WEST ASSOCIATES
ENVIRONMENTAL ENGINEERS, INC.

May 6, 1996

Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
Attn: Ms. Juliet Shin
Hazardous Materials Specialist

SUBJECT: SUBMITTAL OF GROUNDWATER SPARGING/VAPOR EXTRACTION SYSTEM PILOT TEST REPORT, WEYERHAEUSER PAPER COMPANY, ALAMEDA CORRUGATED BOX FACILITY, 1801 HIBBARD STR., STID 1202

Dear Ms. Shin,

West & Associates Environmental Engineers, Inc. respectfully submits the Groundwater Sparging/Vapor Extraction System Pilot Test Report for the Weyerhaeuser Paper Company, Alameda Corrugated Box Facility.

We look forward to your review of the attached report. Should you require any additional information please contact me at (707) 451-1360.

Yours truly,

Brian West for

Brennan Mahoney APSS
Project Manager
West & Associates Environmental Engineers, Inc.

BGM/di

Enclosure: Groundwater Sparging/Vapor Extraction Pilot Test Report

cc: Ed Granados, Weyerhaeuser Office of the Environment, Tacoma
John Hipner, WPC Alameda

GROUNDWATER SPARGING/VAPOR EXTRACTION SYSTEM PILOT TEST REPORT

WEYERHAEUSER PAPER COMPANY
1801 HIBBARD STREET
ALAMEDA, CALIFORNIA

Submitted to:

ALAMEDA COUNTY HEALTH CARE AGENCY
DIVISION OF HAZARDOUS MATERIALS
Alameda

Prepared for:

THE WEYERHAEUSER COMPANY
OFFICE OF THE ENVIRONMENT
TOXIC/SOLID WASTE TEAM
Tacoma, Washington

Prepared by:

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS, INC.
Vacaville, California

April 1996

ACKNOWLEDGEMENTS

This report was prepared under authorization of the Weyerhaeuser Corporation, Office of the Environment, Toxic/Solid Waste Team, Tacoma, Washington. The Weyerhaeuser project officer is Mr. Ed Granados, mail stop CH 1K29, Tacoma, WA 98477; (206) 924-3934.

At the Alameda Corrugated Box plant, both Mr. John Hipner, Plant Engineer and Mr. Tom Muncell, Maintenance Manager, have environmental compliance responsibilities related to this project. The Alameda plant address is 1801 Hibbard Street, PO Drawer X, Alameda, CA 95601; (510) 814-1167.

The lead regulatory agency for the Weyerhaeuser Alameda plant is the Alameda County Health Care Agency, Department of Environmental Health. Ms. Juliet Shin, Hazardous Materials Specialist, is the staff person assigned. The Department of Environmental Health is located at 1131 Harbor Bay Parkway, Suite 250, Alameda, CA 94502-6577; (510) 567-6700.

This report was prepared by West & Associates Environmental Engineers, Inc. West & Associates is located at 490 Merchant Street, Suite 104, Vacaville, CA 95688; mailing address, PO Box 5891, Vacaville 95696; (707) 451-1360. Principal authors are Mr. Brennan Mahoney APSS and Mr. Brian W. West PE. (Registered California Civil Engineer No. 32319 - expires 12/31/96).

EXECUTIVE SUMMARY

The Weyerhaeuser Paper Company (WPC) plant in Alameda California formerly was equipped with three underground gasoline tanks. The tanks were removed in 1991, however product leakage was found to have contaminated both soil and groundwater.

Between 1991 and 1995 site investigations were performed to determine the extent and magnitude of contamination. In late 1995, approximately 95% of the contaminated soil around the former UGT cluster was excavated. A small quantity of contaminated soil remains under the plant building and in some other inaccessible locations.

During the excavation project a groundwater sparging/vapor extraction grid was installed. The groundwater sparging grid is designed to inject compressed air into the saturated zone to volatilize contaminants. Volatiles rise through the soil to be collected in the overlying vapor extraction grid. Collected volatiles are removed from the vapor stream by activated carbon prior to discharge.

Testing of the groundwater sparge system was conducted in February and March 1996. Mr. Ed Granados of Weyerhaeuser, Office of the Environment, and Ms. Juliet Shin of Alameda County Health Care Agency, Department of Environmental Health, were on site February 28th for an orientation on the system and to observe testing activities.

The scope of this project included testing of the existing groundwater sparging/vapor extraction system and evaluation of its potential beneficial impact on residual soil and groundwater contamination around the former gasoline UST cluster. This report presents results of the pilot test program.

Results of the pilot test indicate that the groundwater sparging/soil vapor extraction system is adequately designed to successfully remove residual volatile contaminants from the soil and groundwater below the WPC site. Field monitoring with a photoionization detector and laboratory chemical analysis of air samples from the vapor extraction air stream both indicate that the groundwater sparge/vapor extraction system is removing volatiles from groundwater.

It is projected that the remedial system will be in full scale operation from April 1, 1996 through September 30, 1996. Review of analytical results from the September 1996 quarterly groundwater sampling cycle will determine whether further system operation is needed. Under the best case scenario, remedial system operation can be terminated by October 1, 1996. Groundwater monitoring through the remainder of 1996 and the first half of 1997 will document site closure eligibility by June 1, 1997.

The remedial system is currently being monitored for performance and efficiency weekly. Progress reports are prepared and submitted to Weyerhaeuser on a monthly basis.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS ii

EXECUTIVE SUMMARY iii

TABLE OF CONTENTS iv

1.0 INTRODUCTION 1
1.1 Objectives 1
1.2 Scope 1
1.3 Summarized Background 1

2.0 AIR SPARGING SYSTEM CONFIGURATION 7
2.1 Air Sparging and Vapor Recovery Grids 7
2.2 System Manifold and Valve Controls 10
2.3 Air Compressor and Filter 10
2.4 Vacuum Blower 12
2.5 Moisture Removal Chamber 12
2.6 Activated Carbon Filters 12

3.0 SPARGING SYSTEM TEST 13
3.1 Test Parameters 13

4.0 DISCHARGE SAMPLE COLLECTION 18
4.1 Laboratory Chemical Analysis 18
4.2 Laboratory Chemical Analysis Results 18

5.0 SYSTEM PERMITTING 19

6.0 CONCLUSIONS 19

7.0 RECOMMENDATIONS 20

8.0 MAINTENANCE AND MONITORING 21

APPENDICES

Chain of Custody & Laboratory Analysis Results
BAAQMD Notification Letter
BAAQMD Permit to Operate

1.0 INTRODUCTION

This Groundwater Sparging/Vapor Extraction Pilot Test Report describes the methods and results of groundwater sparge system testing activities conducted at the Weyerhaeuser Paper Company (WPC) property in Alameda, California. The location of the WPC facility is presented on Figures 1 and 2. Continued remediation of contamination at the WPC site is necessary in order to meet acceptable groundwater quality standards.

For simplicity, in this report the Groundwater Sparging/Vapor Extraction System will be referred to as a Groundwater Sparge System.

1.1 Objectives

The objective of this project was to determine 1) if the groundwater sparge system is capable of removing volatiles from the remaining soil and groundwater contaminated areas; 2) which areas (zones) below the site exhibit the highest contaminant removal rates; 3) operational parameters such as run time durations, air flow rates, air pressure levels and vacuum levels; and 4) base line volatile removal concentrations prior to full scale operation.

