	5.7

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-2

TIME OIL CO.

COORDINATES - 2 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3
K	-42	55	8.8
M	-91	55	87
N	-4	38	3.1
O	-29	38	59
P	-54	38	16
R	-17	20	34
S	-42	20	252
T	-66	20	123
U	-91	20	44
V	-2	2	260
W	-29	2	15
X	-54	2	4.5
Z	-78	73	14
6	-66	91	0
5	-54	73	5.6
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-3

TIME OIL CO.

COORDINATES - 4 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3.6
K	-42	55	10.5
L	-66	55	7200
M	-91	55	22
N	-4	38	238
O	-29	38	23
P	-54	38	15
Q	-78	38	2205
R	-17	20	50
S	-42	20	184
T	-66	20	534
U	-91	20	55
V	-2	2	380
W	-29	2	8.1
X	-54	2	1.3
Y	-78	2	598
Z	-78	73	2
6	-66	91	0
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-4

TIME OIL CO.

COORDINATES - 7 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	3
L	-66	55	8400
M	-91	55	1
O	-29	38	13
P	-54	38	130
Q	-78	38	700
R	-17	20	500
S	-42	20	1130
T	-66	20	75
U	-91	20	5
V	-2	2	1
W	-29	2	1
X	-54	2	1.9
Y	-78	2	700
Z	-78	73	7
6	-66	91	0
5	-54	73	0
4	-29	73	0.96
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-5

TIME OIL CO.

COORDINATES - 12 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	2.3
L	-66	55	2030
M	-91	55	690
O	-29	38	38
P	-54	38	450
Q	-78	38	1150
R	-17	20	1
S	-42	20	217
T	-66	20	90
V	-2	2	3.4
W	-29	2	1.9
X	-54	2	1
Y	-78	2	720
Z	-78	73	1
6	-66	91	0.94
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

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TABLE III-6

TIME OIL CO.

GROUNDWATER ANALYTICAL RESULTS

(AUGUST 29, 1986)

WELL NUMBER	STATIC WATER LEVEL (FT BELOW TOP OF CASING)	pH	[PCP] (ppm)
MW-A	14.06	6.80	N.D.
MW-B	15.07	6.70	N.D.
MW-C	DRY	N.A.	N.A.
MW-D	14.48	6.53	.044
MW-E	15.22	6.54	N.D.
MW-F	15.44	6.57	N.D.
MW-G	DRY	N.A.	N.A.
MW-H	11.28	6.91	N.D.
MW-I	14.75	6.77	N.D.
RIVER	25.70	N.A.	N.A.

NOTES:

[PCP] = CONCENTRATION OF PENTACHLOROPHENOL
ppm = PARTS PER MILLION
N.A. = NOT AVAILABLE
N.D. = NOT DETECTED

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IV. LABORATORY REPORTS

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COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Associates, Inc.
P.O. Box 14005
Portland, Oregon 97214
Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
J-0 - Surface-N.E. Tank Farm	2.3
K-0 - Surface-N. Tank Farm	2964
L-0 - Surface-N.W. Tank Farm	0.7
M-0 - Surface-N.W. Tank Farm	1.8
N-0 - Surface-E. Tank Farm	6.3
0-0 - Surface-N.E. Central Tank Farm	176
P-0 - Surface-N. Central Tank Farm	75.3
Q-0 - Surface-N.W. Central Tank Farm	620
R-0 - Surface-E. Central Tank Farm	891
S-0 - Surface-S.E. Central Tank Farm	736
T-0 - Surface-N. Central Tank Farm	1600
U-0 - Surface-W. Central Tank Farm	0.7
V-0 - Surface-S.E. Tank Farm	5.0
W-0 - Surface-S. Tank Farm	354
X-0 - Surface-S. Tank Farm	44.6
Y-0 - Surface-S.W. Tank Farm	19
Z-0 - Surface-N.W. Roadway	537
1-S - Boring #1, Warehouse Loading Dock, Surface Below Concrete	1.2
1-0 - Boring #1, Warehouse Loading Dock, 3.5 ft. Below Concrete	5.7
5-0 - Boring #5, S.W. Inside Warehouse #5, 3'4" - 5'4" Below Concrete	1.4

Results in mg/kg

REPORT CONTINUES

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

61

32319

TOLS004202

BZTO104(e)041023

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
Page Two

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
5-2 - Boring #5, S.W. Inside Warehouse 5'4" - 7'4" Below Concrete	5.6
5-4 - Boring #5, S.W. Inside Warehouse 7'4" - 9'4" Below Concrete	< 1
5.7 - Boring #5, S.W. Inside Warehouse 10'4" - 17'4" Below Concrete	< 1
5.12- Boring #5, S.W. Inside Warehouse 15'4" - 17'4" Below Concrete	< 1
6-0 - Boring #6, W. Central Inside Warehouse 3'5" - 5'5" Below Concrete	< 1
6-2 - Boring #6, W. Central Inside Warehouse 5'5" - 7'5" Below Concrete	< 1
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete	< 1
6-7 - Boring #6, W. Central Inside Warehouse 10'5" - 12'5" Below Concrete	< 1
6-12- Boring #6, W. Central Inside Warehouse 15'5" - 17'5" Below Concrete	0.94
D-2 - Waste Pile @ T-5, Duplicate of T-5	3420

Results in mg/kg

< denotes "less than"

REPORT CONTINUES

61

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

TOLS004203

32319

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
Page Three

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
T-S - Waste Pile, Feet Below Top of Pile	1280
Q-S - Waste Pile, Feet Below Top of Pile	298
D-1 - Boring #6, Duplicate of G-S	< 1
4-0 - Boring #4, S.E. Warehouse 3'5" - 5'5" Below Concrete	< 1
4-2 - Boring #4, S.E. Warehouse 5'5" - 7'5" Below Concrete	< 1
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete	< 1
4-7 - Boring #4, S.E. Warehouse 10'5" - 12'5" Below Concrete	0.96
4-12- Boring #4, S.E. Warehouse 15'5" - 17'5" Below Concrete	< 1
3-0 - Boring #3, E. Central Warehouse 3'5" - 5'5" Below Concrete	< 1
3-2 - Boring #3, E. Central Warehouse 5'5" - 7'5" Below Concrete	< 1
3-4 - Boring #3, E. Central Warehouse 7'5" - 9'5" Below Concrete	< 1
3-7 - Boring #3, E. Central Warehouse 10'5" - 12'5" Below Concrete	< 1
3-12- Boring #3, E. Central Warehouse 15'5" - 17'5" Below Concrete	< 1

Results in mg/kg

REPORT CONTINUES

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

32319

TOLS004204

BZTO104(e)041025

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
Page Four

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS	% Recovery
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete (Duplicate)	< 1	
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete (Duplicate)	< 1	
3-12- Boring #3, E. Central Warehouse 15'5" - 17'5" Below Concrete (Duplicate)	< 1	
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete (Spike)	399	101
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete (Spike)	373	96

Results in mg/kg

< denotes "less than"

Analysis by soxhlet extraction, capillary GC/FID, EPA Method 8040

Sincerely,

Susan M. Coffey

Susan M. Coffey,
President

SMC/gs

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

61

TOLS004205

32319

BZTO104(e)041026

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860826-C

SRH Assocates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachloropnenol

Sample Location: Time Oil Co., Portland

Sample Date: 8/25/86

SAMPLE ID	RESULTS
2-0	< 1.0
2-2	< 1.0
2-4	< 1.0
2-7	< 1.0
2-12	< 1.0
1-2	< 1.0
1-4	< 1.0
1-7	< 1.0
1-12	< 1.0

Results in mg/kg

< denotes "less than"

Analysis by soxhlet extraction, capillary GC/FID, EPA Method 8040

Sincerely,

Susan M. Coffey
President

61

SMC/gs

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

TOLS004206

32319

BZTO104(e)041027

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 5, 1986
Log # A8608Z9-N
P.O. None

SRM Associates Incorporated
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Subject: Pentachlorophenol and pH Analysis

Sample Type: Ground Water
Sample Collected by: John Ruddick
Sample Collection Date: August 29, 1986

SAMPLE NAME	PENTACHLOROPHENOL	pH
MW-D	0.04 mg/L	6.53 SU
MW-E	< 0.01 mg/L	6.54 SU
MW-F	< 0.01 mg/L	6.57 SU
MW-H	< 0.01 mg/L	6.81 SU
MW-I	< 0.01 mg/L	6.77 SU

Pentachorophenol analysis by extraction and capillary GC/FID. The symbol "<" means less than and denotes none detected at or above the level indicated.

Sincerely,

Susan M. Coffey

Susan M. Coffey
President

SMC:hh

This report for the sole and exclusive use of the above named client. Samples are held for a maximum of 30 days from the date of this report.

61

TOLS004207

32319

BZTO104(e)041028

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 9, 1986
Log #A860903-J

SEH Associates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analyses Requested: Pentachlorophenol (PCP) and pH

SAMPLE ID	PCP*	pH
MWA, 9/3/86, 1030	< 0.01 mg/L	6.8 S.U.
MWA, 9/3/86, 1110	< 0.01 mg/L	6.7 S.U.

< denotes "less than"

* Analysis by extraction, capillary GC/FID, Method 604.

Approved by,
Susan M. Brillante
Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,
Susan M. Coffey
Susan M. Coffey,
President

SMC/gs

61

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

TOLS004208

32319

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 18, 1986
Log #ASE0916-F

SRH Associates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

SAMPLE ID	RESULTS
#20 55	< 0.3 mg/kg

Analysis by extraction, capillary GC/FID and comparison with solutions of standards.

Approved by,
Susan M. Brillante
Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,
Susan M. Coffey
Susan M. Coffey,
President

SMC/ps

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

61

TOLS004209

32319

BZTO104(e)041030

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

October 1, 1986
Log #A860926-A

SRH Associates, Inc.
123 N.E. Third/Suite 230
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

SAMPLE ID	RESULTS
K-O, 9/26 0915, Soil	1200 mg/kg

Analysis by EPA Method 8040, capillary GC/FID.

Approved by,

Susan M. Brillante

Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,

Susan M. Coffey

Susan M. Coffey,
President

SMC/gs

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

61

32319

TOLS004210

BZTO104(e)041031

V. CHAIN OF CUSTODY

TOLS004211

32319

32319

CHAIN OF CUSTODY RECORD (8010)

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co

SAMPLERS: (Signature) [signature] / SRH

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE: PENTACHLOROPHENOL	AMOUNT/PRESERVATIVE: pH					SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
MW A	7/3/86	1030	BAILED	WATER	NEAR W TANK FARM	2	[illegible]	[illegible]							
MW A	"	1030	↓	↓	" "	1	[illegible]	[illegible]							
MW B	"	1110	↓	↓	" "	2	[illegible]	[illegible]							
MW B	"	1110	↓	↓	" "	1	[illegible]	[illegible]							

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature]	9/3/86 1445	[signature]			
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

61

TOLS004212

BZTO104(e)041033

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co PDX

SAMPLERS: (Signature) John H Randall

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE	PENTACHLOROPHENOL (8040)	pH				SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
MW-D	8/29	1600	BAILER	WATER	SE TANK FARM	3	2x1		250						
MW-E	↓	1430	↓	↓	SW TANK FARM	↓	2x1		250						
MW-F	↓	1615	↓	↓	ROADWAY (S)	↓	2x1		250						
MW-H	↓	1500	↓	↓	NEAR LOADING DOCK	↓	2x1		250						
MW-I	↓	1650	↓	↓	ROADWAY (N)	↓	2x1		250						

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
John H Randall / SRH	8/29/86 1800	Susan M Coffey Coffey Labs			
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

61 7

TOLS004213

BZTO104(e)041034

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co - Portland

SAMPLERS: (Signature) John H Puddick — SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	Pentachlorophenol (SOHO)	SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
2-5	8/25	1130	GRAB	SOIL	NW Wineland Hole 2 Surface	1	8/0			HOLD
2-0		1145	SPLIT SPOON		" " 3'5"-5'5"	1	8/0			
2-2		1450			" " 5'5"-7'5"	1	8/0			
2-4		1520			7'5"-9'5"	1	8/0			
2-7		1545			10'5"-12'5"	1	8/0			
2-12		1720			15'5"-17'5"	1	8/0			Saturated
1-2		1915	SPLIT SPOON		Hole 1 outside loading dock 5'5"-7'5"	1	8/0			
1-4		1950			" 7'5"-9'5"	1	8/0			
1-7		2030			" 10'5"-12'5"	1	8/0			
1-12		2130			Hole 1 outside loading dock 15'4"-17'4"	1	8/0			SATURATED Possible contamination sampling [illegible]

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature] -SRH	8/26/82 1225				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/26 1226	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	
61					

TOLS004214

BZTO104(e)041035

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	TIMBROIL Co – PORTLAND TERMINAL

SAMPLERS: (Signature) [signature] SRH ASSOC.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (NONE)	PENTACHLOROPHENOL (8040)						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
J-0	8/23	1015	GRAB	SOIL	SURFACE – NE – TANK FARM	1	8/0									
K-0		1030			" – N "	1	8/0									
L-0		1045			" – NW "	1	8/0									
M-0		1055			" – NW "	1	8/0									
N-0		1105			" – E "	1	8/0									
Ø-0		1110			" – NE CENTRAL "	1	8/0									
P-0		1115			" – N CENTRAL "	1	8/0									
Q-0		1120			" – NW CENTRAL "	1	8/0									
R-0		1125			" – E CENTRAL "	1	8/0									
S-0		1130			" – SE CENTRAL "	1	8/0									
T-0		1135			" – N CENTRAL "	1	8/0									
U-0		1140			" – W CENTRAL "	1	8/0									
V-0		1145			" – SE "	1	8/0									
W-0		1150			" – S "	1	8/0									
X-0		1200			" – S "	1	8/0									

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature] /SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

61

TOLS004215

BZTO104(e)041036

32319

CHAIN OF CUSTODY RECORD (8040)

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co - Portland Terminal

SAMPLERS (Signature): [signature] SRH Assoc

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (0=NONE) PENTACHLOROPHENOL						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
6-2	8/24	11:40	Split Spoon	Soil	Boring #6 w/ Contact 5'5"-7'5" Below Concrete	1	8/0								
6-4	↓	12:00	↓	↓	7'5"-9'5" " "	1	8/0								
6-7	↓	12:30	↓	↓	10'5"-12'5" " "	1	8/0								
6-12	↓	14:20	↓	↓	15'5"-17'5" " "	1	2/0								Saturated Sample only part recovered
D-2	8/24	15:30	Grab	Soil	Waste Pile @ T-S Duplicate of T-S	1	8/0								
T-S	↓	15:30	↓	↓	Waste Pile Feet Below Top of Pile	1	8/0								
Q-S	↓	16:15	↓	↓	Waste Pile Feet Below Top of Pile	1	8/0								
2-1	8/24	10:50	Grab	Soil	Boring #6 Duplicate of 6-S	1	8/0								
4-5	8/24	16:10	Grab	Soil	Boring #4 SE Wase Surface Below Concrete	1	8/0								HOLD
4-0	↓	1650	Split Spoon	↓	Boring #4 SE Wase 3'5"-5'5" Below Concrete	1	8/0								
4-2	↓	1715	↓	↓	5'5"-7'5" " "	1	8/0								
4-4	↓	1745	↓	↓	7'5"-9'5" " "	1	8/0								
4-7	↓	1820	↓	↓	10'5"-12'5" " "	1	8/0								

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature] / SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	
61					

TOLS004216

BZTO104(e)041037

32319

CHAIN OF CUSTODY RECORD (8040)

PROJ. NO.: 1003

SITE/LOCATION: Time Oil Co - PDX Terminal

SAMPLERS: (Signature) [signature] SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (0 = None)						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
4-12	8/24	1900	Split Spoon	Soil	Boring #4 SE Wash 15'5"-17'5" Below Concrete	1	8/0								Saturated Sample
3-5	8/24	1915	Grab	Soil	Boring #3 E-Central Wash Surface Below Concrete	1	8/0								HOLD
3-0		1955	Split Spoon		3.5"-5'5" " "	1	8/0								
3-2		2010			5'5"-7'5" " "	1	8/0								
3-4		2015			7'5"-9'5" " "	1	8/0								
3-7		2025			10'5"-12'5" " "	1	8/0								
3-12		2100			15'5"-17'5" " "	1	8/0								Sat'd Sample

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature] SRH	8/25/84 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	
61					

TOLS004217

BZTO104(e)041038

32319

CHAIN OF CUSTODY RECORD 60401

PROJ. NO.	SITE/LOCATION
1003	TIME OIL CO – PORTLAND TERM.

SAMPLERS: (Signature) John H [illegible] – SRH ASSOC.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (Cancel/Pentachlorophenol)	SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
Y-0	8/23	1205	GRAB	SOIL	SURFACE – SW TANK FARM	1	8/0			
Z-0	"	1210	"	"	SURFACE – NW ROADWAY	1	8/0			
1-S	8/23	1255	GRAB	SOIL	BORING #1 WAREHOUSE LOADING DOCK SURFACE BELOW CONCRETE	1	8/0			
1-0		1035	SPLIT SPOON	"	3.5 FT BELOW CONCRETE WAREHOUSE LOADING DOCK BORING #1	1	8/0			HOT CONCRETE OR ASPHALT
5-S	8/23	~~1035~~ 1655	GRAB	SOIL	BORING #5 SW INSIDE WASTE SURFACE BELOW CONCRETE	1	8/0			HOLD
5-0		1710	SPLIT SPOON		BORING #5 3.4-5.4' BELOW CONCRETE	1	8/0			
5-2		1745			BORING #5 SW INSIDE WASTE 5.4-7.4' " "	1	8/0			
5-4		1805			BORING #5 7.4-9.4' " "	1	8/0			
5-7		1825			BORING #5 10.4-12.4 " "	1	7/0			
5-12		1900			BORING #5 15.4-17.4 " "	1	8/0			Saturated Sample JHR
6-S	8/24	1050	GRAB	SOIL	BORING #6 W CENTRAL SURFACE BELOW CONCRETE	1	8/0			HOLD
6-0	8/24	1130	SPLIT SPOON	SOIL	BORING #6 " 3.5' TO 5' BELOW CONCRETE	1	8/0			

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
John H [illegible] SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[illegible]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

61

12

TOLS004218

BZTO104(e)041039

VI. ANALYSIS REQUESTS

TOLS004219

32319

BZTO104(e)041040

LIENT ANALYSIS REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

OMPANY NAME SHR ASSOCIATES TELEPHONE# 232 0824

DDRESS 123 NE 3RD SUITE 230 PURCHASE ORDER # VER.BAC

DDRESS PO BOX 14005 LAB PRICE QUOTE # $60 / sample

ITY/STATE/ZIP PORTLAND OR 97205 BILLING ADDRESS: SAME

TTENTION John Ruddick

AMPLE COLLECTION DATE 9/3/86 DUE DATE ASAP RUSH

AMPLE COLLECTED BY [signature] DELEVERED BY J Ruddick

LIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTA BY EPA 8040 (SW846)
(DONT FILTER — DECANT WATER OFF ANY SEDIMENT)

ID	FieldID	Date	Time	Media	Pres	cntnr	Analysis requested	MDL
	MWA	9/3/86	1030	WATER	1:1 H_2SO_4 TO PH2	2 EA 1L AMBER GLASS	PENTACHLOROPHENOL	
	MWA	"	1030	"	NONE	250 ml PLASTIC	PH	
	MWB	"	1110	"	1:1 H_2SO_4 TO PH2	2 EA 1L AMBER GLASS	PENTACHLOROPHENOL	
	MWB	"	1110	"	NONE	250 ml PLASTIC	PH	

Relinquished by:	Date	Time	Received for Coffey Labs by:
[signature] / SRH	9/3/86	1450	[signature]

PLE INTEGRITY COMMENTS:

AB LOG # 860903-J | LOGGED IN BY: | DATE: | TIME:

:\wp\clom\form\log\login.log

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TOLS004220

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BZTO104(e)041041

CLIENT:
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRI Associate TELEPHONE# 232-0824

ADDRESS 123 NE 3rd Sti 230 PURCHASE ORDER # Verbal

ADDRESS 14005 LAB PRICE QUOTE # [redacted]

CITY/STATE ZIP Portland OR 97214 BILLING ADDRESS:

ATTENTION John Ruddick

SAMPLE COLLECTION DATE 8/29/86 DUE DATE ASAP RUSH

SAMPLE COLLECTED BY J. Ruddick DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):

Penta by EPA 8040 (SW-846)

ID	Date	Time	Media	Pres	cntnr	Analysis requested	MD
MW-D	8/29	1600	Ground Water	1:1 Nitric Acid	2 L Amber Glass	Pentachlorophenol (EPA 8040)	
MW-E		1430					
MW-F		1615					
MW-H		1500					
MW-I		1650					
MW-D		1600		None	250 ml Plastic	P H	
MW-E		1430					
MW-F		1615					
MW-H		1500					
MW-I		1650					

Relinquished by: [signature] Date 8/29/86 Time 1800 Received for Coffey Labs by Susan M Coffey

SAMPLE INTEGRITY COMMENTS: 61

LAB LOG # A860829 N 1-10 LOGGED IN BY: S Coffey DATE: 8-29-86 TIME: 1755

32319

TOLS004221

BZTO104(e)041042

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates
TELEPHONE#: 503 232 0824
ADDRESS: 123 S.E. 3RD STE 230
PURCHASE ORDER #: Verbal
ADDRESS: PO Box 14005
LAB PRICE QUOTE #: 60.00/sample
CITY/STATE: Portland OR 97214
BILLING ADDRESS:
ATTENTION: John Ruddick
SAMPLE COLLECTION DATE: 8/23/86
DUE DATE: 9/2/86
RUSH:
SAMPLE COLLECTED BY: J Ruddick
DELIVERED BY: JHR
CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

Lab #	Date	Time	Media	Pres	Cntnr	Analysis requested	MD
R-0	5/23	1125	Soil	None	50Z Glass	Pentachlorophenol (EPA 8040)	
S-0		1130					
T-0		1135					
U-0		1140					
V-0		1145					
W-0		1150					
X-0		1200					

Relinquished by: John H Ruddick
Date: 8/25/86
Time: 1045
Received for Coffey Labs by: [signature]

SAMPLE QUALITY COMMENTS:

LAB LOG
LOGGED IN BY:
DATE:
TIME:

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TOLS004222

32319

BZTO104(e)041043

CLIENT ANALYSIS REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH ASSOCIATES TELEPHONE# 503 232 0824

ADDRESS 123 NE 3RD STE 230 PURCHASE ORDER # VERBAL

ADDRESS PO Box 14005 LAB PRICE QUOTE # 60.00/SAMPLE

CITY/STATE ZIP PORTLAND OR 97214 BILLING ADDRESS:

ATTENTION JOHN RUDDICK

SAMPLE COLLECTION DATE 8/24/86 + 8/23 DUE DATE 9/2/86 RUSH

SAMPLE COLLECTED BY J RUDDICK DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTACHLOROPHENOL BY EPA 8040 (SW 846)

ID	Date	Time	Media	Pres	Cntnr	Analysis requested	MI
4-4	8/24	1745	Soil	None	803 Glass	Pentachlorophenol (EPA 8040)	
4-7	8/24	1820					
J-0	8/23	1015					
K-0		1030					
L-0		1045					
M-0		1055					
N-0		1105					
Ø-0		1110					
P-0		1115					
Q-0		1120					

Relinquished by:	Date	Time	Received for Coffey Labs by
John H Ruddick / SRH	8/25/86	1045	Steven E. [illegible]

SAMPLE INTEGRITY COMMENTS:

LAB LOG: CLOSED IN BY: DATE: TIME:

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TOLS004223

32319

BZTO104(e)041044

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates TELEPHONE# 503 232 0824
ADDRESS: 121 SW 3rd Ste 230 PURCHASE ORDER # Verbal
ADDRESS: PO Box 14005 LAB PRICE QUOTE # 60.00/sample
CITY/STATE/ZIP: Portland OR 97214 BILLING ADDRESS:
ATTENTION: John Ruddick
SAMPLE COLLECTION DATE: 8/25/86 DUE DATE: 9/2/86 RUSH
SAMPLE COLLECTED BY: J Ruddick DELIVERED BY: JHR
CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachloro Phenol by EPA 8040 (SW 846)

Lab #	Date	Time	Media	Preservative	Analysis requested	MD
6-4	8/24	1200	Soil	None	8oz Glass Jar	Penta (EPA 8040)
6-7		1230				
6-12		1420				
D-2		1530				
T-5		1530				
Q-5		1615				
D-1		1050				
4-5		1610				(Hold)
4-0		1650				
4-2		1715				

RELINQUISHED BY: JHR / SRH Date: 8/25/86 Time: 1045 Received for Coffey Labs by: Steven Hughes
SAMPLE QUALITY COMMENTS:
LAB LOG LOGGED IN BY: DATE: TIME:

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TOLS004224

BZTO104(e)041045

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH ASSOCIATES TELEPHONE# 503 232 0824
ADDRESS 123 NE 3RD STE 230 PURCHASE ORDER # VERBAL
ADDRESS PO Box 14005 LAB PRICE QUOTE # 60.00/SAMPLE
CITY/STATE/ZIP PORTLAND OR 97214 BILLING ADDRESS:
ATTENTION JOHN RUDDICK
SAMPLE COLLECTION DATE 8/24/86 DUE DATE 9/2/86 RUSH
SAMPLE COLLECTED BY J RUDDICK DELIVERED BY JHR
CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTACHLOROPHENOL BY EPA 8040 (SW 846)

Sample	Date	Time	Media	Pres	Cntnr	Analysis requested	MD
6-S	8/24	1050	Soil	None	80z glass	Penta (EPA 8040)	(HOLD)
6-0		1130					
4-12		1900					
3-S		1915					(HOLD)
3-0		1955					
3-2		2010					
3-4		2015					
3-7		2025					
3-12		2100					
6-2		1140					

Relinquished by: John H Ruddick /SRH Date 8/25/86 Time 1045 Received for Coffey Labs by [signature]
SAMPLE CONSISTENCY COMMENTS.

LAB LOG CHECKED IN BY: DATE: TIME:

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BZTO104(e)041046

CLIENT:
ANALYSIS:
REQUEST:

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH Associates TELEPHONE# 503 232 0824

ADDRESS 123 SE 3rd STE 230 PURCHASE ORDER # VERBAL

ADDRESS PO Box 14005 LAB PRICE QUOTE # 60.00/sample

CITY/STATE/ZIP Portland OR 97214 BILLING ADDRESS:

ATTENTION John Ruddick

SAMPLE COLLECTION DATE 8/25/86 DUE DATE 9/2/86 RUSH

SAMPLE COLLECTED BY J Ruddick DELEVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

LIF	Date	Time	Media	Preservative	Analysis requested	MD
2-S	8/25	1130	Soil	None	Glass 8oz	Penta by EPA 8040 (HOLD)
2-0		1145				Run
2-2		1450				Run
2-4		1520				Run
2-7		1545				Run
2-12		1720				Run
1-2		1915				Run
1-4		1950				Run
1-7		2030				Run
1-12		2130				Run

Relinquished by: Date 8/26 Time 1225 Received for Coffey Labs by

SAMPLE INTEGRITY COMMENTS.

LAB LOG # LOGGED IN BY: DATE: TIME:

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TOLS004226

BZTO104(e)041047

CLIENT ANALYSIS REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH ASSOCIATES TELEPHONE# 503 232 0824

ADDRESS 123 NE 3RD STE 230 PURCHASE ORDER # VERBAL

ADDRESS PO BOX 14005 LAB PRICE QUOTE # 60.00/SAMPLE

CITY/STATE/ZIP PORTLAND OR 97214 BILLING ADDRESS:

ATTENTION JOHN RUDDICK

SAMPLE COLLECTION DATE 8/23/86 DUE DATE 9/2/86 RUSH

SAMPLE COLLECTED BY J RUDDICK DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTACHLOROPHENOL BY EPA 8040 (SW 846)

ID	Date	Time	Media	Pres	Cntnr	Analysis requested	MI
Y-0	8/23	1205	SOIL	NONE	802 Glass	PENTACHLOROPHENOL (EPA 8040)	
Z-0		1210					
1-S		1255				(HOLD)	
1-0		1635					
5-S		1655				(HOLD)	
5-0		1710					
5-2		1745					
5-4		1805					
5-7		1825					
5-12		1900					

Relinquished by: John H Ruddick Date 8/25 Time 1045 Received for Coffey Labs by [signature]

SAMPLE INTEGRITY COMMENTS:

LAB LOG NO. LOGGED IN BY: DATE: TIME:

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TOLS004227

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BZTO104(e)041048

REPAID_____
ART DEPOSIT_____
/ FOR RELEASE_____
ILL_____

COFFEY LABORATORIES, INC.

4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

LOG#_____

LOGIN TIME_____

OMPANY NAME SRH ASSOC. TELEPHONE# 232-0824

DDRESS 123 NW 3RD PURCHASE ORDER # VERBAL

DDRESS STE 230 LAB PRICE QUOTE #_____

ITY/STATE/ZIP PORTLAND OR 97232 BILLING ADDRESS:

TTENTION JOHN RUDDICK

AMPLE COLLECTION DATE 9/26/86 DUE DATE MONDAY AFTERNOON 9/29/86 RUSH_____

AMPLE COLLECTED BY J RUDDICK DELIVERED BY JHR

_IENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):

D: Field ID	Date	Time	Media	Pres	btl	Analysis Requested	MDL
K-O	9/26	0915	SOIL	NONE	8oz GLASS	PENTACHLOROPHENOL (EPA 8040)	

MPLE INTEGRITY COMMENTS

elinquished by:	Date	Time	Received for Coffey Labs by
	9/26/86	0950	Mary L Howell

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BZTO104(e)041049

PROPOSAL AND COST ESTIMATE

BENCH SCALE FEASIBILITY STUDIES FOR THE ELUTION OF PCP FROM CONTAMINATED SOIL

DECEMBER 19, 1986

Prepared for:

TIME OIL COMPANY
2737 WEST COMMODORE WAY
SEATTLE, WASHINGTON

Prepared by:

SRH ASSOCIATES, INC.
123 NE THIRD AVE, SUITE 230
PORTLAND, OREGON 97232
(503) 232-0824

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INTRODUCTION

Time Oil Co. has been investigating the nature and extent of soil and groundwater contamination at its Northwest Terminal facility located in Portland, Or. as a result of pentachlorophenol (PCP) releases which occurred at that site over a period of several years. The results of this investigation indicate that the sandy soils to the south of the wood treating chemicals warehouse are contaminated with PCP at concentrations ranging up to several thousand parts per million.

As a result of these findings, Time has performed a preliminary analysis of potential remedial alternatives for the contaminated soils at the site. Due to existing bans on landfilling of the waste (categorized by EPA as listed hazardous waste number F027) and due to Time's expressed interest in preventing further environmental impairment from this site, few alternatives were concluded to be viable. In October of 1986, SRH Associates conducted a review of all available alternatives for the disposal or treatment of Time's PCP contaminated soil. Since this evaluation, the residual soils from the incineration or thermal treatment of F027 contaminated soils have been upheld as being a separately listed hazardous waste (F028), making such thermal processes unsatisfactory remedial alternatives for Time since the resulting soils could not reasonably be expected to be easily delisted from hazardous status.

On the basis of these cumulative findings, no commercially available, licensed process was identified that was capable of treating or disposing of Time's PCP contaminated soils. Several developmental technologies were identified that appeared to have the capability to achieve Time's objectives but which had not been commercialized or demonstrated under conditions found at the Northwest Terminal facility.

On the basis of Time's evaluation of the available remedial alternatives and the above information, a site specific assessment of soil washing technology was recommended. (See Report "Pentachlorophenol Contamination, Northwest Terminal, Section II, pg. 20) Soil washing involves the extraction of wastes from soils using solvents, surfactants or other solutions. The current status of soil washing technology is generally regarded as developmental, however it represents one of the more advanced technologies available to Time in light of the restrictions placed on landfilling, incineration, and closure of the wastes in place. Assessment of this process is consistent with EPA's Research, Development and Demonstration (RD&D) protocols which ultimately require a demonstration to the agency of the effectiveness and limitations of a waste treatment technology prior to its implementation.

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The Northwest Terminal contamination is of such a nature that some degree of demonstration to the regulatory agencies of any cleanup process can be expected to be required prior to the implementation of cleanup efforts. This requirement can be expected due to existing regulations, the extent of contamination at Northwest Terminal, and the potential for the presence of dioxin in the wastes.

The following is a proposed scope of work and cost estimate for a bench scale evaluation of soil washing protocols for application to Time's PCP contaminated soil. The proposal defines the work necessary to review existing literature and to perform bench scale studies to generate data which confirm or reject the assumption that soil washing technologies can successfully clean up Time's contaminated soils. The proposed scope of work does not, at this time, include pilot scale studies, which ordinarily follow bench scale determinations, since it is misleading to attempt to define the scope of work or costs associated with the pilot phase of the project until such time as bench scale results define an appropriate process for scale-up considerations.

SCOPE OF WORK

OVERVIEW

The complete investigation of the feasibility of using soil washing procedures to remediate soils at Time's Northwest Terminal includes the following tasks:

- Review of existing literature and regulations.
- Performance of bench scale experiments.
- Evaluation of bench scale results and execution of a decision to continue or terminate the investigation.
- Performance of pilot scale experiments.
- Determination of the economic feasibility of the projected process and execution of a decision to proceed or terminate the investigation.
- Engineering and design of process equipment, if not commercially available.
- Fabrication of unavailable equipment and implementation of the process for EPA demonstration and subsequent cleanup activities.

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This proposal addresses only the first phase of the project which includes the first three tasks. Segmenting the project into rational phases with decision points at which to appraise the value of proceeding following completion of each phase, permits stricter control over the project and allows better estimation of the scope of work and costs involved with each phase. The phases may be described as follows:

- o Bench scale studies
- o Pilot scale studies
- o Engineering and Implementation

The detailed scope of work and cost estimate for the bench scale study phase of this project is presented below.

BENCH SCALE STUDIES

The bench scale studies are intended to generate sufficient data to allow Time to make an informed decision to proceed with or abandon the project with a minimal amount of capital expended. The tasks associated with this phase are designed to evaluate three different soil washing procedures, to define the parameters associated with their use, to characterize the soil chemistry and the spectrum of contaminants in the PCP contaminated soil at Time's Northwest Terminal facility, to select the most effective soil washing procedure based on bench study results, to define the nature of the recovered elutriate solution generated during soil washing, and to assess methods for destruction of the contaminants found in that elutriate. The following is a detailed task breakdown to accomplish these objectives.

Task 1 - Review Current Regulations

To reduce the risk of new regulations or new interpretations of existing regulations unfavorably impacting this study, SRH will appraise the status of regulations affecting soil washing technology. These evaluations are necessary to prevent the expenditure of time investigating technologies which are generally regarded as unpermittable and to preclude the potential for regulatory violations and fines. Perhaps the most functional purpose of this task is to provide Time with both regulatory and political data to properly prepare submittals to EPA and DEQ in order to expedite acceptance of plans, permits and other communications.

EPA representatives from Region X, Waste Management Branch, Hazardous Waste Division, Seattle; EPA Headquarters, Office of Solid Waste, Washington, D.C.; and the Office of Research and

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Development (ORD), Cincinnati, OH., will be queried regarding the current and pending status of regulations regarding PCP treatment technologies. SRH proposes to solicit and evaluate the information received from these agencies in a confidential manner to allow Time Oil Co. access to unbiased information and to develop strategies which are expeditious due to their regulatory and political acceptability. Emphasis will be placed on extraction procedures. Particular effort will be placed on discussions with representatives from the Alternative Treatment Technologies Section of ORD to not only review the regulations associated with extraction of PCP contaminated soils, but to also determine the status of research being performed by EPA in this area.

This task is expected to require 2 weeks for completion with an estimated cost of $2,336.

Task 2 - Review Current Extraction Literature

SRH will review existing extraction technology by examining literature in the fields of hazardous waste extraction, food processing technology (specifically edible oils) and metal recovery and mining (ore leaching). In addition to the discussions with ORD described under task 1, EPA's list of internal publications will be reviewed to identify, obtain copies of, and subsequently review EPA literature in this field. General extraction theory will be reviewed using current texts. U.S. patent literature will be reviewed to appraise the status of engineering in this field. Manufacturers of extraction equipment will be contacted to determine the commercial availability of extraction equipment and to allow initial estimates of potential costs.

SRH will present the results of tasks 1 through 3 to Time Oil Company representatives at Time's offices in Seattle as a part of task 2. This meeting will be conducted to review findings and to refine the scope of work relative to the development of the bench scale study plan.

This task is expected to require 2 weeks for completion with an estimated cost of $4,316.

Task 3 - Evaluate the Nature of the Wastes to be Treated

SRH will determine the porosity, grain size distribution, organic carbon content and other critical parameters of Time's contaminated soil which affect the extraction of PCP and any other identified contaminants from the soil. Analyses performed to date have indicated the presence of unidentified contaminants

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in addition to PCP in the soil at Northwest Terminal. SRH will determine the presence and nature of contaminants other than PCP in the soil to allow determination of their impact on the extraction process. Samples of soil from the Northwest Terminal PCP site will be taken and evaluated for priority pollutants by GC/MS, ICP and other appropriate analytical techniques with identification of other major peaks as indicated. Specifically, soil will be evaluated for grain size (particle size distribution), soil type, porosity, specific gravity, moisture content, pH, total organic carbon and oil and grease levels. Two samples are proposed for each test to allow for an estimation of the range of concentration of the contaminants found.

This task is expected to require 3 weeks for completion (including 2 weeks for laboratory analyses) with an estimated cost of $6781.

Task 4 - Develop an Initial Plan for Bench Scale Studies

The information generated in tasks 1 through 3 will be used to refine the experimental approaches needed to complete bench scale studies. The following proposed plan is expected to undergo modification based on those results.

This investigatory plan is based on extraction theory and the existing literature but is heavily weighted towards existing and available technology and equipment. It is intended to quickly produce sufficient results to allow Time to determine if further pursuit of the project is warranted.

Extractability of soil contaminants will be initially evaluated using simple jar tests. Jar tests will be performed by introducing a known amount of contaminated soil into a beaker containing a fixed volume of extracting solution. The material will be agitated for a fixed period of time at a known temperature. Following this protocol, the filtered solution and the extracted soil will be analyzed for PCP and the extraction ratio determined.

Organic solvents, elevated pH solutions and aqueous solutions of surfactants will be evaluated. Up to four solvents, four different pH levels and four different surfactants will be evaluated. Based on the observed results, relative costs, safety and environmental considerations, two different elutriating solutions will be selected for further evaluation, including optimization of extraction conditions. The effect of the extraction procedure on contaminants other than PCP which have been determined to be present in the soil will be assessed by

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analysis of the extract and the residual soil for these materials. Conditions indicative of a potentially successful soil cleaning process will be pursued for optimization of the batch process. To optimize the process, the extracting conditions will be varied with respect to surfactant concentration, extraction time, temperature and/or pH, as appropriate, to maximize the removal of PCP and other contaminants from the soil. It should be noted that different contaminants may require different extraction solutions (or combinations of solutions). SRH believes that PCP and oil are the principal contaminants and a single extraction solution may be used to remove both substances from Time's soil.

When the batch process has been optimized in the above fashion, samples of the elutriate will be analyzed for all identified contaminants. A description of the elutriate solution will be prepared to allow for evaluation of elutriate treatment alternatives. At this time, it is expected that oxidation or reduction of the waste material represents a potential treatment option but that final selection of a suitable treatment will require a precise understanding of what contaminating materials, other than PCP, may be present.

The optimized solution will be used to compare three extraction procedures, as appropriate, i.e. sequenced batch, countercurrent, and reflux (Soxhlet) extractions. These processes can be conducted in SRH's bench scale, laboratory apparatus. The objective of this set of tests is to optimize the extraction procedure by improving efficiency and minimizing the quantities of solution required. This study will necessarily be contingent upon the extraction solutions selected. For example, since caustic and surfactant solutions are not generally volatile, Soxhlet procedures would not be applicable to these solutions and therefore would not be evaluated. Conversely, if an organic solvent is indicated as the elutriating solution, it may be necessary to remove the residual solvent from the extracted soil prior to discharge from the extractor. In this case, sequenced batch extraction may be favored while continuous processes such as countercurrent or soxhlet extraction would be contraindicated.

The last evaluation in the bench scale phase of the project is the determination of a treatment method for the extracted material. Although this evaluation will ultimately depend on the nature of the material as produced, it is believed that oxidation/reduction or separatory methods represent likely candidates. For example, if the extraction is performed using caustic solutions, acidification of the extract to a pH < 5.0 may precipitate significant amounts of

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PCP due to the reduced solubility of this compound in its acid form. Conversely, if large amounts of oil are present, it may be necessary to utilize a solvent as the extractant, in which case removal of the solvent and treatment of the residual material through peroxide, permanganate, or other chemical oxidation process, chemical reduction, or physical adsorption onto organic or inorganic substrates may be preferred.

The plan will be developed in close association with Time Oil Co. personnel to ensure that the resultant plan meets Time's expectations and requirements.

This task is expected to require 1 week for completion, with an estimated cost of $2290.

Task 5 - Implement Bench Scale Study Plan

SRH will conduct the implementation of the study as planned in task 4, above. The plan, which will have been developed in close coordination with Time Oil Company, will have the following components for the sake of discussion and cost estimation:

- perform 12 initial jar tests
- analyze 24 PCP samples from initial jar tests
- perform 6 secondary jar tests
- analyze 12 PCP samples from secondary jar tests
- perform 4 jar tests for optimization
- analyze 8 PCP samples from optimization jar tests
- perform 3 process emulating extractions (i.e. soxhlet, countercurrent, etc)
- analyze 6 PCP samples from process emulating extractions
- analyze optimized extract from optimized jar test for all identified contaminants
- perform 4 separatory tests on optimized extract
- perform 3 oxidation tests on optimized extract
- perform 2 reduction tests on optimized extract
- analyze effluent from the above extract destruction tests (9 PCP analyses)
- analyze 1 effluent sample for all identified contaminants

The results of the bench scale study will be a summary report to Time Oil Co. indicating the success or failure of the soil washing process at the bench scale level and projecting the probability for success of a pilot level scale-up.

SRH has evaluated the topic of PCP extraction from soil and is aware that extensive work has already been performed in assessing

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the extraction efficiency of this material from soils in an EPA directed extraction procedure for preparing samples for quantitative analysis. This work, done to provide a means for analyzing contaminated soil, has direct bearing on this project, and leads SRH to conclude that reflux extractions may pose a viable and well documented process for PCP contaminated soil remediation. To date, SRH is unaware of any commercial effort to decontaminate soils by this process.

This task is expected to require approximately 12 weeks for completion, including laboratory turn around time. The estimate cost for this task is $23,680, including analytical costs.

Task 6 - Prepare Report and Submit Recommendations

SRH will prepare a summary report presenting the data, conclusions and its recommendations to Time Oil Company. The report will include copies of experimental protocols and analytical results and will present a summary of the results and their significance to allow Time Oil Company to determine if further pursuit of this project is warranted. SRH will also attend a one day meeting at Time's offices in Seattle to review the results and conclusions with Time's representatives.

This task is expected to require 1 week for completion with an estimated cost of $2,626.

COST ESTIMATE

Although the precise determination of the costs associated with any developmental process is difficult due to the large potential for project reorientation based on new results and findings, SRH believes that the following cost estimates provide a good foundation for project assessment. SRH proposes to perform the work on a time and materials basis according to its current rate schedule. The estimated costs presented herein would not be exceeded without prior authorization from Time.

A detailed cost estimate breakdown is presented in figure 1. SRH suggests that the estimate be reviewed following the completion of tasks 1 - 3, to reflect information obtained during these activities which could impact the assumptions made in estimated tasks 4 through 6. SRH estimates the total bench scale phase costs to be $37,868 including labor and expenses.

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TABLE 1 - COST ESTIMATE DETAIL

TASK	PERSONNEL	HOURS	COST
TASK 1 - REVIEW CURRENT REGULATIONS			
LABOR	REG. SPEC.	24.0	$1,920.00
	CLER	8.0	$216.00
	TOTAL	32.0	$2,136.00
EXPENSES	MISC.		$200.00
	TOTAL		$200.00
TOTAL			$2,336.00
TASK 2 - REVIEW CURRENT EXTRACTION LITERATURE			
TASK 2A - REVIEW LITERATURE			
LABOR	SR. SCI	32.0	$2,560.00
	CLER	8.0	$216.00
	CHEM	10.0	$500.00
	TOTAL	50.0	$3,276.00
EXPENSES	MISC.		$200.00
	TOTAL		$200.00
TOTAL			$3,476.00
TASK 2B - MEETING WITH TIME OIL CO			
LABOR	PRIN	8.0	$640.00
	TOTAL	8.0	$640.00
EXPENSES	MISC.		$200.00
	TOTAL		$200.00
TOTAL			$840.00

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	TOTAL TASK 2			$4,316.00
TASK 3 - EVALUATE NATURE OF WASTES				
	LABOR	SR. SCI	16.0	$1,280.00
		CLER	8.0	$216.00
		CHEM	8.0	$400.00
		GEOL	8.0	$480.00
		TOTAL	40.0	$2,376.00
	EXPENSES	MISC.		$300.00
		ANALYTICAL		$4,105.50
		TOTAL		$4,405.50
	TOTAL			$6,781.50
TASK 4 - DEVELOP STUDY PLAN				
	LABOR	SR. SCI	24.0	$1,920.00
		CLER	10.0	$270.00
		TOTAL	34.0	$2,190.00
	EXPENSES	MISC.		$100.00
		TOTAL		$100.00
	TOTAL			$2,290.00
TASK 5 - IMPLEMENT BENCH SCALE STUDY				
	LABOR	SR. SCI	40.0	$3,200.00
		CLER	16.0	$432.00
		CHEM	72.0	$3,600.00
		GEOL	24.0	$1,440.00
		TECH	40.0	$1,600.00
		TOTAL	192.0	$10,272.00
	EXPENSES	MISC.		$350.00
		ANALYTICAL		$9,487.50
		COMPUTER		$150.00
		OTHER LABORATORY		$3,421.25
		TOTAL		$13,408.75
	TOTAL			$23,680.75

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TASK 6 - REPORT AND RECOMMENDATIONS

TASK 6A - PREPARE REPORT

LABOR	SR. SCI	8.0	$640.00
	ADMIN	8.0	$480.00
	CHEM	5.0	$250.00
	CLER	8.0	$216.00
	TOTAL	29.0	$1,586.00
EXPENSES	MISC.		$200.00
	TOTAL		$200.00
TOTAL			$1,786.00

TASK 6B - MEETING WITH TIME OIL CO

LABOR	PRIN	8.0	$640.00
	TOTAL	8.0	$640.00
EXPENSES	MISC.		$200.00
	TOTAL		$200.00
TOTAL			$840.00
TOTAL TASK 6			$2,626.00

PROJECT TOTAL $42,030.25

NOTES:

REG. SPEC	REGULATORY SPECIALIST
CLER	CLERICAL
SR. SCI	SENIOR SCIENTIST
CHEM	CHEMIST
PRIN	PRINCIPAL
ADMIN	ADMINISTRATIVE ASSISTANT
GEOL	GEOLOGIST

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Time 2

NORTHWEST TERMINAL WOODTREATING
CHRONOLOGY OF EVENTS

1981

Jan 28	Notice given to Koppers terminating 3/1/67 agreement effective March 31, 1982.