1.2 Scope

The scope of this project included testing of the existing air sparging and vapor extraction system for evaluation of its potential beneficial impact on residual soil and groundwater contamination around the former gasoline UST cluster. Specifically, the scope of this project included the following elements:

- Notify Bay Area Air Quality Management District (BAAQMD) of test
- Measure volatile concentrations in extracted soil vapor prior to initiating groundwater sparging
- Measure volatile concentrations in extracted soil vapor while injecting air into groundwater through the sparge lines
- Isolate the operation of each remedial zone below the site while monitoring vapor concentrations over time
- Monitor volatile concentrations in the field utilizing a photoionization detector (PID)
- Collect vapor samples for laboratory analysis
- Preparation of a written report of findings

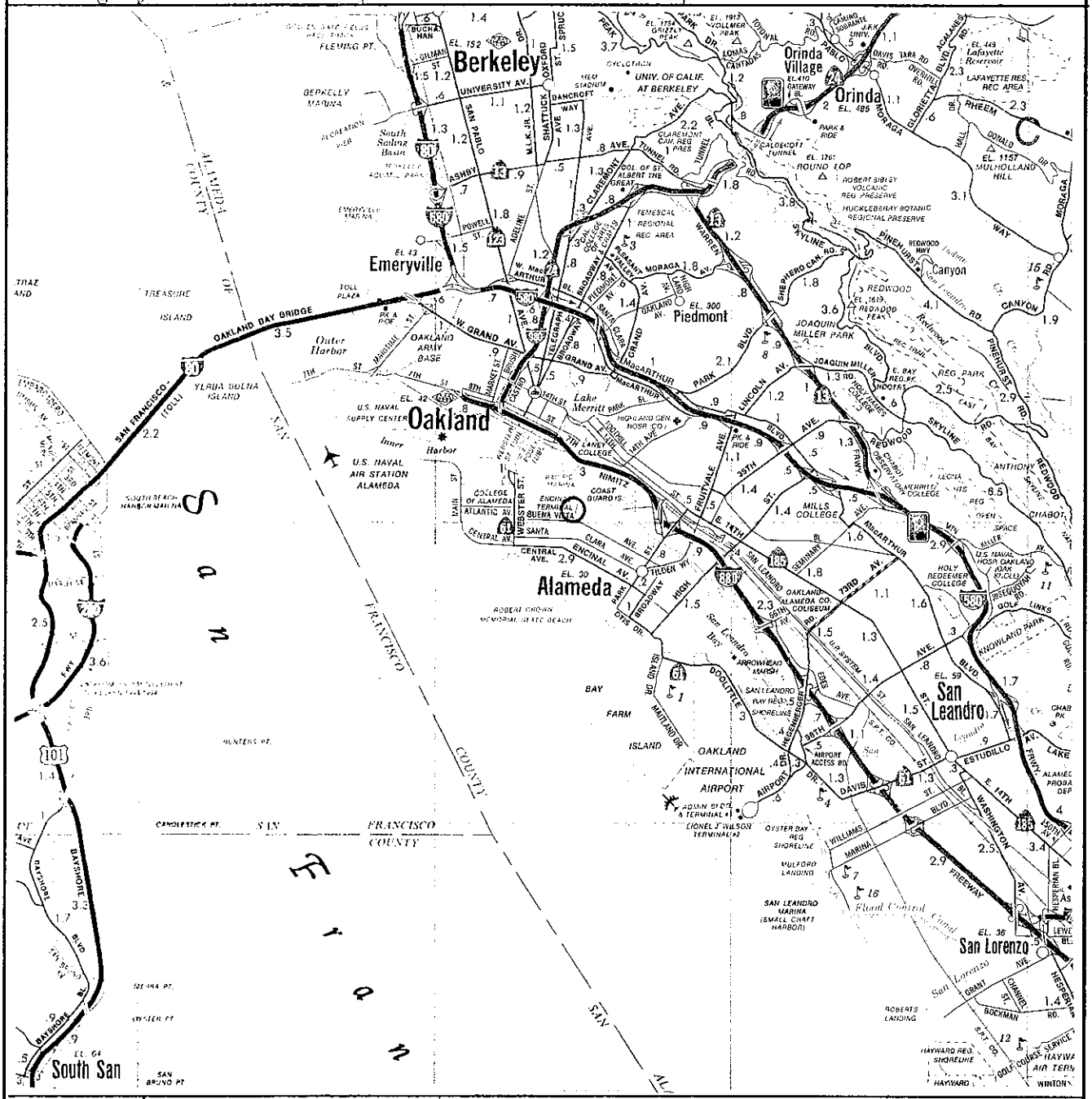
1.3 Summarized Background

The WPC Alameda facility at 1801 Hibbard Str. manufacturers corrugated cardboard boxes. The facility was originally constructed in 1946. Underground fuel tanks had been historically installed at the facility for vehicle, generator and boiler fuel storage. Both gasoline and diesel fuels were formerly stored underground. All underground fuel storage capacity has now been removed, the last remaining underground tank having been taken out in January 1994.

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS, INC.

PO Box 5891, Vacaville, California 95696

Project Name: Weyerhaeuser Paper Company - Alameda	Date: Jan. 1995
Location: 1801 Hibbard Str., Alameda, California 94501	
Drawing By: BWW	Scale: 1" = 2.5 miles



LEGEND

○ SITE LOCATION

Figure 1

WPC ALAMEDA FACILITY - REGIONAL SETTING

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS, INC.

PO Box 5891, Vacaville, California 95696

Project Name: Weyerhaeuser Paper Company - Alameda	Date: Jan. 1995
Location: 1801 Hibbard Str., Alameda, California 94501	
Drawing By: BWW	Scale: 1" = 0.4 Miles

LEGEND

○ SITE LOCATION

Figure 2

WPC ALAMEDA FACILITY - SITE LOCATION

The WPC facility is located on Alameda island in San Francisco Bay. The site is less than 0.25 miles west of the Oakland Inner Harbor. Site soils are predominantly sand with minor clay stringers. Groundwater is 3-6 feet below ground surface and tidally influenced.

Two former underground tank installations currently have open case files: the 1991 diesel tank and the 1991 gasoline tank cluster. The 1991 designation refers to the year of removal. This workplan addresses soil remediation in the vicinity of the 1991 gasoline tank cluster.

The 1991 gasoline tank cluster consisted of three 1,000 gallon gasoline tanks. Apparently, one of the tanks was also used for waste oil storage. Leakage from the 1991 gasoline tank cluster is the predominant environmental problem on-site. Both soil and groundwater contamination exists as a result of 1991 gasoline tank cluster leakage.

There was an attempt at soil remediation made during the 1991 gasoline tank cluster removal. A series of three overexcavations were completed before site constraints rendered further excavation impractical. The final excavation dimensions were approximately 30'x 30'. Soil contamination extended considerably further than the final 1991 overexcavation dimensions in the west, north and south directions.

Soil Tech Engineering, Inc. (STE) performed a series of site investigations at the WPC facility beginning in 1991. STE eventually installed seven groundwater monitoring wells and performed periodic groundwater monitoring.

Throughout 1994, West & Associates Environmental Engineers, Inc. conducted further site investigations at the 1991 gasoline tank cluster study area and performed quarterly groundwater monitoring. West & Associates installed four groundwater wells including one (MW-12) through the floor of the main plant building, 20 feet inside the building footprint. The presence of contamination under the main plant building was confirmed by an angle boring (SB-2) completed in October.

In October and November 1995 West & Associates Environmental Engineers conducted remedial excavation activities at the site. Contaminated soil was excavated from around the former gasoline tank cluster area and air sparging lines along with vapor recovery lines were installed in the open excavations prior to backfill. Air sparging lines and vapor recovery lines were also installed under the Main Plant Building. A total of approximately 530 yds^3 of contaminated soil was excavated. Some of the contaminated soil was aerated on site and reused as backfill material and some of the contaminated soil was transported to a local landfill for disposal.

Some contaminated soil was left in place in various areas that were not practical to excavate. The areas are 1) under the main plant building, 2) under various underground utilities, 3) adjacent to sidewalls of former tank removal excavations and 4) a thin section of earth between each section (zone) of the excavation. The areas where contaminated soil remains below the site are identified on Figure 3.

LEDGEND

- ▲ Soil Boring
- ⊕ Monitoring Well
- ○ Pit Sidewall or Bottom
- ▨ Area of Residual Soil Contamination

MW-12

MAIN PLANT BUILDING

MACHINE SHOP

REST ROOM

OFFICES

SB-1

SB-2

B-4

B-MW 8

MW-9

ZONE II

HOT WAX TANK

B-1

G.W.