1983

April 18	Bioassay results show soil sample is toxic.
Oct. 5	Meeting with Koppers at terminal to formulate tank and soil removal agreement.
Nov. 15	Koppers removed all penta product and raw material from terminal.

1984

April 27	DEQ advised that terminal was to be inspected as part of DEQ/EPA "hit list" of 44 companies.
June 28	DEQ denied 5/24/84 TOC request to be deleted from inspection list.
Oct. 25	DEQ inspection and determination to collect samples.
Nov. 7	Information on terminal provided per DEQ request.
Dec. 12	DEQ collected 12 soil samples throughout tank farm, of which one was in penta area.

1985

Jan. 11	Status meeting with Koppers in St. Louis.
Jan. 24	Received results of DEQ soil sampling, showing 1820 ppm penta in woodtreating area.
Feb. 4	Status update letter to DEQ (Janet Gillaspie).
Feb. 19	Contract executed with Northwest Vacuum Truck Service, Inc. for removal of soil and transport to Arlington.
May 14	DEQ approved "Disposal Request" for penta contaminated soil at Arlington.
June 24	"Waste Transportation and Disposal Agreement" executed with Chem-Security Systems, Inc. for disposal of soil at Arlington.
June 25-28	242.76 tons (7781 cubic feet, 288 cubic yards) of soil removed to Arlington.

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June 28	Contract executed with Riedel for penta sampling and analysis.
June 28	Received DEQ interpretation of maximum allowable penta concentration in soil (600 ppm) and water (0.15 ppm).
July 17	Received composite sample results showing maximum of 860 ppm penta.
Aug. 15	Received individual sample results and contour maps from Riedel showing maximum of 26,550 ppm penta (on ground surface where trucks were loaded).
Nov. 5	Amendment 2 to Riedel contract calling for decontamination of wall and installation of groundwater monitoring wells.
Dec.13	Received letter from EPA advising that there were no commercial facilities that would accept penta.

1986

Jan. 8	Northwest vacuum truck contract cancelled.
Feb. 12	Received Riedel report on well installation and soil sampling showing maximum penta concentration of 116,000 ppm beneath warehouse.
Feb. 26	Received sample analysis results from ATW/Cadweld.
Feb. 28	TOC installed 3 well points (A,B,C) to measure water table gradient.
March 6	Submitted invoice to Koppers for their share of clean up costs.
April 1	TOC completed installation of 3 additional well points (E,F,G). Water level measurements indicated drainage through Riedel Well #4.
April ?	Century Environmental Services collected water samples from wells B,E,F, and 4.
May 8	Riedel completed installation of 3 monitoring wells (D,H,I).
May 9	TOC collected water sample from well #4.
May 14	Riedel completed removal and sealing of well #4.
May ?	Century collected water samples from wells A,B,D,E,F,H and I.
June 4	Received results of April water samples showing maximum of 6.1 ppb of penta in well #4.
June 11	Paid $3,500 fee to Oregon DEQ for June 1985 movement of soil to Arlington.

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July 7	Received results of May water samples showing only well #1 having detectable concentration (0.0022 ppm) of penta.
Aug. 8	Letter to Koppers briefly summarizing action to date.
Aug. 14	Contract with SRH Assoc. to collect and analyse soil samples and evaluate clean-up alternatives.
Aug. 20	Consolidated shallow "hot spots" of penta contamination into one pile.
Oct. 1	Received report from SRH on project history, remedial alternatives and analysis results. "Soil Washing" recommended as clean-up approach. Bench scale studies suggested as first step in design of system.

1987

Jan. 6	Received SRH proposal for bench scale studies of soil washing technique.
Feb. 27	Inquiry into on-site incineration by Waste Tech Inc.: project would cost $2 million and take more than one year to complete.
Mar. 25	Soil sample sent to Keystone Environmental Resources (per Koppers instructions) for analysis of treatment alternatives.
Apr. 1	Invoice for $54,780.28 sent to Koppers to cover their share of expenditures to date.
Aug. 13	Koppers advised that Jim Campbell (Keystone Environmental Resources) and Billy Nolan assigned to replace Jay Stebbins on this project. Results of soil tests and payment of invoice not yet received.
Oct. 2	Koppers reminded of obligation not yet paid.
Nov. 5	Received SRH report on samples collected 8/20 and 10/16 showing penta contamination in Well B of 2300 ppm and 1000 ppm, respectively. Highest levels found in groundwater to date.
Nov. 9	Koppers reminded of obligation. Jim Campbell agreed to provide soil test results and payment of April invoice. Campbell advised Koppers wishes to buy out of future liability.
Dec. 17	Received SRH proposal for treatment by excavation and soil washing. Treatment technique to be developed by bench scale tests.

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1988

Feb. 2	Received SRH proposal for excavation and temporay stockpile of soil while treatment approach is being developed.
June 14	Revised SRH proposal and cost estimate for development of soil washing techniques.
July 21	Requested cleanup proposal from Ecova Corp.
Sept. 12	Received Ecova Work Plan for soil and groundwater remediation using biological treatment in above-ground reactors. Three alternative treatment levels - 500 ppm, 100 ppm & 50 ppm - were evaluated.
Sept 19-22	Contacted Oregon DEQ (Ed Woods and Tom Miller) to determine DEQ's role. Was advised that DEQ does not necessarily need to approve the treatment process, but does need to sign-off that the cleanup was effectively completed.
Oct. 12	Ammended Ecova Work PLan to achieve final cleanup level of 0.5 ppm pentachlorophenol.
Oct. 18	Ammended Ecova Work PLan to include installation of additional monitoring wells.
Nov. 9	Signed contract with Ecova. Cost for cleanup of penta in soil and water to 0.5 ppm is fixed at $445,000 for 3,440 cubic yards of soil. Excavation and treatment of additional volumes of soil will cost $90 per cubic yard.
Dec. 2	Received notification from DEQ (letter dated 11/30/88) that facility was listed on "Inventory of Confirmed Releases" (site identification number 170).
Dec. 5	Ecova commenced site mobilization.

1989

Jan. 13	Received $59,185.55 from Koppers for their share of investigation and cleanup costs through September 19, 1988.

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PENTACHLOROPHENOL

CONTAMINATION

NORTHWEST TERMINAL

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PENTACHLOROPHENOL

CONTAMINATION

AT

TIME OIL COMPANY

NORTHWEST TERMINAL

12005 NORTH BURGARD ROAD

PORTLAND, OREGON

OCTOBER 1, 1986

PREPARED FOR:

TIME OIL COMPANY
2737 WEST COMMODORE WAY
SEATTLE, WASHINGTON

PREPARED BY:

SRH ASSOCIATES, INC.
123 N.E. THIRD AVENUE, SUITE 230
PORTLAND, OREGON 97232
(503) 232-0824

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EXECUTIVE SUMMARY

On March 1, 1967, Time Oil Co. and Koppers Company entered into an agreement wherein Time would provide certain labor and services connected with the receipt, storage, handling and blending of specified woodtreating products, including pentachlorophenol. All products were owned by Koppers. The site selected for this activity included a warehouse and tank farm on a small (70' x 70') portion of Time's 45 acre Northwest Terminal located at 12005 North Burgard Road in Portland, OR.

The operation started up and continued routinely until January 28, 1981. Time then advised Koppers of its election to terminate the project effective March 31, 1982, the scheduled agreement expiration date. Various in-house inspections had indicated the possibility of soil contamination. Subsequent bioassay tests confirmed the existence of pentachlorophenol in the soil adjacent to the warehouse. Both companies concurred to close the site. Operations ceased. Orderly phase out actions were established and begun.

It is noteworthy that this entire closure effort was jointly planned and undertaken by the two companies to voluntarily correct what both felt may become a future problem.

By February 1985, on hand product inventory had been blended off and shipped out. All tanks and piping had been cleaned, with cleaning wastes being shipped to Arlington. Piping and tanks had been disassembled, removed and scrapped. In short, the site was cleared to ground level.

Soil clean-up began. Following coordination with the DEQ, the Arlington landfill and local contractors, some 242 tons of soil were shipped to Arlington. A sampling matrix was prepared and more than 150 soil samples were collected and analyzed for PCP. Concentration isopleths were generated, which depicted remaining contamination locations and degrees of contamination, the highest of which was 116,000 ppm. Isopleths showed site size had now expanded to about 70' x 140' in area. The concrete wall along the western edge of the site was removed, decontaminated and disposed of to facilitate removal of this newly discovered increased area of soil contamination. To aid in reducing the physical size of this newly defined area, the extremities of site soil were centralized to the one spot having the highest known contaminant concentration. Soil relocation actions were based on previously plotted contour determinations. They were successful in that the area was reduced to about 60' x 60'.

At the end of 1985, the EPA advised Time that soil contaminated with leaked PCP had been reclassified as hazardous waste (number F027) and that there were currently no hazardous waste facilities in the U.S. that would accept this waste.

Pending resolution of EPA/DEQ acceptable disposal methods for PCP contaminated soil, efforts were directed toward the determination of possible groundwater contamination. Fourteen wells were installed and developed during 1986. Two were subsequently closed due to inefficient operation. Remaining wells have been repeatedly sampled and those samples analyzed for PCP. Concentrations have not exceeded .044 ppm at the highest reading. While well water analysis is scheduled to continue quarterly until the project is completed, to ensure no groundwater migration goes undetected, there appears to be no real groundwater problem.

Since there was no regulatory relief in sight, which would permit off-site disposal of PCP contaminated soil, Time initiated an assessment of on-site remedial alternatives. Recommended actions are:

a. Select the "Surface Mounted Soil Washing" technique as the most logical remedial approach.

b. Perform bench scale and pilot level evaluations.

c. Determine necessary destruction steps of recovered extracts.

d. Ascertain technical permitting and economic feasibility of technique for final disposal action.

e. Compare results with repeat step by step examination of next most logical remedial approaches which are: "Surface Mounted Thermal Extraction" and "In-Situ Thermal Extraction".

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SECTION I

HISTORY

Section I provides a sequential summary of those activities relating to pentachlorophenol (PCP) operations within the Time Oil Company Northwest Terminal located at 12005 North Burgard Road in Portland, Oregon. The information was gathered from Time Oil files at the firm's Seattle headquarters. Data was extracted from reports, memos and other correspondence from Time employees, the Oregon Department of Environmental Quality (DEQ), the US Environmental Protection Agency (EPA) and private consultants.

BACKGROUND

Agreement with Koppers Company, Inc. (1967-1982)

On March 1, 1967, Time Oil Company reached an agreement with the Koppers Company, whereby Time would provide the storage, handling and distribution of Koppers owned specialty woodtreating chemicals, including PCP. The operating area included a warehouse building and an adjacent tank farm area (about 70' x 70') with an earthern surface. This small site was to become known collectively as the woodtreating chemicals area. Early in 1981, Time notified Koppers of their intent to terminate the agreement on March 31, 1982. Time and Koppers jointly agreed to immediately cease all PCP operations at the site, to remove all products, to clean all tanks and pipelines, to remove and dispose of all tanks and pipelines, to effect clean up of whatever contamination existed and to do it all within existing regulatory guidelines.

Various Site Inspections (1971-1984)

A summary of in-house site inspections, over the ten year period (1971-1981), identified the following problems related to the PCP operation.

- No spill control system in warehouse. Spilled liquid was able to run unrestricted through the warehouse area and drain out through doors. Sloping of the warehouse floor and installation of drains was recommended.

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- o Floor of warehouse work area caked with product. Steam cleaning recommended.
- o No warning signs were posted which call attention to hazards in the area where PCP was stored and mixed.
- o Ground near end of pipelines saturated with product to a depth of 12 inches.

During February 1983, Time contracted with the AM-Test Corporation to conduct a fish bioassay test on the site soil. Analysis resulted in a finding of the soil (only) being toxic at the 100 and 1000 ppm levels.

On a subject matter completely unrelated to the pentachlorophenol operation and Time/Koppers planned actions, the DEQ conducted an inspection of the entire Northwest Terminal facility on October 25, 1984. On that date, the DEQ advised their intent to collect soil samples throughout the facility. It is because of this latter DEQ advisory that the following soil test results are included since two samples were taken from the woodtreating chemicals area.

On December 12, 1984, DEQ personnel collected twelve soil samples from the entire facility. Splits of each sample were provided to Time. DEQ analytical results were received by Time on January 24, 1985. The DEQ samples were analyzed for EPA Priority Pollutants and for other substances identifiable through GC/MS scan, with a specific interest in lead content. No samples were found to have lead concentrations above the detection limit. The samples were also analyzed for fourteen pesticides, but no concentrations above the detection limit were found. Non-priority GC/MS scans indicated the presence of low concentrations of petroleum hydrocarbons in three of the twelve samples. In the analysis for EPA Priority Pollutants, ten of twelve samples were found to contain either no concentrations of any organics above the detection limit, or only trace amounts of polynuclear aromatics. One sample, taken from the woodtreating chemicals tank farm, contained 515 ppm of PCP and 12 ppm of tetrachlorophenol (TCP). The second sample from this area contained 1820 ppm of PCP and 71 ppm of TCP.

Sample splits, which had been provided to Time, were then submitted to Coffey Laboratories for analysis in order to confirm DEQ findings. Results of these analyses were received on March 15, 1986 and showed no PCP concentrations higher than 275 ppm. No pentachlorophenol was detected in any sample outside of the woodtreating chemicals area.

INITIAL CLEAN UP EFFORTS

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Proposal for Removal of Contaminated Soil (1983)

In October of 1983, pending completion of site tank and pipeline

physical removal, plans were made to excavate and dispose of soil to a depth below that where PCP contamination was found to exist. This was to be a three phase effort, fully coordinated with the DEQ and the disposal facility. Phase I consisted of initial soil removal and its transport to an authorized disposal facility. Phase II involved a thorough investigation to determine the extent of PCP contamination and its degree of concentration. Phase III was to remove and dispose of any remaining soil which was detected, by laboratory analysis, to be contaminated above acceptable limits.

On November 1, 1983, a delay in Phase I of the planned removal occurred because ownership of the hazardous waste facility at Arlington changed and some period of time was needed for the new management to reach full operational status. Further, an agreement from the new owners (Chemical Waste Management) to accept the soil at Arlington prior to any excavation was absolutely essential to ensure that Time did not become classified as a hazardous waste storage facility.

Removal and Disposal of Contaminated Soil (February - June, 1985)

On February 4, 1985, Time reiterated to the DEQ, its intent to excavate PCP-contaminated soil and dispose of it at an approved disposal facility. On February 19, Time executed a contract with Northwest Vacuum Truck Service, Inc. for removal and transport of the contaminated soil. On May 14, the DEQ granted approval for disposal of the PCP-contaminated soil at the Arlington landfill. On June 24, an agreement covering disposal was reached with Chem-Security Systems, Inc., operator of the Arlington facility.

Between June 25 and June 28, 1985, 288 cubic yards (242.76 tons) of soil were removed and shipped to Arlington. The soil was excavated to a depth of 2 to 4 feet below grade in the northwest corner of the woodtreating chemicals tank farm.

Soil Sampling (June - July, 1985)

On June 28, 1985, following completion of contaminated soil excavation, Time retained Riedel Environmental Services to perform sampling and analysis of the remaining soil. Samples of surface soils were initially collected from 22 locations around the perimeter of the woodtreating chemicals tank farm area. Three composite samples were formed and analyzed, showing PCP concentrations of up to 860 ppm. Samples of the soil from 81 individual sample sites surrounding the woodtreating tank farm area were then collected and analyzed for PCP. The results indicated that the contamination was localized to the west and south of the warehouse with little or no contamination occurring to the east of the site.

Soil was then collected from fourteen locations at depths of 0, 2, 4, 7 and 12 feet below the surface on a triangular grid across the tank farm area. Samples were taken by the split spoon technique using a hollow stem auger drill rig, and analyses were performed in accordance with EPA procedure #8040 (SW-846). Contaminant contour maps were developed from the data which showed a maximum PCP concentration of 26,500 ppm at the surface in the area where the loading of trucks had occurred. This finding of soil contamination caused an increase of the site size to about 70' x 140'. A second focus of contamination was at the southwest corner of the warehouse. The vertical column of contamination at the second location extended to the lowest sampling interval (12-14 feet below the surface), which was noted as being in the saturated zone at the time of sampling. The highest concentration at this depth was 2,030 ppm.

The two focal points of contamination are indicated on the surface contour isopleth map generated by Riedel and presented as Figure I-1 of this report. Figure I-2 indicates the 12 foot contaminant isopleth. (Note: the southwest corner of the warehouse is indicated by the reference mark at coordinates (76,166)).

600 ppm Chlorophenol Toxicity Level Interpretation (June, 1985)

On June 28, 1985, Time received a letter from the DEQ laboratory, concerning previous interpretations by the agency, that 600 ppm of total chlorophenols in soil represented the hazardous waste threshold. This conclusion was based on extraction and bio-toxicity tests peformed by DEQ. The letter stated, however, that this was only used as guidance and did not necessarily reflect specific clean up requirements.

Removal of Concrete Wall (November, 1985)

Time retained Riedel Environmental Services in November, 1985 to remove and decontaminate a concrete wall which stood along the west perimeter of the woodtreating chemicals tank farm area. The intent of the removal of the wall was to allow for easy sample analysis, contaminant containment and future removal of the contaminated soil adjacent to the wall. This project included wall steam cleaning, subsequent testing of the wall for residual PCP and wall demolition following certification of decontamination to background levels of PCP. The wall was broken into pieces by Riedel and disposed of by Time.

Classification of Contaminated Soil as Hazardous Waste (December, 1985)

On December 10, 1985, the EPA Region X office advised Time that soil contaminated with leaked PCP had been reclassified (from U242)

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to a hazardous waste bearing number F027. Referring to a moratorium on landfilling of such wastes, the EPA letter stated that at that time there were "no commercial hazardous waste facilities in the United States that would accept waste designated as F027." EPA also suggested that Time consult with the DEQ before continuing with clean-up operations at the site.

Wells 1, 2, 3 and 4 Installation (November, 1985)

Pending resolution of acceptable disposal techniques for contaminated soil containing PCP, Time concentrated on determination of possible groundwater contamination.

In November, 1985, Time again retained Riedel Environmental Services to install four groundwater monitoring wells near the southwest corner of the warehouse building. Wells 1, 2 and 3 were placed in 16-inch (O.D.) 45° slant borings which penetrated soil beneath the building to a vertical depth of 14 feet. Well 4 was installed in a 16-inch (O.D.) vertical hole drilled to a depth of 50 feet. Samples for PCP analysis were taken to advance and further earlier analyses, particularly to determine if contamination existed beneath the woodtreating chemicals warehouse.

Samples from the slant borings indicated PCP concentrations as high as 116,000 ppm at 2.5 to 4 feet below the surface, with surface concentrations ranging from 65.3 to 1,690 ppm. The concentrations generally decreased with depth. The vertical boring (Well #4) showed concentrations descreasing with depth from 574 ppm at 18.5 to 20 feet below the soil surface to a low of 1.59 ppm at 43.5 to 45 feet below the surface. The conclusion of this report was that contamination exists below the southwest corner of the woodtreating warehouse floor, although the horizontal limits of contamination were not definable with the existing data.

Geologic logging of the soil at Well #4 indicated a minor layer of low permeability about 18 to 35 feet below the surface. The well was completed by installing 4-inch PVC well casing and screen to a depth of 40 feet in the 16-inch auger hole and sand packing the well annulus to within 6 feet of the surface. A well construction diagram is shown in Figure I-3. The geologic log of this boring is shown in Figure I-4. A well construction diagram of the slant borings is shown in Figure I-5.

Installation of Well Points (February - May, 1986)

In February, 1986, in order to identify groundwater flow direction and gradient beneath the Northwest Terminal facility, Time installed well points at three locations surrounding the woodtreating chemicals warehouse and tank farm area. Two of the wells (A and B) were installed to a depth of 20 feet. Two wells were installed at a depth of 8 feet at location C (see Figure I-6).

Water level measurements were taken on nine occasions between February 28 and March 11 in Wells A, B, C_1, C_2 and 4. The data collected indicated an unexpectedly lower water level in well 4 as compared with the other well locations.

To further investigate this unusual circumstance, three additional well points, four observation pits and a river level reference point were installed by Time in late March, 1986. Wells E and F were driven to depths of 20 and 19 feet, respectively, while Well G was driven to a depth of 13 feet where advancement of the point was halted by cobbles. Well C_2 was removed, and Well C_1 was henceforth known simply as Well C. Water levels in Well 4 and Wells A-G were again measured repeatedly over a period of several days. The data confirmed earlier indications that a water table depression existed in the area of Well 4.

A detailed evaluation of the boring log data for Well 4 showed that a series of clay lenses and silty sands had been penetrated by the bore hole between the depths of 18.5 and 35 feet.

Gravelly sand lies above this zone and medium to fine sand predominates below it. The clay lenses appear to have formed a zone of relatively low permeability separating a perched upper water bearing zone from a lower aquifer. This zone of low permeability was apparently breached by the installation of Well 4. The boring was drilled with a 16-inch diameter auger while the well consisted of 4-inch PVC pipe. The annulus was filled with coarse sand, violating the integrity of the low permeability layer and providing a potential pathway for water from the upper perched water bearing zone to flow down the hole to the lower aquifer, creating a depression in the natural groundwater flow. This appeared to have altered the natural direction of groundwater flow (toward the Willamette River) within a zone of influence surrounding Well 4.

Although the observed water table depression could represent a strong, natural vertical gradient in the vicinity of Well 4, the influence of this well on adjacent wells indicated a strong probability of an induced groundwater sink caused by an unsealed annulus of Well 4. This conclusion was reached by Time upon evaluation of the piezometric surface of the perched water, which indicated that wells in close proximity to Well 4 were apparently influenced by Well 4, showing water level depressions, while wells distant from Well 4 were unaffected.

Additional Groundwater Monitoring Wells and Well 4 Abandonment (May, 1986)

At Time's direction, three additional groundwater monitoring wells (D, H and I) were installed by Riedel in early May, 1986. The purpose of these wells was to further define the upper piezometric surface and to obtain data on groundwater quality.

In an effort to reinstate natural groundwater flow patterns in the area and to eliminate possible intercommunication between upper and lower water bearing zones, Well 4 was removed by overdrilling and the hole sealed on May 14, 1986. Prior to choosing this method of abandonment, Time evaluated several possibilities, including pressure grouting and two different overdrilling processes, with input from Hart Crowser and Associates, Century Environmental Sciences and Riedel.

Groundwater Sampling (April - May, 1986)

Time retained Century Environmental Sciences to perform groundwater sampling and analysis of the wells and well points at the Northwest Terminal facility. In April, 1986, Century measured static water levels in Well 4, in Wells A-C and Wells E-G. These measurements again showed that the water level in Well 4 was lower than in surrounding wells. Samples collected from each well were analyzed and .0061 ppm, .0026 ppm and .0014 ppm of PCP were detected in Wells 4, B and F, respectively.

On May 28, following abandonment of Well 4, a second group of groundwater samples were collected from Wells A, B, D, E, F, H and I. The locations of these wells is indicated in Figure 6. The analytical results showed PCP in a concentration just slightly above the detection level (.0002 ppm) in Well I. Other wells contained no detectable levels of PCP.

Additional Soil and Groundwater Sampling (August, 1986)

In August, 1986, Time retained SRH Associates to perform additional sampling and analysis of soil and groundwater at the Northwest Terminal facility. Based on previous contour map determinations, Time re-graded the surface of the woodtreating chemicals tank farm area, gathering all suspected contaminated surface soil in a centralized area, reducing the area to about 60' x 60'. SRH then collected surface soil samples from the same 14 locations in the tank farm area which had been sampled earlier by Riedel, drilled six holes through the warehouse floor and sampled soil from beneath the building. Samples were collected from the surface of the soil underlying the concrete floor of the warehouse as well as the same five subsurface intervals sampled by Riedel in 1985. These borings were made in an effort to determine the extent of contamination underlying the warehouse.

SRH also collected groundwater samples for PCP analysis and pH, and made measurements of static water levels from all monitoring wells in existence. The results of these analyses are supplied in Section III of this report.

SUMMARY

During the duration of the agreement between Time and Koppers, pentachlorophenol and probably some tetrachlorophenol were released into the sandy soil adjacent to the woodtreating chemical warehouse. This material may have been released in combination with various hydrocarbon solvents used as a part of the process. The primary cause for these releases appears to have been intermittent spillage from hoses and mixing vessels during end product formulation and transfer operations, rather than a one-time spill event.

Upon investigation of these findings, Time and Koppers terminated their agreement, ceased all pentachlorophenol operations and began clean up operations at the site.

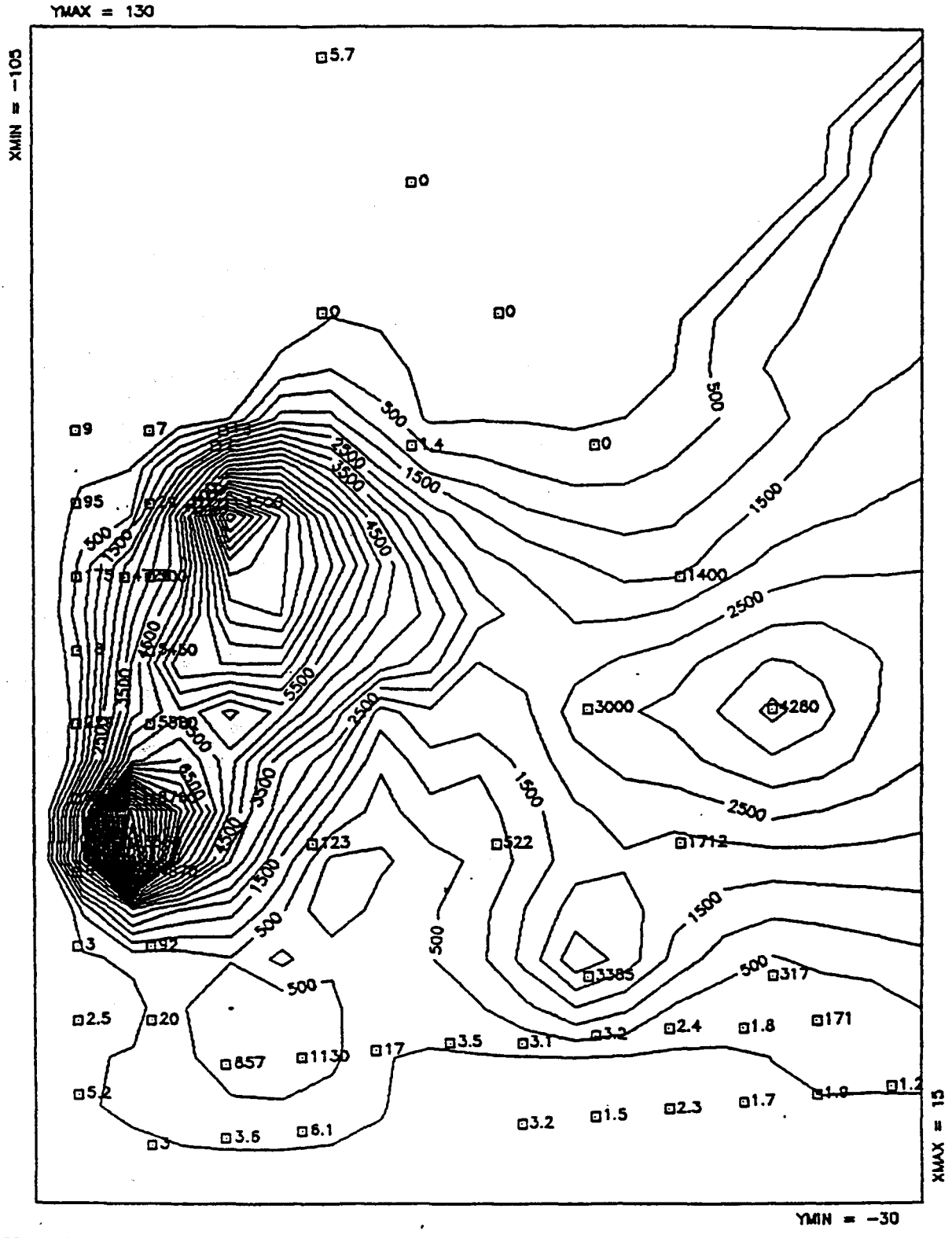
In investigating the extent of soil contamination, Time has obtained assistance from several consulting firms and clean up contractors, and has analyzed sufficient soil samples to determine the vertical and horizontal extent of contamination. The contamination is localized in the northwest corner of the woodtreating chemicals tank farm, with some slight penetration below the warehouse. An estimated 2,000 cubic yards of soil, a portion of which extends down to the first water bearing zone, is contaminated.

Time has installed an extensive water well monitoring network at the site and is continuously acquiring data on the flow directions and rates of flow of the first water bearing zone, as well as on water quality and PCP concentrations. Early data indicates that gross contamination of the groundwater has not occurred outside of the contaminated zone. PCP can barely be detected in wells in, or immediately adjacent to, the contaminant zone. Groundwater flow is generally in the direction of the Willametter River. Vertical gradients in the vicinity of the contaminant zone have not been determined at this time.

Time attempted to minimize the risk of contaminant migration by disposing of some material at Chemical Waste Management's Arlington facility. This effort was thwarted due to a moratorium on landfilling of PCP subsequently disallowing further such disposal. Time has consolidated the bulk of the contaminated soil into one spot within the woodtreating chemicals tank farm area to facilitate containment and minimize the risk of off-site migration.

Time has now retained SRH Associates to identify available alternatives to destroy or immobilize the PCP contaminated soil and is presently evaluating additionally generated data regarding groundwater quality and soil contamination.

FIGURE I-1



TIME OIL CO – ORIGINAL SURFACE PCP CONTOURS

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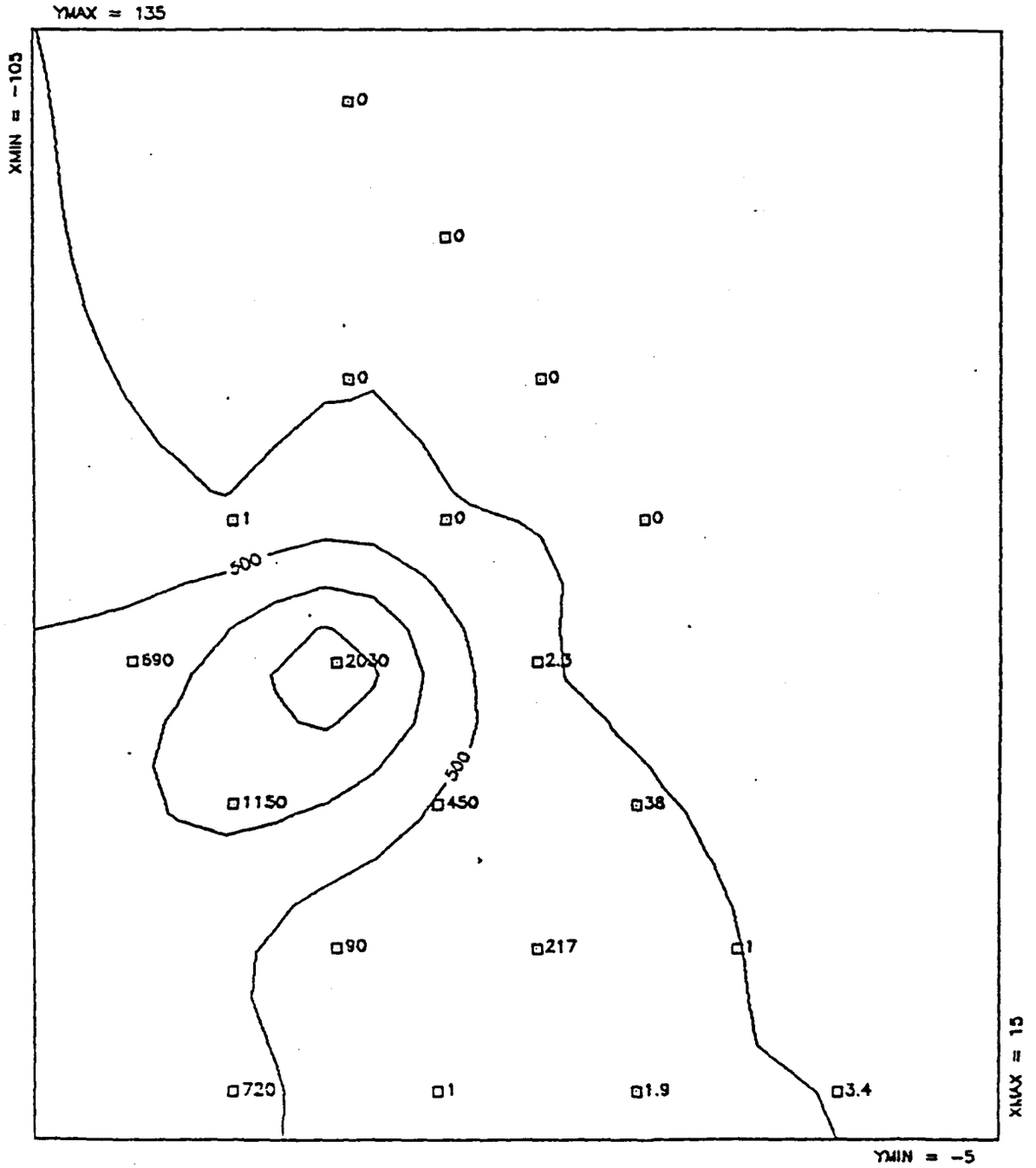
FIGURE I-2



TIME OIL CO – ORIGINAL 12 FOOT PCP CONTOUR

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FIGURE I-3

CONSTRUCTION DIAGRAM FOR

WELL 4

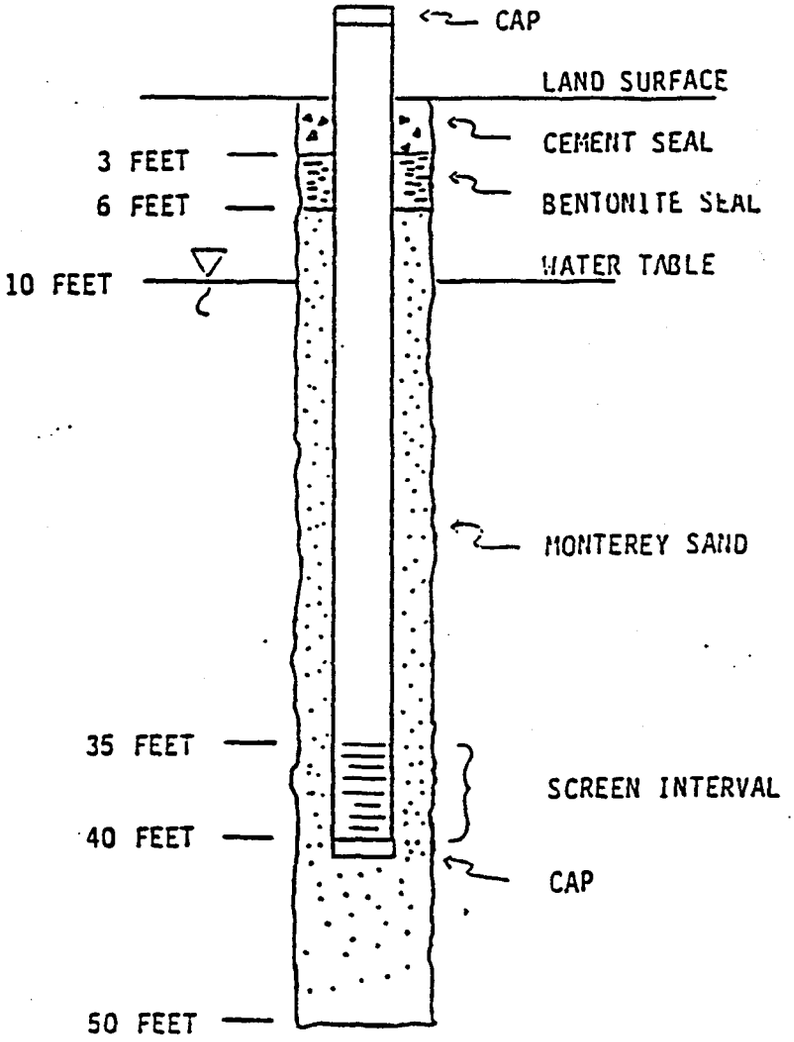

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FIGURE I-4

BORING LOG WELL 4

Depth in Feet	Soil Description
0 - 1-1/2	Light brown gravelly sand, moderately compacted, moist (shovel sample)
3-1/2 - 5	Dark brown gravelly sand, moderately compacted, moist, split spoon sample (S.S. sample)
8-1/2 - 10	Light brown gravelly sand, in contact with blue gray gravelly sand, moderately compacted, moist (S.S. sample)
10 - 13	Gravelly sand
13-1/2 - 15	Light blue gray gravelly sand, moderate compaction, saturated (S.S. sample)
15 - 18-1/2	Gravelly sand
18-1/2 - 20	Light blue gray gravelly silty sand with a clay lens, moderately compacted, saturated (S.S. sample)
20 - 23-1/2	Gravelly silty sand with clay lens
23-1/2 - 25	Light gray gravelly silty fine sand with minor clay lens, moderately compacted, saturated (S.S. sample)
25 - 28-1/2	Fine sand
28-1/2 - 30	Light gray medium to fine sand, 3-1/2" thick clay lens, saturated (S.S. sample)
30 - 32-1/2	Medium to fine sand with clay lenses
32-1/2 - 35	Light gray medium to fine sand, minor clay lenses, saturated (S.S. sample)
35 - 37-1/2	Medium to fine grained sand
37-1/2 - 39	Light gray medium to fine sand (S.S. sample)
39 - 42-1/2	Light gray medium to fine sand
42-1/2 - 45	Light gray medium sand grading to fine sand with depth, minor clay lens (S.S. sample)
45 - 47-1/2	Fine sand, saturated
47-1/2 - 49	Light gray sandy silt grading to light gray silty fine sand (S.S. sample)

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FIGURE I-5

CONSTRUCTION DIAGRAM FOR

WELLS 1, 2 AND 3

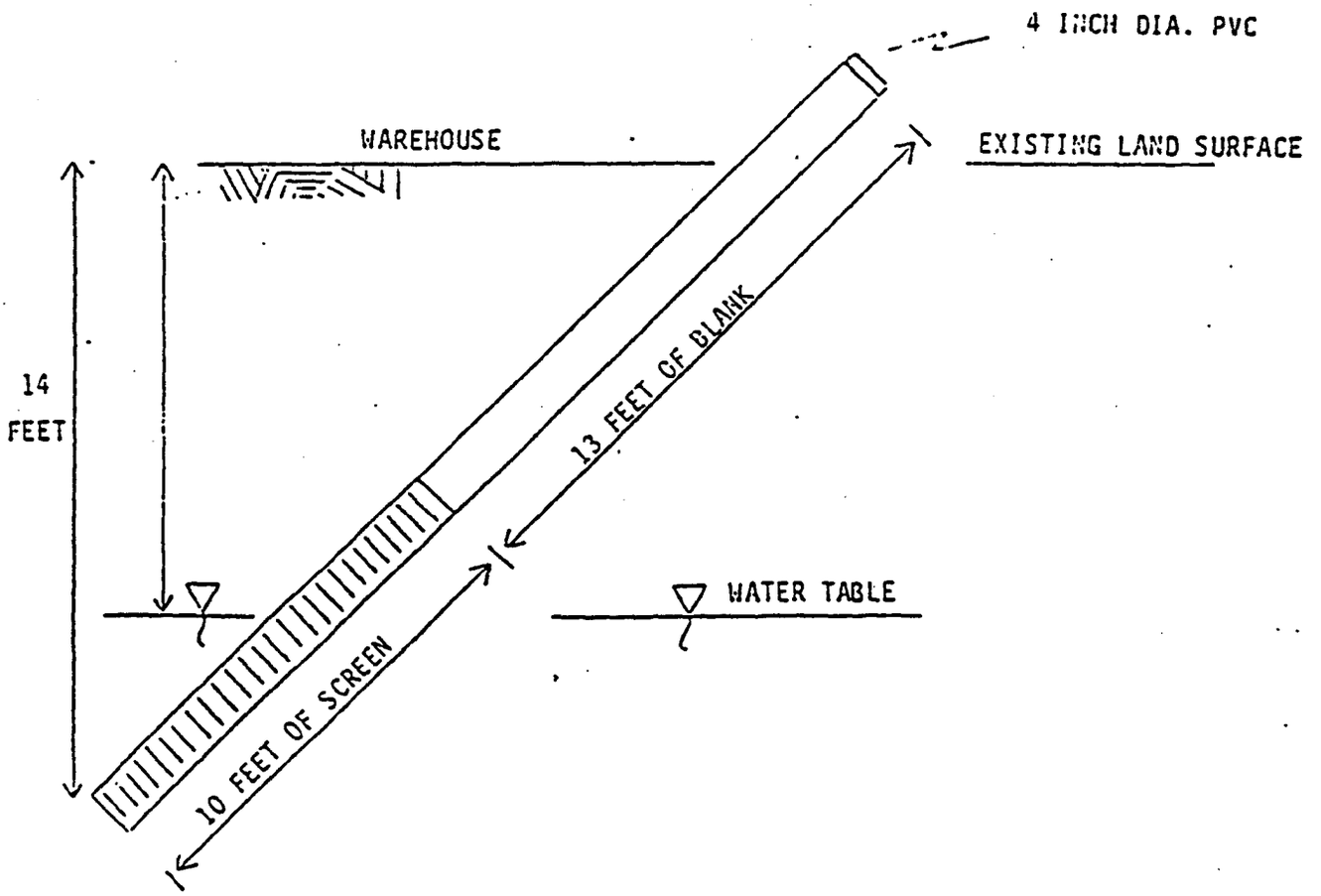

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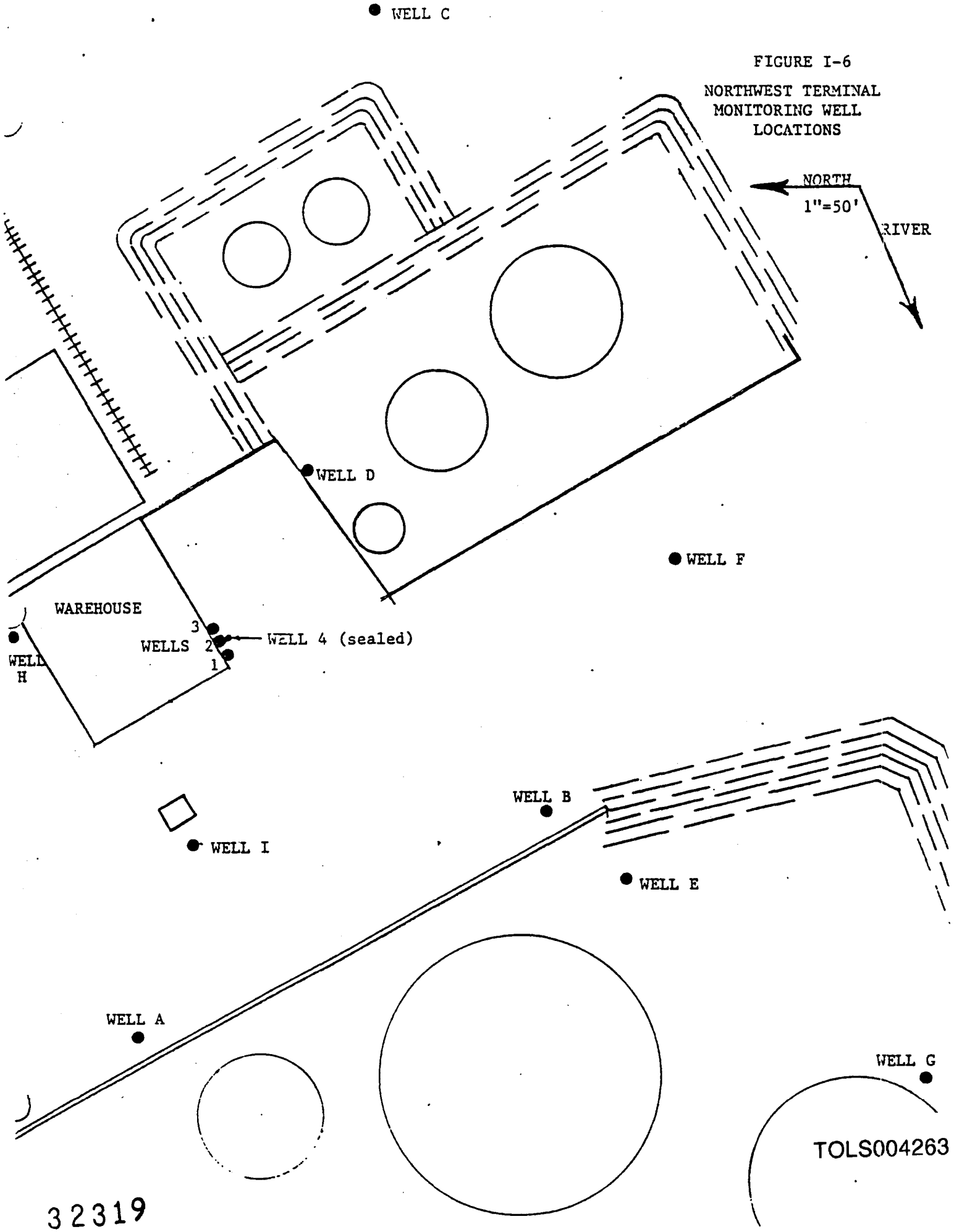
FIGURE I-6

NORTHWEST TERMINAL
MONITORING WELL
LOCATIONS



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SECTION II

REMEDIAL ALTERNATIVE ASSESSMENT

INTRODUCTION

A small portion of Time's 45 acre property at 12005 N. Burgard Road in Portland, Oregon has been identified as being contaminated with pentachlorophenol (PCP). Contamination at this site has been found to extend to approximately 70' x 140' in area and to depths of about 15 feet below the surface in one spot. The site was used for the formulation and storage of woodtreating chemicals under an agreement between Time and Koppers from 1967 until 1982. In addition to pentachlorophenol, a number of hydrocarbon solvents and petroleum products were used in this process.