MW-3

ZONE I

MW-3B

FORMER UST EXCAVATION

PIPE TRENCH

B-5

E-SE

GAS TANK

GAS TANK

GAS TANK

MW-5

ZONE III

MW-1

ZONE IV

PIT WALL

1994 DIESEL TANK EXCAVATION

PIT MIDDLE

SOUTH TANK PIT

NORTH TANK PIT

PROPANE ENCLOSURE

B-2

6" WATER

W

PLATE

MW-G

MW-2

B-3

MW-11

ZONE V

ZONE VI

MW-4

MW-4B

PIPING TRENCH

8" SEWER

BUENA VISTA ST.

12" STORM W

B-MW 10

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

12" SEWER

FORMER DISPENSER

GATE

MW-10

PRIVATE DRIVE

N

WEYERHAEUSER - ALAMEDA		
SCALE: 1"= 10'	APPROVED BY:	DRAWN BY BWW
DATE: JAN. 1996		REVISED
REMEDIAL EXCAVATION DIAGRAM		
1801 HIBBARD ST.		Figure 3

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

During the remedial excavation program monitoring wells MW-1, MW-2, MW-3, MW-4 and MW-9 were removed. In December 1995 two new wells MW-3B and MW-4B were installed near the former locations of MW-3 and MW-4, respectively. A total of eight groundwater monitoring wells are now in existence at the former 1991 gasoline tank cluster study area. Details of the remedial excavation program were presented in the January 1996 Remedial Action Report prepared by West & Associates Environmental Engineers, Inc.

A groundwater sparging and vapor extraction system was installed at the site in February 1996. The groundwater sparging system introduces a flow of air into the subsurface groundwater sparging lines that were installed within the saturated zone during remedial excavation backfilling activities in November and December 1995. The vapor extraction system removes subsurface air from just above the saturated zone via the vapor extraction lines that were installed during remedial excavation backfilling activities.

2.0 AIR SPARGING SYSTEM CONFIGURATION

This section describes the design and key components of the groundwater sparge system. The various components of the sparge system are summarized as follows:

- Air sparging and vapor recovery grids
- Distribution manifold and valve controls
- Air compressor and filter
- Vacuum Blower
- Moisture removal chamber
- Activated carbon filters

Each component of the air sparging system listed above is further described in the following sections.

2.1 Air Sparging and Vapor Recovery Grids

The air sparging system consists of a series of individual grids constructed with 1.5 inch diameter, schedule 40 PVC pipe perforated with 1/8 - 3/16 inch diameter holes. Each remedial zone is served by a separate sparging and vapor recovery grid. Each sparge grid was manifolded to an air supply line and provided with controls such that pressures and air flow rates can be regulated, or turned off, so that separate sparging zones can be established, if desired.

The sparging grids were installed at a depth of approximately 9 feet BGS and were bedded in 3/8 inch washed pea gravel. The pea gravel was placed in each section of the excavation from the bottom, approximately 9.5 feet BGS to approximately 8 feet BGS. Soil was then placed on top of the gravel and compacted with a compaction wheel between the depths of approximately 8 and 4 feet bgs. Then a second layer of 3/8 inch pea gravel was applied between the approximate depths of 4 and 5 feet BGS.

Within this second layer of gravel vapor recovery lines were installed. The soil vapor recovery/extraction lines were placed at approximately 4.5 feet BGS to complement the air sparging system. The vapor extraction lines were constructed of perforated (0.010 slots), 1.5 inch diameter, PVC piping.

From 4 feet to 1 foot below grade surface the excavation was backfilled with clean soil. The clean soil was compacted in 18 inch lifts. A layer of plastic sheeting was installed on top of the compacted soil at a depth of 1 foot BGS to reduce the chance of the vapor recovery system short circuiting to the surface. Basecoarse was then spread and concrete pavement installed over the top of the entire excavation area.

The sparge grids are designed to promote even distribution of injected air through the saturated zone. The vapor recovery system is designed to create a slight low pressure area within the unsaturated vadose zone to collect sparged volatiles. Top views of the air sparging and vapor recovery line layouts are presented on Figures 4 and 5, respectively.

Wells destroyed during excavation
Remaining & New Monitoring Wells

Zones w/ highest contaminant removal rates

LEDGEND

- ▲ Soil Boring
- Monitoring Well
- Area of Residual Soil Contamination
- Air Sparge Line
- Air Sparge Line Riser

MAIN PLANT BUILDING

MW-12

Fig.7 X-Section

MACHINE SHOP

REST ROOM

OFFICES

HOT WAX TANK

SB-1

SB-2

B-4

MW-9

ZONE II

B-MW 8

MW-3

ZONE I

MW-3B

B-1

B-5

FORMER UST EXCAVATION

E-SE

ZONE III

MW-1

GAS TANK

GAS TANK

GAS TANK

ZONE IV

PIPE TRENCH

MW-5

PIT WALL

1994 DIESEL TANK EXCAVATION

PIT MIDDLE

NORTH TANK PIT

SOUTH TANK PIT

PROPANE ENCLOSURE

B-2

6" WATER

W

MW-G

PLATE

MW-11

B-3

MW-2

ZONE V

ZONE VI

MW-4

MW-4B

TRENCH

PIPING

8" SEWER

12" STORM W

B-MW 10

BUENA VISTA ST.

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

12" SEWER

FORMER DISPENSER

GATE

MW-10

PRIVATE DRIVE

N

WEYERHAEUSER - ALAMEDA		
SCALE: 1" = 10'	APPROVED BY:	DRAWN BY BWW
DATE: JAN. 1996		REVISED
PLAN VIEW-AIR SPARGING SYSTEM		
1801 HIBBARD ST.		Figure 4

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

LEDGEND

- ▲ Soil Boring
- ⊕ Monitoring Well
- ○ Pit Sidewall or Bottom
- ▨ Area of Residual Soil Contamination
- — Vapor Extraction Line
- ⊕ Vapor Extraction Line Riser

MW-12

MAIN PLANT BUILDING

Fig. 7 X-Section

MACHINE SHOP

REST ROOM

OFFICES

SB-1

SB-2

B-4

MW-9

ZONE II

B-MW 8

MW-3

ZONE I

HOT WAX TANK

B-1

MW-3B

FORMER UST EXCAVATION

B-5

E-SE

ZONE III

MW-1

GAS TANK

GAS TANK

GAS TANK

ZONE IV

PIPE TRENCH

MW-5

PIT WALL

1994 DIESEL TANK EXCAVATION

PIT MIDDLE

NORTH TANK PIT

SOUTH TANK PIT

PROPANE ENCLOSURE

B-2

6" WATER

W

PLATE

MW-6

MW-2

ZONE V

MW-4

ZONE VI

MW-4B

MW-11

B-3

8" SEWER

PIPING TRENCH

BUENA VISTA ST.

12" STORM W

B-MW 10

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

12" SEWER

FORMER DISPENSER

GATE

PRIVATE DRIVE

MW-10

N

WEYERHAEUSER - ALAMEDA		
SCALE: 1"= 10'	APPROVED BY:	DRAWN BY BWW
DATE: JAN. 1996		REVISED
PLAN VIEW- VES SYSTEM		
1801 HIBBARD ST.		Figure 5

A vertical cross sectional profile of the excavation backfill and construction of the air sparging and vapor recovery system is presented on Figure 6.

In addition to the sparging grids, air sparging lines were also installed into the saturated zone under the Main Plant building. A total of 5 sparging lines were installed below the building at an approximate 45 degree angle in individual 4 inch diameter hand auger borings. Each sparge line extends approximately 7 feet horizontally under the building.

The sparge lines were constructed with 1.5 inch diameter schedule 40 PVC pipe. The annulus between the PVC pipe and the borehole was backfilled with coarse aquarium sand throughout the perforated section with a 4 foot bentonite plug installed at the base.

Above each sparge line that extends under the building a vapor recovery chamber was bored in the unsaturated zone. The chambers were constructed by auguring a horizontal 4 inch diameter hole under the building. The holes were then backfilled with 3/8 inch pea gravel and tied in with the adjacent vapor recovery gravel bed in Zone I of the excavation. These vapor recovery chambers also extended horizontally a distance of approximately 7 feet under the building.