Concentrations of PCP, ranging from below detectable limits to 116,000 ppm, have been detected in the soil, with concentrations generally decreasing with depth and distance from the southwest corner of the woodtreating chemicals warehouse. Concentration data has been used to generate equiconcentration isopleths which indicate that soil contamination is generally restricted to the upper 3 feet of soil, with the exception of a major vertical column of contamination located at the corner of the warehouse.

Perched groundwater underlies the site at a depth of approximately 13 feet below the surface. This water appears to be continuous with and potentially discharging to, the Willamette River. The surface soil consists predominantly of medium-grained sands with occasional minor clay lenses and/or gravels. The soil is characteristically homogeneous from the surface to the perched water table. A layer of somewhat lower permeability underlies the perched water and consists of silty sands with clay lenses. Fine-grained sands predominate below this layer.

Concentrations of PCP in groundwater below the known contaminated zone have not exceeded .044 ppm. Most wells indicate no detectable concentrations of PCP, and outside of the contaminated zone, concentrations have not exceeded .003 ppm in any well. Contamination does not appear to have migrated extensively from the known contaminated zone. Analyses of groundwater are continuing on a quarterly basis.

A water well monitoring network consisting of shallow wells and well points has been installed to monitor the upper perched water. A total of nine vertical and three slanted (45°) wells have been installed and are regularly sampled for pH and PCP plus being measured for static water levels.

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Time is concerned with potential off-site migration of PCP from this source and is determined to eliminate this risk by remediating the site. Due to an existing ban on the land disposal of soil containing pentachlorophenol, excavation and landfilling is not an available remediation alternative (the material at Time has recently been designated by the EPA as RCRA-listed waste F027 vs. its previous U242 designation). Time does not desire to either leave the material in place without corrective action, cap the contaminated area without first eliminating the contamination or excavate and store the waste on site due to the long-term risks associated with these alternatives. Time has performed emergency phase stabilization and containment measures to minimize the risks of contaminant migration.

The following discussion identifies and describes several remedial alternatives which are potentially capable of destroying or immobilizing PCP in sandy soils such as those found at Time. Comments are made regarding soil and groundwater treatment, economics, availability and technical feasibility. This discussion is not intended to represent an indepth feasibility analysis of remediation options, but rather presents a summary review of options which Time may wish to investigate in greater detail.

ALTERNATIVES

The following alternatives were identified during the preliminary evaluation as remedial methods potentially capable of achieving effective results at Time:

Adsorption onto Polymers or Activated Carbon
Biodegradation
Capping in Place
Chemical Reduction
Closure in Place with Monitoring (No Remedial Actions)
Encapsulation
Excavation and Disposal
High Temperature, Catalyzed Oxidation
Incineration
In-Situ Soil Washing and Surface-Mounted Soil Washing
In-Situ Thermal Extraction and Surface-Mounted Thermal Extraction
Sodium Dehalogenation

Of these listed alternatives, excavation and disposal, capping in place, and closure in place are either unavailable due to the regulatory moratorium on landfilling of F027 material, or do not satisfy Time's requirements for long-term risk reduction. The remaining alternatives are discussed below.

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Adsorption Onto Polymers or Activated Carbon

Should contaminating PCP, at some point, be removed from the soil by soil washing, thermal extraction or other processes, final treatment of the recovered wastes will be required. Although not a destructive process, sorption of the recovered PCP onto carbon or other polymeric substrates utilizing hydrophobic interactions as a sorptive process, will reduce the volume of PCP contaminated material.

Activated carbon and a variety of organic and silicaceous polymeric adsorbents have been utilized to bind PCP and other phenols. The sorptive process, however, is usually reversible under appropriate conditions (usually temperature elevation or through the use of non-polar solvents) and therefore may not be suitable for long term stabilization of PCP wastes under uncontrolled conditions.

These sorbents may be used to concentrate PCP from a waste stream (i.e. soil washing eluates or thermal extraction scrubber liquors) which could then be recycled or disposed of as a non-hazardous waste. The adsorbent may then be regenerated for reuse and the concentrated PCP solutions so generated, collected for disposal by destructive methods such as incineration or chemical decomposition. Such an approach may be a logical consideration for the Time site.

Biodegradation

Biodegradation of man-made compounds has been observed for many years and the results of aerobic sewage treatment systems have been documented in detail. Aerobic landfarming of oily wastes from the petroleum industry has also been in general use for years. Biodegradation occurs under essentially two basic conditions: aerobic (respiratory) and anaerobic (fermentative). Many compounds have been observed to be degraded, either partially or completely to carbon dioxide and water, by one or both of these pathways.

Pentachlorophenol has been observed to undergo degradation by bacteria and fungi. Although PCP degradation has been observed under aerobic conditions, it occurs at a more rapid rate and with fewer complications under anaerobic conditions.

In addition to the biodegradation of pentachlorophenol in soil, it has been documented that fungal enzymes promote the binding of PCP to humic acids in soils, resulting in immobilization of the PCP.

Bench scale studies by SRH Associates scientists have indicated that, under controlled conditions, PCP can be degraded in both aerobic and anaerobic soil environments. Controlling conditions for biodegradation include soil porosity, pH, moisture content, inorganic nutrients (including nitrogen, phosphorus and potassium,

Eh (oxidation reduction potential), microbial populations and PCP concentrations. Elevated concentrations of PCP are inhibitory or toxic to microbial populations, even under conditions of acclimatization.

The application of biodegradation to the treatment of soils from the site is severely limited due to the existence of high concentration material. PCP degradation, even under optimal conditions, ceases when PCP concentrations are in excess of 1000 ppm. Typically 500 ppm is considered the maximum effective limit. Between 500 and 1000 ppm, degredation effectiveness decreases. Since some material at the site contains PCP in excess of 1000 ppm, not all of the material would be considered ammenable to this treatment without significant dilution or pretreatment to reduce the contaminant concentrations. A large amount of the soil contains PCP at low concentrations however and may be treatable if it can be successfully isolated from the high concentration material found nearby.

Biodegradation may be performed either in-situ or in surface-mounted fermentation reactors. Due to the highly permeable soil at Time, the shallow groundwater table and the possible adsorption of PCP in co-contaminating hydrocarbons which tend to immobilize the PCP, in-situ degradation is considered to present an excessive risk of PCP migration to off-site locations. Additionally, generation of anaerobic conditions in sandy soils is highly difficult. Should a biological process be initiated in-situ, significant risk of PCP mobilization through partial decomposition, preferential degradation of stabilizing hydrocarbon absorbents, or bio-emulsification of the PCP could be expected. For these reasons a surface-mounted fermenter would be the preferred method for soil treatment at the site.

A surface reactor may be used to directly treat a soil/water suspension, or may be used to treat extracted and diluted contaminants removed from the soil by other technologies. A surface fermenter allows for control of pH, nutrients, Eh, and other critical parameters, as well as preventing the release and migration of waste or waste products.

Nutrients, pH and Eh control are parameters that are easily controlled once optimal process conditions have been identified by bench and pilot scale studies. Co-metabolities or other nutrient augmentation is also easily regulated. Fermenters capable of handling soils such as those found at Time are commercially available, but may be constructed on site for considerable less cost. The requirements of this equipment vary with the amount of material to be treated, the reaction kinetics and the degree of control required.

Much debate currently exists over the benefits obtained by using PCP acclimated, commercially available bacterial preparations to promote degradation vs. using cultures of indigenous bacteria obtained from the site. There is considerable evidence to support

the use of indigenous microorganisms. The effect on the overall cost of the project is similar for both methods. Effective preparations range from $20 to $50 per pound of material. Microbial requirements depend on a variety of soil and waste-specific parameters that have not yet been determined at the site.

Costs not directly associated with the on-site remediation include bench and pilot scale tests, engineering, permitting, chemical, biological and physical analyses, agency negotiations, waste delisting and management. These costs are expected to be similar for all of the alternative technologies evaluated here.

Chemical Reduction

Oxidation and reduction reactions have been utilized to destroy organic wastes under a variety of circumstances. Due to its high degree of chlorination, PCP is not readily oxidized by such mild oxidants as ozone or hydrogen peroxide. Stronger oxidants present such a great hazard in and of themselves as to be unsuitable for treating wastes (See High Temperature Catalyzed Oxidation).

PCP is, however, readily reduced by sodium borohydride solutions. Staiff (1981) and Sweeney (1981) have both demonstrated the use of catalyzed metal powders and/or borohydride solutions in the oxidation of chlorinated aryls. In-situ techniques have been demonstrated, however competition from reducible soil components may severely limit the reaction, requiring retreatment. This soil reduction chemistry must be identified to allow for proper selection and application of reducing agents.

Reduction, either in-situ or in surface-mounted reactors, has realistic potential for remediating the contamination at Time. The low organic content of the naturally occuring sands in the area, their homogeneity, the low trafficability of the soil, and the nature of the contaminants all support this alternative. Bench and pilot analyses would be required to determine the reduction potential and the products of reduction formed by this process. If technically successful, implementation costs should be moderate.

Encapsulation

One method of encapsulation of organic material is through t application of sorbents to the contaminated soil. Sorbents r include carbon granules, polymeric materials or substances which the waste is soluble. All sorbents must be insoluble water, inert and not readily degradable in order to achieve term stabilization of the wastes in question.

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Pentachlorophenol is readily adsorbed by activated carbon granules and is soluble (absorbed) in a variety of organic substances including high molecular weight hydrocarbons such as tar or asphalt. Since both of these materials meet the criteria listed above for acceptable sorbents, they offer a feasible alternative for PCP immobilization. Additionally, both materials are capable of sorbing any petroleum hydrocarbons which may exist in the soil in addition to PCP.

An attractive alternative for immobilization of Time's wastes is the admixing of the PCP contaminated soil with asphalt to form a structurally sound paving material which could then be used to seal the soil surface in the vicinity of the woodtreating chemicals tank farm. This alternative would require an analysis of the leachability of the wastes from the surfacing material and a determination of the structural integrity of the asphalt so produced at various levels of waste incorporation.

High Temperature, Catalyzed Oxidation

PCP is not ordinarily oxidized by readily available, easily handled oxidizers such as ozone or hydrogen peroxide. Although permanganate, dichromate or other strong oxidizers have been reported to successfully oxidize PCP, their cost, side reactions with soil components, and the environmental hazards generated by them restrict their use in treating contaminated soils. Zimpro has developed a process, commonly referred to as wet air oxidation, which has been successful in destroying phenols and other hazardous compounds in aqueous media.

The Zimpro, Wetox and other processes based on this same principle, employ high temperature and elevated pressures in an oxygen enriched aqueous environment to oxidize and thereby destroy hazardous organics. PCP and other extensively chlorinated organics are refractile to this process without the addition of suitable catalysts which can facilitate the dechlorination of these compounds, rendering them retreatable. Once dechlorinated, the resulting intermediates have increased susceptibility to oxidation by the wet air oxidation process and are degraded to either carbon dioxide and water or to non-toxic biodegradable intermediates.

All wet air oxidation processes are provided as packaged systems by the supplier. Included are the reactor, reagents and operators. Additional support and feasibility testing of representative media can ordinarily be negotiated. Cost of the system, which is provided on a lease basis, is variable dependent upon the volume of material to be treated, the size of the required reactor and the type of process necessary.

Incineration

Incineration represents a tested and proven method for the destruction of chlorinated hazardous wastes, including PCP. Several types of incineration capacity exist in the U.S. Ordinary incineration, which is not acceptable for chlorinated organics, does not incorporate the appropriate acid scrubbers needed to produce an acceptable air discharge from wastes such as PCP. High efficiency incinerators, (often referred to as "6 nine" incinerators, based on their destruction and removal efficiencies) are capable of treating pentachlorophenol in high concentrations. Incinerators of this type are available in the U.S. as both fixed and mobile units. However, there is not sufficient capacity at this time in either type of unit, to satisfy domestic demands. Although most incinerators can handle liquids, few are equipped to handle solids such as contaminated soil.

Incineration can easily satisfy Time's objectives of reducing long term risk related to the contamination found on site. However, since no small mobile units are available nearby, Time must either absorb significant mobilization, siting and permitting costs or ship its waste to a fixed unit. The attendant risks in shipping must be weighed against those associated with leaving the soil on site.

The nearest incinerator for solid hazardous wastes such as those at the Time facility, is located in Deer Park, TX and is operated by Rollins Environmental. A primary concern with disposal by this alternative is cost. Rollins current price for incineration of contaminated soils is approximately $0.50 per pound. Based on Time's estimate of 2000 cubic yards of contaminated soil, incineration costs may approach $2.5 million. This figure does not include excavation, shipping and other associated costs. For comparison purposes, this amount is on the order of five times the cost of landfilling, if this alternative were available to Time.

In-Situ Soil Washing and Surface Mounted Soil Washing

Removal of contaminants from soil may be accomplished through extraction with a variety of elutriating solutions. The choice of the proper solution must be based on the physico-chemical nature of the contaminants, the effect of the elutriate on the soil geochemistry and its permeability, plus the method by which the eluted contaminants are to be treated for destruction or disposal. Ordinarily, aqueous solutions of acids, bases, surfactants or other compounds are selected (US EPA, 1982).

The effect of washing contaminated soils with water alone, or with mixtures of non-ionic surfactants was investigated by Science Applications International Corp. Their findings indicate that surfactants greatly increased the effectiveness of soil washing when the contaminant of concern was either PCP or a high boiling

oil fraction. With pentachlorophenol alone, or when used in conjunction with other chlorinated phenols, plain water provided effective washing of the contaminants from a relatively sandy soil (83% sand, 10% silt and clay).

Since the contaminants at Time initially appear to be refractile to natural elution with precipitation or groundwater, surfactants appear to be desirable at this site. The use of alkaline solutions, while ordinarily effective with phenols, may be ineffective at Time due to the possibility of co-contamination with oils or hydrocarbon solvents. Extraction with other hydrocarbon solvents, while likely to effectively extract the contaminating PCP from the soil, will result in the formation of a hydrocarbon contaminated soil requiring an additional purification step.

Two means of applying soil washing methodologies have been identified: in-situ techniques and surface-mounted techniques, (including batch or continuous flow apparatus). In-situ techniques involve the treatment of soil without excavation and provide for the application of the elutriating solvent to the soil surface and recovery of the eluate by using recovery wells in the treatment zone. Surface-mounted systems involve the use of batch extraction tanks or counter-current extraction columns which extract the contaminants under controlled conditions.

In-situ techniques are effective in extracting contaminants only where the soil geology is known to be uniform and where the permeability is high enough to permit adequate percolation of the elutriating solutions through the soil. Additionally, in cases where the distance from the lower limit of the contaminants to groundwater (or alternatively to either a natural or induced low permeability soil layer) is great, excessive amounts of solution are required. Control is reduced and the potential for uncontrolled release of the eluate is great. The technique is well suited for situations where contamination is not generally accessible by ordinary excavation techniques (i.e. below buildings, in developed or heavily utilized areas).

The in-situ process is generally implemented by applying the solution through trickle irrigation or infiltration galleries, and recovering the product through judiciously placed recovery wells. The recovered eluate is treated and, if possible, recycled. A thorough evaluation of all waste components and soil chemistry must be performed to facilitate the selection of a proper surfactant, determine application rates, evaluate recovery potential and to provide information regarding eluate characteristics for the determination of treatment alternatives.

Surface mounted processes are indicated where the distance to groundwater, extraction requirements or heterogeneity of the soil (i.e. channelling, lenses, etc.) require a higher degree of control on the process. In these cases, soil is excavated by suitable procedures and placed into batch or countercurrent continuous extractors. Batch extractors usually involve the

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submersion and agitation of batches of contaminated soil in large tanks fitted with a filtration stage to separate the cleaned soil from the eluate. This step is usually repeated until a suitable clean-up standard is achieved.

Countercurrent extractors involve the introduction of contaminated soil into an upwardly moving extraction bed while the elutriating solution is introduced at the top of the bed and allowed to migrate downwards. In this latter process, the cleanest soil (already partially extracted) contacts the cleanest solvent just prior to exiting the column at the top. This continuous process has the advantage of generating less spent solvent requiring subsequent treatment than does the batch process. It requires a higher degree of process control but is generally less labor and energy intensive than a batch process. A continuous process also allows for the fitting of a second solvent stage to elute any residual surfactant from the treated soil where water was used.

The cost of soil washing is expected to be moderate, however this process does not address the final destruction and/or disposal of the recoverd solutions. These solutions, containing PCP, water, surfactants, and possibly hydrocarbons, must be treated by incineration, biodegradation, immobilization, recycling or by chemical processes prior to completion of the project. The extraction process and the treatment process should be determined in conjunction with one another in order to maximize their mutual effectiveness.

In-Situ Thermal Extraction and Surface Mounted Thermal Extraction

Thermal extraction processes involve the introduction of heat to the contaminated soil mass to increase the vapor pressure of the contaminants, rendering them sufficiently volatile to allow their recovery as a vapor. As might be expected, these processes work best with relatively volatile contaminants that tend to remain free, rather than binding to soil components. Additionally, the processes work best in friable or loose-grained soils which allow free permeation of the vapors and their subsequent release to the recovery system.

Coia (1985) has presented a system for recovery of volatiles from contaminated soils using an in-situ process. This system consists of a network of thermal injection wells and extraction wells connected to injection and extraction blowers, respectively. Although the system was intended for extraction of TCE from glacial sands, any compound that can be brought to exert a significant vapor pressure can be recovered with this system.

A similar system utilizing a modified drilling rig has been developed by ATW Calweld. This firm, a manufacturer of drilling equipment has modified the kelly of a drilling rig to incorporate several channels which allow the introduction of hot air, steam and various chemicals, if appropriate. The equipment rapidly

agitates the soil while applying heat and volatilizes contaminants which are then recovered in a negative pressure hood surrounding the surface of the rig. Contaminant vapors are drawn off to a cyclone and scrubber system. Although the device has only been demonstrated on hydrocarbon spills (gasoline and diesel oil), ATW Calweld suggests that the process is applicable to lower volatility compounds such as pentachlorophenol.

Thermal extraction in surface units has been advanced by several firms. American Toxic Disposal in Waukegan illinois, has operated a 10-ton-per-day unit which has successfully removed PCB's from contaminated soils and sludges. This system has been demonstrated to the EPA and is currently being used to treat material containing PCB's in Gary, Indiana.

As with soil washing techniques, thermal extraction techniques do not destroy contaminants, which must be recovered and treated or immobilized by other techniques. The process does, however, result in a volumetric reduction of the contaminated soil by 10 to 100 fold, allowing consideration of incineration as a final destruction alternative.

Thermal extraction processes are viable candidates for treating Time's contaminated soils since the soil at Time is friable and loose-grained. A preliminary consideration to be addressed before selecting this process is the degree of volatility of the contaminants in the matrix found at Time. Since moisture does not present a major deterrent to thermal processes, saturated material may also be successfully treated.

Sodium Dehalogenation

Both Acurex and the Franklin Institute have developed processes whereby soils are extracted (similar to Soil Washing, above) and subjected to dehalogenation using sodium based proprietary compounds. Although the process has been primarily utilized for PCB destruction, it appears to be ammenable to chlorinated phenols as well.

The Acurex process is less stable and more sensitive to interference from water than is the Franklin Institute process, which uses a specially modified sodium/polyethylene glycol complex. The Franklin Institute process has been applied directly to soils in an in-situ operation.

These procedures have been used primarily in the destruction of PCB oils and have only recently been used to treat contaminated soils. PCP has not been treated by this process. Adaptation to the Time site may be possible but should be pursued only if other demonstrated technologies do not prove successful in pilot demonstrations.

SUMMARY

Twelve alternative processes have been identified for isolation, immobilization, separation and/or destruction of PCP contaminated soil found at Time. The selection of any one or a combination of these alternatives requires additional characterization of the wastes found at the site. Among the additional data that may be required are:

- Adsorption Isotherms of Wastes on Soil and Carbon
- Biodegradability of Waste Constituents (Half-life and Rate Constant)
- Biodegradation Products
- Bioinhibition Threshold Concentration of Waste Constituents
- Characterization of Co-contaminants (if any)
- Climatic Conditions
- Determination of Soil pH
- Determination of Soil Particle Size Distribution
- Groundwater Parameters (Flow Rates, Storage Coefficient)
- Organic Carbon and Octanol/Water Partition Coefficients of Waste Components
- Oxidation/Reduction Potentials of Waste Constituents
- Required Clean-up Levels
- Soil Microflora
- Soil Moisture Content
- Soil Nutrient Concentrations (N, P & K ratios)
- Soil Organic Matter
- Soil Oxygen Concentration
- Soil Permeability
- Soil Temperature
- Surfactant Solvation Efficiency (for Each Waste Constituent)
- Trafficability of Soil and Site
- Waste Constituent Vapor Pressure Curves

While other information may be needed for each specific alternative, some of the above data may also be necessary, depending on method selected.

It should be remembered that separatory procedures such as soil washing or thermal extraction will require additional disposal or destructive treatment processes as a final step. Surface mounted separatory or treatment processes will require excavation, containment and storage steps prior to implementation.

A recommended course of action for the determination and selection of a remedial technique for the Time site involves additional definition of the waste constituents, clarification of soil parameters, further definition of groundwater conditions and determination of site specific conditions listed above. Following

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these determinations, the specific questions of technical feasibility of the various alternatives listed above can be addressed.

With this information, alternatives may then be selected with a greater degree of confidence and further pursued by performing bench scale tests to evaluate their applicability to the contaminated soils found at Time. Bench scale conditions can then be scaled up to pilot level demonstrations, either on-site or at supplier's test facilities. Finally, these data may then be used to develop and obtain required treatment permits from appropriate State/Federal agencies. The generally accepted approach to selecting an operational treatment procedure is to evaluate the most logical alternative first and if it proves unsatisfactory due to site specific or economic factors, evaluate the next logical option.

RECOMMENDATIONS

Based on existing information, the following is recommended:

a. Select the "Surface Mounted Soil Washing" technique as the most logical remedial approach.

b. Perform bench scale and pilot level evaluations.

c. Determine necessary destruction steps of recovered extracts.

d. Ascertain technical permitting and economic feasibility of technique for final disposal action.

e. Compare results with repeat step by step examination of next most logical remedial approaches which are: "Surface Mounted Thermal Extraction" and "In-Situ Thermal Extraction".

Bench scale evaluations of a surface mounted, countercurrent soil washing process involve the excavation of contaminated soils, temporary storage of the soils on an impervious slab, extraction of the contaminants with an aqueous solution of nonionic surfactants, removal of the surfactants by countercurrent washing with water, recovery and treatment of the rinsates, their analysis and on-site placement of the purified soils. The contaminated rinsates would then be subjected to a destruction step that can only be determined based on the constituents in the recovered extracts, but may include chemical reduction, incineration, biodegradation or other processes outlined earlier. A schematic drawing of a proposed process is shown in Figure II-1.

The actual process consists of the physical excavation of contaminated soil using classical techniques and the temporary storage of the excavated soils on an impervious, protected surface. Material from this location would be transferred to an infeed hopper connected to a primary extractor or soil washer. The soil would be introduced into the lower section of the extractor via a screw feed auger. Once in the extractor, the soil would be agitated and conveyed upwards while extracting solvent [an aqueous solution of nontoxic, nonionic detergents (surfactants)] is introduced into the top of the extractor. The extraction would take place in a countercurrent fashion, producing a cleaned soil product and contaminated elutriate in a continuous process.

Cleaned soil would then be subject to rinsing with clean water in a secondary extractor, operated similarly to the primary extractor, to reduce or eliminate residual surfactant concentrations, allowing the soil to be returned to the site. The contaminated fluids would be stored, tested and treated to effect ultimate disposal. Analytical decision points are noted as diamonds in Figure II-1. There are three. It is possible that surfactant solutions with suitably low or undetectable levels of PCP could be discharged to the sanitary sewer.

The process can easily be modelled in bench scale experiments and the technical feasibility of the process can be accurately determined. The nature and required concentrations of the surfactants, soil retention times, elution rates and contaminant loading factors can all be determined to allow approximation of full scale process operating parameters. Following determination of these parameters, scale up protocols and economic feasibility may accurately be determined.

Soil washing is recommended since it has been successfully applied to soils contaminated with PCP in pilot studies on similar soil types and does not use hazardous materials which may interact with or be retained by the soil. The process should be directed towards a surface, rather than in-situ technology to improve process control and to minimize the chance of uncontrolled releases to the environment. Residual surfactants may be eliminated from the soil using only water, and surfactants can be modified to remove PCP as well as co-contaminating hydrocarbons, which may also be present.

The aqueous extracts so produced may be subjected to a variety of concentrating and destructive steps to remove the entrained PCP and hydrocarbons, placing a wider array of treatment alternatives at Time's disposal.

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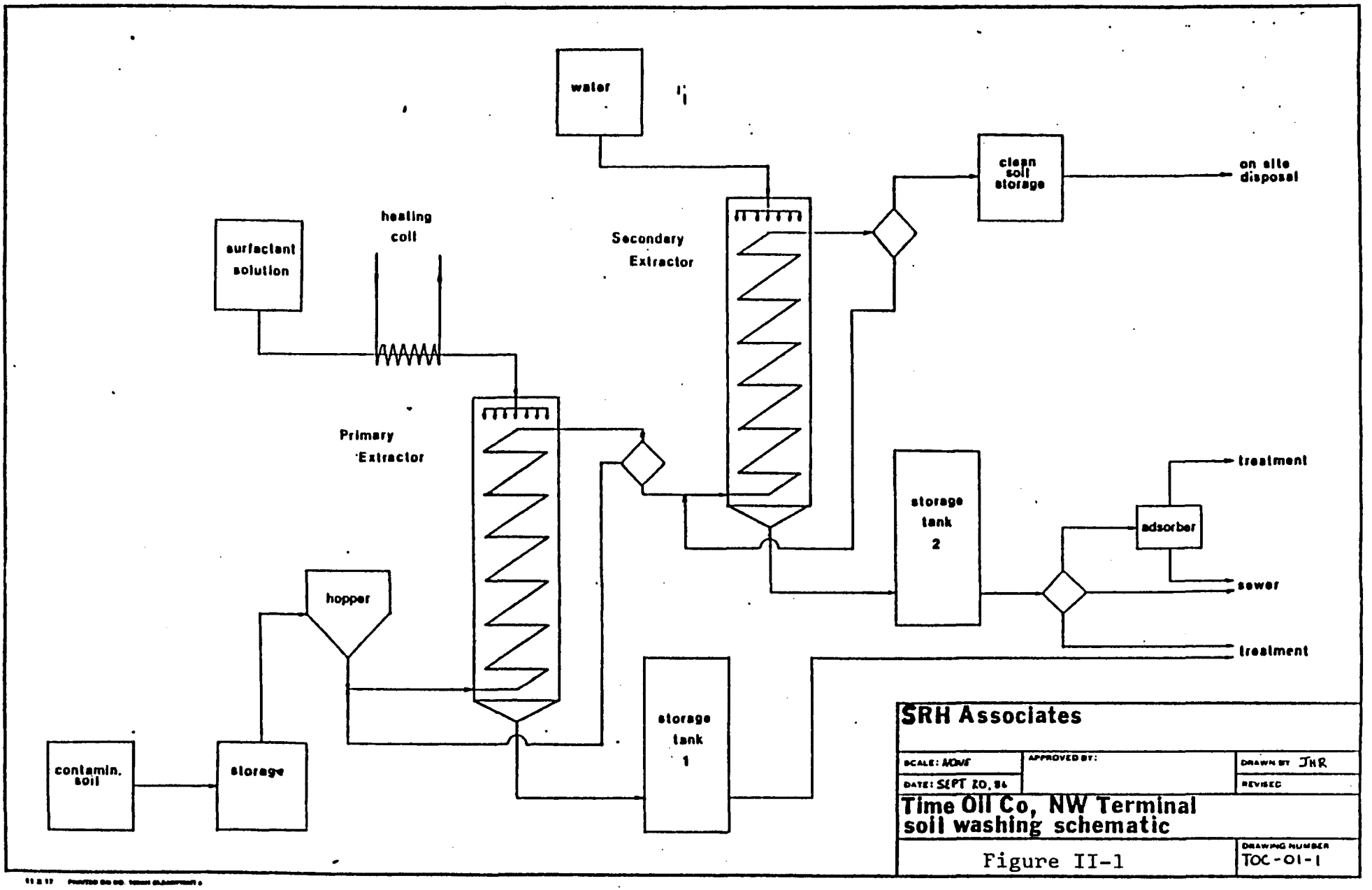

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SECTION III

ANALYSIS RESULTS

INTRODUCTION

During August of 1986, Time retained SRH Associates to collect samples of surface and subsurface soil and groundwater from the Time Facility located in Portland, Oregon. The samples were analyzed for pentachlorophenol (PCP) in an effort to further existing data concerning past releases of this chemical from a woodtreating chemicals formulating operation at this site.

Samples of surface soils were collected from an earthen tank farm area located south of the woodtreating chemicals warehouse and from six locations below the concrete floor of the warehouse itself. Additional samples were taken from five other depths below the warehouse floor from the same holes as the surface samples. Groundwater was sampled at seven existing monitoring wells surrounding the woodtreating chemicals area and was analyzed for PCP and pH. Static water levels were determined in these wells and at a monitoring station for the measurement of Willamette River water elevations located on the Northwest Terminal Facility pier.

SURFACE SOIL SAMPLING AND ANALYSIS

Following the contaminated soil relocation to one pile, surface soils were collected from 17 locations in the woodtreating tank farm area. The locations were identical to those sampled by Riedel Environmental Services during initial samplings performed in 1985. Samples were obtained from 2 to 3 inches below the soil surface to reduce the risk of contamination arising during set up procedures at the sample site.

Additionally, six locations inside the warehouse were sampled by coring through the concrete with abrasive saws. The six locations were selected by Time and represent an extension of the triangular sampling grid employed by Riedel in the 1985 study. Samples were obtained from an interval of 3.5 to 5.5 feet below the lower

surface of the concrete using split spoon samplers. The sampling procedure used will be described in the next (Subsurface Samples) part. The selected depth was chosen to position the samples at the same true elevation as the surface samples taken from the tank farm area. Samples of soil from 2 to 6 inches below the lower surface of the concrete floor were obtained and held for possible future analysis.

Samples were obtained using stainless steel sampling spoons which had been previously cleaned with sequential washings of laboratory detergent, tap water, hexane, tap water, trisodium phosphate and sodium carbonate in water, tap water and distilled water (3X). Samples were screened through 0.10 inch stainless steel mesh which had been similarly cleaned. The screened material was allowed to fall directly from the screens into pre-washed 8 ounce glass jars fitted with screw cap closures and teflon liners. The containers had been cleaned to EPA specifications and were not opened prior to receiving the sampled material.

Samples were field logged and containers were marked with the date, time, location, sample code, requested analyses and other relevant data. Lids were replaced with care being taken to ensure that no interference with the hermetic seal occurred. Tamper indicating seals were applied, chain of custody and analysis request forms were completed and the samples placed on ice prior to transport to the laboratory. Samples were delivered to the laboratory within 48 hours of collection in all cases. No preservatives were added to soil samples.

Samples were extracted in the laboratory using method number 3540, Soxhlet Extraction, as described in EPA publication SW 846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. The extract so obtained was analyzed for pentachlorophenol by method 8040, Phenols, as described in EPA publication SW 846. Field and laboratory duplicates were analyzed and spiked sample recovery efficiencies were determined. Laboratory blanks were analyzed. No field blanks of soil were submitted. All quality control results indicated acceptable performance of sampling and analysis.

The results of the surface soil samples are listed, along with the X and Y coordinates of their respective sampling locations, in Table III-1. The coordinates are referred to a temporary bench mark located at the end of a concrete wall at the southeast corner of the woodtreating tank farm area. The coordinates are given in feet. The X axis is aligned in an approximately northeast - southwest plane while the Y axis is aligned in an approximately northwest - southeast plane at at 90° to the X axis.

The results listed in Table III-1 were subjected to Kriging analysis to generate lines of equal concentration (equiconcentration-isopleths). A .95 smoothing ratio and a search radius of 213 feet was used for generation of the contours which are shown in Figures III- 1 to III-4. The sample sites and their respective concentrations are indicated. The contours are to

scale (1" = 20 feet) and can be overlaid on the associated plan drawing of the sampled area. (Figure III-5).

The results indicate that the bulk of the surface contamination exists in a pile of material located in the vicinity of sample point S. Additional contamination is located to the east of point S, continuing to approximately the concrete wall bordering the tank farm on the east. The strong focal point of contamination located at point K has generated a broad area of calculated contamination on the Kriging generated contour maps. Due to the lack of supporting high concentrations of PCP adjacent to point K, it is concluded that this contour is primarily artifactual, generated by the data reducing program in response to the single very high concentration detected at K. It is more likely that K represents a small focus of high concentration, rather than the large area implied by the contours.

Most contamination that had been previously detected to the west of the woodtreating tank farm area appears to have been removed during recent excavation activities performed by Time. This is reflected by the low results found at points M and U.

Two locations beneath the warehouse floor were found to contain low levels of PCP. Borings 1 and 5 contained 5.7 and 1.4 ppm of PCP, respectively. It should be noted, however, that despite stringent efforts to prevent contamination, blowing winds and "dust devils" were noted during sampling and were observed picking up soil from the tank farm area and warehouse floor. Because of these concerns, the low levels noted in these samples are probably a result of field contamination.

SUBSURFACE SAMPLES

Samples were obtained from six depths below the lower surface of the concrete floor in the woodtreating chemicals warehouse. Six locations, determined by Time and located at extensions of the triangular sampling grid developed by Riedel, were sampled. The approximately 6 inch thick concrete floor was cored using an abrasive wheel. Twelve inch diameter holes were cut. The surface of the concrete within a 6 foot radius of the hole was swept clean and covered with .005 inch thick polyethylene film to minimize contamination from residue found in the warehouse.

The upper 2 to 3 inches of soil in the hole was removed to eliminate contamination with cuttings generated during the coring and set up operations. A sample was subsequently obtained using the technique given above, from the exposed surface of the hole. The holes were designated as numbers 1 through 6. The surface sample was collected and held for future analysis.

Following collection of the surface sample, the hole was advanced using a hand operated, 2 1/2 inch (O.D.) continuous flight auger. Samples were obtained at the following intervals below the upper surface of the concrete floor using a 2 inch (O.D.) split spoon sampler:

3.5 to 5.5 feet	(0)
5.5 to 7.5 feet	(2)
7.5 to 9.5 feet	(4)
10.5 to 12.5 feet	(7)
15.5 to 17.5 feet	(12)

Since the upper surface of the concrete floor was 3.5 feet above the surrounding soil surface, the five depths listed above were equivalent to the 0 to 2 foot, 2 to 4 foot, 4 to 6 foot, 7 to 9 foot and 12 to 14 foot intervals sampled in the woodtreating tank farm area by Riedel in 1985.

Samples were taken by removing the drill from the bore hole and inserting the split spoon sampler into the bore hole taking care not to dislodge any material from the surface or walls of the hole. The sampler was driven into the soil using a 20 lb. hammer. Hand drilling and driving of the penetrometer/sampler was required due to the inaccessibility of the site to conventional drill rigs and to the low overhanging roof of the warehouse.

Samples were extruded by gently tapping the soils out of the sampler onto stainless steel screens, which were cleaned as indicated above. The samples were screened, placed into jars, labelled, logged and handled as described above. Samplers were cleaned after each use, using the decontamination procedures described above. The drilling equipment was decontaminated between holes and prior to leaving the site. All decontamination water was impounded in D.O.T. 17 E drums until proper disposal requirements could be established based on analytical results.

During drilling, saturated conditions were encountered at the 12 foot interval in all holes. No groundwater samples were taken from any location. All soil samples consisted of medium grained grey - brown to blue sands. Cobbles were encountered in holes number 1 and 2 at a depth of approximately 3 feet below the floor surface. The cobbles were associated with a minor clay lens approximately 2 inches thick.

Following drilling, holes were abandoned through the addition of bentonite pellets to a depth of 13 feet below the concrete floor. The remainder of the hole was filled with bentonite grout to the surface. The concrete core plugs removed during coring of the warehouse floor were replaced in the hole and bedded with bentonite in accordance with Time's request.

The samples were refrigerated and shipped to the laboratory for PCP analysis as outlined above. The results, together with the X and Y coordinates of the sample points, are presented in Tables

III-1 through III-4. The data from these analyses have been combined with the results obtained by Riedel at the sample locations labelled J through Z in 1985, for the nominal sampling depths 2, 4, 7 and 12, to generate concentration isopleths at these depths.

The data listed in these tables was analyzed by Kriging analysis according to the procedure given above. The results of the contouring are shown in Figures III-1 through III-4. Figure III-5 shows the sample locations on a plan drawing of the woodtreating chemicals warehouse. Figure III-6 incorporates the X and Y coordinates of the sample locations on this drawing.

The results indicate that contamination is restricted to the woodtreating tank farm area with virtually no contamination being found beneath the central and northern portions of the warehouse. There is significant PCP contamination below the surface of the southwest corner of the warehouse, which appears to be continuous with a vertical column of contamination located immediately adjacent to this area in the tank farm.

Excavations in the woodtreating tank farm area have perturbed the original conditions of the site, and therefore the surface and 2 foot contours are not expected to be representative of conditions existing prior to the movement of soil. This can be seen by the distortion of the vertical column of contamination at the surface and two foot intervals, due to the fact that soil at these sites had been removed and replaced with soils from other areas within the woodtreating tank farm. A computer generated topographic grid net of the woodtreating tank farm and warehouse area can be seen in Figure III-7.

The 4, 7 and 12 foot contours reflect the strong vertical plume of PCP contamination which decreases to about 2000 ppm at the 12 foot depth. A minor lobe of this plume appears to extend to the southeast into the lower corner of the woodtreating tank farm area at or around the seven foot interval. The vertical plume appears to widen and diffuse to the south at the 12 foot contour, presumedly due to the presence of groundwater at or near this sampling depth.

GROUNDWATER ANALYSES

The nine vertical groundwater monitoring points at Time (See Figure I-6, Section I) were measured for static water levels and tested for pH and PCP. The three slant borings located at the southwest corner of the warehouse were not examined. The wells, which had been previously installed by Time employees or other contractors, consist of 1 1/4 and 2 inch (I.D.) stainless steel well points and 2 inch (I.D.) PVC screen and casing.

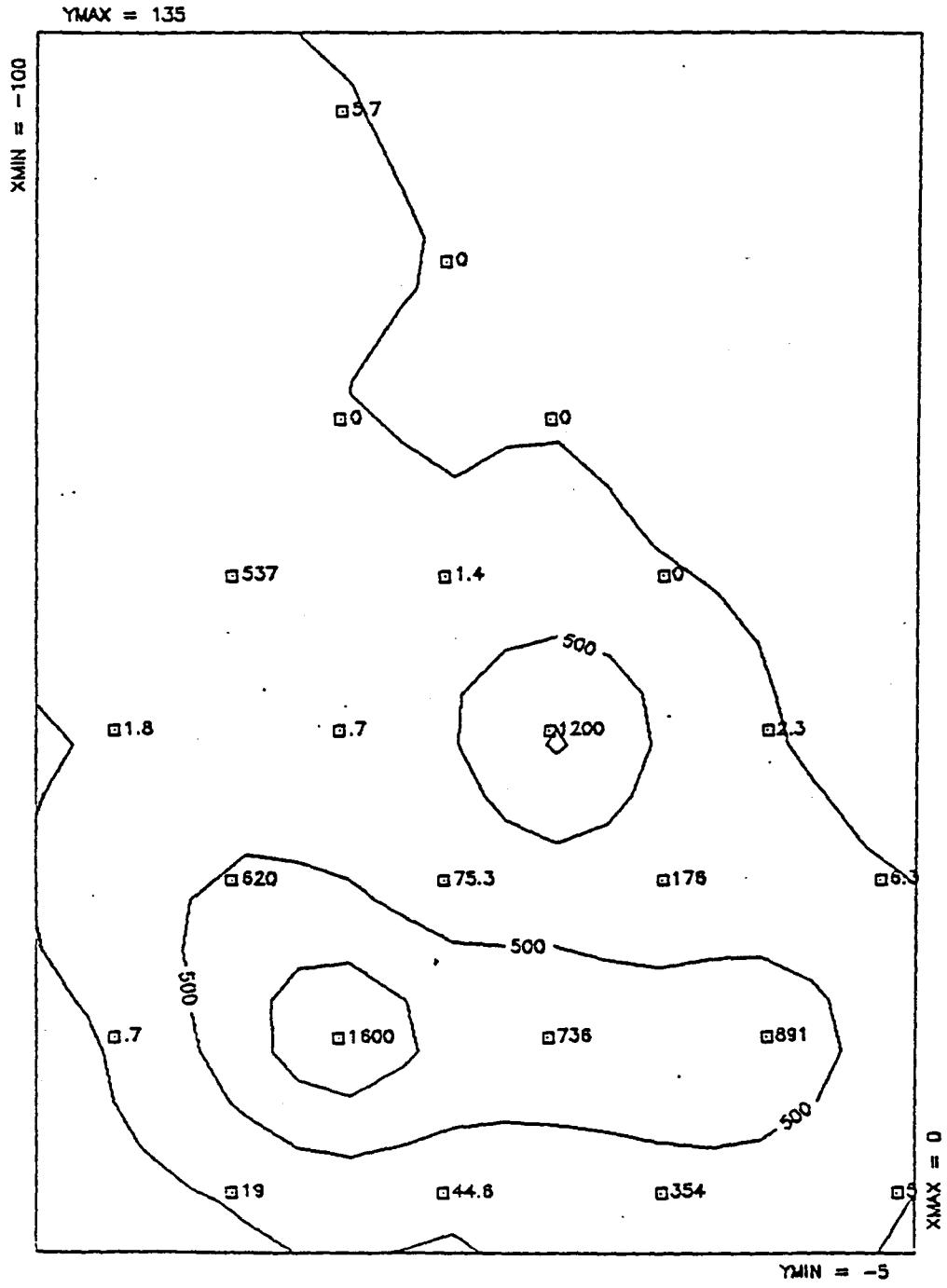
The water level elevations in the wells, labelled A through I, were measured to the nearest .01 foot from the top edge of the casing at a scribed mark located on the north side of the casing. A Fisher M-Scope previously calibrated against a steel tape was used to obtain the measurements. Standing bore volumes of well water were calculated based on these measurements and well construction drawings provided by Time. A measurement of the Willamette River water elevation relative to a mark located by Time on its unloading pier was also taken.

Stainless steel weighted bailers were used to remove at least 4 standing bore volumes of water prior to collecting representative samples of groundwater. The bailers had been previously cleaned by the procedure described above, and were re-cleaned after each well was sampled. The purged water was collected into D.O.T. 17 E drums until proper disposal could be determined based on analytical results.

The samples were dispensed directly from the bailer into two 1 liter amber glass bottles fitted with screw cap closures and teflon liners for PCP analysis. Samples were adjusted to pH 2 with 1:1 Sulfuric Acid in distilled water and checked with pH paper prior to refrigeration and delivery to the lab. Samples for pH analyses were dispensed directly into 250 ml polyethylene wide mouthed bottles without preservatives. pH analyses were performed within 2 hours of sample collection using a silver-silver chloride reference electrode standardized against two NBS traceable reference buffer solutions. Samples were logged, labelled, sealed and transferred to the laboratory within 6 hours of collection. Analyses for PCP were performed as above, except that the sample was not filtered prior to analysis, and was extracted by method 3510, Separatory Funnel Liquid - Liquid Extraction, as described in EPA publication SW 846.

The results of the groundwater investigation are shown in Table III-6. Wells C and G were dry and could not be sampled. The pH ranged from 6.53 to 6.91. The only well showing detectable PCP was well D, in which .044 ppm was detected. Well D is located southeast of the woodtreating chemicals warehouse.