2.2 System Manifold and Valve Controls

All of the air sparging grids were manifolded together and connected to a clean compressed air supply. Air flow to each sparging grid zone can be controlled with an individual valve. Similarly, all of the vapor extraction grids are manifolded together and connected to one vacuum source. Vacuum to each vapor extraction grid, induced by a 1/3 HP regenerative blower, can be controlled with an individual valve.

The five individual sparge lines that extend under the Main Plant Building were also manifolded into the system and can be controlled with a dedicated control valve.

2.3 Air Compressor and Filter

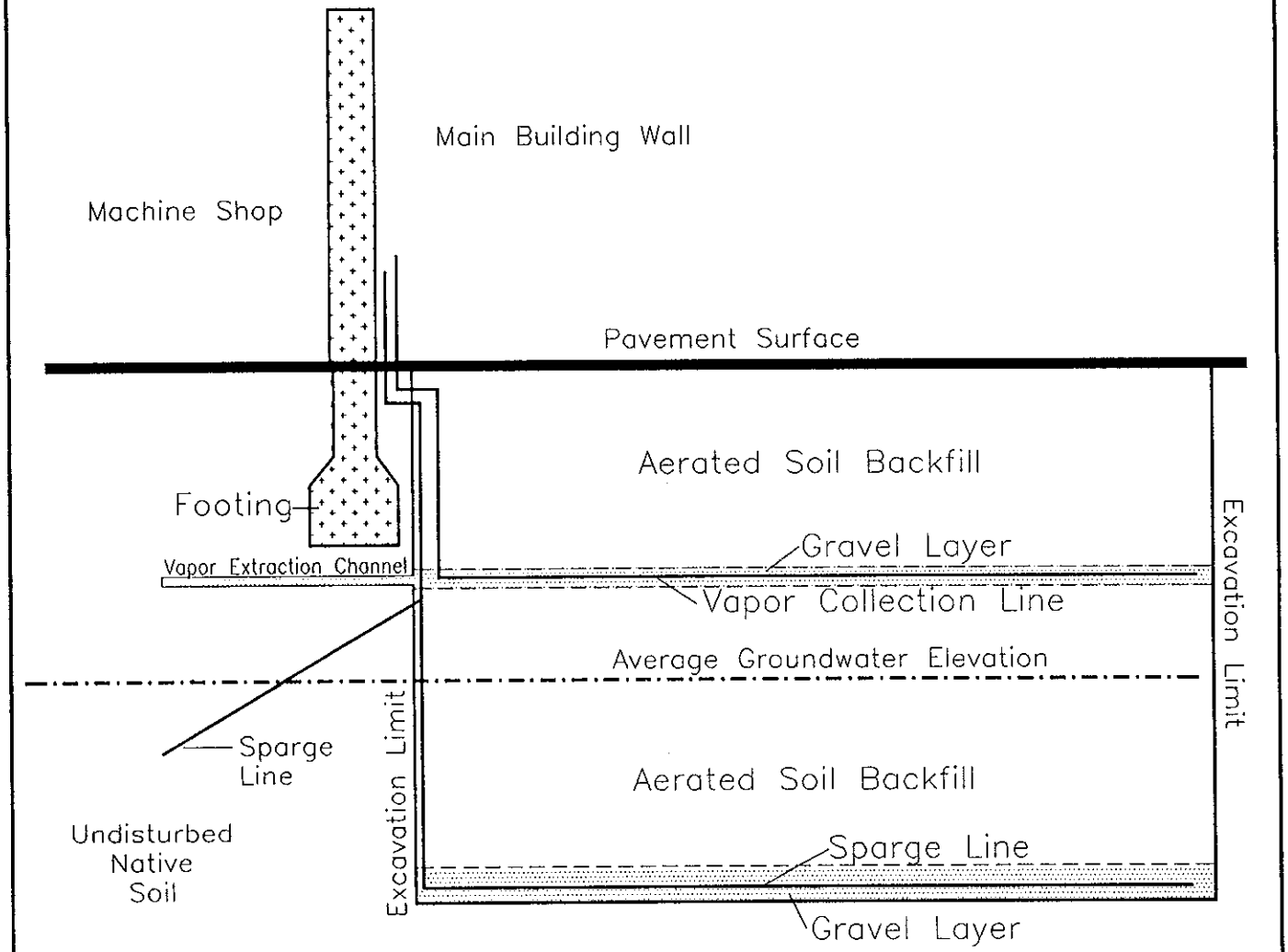
The groundwater sparging system is connected to the compressed air system serving the WPC Main Plant building. The compressed air demand from the sparging system, approximately 10 PSI at 40 CFM, is small compared to the compressed air demand of the Plant as a whole and will have no noticeable impact on manufacturing operations.

Prior to introduction into the sparge system the compressed air stream passes through a filtration system that removes any oil, water or particulate from the air supply. This insures that only clean, non-contaminated air is entering the sparging system. Attached to the air filter is a pressure regulator and an air supply shutoff valve.

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS, INC.

PO Box 5891, Vacaville, California 95696

Project Name: WPC Alameda Soil Remediation		Date: Jan. 1996
Location: Former Gasoline Tank Cluster		
Drawing By: BWW	Source: W&A	Scale:



LEGEND

Figure 6

Zone I Vertical Cross Section

2.4 Vacuum Blower

A 1/3 HP regenerative vacuum blower, capable of 42 CFM with open flow, is used to collect contaminated vapors via the vapor recovery grids. The blower utilizes a 115 volt, 3.6 amp electrical service and is equipped with a dedicated fuse box and disconnect switch.

2.5 Moisture Removal Chamber

A moisture removal chamber was installed between the vapor extraction manifold and the vacuum blower. Any groundwater or condensate that may be drawn up the vapor extraction lines during normal operation will be removed from the vapor stream in the moisture removal chamber. The chamber prevents water from being drawn into the regenerative blower and activated carbon filters. A site glass permits visual measurement of the water level in the removal chamber. A manual valve at the bottom of the chamber allows recovered water to be drained from the unit.

Water that is manually drained from the moisture removal chamber is captured by placing a shallow bucket below the discharge valve. The water captured in the bucket is then transferred to a 55 gallon drum that is kept on site. The water contained in the drum is disposed of at a recycling facility on a quarterly basis along with monitoring well purge water accumulated from quarterly groundwater monitoring well sampling activities.

2.6 Activated Carbon Filters

Prior to being discharged to the atmosphere the contaminated vapors recovered via the vapor recovery grids are directed through two activated carbon absorption canisters arranged in series. The carbon vessels are both Calgon brand Ventsorbs. Each vessel contains approximately 160 pounds of granular activated carbon.

Air sample ports are installed at both the influent and effluent ends of the carbon vessels and between each vessel. Contaminant breakthrough at the discharge of the lead carbon unit is measured with a hand held photoionization detector (PID). Measurements for breakthrough will be made once for approximately every 168 hours of operation. ≥ 7 days

Monitoring and control of air pollutant emissions are in conformance with Bay Area Air Quality Management District (BAAQMD) specifications.

3.0 SPARGING SYSTEM TEST

This section describes details of the groundwater sparge system test program.

Testing of the air groundwater sparge system was conducted in February and March 1996. Mr. Ed Granados of Weyerhaeuser Corporation, Office of the Environment, and Ms. Juliet Shin of Alameda County Health Care Agency, Department of Environmental Health were on site February 28th for an orientation on the system and to observe testing activities.

3.1 Test Parameters

Several test parameters were taken into account to fulfill the objectives of the pilot program as described in Section 1.1.