FIGURE III-1



TIME OIL CO - SURFACE PCP CONTOURS

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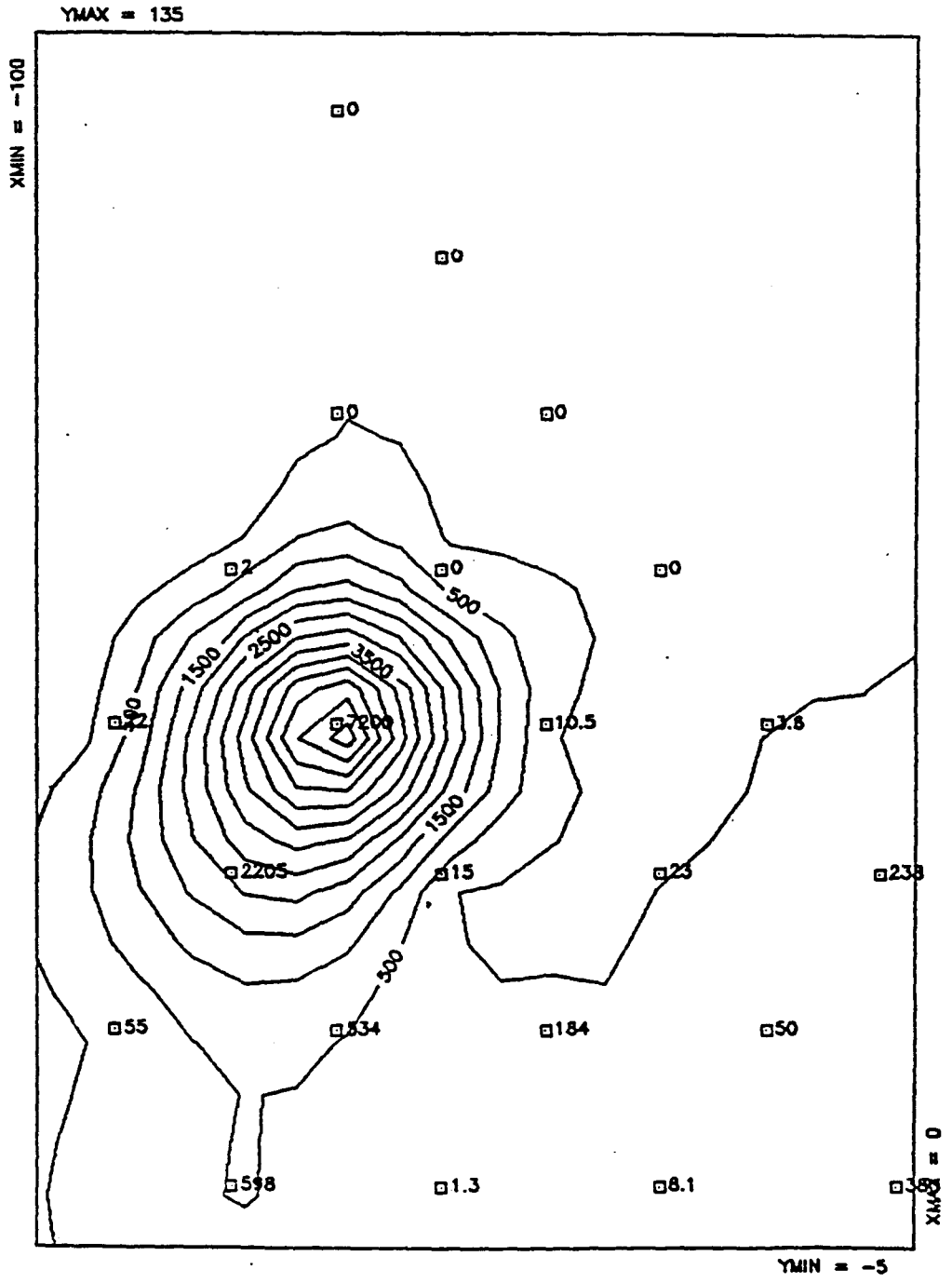
TOLS004284

BZTO104(e)041105

FIGURE III-2



TIME OIL CO – 4 FOOT PCP CONTOURS

TOLS004285

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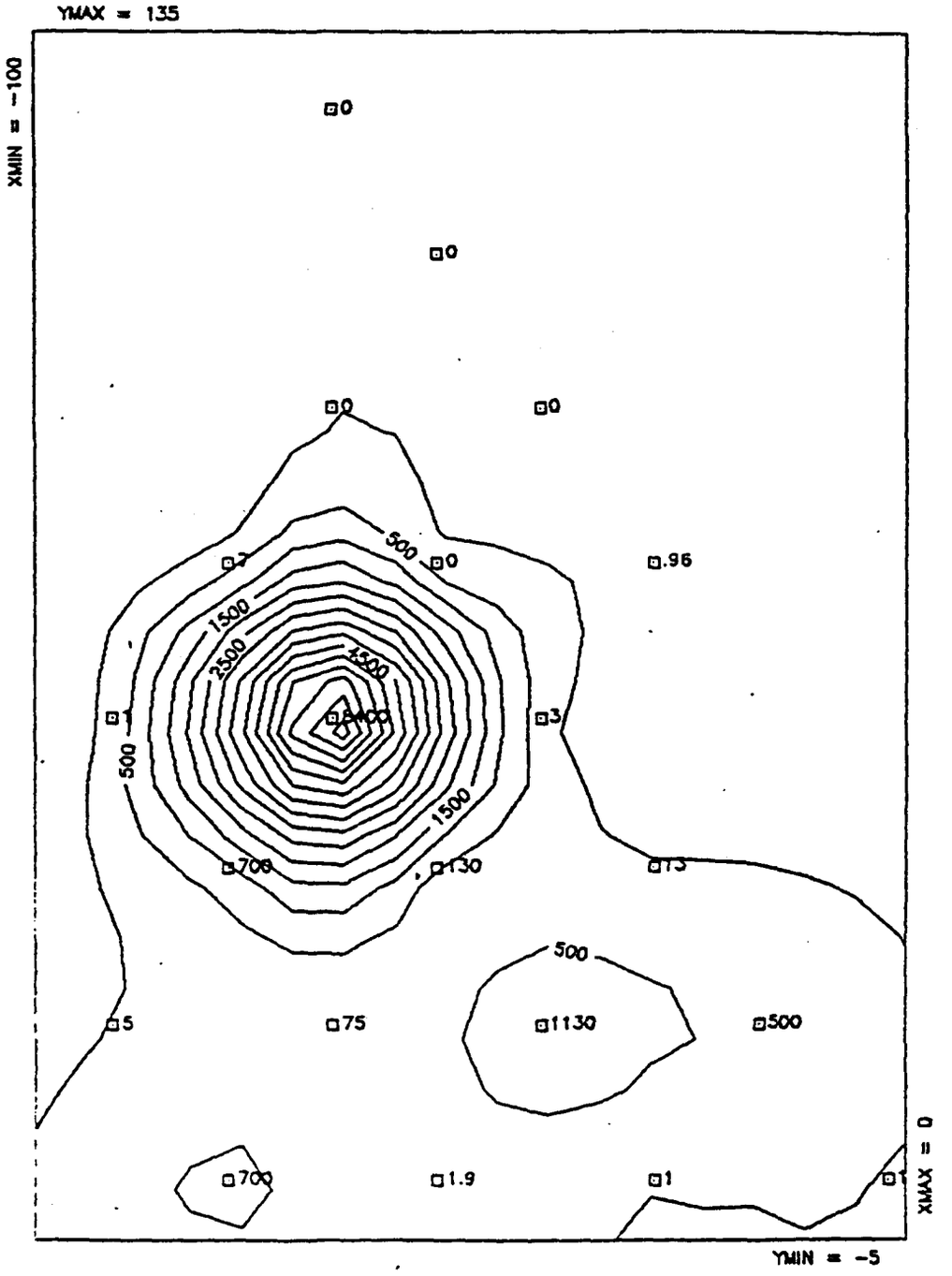
BZTO104(e)041106

FIGURE III-3



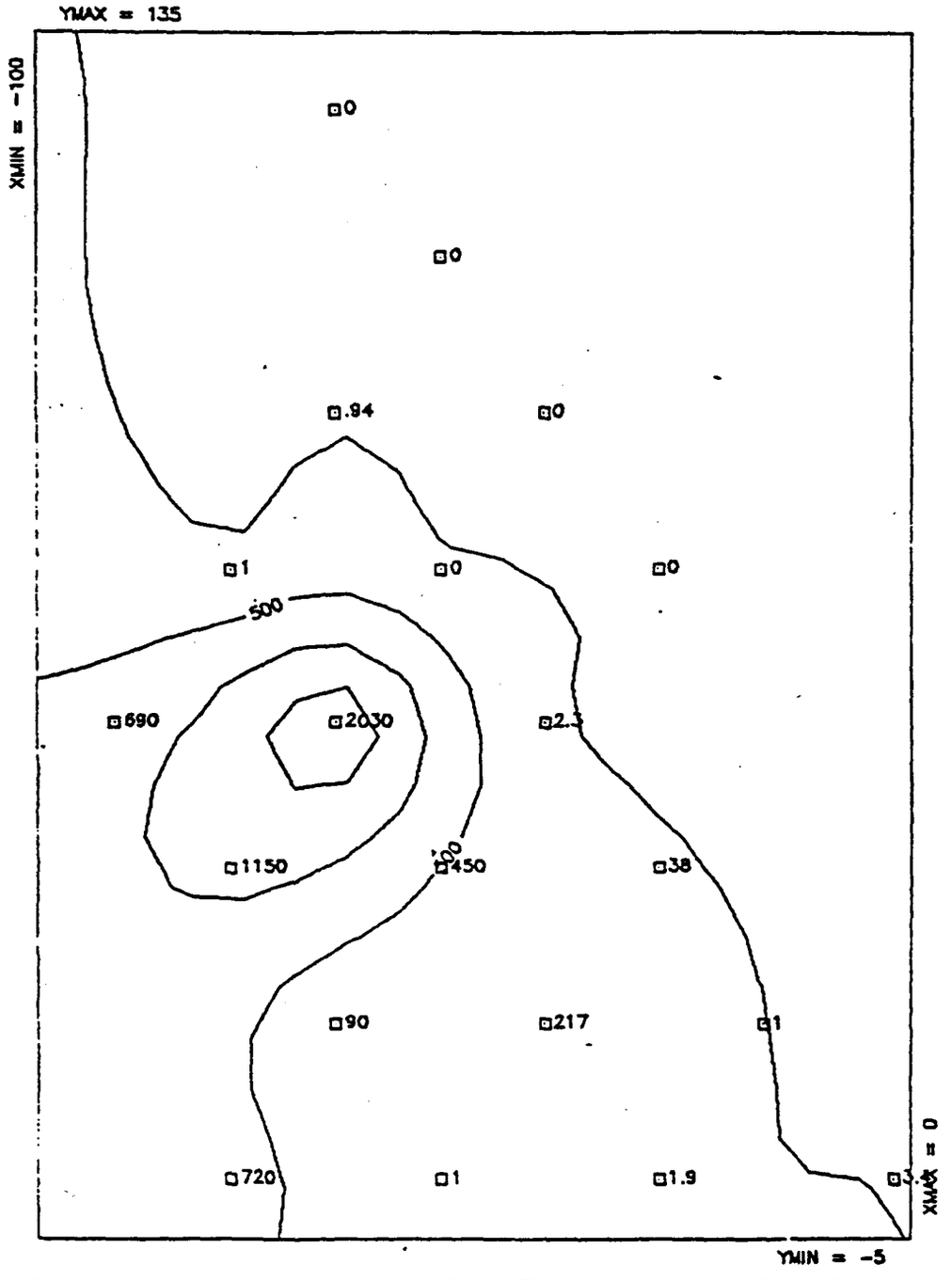
TIME OIL CO - 7 FOOT PCP CONTOURS

TOLS004286

32319

BZTO104(e)041107

FIGURE III-4



TIME OIL CO – 12 FOOT PCP CONTOURS

TOLS004287

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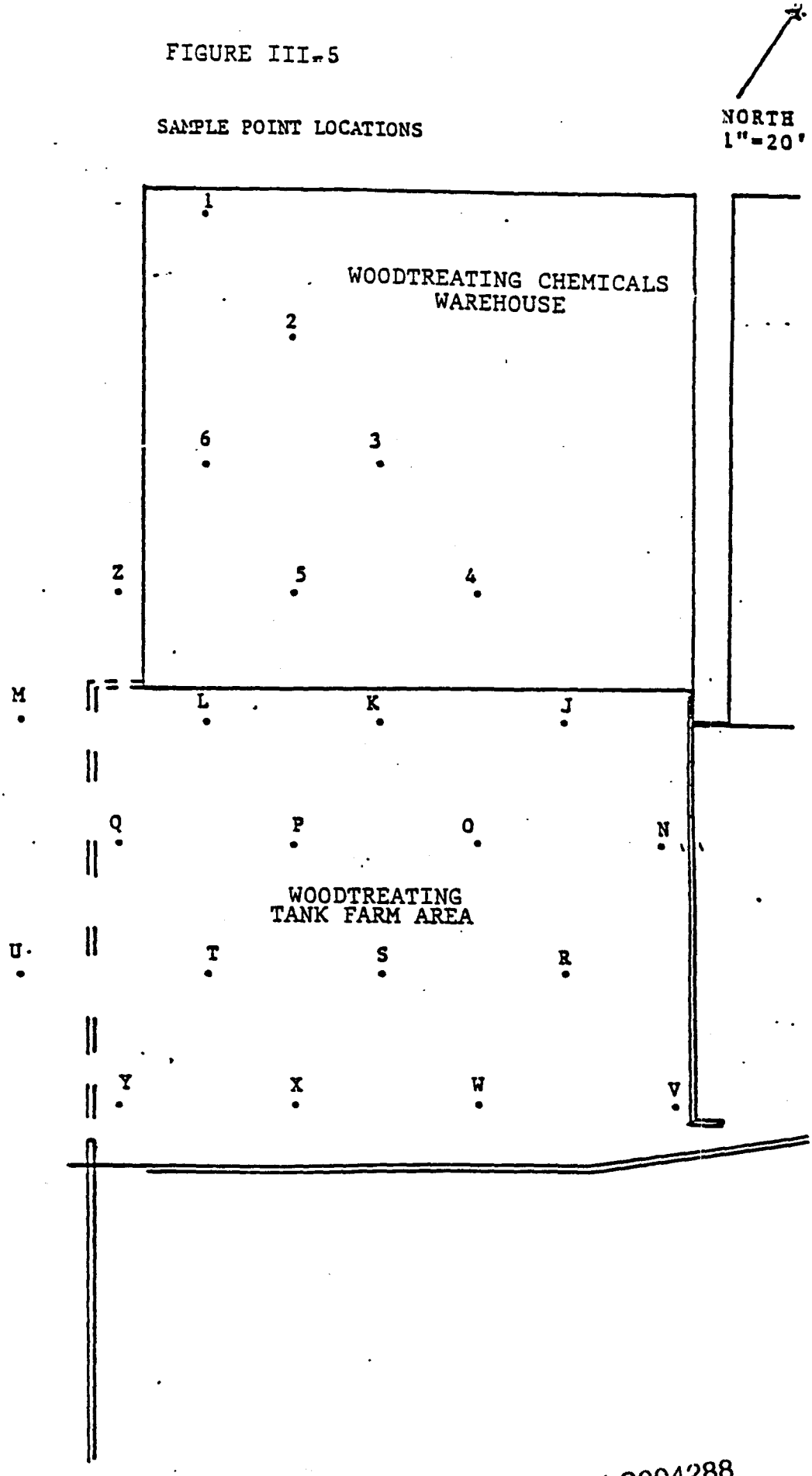
BZTO104(e)041108

FIGURE III-5

SAMPLE POINT LOCATIONS



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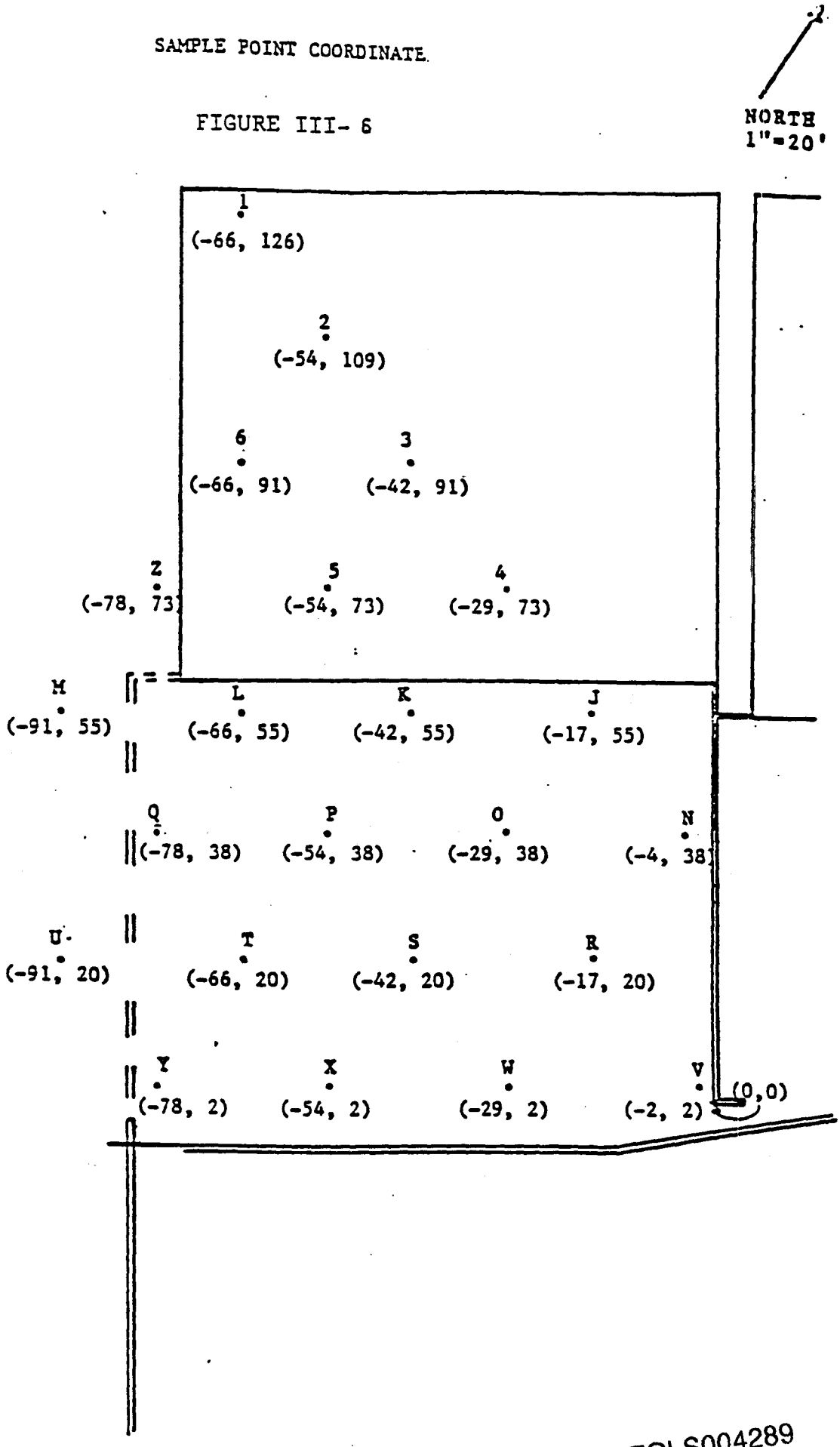
TOLS004288

BZTO104(e)041109

SAMPLE POINT COORDINATE

FIGURE III- 6



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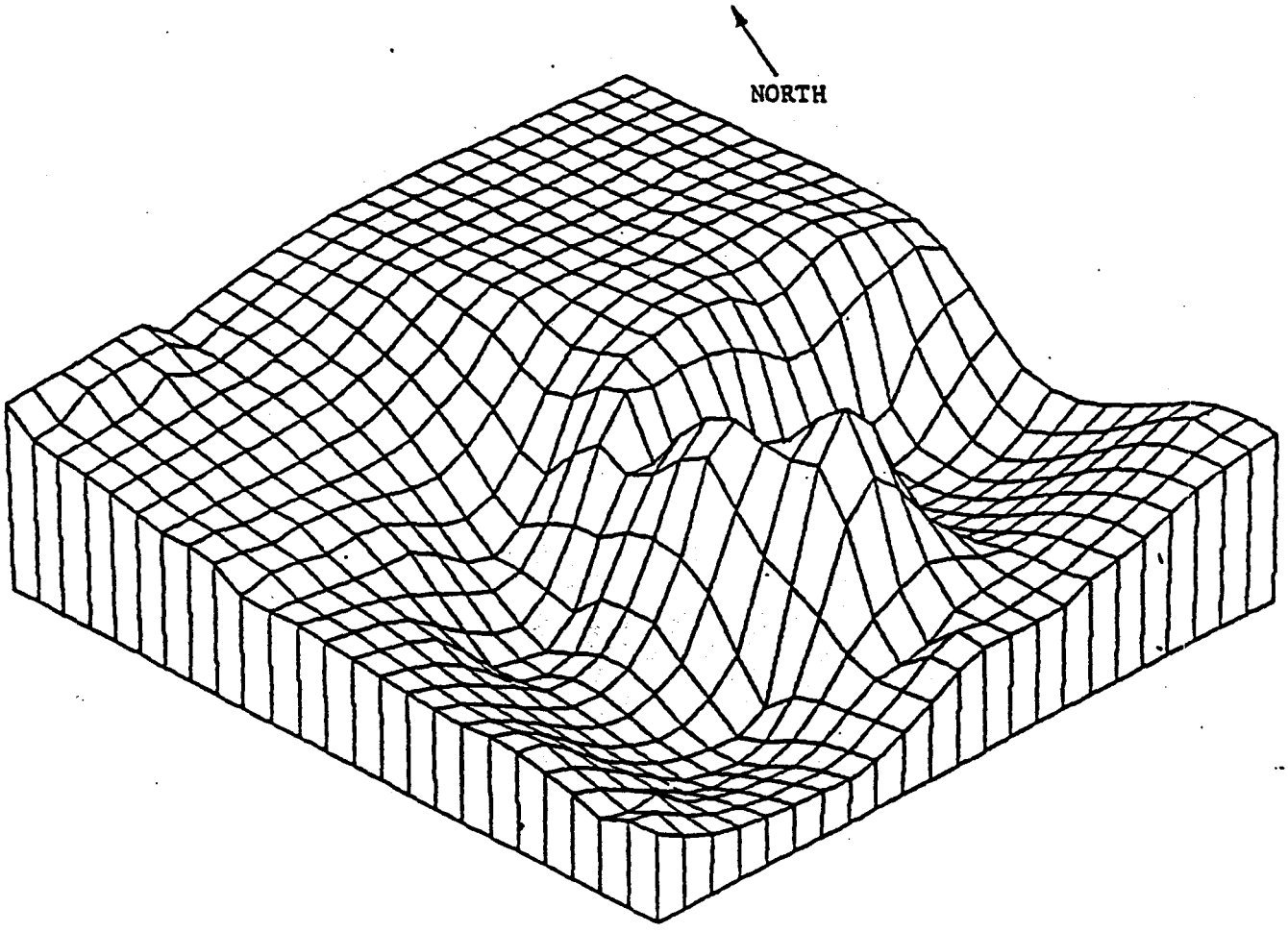
TOLS004289

BZTO104(e)041110

FIGURE III- 7

APPROXIMATE SURFACE TOPOGRAPHY

WOOD TREATING CHEMICALS AREA



TIME OIL CO. - TOPOGRAPHY

TOLS004290

32319

BZTO104(e)041111

TABLE III-1

TIME OIL CO.

COORDINATES - SURFACE PCP CONTOUR

CODE	X	Y	[PCP]
J	-17	55	2.3
K	-42	55	1200
L	-66	55	0.7
M	-91	55	1.8
N	-4	38	6.3
O	-29	38	176
P	-54	38	75.3
Q	-78	38	620
R	-17	20	891
S	-42	20	736
T	-66	20	1600
U	-91	20	0.7
V	-2	2	5
W	-29	2	354
X	-54	2	44.5
Y	-78	2	19
Z	-78	73	537
6	-66	91	0
5	-54	73	1.4
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	5.7

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

TABLE III-2

TIME OIL CO.

COORDINATES - 2 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3
K	-42	55	8.8
M	-91	55	87
N	-4	38	3.1
O	-29	38	59
P	-54	38	16
R	-17	20	34
S	-42	20	252
T	-66	20	123
U	-91	20	44
V	-2	2	260
W	-29	2	15
X	-54	2	4.5
Z	-78	73	14
6	-66	91	0
5	-54	73	5.6
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

TABLE III-3

TIME OIL CO.

COORDINATES - 4 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
J	-17	55	3.6
K	-42	55	10.5
L	-66	55	7200
M	-91	55	22
N	-4	38	238
O	-29	38	23
P	-54	38	15
Q	-78	38	2205
R	-17	20	50
S	-42	20	184
T	-66	20	534
U	-91	20	55
V	-2	2	380
W	-29	2	8.1
X	-54	2	1.3
Y	-78	2	598
Z	-78	73	2
6	-66	91	0
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

TABLE III-4

TIME OIL CO.

COORDINATES - 7 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	3
L	-66	55	8400
M	-91	55	1
O	-29	38	13
P	-54	38	130
Q	-78	38	700
R	-17	20	500
S	-42	20	1130
T	-66	20	75
U	-91	20	5
V	-2	2	1
W	-29	2	1
X	-54	2	1.9
Y	-78	2	700
Z	-78	73	7
6	-66	91	0
5	-54	73	0
4	-29	73	0.96
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

TABLE III-5

TIME OIL CO.

COORDINATES - 12 FOOT PCP CONTOURS

CODE	X	Y	[PCP]
K	-42	55	2.3
L	-66	55	2030
M	-91	55	690
O	-29	38	38
P	-54	38	450
Q	-78	38	1150
R	-17	20	1
S	-42	20	217
T	-66	20	90
V	-2	2	3.4
W	-29	2	1.9
X	-54	2	1
Y	-78	2	720
Z	-78	73	1
6	-66	91	0.94
5	-54	73	0
4	-29	73	0
3	-42	91	0
2	-54	109	0
1	-66	126	0

NOTE: [PCP] = CONCENTRATION OF PCP (mg/Kg) or (ppm)

TABLE III-6

TIME OIL CO.

GROUNDWATER ANALYTICAL RESULTS

(AUGUST 29, 1986)

WELL NUMBER	STATIC WATER LEVEL (FT BELOW TOP OF CASING)	pH	[PCP] (ppm)
MW-A	14.06	6.80	N.D.
MW-B	15.07	6.70	N.D.
MW-C	DRY	N.A.	N.A.
MW-D	14.48	6.53	.044
MW-E	15.22	6.54	N.D.
MW-F	15.44	6.57	N.D.
MW-G	DRY	N.A.	N.A.
MW-H	11.28	6.91	N.D.
MW-I	14.75	6.77	N.D.
RIVER	25.70	N.A.	N.A.

NOTES:

[PCP] = CONCENTRATION OF PENTACHLOROPHENOL
ppm = PARTS PER MILLION
N.A. = NOT AVAILABLE
N.D. = NOT DETECTED

TOLS004296

32319

BZTO104(e)041117

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
P.O. Box 14005
Portland, Oregon 97214
Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
J-0 - Surface-N.E. Tank Farm	2.3
K-0 - Surface-N. Tank Farm	2964
L-0 - Surface-N.W. Tank Farm	0.7
M-0 - Surface-N.W. Tank Farm	1.8
N-0 - Surface-E. Tank Farm	6.3
0-0 - Surface-N.E. Central Tank Farm	176
P-0 - Surface-N. Central Tank Farm	75.3
Q-0 - Surface-N.W. Central Tank Farm	620
R-0 - Surface-E. Central Tank Farm	891
S-0 - Surface-S.E. Central Tank Farm	736
T-0 - Surface-N. Central Tank Farm	1600
U-0 - Surface-W. Central Tank Farm	0.7
V-0 - Surface-S.E. Tank Farm	5.0
W-0 - Surface-S. Tank Farm	354
X-0 - Surface-S. Tank Farm	44.6
Y-0 - Surface-S.W. Tank Farm	19
Z-0 - Surface-N.W. Roadway	537
1-S - Boring #1, Warehouse Loading Dock, Surface Below Concrete	1.2
1-0 - Boring #1, Warehouse Loading Dock, 3.5 ft. Below Concrete	5.7
5-0 - Boring #5, S.W. Inside Warehouse #5, 3'4" - 5'4" Below Concrete	1.4

Results in mg/kg

REPORT CONTINUES

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

32319

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
Page Two

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
5-2 - Boring #5, S.W. Inside Warehouse 5'4" - 7'4" Below Concrete	5.6
5-4 - Boring #5, S.W. Inside Warehouse 7'4" - 9'4" Below Concrete	< 1
5.7 - Boring #5, S.W. Inside Warehouse 10'4" - 17'4" Below Concrete	< 1
5.12- Boring #5, S.W. Inside Warehouse 15'4" - 17'4" Below Concrete	< 1
6-0 - Boring #6, W. Central Inside Warehouse 3'5" - 5'5" Below Concrete	< 1
6-2 - Boring #6, W. Central Inside Warehouse 5'5" - 7'5" Below Concrete	< 1
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete	< 1
6-7 - Boring #6, W. Central Inside Warehouse 10'5" - 12'5" Below Concrete	< 1
6-12- Boring #6, W. Central Inside Warehouse 15'5" - 17'5" Below Concrete	0.94
D-2 - Waste Pile & T-5, Duplicate of T-5	3420

Results in mg/kg

< denotes "less than"

REPORT CONTINUES

TOLS004298

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

32319

BZTO104(e)041119

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Associates, Inc.
Page Three

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS
T-S - Waste Pile, Feet Below Top of Pile	1280
Q-S - Waste Pile, Feet Below Top of Pile	298
D-1 - Boring #6, Duplicate of G-S	< 1
4-0 - Boring #4, S.E. Warehouse 3'5" - 5'5" Below Concrete	< 1
4-2 - Boring #4, S.E. Warehouse 5'5" - 7'5" Below Concrete	< 1
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete	< 1
4-7 - Boring #4, S.E. Warehouse 10'5" - 12'5" Below Concrete	0.96
4-12- Boring #4, S.E. Warehouse 15'5" - 17'5" Below Concrete	< 1
3-0 - Boring #3, E. Central Warehouse 3'5" - 5'5" Below Concrete	< 1
3-2 - Boring #3, E. Central Warehouse 5'5" - 7'5" Below Concrete	< 1
3-4 - Boring #3, E. Central Warehouse 7'5" - 9'5" Below Concrete	< 1
3-7 - Boring #3, E. Central Warehouse 10'5" - 12'5" Below Concrete	< 1
3-12- Boring #3, E. Central Warehouse 15'5" - 17'5" Below Concrete	< 1

Results in mg/Kg

REPORT CONTINUES

TOLS004299

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

32319

BZTO104(e)041120

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860825-F

SRH Assocates, Inc.
Page Four

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland Terminal

SAMPLE ID	RESULTS	% Recovery
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete (Duplicate)	< 1	
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete (Duplicate)	< 1	
3-12- Boring #3, E. Central Warehouse 15'5" - 17'5" Below Concrete (Duplicate)	< 1	
6-4 - Boring #6, W. Central Inside Warehouse 7'5" - 9'5" Below Concrete (Spike)	399	101
4-4 - Boring #4, S.E. Warehouse 7'5" - 9'5" Below Concrete (Spike)	373	96

Results in mg/kg

< denotes "less than"

Analysis by soxhlet extraction, capillary GC/FID, EPA Method 8040

Sincerely,

Susan M. Coffey

Susan M. Coffey,
President

SMC/gs

TOLS004300

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

32319

BZTO104(e)041121

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 3, 1986
Log #A860826-C

SRH Assocates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

Sample Location: Time Oil Co., Portland

Sample Date: 8/25/86

SAMPLE ID	RESULTS
2-0	< 1.0
2-2	< 1.0
2-4	< 1.0
2-7	< 1.0
2-12	< 1.0
1-2	< 1.0
1-4	< 1.0
1-7	< 1.0
1-12	< 1.0

Results in mg/kg

< denotes "less than"

Analysis by soxhlet extraction, capillary GC/FID, EPA Method 8040

Sincerely,

Susan M. Coffey

Susan M. Coffey
President

SMC/gs

TOLS004301

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

32319

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 5, 1986
Log # A860829-N
P.O. None

SRH Associates Incorporated
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Subject: Pentachlorophenol and pH Analysis

Sample Type: Ground Water
Sample Collected by: John Ruddick
Sample Collection Date: August 29, 1986

SAMPLE NAME	PENTACHLOROPHENOL	pH
MW-D	0.04 mg/L	6.58 SU
MW-E	< 0.01 mg/L	6.54 SU
MW-F	< 0.01 mg/L	6.57 SU
MW-H	< 0.01 mg/L	6.91 SU
MW-I	< 0.01 mg/L	6.77 SU

Pentachorophenol analysis by extraction and capillary GC/FID. The symbol "<" means less than and denotes none detected at or above the level indicated.

Sincerely,

Susan M. Coffey

Susan M. Coffey
President

SMC:hh

This report for the sole and exclusive use of the above named client. Samples are held for a maximum of 30 days from the date of this report.

TOLS004302

32319

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 9, 1986
Log #A860903-J

SRH Associates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analyses Requested: Pentachlorophenol (PCP) and pH

SAMPLE ID	PCP*	pH
MWA, 9/3/86, 1030	< 0.01 mg/L	6.8 S.U.
MWA, 9/3/86, 1110	< 0.01 mg/L	6.7 S.U.

< denotes "less than"

* Analysis by extraction, capillary GC/FID, Method 604.

Approved by,
Susan M. Brillante
Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,
Susan M. Coffey
Susan M. Coffey,
President

SMC/gs

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

TOLS004303

32319

BZTO104(e)041124

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

September 18, 1986
Log #A860916-F

SRH Associates, Inc.
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

SAMPLE ID	RESULTS
#20 SS	< 0.3 mg/kg

Analysis by extraction, capillary GC/FID and comparison with solutions of standards.

Approved by,
Susan M. Brillante
Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,
Susan M. Coffey
Susan M. Coffey,
President

SMC/gs

This report is for the sole and exclusive use of the above client. Samples are retained a maximum of 15 days from the date of this letter.

TOLS004304

32319

BZTO104(e)041125

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

October 1, 1986
Log #A860926-A

SRH Associates, Inc.
123 N.E. Third/Suite 230
P.O. Box 14005
Portland, Oregon 97214

Attention: John Ruddick

Analysis Requested: Pentachlorophenol

SAMPLE ID	RESULTS
K-O, 9/26 0915, Soil	1200 mg/Kg

Analysis by EPA Method 8040, capillary GC/FID.

Approved by,

Susan M. Brillante

Susan M. Brillante,
Mgr., Organic Laboratories

Sincerely,

Susan M. Coffey

Susan M. Coffey,
President

SMC/gs

TOLS004305

This report is for the sole and exclusive use of the above client.
Samples are retained a maximum of 15 days from the date of this letter.

32319

BZTO104(e)041126

00010

32319

CHAIN OF CUSTODY RECORD (8040)

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co

SAMPLERS: (Signature) [signature] / SRH

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE: PENTACHLOROPHENOL	AMOUNT/PRESERVATIVE: pH					SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
MWA	7/3/86	1030	BAILED	WATER	NEAR W TANK FARM	2	[illegible]	[illegible]							
MWA	"	1030	↓	↓	" "	1	[illegible]	[illegible]							
MWB	"	1110	↓	↓	" "	2	[illegible]	[illegible]							
MWB	"	1110	↓	↓	" "	1	[illegible]	[illegible]							

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature]	9/3/86 1445	[signature]			
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS004306

BZTO104(e)041127

3231

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co PDX

SAMPLERS: (Signature) John H Arnold

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/ PRESERVATIVE	FILTERED (Y/N)	pH				SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
MW-D	8/29	1600	GRAB	WATER	SE Tank Farm	3									
MW-E		1430			SW Tank Farm										
MW-F		1615			Roadway (S)										
MW-H		1500			Near Loading Dock										
MW-I	↓	1630	↓	↓	Roadway (N)	↓									

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
John H Arnold/SRH	8/29/02 1800	Susie M Coffey Lab			
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS004307

BZTO104(e)041128

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE / LOCATION
1003	Time Oil Co - Portland

SAMPLERS: (Signature) Jon H Riddle — SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	8oz AMOUNT / PRESERVATIVE (Initials/Lot#)	SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with Initials)
2-5	8/25	1130	GRAB	SOIL	NW Wing Hall 2 SURFACE	1	8/0			HOLD
2-0		1145	SPLIT SPOON		" " 2'5"-5'5"	1	8/0			
2-2		1450			" " 5'5"-7'5"	1	8/0			
2-4		1520			7'5"-9'5"	1	8/0			
2-7		1545			10'5"-12'5"	1	8/0			
2-12		1720			15'5"-17'5"	1	8/0			saturated
1-2		1915	SPLIT SPOON		Hall 1 OUTSIDE LOADING DOCK 5'5"-7'5"	1	8/0			
1-4		1950			" 7'5"-9'5"	1	8/0			
1-7		2030			" 10'5"-12'5"	1	8/0			
1-12		2130			Hall 1 OUTSIDE LOADING DOCK 15'4"-17'4"	1	8/0			SAT-RATED Possible CUTTING OIL sample

Relinquished by: (Signature/Firm)	Date / Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date / Time	Received by: (Signature/Firm)
Jon H Riddle - SRH	8/26/82 1225				
Relinquished by: (Signature/Firm)	Date / Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date / Time	Received by: (Signature/Firm)
				8/26 1226	Steven M. Lucy
Relinquished by: (Signature/Firm)	Date / Time	Received by: (Signature/Firm)	Date / Time	Remarks (attachments if necessary)	

TOLS004308

BZTO104(e)041129

2319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	TIMBROL CO - PORTLAND TERMINAL

SAMPLERS: (Signature) SRH ASSOC.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	Amount/Volume / Preservative / Filtered (Y or N)							SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
J-0	8/23	1015	GRAB	SOIL	SURFACE - NE - TANK FARM	1	8/0									
K-0		1030			" - N "	1	8/0									
L-0		1045			" - NW "	1	8/0									
M-0		1055			" - NW "	1	8/0									
N-0		1105			" - E "	1	8/0									
O-0		1110			" - NE CENTRAL "	1	8/0									
P-0		1115			" - N CENTRAL "	1	8/0									
Q-0		1120			" - NW CENTRAL "	1	8/0									
R-0		1125			" - E CENTRAL "	1	8/0									
S-0		1130			" - SE CENTRAL "	1	8/0									
T-0		1135			" - CENTRAL "	1	8/0									
U-0		1140			" - W CENTRAL "	1	8/0									
V-0		1145			" - SE "	1	8/0									
W-0		1150			" - S "	1	8/0									
X-0		1200			" - S "	1	8/0									

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
SRH	8/25/84 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

BZTO104(e)041130

TOLS004309

319

CHAIN OF CUSTODY RECORD (804

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co - Portland Terminal

SAMPLERS (Signature): [signature] SRH Assoc

A. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (Ø = NONE) PENTACHLOROPHENOL						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
-2	8/24	11:40	SPLIT SPOON	SOIL	BORING #6 W CENTRAL INSIDE WASE 5'5"-7'5" BELOW CONCRETE	1	8/Ø								
-4	↓	12:00	↓	↓	" " 7'5"-9'5" " "	1	8/Ø								
-7	↓	12:30	↓	↓	" " 10'5"-12'5" " "	1	8/Ø								
6-12	↓	14:20	↓	↓	" " 15'5"-17'5" " "	1	2/Ø								SATURATED SAMPLE ONLY PART RECOVERED
D-2	8/24	15:30	GRAB	SOIL	WASTE PILE @ T-S DUPLICATE OF T-S	1	8/Ø								
T-S	↓	15:30	↓	↓	WASTE PILE FEET BELOW TOP OF PILE	1	8/Ø								
Q-S	↓	16:15	↓	↓	WASTE PILE FEET BELOW TOP OF PILE	1	8/Ø								
2-1	8/24	10:50	GRAB	SOIL	BORING #6 DUPLICATE OF 6-S	1	8/Ø								
4-5	8/24	16:10	grab	SOIL	BORING #4 SE WASE SURFACE BELOW CONCRETE	1	8/Ø								HOLD
4-0	↓	1650	SPLIT SPOON	↓	Boring #4 SE WASE 2'5"-5'5" BELOW CONCRETE	1	8/Ø								
4-2	↓	1715	↓	↓	" " 5'5"-7'5" " "	1	8/Ø								
4-4	↓	1745	↓	↓	" " 7'5"-9'5" " "	1	8/Ø								
4-7	↓	1820	↓	↓	" " 10'5"-12'5" " "	1	8/Ø								

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature]/SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS004310

BZTO104(e)041131

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	Time Oil Co - PDX Terminal

SAMPLERS: (Signature) [signature] SRH Assoc.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (0 = None) Pentachlorophenol						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
4-12	8/24	1900	Split Spoon	Soil	Boring #4 SE WHSE 15'5"-17'5" Below Concrete	1	8/0								Saturated Samples
3-5	8/24	1915	Grab	Soil	Boring #3 E-Central WHSE Surface Below Concrete	1	8/0								HOLD
3-0	↓	1955	Split Spoon	↓	3.5"-5'5" " "	1	8/0								
3-2	↓	2010	↓	↓	5.5"-7.5" " "	1	8/0								
3-4	↓	2015	↓	↓	7'5"-9'5" " "	1	8/0								
3-7	↓	2025	↓	↓	10'5"-12'5" " "	1	8/0								
3-12	↓	2100	↓	↓	15'5"-17'5" " "	1	8/0								Sat'd Sample

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
[signature] SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS004311

BZTO104(e)041132

32319

CHAIN OF CUSTODY RECORD

PROJ. NO.	SITE/LOCATION
1003	TIME OIL CO – PORTLAND TERM.

SAMPLERS: (Signature) John H [signature] – SRH ASSOC.

STA. NO.	DATE	TIME	SAMPLE TYPE	MEDIA	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	AMOUNT/PRESERVATIVE (CONCENTRATED PENTACHLOROPHENOL)						SEAL NO.	SEAL INTACT? (Y or N)	REMARKS (with initials)
Y-0	8/23	1205	GRAB	SOIL	SURFACE – SW TANK FARM	1	8/0								
Z-0	"	1210	"	"	SURFACE – NW ROADWAY	1	8/0								
1-S	8/23	1255	GRAB	SOIL	BORING #1 WAREHOUSE LOADING DOCK SURFACE BELOW CONCRETE	1	8/0								
1-0		1635	SPLIT SPOON	"	3.5 FT BELOW WAREHOUSE LOADING DOCK CONCRETE BORING #1	1	8/0								HIT CONCRETE OR ASPHALT
5-S	8/23	~~1055~~ 1655	GRAB	SOIL	BORING #5 SW INSIDE WASH SURFACE BELOW CONCRETE	1	8/0								HOLD
5-0	↓	~~1610~~ 1710	SPLIT SPOON	↓	BORING #5 3.4-5.4' BELOW CONCRETE	1	8/0								
5-2		1745			BORING #5 SW INSIDE WASH 5.4-7.4' " "	1	8/0								
5-4		1805			BORING #5 7.4-9.4' " "	1	8/0								
5-7		1825			BORING #5 10.4-12.4 " "	1	7/0								
5-12	↓	1900	↓	↓	BORING #5 15.4-17.4 " "	1	8/0								Saturated Sample JHR
6-S	8/24	1050	GRAB	SOIL	BORING #6 W CENTRAL SURFACE BELOW INSIDE WASH CONCRETE	1	8/0								HOLD
6-0	8/24	1130	SPLIT SPOON	SOIL	BORING #6 " 3.5" to 5.5" BELOW CONCRETE	1	8/0								

Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
John H [signature] SRH	8/25/86 1045				
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)
				8/25 1051	[signature]
Relinquished by: (Signature/Firm)	Date/Time	Received by: (Signature/Firm)	Date/Time	Remarks (attachments if necessary)	

TOLS004312

12

BZTO104(e)041133

* * * * * *
LIENT *
ANALYSIS *
REQUEST *
* * * * * *

COFFEY LABORATORIES, INC.

4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

PANY NAME SHR Associates TELEPHONE# 232 0824

DRESS 123 NE 3RD Suite 230 PURCHASE ORDER # VERBAL

DRESS PO Box 14005 LAB PRICE QUOTE # $60 / sample

TY/STATE/ZIP PORTLAND OR 97205 BILLING ADDRESS: SAME

TENTION Jon Puddick

MPLE COLLECTION DATE 9/3/86 DUE DATE ASAP RUSH

MPLE COLLECTED BY J.R. Dodd DELEVERED BY J Puddick

IENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTA BY EPA 8040 (SW846)
(DONT FILTER — DECANT WATER OFF ANY SEDIMENT)

ID	FieldID	Date	Time	Media	Pres	cntnr	Analysis requested	MDL
	MW A	9/3/86	1030	WATER	1:1 H_2SO_4 to pH 2	2.5A IL amber glass	PENTACHLOROPHENOL	
	MW A	"	1030	"	NONE	250 ml plastic	pH	
	MW B	"	1110	"	1:1 H_2SO_4 to pH 2	2.5A IL amber glass	PENTACHLOROPHENOL	
	MW B	"	1110	"	NONE	250 ml plastic	pH	

TOLS004313

Relinquished by:	Date	Time	Received for Coffey Labs by:
J.R. Dodd / SRH	9/3/86	1450	M. Schultz

PLE INTEGRITY COMMENTS:

LAB LOG #	LOGGED IN BY:	DATE:	TIME:
0903-J			

:\wp\clom\form\log\login.log
32319

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH ASSOCIATE TELEPHONE# 232-0824

ADDRESS 123 NE 3RD STE 230 PURCHASE ORDER # VERBAL

ADDRESS 14005 LAB PRICE QUOTE # [redacted]

CITY/STATE ZIP PORTLAND OR 97214 BILLING ADDRESS:

ATTENTION JOHN RUDDICK

SAMPLE COLLECTION DATE 8/29/86 DUE DATE ASAP RUSH

SAMPLE COLLECTED BY J. RUDDICK DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):

Penta by EPA 8040 (SW-846)

ID	Fre. ID	Date	Time	Media	Pres	cntnr	Analysis requested	MDL
MW-D		8/29	1600	GROUND WATER	1:1 HCl PH2	2 E 1 LAMBER GLASS	PENTACHLOROPHENOL (EPA 8040)	
MW-E			1430					
MW-F			1615					
MW-H			1500					
MW-I			1650					
MW-D			1600		NONE	250 ml PLASTIC	PH	
MW-E			1430					
MW-F			1615					
MW-H			1500					
MW-I			1650					

TOLS004314

Relinquished by: [signature] Date 8/29/86 Time 1800 Received for Coffey Labs by: Susan M Coffey

SAMPLE INTEGRITY COMMENTS:

LAB LOG # A860829 N 1-10 LOGGED IN BY: S Coffey DATE: 8-29-86 TIME: 1755

32319

BZTO104(e)041135

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates TELEPHONE# 503 232 0824
ADDRESS: 123 SW 3rd STE 230 PURCHASE ORDER # Verbal
ADDRESS: PO Box 14005 LAB PRICE QUOTE # 60.00/sample
CITY/STATE/ZIP: Portland OR 97214 BILLING ADDRESS:
ATTENTION: John Ruddick
SAMPLE COLLECTION DATE: 8-23-86 DUE DATE: 9/2/86 RUSH
SAMPLE COLLECTED BY: J Ruddick DELIVERED BY: JHR
CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 5040 (SW 846)

LAB #	Date	Time	Matrix	Preservative	Analysis requested	MI
R-0	8/23	1125	Soil	None	50z Glass	Pentachlorophenol (EPA 5040)
S-0		1130				
T-0		1135				
U-0		1140				
V-0		1145				
W-0		1150				
X-0		1200				

TOLS004315

RELINQUISHED BY: J H Ruddick Date 8/25/86 Time 1045 Received for Coffey Lab

SAMPLE QUALITY COMMENTS:

32319

LOGGED IN BY: DATE: TIME:

BZTO104(e)041136

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH ASSOCIATES TELEPHONE# 503 232 0824

ADDRESS 125 NE 3RD STE 230 PURCHASE ORDER # VERBAL

ADDRESS PO Box 14005 LAB PRICE QUOTE # 60.00/sample

CITY/STATE ZIP PORTLAND OR 97214 BILLING ADDRESS:

ATTENTION JOHN RUDDICK

SAMPLE COLLECTION DATE 8/24/86 + 8/23 DUE DATE 9/2/86 RUSH

SAMPLE COLLECTED BY J RUDDICK DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTACHLOROPHENOL BY EPA 8040 (SW 846)

ID	Date	Time	Media	Pres	Cntnr	Analysis requested	MDL
4-4	8/24	1745	Soil	None	803 Grass	Pentachlorophenol (EPA 8040)	
4-7	8/24	1820					
J-0	8/23	1015					
K-0		1030					
L-0		1045					
M-0		1055					
N-0		1105					
Ø-0		1110					
P-0		1115					
Q-0		1120					

TOLS004316

Received by:	Date	Time	Received for Coffey Labs by:
John H Ruddick / SRH	8/25/86	1045	Steven E. [illegible]

SPECIFICITY COMMENTS.