The variable test parameters are listed as follows:

1) Air pressure/flow rate
2) Vacuum level
3) Vacuum flow rate
4) Zone isolation
5) Run time duration

By varying the air supply and vacuum parameters while monitoring contaminant concentrations in the vapor recovery stream, optimum operating settings were established. The optimum operational settings are:

Parameter	Operational Setting
1) Air pressure	12.5 PSI
2) Vacuum level	-10" H_2O
3) Vacuum flow rate	36 CFM

Upon establishment of optimum air pressure and vacuum settings variations in volatile concentrations over time were monitored to determine the ideal operational configuration for full scale operation. All field measurements of volatile concentrations were made utilizing a calibrated Photovac photoionization detector (PID).

Testing activities began on February 28, 1996. To begin the test, vacuum was applied to the Zone I recovery grid with the sparging system off. Volatile concentrations in the recovery air steam were monitored until stabilization. Compressed air was then supplied to the Zone I sparge lines. Vapor concentrations in the recovery vapor stream were

observed to increase significantly within five minutes after supplying air to the sparge grid. The observed increase in volatile concentration demonstrated that the sparge lines are effective at enhancing the volatilization and removal of gasoline contamination from groundwater.

For the pilot test program volatile concentrations in the recovery vapor stream were measured and recorded every fifteen minutes over an approximate three hour time period. A steady increase in volatile concentration over the first thirty minutes of operation was observed followed by a slow continual decrease in concentration over the next 2.5 hours.

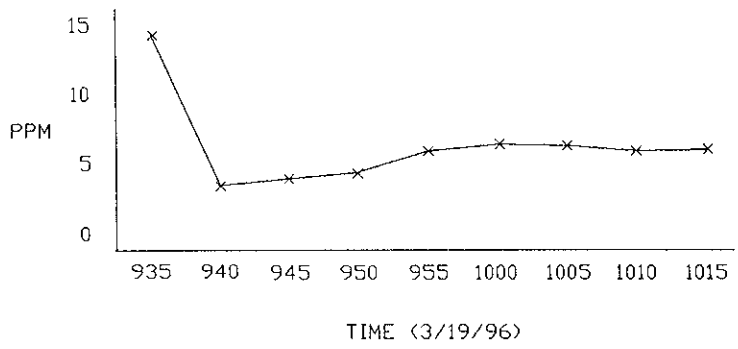
Testing the remainder of the system continued as follows. The entire system was operated by simultaneously supplying pressure to all sparging grids and drawing vacuum from all vapor extraction grids. Following this test on the whole system, Zones II through Zone VI were each isolated and tested in a manner similar to Zone I. Similar trends as observed during the initial test on Zone I were witnessed during the testing of Zones II through VI.

The time dependent vapor concentration curves for each isolated zone(s) showed a similar pattern, however the relative degree of contaminant concentrations in the vapor from each zone varied widely. Contaminant removal rates were observed to be highest in Zones II, V and VI.

Results of all vapor testing are presented and plotted graphically in Tables 1 through 6.

TABLE 1
VOLATILE CONCENTRATIONS MEASURED FROM OPERATION OF ENTIRE SPARGING SYSTEM (ALL ZONES)

TIME	CONCENTRATION (ppmv)*	VOLATILE CONCENTRATION CURVE (ppmv)
935	14	
940	3.2	
945	3.5	
950	4.0	
955	5.5	
1000	6.0	
1005	6.0	
1010	5.5	
1015	5.8	



Notes:

* Parts per million concentration by volume (v/v)

TABLE 2
VOLATILE CONCENTRATIONS MEASURED FROM OPERATION OF ZONE I ONLY

TIME	CONCENTRATION (ppmv)	VOLATILE CONCENTRATION CURVE (ppmv)
1155	1.0	
1210	5.0	
1225	9.5	
1240	10	
1255	9.7	
1310	9.7	
1325	8.5	
1340	8.5	
1355	7.9	
1410	7.5	

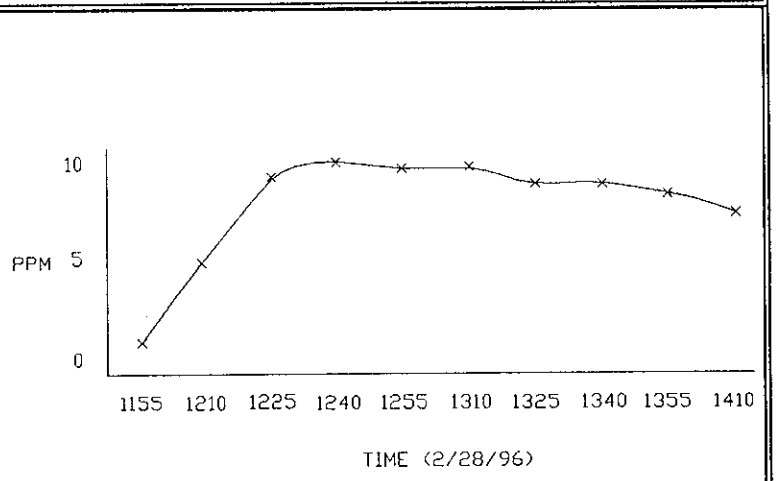


TABLE 3
VOLATILE CONCENTRATIONS MEASURED FROM OPERATION OF ZONE II ONLY

TIME	CONCENTRATION (ppmv)	VOLATILE CONCENTRATION CURVE (ppmv)
1030	21	
1040	215	
1050	425	
1100	600	
1110	225 w/ dilution air	
1120	400	
1130	200 w/ dilution air	

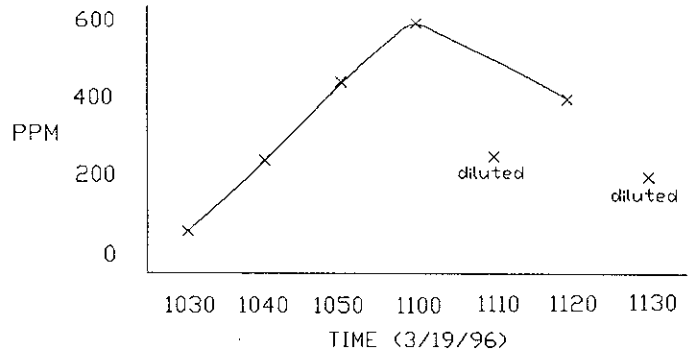


TABLE 4
VOLATILE CONCENTRATIONS MEASURED FROM OPERATION OF ZONE III ONLY

TIME	CONCENTRATION (ppmv)	VOLATILE CONCENTRATION CURVE (ppmv)
1645	10	
1650	10	
1655	no reading	
1700	no reading	
1705	19	
1710	20	

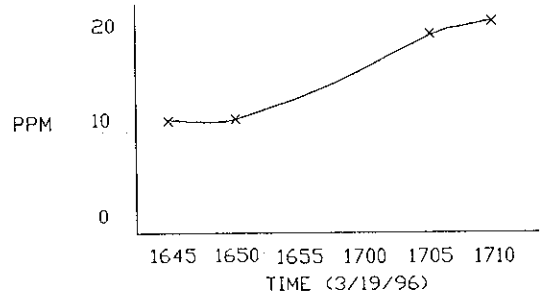


TABLE 5
VOLATILE CONCENTRATIONS MEASURED FROM OPERATION OF ZONES IV

TIME	CONCENTRATION (ppmv)	VOLATILE CONCENTRATION CURVE (ppmv)
1145	4.0	
1200	27.5	
1215	49.9	
1230	35.0	
1245	29.5	
1300	no reading	
1315	no reading	
1330	no reading	
1345	110	
1400	no reading	
1415	100	