LOG #	LOGGED IN BY:	DATE:	TIME:
32319			

BZTO104(e)041137

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

MPANY NAME SRH ASSOCIATES TELEPHONE# 503 232 0824

DRESS 123 NE 3RD STE 230 PURCHASE ORDER # VERBAL

DRESS PO Box 14005 LAB PRICE QUOTE # 60.00/sample

TY/STATE ZIP PORTLAND OR 97214 BILLING ADDRESS:

TENTION JOHN RUDDICK

MPLE COLLECTION DATE 8/25/86 DUE DATE 9/2/86 RUSH

MPLE COLLECTED BY J RUDDICK DELIVERED BY JHR

IENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTACHLOROPHENOL BY EPA 8040 (SW 846)

DIP	Date	Time	Media	Pres	Cntnr	Analysis requested	MDL
6-4	8/24	1200	Soil	None	802 Glass	Penta (EPA 8040)	
6-7		1230					
6-12		1420					
D-2		1530					
T-S		1530					
Q-S		1615					
D-1		1050					
4-S		1610				(HOLD)	
4-0		1650					
4-2		1715					

TOLS004317

Sampled by:	Date	Time	Received for Coffey Labs by:
John H Ruddick / SRH	8/25/86	1045	Steven [illegible]

ALE INTEGRITY COMMENTS.

B LOG # 32319 LOGGED IN BY: DATE: TIME:

BZTO104(e)041138

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME: SRH Associates — TELEPHONE#: 503 232 0824
ADDRESS: 123 SW 3rd STE 230 — PURCHASE ORDER #: Verbal
ADDRESS: PO Box 14005 — LAB PRICE QUOTE #: 60.00/sample
CITY/STATE/ZIP: Portland OR 97214 — BILLING ADDRESS:
ATTENTION: John Ruddick
SAMPLE COLLECTION DATE: 8/24/86 — DUE DATE: 9/2/86 — RUSH:
SAMPLE COLLECTED BY: J Ruddick — DELIVERED BY: JHR
CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

LAB #	Date	Time	Matrix	Res/cntnr	Analysis requested	MDL
6-5	8/24	1050	Soil Nmo	80z glass	Penta (EPA 8040)	(Hold)
6-0		1130				
4-12		1900				
3-5		1915				(Hold)
3-0		1955				
3-2		2010				
3-4		2015				
3-7		2025				
3-12		2100				
6-2		1140				

TOLS004318

RELINQUISHED BY: John H Ruddick / SRH — Date: 8/25/86 — Time: 1045 — Received for Coffey Labs by:
SAMPLE QUALITY COMMENTS:

LOG # — LOGGED IN BY: — DATE: — TIME:

32319

BZTO104(e)041139

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH Associates TELEPHONE# 503 232 0824

ADDRESS 123 NE 3rd STE 230 PURCHASE ORDER # Verbal

ADDRESS PO Box 14005 LAB PRICE QUOTE # 60.00/sample

CITY/STATE/ZIP Portland OR 97214 BILLING ADDRESS:

ATTENTION John Ruddick

SAMPLE COLLECTION DATE 8/25/86 DUE DATE 9/2/86 RUSH

SAMPLES COLLECTED BY J Ruddick DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
Pentachlorophenol by EPA 8040 (SW 846)

LAB ID	Date	Time	Media	Preservative	Analysis requested	MDL
2-S	8/25	1130	Soil	None	Glass 8oz	Penta by EPA 8040 (HOLD)
2-0		1145				Run
2-2		1450				Run
2-4		1520				Run
2-7		1545				Run
2-12		1720				Run
1-2		1915				Run
1-4		1950				Run
1-7		2030			TOLS004319	Run
1-12	↓	2130	↓	↓	↓	Run

Relinquished by: [signature] Date 8/26 Time 1125 Received for Coffey Labs [signature]

SAMPLE INTEGRITY COMMENTS:

LAB NO. 32319 LOGGED IN BY: DATE: TIME:

CLIENT
ANALYSIS
REQUEST

COFFEY LABORATORIES, INC.
4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

COMPANY NAME SRH Associates TELEPHONE# 503 232 0824

ADDRESS 123 NE 3rd STE 230 PURCHASE ORDER # V12841

ADDRESS PO Box 14005 LAB PRICE QUOTE # 60.00/sample

CITY/STATE/ZIP Portland OR 97214 BILLING ADDRESS:

ATTENTION John Ruddick

SAMPLE COLLECTION DATE 8/23/86 DUE DATE 9/2/86 RUSH

SAMPLE COLLECTED BY J Ruddick DELIVERED BY JHR

CLIENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):
PENTACHLOROPHENOL BY EPA 8040 (SW 846)

COF #	Date	Time	Media	Preservative	Container	Analysis requested	MD
Y-0	8/23	1205	Soil	None	8oz Glass	Pentachlorophenol (EPA 8040)	
Z-0		1210					
1-S		1255				(HOLD)	
1-0		1635					
5-S		1655				(HOLD)	
5-0		1710					
5-2		1745					
5-4		1805					
5-7		1825					
5-12		1400					

TOLS004320

SAMPLED BY: [signature] Date 8/25 Time 1045 Received for Coffey Labs by: [signature]

SPECIAL SECURITY COMMENTS:

COFFEY LOG # LOGGED IN BY: DATE: TIME:

32319

REPAID_____
ART DEPOSIT_____
Y FOR RELEASE_____
ILL_____

COFFEY LABORATORIES, INC.

4914 N.E. 122nd Ave.
Portland, OR 97230
Phone: (503) 254-1794

LOG#_____

LOGIN TIME_____

OMPANY NAME SRH Assoc. TELEPHONE# 232-0824

DDRESS 123 NW 3RD PURCHASE ORDER # VERBAL

DDRESS STE 230 LAB PRICE QUOTE #_____

ITY/STATE/ZIP PORTLAND OR 97232 BILLING ADDRESS:

TTENTION Jon Ruddick

AMPLE COLLECTION DATE 9/26/88 DUE DATE MONDAY AFTERNOON ~~FRI.~~ 9/29/88 RUSH_____

AMPLE COLLECTED BY J RUDDICK DELIVERED BY JHR

_IENT COMMENTS-(SPECIAL INSTRUCTIONS, SPECIFIC METHOD ETC):

ID	Field ID	Date	Time	Media	Pres	btl	Analysis Requested	MDL
	K-O	9/26	0915	SOIL	NONE	8oz GLASS	PENTACHLOROPHENOL (EPA 8040)	

TOLS004321

MPLE INTEGRITY COMMENTS

Relinquished by:	Date	Time	Received for Coffey Labs by:
	9/26/88	0950	Mary L Haswell

:\wp\clom\form\log\request.log

32319

EXPENDITURES

7/10/85	Northwest Vacuum Truck Service	9000.00 } 242 tons
7/29/85	Chem-Security Systems	27270.88 }
8/8/85	Environmental Emergency Services	500.00
12/5/85	Environmental Emergency Services	18741.55
		55512.43

Due:

DEQ per OAR 340-102-065	3500.00
Riedel Environmental Services (Amendment 2) Consultants	25000.00 includes the 5 new wells
Whatever is necessary to finish job	??
Spent + committed to date.	$ 84,012.43

32319

TOLS004322

BZTO104(e)041143

STATE OF OREGON
DEPARTMENT OF ENVIRONMENTAL QUALITY

Memorandum

To: Alan S. Goodman, EPA-000

Date: 12 February 1985

From: Gregory D. Baesler, DEQ

Subject: HW - 3012 Superfund Investigations

Attached please find a cover memo and copies of the preliminary assessment and site investigations for Time Oil Company, 12005 N. Burgard, Portland, Oregon.

Please review, advise of any deficiencies, or route to EPA-Region X, as appropriate.

GDB/mb
Attachments
cc: Hazardous Waste Section, DEQ

RECEIVED
FEB 13 1985
OREGON OPERATIONS OFFICE
EPA-REGION 10

TOLS004323

32319

DEQ-4

BZTO104(e)041144

STATE OF OREGON

DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE MEMO

TO: Debbie Flood, Superfund Program
Management Section, EPA-Region X

DATE: February 12, 1985

FROM: John L. Smits
Northwest Region, DEQ

SUBJECT: HW - 3012 Superfund
Time Oil Company
ORD 009597543
Multnomah County

Time Oil Company operates a petroleum products storage terminal at 12005 N. Burgard, Portland, Oregon 97203. The terminal occupies a 51.53-acre site along the east bank of the Willamette River and is owned by Time Oil Co., PO Box 24447 Terminal Annex, Seattle, Washington 98124. The present capacity of the terminal in 30+ tanks is 770,000 barrels.

The on-site inspection was conducted on Oct. 25, 1984. John Denham, environmental manager who has worked for Time Oil since 1970 and Neil Wallis, terminal manager employed by Time Oil since 1979 were interviewed. Time Oil Co. acquired the site during 1959. Mr. Denham provided by letter dated Nov. 7, 1984, the attached chart which lists the tanks by number and indicates the types of chemicals stored in each since 1973. As can be seen from the chart, most tanks have held a number of different chemicals at different times. For example, tank no. 4408 held the following during the period:

1973	Methanol
1974	Jet fuel
1975	Premium gasoline
1976-78	Unleaded gasoline
1979-80	Fuel oil no. 2
1981-83	Empty

The terminal has handled the following chemicals:

- Fatty acid (wood byproduct)
- Isobutanol
- Jet fuel
- Methanol
- Premium gasoline
- Regular gasoline
- Turpentine
- Butyl alcohol
- Liquid fertilizer (ammonium nitrate)
- Lignin liquor
- Lube oil
- Methyl 10
- Pentachlorophenol
- Solvent (xylene, toluene)
- Unleaded gasoline

A number of the substances that have been and are stored at this Time Oil terminal are hazardous substances due to ignitability or toxicity.

32319

TOLS004324

BZTO104(e)041145

It appears that several arrangements have been made at the terminal related to product handling. Time Oil may lease a tank to a company like Chevron with the stored product owned by Chevron and handling, distribution and storage services performed by Time Oil. Time may control the tank, own the product and distribute the product, or rent a tank for storage only.

In the case of tanks 50067 and 10002, Time Oil Co. leased the tanks and possibly that portion of the tank farm site to Crosby and Overton of 5420 N. Lagoon, Portland, Oregon 97217. The same tanks appear to have been leased prior to this time by Pac-Mar, the previous name of Crosby and Overton. The Department has been unable to obtain a copy of the lease agreement. Crosby and Overton provides the service of collecting and then storing waste oils from separators, oil slop tanks, ship tank cleaning, etc. The two tanks appear to have been leased to Crosby and Overton since 1973.

Several smaller tanks, no. 20001, 20002 and 20003 having a capacity of 20,000 gal. each were leased to Koppers Co., Inc., of 5137 Southwest Ave., St. Louis, MO 63110. Several smaller, above-ground, horizontal oriented tanks in this area belong to Koppers Co. as well. According to Mr. Denham, Time Oil Co. formulated pentachlorophenol for Koppers to Koppers specifications and then handled or stored the formulations for later pickup by customers of Koppers.

The 20,000-gal. tanks were present during the Oct. 25, 1984 site inspection (reportedly empty) but had been removed from the site prior to the Dec. 12, 1984 soil sampling event. There was visually obvious contamination of the soil by incidental spills and slops in this former pentachlorophenol handling area. The level of contamination will be discussed later in this narrative.

Present Waste Management Practices

Since around December 1972, all tanks (except 50067 and 10002 leased to Crosby and Overton and the smaller tanks leased to or belonging to Koppers Company), the loading rack area and the pump house have been connected to a water draw system. A water draw box and water draw fittings are located beside each tank. These in turn are connected to a drainage piping network in place throughout the terminal. About once each year, water is drawn from the bottom of each tank and pumped to slop tank 3007 located in the northwest terminal area, or to tank 1406 in the area known as the Bell Oil Terminal. A portable Fram-Akers oil/water separator is periodically connected to the slop tank. The separated oil is either piped back to the appropriate storage tank or to an underground 3000-gal. separator tank near tank 3007 or an above-ground separator tank no. 1407 beside tank 1506. Water removed by the separator which contains less than 100 ppm ether soluble oil is by agreement discharged by a piping system to the City of Portland sanitary sewer system for treatment at the publicly owned treatment works (POTW). Two sampling manholes associated with two sewer lines are periodically monitored by staff with the City Dept. of Public Works. Waste oil from the separator is periodically removed from the underground 3000-gal. tank and above-ground tank 1507, and taken by Crosby and Overton to the tanks 50067 or 10002 that they lease from Time Oil on

the same site area. Alternately, a vacuum truck may be connected directly to the oil/water separator with waste oils transported to the Crosby and Overton tanks.

There is also an underground 6000-gal. spill prevention control and countermeasure (SPCC) tank associated with the off-shore pier to hold any spills and storm water that may be collected during ship loading/unloading. An 8000-gal. underground SPCC tank is located near the pump house and truck loading rack to collect any spills and storm water from those areas. The rail spur line recently constructed with curbing and spill drains has an underground 12,000-gal. tank for containment of any spills in that area. The loading rack area of the Bell Oil Terminal section was proposed to be equipped with an underground 4000-gal. slop and water tank. This section of the terminal has not been in use for quite some time.

Time Oil Co. on Aug. 11, 1980, completed EPA Form 8700-12, Notification of Hazardous Waste Activity, as required by RCRA 3010 listing specific source wastes, K051 - API separator sludge, K052 - tank bottoms (leaded) and P090 - pentachlorophenol. On Feb. 22, 1982, Time Oil requested assignment of a generator identification number by correspondence with the Department of Environmental Quality.

Past Waste Management Practices

According to Mr. Denham, there are no retrievable inventory records of product storage for the period 1959 to 1973. He agreed that it can be assumed similar products were stored on-site in a pattern like that shown on the 1973 to 1983 chart provided by Time Oil Co.

Prior to the installation of the draw water system for each tank, associated piping and use of the portable oil/water separator in late 1972, wastewater from tank bottoms was allowed to spill onto the ground around the site. This practice was apparently common to oil terminal facilities in the area until Oregon DEQ began to work in 1970-71 with terminals to discontinue discharge into public waters and onto ground surfaces. This practice apparently occurred at the Time Oil terminal during the period from 1959 to late 1972. A Feb. 16, 1971 internal memo describes a conversation with the plant engineer employed by Time Oil at that time that confirms the discharge of draw water from tank bottoms onto the ground but states further that the company maintained no such effluent discharged to the river, drainage ditch or storm sewer.

In view of the wasting of water from tank bottoms onto the soil surface for a period of up to 13 years, and the storage of leaded gasoline at one time or another in most of the tanks, a decision was made to collect soil samples in a somewhat random grid fashion throughout the terminal area. Samples were also collected in the area near tanks used by Crosby and Overton and those leased to Koppers to store pentachlorophenol formulations.

Sampling

At each of 12 locations, a composite soil sample using a soil core was collected. The composite was made up of the surface and 1, 2 and 3 foot intervals. Samples were collected and analyzed by the DEQ laboratory. Analysis of each sample included base-neutral extractables, pesticides/PCBs (method 608), acid extractables, pesticides (method 625) and EP Toxicity for lead. An effort was also made to identify and quantify any other organic chemical observed with the extraction/GC (gas chromatograph) MS (mass spectrometer) procedures.

All 12 soil samples tested for EP Toxicity lead showed concentrations of <0.1 mg/l. Concentrations of 5 mg/l or greater for EPA Toxic lead are classified as hazardous waste. The detection limit for this procedure is 0.1 mg/l.

Of 12 soil samples tested for pesticides, method 625, extracted by RCRA method 3540, all showed concentrations of <5 mg/kg (the detection limit) of these pesticides.

Samples tested for acid extractables method 625, extracted by RCRA method 3540 (acetone/hexane) showed all 12 sites to contain <1 mg/kg (detection limit) for these phenol species except item 9, sample Z1018 collected 19 ft. NE of tank 50067 (Crosby and Overton leased tank) contained 515 mg/kg pentachlorophenol and 12 mg/kg tetrachlorophenol. Item 10, sample Z1017 contained 1820 mg/kg pentachlorophenol and 71 mg/kg tetrachlorophenol collected at the site of the tanks leased to Koppers for storage of pentachlorophenol formulations.

Of the soil samples collected and analyzed for base-neutral extractables, method 625, extracted by RCRA method 3540 all showed concentrations of this group of pollutants to be less than the detection limit (< 1 mg/kg) except the following tanks showed:

No. 20511 - Item 4, soil bag Z1008

Isophorone	1 mg/kg
2,4-dinitrotoluene	3 mg/kg
Fluorene	1 mg/kg
n-nitrosodiphenylamine	2 mg/kg
Phenanthrene	1 mg/kg
Anthracene	1 mg/kg

No. 15002 - Item 8, soil bag Z1012

Fluorene	13 mg/kg
Phenanthrene	14 mg/kg
Anthracene	105 mg/kg

Crosby and Overton

No. 50067 - Item 9, soil bag Z1018

Chrysene	1 mg/kg
Bis(2-ethylhexyl)phthalate	3 mg/kg

TOLS004327

323je

Although polychlorinated biphenyls (PCBs) were detected at several soil sample sites, total PCBs were well below the 50 mg/kg concentration which requires handling.

At each sample site, in addition to the priority pollutant chemicals, the sample was scanned for any other unknowns above the detection limit of 1.0 mg/l. In the case of 3 sample sites, 4 (Z1008), 9 (Z1018) and 10 (Z1017), a number of other chemicals were tentatively identified and estimated concentrations determined. These results are shown on the attached lab sheets.

Crosby and Overton Leased Tanks

During 1983 on an as yet unspecified date, an individual was allegedly exposed to a substance while cutting an access hole into tank no. 10002 leased to Crosby and Overton by Time Oil Co. The hole was reportedly cut to remove the substance inside. Allegedly, the individual developed immediate symptoms involving skin irritation. Reportedly, the individual returned to the tank some time later and collected three (3) soil samples near the tank. Those soil samples were said analyzed by CH2M/Hill. CH2M/Hill reported PCB concentrations of 29.4 mg/kg, 584, mg/kg and 1060 mg/kg (disposal restrictions apply when PCB concentrations exceed 50 mg/kg).

On May 2, 1984, DEQ laboratory staff collected samples at the Crosby and Overton tank in question. A soil sample 10 ft. from the apparent access hole cut into the tank showed a total PCB concentration of 59.7 mg/kg. Sludge collected on a surface 4 ft. from the edge of the tank entry hole showed a total PCB concentration of 1357 mg/kg.

Detection of PCB near the tank resulted in review of past waste oil disposal records involving the Crosby and Overton tank. The records showed disposal of 210,000 gal. of petroleum-based sludge by Crosby and Overton at the St. Johns Municipal Landfill located on Columbia Blvd. in Portland, Oregon. An application for disposal of special wastes at the landfill was approved by the Metropolitan Service District (Metro) Aug. 10, 1983, following review of sample analysis of the tank contents which showed PCB concentrations to be <1 ppm.

During Sept. 1984, the area at the St. Johns Landfill believed to contain the 210,000 gal. of petroleum sludge was extensively sampled and analyzed for PCBs. The presence of PCBs in the areas tested was not confirmed.

Assessment

There are problems at the Time Oil Co. terminal associated with the past handling of hazardous substances. The long-time discharge of tank bottom draw water onto the ground surface within the terminal area may have impacted groundwater below the site. This could not be confirmed using the sampling equipment available. Surface soil samples did not detect any significant concentrations of priority pollutants to depths of three (3) feet that might be expected within a tank farm that had discharged wastewater onto the ground. As mentioned above under the Sampling section, priority pollutants and other organic chemicals were found in some areas.

The soil on-site appears to be dredge sand that has been in place for many years. Lenses of silt were observed within the 3-ft. sample. The silt appeared to perch water at some sample sites. The permanent groundwater table is apparently about 20 ft. below the land surface. Downgradient groundwater usage could not be confirmed.

Based on past practices of draw water disposal, presence of some contaminants within the upper surface and shallow depth of groundwater, it is recommended that construction of groundwater monitoring wells be seriously considered to better characterize the extent of pollution.

Pentachlorophenol is present in high concentrations within the soil in the area of the tanks leased to Koppers Co. and those leased to Crosby and Overton. These areas need cleanup of the spilled hazardous wastes. Cleanup should include careful evaluation of the effectiveness of the removal including groundwater sampling. Further review of the alleged incident involving presence of PCB at the Crosby and Overton tanks appears to be warranted.

During a Jan. 28, 1985, phone conversation with John Denham of Time Oil, the detection of pentachlorophenol was discussed. He told me the company realized the waste was present on the ground and soil some time ago. Denham also told me that after this information became available, Time had cancelled the contract to handle pentachlorophenol and its ingredients for Koppers as well as the lease of tanks. Denham stated that tanks have been cleaned out and removed and the remaining tanks will be moved out soon and cleanup of the area will start. It was suggested that this information be sent by letter to the Northwest Region of DEQ including proposed cleanup methods and time schedule. He said he would do that after reviewing sampling results.

Backlog Reduction

It is recommended that Time Oil Co. (ORD 009597543) be placed into backlog reduction category B-5. Problems involving hazardous wastes are present. The State of Oregon DEQ, Northwest Region, has the regulatory authority to investigate hazardous waste handling/disposal and to require remedial cleanup action. Northwest Region of DEQ fully intends to follow up this assessment and work with the company to establish necessary monitoring and cleanup.

The site does not appear to present a hazard to the health of the general public by direct contact with wastes present due to the security of fences, 24-hr/day staffing of the site and a watchman service. The threat to the environment appears to be related to the potential impact to groundwater. Groundwater impact needs to be further evaluated.

At this time, it does not appear that further involvement of the RCRA 3012 program will be necessary.

RC2044
Attachment
cc: Northwest Region, DEQ
Hazardous Waste Operations, DEQ
Time Oil Co.
Crosby and Overton

TOLS004329

32319

PA/SI

EPA POTENTIAL HAZARDOUS WASTE SITE DISPOSITION

REGION	SITE NUMBER
10	ORD009597543

File this form in the regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System: Hazardous Waste Enforcement Task Force (EN-335); 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME	B. STREET	
TIME OIL COMPANY	12005 NORTH BURGARD STREET	
C. CITY	**D. STATE**	**E. ZIP CODE**
PORTLAND	OR	97203

II. TENTATIVE DISPOSITION

Indicate the recommended action(s) and agency(ies) that should be involved by marking 'X' in the appropriate boxes.

RECOMMENDATION	MARK 'X'	ACTION AGENCY: EPA	STATE	LOCAL	PRIVATE
A. NO ACTION NEEDED -- NO HAZARD					
B. INVESTIGATIVE ACTION(S) NEEDED (If yes, complete Section III.) PENDING	X	-	X		
C. REMEDIAL ACTION NEEDED (If yes, complete Section IV.)					
D. ENFORCEMENT ACTION NEEDED (If yes, specify in Part E whether the case will be primarily managed by the EPA or the State and what type of enforcement action is anticipated.).	X				

E. RATIONALE FOR DISPOSITION / SOURCES OF INFORMATION

SITE CONTAINS A PETROLEUM & CHEMICAL STORAGE TERMINAL WITH A 770,000 BARREL CAPACITY. THE FACILITY DISCHARGED DRAW WATERS FROM TANK BOTTOMS TO GROUND FROM 1954 TO 1972. A SOIL SAMPLE TAKEN NEAR A TANK LEASED TO CROSBY & OVERTON CONTAINED 1357 mg/kg OF PCBs & HIGH LEVELS OF OTHER PRIORITY POLLUTANTS. A SOIL SAMPLE TAKEN NEAR A TANK LEASED TO KOPPERS CONTAINED 1820 mg/kg OF PCP.

KSOB: 4 (THE SI INDICATES THAT DEQ DEFERS THE LEAD IN REQUIRING CLEANUP BY TIME OIL COMPANY) B2 PENDING - Outcome of State action

F. INDICATE THE ESTIMATED DATE OF FINAL DISPOSITION (mo., day, & yr.)	G. IF A CASE DEVELOPMENT PLAN IS NECESSARY, INDICATE THE ESTIMATED DATE ON WHICH THE PLAN WILL BE DEVELOPED (mo., day, & yr.)

H. PREPARER INFORMATION

1. NAME	2. TELEPHONE NUMBER	3. DATE (mo., day, & yr.)
ROBERT KIEVIT	(206) 753-9014	7-31-85

III. INVESTIGATIVE ACTIVITY NEEDED

A. IDENTIFY ADDITIONAL INFORMATION NEEDED TO ACHIEVE A FINAL DISPOSITION.

- THE AREAS AROUND THE CROSBY & OVERTON AND KOPPERS TANKS SHOULD BE CLEANED UP.
- A GROUNDWATER MONITORING SYSTEM SHOULD BE INSTALLED ON SITE
- SOME SEDIMENT SAMPLING IN THE WILLAMETTE RIVER SHOULD BE DONE OFF OF THE TIME OIL SITE.

B. PROPOSED INVESTIGATIVE ACTIVITY (Detailed Information)

1. METHOD FOR OBTAINING NEEDED ADDITIONAL INFO.	2. SCHEDULED DATE OF ACTION (mo., day, & yr.)	3. TO BE PERFORMED BY (EPA, Contractor, State, etc.)	4. ESTIMATED MANHOURS	5. REMARKS
a. TYPE OF SITE INSPECTION (1)				
(2)				
(3)				
b. TYPE OF MONITORING (1)				
(2)				TOLS004330
c. TYPE OF SAMPLING (1)				
(2)				

EPA Form T2070-4 (10-79)

32319

Continue On Reverse

BZTO104(e)041151

Continued From Front

III. INVESTIGATIVE ACTIVITY NEEDED and PART B - PROPOSED INVESTIGATIVE ACTIVITY (Continued)

c. TYPE OF LAB ANALYSIS (1)				
(2)				
e. OTHER (specify) (1)				
(2)				

C. ELABORATE ON ANY OF THE INFORMATION PROVIDED IN PART B (on front & above) AS NEEDED TO IDENTIFY ADDITIONAL INVESTIGATIVE WORK.

D. ESTIMATED MANHOURS BY ACTION AGENCY

1. ACTION AGENCY	2. TOTAL ESTIMATED MANHOURS FOR INVESTIGATIVE ACTIVITIES	1. ACTION AGENCY	2. TOTAL ESTIMATED MANHOURS FOR INVESTIGATIVE ACTIVITIES
a. EPA		b. STATE	
c. EPA CONTRACTOR		d. OTHER (specify)	

IV. REMEDIAL ACTIONS

A. SHORT TERM/EMERGENCY STRATEGY (On Site & Off-Site): List all emergency actions needed to bring site under immediate control, e.g., restrict access, provide alternate water supply, etc. See instructions for a list of Key Words for each of the actions to be used in the space below.

1. ACTION	2. EST. START DATE (mo.day.&yr)	3. EST. END DATE (mo.day.&yr)	4. ACTION AGENCY (EPA, State, Private Party)	5. ESTIMATED COST	6. SPECIFY 311 OR OTHER ACTION: INDICATE THE MAGNITUDE OF THE WORK REQUIRED
				$	
				$	
				$	
				$	
				$	
				$	

B. LONG TERM STRATEGY (On Site & Off-Site): List all long term solutions, e.g., excavation, removal, ground water monitoring wells, etc. See instructions for a list of Key Words for each of the actions to be used in the spaces below.

1. ACTION	2. EST. START DATE (mo.day.&yr)	3. EST. END DATE (mo.day.&yr)	4. ACTION AGENCY (EPA, State Private Party)	5. ESTIMATED COST	6. SPECIFY 311 OR OTHER ACTION: INDICATE THE MAGNITUDE OF THE WORK REQUIRED
				$	
				$	
				$	
				$	
				$	
				$	

C. ESTIMATED MANHOURS AND COST BY ACTION AGENCY

1. ACTION AGENCY	2. TOTAL EST. MANHOURS FOR REMEDIAL ACTIVITIES	3. TOTAL EST. COST FOR REMEDIAL ACTIVITIES	1. ACTION AGENCY	2. TOTAL EST. MANHOURS FOR REMEDIAL ACTIVITIES	3. TOTAL EST. COST FOR REMEDIAL ACTIVITIES
a. EPA			b. STATE		
c. PRIVATE PARTIES			d. OTHER (specify)		

TOLS004331

EPA Form T2070-4 (10-79) REVERSE

32319

BZTO104(e)041152

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

EPA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D009597543

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER				
Time Oil Company	12005 N. Burgard St.				
03 CITY	**04 STATE**	**05 ZIP CODE**	**06 COUNTY**	**07 COUNTY CODE**	**08 CONG DIST**
Portland	OR	97203	MULTNOMAH	051	03

09 COORDINATES LATITUDE 45° 36' 56.4" | LONGITUDE 122° 47' 00.3"

10 TYPE OF OWNERSHIP (Check one)
■ A. PRIVATE ☐ B. FEDERAL _____ ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER _____ ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
10 25 84 (MONTH DAY YEAR)	■ ACTIVE ☐ INACTIVE	1959 (BEGINNING YEAR) _____ (ENDING YEAR) ☐ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR _____ (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR _____ (Name of firm)
■ E. STATE ☐ F. STATE CONTRACTOR _____ (Name of firm) ☐ G. OTHER _____ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
John L. Smits	ENVIRONMENTAL ANALYST	OR-DEQ	(503) 325-8660

09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO.
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
John P. Denham	ENVIRONMENTAL MANAGER	TIME OIL COMPANY P.O. BOX 24447 Seattle WA 98124	(206) 285-2400
NEIL WALLIS	Terminal MANAGER	TIME OIL COMPANY P.O. Box 03137 Portland, OR 97203	(503) 286-1611
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
■ PERMISSION ☐ WARRANT	11:00	Cool, Overcast, occasional showers

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO
John P. Denham	Time Oil Company	(206) 285-2400

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
John L. Smits	OR-DEQ	NW REGION	503-325-8660	1 15 85 (MONTH DAY YEAR)

EPA FORM 2070-13 (7-81)

32319

TOLS004332

BZTO104(e)041153

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D009597543

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER — Contaminated soil (Specify)
- ☐ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS: ____
CUBIC YARDS: Est at least 1037 CY
NO. OF DRUMS: ____

03 WASTE CHARACTERISTICS (Check all that apply)

- ☒ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☐ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES Estimate at least	1037	CY	Soil contaminated with pentachlorophenol
OCC	OTHER ORGANIC CHEMICALS			and tetrachlorophenol
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
PSD	Pentachlorophenol and	87865	Contaminated soil ground	1820	mg/KG
	2,3,4,6-Tetrachlorophenol	58902	old tank sites	71	mg/KG
	*See cover narrative for further explanation				
	Time Oil Co registered as Generator of Hazardous Waste				
	API Separator Sludge	K051			
	Tank bottoms (leaded)	K052			
	Pentachlorophenol	P090			

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	Petroleum Products Storage/Handling		FDS		
FDS	facility (terminal)		FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Site inspection Oct. 25, 1984, interview with Environmental manager John Denham, terminal manager Neil Wallis. Search of OR-DEQ files, City of Portland Dept. of Public Works files
Review of OR-DEQ laboratory soil sample analysis data.

EPA FORM 2070-13(7-81)

TOLS004333

32319

BZTO104(e)041154

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
OR	D009597543

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ■ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: 1970 —) ☐ POTENTIAL ■ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: N/A Not USED
04 NARRATIVE DESCRIPTION: Probable groundwater contamination below area leased to and headed for Koppers Co. for formulation and storage of pentachlorophenol. Same potential for adjacent area leased to Crosby and Overton which showed Penta contamination of upper 36" of soil at 515 mg/kg. Ground water impact in general tank farm area needs further evaluation

01 ☐ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____
04 NARRATIVE DESCRIPTION: None documented

01 ☐ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____
04 NARRATIVE DESCRIPTION: VOC only. Notice of Violation sent by OR-DEQ for storage of gasoline without vapor control

01 ■ D. FIRE EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: N/A) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: N/A
04 NARRATIVE DESCRIPTION: Lt. Wm. Knotts of the Portland Fire Bureau reported: Typical tank farm. Probability of fire fairly low, but if it does occur, as with any tank farm, fire can be very severe with multiple explosions. There have been no fire responses since 1975. Mr. Knotts can be reached at (503) 248-4375.

01 ■ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: N/A) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: N/A
04 NARRATIVE DESCRIPTION:
Low potential for direct contact by public with soil contaminated by pentachlorophenol due to site security of fences, personel on-site 24 hrs/day and watchmans service.

01 ■ F. CONTAMINATION OF SOIL — 02 ■ OBSERVED (DATE: 1970 — ?) ☐ POTENTIAL ■ ALLEGED
03 AREA POTENTIALLY AFFECTED: ~5 (acres)
04 NARRATIVE DESCRIPTION: Surface to at least 3 ft. depth contaminated by pentachlorophenol, tetrachlorophenol spills/drippage in area of Koppers Co. tanks and tanks leased to Crosby and Overton.

01 ☐ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____
04 NARRATIVE DESCRIPTION:
N/A

01 ■ H. WORKER EXPOSURE/INJURY — 02 ■ OBSERVED (DATE: 1983) ☐ POTENTIAL ■ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 1
04 NARRATIVE DESCRIPTION: Workman cutting hole in a tank leased to Crosby & Overton to remove contents allegedly contacted PCB, reported immediate symptoms of skin irritation

01 ☐ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____
04 NARRATIVE DESCRIPTION:
N/A

EPA FORM 2070-13 (7-81)

TOLS004334

32319

BZTO104(e)041155

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: D009597543

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

N/A

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES (Spills/Runoff/Standing liquids/Leaking drums) — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

N/A

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

01 ■ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION Oil/water separator water discharged to sanitary sewer and then City of Portland POTW. Sampling manhole checked by City. No documented violations. City standard is not ≥ 100ppm ether soluble oil to sewer

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

N/A

III. TOTAL POPULATION POTENTIALLY AFFECTED: N/A Groundwater contamination needs further evaluation

IV. COMMENTS

See cover narrative

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See part 2, VI.

EPA FORM 2070-13 (7-81)

TOLS004335

32319

BZTO104(e)041156

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D009597543

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A. NPDES				
☐ B. UIC				
■ C. AIR				Related to VOC (Volatile Organic Compounds)
☐ D. RCRA				
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
■ H. LOCAL (Specify) Agreement with city of Portland Dept. of Public Works re: discharge to sewer.				
☐ I. OTHER (Specify) Registered as generator of hazardous wastes.				
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☐ D. TANK, ABOVE GROUND		
■ E. TANK, BELOW GROUND	3000 1500	GA BBLS
☐ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
☐ I. OTHER (Specify)		

04 TREATMENT (Check all that apply)
☐ A. INCENERATION
☐ B. UNDERGROUND INJECTION
■ C. CHEMICAL/PHYSICAL
☐ D. BIOLOGICAL
☐ E. WASTE OIL PROCESSING
☐ F. SOLVENT RECOVERY
■ G. OTHER RECYCLING/RECOVERY
■ H. OTHER (Specify) Removed to Crosby and Overton tank

05 OTHER

■ A. BUILDINGS ON SITE

06 AREA OF SITE

51.53 Acres

07 COMMENTS

Tank draw water sent to slop tank periodically run through FRAM AKERS Oil Water Separator water to sewer - waste oil back to tank drawn from if possible or to Vacuum truck and to Crosby and Overton Tanks or to 3000 gal below ground separator tank or above ground 1500 bbl. separator tank for lake removal by Crosby and Overton taken to tanks on-site leased to Crosby & Overton

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

■ A. ADEQUATE, SECURE ☐ B. MODERATE ☐ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

Diking - SPCC Plans - SPCC Tanks

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☐ YES ■ NO Fenced, 24 hr personel, watchmans service

02 COMMENTS

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis reports)

See part 2, VI.

EPA FORM 2070-13 (7-81)

TOLS004336

32319

BZTO104(e)041157

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: 0009597543

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)	SURFACE	WELL	02 STATUS: ENDANGERED	AFFECTED	MONITORED	03 DISTANCE TO SITE
COMMUNITY	A. ■	B. ☐	A. ☐	B. ☐	C. ■	A. 720 (mi)
NON-COMMUNITY	C. ☐	D. ☐	D. ☐	E. ☐	F. ☐	B. _____ (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING ☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available) ☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available) ■ D. NOT USED, UNUSEABLE could not be accurately determined

02 POPULATION SERVED BY GROUND WATER	03 DISTANCE TO NEAREST DRINKING WATER WELL
N/A	? 1 (mi)

04 DEPTH TO GROUNDWATER	05 DIRECTION OF GROUNDWATER FLOW	06 DEPTH TO AQUIFER OF CONCERN	07 POTENTIAL YIELD OF AQUIFER	08 SOLE SOURCE AQUIFER
< 20 (ft)	NNW	< 20 (ft)	Unknown (gpd)	☐ YES ■ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)
Old well logs for area could not locate on ground in area

10 RECHARGE AREA		11 DISCHARGE AREA	
☐ YES ☐ NO	COMMENTS	■ YES ☐ NO	COMMENTS Along east bank of Willamette River

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☐ A. RESERVOIR, RECREATION DRINKING WATER SOURCE ☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES ☐ C. COMMERCIAL, INDUSTRIAL ☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
_____	☐	_____ (mi)
_____	☐	_____ (mi)
_____	☐	_____ (mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

NOT APPLICABLE

01 TOTAL POPULATION WITHIN			02 DISTANCE TO NEAREST POPULATION
ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE	
A. _____ NO. OF PERSONS	B. _____ NO. OF PERSONS	C. _____ NO. OF PERSONS	_____ (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE	04 DISTANCE TO NEAREST OFF-SITE BUILDING
_____	_____ (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site (e.g., rural, village, high density, suburban area))

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32319

TOLS004337

BZTO104(e)041158

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: D009597543

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one) — estimate

☐ A. $10^{-6} - 10^{-8}$ cm/sec ☐ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ■ D. GREATER THAN 10^{-3} cm/sec

DREDGE SAND - Silt lenses

02 PERMEABILITY OF BEDROCK (Check one) — unknown

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B. RELATIVELY IMPERMEABLE ($10^{-4} - 10^{-6}$ cm/sec) ☐ C. RELATIVELY PERMEABLE ($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
> 200 (ft)	≥ 3 (ft)	5.5-6

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
Annual 45 (in)	(in)	0-1 %	NNW	1 %

09 FLOOD POTENTIAL: SITE IS IN 100 YEAR FLOODPLAIN

10: ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum): ESTUARINE A. _____ (mi); OTHER B. .5 (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species): _____ (mi); ENDANGERED SPECIES: Unknown

13 LAND USE IN VICINITY

DISTANCE TO:	COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS; NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AGRICULTURAL LANDS: AG LAND
	A. Within (mi)	B. 1 mi (mi)	C. 7 1 (mi)	D. _____ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

Low River terrace adjacent to Willamette River, upper older terraces about 1 mile to the southeast

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See part 2, VI.

EPA FORM 2070-13 (7-81)

TOLS004338

32319

BZTO104(e)041159

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D009597543

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL	12	OR-DEQ Laboratory	Attached
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
NONE	

IV. PHOTOGRAPHS AND MAPS

01 TYPE ■ GROUND ■ AERIAL

02 IN CUSTODY OF Attached or in DR-DEQ HW Files
(Name of organization or individual)

03 MAPS ■ YES ☐ NO

04 LOCATION OF MAPS: Site, quadrangle - plan attached

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

None

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See part 2, VI.

EPA FORM 2070-13 (7-81)

TOLS004339

32319

BZTO104(e)041160

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: D009597543

II. CURRENT OWNER(S) / PARENT COMPANY

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
Time Oil Company		SAME	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE
P.O. Box 24447, Terminal Annex	5171		

05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE
Seattle	WA	98124			

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE

III. PREVIOUS OWNER(S) (List most recent first) / IV. REALTY OWNER(S) (If applicable, list most recent first)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
Not available		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sampling results)

See part 2, VI.

EPA FORM 2070-13 (7-81)

TOLS004340

32319

BZTO104(e)041161

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D009597543

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME	02 D+B NUMBER
Time Oil Company	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
12005 N. Burgard St.	5171

05 CITY	06 STATE	07 ZIP CODE
Portland	OR	97203

08 YEARS OF OPERATION	09 NAME OF OWNER
1959—	Time Oil Company

OPERATOR'S PARENT COMPANY (If applicable)

10 NAME	11 D+B NUMBER
Time Oil Company	

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE
P.O. Box 24447, Terminal Annex	

14 CITY	15 STATE	16 ZIP CODE
Seattle	WA	98124

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

01 NAME	02 D+B NUMBER	10 NAME	11 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

01 NAME	02 D+B NUMBER	10 NAME	11 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

01 NAME	02 D+B NUMBER	10 NAME	11 D+B NUMBER
N/A		N/A	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See part 2, VI.

EPA FORM 2070-13 (7-81)

32319

TOLS004341

BZTO104(e)041162

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: D009597543

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER
N/A	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE

III. OFF-SITE GENERATOR(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
Crosby and Overton			
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
5420 N. Lagoon			
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
Portland	OR 97217		
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Crosby and Overton lease 2 tanks from Time Oil Company. C+O collects oily wastes oil slops, ship pumpings to the site, from off-site generators too numerous to list

See part 2, VI.

TOLS004342

EPA FORM 2070-13 (7-81)

32319

BZTO104(e)041163

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: D009597543

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ C. PERMANENT WATER SUPPLY PROVIDED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☒ D. SPILLED MATERIAL REMOVED 04 DESCRIPTION Heating oil and diesel spill at Tank 29508, Tank weld failure lost 3663615 onto soil. Cleaned up reportedly soil removed by company	02 DATE MARCH 8, 1985	03 AGENCY Time Oil.
01 ☒ E. CONTAMINATED SOIL REMOVED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ F. WASTE REPACKAGED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ G. WASTE DISPOSED ELSEWHERE 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ H. ON SITE BURIAL 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ I. IN SITU CHEMICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ J. IN SITU BIOLOGICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ K. IN SITU PHYSICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ L. ENCAPSULATION 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ M. EMERGENCY WASTE TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ N. CUTOFF WALLS 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ P. CUTOFF TRENCHES/SUMP 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ Q. SUBSURFACE CUTOFF WALL 04 DESCRIPTION	02 DATE	03 AGENCY

N/A

NOT APPLICABLE

EPA FORM 2070-13 (7-81)

TOLS004343

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EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: 0009597543

II. PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ S. CAPPING/COVERING 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ T. BULK TANKAGE REPAIRED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ U. GROUT CURTAIN CONSTRUCTED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ V. BOTTOM SEALED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ W. GAS CONTROL 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ X. FIRE CONTROL 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ Y. LEACHATE TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ Z. AREA EVACUATED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ 1. ACCESS TO SITE RESTRICTED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ 2. POPULATION RELOCATED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ 3. OTHER REMEDIAL ACTIVITIES 04 DESCRIPTION	02 DATE	03 AGENCY

NOT APPLICABLE

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See part 2, VI.

EPA FORM 2070-13 (7-81)

32319

TOLS004344

BZTO104(e)041165

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D009597543

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ■ YES ☐ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

OR-DEQ NW Region Notice of Violation to Time oil Company 7-26-78
Storage of >40,000 gal. gasoline without vapor emission control devices

1983-1984 Multnomah County Sherrifs Criminal Investigation related to workmen allegedly contacting PCB at Crosby and Overton tanks

III. SOURCES OF INFORMATION Cite specific references, e.g., state files, sample analysis, reports

See Part 2, VI.

EPA FORM 2070-13 (7-81)

TOLS004345

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BZTO104(e)041166

EPA

POTENTIAL HAZARDOUS WASTE SITE
IDENTIFICATION AND PRELIMINARY ASSESSMENT

REGION	SITE NUMBER (to be assigned by Hq)

NOTE: This form is completed for each potential hazardous waste site to help set priorities for site inspection. The information submitted on this form is based on available records and may be updated on subsequent forms as a result of additional inquiries and on-site inspections.

GENERAL INSTRUCTIONS: Complete Sections I and III through X as completely as possible before Section II *(Preliminary Assessment)*. File this form in the Regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force *(EN-335)*; 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME	B. STREET (or other identifier)		
Time Oil Co	12005 N. Burgard St.		
C. CITY	**D. STATE**	**E. ZIP CODE**	**F. COUNTY NAME**
Portland	OR	97203	Multnomah

G. OWNER/OPERATOR *(if known)*

1. NAME	2. TELEPHONE NUMBER

H. TYPE OF OWNERSHIP

☐ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☐ 4. MUNICIPAL ☐ 5. PRIVATE ☐ 6. UNKNOWN

I. SITE DESCRIPTION

J. HOW IDENTIFIED *(i.e., citizen's complaints, OSHA citations, etc.)*
FIFRA/TSCA LIST

K. DATE IDENTIFIED *(mo., day, & yr.)*

L. PRINCIPAL STATE CONTACT

1. NAME	2. TELEPHONE NUMBER

II. PRELIMINARY ASSESSMENT *(complete this section last)*

A. APPARENT SERIOUSNESS OF PROBLEM

☐ 1. HIGH ☐ 2. MEDIUM ☐ 3. LOW ☐ 4. NONE ☐ 5. UNKNOWN

B. RECOMMENDATION

☐ 1. NO ACTION NEEDED *(no hazard)*

☐ 2. IMMEDIATE SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR: _____
b. WILL BE PERFORMED BY: _____

☐ 3. SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR: _____
b. WILL BE PERFORMED BY: _____

☐ 4. SITE INSPECTION NEEDED *(low priority)*

C. PREPARER INFORMATION

1. NAME	2. TELEPHONE NUMBER	3. DATE (mo., day, & yr.)

III. SITE INFORMATION

A. SITE STATUS

☐ 1. ACTIVE *(Those industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if intermittently.)*

☐ 2. INACTIVE *(Those sites which no longer receive wastes.)*

☐ 3. OTHER *(specify)*: _____ *(Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.)*

B. IS GENERATOR ON SITE?

☐ 1. NO ☐ 2. YES *(specify generator's four-digit SIC Code)*: _____

C. AREA OF SITE *(in acres)*	D. IF APPARENT SERIOUSNESS OF SITE IS HIGH, SPECIFY COORDINATES	
	1. LATITUDE *(deg.-min.-sec.)*	2. LONGITUDE *(deg.-min.-sec.)*

E. ARE THERE BUILDINGS ON THE SITE?

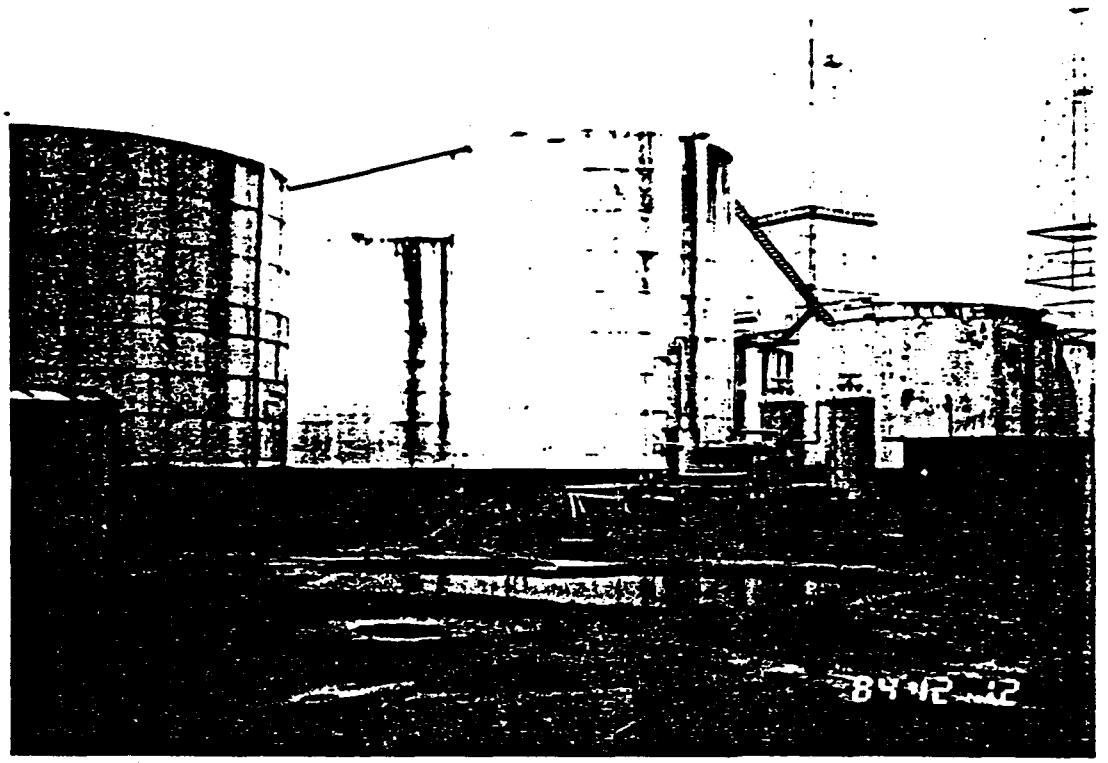
☐ 1. NO ☐ 2. YES *(specify)*: _____

TOLS004346

T2070-2 (10-79)

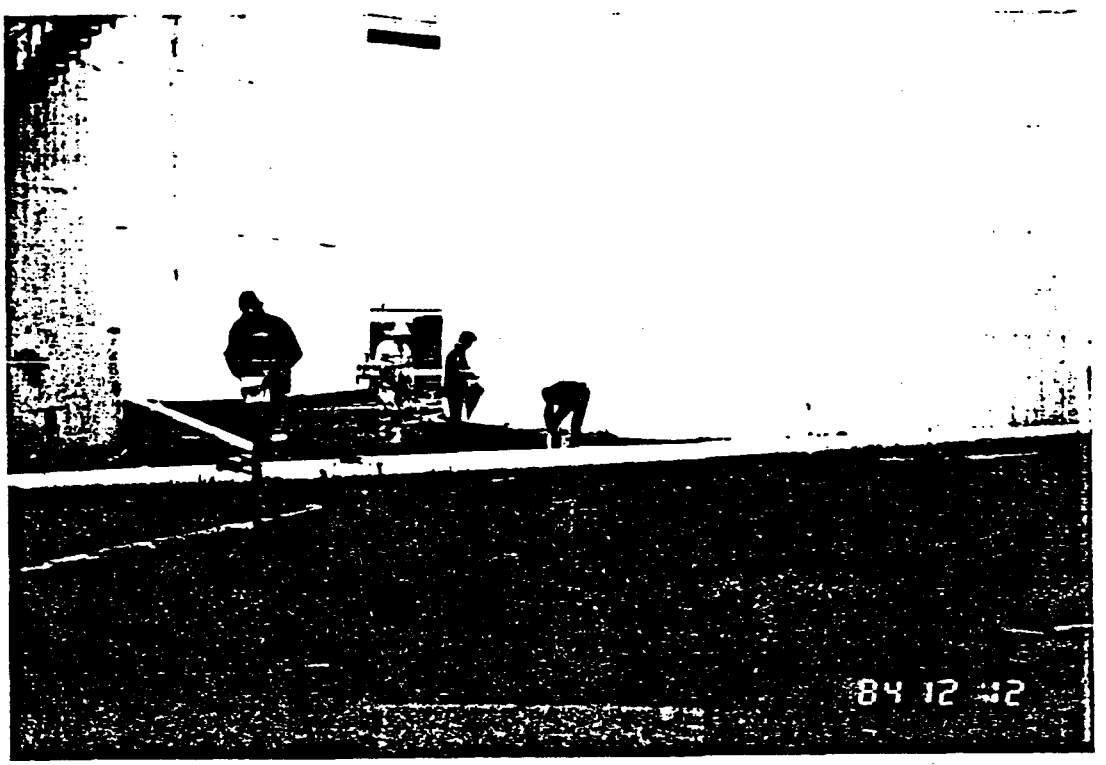
Continue On Reverse

2319



Time Oil Co. Vapor Control System
looking NNW

Looking NNW
toward tank 5312



TOLS004347

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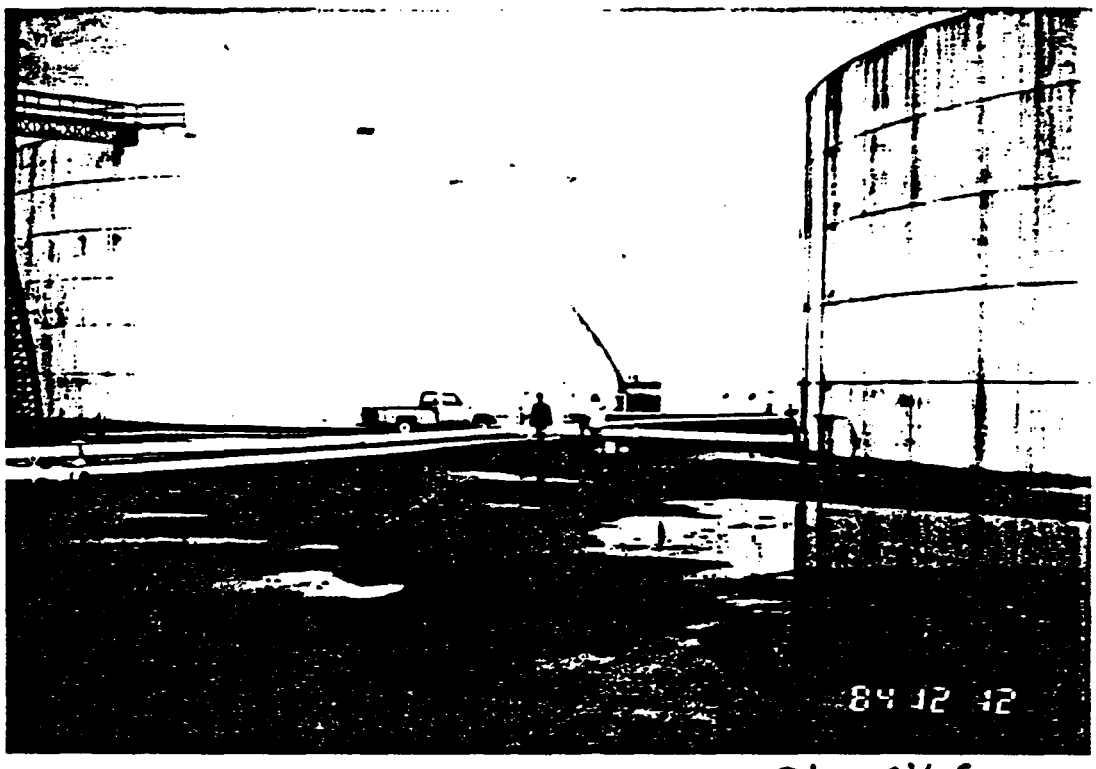
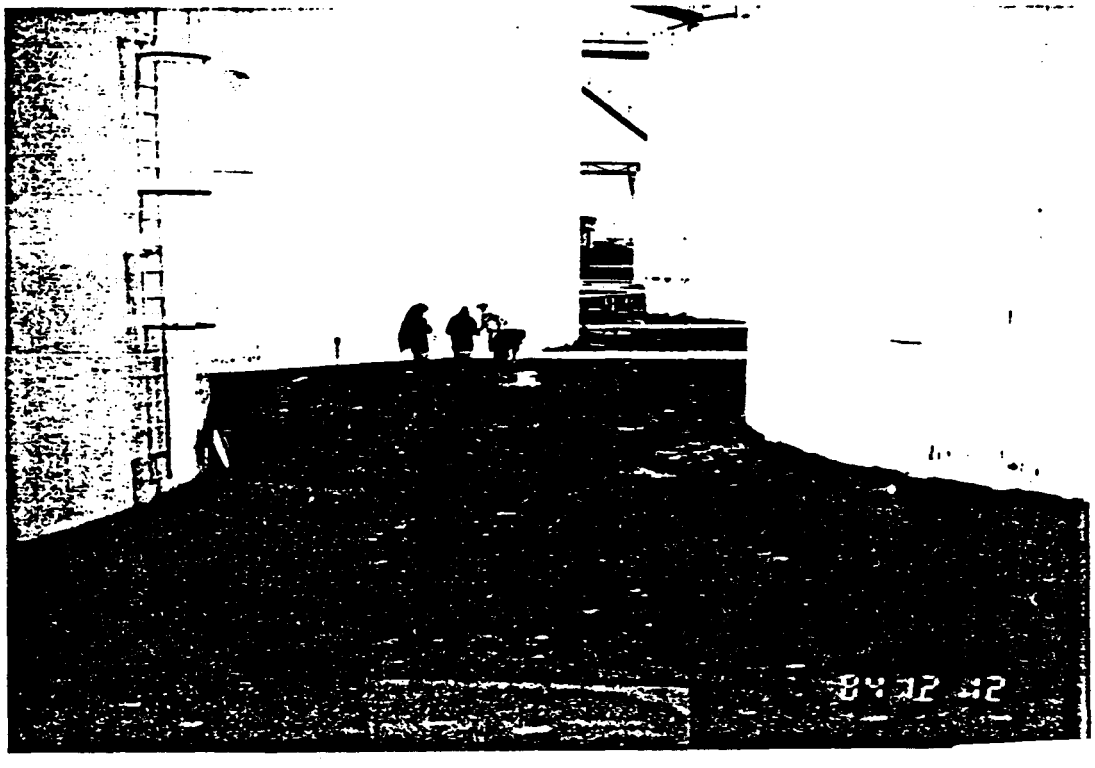
BZTO104(e)041168



Time Oil Co.
Bell Oil Section
looking NNE

Looking North



TOLS004348

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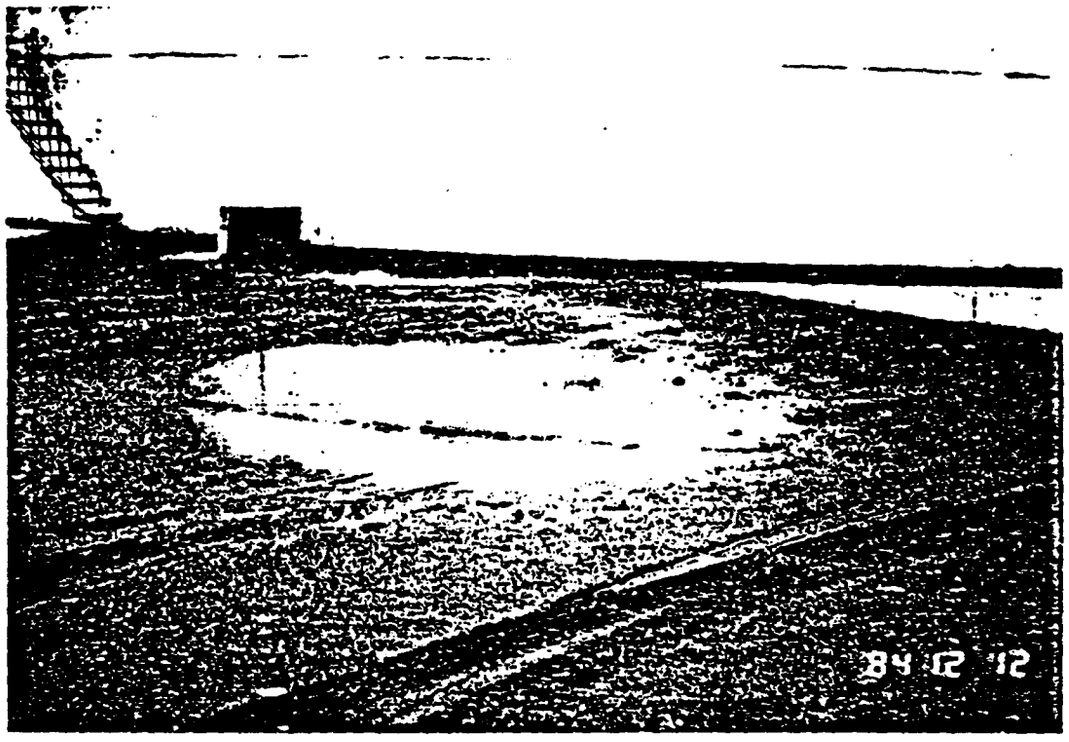
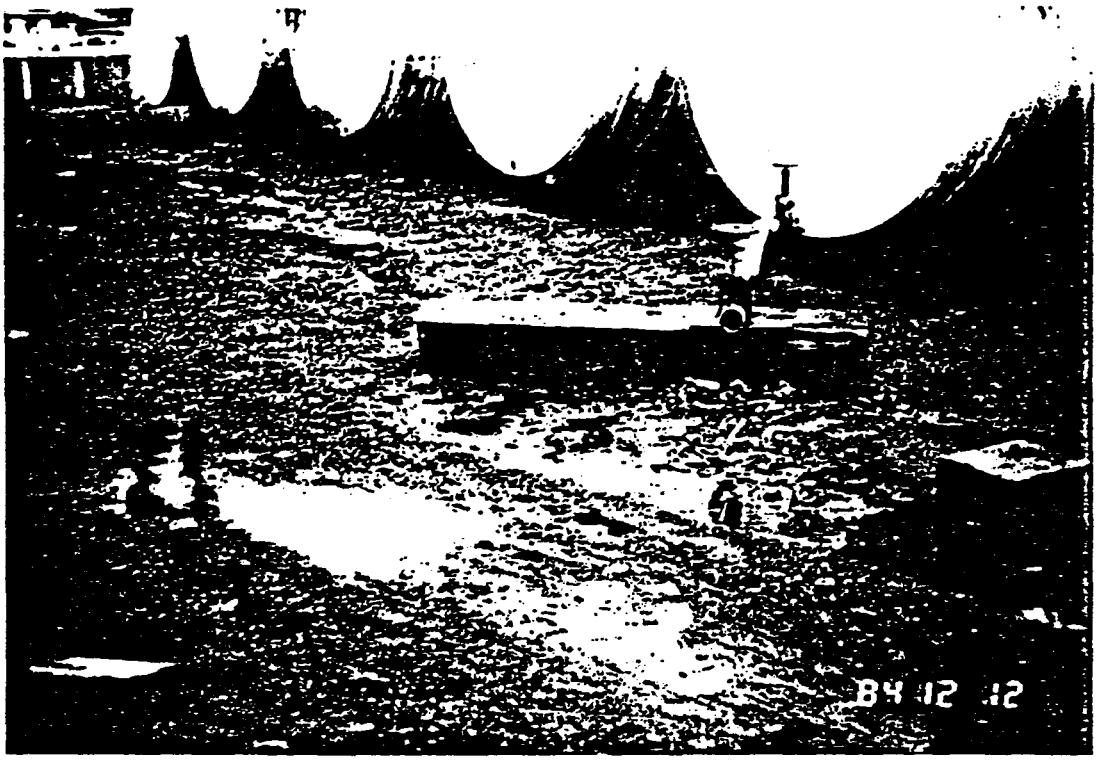


Time Oil Company

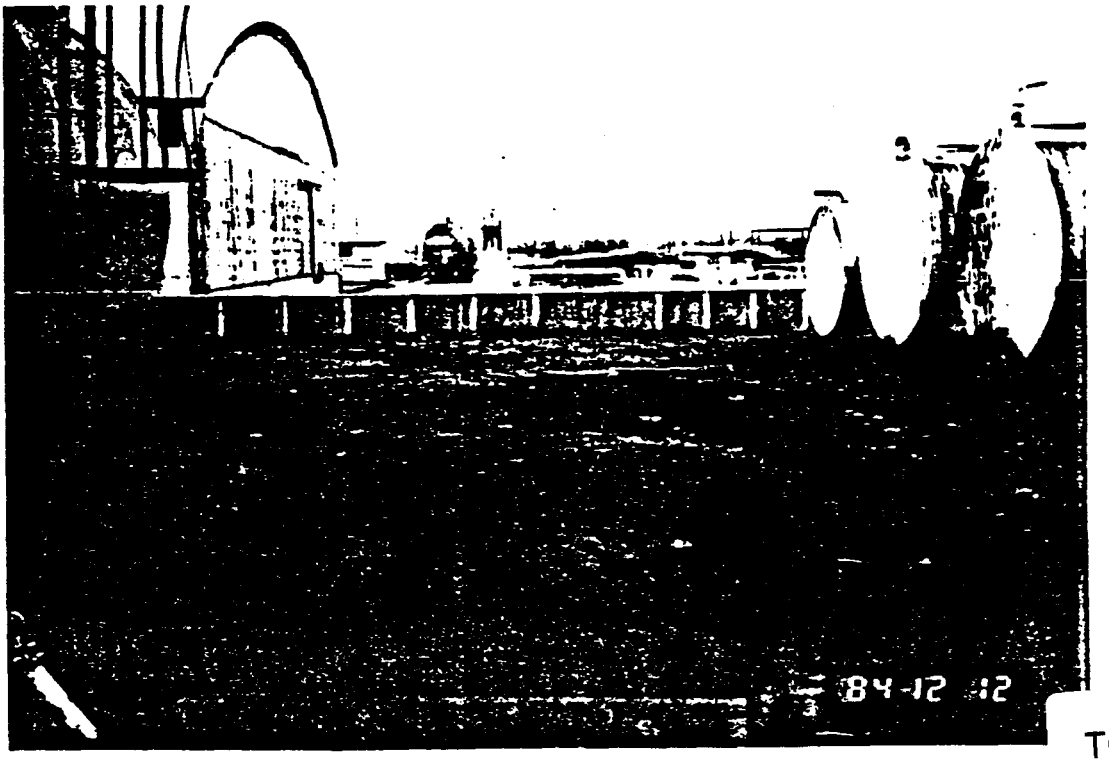
TOLS004349

32319



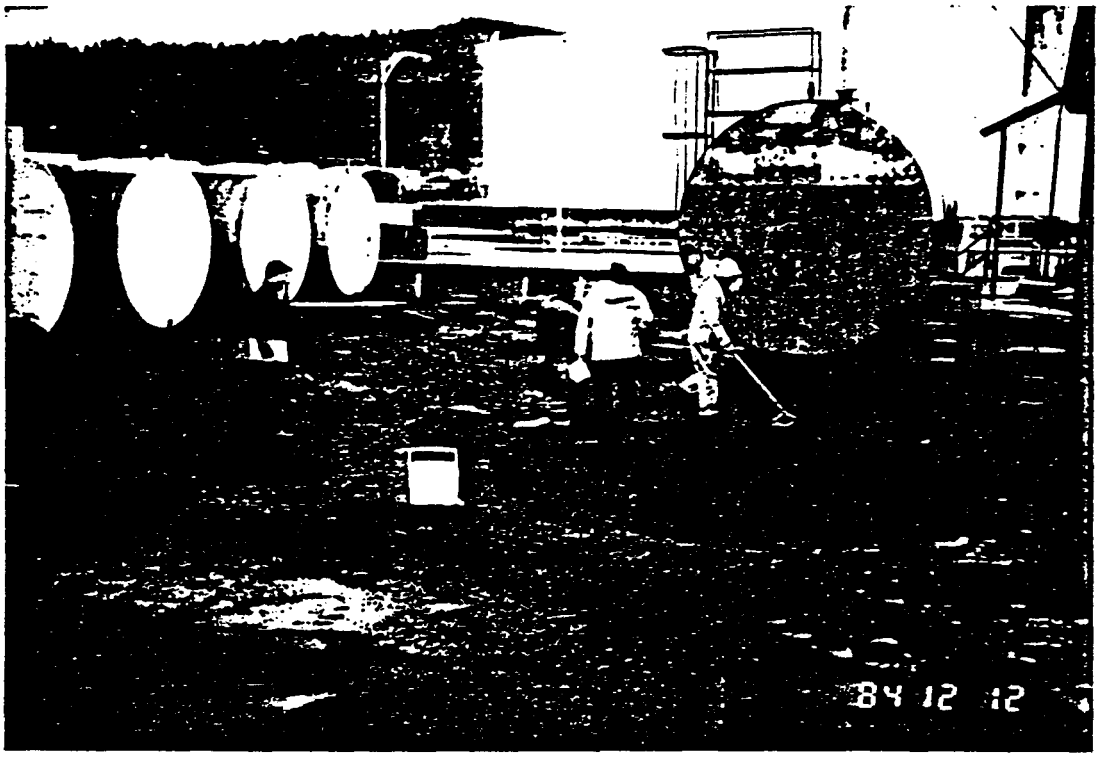
Time Oil Co
Koppers tanks area
looking NNE

Looking East



TOLS004350

32319



Time Oil Co.

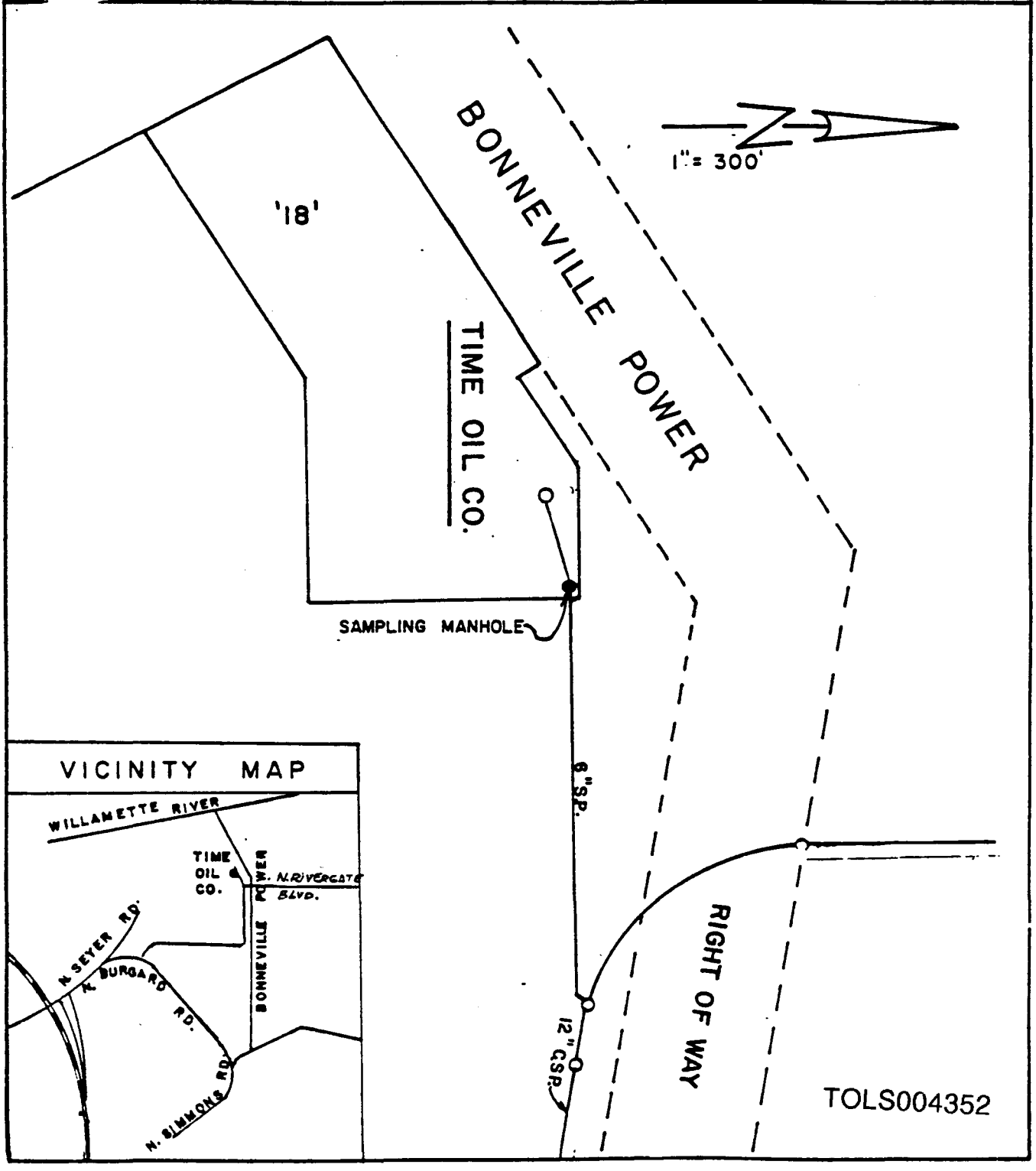
Koppers Tank area looking SW

SAMPLING MANHOLE MAP

INDUSTRIAL WASTEWATER MANAGEMENT
CITY OF PORTLAND, OREGON
DEPT OF PUBLIC WORKS
OFFICE OF THE CITY ENGINEER

TIME OIL TERMINAL
12005 N. BURGARD ROAD
PORTLAND, OR. 97203

SIC5171 1/4 SEC. 1719 DATE 9/11/79. | OIL TERMINAL



32319

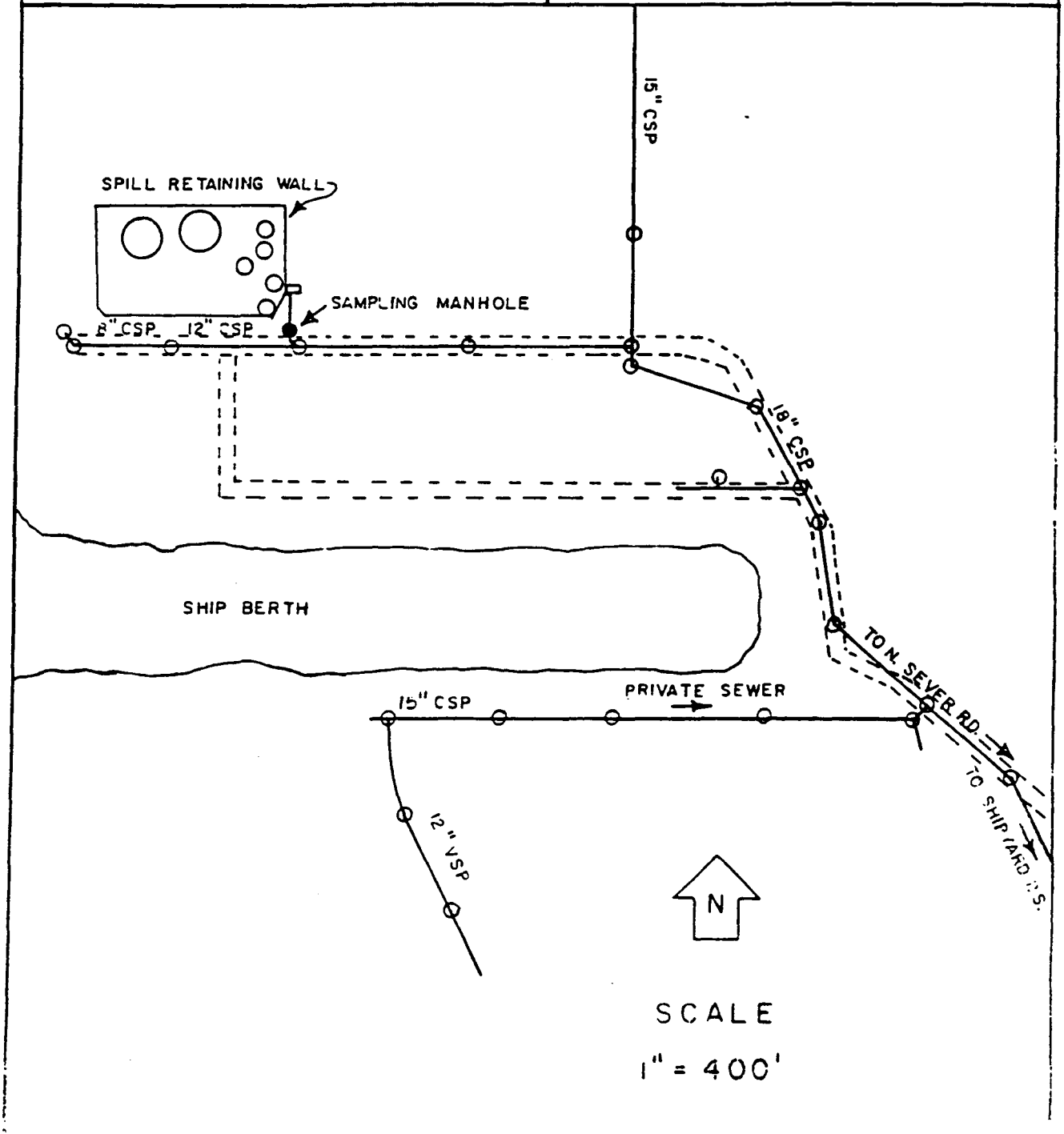
SAMPLING MANHOLE MAP

INDUSTRIAL WASTEWATER MANAGEMENT
CITY OF PORTLAND, OREGON
DEPT OF PUBLIC WORKS
OFFICE OF THE CITY ENGINEER

BELL OIL TERMINAL (TIME OIL)
12005 N. BURGARD RD.
PORTLAND, OREGON 97203

SIC 5171 1/4 SEC. 1819 DATE 8/21/84

OIL TERMINAL AREA



SCALE
1" = 400'

TOLS004353

32319

1717 S.W SANITARY ONLY SEWER

FORM W 271.1 (4-69)

CITY OF PORTLAND, OREGON
DEPARTMENT OF PUBLIC WORKS
BUREAU OF DESIGN
SEWER BRANCH

Pmt. No. 92355

Date 10-25-72

Location 12005 N. Burgard Rd.

Between

Addition Sec 35, 2N, 1W Lot T.L. '18' Blk.

Applicant Harder Mech. Waiver No ☐ Yes ☐ #

Remarks 6" transite pipe to existing 8" stub in manhole.
Sampling manhole on property.

Inspected 10-25-72 19 By Brooks

Book 9 Page 148 New ✓ Repair

1719-1819

FORM W 271.1 (2-68)

CITY OF PORTLAND, OREGON
DEPARTMENT OF PUBLIC WORKS
SEWER BRANCH

92355

Pmt. No. 92422

Date

Location 12005 N Burgard Road

Between

Addition Sec. 35 T2N R1W WM T Lot (38) Blk.

Applicant Harder Mech. Waiver No ☐ Yes ☐ #

Remarks 12x8 CSP wye to existing stub out of manhole
9' deep 6" CSP into property sampling manhole
on property

SANITARY ONLY SEWER

Inspected 1-13-72 19 By Brooks

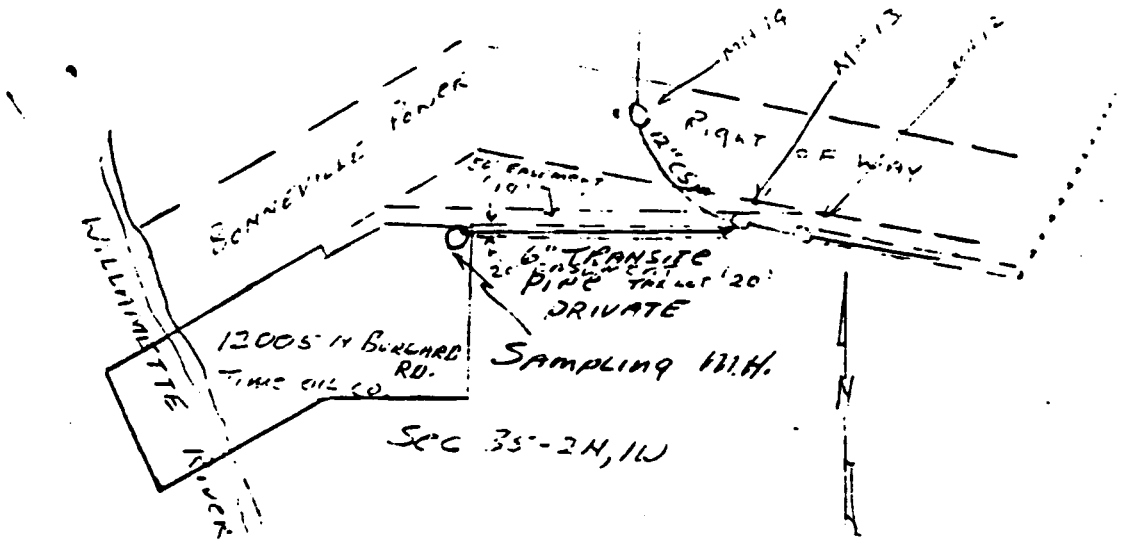
Book 9 Page 147 New Repair

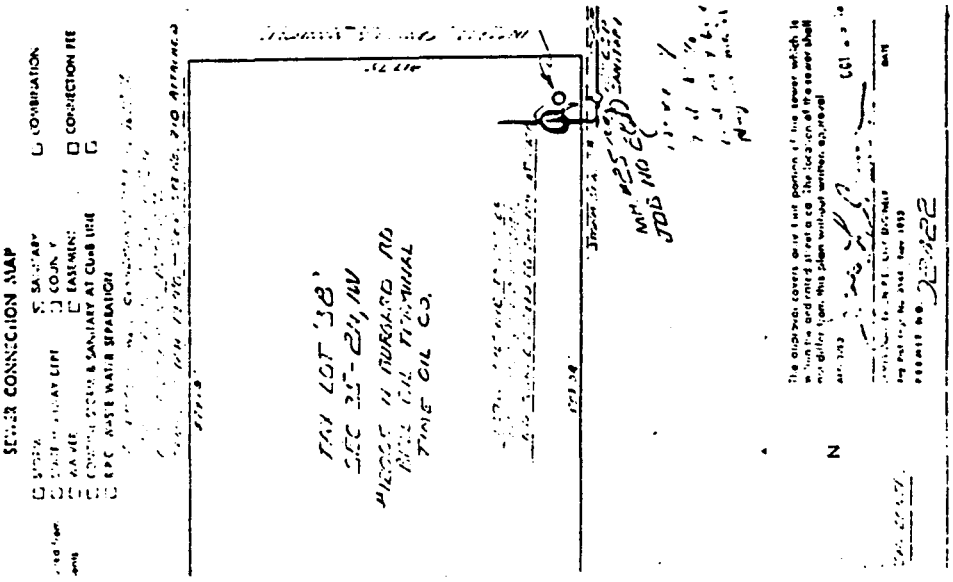
Not ENTERED SEWER BOOK 4-74

32319

TOLS004354

BZTO104(e)041175





32319

TOLS004355

BZTO104(e)041176

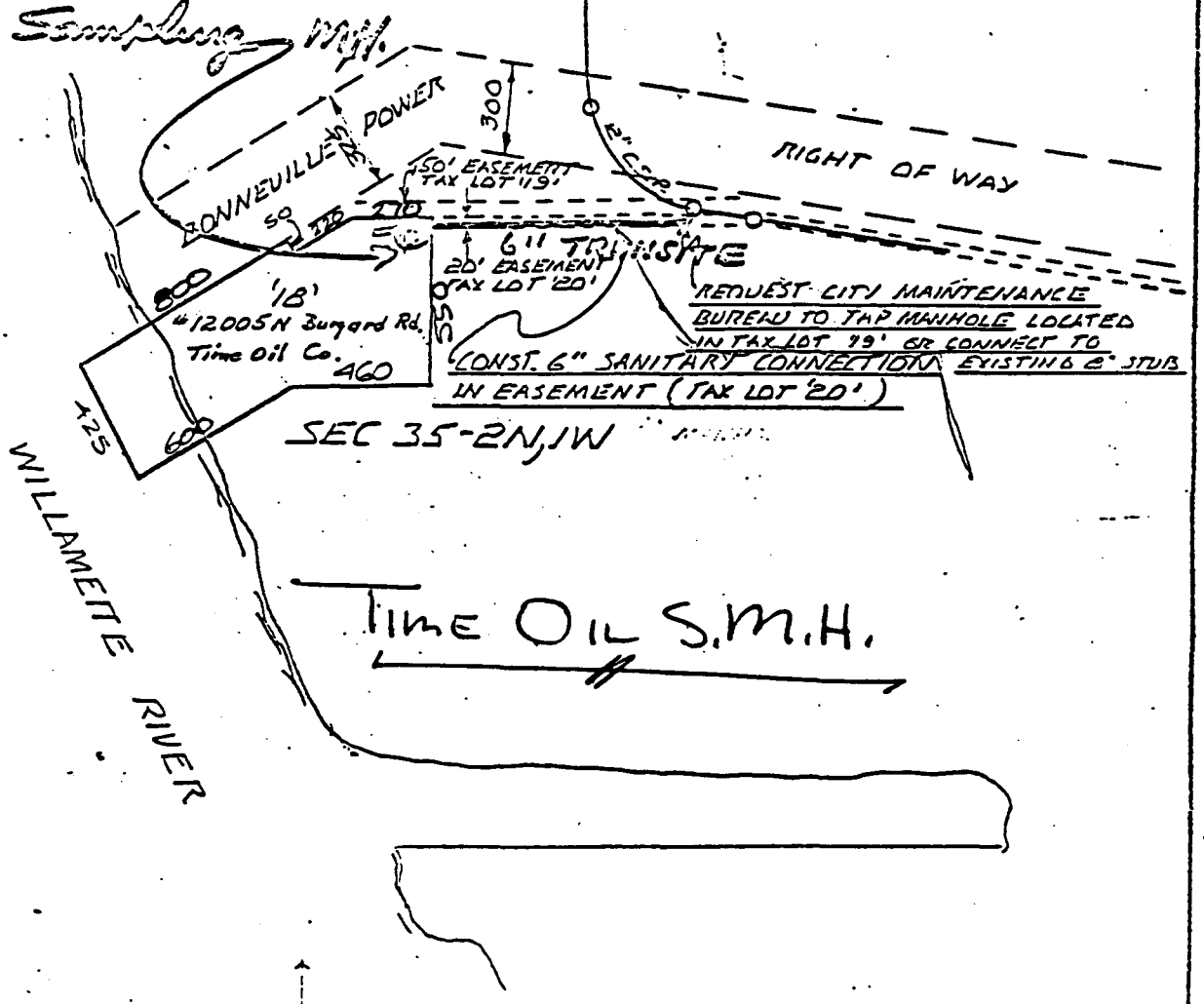
3591

...MENT OF PUBLIC WORKS, CITY OF ... AND

SEWER CONNECTION MAP

Type of sewer	☐ STORM	☒ SANITARY	☐ COMBINATION
Road permit required from	☐ STATE HIGHWAY DEPT.	☒ COUNTY	
Special requirements	☐ WAIVER	☒ EASEMENT	☐ CONNECTION FEE
	☐ COMBINE STORM & SANITARY AT CURB LINE		☐
	☐ ...P.C. WASTE WATER SEPARATION		

NOTE:
1) OUT OF CITY BOND REQUIRED
2) MULT. CO. PLUMBING PERMIT REQ'D.
3) SAMPLING MH REQUIRED
SEE STD #1210 ATTACHED
4) SEWER USER AGREEMENT REQUIRED



The approval covers only that portion of the sewer which is within the dedicated street area. The location of the sewer shall not differ from this plan without written approval.

APPROVED:

OCT 10 1972

JAMES L. APPERSON P.E., CITY ENGINEER — DATE

Reg. Prof. Engr. No. 3544 Nov. 1950

PERMIT NO.

SCALE: 1" = 600'
1/4 Sec. No. 1719

HARDER MECHANICAL CONTR.

CONTRACTOR

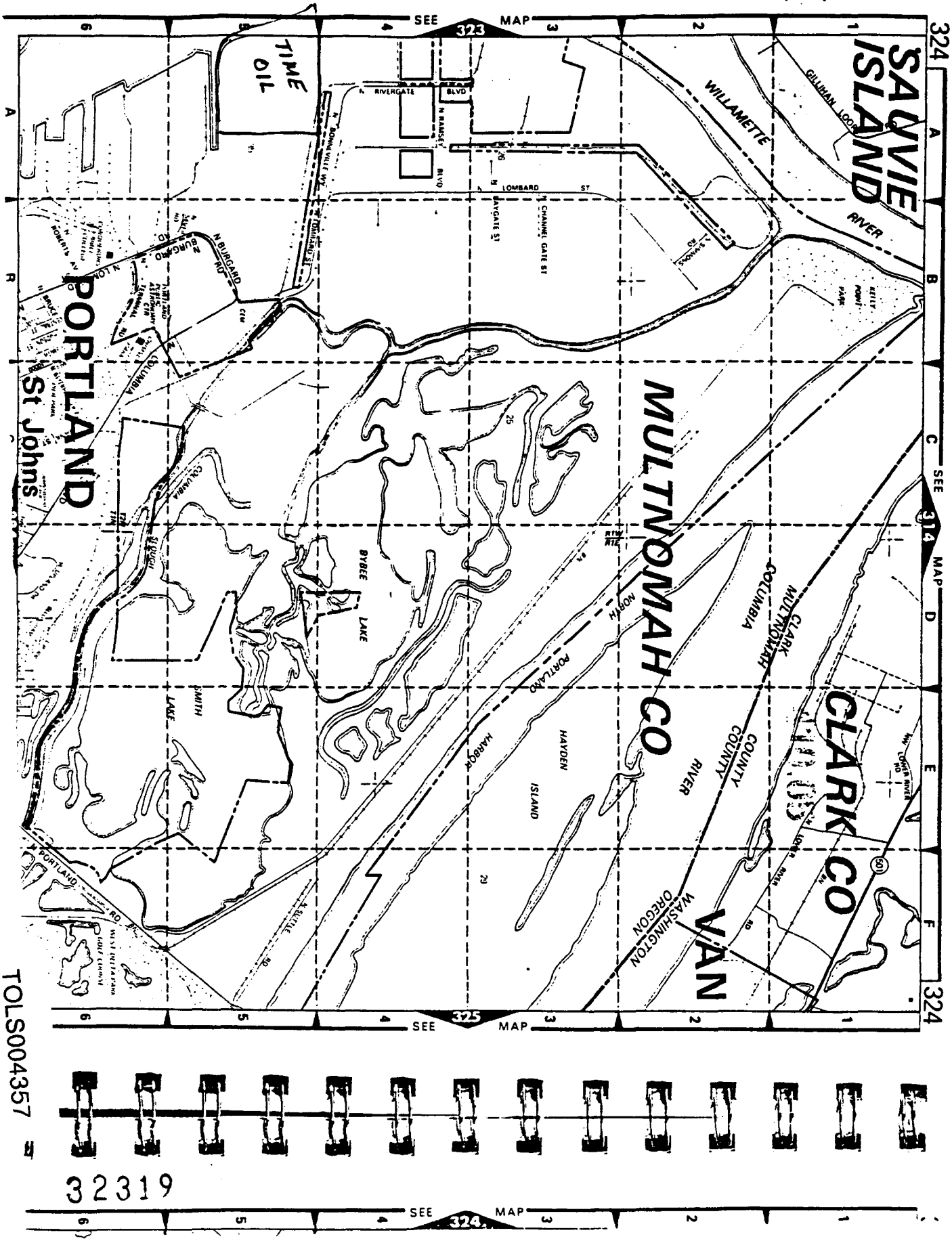
32319

TOLS004356

Sewer Book 9 Page 148

BZTO104(e)041177

Locator MAP



TOLS004357

32319

BZTO104(e)041178

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D009597543

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Time Oil Company	12005 N. Burgard St.

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Portland	OR	97203	MULTNOMAH	051	03

09 COORDINATES LATITUDE	LONGITUDE
45° 36' 56.4"	122° 47' 00.3"

10 DIRECTIONS TO SITE (Starting from nearest public road): Heading North through Portland on Interstate 5 take the North Columbia Blvd. Exit. Proceed NW on N. Columbia Blvd about 3 miles. At sharp left corner N. Columbia Blvd. becomes N. Burgard Rd., proceed to next sharp left corner turn Rt onto N. Burgard St. Bear Right, proceed about .75 miles to Time Oil Co.