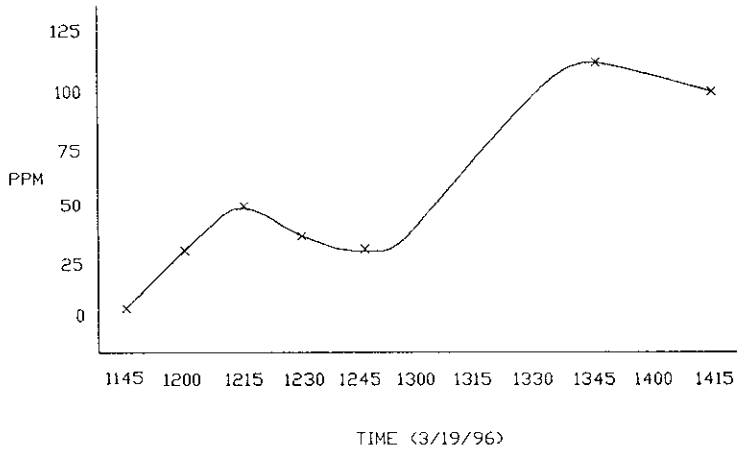
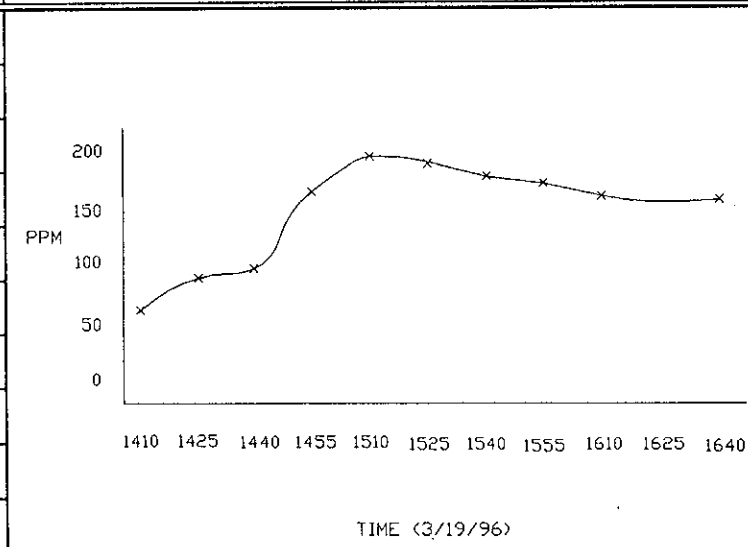


TABLE 6
VOLATILE CONCENTRATIONS MEASURED FROM OPERATION OF ZONE V & VI COMBINED

TIME	CONCENTRATION (ppmv)	VOLATILE CONCENTRATION CURVE (ppmv)
1410	65	
1425	80	
1440	90	
1455	160	
1510	195	
1525	190	
1540	175	
1555	167	
1610	160	
1625	no reading	
1640	155	



4.0 DISCHARGE SAMPLE COLLECTION

Three discharge vapor samples were retrieved from the system on March 19, 1996 for laboratory chemical analysis. Each sample was collected in a three liter tedlar bag, was protected from sunlight and submitted to the testing laboratory within 24 hours of collection.

One sample (Vapor 1) was collected from the pre-treatment discharge air stream while all sparging zones were in operation. The second sample (Vapor 2) was collected from the pre-treatment discharge air stream during operation of Sparging Zone II only, the zone exhibiting the highest volatile concentrations in the vapor extraction air stream. The third sample (Vapor 3) was collected from the treated discharge air stream while Sparging Zone II was in operation only.

4.1 Laboratory Chemical Analysis

Chemical analyses were conducted by Excelchem Environmental Labs located in Roseville, California, a DHS certified laboratory. Air samples were analyzed for Total Petroleum Hydrocarbons as gasoline (TPH-G) by EPA Method (M)8015 and benzene, toluene, eythylbenzene and xylenes (BTEX) by EPA Method 8020. Laboratory detection limits are presented on the laboratory data forms presented in the appendix.

4.2 Laboratory Chemical Analysis Results

Laboratory chemical analysis results for the three vapor samples, Vapor 1, Vapor 2 and Vapor 3, are presented in Table 7.

TABLE 7
SOIL SAMPLE ANALYTICAL RESULTS FOR VAPOR SAMPLES
all values in mg/M^3

SAMPLE ID	DESCRIPTION	TPH-G	BENZENE	TOLUENE	ETHYL-BENZENE	TOTAL XYLENES
VAPOR-1	All zones operating; pre-treatment of vapors	14	ND	ND	ND	ND
VAPOR-2	Zone II operating only; pre-treatment of vapors	5,200	ND	ND	36	56
VAPOR-3	Zone II operating only; after carbon treatment of vapors	ND	ND	ND	ND	ND

Probably no benzene + toluene due to higher detection limits

NOTES
ND: Not Detected (Minimum detection limit specified on original laboratory report forms presented in the Appendix)

5.0 SYSTEM PERMITTING

As required by prevailing regulations, prior to starting the sparging system pilot test, the BAAQMD was notified in writing. A copy of the notification letter is presented in the Appendix.

On March 27, 1996 an application for an accelerated permit to operate was submitted, along with the associated fees, to BAAQMD. Per a discussion with Robert Cave of BAAQMD on March 27th, full scale operation of the system was authorized to begin. A copy of the BAAQMD permit to operate the groundwater sparging system is presented in the Appendix.

6.0 CONCLUSIONS

Results of the pilot test indicate that the groundwater sparging/soil vapor extraction system is adequately designed to successfully remove residual volatile contaminants from the soil and groundwater below the WPC site. The conclusions of the pilot test are summarized below.

1) The groundwater sparging/vapor extraction system is capable of enhancing remediation of volatile contaminants from the soil and groundwater below the site.

2) Volatiles are removable from the subsurface by utilizing the vapor extraction portion of the system alone, however, volatile extraction rates are increased significantly when the groundwater sparging system is used in conjunction with the vapor extraction system.

3) The volatile removal rate from groundwater follows a general trend over time. Volatile contaminant levels tend to reach a maximum concentration after a period of operation (generally 30 minutes to 2 hours) and then gradually drop back down before reaching an equilibrium concentration. This is demonstrated by the volatile concentration curves presented in Tables 1 through 6.

4) Base line volatile removal concentrations have been determined for each remedial zone below the site.

5) The zones that were found to exhibit the highest contaminant removal rates during operation of the sparging system are consistent with the areas observed to have the most residual contamination during previous site investigation and remedial excavation activities.

6) Contaminant removal rates were observed to be highest in Zones II, V and VI.

7) It appears that the sparging system will adequately mitigate residual soil and groundwater contamination present in the area of the former gasoline tank cluster to acceptable levels for regulatory closure.

8) It is anticipated that the system will require approximately six months of continual operation to adequately mitigate the contamination in the subject areas.

7.0 RECOMMENDATIONS

West and Associates Environmental Engineers recommends the start up of full scale operation of the air sparging/soil vapor extraction system by April 1, 1996. The system should be operated as follows:

- The system should be operated initially 24 hours per day and volatile extraction should be focused on Zones II, V and VI initially.
- The system should be monitored at least 2 times per week following start-up and adjusted during each site visit to maintain the highest contaminant removal rates.
- The system should be adjusted periodically to remediate contamination from all seven zones.

It is anticipated that over time, contaminant concentrations will be significantly reduced in the vapor recovery air stream, at which time it may be beneficial to operate the system on a timed schedule (ie. 2 hours per day) to allow for volatile recharge below the site and to minimize operating and monitoring resources.

8.0 MAINTENANCE AND MONITORING

Specific maintenance and monitoring items associated with the operation of the groundwater sparging and vapor extraction system are summarized in Table 8. The recommended frequency of maintenance and monitoring is also presented.

TABLE 8
MAINTENANCE AND MONITORING OF REMEDIATION SYSTEM
WEYERHAEUSER PAPER COMPANY
ALAMEDA CALIFORNIA

Item No.	Maintenance/Monitoring Item	Approximate Frequency
1	Drain water from moisture collection chamber (store water in on-site drum)	2 times/week
2	Inspect/clean air filter on sparge system air supply line	1 time/week
3	Collect vapor readings from all air sample ports utilizing a field PID	1 time/week
4	Adjust valve controls on sparge line and SVE manifolds	As needed based on field PID readings of vapors
5	Change out spent carbon vessels	As needed based on field PID readings, two change outs anticipated for duration of project
6	Groundwater Monitoring	Quarterly; May 96, August 96, November 96, February 97, May 97

Table 9 presents the estimated time frames of future site activities through closure.

TABLE 9
PROJECTED TIME SCHEDULE FOR REMEDIATION SYSTEM OPERATION
WEYERHAEUSER PAPER COMPANY
ALAMEDA CALIFORNIA

Activity	Estimated Time Frame
Remedial system operation; 24 hr/day basis	April 1996 - July 1996
Remedial system operation; timed schedule basis (ie. 2 hrs/day)*	August 1996 - September 1996
Quarterly groundwater monitoring	January 1996 - May 1997
Closure request submitted to Alameda County	May 1, 1997
Closure granted by county	June 1997
Monitoring well and remediation system abandonment	July 1997

* - The necessity of a timed operation schedule will be further evaluated once volatile concentrations are observed to decrease. System performance may prove to be more efficient if operated continually on 24 hr/day basis.

960053

WEST ASSOCIATES
ENVIRONMENTAL ENGINEERS, INC.

WORK ORDER
CHAIN OF CUSTODY RECORD

DATE MAR. 19, 1996 PAGE 1 OF 1

PHONE: (707) 451-1360 ▪ P.O. BOX 5891, VACAVILLE, CALIFORNIA 95696

CLIENT'S NAME: WEST & ASSOCIATES, INC.	PROJECT MANAGER: B. Mahoney
STREET ADDRESS: PO BOX 5891, CITY: VACAVILLE, STATE: 95696 ZIP	PHONE NUMBER: 707-451-1360
PROJECT NAME: WPC - ALAMEDA	FAX NUMBER: 707-447-0631
CONTRACT/PURCHASE ORDER/QUOTE NUMBER: WPC	SITE CONTACT
SIGNATURE OF PERSON AUTHORIZING WORK UNDER TERMS STATED ON REVERSE SIDE OF THIS FORM: Brennan Mahoney	SAMPLED BY: Brennan Mahoney

ANALYSES

SAMPLE CONDITION ON RECEIPT:

COLD/ICED? _____

BUBBLES OR AIR SPACE? _____

WERE SAMPLES PRESERVED? _____

SAMPLE NUMBER/IDENTIFICATION	DATE	TIME	LAB SAMPLE NUMBER	SAMPLE TYPE: LIQ	AIR	SOLID	SLUDGE	SEDIMENT	NO. OF CONTS.	TPH-GAS	BTEX	EXPLAIN IRREGULARITIES BELOW
VAPOR 1	3/19/96	10:25	A0396494						1	✓	✓	AIR SAMPLE - RUN
VAPOR 2	3/19/96	11:15	A0396495						1			- HOLD
VAPOR 3	3/19/96	11:20	A0396496						1			- HOLD

Run all samples for Gas, BTEX per conv. with Brennan Mahoney 3/20/96 JCA

RELINQUISHED BY: (SIGNATURE) Brennan Mahoney	RECEIVED BY: (SIGNATURE)	DATE: 3/19/96	TIME
RELINQUISHED BY: (SIGNATURE)	RECEIVED BY: (SIGNATURE)	DATE	TIME
RELINQUISHED BY: (SIGNATURE)	RECEIVED FOR LABORATORY BY: Patricia R. Cook	DATE: 3/20/96	TIME
METHOD OF SHIPMENT	AUTHORIZED BY:		

TURN AROUND TIME REQUESTED

SAMPLE CONTROL OFFICER

SPECIAL INSTRUCTIONS: WILL CALL ~~and~~ EXCEL CHEM ON 3/20 FOR ADDITIONAL INSTRUCTION

DRIVING TIME	SITE TIME	TOTAL TIME

SAMPLE DISPOSITION:

1. STORAGE TIME REQUESTED _____ DAY (SAMPLES WILL BE STORED FOR 30 DAYS WITHOUT ADDITIONAL CHARGE; THEREAFTER STORAGE CHARGES WILL BE BILLED AT THE PUBLISHED RATES)
2. SAMPLE TO BE RETURNED TO CLIENT? ☐ YES ☐ NO

HAZARDOUS MATERIALS ARE THE PROPERTY OF THE CLIENT. THE CLIENT IS RESPONSIBLE FOR PROPER DISPOSAL OF HAZARDOUS WASTES. CLIENTS NO PICKING UP HAZARDOUS WASTES MAY BE ASSESSED AN APPROPRIATE FEE

EXCELCHEM
ENVIRONMENTAL LABS

500 Giuseppe Court, Suite 9
Roseville, CA 95678
Phone#: (916) 773-3664 Fax#: (916) 773-4784

ANALYSIS REPORT

Attention:	Mr. Brennan Mahoney	Date Sampled :	03-19-96
	WEST & ASSOCIATES	Date Received:	03-20-96
	P.O. Box 5891	BTEX Analyzed:	03-20/21-96
	Vacaville, CA 95696	TPHg Analyzed:	03-20/21-96
Project:	WPC-Alameda	Matrix:	Air

	Benzene mg/M^3	Toluene mg/M^3	Ethyl-benzene mg/M^3	Total Xylenes mg/M^3	TPHg mg/M^3
Reporting Limit:	0.5	0.5	0.5	0.5	10
SAMPLE Laboratory Identification:					
Vapor 1 A0396494	ND	ND	ND	ND	14
Vapor 3 A0396496	ND	ND	ND	ND	ND

mg/M^3 = milligram per cubic meter.
ND = Not detected. Compound(s) may be present at concentrations below the reporting limit.

ANALYTICAL PROCEDURES

BTEX-- Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are analyzed by using modified EPA Method 8020 which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID).
TPHg--Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are analyzed by using modified EPA Method 8015, which utilizes a GC equipped with an FID.

Laboratory Representative

03-25-96
Date Reported

EXCELCHEM
ENVIRONMENTAL LABS

500 Giuseppe Court, Suite 9
Roseville, CA 95678
Phone#: (916) 773-3664 Fax#: (916) 773-4784

ANALYSIS REPORT

Attention:	Mr. Brennan Mahoney	Date Sampled :	03-19-96
	WEST & ASSOCIATES	Date Received:	03-20-96
	P.O. Box 5891	BTEX Analyzed:	03-21-96
	Vacaville, CA 95696	TPHg Analyzed:	03-21-96
Project:	WPC-Alameda	Matrix:	Air

	Benzene mg/M^3	Toluene mg/M^3	Ethyl-benzene mg/M^3	Total Xylenes mg/M^3	TPHg mg/M^3
Reporting Limit:	10	10	10	10	200
SAMPLE Laboratory Identification:					
Vapor 2 A0396495	ND	ND	36	56	5200

Higher detection limits due to high levels of gas.

mg/M^3 = milligram per cubic meter.
ND = Not detected. Compound(s) may be present at concentrations below the reporting limit.

ANALYTICAL PROCEDURES

BTEX-- Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are analyzed by using modified EPA Method 8020 which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID).
TPHg--Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are analyzed by using modified EPA Method 8015, which utilizes a GC equipped with an FID.

Laboratory Representative

03-25-96
Date Reported

WEST ASSOCIATES
ENVIRONMENTAL ENGINEERS, INC.

February 21, 1996

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109
Attn: Mr. Robert Cave

SUBJECT: NOTIFICATION OF SHORT TERM SOIL VAPOR EXTRACTION TEST, 1801 HIBBARD STR., ALAMEDA 94501 (ALAMEDA COUNTY)

Dear Mr. Cave,

West & Associates Environmental Engineers, Inc. is under contract to the Weyerhaeuser Corporation to remediate sub-surface gasoline contamination at the site named above. In order to evaluate the potential effectiveness of soil vapor recovery in conjunction with air sparging as a remedial approach for this site, we plan to conduct a short term test project. In accordance with BAAQMD policy regarding vapor extraction tests less than 5 days duration, we are providing the following notification:

1). The test will be conducted by West & Associates Environmental Engineers, Inc. PO Box 5891, Vacaville, CA 95696
2). The test program will commence on February 27, 1996 and conclude on February 29, 1996
3). The site address and zip code are listed above
4). We propose to use two Calgon Ventsorb activated carbon canisters in series to control air emissions. Each canister contains 150 pounds of new, unused, activated carbon.
5). Volatile organic gas concentrations will be monitored between the two carbon units and at the exhaust with a PhotoVac MP-1000 photoionization detector. Testing will be suspended if a detectable volatile measurement indicates contaminant breakthrough from the lead carbon canister.
6). The contact person for this test is Mr. Brian W. West PE, Project Manager; (707) 451-1360. Site telephone (707) 322-1646

Please contact me at (707) 451-1360 for any additional information.