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)
TIME Oil Company	P.O. Box 24447, Terminal Annex

03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
Seattle	WA	98124	(206) 285-2400

07 OPERATOR (If known and different from owner)	08 STREET (Business, mailing, residential)
TIME Oil Company	P.O. Box 03137

09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER
Portland	OR	97203	(503) 286-1611

13 TYPE OF OWNERSHIP (Check one)
■ A. PRIVATE ☐ B. FEDERAL: _____ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: _____ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
■ A. RCRA 3001 DATE RECEIVED: 8 / 11 / 80 (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: / / (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
■ YES ☐ NO DATE 10 / 25 / 84 (MONTH DAY YEAR)

BY (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR ■ C. STATE ☐ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: _____ (Specify)
CONTRACTOR NAME(S): _____

02 SITE STATUS (Check one)	03 YEARS OF OPERATION
■ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN	1959 (BEGINNING YEAR) / _____ (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED: Petroleum tank farm. Registered as a generator of hazardous wastes including API Separator sludge, tank bottoms (leaded) and Pentachlorophenol. Tank farm has handled gasoline, xylene, toluene, diesel, products containing pentachlorophenol, fertilizer (ammonium nitrate), Jet fuel, methyl alchol, butyl alcohol

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION: During the period 1940-1972 tank draw water waste water and apparently tank bottoms were allowed to spill on to the ground surface (old sand fill) and seep away. 1972-1974 waste water from oil water separator discharged to drywells. Groundwater (unused) may have been contaminated with lead, toxic and Ignitable wastes. Portion of farm leased to firm collecting and storing waste oils in two tanks, PCB's have been detected on ground surface near these leased tanks.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
■ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☐ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
John Denham	Time Oil Company	(206) 285-2400

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
John L. Smits	OR-DEQ	NW REGION	(503) 325-8660	1 / 15 / 85 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

32319

TOLS004358

BZTO104(e)041179

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OR	D 009597543

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER — Contaminated Soil (Specify)
- ☐ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS: _____
EST at least
CUBIC YARDS: 1037 CY
NO. OF DRUMS: _____

03 WASTE CHARACTERISTICS (Check all that apply)

- ☒ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☐ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES EST at least	1037	CY	Soil contaminated with pentachlorophenol
OCC	OTHER ORGANIC CHEMICALS			and tetrachlorophenol
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
PSD	Pentachlorophenol and	87865	Contaminated soil	1820	mg/KG
	2,3,4,6-Tetrachlorophenol	58902	Area around old tank	71	mg/KG
			site		
	* See cover narrative for further explaination				
	Time oil registered as	Generator of	Hazardous Waste		
	API Separator	Sludge	K052		
	Tank bottom's (leaded		K052		
	Pentachlorophenol		P090		

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	Petrolem Products	Storage	FDS		
FDS	handling facility		FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Site inspection Oct. 25, 1984, interview with Environmental Manager John Denham, Terminal Manager Neil Wallis, Search of OR-DEQ files, City of Portland Dept. of Public Works files Review of OR-DEQ soil sample analysis data.

EPA FORM 2070-12 (7-81)

32319

TOLS004359

BZTO104(e)041180

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: OR | 02 SITE NUMBER: D009597543

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ■ A. GROUNDWATER CONTAMINATION | 02 ☐ OBSERVED (DATE: 1970 —) | ☐ POTENTIAL | ■ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: N/A Not used
04 NARRATIVE DESCRIPTION: Probable contamination of groundwater below area leased to and handled for Koppers Co. for formulation and storage of pentachlorophenol. Same potential for tanks leased to Crosby and Overton. Pentachlorophenol detected in soil at 515 mg/kg. Groundwater impact in general tank farm area needs further study

01 ☐ B. SURFACE WATER CONTAMINATION | 02 ☐ OBSERVED (DATE:) | ☐ POTENTIAL | ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED:
04 NARRATIVE DESCRIPTION: None documented

01 ☐ C. CONTAMINATION OF AIR | 02 ☐ OBSERVED (DATE:) | ☐ POTENTIAL | ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED:
04 NARRATIVE DESCRIPTION: VOC only. Notice of Violation for storage of gasoline without vapor control.

01 ■ D. FIRE/EXPLOSIVE CONDITIONS | 02 ☐ OBSERVED (DATE: N/A) | ■ POTENTIAL | ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: N/A
04 NARRATIVE DESCRIPTION: Lt. Wm Knotts of the Portland Fire Bureau reported: Typical tank farm. Probability of fire fairly low, but if it does occur, as with any tank farm, fire can be very severe with multiple explosions. There have been no fire responses since 1975. Mr. Knotts can be reached at (503) 248-4375.

01 ■ E. DIRECT CONTACT | 02 ☐ OBSERVED (DATE: N/A) | ■ POTENTIAL | ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: N/A
04 NARRATIVE DESCRIPTION: Low potential for direct contact by public with soil contaminated by pentachlorophenol due to site security, fenced, personell on site 24 hrs/day and watchmans service

01 ■ F. CONTAMINATION OF SOIL | 02 ■ OBSERVED (DATE: 1970 Beginning probably) | ☐ POTENTIAL | ■ ALLEGED
03 AREA POTENTIALLY AFFECTED: .5 (Acres)
04 NARRATIVE DESCRIPTION: Surface to at least 3ft. depth contaminate by pentachlorophenol, tetrachlorophenol spills/drips in area of Koppers Co. tanks and tanks leased to Crosby and Overton.

01 ☐ G. DRINKING WATER CONTAMINATION | 02 ☐ OBSERVED (DATE:) | ☐ POTENTIAL | ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED:
04 NARRATIVE DESCRIPTION: N/A

01 ■ H. WORKER EXPOSURE/INJURY | 02 ■ OBSERVED (DATE: 1983) | ☐ POTENTIAL | ■ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 1
04 NARRATIVE DESCRIPTION: Workmen cutting hole in a tank leased to Crosby and Overton to remove contents allegedly contacted PCB, reported immediate symptoms of skin irritation

01 ☐ I. POPULATION EXPOSURE/INJURY | 02 ☐ OBSERVED (DATE:) | ☐ POTENTIAL | ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED:
04 NARRATIVE DESCRIPTION: N/A

EPA FORM 2070-12 (7-81)

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TOLS004360

BZTO104(e)041181

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
OR	D 009597543

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include number of species)

N/A

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES (Spills/Runoff/Standing liquids/Leaking drums) — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

N/A

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

01 ■ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION Oil water Separator water discharged to Sanitary sewer and then City of Portland POTW, Sampling manhole checked by city. No documented violations. City standard is Not >100 ppm other soluble oil to sewer

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

N/A

III. TOTAL POPULATION POTENTIALLY AFFECTED: N/A Groundwater contamination needs further evaluation

IV. COMMENTS

See cover narrative

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See Part 2, VI.

EPA FORM 2070-12 (7-81)

TOLS004361

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BZTO104(e)041182

KOPPERS

Interoffice Correspondence

OCT 18 1985

To W. J. Baldwin

Location K-1350

Subject Time Oil Visit - October 9, 1985

From D. F. Marion

Location K-750

Date October 14, 1985

On October 9, 1985, Jim Garrity, Denise Burrell and I visited with Neil Wallis at Time Oil Company's terminal in Portland, Oregon. We discussed the clean-up efforts at the Portland terminal to date and reviewed where we would go in the future. At this time, Time Oil has disposed of nine truckloads of soil and incurred costs of $55,000 - $60,000. While visiting Neil Wallis, he made copies of the pentachlorophenol sampling and analysis report prepared by Riedel Environmental Services which is attached for everyone's review and comments. Neil indicated that a meeting with John Denham and John Ruddick of Riedel Environmental Services was to be held on Thursday, October 10, in Portland. After this meeting, Neil Wallis, John Denham and Bob Abbendroth would like to get together to determine the next steps in meeting allowable limits of PCP at the Portland Terminal. In addition, Bob Abbendroth would like to set up a meeting to finalize Koppers portion of the payment for services to clean up the Portland Terminal.

After you have had an opportunity to review the attached report, please give me a call to determine our options at this point in time. If you have any questions regarding the above information or attached report, please call me immediately.

Donald F. Marion

DFM/jls

Attachment

cc: J. F. Garrity
R. G. Hamilton
J. D. Hite
J. Kusar
R. J. Parry
T. Smith
M. R. Urbassik
A. S. Wells

cc D. Kerschner sent 10/29/85

Dave,
Lets discuss.
Bill Baldwin
10/25/85

K-5 REV. 2

32319

TOLS004362

BZTO104(e)041183

TIME OIL COMPANY
PORTLAND, OREGON

PENTACHLOROPHENOL SAMPLING & ANALYSIS

Prepared by
RIEDEL ENVIRONMENTAL SERVICES
P.O. Box 5007
Portland, Oregon 97208

October, 1985

TOLS004363

BZTO104(e)041184

Introduction

Between 1967 and 197_ Time Oil Company operated a pentachlorophenol (PCP) facility at its North Portland, Oregon, terminal. This facility consisted of blending and storage operations used to prepare commercial pentachlorophenol solutions. The facility consisted of various storage and mixing tanks, a warehouse, a bermed, unpaved containment area, various pumps and a truck loading area.

The facility geography is essentially flat and is located less than 1/4 mile from the Willamette River. The soil is principally fine to medium sand with some silt. Ground water is reportedly found from 10 to 20 feet below the surface in this area. During June of 1985, a portion of visibly contaminated soil in the containment area was excavated and disposed of as a hazardous waste. This excavation left a depression in the northwest corner of the containment area sloping gradually to approximately four feet below the adjacent grade. Surface soil was disturbed during this process and, as such, surface sampling was not expected to be representative of conditions existing prior to excavation.

During the years of operation, several intermittent PCP discharges were known to occur, especially during mixing and transfer operations. These discharges resulted in soil contamination in and around the containment area. Initial site visits in April 1985 indicated visible PCP contamination of soils in this vicinity. A sampling plan for surface and subsurface soils extending through the vadose zone was designed and initiated in July 1985.

This sampling and analytical protocol was designed to estimate the spatial limits of PCP contaminant migration in the vadose zone of the soil in and immediately adjacent to the PCP containment area facility. As such, a systematical gridding array was used in lieu of random or other types of probability sampling. No attempt was made to sample underneath structures or paved areas. The protocol was not intended to determine the average concentration of PCP in soil at the facility since the area sampled was not expected to be homogeneous nor to represent a specific population of PCP concentrations. Therefore, statistical evaluations such as mean and standard deviation, have only academic significance in respect to these data.

However, since the origin points in the regular sampling arrays were randomly selected (i.e., a systematic random sampling procedure), there is no reason why some or all of this data could not be used for this purpose at a future time.

Sampling

All sampling was performed in accordance with EPA publication SW846, "Test Methods for Evaluating Solid Waste". Surface soil sampling was achieved using a small trier and/or sampling scoop. Subsurface samples were obtained using a 6" continuous flight hollow stemmed auger fitted with a 2" split-spoon sampler. All sampling equipment was decontaminated between samples with a trisodium phosphate wash, water rinse, hexane wash and a triple rinse with distilled, deionized water. Auger flights were decontaminated by high pressure steam cleaning between bore holes.

Samples were obtained from two areas. Area 1 consisted of a peripheral surface margin surrounding the containment areas on all of the available sides (see Figure 1). Area 2 consisted of the area inside the containment wall. All samples from each site were placed in new 16-ounce wide-mouthed glass jars previously washed with laboratory cleaner, water rinsed, hexane washed, air dried and rinsed three times with distilled, deionized water, then fitted with teflon-lined caps under clean conditions. Samples were labelled with client identification, sample number, date, time, sampler's name, sample location, and other pertinent information. Containers were sealed and placed in portable, refrigerated ice chests for transportation to the laboratory. Samples were delivered to the laboratory by RES courier within 48 hours after collection. Chain of custody forms accompanied all samples from original field sampling to final analysis and are included in this report (Appendix A). A field log of each sample was generated on site during sampling and retained for future reference.

Preliminary surface sampling in Area 1 was performed by preparation of a composite sample obtained from sub-areas A, D and F by pooling grab samples taken with triers or spoons at 10-foot intervals, five feet away from the containment area.

Secondary surface sampling was conducted in Area 1 by obtaining individual grab samples using triers or spoons. The sample sites are numbered 1-81 and are indicated on Figure 1. Secondary samples were obtained in response to the detection of significant concentrations of PCP in preliminary composite samples from sub-areas A and D, above, and were used solely to estimate the limits of contamination beyond the containment area. As stated earlier, no attempt was made in this sampling and analytical protocol to determine average (mean) values of PCP contamination.

Sampling in Area 1, peripheral samples, was performed to ascertain the surface margins of the contaminated area. It was arbitrarily assumed that the area within the containment walls was contaminated with PCP and the peripheral margins of this area established as consisting of the warehouse south wall, the east and west concrete walls and the southern edge of a pipeline transecting the containment area as indicated in Figure 1. Three concentric, 10-foot-wide marginal strips were staked out surrounding this boundary and are indicated by broken lines in Figure 1. These areas did not include areas inside the warehouse or below the asphalt paved railway siding located, respectively, on the north and northeast sides of the containment area. The 10 foot marginal strips were subdivided into areas A, B and C to the west, D, E and F to the south, and G, H, and I to the east (see Figure 1).

Sampling of Area 2, the containment area proper, was performed to evaluate PCP concentrations at the surface and at depth in subsoils to the saturated zone. Grab samples were obtained from a 2-foot x 2-inch split spoon sampler pressed through a 6-inch hollow-stem augered bore hole, and were placed in 16-ounce sample containers as previously described. Decontamination procedures, chain of custody, labelling and logging were identical to Area 1 samples. Auger flights were decontaminated at the completion of each coring to prevent cross contamination. Samples were taken at a mximum depth of 0, 2, 4, 7 and 12 feet below the surface elevation of the unexcavated portion of the containment area. Sampling at 17 feet, as originally planned, was not undertaken due to the detection of groundwater at approximately 12 feet.

Due to the sloping contour of the containment area caused by the excavation, the surface elevation below grade was measured from a string line pulled tightly between two unexcavated surface points and spanning the sampling point. Elevation of sampling site surfaces below this grade line was measured using a rigid ruler and is shown in Table I. Data from this table was used to calculate the actual auger depth below the surface required to obtain the split spoon samples to align all samples in the same respective horizontal plane. This data is listed in Table II and indicates the actual depth drilled below the surface required to obtain a sample at the nominal depth listed (0, 2, 4, 7, 12 or 17 feet). In cases where it was deemed practical, soil was hand excavated to the depth corresponding to the first sampling depth indicated and the sample obtained manually with a small trier or spoon.

The horizontal array of borings was selected to minimize the maximum distance from any given point in the sampling area to the nearest boring. To do this most effectively, a triangular grid was staked off. The array was based on a

triangle with an east-west base of 25 feet and a north-south height of 18 feet. The maximum distance from any point on the grid to the nearest sample point in this case is 13.34 feet as opposed to 14.14 feet for a standard 20-foot x 20-foot rectangular array. This selection allowed for the placement of additional wells just outside the containment wall without increased cost, thereby improving coverage with fewer sampling points (reference: Parkhurst, D.F., Optimal Sampling Geometry for Hazardous Waste Sites; Environmental Science & Technology, 18 No. 7, p. 521 [1984]). The triangular grid is indicated on Figure 1. Bore holes are indicated by the symbol "B" and are labeled with alpha symbols J-Z. A table of samples so obtained is given in Table III.

Following sampling, borings were sealed with bentonite grout in accordance with state well sealing standards under the direction of a registered geologist. Decontamination water, collected into tubs, was analyzed and, following receipt of negative results for PCP, disposed of on site.

Results

Samples were analyzed by Coffee Laboratories, Portland, Oregon, using EPA SW-846 protocols. Soil samples were Sohxlet extracted using EPA protocol #3540. Procedure #8040 was utilized with electron capture quantification for PCP analysis. Results are expressed in milligrams of PCP per kilogram soil (ppm, dry weight). At sites where results could be expected to approach zero (based on results from adjacent sites), samples were held but not analyzed. The results are listed in Table IVA-E. Preliminary composite results are shown in Table IVF and confirm PCP contamination beyond the containment wall.

These tables list PCP concentrations at each sample site as well as the X and Y coordinates used to locate these sites on the plan drawing (Figure 1). These coordinates are tied to an arbitrary grid as shown on Figure 1. The northwest corner of the containment wall is located at coordinates X=76, Y=166 (76,166), for sake of reference. Each sampling depth is listed on a separate table. Copies of the laboratory reports are listed in Appendix B.

The coordinate data and concentration results were plotted using an interpolating contouring program (In-Situ Corp., Laramie WY). This package performs smoothed contouring of the data using a triangularization method and bivariate interpolation. Contours were generated from surface samples (regardless of elevation below grade) and 2-, 4-, 7- and 12-foot depths below grade. The contours are plotted on Figures IIA-E. These contour diagrams have been reduced and printed on mylar sheets in addition to the attached figures.

TABLE I

TIME OIL CO. - PORTLAND, OREGON

Depth of Boring Site Surface Sample Below Grade
(Horiz. String Line)

Boring	Depth
J	0
K	6"
L	3'
M	0
N	0
O	0
P	1'8"
Q	2'6"
R	0
S	0
T	2'
U	0
V	0
W	0
X	2'
Y	3'
Z	0

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TABLE II

TIME OIL CO. - PORTLAND, OREGON

Actual Split-Spoon Sample Depths Below Grade

	Nominal Depth					
Boring	0	2	4	7	12	17
J	0	0-2'	2-4'	5-7'	10-12'	15-17'
K	NA	0-1 1/2	1 1/2-3 1/2	4 1/2-6 1/2	9 1/2-11 1/2	14 1/2-16 1/2
L	NA	NA	Surf (11")	2-4'	7-9'	12-14'
M	0	0-2'	2-4'	5-7'	10-12'	15-17'
N	0	0-2'	2-4'	5-7'	10-12'	15-17'
O	0	0-2'	2-4'	5-7'	10-12'	15-17'
P	NA	Surf (4")	0-2'	3-5'	8-10'	13-15'
Q	NA	NA	0-1 1/2	2 1/2-4 1/2	7 1/2-9 1/2	12 1/2-14 1/2
R	0	0-2'	2-4'	5-7'	10-12'	15-17'
S	0	0-2'	2-4'	5-7'	10-12'	15-17'
T	NA	Surf	0-2'	3-5'	8-10'	13-15'
U	0	0-2'	2-4'	5-7'	10-12'	15-17'
V	0	0-2'	2-4'	5-7'	10-12'	15-17'
W	0	0-2'	2-4'	5-7'	10-12'	15-17'
X	NA	Surf	0-2'	3-5'	8-10'	13-15'
Y	NA	NA	Surf (11")	2-4'	7- 9'	12-14'
Z	0	0-2'	2-4'	5-7'	10-12'	15-17'

NOTE:

Actual depths indicate depth of bottom of split-spoon.

NA = Not available

Surf = Surface sample obtained by hand excavation at depth indicated in parentheses

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TABLE III

TIME OIL CO. - PORTLAND, OREGON

Nominal Split-Spoon Sample Depths

Boring	0 Surface	2 0-2'	4 2-4'	7 5-7'	12 10-12'	17 15-17'
J	X	X	X	X	X	ND
K	-	X	X	X	X	ND
L	-	-	X	X	X	ND
M	X	X	X	X	X	ND
N	X	X	X	X	X	ND
O	X	X	X	X	X	ND
P	-	X	X	X	X	ND
Q	-	-	X	X	X	ND
R	X	X	X	X	X	ND
S	X	X	X	X	X	ND
T	-	X	X	X	X	ND
U	X	X	X	X	X	ND
V	X	X	X	X	X	ND
W	X	X	X	X	X	ND
X	-	X	X	X	X	ND
Y	-	-	X	X	X	ND
Z	X	X	X	X	X	ND

NOTE: X = Sample

\- = Not available due to excavation

ND = Not sampled due to presence of groundwater

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TABLE IVA
TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Surface Contour Data

Sample #	Coordinates X	Coordinates Y	Concentration Mg/Kg
1	81	171	13500
2	71	171	29
3	71	161	500
4	71	151	5450
5	71	141	5560
6	71	131	8760
7	71	121	4870
8	71	111	92
9	71	101	20
10	81	181	16
11	71	181	7
12	61	181	9
13	61	171	95
14	61	161	175
15	61	151	18
16	61	141	229
17	61	131	88
18	61	121	6
19	61	111	3
20	61	101	2.5
21	61	91	5.2
37	81	95	857
38	91	96	1130
39	101	97	17
40	111	98	3.5
41	121	98	3.1
42	131	99	3.2
43	141	100	2.4
44	151	100	1.8
45	161	101	171
46	71	84	3
47	81	85	3.6
48	91	86	6.1
49	121	87	3.2
50	131	88	1.5
51	141	89	2.3
52	151	90	1.7
53	161	91	1.9
54	171	92	1.2

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	1400
K	117.5	161	N/A
L	92.5	161	N/A
M	67.5	161	4720
N	155	143	4280
O	130	143	3000
P	105	143	N/A
Q	80	143	N/A
R	142.5	125	1712
S	117.5	125	522
T	92.5	125	123
U	67.5	125	26550
V	155	107	317
W	130	107	3385
X	105	107	N/A
Y	80	107	N/A
Z	80	179	21

N/A = Not Available

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TABLE IVB

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Two Foot Contour Data

Core #	Coordinates X	Coordinates Y	Concentration Mg/Kg
J	142.5	161	3
K	117.5	161	8.8
L	92.5	161	N/A
M	67.5	161	87*
N	155	143	3.1
O	130	143	59
P	105	143	16
Q	80	143	N/A
R	142.5	125	34
S	117.5	125	252
T	92.5	125	123
U	67.5	125	44
V	155	107	260
W	130	107	15
X	105	107	4.5
Y	80	107	N/A
Z	80	179	14*

N/A = Not Available
* = Data points omitted from contouring program to reduce extrapolation error

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TABLE IVC

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Four Foot Contour Data

Core #	Coordinates X	Y	Concentration Mg/Kg
J	142.5	161	3.6
K	117.5	161	10.5
L	92.5	161	7200
M	67.5	161	22
N	155	143	238
O	130	143	23
P	105	143	15
Q	80	143	2205
R	142.5	125	50
S	117.5	125	184
T	92.5	125	534
U	67.5	125	55
V	155	107	380
W	130	107	8.1
X	105	107	1.3
Y	80	107	598
Z	80	179	2

TABLE IVD

TIME OIL CO. - PORTLAND, OREGON

Pentachlorophenol in Soil

7 Foot Contour Data

CORE #	COORDINATES X	COORDINATES Y	CONCENTRATION mg/kg
J	142.5	161	(NA)
K	117.5	161	3
L	92.5	161	8400
M	67.5	161	1
N	155	143	(NA)
O	130	143	13
P	105	143	130
Q	80	143	700
R	142.5	125	500
S	117.5	125	1130
T	92.5	125	75
U	67.5	125	5
V	155	107	1
W	130	107	1
X	105	107	1.9
Y	80	107	700
Z	80	179	7

TABLE IVE

TIME OIL CO. - PORTLAND, OREGON

Pentachlorophenol in Soil

12 Foot Contour Data

CORE #	COORDINATES X	COORDINATES Y	CONCENTRATION mg/kg
J	142.5	161	NA
K	117.5	161	2.3
L	92.5	161	2030
M	67.5	161	690
N	155	143	NA
O	130	143	38
P	105	143	450
Q	80	143	1150
R	142.5	125	1
S	117.5	125	217
T	92.5	125	90
U	67.5	125	NA
V	155	107	3.4
W	130	107	1.9
X	105	107	1.0
Y	80	107	720
Z	80	179	1.0

TABLE IVF

TIME OIL CO. - PORTLAND, OREGON
PENTACHLOROPHENOL IN SOIL

Preliminary Surface Composites

Area	PCP (mg/kg)
A	660
D	860
G	17

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The scale on the mylar prints is such that the contours are superimposable on Figure 1 (site plan). This allows for facile comparison of PCP concentration profiles at depth with surface features of the facility. A reference point on Figures 1 and 2(a-e) is located at (76,166) for ease of alignment.

Conclusions

As seen in Tables IVA-E, PCP concentrations range from 1 ppm to 26,550 ppm. Two foci of contamination are seen at the surface. One, located at coordinates (83,168) in the northwest corner of the containment area, is consistent with reported spillage at this corner of the warehouse. A second focus occurs just outside the containment wall to the west at coordinates (65,125). This site is consistent with reported minor spills during truck loading procedures at this site. Additional minor contamination sites occur at the surface in various positions throughout the sample area; however, no prominent concentration peaks are evident. This may be due, in part, to the partial excavation mentioned previously or to vehicle traffic or other activity in this area.

Additional contours at depth indicate penetration of PCP to the saturated zone at the northwest focus. No evidence of penetration of the "loading area" focus below 2 feet was observed. Note that the results of the 2-foot contouring fail to demonstrate a continuation of the foci found at the surface. This is due, in part, to the excavation which removed the 2-foot material and to the definition of surface samples as surface material regardless of relationship to elevation (i.e. surface samples are not equivalent to "Ø foot" samples). This phenomenon is indicated by the lack of sample sites on the 2-foot contour at boring sites L, M, Q, Y and Z. The lack of high PCP concentrations at boring site U, 2-foot contour, implies that no significant penetration occurred at this site and that PCP contamination at this site is restricted to narrowly distributed but high concentration surface contamination.

Contours at 4, 7 and 12 feet indicate penetration to the groundwater (encountered between 7 and 12 feet) with appreciable attenuation of PCP concentrations with increasing depth. The maximum concentration at 12 feet is 2030 ppm located at boring "L". Note that no samples were analyzed at boring sites "J" and "N" at 7- or 12-foot depths, since concentrations above these depths indicated that concentrations near zero could be expected. No sample was obtained at "U" due to loss of sample when groundwater was encountered.

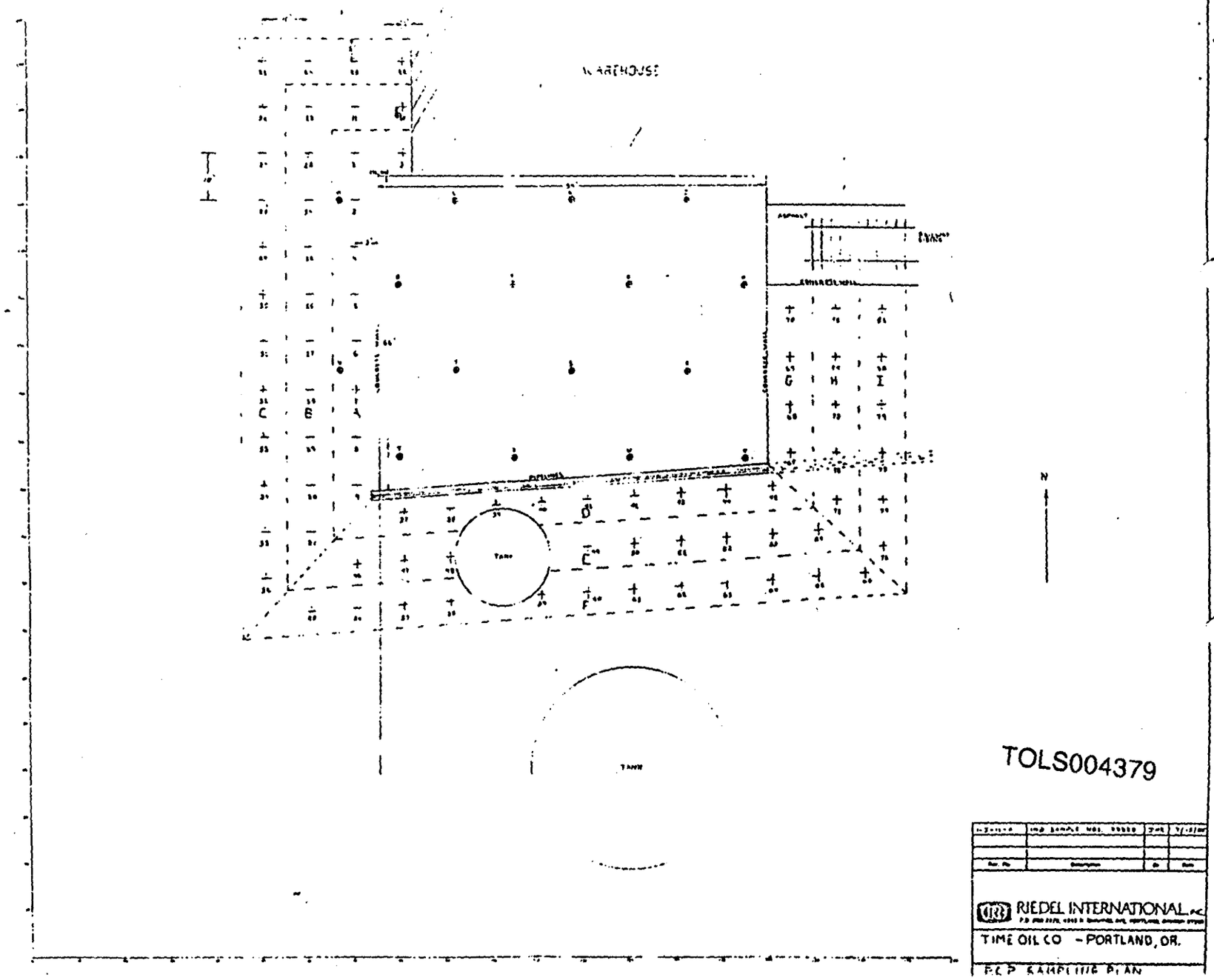
The slight tendency of the PCP plume to tail off to the south implies that groundwater flux may be diffusing the plume in this direction. This conclusion can only be substantiated by hydrogeologic evaluations of the site, however.

The contaminant plume may be restricted at the surface by the presence of the warehouse foundation. This structure could be expected to prevent diffusion of the PCP plume to the north by presenting a physical barrier to contaminant migration. No sampling was performed underneath the warehouse and this study cannot conclude that migration has occurred beyond the foundation base. Identification of concentrations of PCP beneath the building on contour plots is a function of the contouring program and may not be indicative of actual plume morphology in this area.

Summary

Significant PCP concentrations were detected in soil at Time Oil Co.'s north Portland operation. Contamination was pronounced at two focal sites, one at the northwest corner of the containment area and one at the west side of the containment area. Surface concentrations ranged from 1.2 mg/kg to 26,500 mg/kg. Sampling at depth indicated significant PCP concentrations at the northwest focus descending to the saturated zone and approximately 8-12 feet. Concentrations at 12 feet ranged from 1.0 mg/kg to 2,030 mg/kg. Analytical data from surface, 2-, 4- 7- and 12-foot samples were contoured and plotted and may be related to an area plan drawing of the same scale.

FIGURE 1



TOLS004379

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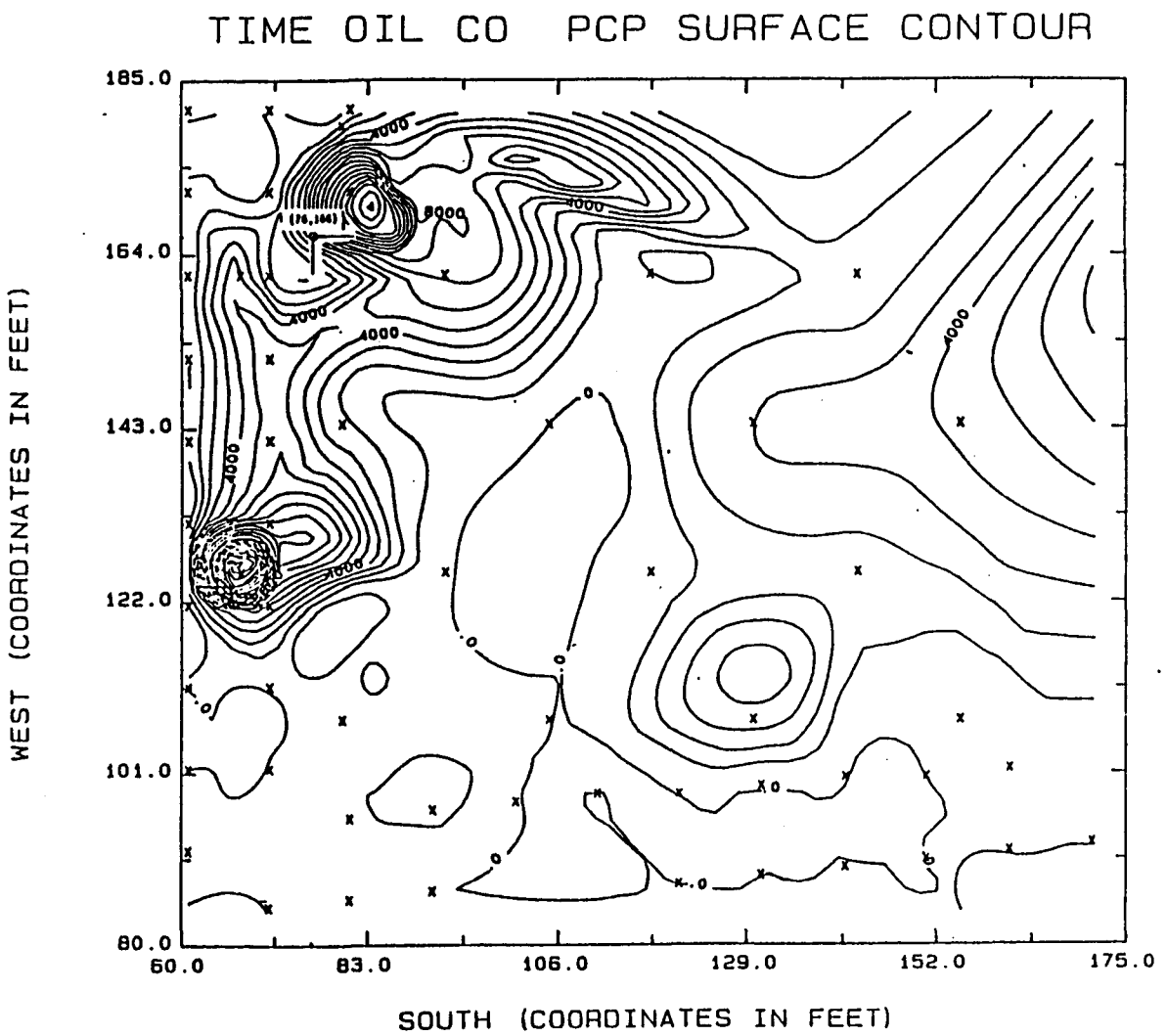
BZTO104(e)04120

FIGURE 2A:



BZTO104(e)041201

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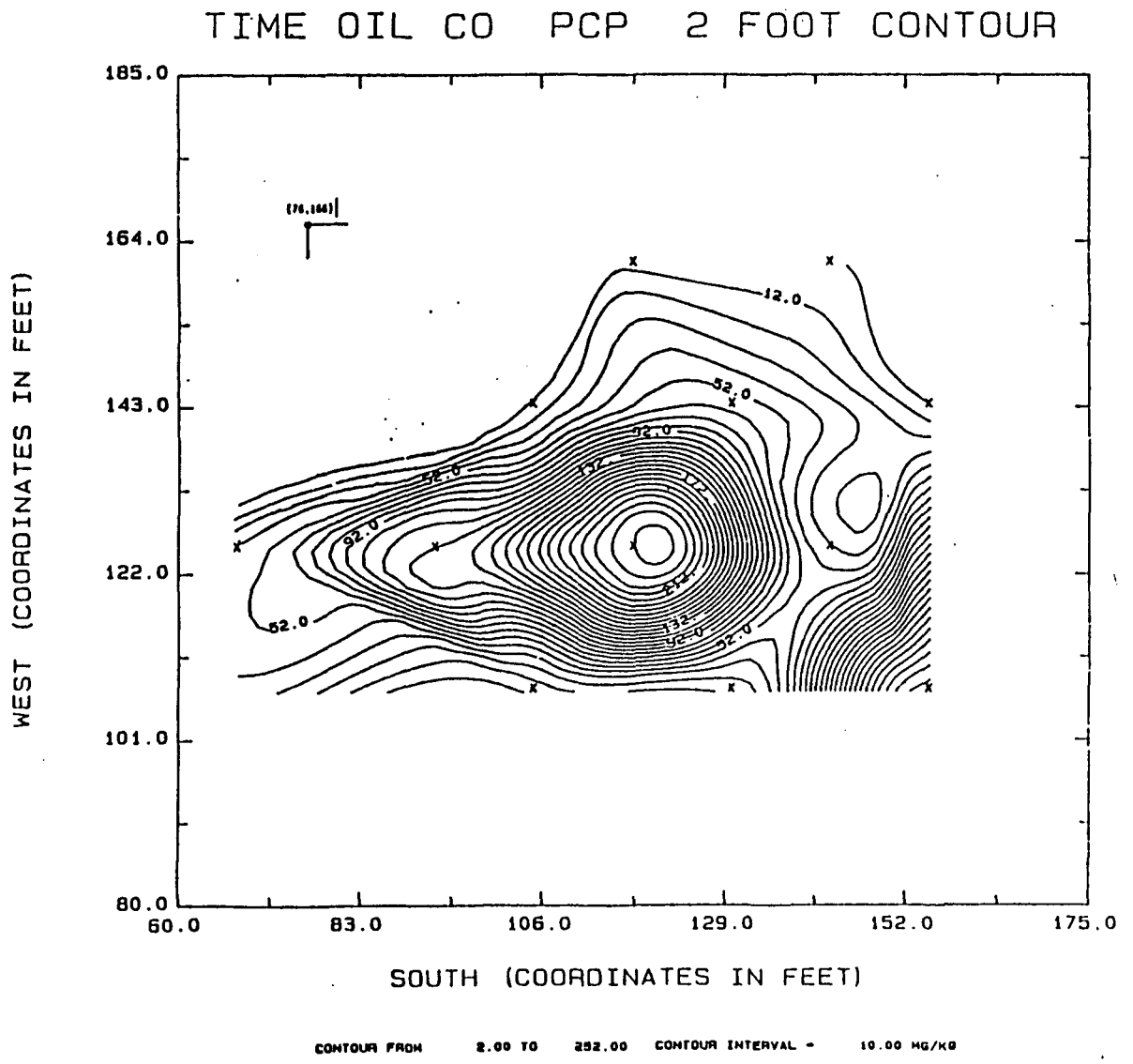
TOLS004380

FIGURE 2B



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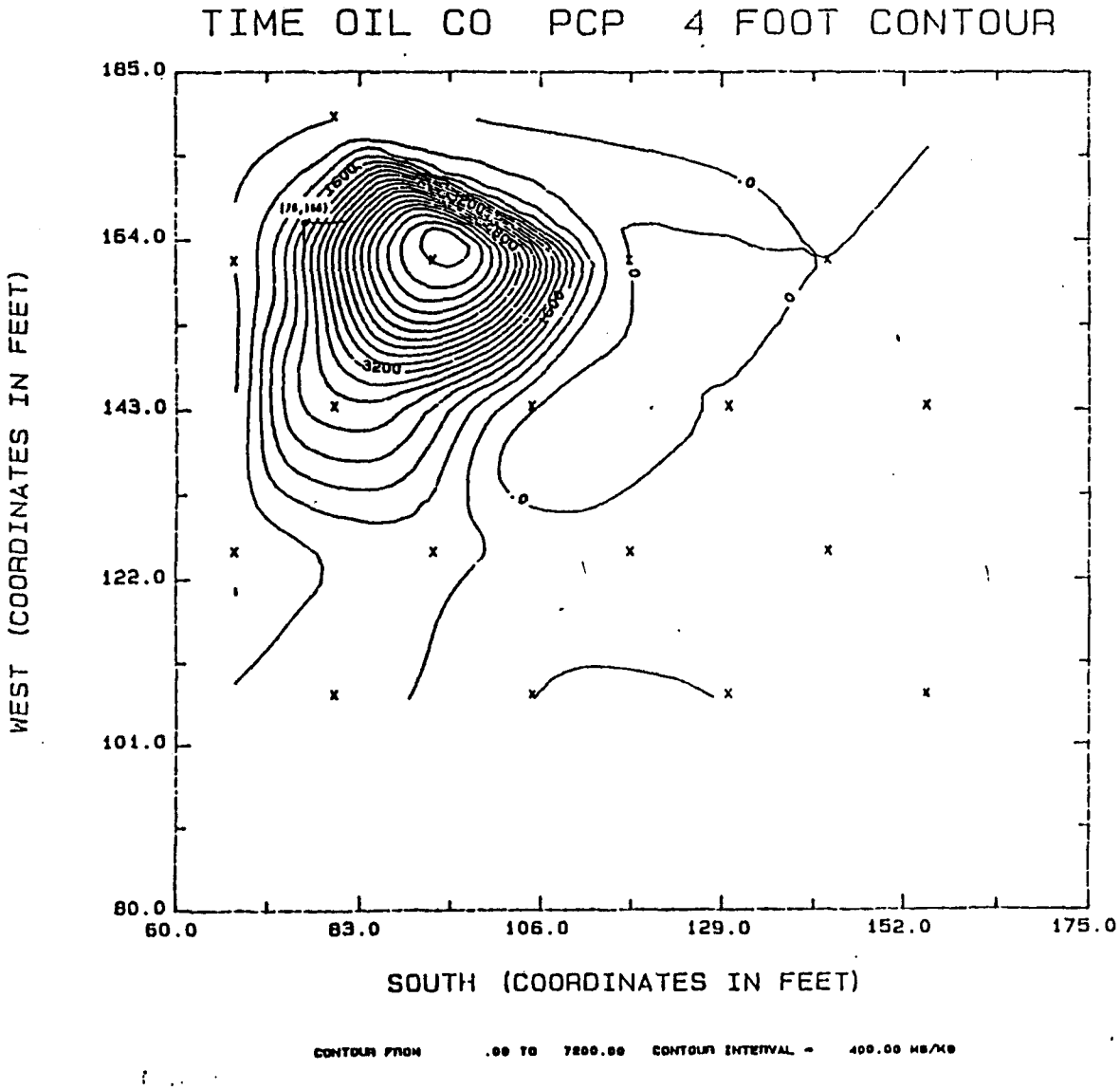
TOLS004381

FIGURE 2C



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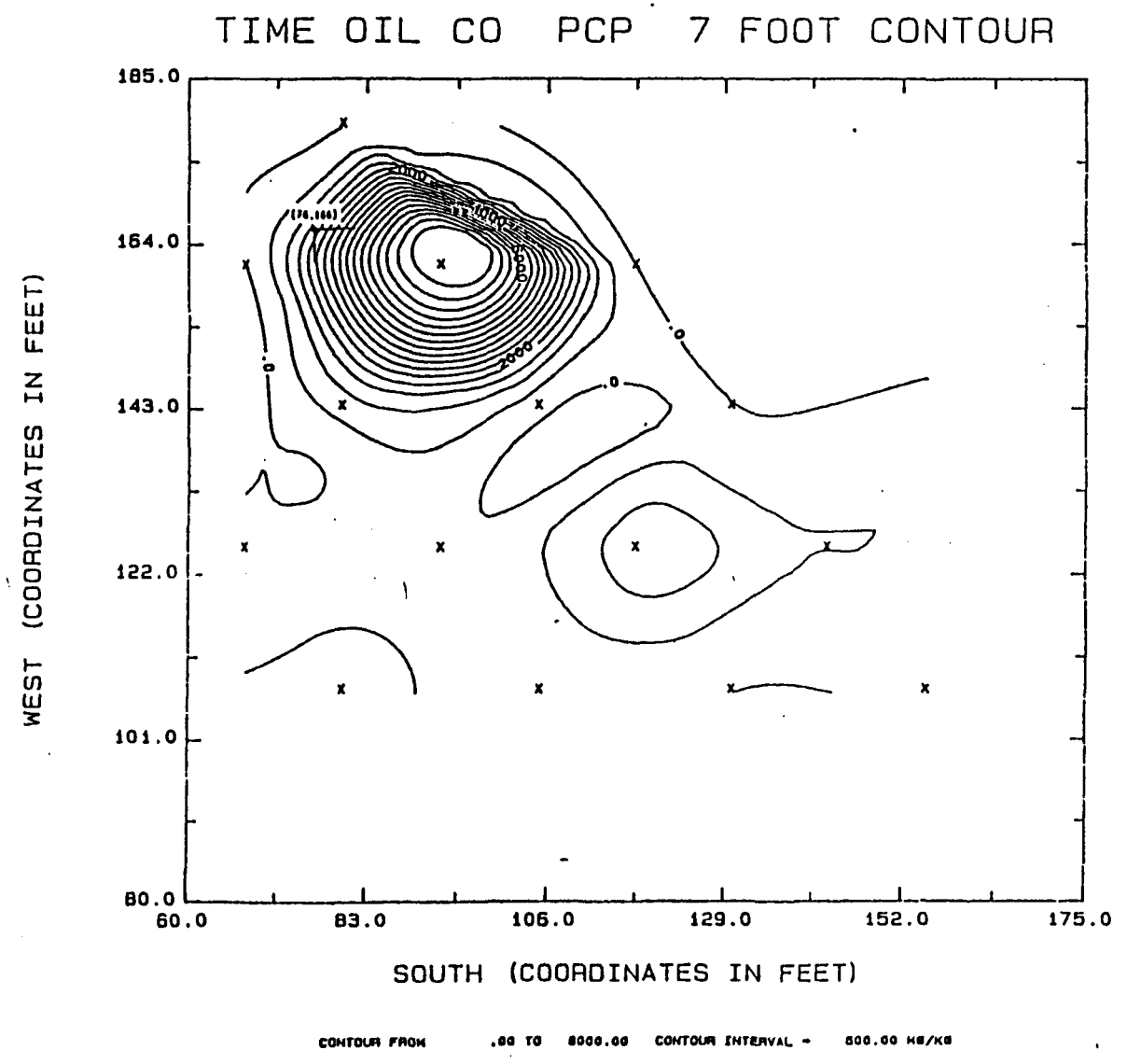
32319
TOLS004382

FIGURE 2 D



BZTO104(e)041204

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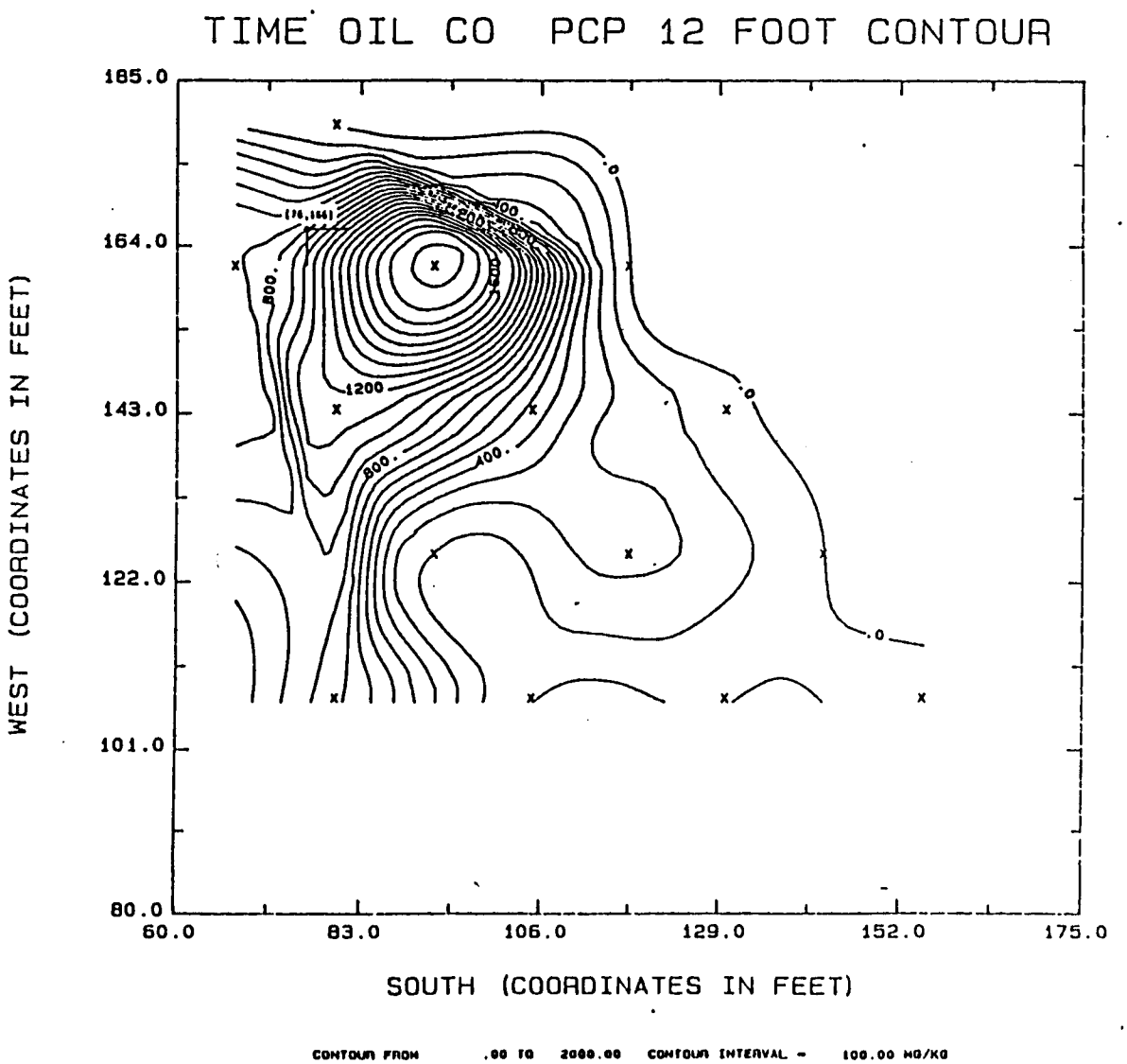
TOLS004383

FIGURE 2E



BZTO104(e)041205

32319

TOLS004384

PHONE 285-2400
CABLE ADDRESS: TIMOIL

SEATTLE
TACOMA
PORTLAND
STOCKTON
RENO
RICHMOND
SAN PEDRO
LOS ANGELES

TIME OIL COMPANY

2737 W. COMMODORE WAY, P.O. BOX 24447, TERMINAL ANNEX, SEATTLE, WA 98124

November 7, 1984

Department of Environmental Quality
Northwest Region
Attn: John L. Smits, R.S.
522 S.W. Fifth Avenue, P.O. Box 1760
Portland, Oregon 97207

Dear Mr. Smits:

The following information is provided per your verbal request of October 25, 1984 regarding this company's storage terminal located at 12005 North Burgard in Portland Oregon.

Enclosed are:

a. Lists of product stored, by tank, at our Northwest terminal from 1973 to date.

b. Three copies of terminal SPCC and drainage plan (#1140).

As I mentioned in our telecon earlier today, terminal acreage is 51.53 and terminal storage capacity is 770,000 bbls.

It is my understanding that your efforts are intended to access waste disposal practices on site from 1940 to 1972 to determine if the groundwater has been affected. A check of our records shows this location actually opened in 1953. Our policy is to generate no waste, so we reclaim products handled. Products which can not be reclaimed are recycled. Products become a waste only in those instances where recycling can not be effected. Quantities of hazardous waste generated are reported to the DEQ.

It is also my understanding that you may wish to sample and test the ground inside several diked areas of the facility. Should this thought materialize, kindly identify desired locations on one copy of enclosed plan and return it, along with a listing of the tests to be conducted, a copy of the test procedures to be used by your laboratory and the date test is desired so such actions can be coordinated. Request you provide Time Oil Co. with a split of each sample obtained from our site.

Dept of Environmental Quality
RECEIVED
NOV 13 1984
NORTHWEST REGION

Sincerely,

John P. Denham

John P. Denham
Environmental Manager

Enclosures a/s

TOLS004385

32319

BZTO104(e)041206

NORTHWEST AND BELL TERMINALS
12005 N. BURGARD
PORTLAND, OR

1984

TANK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
~~164~~ 7004	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
~~301~~ 18001	PE	PE	PE	PE	PE	PE	PE	PE	PE	MT		
~~471~~ 20001	PE	PE	PE	PE	PE	PE	PE	PE	PE	MT		
~~472~~ 20002	S	S	S	S	S	S	S	S	S	MT		
~~473~~ 20003	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
~~910~~ 38009	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
2524	I	I	I	I	I	I	I	I	I	I		
2525	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME		
4408	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
5006	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
5006T	CO	CO	CO	CO	CO	CO	CO	CO	CO	CO		
5312	#2	LF	LF	LF	LF	LF	LF	MT	MT	MT		
5313	MT	MT	MT	MT	MT	MT	MT	MT	#2	MT		
9509	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
9510	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		

KEY

CO - Crosby & Overton
I - Isobutanol
J - Jet Fuel
FA - Fatty Acid (by-prod. of wood)
LO - Lube Oil
LF - Liquid Fertilizer
LL - Lignin Liquor
M - Methanol
ME - Methyl 10
MT - Empty
NI - Not Installed
PE - Pentachlorophenol
P - Premium Gasoline
R - Regular Gasoline
S - Solvent
T - Turpentine
U - Unleaded Gasoline
#1 - Fuel Oil #1
#2 - Fuel Oil #2
#4 - Fuel Oil #4

32310

BZTO104(e)041207

TOLS004386

NORTHWEST AND BELL TERMINALS
12005 N. BURGARD
PORTLAND, OR

1984

323319

TANK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
38015	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
38016	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
38017	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
55021	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
80009	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
80010	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
80014	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
80408	M	M	M	M	M	M	M	M	M	M		

KEY

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LO - Lube Oil
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M - Methanol
ME - Methyl 10
MT - Empty
NI - Not Installed
PE - Pentachlorophenol
P - Premium Gasoline
R - Regular Gasoline
S - Solvent
T - Turpentine
U - Unleaded Gasoline
#1 - Fuel Oil #1
#2 - Fuel Oil #2
#4 - Fuel Oil #4

BZTO104(e)041208

TOLS004387

323319

NORTHWEST AND BELL TERMINALS
12005 N. BURGARD
PORTLAND, OR

1984

TANK NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
10002	CO	CO	CO	CO	CO	CO	CO	CO	CO	CO		
11005	#2	#2	#2	#2	#2	#2	#2	#2	#2	#2		
12001	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
12002	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
12003	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
12004	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
12005	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
14501	#2	LF	LF	LF	LF	LF	MT	MT	MT	MT		
15001	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
15002	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
15005	#2	LF	LF	LF	LF	LF	MT	MT	MT	MT		
16003	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
16804	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		
20511	#2	#2	#2	#2	#2	#2	#2	#2	#2	#2		
29508	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT		

KEY

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J - Jet Fuel
FA - Fatty Acid (by-prod. of wood)
LO - Lube Oil
LF - Liquid Fertilizer
LL - Lignin Liquor
M - Methanol
ME - Methyl 10
MT - Empty
NI - Not Installed
PE - Pentachlorophenol
P - Premium Gasoline
R - Regular Gasoline
S - Solvent
T - Turpentine
U - Unleaded Gasoline
#1 - Fuel Oil #1
#2 - Fuel Oil #2
#4 - Fuel Oil #4

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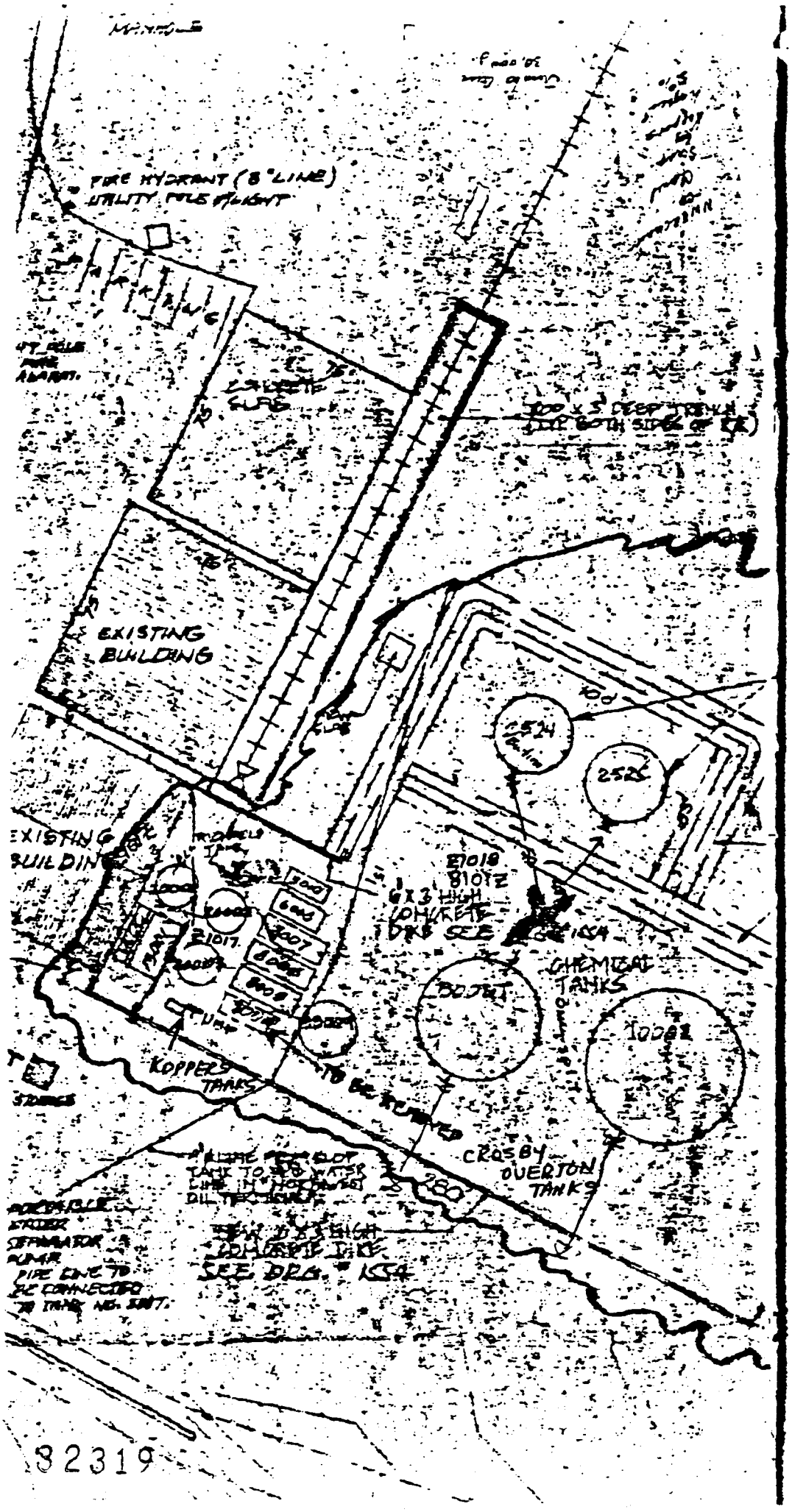
TOLS004388

TOLS004389
80408
METHANOL
SHELL OIL
TERMINAL
32319



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TOLS004391
BZTO104(e)041212

RECORD OF COMMUNICATION

☒ PHONE CALL ☐ DISCUSSION ☐ FIELD TRIP ☐ CONFERENCE
☐ OTHER (SPECIFY)

(Record of item checked above)

TO: John Denham (206) 285-2400

FROM: Janet O'Hara

DATE: 12/2/85

TIME:

SUBJECT: Time Oil Co. soil contamination EPA ID # 7543

SUMMARY OF COMMUNICATION

- March 3, 1982: Time Oil Co. agreement with chemical suppliers to store & "service" (blend) their product was terminated.
- Feb. 4, 1985: storage tanks were physically removed. [The blending of the product in tanks in 1982 took several years because specific ratios of materials is required.] Tanks & piping were cleaned - waste sent to CSSI - and then scrapped.
- We are referring to the Time Oil on N. Burgard in Portland Not on St. Helens Rd. in Portland]

CONCLUSIONS, ACTION TAKEN OR REQUIRED

INFORMATION COPIES TO: file

TOLS004392

EPA Form 1300-6 (7-72) REPLACES EPA HQ FORM 5300-3 WHICH MAY BE USED UNTIL SUPPLY IS EXHAUSTED.

32319

BZTO104(e)041213

12005 N. Burgard #7543

Time Oil briefing from G. Hofer ↓

Products to tanks, mixed, wood fired, "waste" prod's drumme

Drum filling operations observed

1. is soil a RCRA waste? (might talk to Rick Feigner)
   Is it a dioxin waste (F020-23)?

2. is site a RCRA site? GWM apply?
   CERCLA-site, DEQ must nominate, certification must be by compan
   Talk w/ Pat Storm, Janet G?

Keep J. Whitworth informed—
Call John today:

1/8/85 call: Need letter saying whether material is RCRA waste (so CSSI will/won't take it). Important if it's a dioxin waste.
Will talk again on 11/19/85

11/19/85 call to J. Denham: (New Riedel project mgr. Roger Smith, was John Ruddi

- Drips occurred when material transferred
- I told him it was a mixture of solid waste (soil) & F027

⇒ a haz. waste.

- Has talked w/ Ed Chiang in order to get approval to ship to Arlington. Chiang has sampling results from CSSI (Denham sent CSSI a soil sample "long time ago")
- In Nov. '84 DEQ sent "CERCLA search - John Spridts" looking for old contam'n sites, brought Rick Gates & took samples. No follow-up known

J. O'Hara

32319

TOLS004393

BZTO104(e)041214

G. Hofer's notes from a mtg. with John Denham in Seattle.

1/

Time Oil & Koppers, St. Louis in 1968
reached agreement for wood treating preservatives & Did not manufacture only blend
- stuff comes in in tank cars → above ground tanks
Called "Commercial Penta"

1982 company saw where leaks had occurred so shut down & clean up the mess area is 80'x80' located in Riverzak area of PDX
Total land is 53 acres total of 13 tanks 8 horiz & 5 vertical - leaks only at point of transfer

Blended & removed & sold - transferred to drums (leaks occurred there) & then Koppers cleaned tanks with unknown solvent tanks & lines - all cleaning ~~mold~~ matrix was sent to Arlington, tanks & pipes were sent for scrap

Now 1985 & down to bare dirt - took samples in Nov 84 & sent to lab for analysis

TOLS004394

John Smith Schmidt? ODEQ in Dec 84 took 12 samples thruout entire plant

32319

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only thing showed concern was this
80 x 80 area

removed 9 truck loads of dirt
to Arlington - Phase I

Phase II - sample to determine
extent of contamination &
Reidel did analysis 12/23/85
sent report

Worst spot @ 4 ft depth was 7200ppm

Target for clean up was 600 ppm
Rick Gates for CDEQ lab
503 229 5783

Reidel recommends one small area to be
treated with bugs. 3 removal
areas & sampling under the bldg.

No GWM - depth to GW ≈ 14 feet

TOLS004395

32319

BZTO104(e)041216

received from Kopper liquid product
"eg Wood Tox
then time blended the different constituents
& place in common tank then heated
to cause blending - then drummed

John has been talking to Janet Gillespie
of NW ODEQ office - asked
that John keep them informed

Committed to John to call Fri
or Tues re Is the soil that is
contaminated with the PCP product "a
F 020 thru F028

see Jan 14, 1985 FR

F027 - discarded unused formulations containing...
pentachlorophenol
Mixture rule - 261.3 (a)(2)(iv)

- Where can it go?

TOLS004396

32319

BZTO104(e)041217

Rec'd 8/12/86 gpb

REPORT ON FIELD ACTIVITIES CONDUCTED IN LATE 1985 AT TIME OIL COMPANY 12005 NORTH BURGARD STREET PORTLAND, OREGON 97203

February 4, 1986

TOLS004397

32319

BZTO104(e)041218

"Imagineering a cleaner world"

Portland Division
Foot of N. Portsmouth Ave
P.O. Box 5007
Portland, OR 97208
(503) 286-4954

St. Louis Division
529 Spirit of St. Louis
Chesterfield, MO 63017
(314) 532-7660

San Francisco Division
230 Cutting Blvd
Richmond, CA 94802
(415) 234-7400

Seattle Division
901 Fairview Ave. No.
P.O. Box 1730
Seattle, WA 98111
(206) 622-2900

RIEDEL
ENVIRONMENTAL SERVICES, INC.

February 4, 1986

Mr. John P. Denham, PE
Time Oil Company
2737 W. Commodore Way
Seattle, WA 98199

Dear John:

Enclosed for your consideration are analytical results from the November, 1985 field investigation of Time Oil's facility at 12005 North Burgard Street in Portland, Oregon. Preliminary pentachlorophenol (PCP) concentration contour maps have been prepared. Well construction diagrams have been provided for existing Wells 1 through 4, and a preliminary field log has been prepared for Well 4.

Some preliminary conclusions are as follows:

- There are high levels of PCP below the southwest corner of the warehouse.
- The concentration of PCP in the soils is generally highest above the water table.
- Based on analyses of saturated soil samples, the concentration of PCP in groundwater appears highest at the water table and decreases with depth.

Table 1 contains the analytical data from soil samples gathered during the November field work. This data has been compiled with previous analytical data on the soil to produce the four PCP concentration contour plots contained in Figures 1, 2, 3 and 4. The contour lines of the plots are in mg/kg, or ppm (parts per million). The contour interval is 100 ppm.

The two-foot contour plot (Figure 1) identifies the highest PCP concentrations at that level as being near the southeast corner of the warehouse. The four-foot depth contouring is identified in Figure 2. The highest concentration of PCP (116,000 ppm) found anywhere on site was identified in the soil sample obtained from 2-1/2 to 4 feet below the land surface in Well 3. This is illustrated by the closely spaced contour lines depicted in Figure 2. The high levels of PCP identified at Well 3 fall off approximately 15 feet to the west at Well 1 (see Table 1). The seven-foot contour plot is shown in Figure 3. The figure illustrates a decrease in the PCP levels from the four-foot contour.

Figure 4 illustrates the PCP in the soil below the water table at a depth of 12 feet below the land surface. The approximate depth to groundwater is 10 feet. The concentration of PCP as shown in this plot is less than that identified above the water table in the contour plot of the 7 foot depth.

Well construction diagrams for existing Wells 1-4 are contained in Figures 6 and 7. Table 2 is a geologic log of Well 4.

PCP concentrations in the soil above the water table may decrease downward in areas of surface spillage where the spillage event occurred in sufficiently small quantities such that the spill does not completely saturate the unsaturated zone above the water table. This is the mechanism by which low volume spills may fail to directly reach the water table. A portion of the PCP in the unsaturated zone will be soluble in rainwater percolating through the soils.

Upon reaching the water table, PCP will be diffused as it is transported by groundwater flow and, to a lesser extent, by molecular diffusion and downward movement under gravity.

The rate and direction of movement of PCP in the groundwater environment is principally dependent on the natural flow of groundwater. Proposed Wells 5 through 9, depicted in Figure 5, are recommended for installation in order to determine the lateral direction of groundwater flow and the concentration of PCP in groundwater near the water table. Proposed monitoring Well 5 is placed away from the anticipated direction of groundwater flow to obtain background water quality. Proposed monitoring Wells 6 and 9 are placed outside of but adjacent to the zone of soil contamination and are located laterally to the anticipated groundwater flow direction. Proposed Wells 7 and 8 are planned to intercept groundwater flow leaving the area of soil contamination.

The proposed wells are planned to be constructed of 4" diameter polyvinylchloride (PVC) and have a locking cover placed over the exposed casing. Bumper posts would be placed around proposed Well 9, since this well is in a loading area.

Soil samples will be obtained at 5' intervals. The soil samples will be used to describe soil texture. The first soil samples would be taken at 2-1/2 feet below the land surface for PCP analysis. The second soil sample taken at each location will be obtained at a depth of 5' below the land surface. Additional soil samples will be taken at 5' intervals thereafter. The presence of PCP at the near surface depth would be used to identify areas of surface spillage and possible source areas for PCP in the groundwater.

The groundwater in existing Wells 1-4 would be sampled for PCP along with the sampling at proposed Wells 5 through 9. This would be done upon the completion of the installation of proposed Wells 5 through 9.

As we discussed on January 24th, I would like to meet with you to discuss the proposed monitoring well installation. The network can be expanded if you need to minimize the time spent defining the extent of PCP in the groundwater. The additional wells would be located based on best technical judgment using minimal preliminary groundwater information. This usually results in accelerating the definition of the contaminant spread but requires more wells due to their less efficient location.

Please contact me at your earliest convenience should you have any questions about this report.

Sincerely,

RIEDEL ENVIRONMENTAL SERVICES, INC.

Richard R. Ferguson

Richard R. Ferguson
Hydrogeologist

RRF:kps

TABLE 1

SOIL SAMPLE RESULTS

Well Number	Depth, in Feet	Pentachlorophenol, ppm
1	0 - 1-1/2	1690
1	2-1/2 - 4	16.8
1	7-1/2 - 9	886
1	16 - 17-1/2	110
2*		
3	0 - 1-1/2	65.3
3	2-1/2 - 4	116000
3	7-1/2 - 9	11000
3	17-1/2 - 19	1560
4	18-1/2 - 20	574
4	32-1/2 - 35	62.3
4	43-1/2 - 45	1.59
4	47-1/2 - 49	2.81

* Soil samples from Well 2 were not analyzed.

RRF:kps

TOLS004401

32319

MEMORANDUM

May 2, 1986

TO: File

FROM: Fred Proby

SUBJECT: NORTHWEST TERMINAL GROUNDWATER INVESTIGATION

Purpose of investigation was to establish depth and flow direction of groundwater. Location of groundwater measurement points are shown on attachment 1.

Riedel Environmental Services Inc. installed four 4" diameter PVC wells at the pentachlorophenol mixing site in November, 1985. Wells 1 - 3 were installed at an angle beneath the warehouse. Their vertical depth is 14'. Well number 4 was installed vertically to a depth of 40 feet. The boring log for well 4 is shown on attachment 2.

In February, 1986, Time Oil Co. (Ken McAlpine) installed well points at three locations for the purpose of measuring water table elevation. The well points consisted of 1 1/4" diameter steel pipe attached to a 30" drive point well screen which was driven in with a jackhammer. Wells A and B were driven to a depth of 20 feet. Two wells, designated C1 and C2, were placed at location C. Well C1 could only be driven to a depth of 8'. An attempt to go deeper with well C2 was unsuccessful. The elevation of each well was surveyed relative to an arbitrarily selected benchmark of 100.0'.

Water level measurements from wells A, B, C1, C2 and 4 were taken on nine occasions between 2/28/86 and 3/11/86. Analysis of this data showed a peculiarity between Well 4 and the well points, in that the water table measured at well 4 was as much as 7 feet lower than that measured by the well points. Furthermore, the water level in well 4 was dropping whereas the well points had a stable level.

In late March, 1986, Time Oil Co. (Fred Proby) installed three more well points (E, F and G), dug four pits, (P1 - P4) and established a river measurement point on the dock. The well points consisted of 2" PVC pipe attached to an 8.5' stainless steel drive point well screen which was driven in with a jackhammer. Wells E and F were driven to 20' and 19', respectively. Well G could only be driven to a depth of 13'. The pits were dug in the back portion of the terminal where it was found that water could be encountered at a depth of approximately 6'. Reference elevations were surveyed for the wells, pits and dock. Water level measurements were taken from all locations over a period of several days. Well point C2 was removed and C1 was redesignated as well C. Construction details of the wells are shown on attachment 3.

The water level measurements from the new well points (E, F and G) and the pits were consistent with those from the old well points (A, B, C). However, the water table elevation in well 4 matched the river elevation. River elevations for March, obtained from the National Weather Service [Mr. Steiger, (503) 249-0666], showed that the water table drop in well 4 observed between 2/28 and 3/11 closely corresponded with a drop in the river elevation. When the wells are plotted in cross section, spaced according to their distance from well 4, the water table depression around well 4 can be clearly seen (attachment 4). Attachment 5 shows water table contours.

The boring log for well 4 (attachment 2) shows a series of clay lenses and silty sand between the depths of 18.5' and 25'. Above this zone is gravelly sand and below is medium to fine sand. The clay lenses form a 6.5' thick zone of relatively low permeability.

From these observations it is apparent that there are two aquifers, an upper and a lower, beneath the Northwest terminal. The upper aquifer is "perched" on the clay zone. The water table for this aquifer slopes from the rear fence line of the terminal, where water ponds in winter, to the Willamette River. The lower aquifer is "confined" by the clay zone, as shown by the fact that the water in well 4 rises above the top of the clay zone. This zone can therefore be termed a "confining layer". Only well 4 taps the lower aquifer so the slope and direction of flow can not be determined. Since the lower aquifer is fed by the Willamette River, groundwater flow can be expected to change direction with the seasonal rise and fall of the river.

Since the water level in well 4 is lower than in the surrounding wells, groundwater from the upper aquifer flows toward well 4. This well was drilled with a 16" diameter auger and the annulus was filled with coarse sand to within 6 feet of the surface. Consequently, water from the upper aquifer can flow down through the confining layer via the well annulus. (Water can not flow down through the well itself since it is screened below the confining layer.) This is an undesirable situation, in that contaminant could reach the lower aquifer at a higher rate than would otherwise occur.

The drainage through well 4 creates a cone of depression that extends nearly 200' and forms a groundwater divide between wells B and E. The normal direction of groundwater flow in the upper aquifer should be toward the river. However, this is reversed in the area between well 4 and wells A and B. The actual shape of the cone of depression can not be determined since there are no wells closer than 150 feet from well 4.

Conclusions

Well 4 was improperly installed in that it connected two aquifers which are separated under natural conditions. The result is a depression of the water table around well 4 and a reversal of the normal groundwater flow direction.

Sealing the annulus of well 4 would stop drainage from the upper to the lower aquifer.

Installing additional monitoring wells closer to well 4 would enable better definition of the cone of depression and would allow recovery of the upper aquifer to be observed. Without this, the success of the sealing operation could not be verified.

Recommendations

1. Seal the well 4 annulus.
2. Install additional monitoring wells closer to well 4 to verify that the well 4 annulus has been sealed.

Attachments a/s

FLP/ch

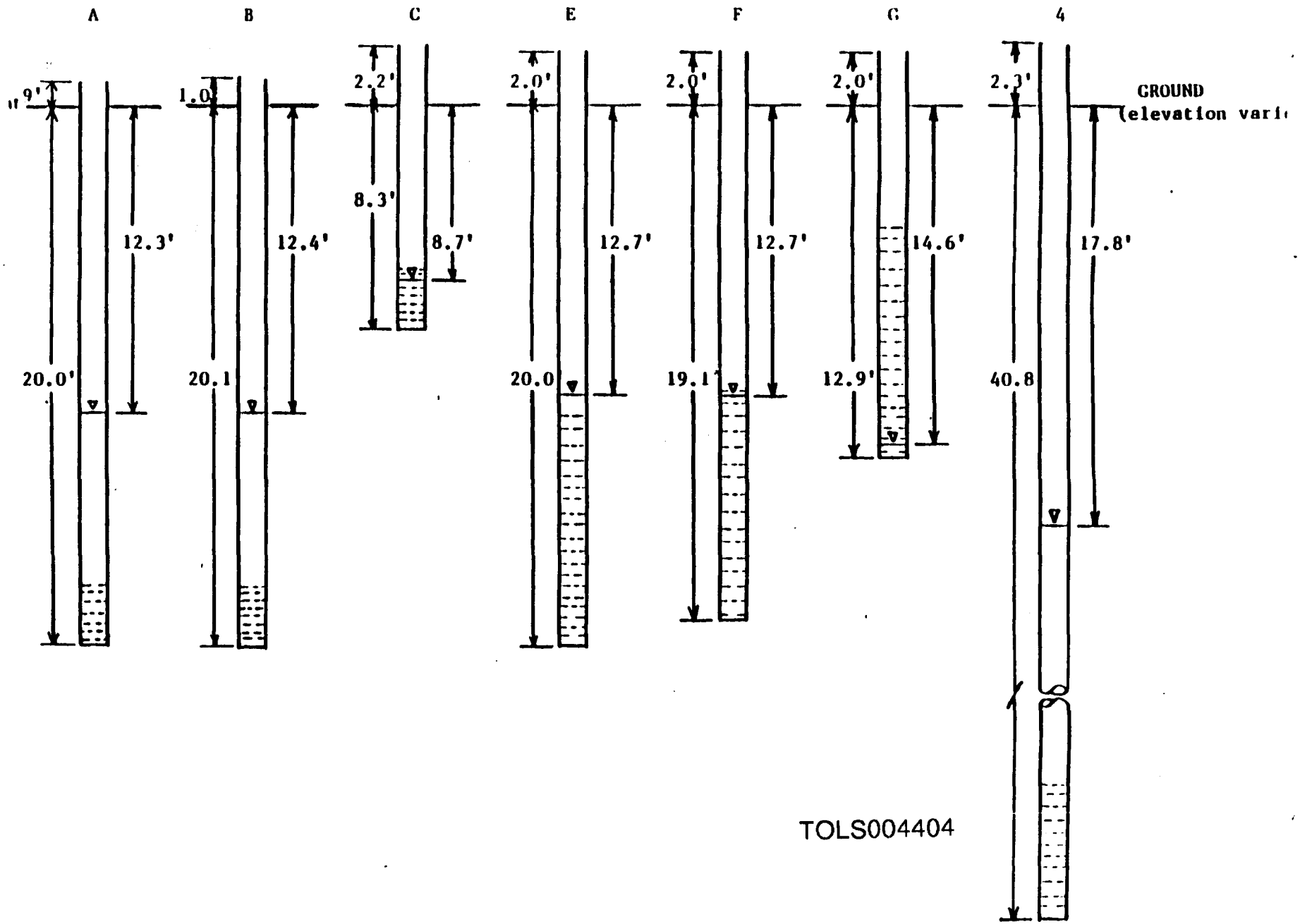
TOLS004403

32319

Attachment 3

223319

WELL CONSTRUCTION DETAILS



TOLS004404

BZTO104(e)041225

State of Oregon
Department of Environmental Quality — Memorandum

Date: April 8, 1992

To: Time Oil File

From: Mike Kortenhof

Subject: Time Oil Project Review
ECSI Site No. 170
CERCLIS ID No. ORD009597543

This memo summarizes the results of the review of the files and submittal regarding the Time Oil Company storage terminal located in North Portland. In conjunction with the review, I visited the site on January 30, 1992. Notes from that visit are included in the COMM file.

The following documents were reviewed:

Northwest Region Source files - Air Quality, Water Quality, Hazardous Waste

ECSI file, Site Assessment Section

CERCLIS file, Site Assessment Section

Time Oil submittal, received December 6, 1991
ECOVA Corporation report, Project 1067, dated December, 1991.
Title: Preliminary Assessment/Data Evaluation and Proposed Remediation Plan for Pentachlorophenol Contaminated Soil at Time Oil Co. - Northwest Terminal
Volume I - Report
Volume II - Appendices
Volume III - Work Plan

Background

Time Oil Company owns and operates a petroleum products storage terminal on approximately 52 acres located in the Rivergate area of North Portland. Time Oil provided pentachlorophenol (PCP) blending services to the Koppers Company and also leased tanks to Crosby and Overton for storage of waste oil.

Time Oil discovered soil contamination associated with the PCP blending operations in the early 1980's, at which time they began conducting remedial investigations and operations. These activities are summarized in a chronology of events prepared by Time Oil (attached).

The Northwest Region (NWR) of Department of Environmental Quality (DEQ) completed a Preliminary Assessment of this facility in conjunction with the Federal Superfund Program on January 15, 1985. The results of that evaluation, including a detailed description of the facility operating history, were summarized in a memo from NWR to the Environmental Protection Agency (EPA), dated February 12, 1985 (attached). Primary concerns identified were the PCP contaminated soil described above, polychlorinated biphenyl (PCB) contamination apparently associated with the waste oil storage and the potential for groundwater contamination from historic ground disposal of tank bottom wastewater. No further action under the Federal program was recommended; DEQ planned to follow up on remaining issues of concern. This facility is included on the Environmental Cleanup Division's Confirmed Release List (CRL) based on the presence of PCP, PCB, lead, naphthalene and chrysene in soil and sludge in the area of the Crosby & Overton tanks.

Investigation Results

Work plans and results from years of investigations have been submitted by Time Oil. These include general descriptions of investigation and sampling procedures. There is some QA/QC documentation provided, although much of the data presented in the reports is unsupported. There is nothing to suggest that soil samples were handled inappropriately or that the data is invalid. Groundwater quality data is of extremely limited value, as described below.

Soil

The information available about contaminants present in the PCP blending area soil is limited to two samples. One was collected by DEQ in 1984, as described in the attached memo (page 4). It was analyzed for acid and base-neutral extractables, EP Toxicity-lead, pesticides and PCBs. It was also scanned for unknowns. It was found to contain:

Compound	concentration (mg/kg)
pentachlorophenol	1820
tetrachlorophenol	71
1-ethyl-4-methylcyclohexane	10*
2,6-dimethyloctane	10*
4-methylnonane	8*
1-methyl-4-(1-methylethyl)cyclohexane	12*
4-methyldecane	36*
butylcyclohexane	14*
5-methyldecane	15*
3-methyldecane	8*
undecane	18*
octylcyclopropane	53*

* tentatively identified compound (TIC), concentration estimated

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The memo indicates that PCBs, if present, were at a concentration of less than 50 mg/kg. I have not been able to find the portion of the laboratory report describing the PCB results.

The laboratory report indicates that the sample contained numerous other compounds with a pattern indicative of a solvent mixture similar to paint thinner (Appendix A-1). Time Oil describes this associated contamination as consisting of mineral spirits and paraffin (Volume I - Report, p.3-7). During my site visit they described it as long chain fatty alcohols in the C20 to C35 range. They mentioned two specific products, KB-3 and B-11, manufactured by Kodak.

The other sample was collected by Time Oil in 1985 and analyzed for the purpose of evaluating a specific soil treatment alternative (Calweld/ATW, Appendix A-5). Collection methods and handling procedures for this sample are undocumented. Only the results of semivolatile organics analysis (Method 8270) and a TIC scan are available. PCP and hydrocarbons in the C18-C30 range were the only compounds identified at concentrations of 11,000 mg/kg and 2,000 mg/kg, respectively.

Extensive soil sampling intended to delineate the extent of contamination was performed in 1985 and 1986 in the area of the PCP blending operations, including underneath the warehouse. Contour maps depicting the distribution of PCP at 5 levels (surface, 2 feet, 4 feet, 7 feet and 12 feet) were prepared (Appendix D). Most of the soil samples collected throughout the blending area ranged in concentration between 2 and 8,000 mg/kg PCP; the average concentration is estimated to be 950 mg/kg PCP. The highest concentration of PCP found anywhere on site was in a sample taken from a 45° slant hole (MW-3) drilled underneath the warehouse. PCP at a concentration of 116,000 mg/kg was found at a true vertical depth of 3 feet. The boring stopped at a true vertical depth of 13 feet, at a point 13 feet laterally inside the warehouse, where the PCP concentration was found to be 1560 mg/kg. The vertical extent of PCP contamination at the edge of the warehouse (MW-4) was found to be 574 mg/kg at a depth of 19 feet, 62.3 mg/kg at a depth of 33 feet and 1.59 mg/kg at a depth of 44 feet. This sampling has identified an area of approximately 500 square feet under the south corner of the building were PCP concentrations appear to exceed 100 mg/kg from the surface to the water table. Contamination also exists below the water table although it is delineated at only one location.

The PCP blending operations area, excluding the warehouse, was excavated to depths of 12 feet (the approximate depth of the water table) in 1989 (see attached site map). Approximately 3,000 cubic yards of contaminated soil from this excavation are stockpiled on site in a bermed, lined, covered and drained area pending treatment and disposal.

Verification sampling in the excavated pit was performed and documented (Appendix I); results indicate that PCP concentrations as high as 258 mg/kg (sample CA-42 @ 17') exist below the vertical limit of excavation. A single sample (1-B) taken at the edge of the warehouse, 1 foot below the slab had a PCP concentration of 1882 mg/kg. Excavation wall sampling identified

PCP concentrations as high as 1,006 mg/kg (sample CA-61 @ 7') in the vicinity of Tank 38K. Discussions with representatives of Time Oil (Fred Proby) indicate that an additional area of contamination exists underneath the north corner of the soil stockpile area, in the vicinity of one of the drainage sumps.

Groundwater

A number of groundwater monitor wells have been completed around the facility. ECOVA describes the hydrogeology as follows (Volume I - Report, page 29):

> "Shallow groundwater exists in the alluvial sands of two aquifers underlying the site. An unconfined upper zone of perched groundwater occurs at a depth interval between about 13 and 18 feet below ground surface. A silt to clay aquitard, about two feet thick, separates the perched zone from a lower, confined zone that maintains an average water level of approximately 20 feet below ground surface. Groundwater flow is towards the Willamette River, with fluctuations related to tides and seasonal river stages. The aquitard appears to pinch out or terminate toward the river. It is likely that perched water flows somewhat downward and laterally before entering the river."
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> "As subsurface soils appear to be generally quite permeable, groundwater flow can be expected to be fairly rapid (100-200 feet/year). In August and October 1987, water levels and groundwater samples were obtained from the site wells. These measurements confirmed that groundwater was flowing in a southerly direction under an average gradient of 0.008 ft/ft".

Supporting documentation for this characterization is extremely limited. Well completion diagrams, to the extent they are provided (Appendices A-8 and F), are lacking well elevation information. Some water level information is presented (Appendices A-9 and E), although water table maps have not been prepared.

Limited groundwater sampling results are presented. Most of the samples were collected from drive points, that are not well suited for water quality sampling. The most recent round of sampling (March, 1991) included several conventional monitor wells. The detection limit for these analyses (1 mg/l) was very high. A sample collected from one of the wells located down gradient from the PCP blending area was reported to contain PCP at a concentration of 60 mg/l. The magnitude and extent of groundwater contamination is undefined.

Time Oil Proposal

Time Oil has proposed above ground treatment of the contaminated soil followed by on site disposal. EPA has determined that this soil is hazardous waste designated as F027. SRH Associates evaluated remedial alternatives and recommended bench testing above ground soil washing as described in a report dated October 1, 1986 (Appendix A-10). Incineration was estimated to cost approximately $2 million. Time Oil subsequently hired ECOVA Corporation to test and construct an above ground slurry phase bioremediation system, combining soil washing and biological treatment.

Volume III of the ECOVA report is a work plan, prepared in 1988, proposing the conceptual design of the treatment system. Full scale treatment tests reportedly demonstrated that the lowest residual PCP concentration after treatment that can be practically achieved is 100 mg/kg (Volume I - Report, p11), although detailed results of those tests were not submitted to DEQ. PCP degradation is reported to be limited by the presence of mineral spirits and paraffin in the soil. The treatment system design and testing was described in a journal article published in 1991 (Appendix K). Time Oil has asked DEQ to help them define an appropriate cleanup level for this soil. They have proposed treating to a PCP concentration of 500 mg/kg. Time Oil also proposes quarterly groundwater monitoring for a period of one year.

Issues and Recommendations

The 1985 Superfund Preliminary Assessment and the ECOVA reports contain almost all of the information needed for ranking the site. Potential sources of contamination at the site are adequately described. The site should be added to the ECD Inventory of CRL sites requiring further action. Site scoring should be performed.

Additional information about groundwater usage in the surrounding area will be needed for site scoring. Analyses for volatile organics, dioxins and furans have not been performed. They should be checked because of the association of the PCP contamination with petroleum hydrocarbons and because of the high concentrations of PCP identified.

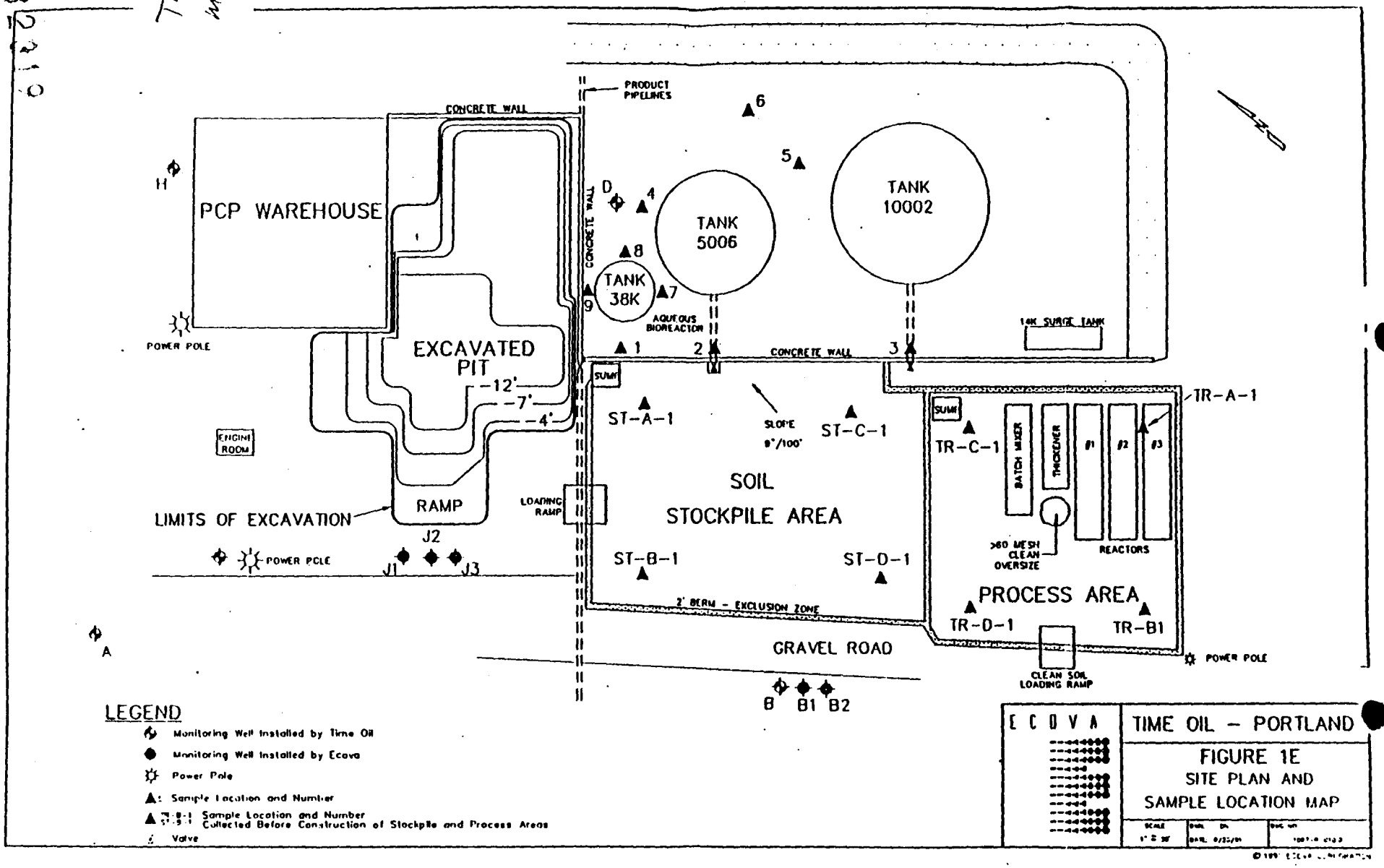
The fate of the PCP contamination remaining in the soil under the warehouse, in the area of Tank 38K and under the north corner of the soil stockpile must be evaluated. Plans for additional remedial action should be developed based on this evaluation. The results of groundwater investigation that will be necessary will be critical to those plans.

The PCB contamination identified in the vicinity of the Crosby and Overton tank requires additional investigation and possibly remedial action.

Groundwater contamination has been identified at levels potentially threatening to human health and the environment. A comprehensive plan for a groundwater investigation at the facility should be developed and implemented.

The selection of the slurry bioreactor treatment system requires additional evaluation. Further discussions with Time Oil and ECOVA are necessary. More needs to be known about the solvents present. Specific consideration should be given to the treatment limitations caused by the presence of mineral spirits and paraffin and to the cost effectiveness of the method of treatment. Treatment goals must be defined. If it is determined that the slurry bioreactor is the most appropriate treatment alternative, as Time Oil proposes, plans for monitoring the effectiveness of the system and for disposal of the treated soil must be prepared.

Some of these activities are covered by RCRA regulations. Coordination with DEQ Northwest Region, DEQ Hazardous and Solid Waste Division and EPA Region X will be necessary.



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