Yours truly,

Brennan Mahoney
West & Associates Environmental Engineers, Inc.

BGM/di

WEST ASSOCIATES
ENVIRONMENTAL ENGINEERS, INC.

May 2, 1996

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109
Attn: Mr. Robert Cave

SUBJECT: CHANGE IN MONITORING SCHEDULE - SOIL VAPOR EXTRACTION, 1801 HIBBARD STR., ALAMEDA 94501 (ALAMEDA COUNTY)

Dear Mr. Cave,

In reference to Permit to Operate # 16067, for the soil vapor extraction (SVE) system at the above referenced site, West & Associates Environmental Engineers, Inc. proposes that the BAAQMD change the monitoring requirement from a daily to a weekly monitoring schedule, based on monitoring results obtained from the system to date.

The system has been operated periodically since March 19, 1996. The system has been regularly monitored during periods of operation utilizing a Photoionization Detector (PID).

A summary of the monitoring results are presented as follows:

Pre-carbon Air Stream - volatile organic concentrations have ranged between a low of 0 ppm and a high of 20 ppm during periods of normal operation.

Between Two Carbons in Series - Volatile organic concentrations have consistently been 0 ppm at all times.

After 2nd Carbon in Series - Volatile organic concentrations have consistently been 0 ppm at all times.

Based on the low volatile concentrations detected in the pre-carbon treatment air steam, we believe that it will take several months before breakthrough of volatiles occurs through the first carbon vessel.

The proposed monitoring schedule of one time per week should be more than adequate to identify carbon breakthrough when or if it occurs.

Please contact me at (707) 451-1360 for any additional information.

Sincerely,

Brennan Mahoney
West & Associates Environmental Engineers, Inc.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

May 2, 1996

Brennan Mahoney
West & Associates
P.O. Box 5891
Vacaville, Ca 95696

Application Number: *16067*
Equipment Location:
1801 Hibbard Street
Alameda, CA

Dear Sir:

The District has reviewed your request, dated 2 May 1996, to change the monitoring frequency from daily to weekly. Based on the information provided, a weekly (every 7 days) monitoring schedule is both reasonable from the District's perspective and will also grant your firm the flexibility requested. This determination is based on the demonstrated breakthrough period in excess of 14 calender days. A reasonable monitoring rate would be half this. Therefore, a monitoring frequency of every 7 days represents a conservative schedule to ensure that compliance is maintained. Be aware that you can monitor your system more frequently if desired.

Please keep a copy of this letter as verification that a monitoring schedule of at least once in every 7 days has been approved by the District for the site subject to P/O # 16067 (plant #2857).

If you have any questions regarding this matter, please call me at **(415) 749-5048.**

Very truly yours,

Robert Cave
Air Quality Engineer
Permit Services Division

REC:rkt

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

April 10, 1996

Weyerhauser Paper Company
c/o West Associates
P O Box 5891
Vacaville CA 95696

Attention: Brennan Mahoney

Application Number: 16067
Equipment Location:
1801 Hibbard Street
Alameda CA

Dear Applicant:

Enclosed is your Permit to Operate the following:

S-100 Soil Vapor Extraction System consisting of a vacuum blower not to exceed 40 scfm operating capacity, and ancillary equipment abated by A-100 two (160 lb minimum capacity) Carbon Adsorption Vessels arranged in series

All Permits should be posted in a clearly visible and accessible place on or near the equipment to be operated, or kept available for inspection at any time.

Operation of this equipment in violation of District Regulations or any permit conditions is subject to penalty action.

In the absence of specific permit conditions to the contrary, the throughputs, fuel and material consumptions, capacities and hours of operation described in your permit application will be considered maximum allowable limits. A new permit will be required before any increase in these parameters, or change in raw material handled may be made.

Please include your permit number with any correspondence with the District. If you have any questions on this matter, please call, Robert Cave, Air Quality Engineer I at (415) 749-5048.

Very truly yours,

John F. Powell
Acting Air Pollution Control Officer

by _____
Permit Services Division

BB:RC:es
Enclosures

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

PERMIT TO OPERATE No. 16067

PLANT No. 2857
SOURCE No. 100

WEYERHAUSER PAPER COMPANY

IS HEREBY GRANTED A PERMIT TO OPERATE THE FOLLOWING EQUIPMENT:

Soil Vapor Extraction System consisting of a vacuum blower not to exceed 40 scfm operating capacity, and ancillary equipment abated by A-100 two (160 lb minimum capacity) Carbon Adsorption Vessels arranged in series

LOCATED AT: 1801 Hibbard Street
Alameda CA

CONDITIONS: **Yes** (*All permit conditions must be complied with at all times**)

If yes, see attached *Condition No.*: **13744**

JOHN F. POWELL
ACTING AIR POLLUTION CONTROL OFFICER

Date: April 10, 1996

By _____
Permit Services Division

EXPIRATION DATE: March 28, 1997

THIS PERMIT DOES NOT AUTHORIZE ANY VIOLATION OF THE RULES AND REGULATIONS OF THE BAAQMD OR THE HEALTH AND SAFETY CODE OF THE STATE OF CALIFORNIA. THIS PERMIT IS NOT TRANSFERABLE TO ANOTHER PERSON WITHOUT APPROVAL FROM THE DISTRICT.

* ***Compliance with conditions contained in this permit does not mean that the permittee is currently in compliance with District Rules and Regulations. It is the responsibility of the permittee to have knowledge of and be in compliance with all District Rules and Regulations.***

COND# 13744 ----------

1. Source S-100 shall be vented at all times to A-100, at least two (160 lb minimum capacity) activated carbon vessels arranged in series. Influent vapor flow shall not exceed 40 scfm.
2. The operator of this source shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the District's Source Test Manager at the following locations:
   a. At the inlet to the second to last carbon vessel in series.
   b. At the inlet to the last carbon vessel in series.
   c. At the outlet of the carbon vessel that is last in series prior to venting to the atmosphere.

   When using an FID to monitor breakthrough, readings may be taken with and without a Carbon filter tip fitted on the FID probe. Concentrations measured with the Carbon filter tip in place shall be considered methane for the purpose of these permit conditions.
3. These monitor readings shall be recorded in a monitoring log at the time they are taken. The monitoring results shall be used to estimate the frequency of Carbon change-out necessary to maintain compliance with conditions number 4 and 5, and shall be conducted on a daily basis. The operator of this source may propose for District review, based on actual measurements taken at the site during operation of the source, that the monitoring schedule be changed based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels. Written approval by the District's Permit Services Division must be received by the operator prior to a change to the monitoring schedule.
4. The second to last Carbon vessel shall be changed out with unspent Carbon upon breakthrough, defined as the detection at its outlet of the higher of the following:
   a. 10 % of the inlet stream concentration to the Carbon vessel.
   b. 10 ppmv (measured as C1).
5. The last Carbon vessel shall be changed out with unspent Carbon upon detection at its outlet of 10 ppmv (measured as C1).
6. The operator of this source shall maintain the following records for each month of operation of the source:
   a. The hours and times of operation.
   b. Each monitor reading or analysis result for the day of operation they are taken.
   c. The number of Carbon beds removed from service.

   All measurements, records and data required to be maintained by the operator shall be retained and made available for inspection by the District for at least two years following the date the data is recorded.
7. Any exceedance of conditions number 4 and/or 5 shall be reported to the Permit Services Division with the log as well as the corrective action taken. The submittal shall detail the corrective action taken and shall

include the data showing the exceedance as well at the time of occurrence.

8. Upon final completion of the remediation project, the operator of Source S-100 shall notify the Permit Services Division within two weeks of decommissioning the operation.