WEST ASSOCIATES
ENVIRONMENTAL ENGINEERS, INC.

September 25, 1995

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 PROPOSED SOIL REMEDIATION WORKPLAN, WEYERHAEUSER PAPER COMPANY, ALAMEDA CORRUGATED BOX FACILITY, 1801 HIBBARD STR., STID 1202

Dear Ms. Shin,

West & Associates Environmental Engineers, Inc. respectfully submits our proposed workplan for soil remediation at the Weyerhaeuser Paper Company, Alameda Corrugated Box Facility. Included also in this workplan is a proposal to construct an air sparging grid for the future remediation of groundwater contamination.

We would appreciate your immediate attention to the review of this workplan due to the few remaining weeks of favorable aeration weather left this season. Should you require any additional information please contact me at (707) 451-1360.

Yours truly,

Brian West

Brian W. West PE
Principal
West & Associates Environmental Engineers, Inc.

BWW/es
Enclosure: Soil Remediation Workplan

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

PHONE: (707) 451-1360 • P.O. BOX 5891, VACAVILLE, CALIFORNIA 95696
Fax#: (707) 447-0631

VOLUME I
SITE INVESTIGATION REPORT
FORMER UNDERGROUND TANK SITES

WEYERHAEUSER PAPER COMPANY
ALAMEDA CORRUGATED BOX FACILITY
1801 Hibbard Street
Alameda, California
STID 1202

Submitted to:

ALAMEDA COUNTY
HEALTH CARE SERVICES AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
Alameda

Prepared for:

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

Prepared by:

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS, INC.
Vacaville

January, 1995

EXECUTIVE SUMMARY

The Weyerhaeuser Paper Company (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. The last remaining underground tank was removed from the WPC site in January 1994.

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.

Three separate former underground tank locations are addressed in this report. These are designated as: 1). 1991 diesel tank; 2). 1991 gasoline tank cluster and 3). 1994 diesel tank. The year designation refers to the date of underground tank system removal.

The 1991 diesel tank was located at the east end of the site. The single wall steel tank was of 10,000 gallon capacity. Upon removal, minor contamination was noted in pit water. In December 1992 a groundwater monitoring well (MW-7) was installed next to the former tank pit. Periodic monitoring of MW-7 has detected minor groundwater contamination on an intermittent basis.

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.

The 1994 diesel tank was the most modern installation at the WPC facility. It was removed as a part of the Weyerhaeuser corporate program to eliminate all underground hazardous materials storage. No soil or groundwater contamination has been traced to the 1994 diesel tank.

Soil Tech Engineering, Inc. (STE) performed a series of site investigations at the WPC facility beginning in 1991. In January 1992 STE completed a preliminary site investigation at the 1991 gasoline tank cluster which resulted in the construction of 3 groundwater monitoring wells (MW-1, 2 & 3).

In May 1992 STE completed a subsequent site investigation resulting in the construction of 3 additional groundwater monitoring wells (MW-4, 5 & 6). In January 1993 STE constructed one groundwater monitoring well (MW-7) next to the 1991 diesel tank site. One three occasions (August 1992, April 1993 & November 1993) STE performed quarterly groundwater monitoring.

EXECUTIVE SUMMARY Con't.

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'. It has been determined that soil contamination extends considerably further than the final overexcavation dimensions in the west, north and south directions.

Throughout 1994, West & Associates Environmental Engineers, Inc. conducted further site investigations at the 1991 gasoline tank cluster study area and performed quarterly groundwater monitoring. In January 1994 three additional groundwater monitoring wells (MW-8, 9 & 11) were installed as were a number of soil borings. A soil boring completed in September 1994 confirmed both soil and groundwater contamination under the main plant building, south of the former 1991 gasoline tank cluster.

In December 1994 one last groundwater monitoring well (MW-12) was installed through the floor of the main plant building, 20 feet inside the building footprint. Both soil and groundwater were uncontaminated at location MW-12 indicating the contaminant plume had finally been delineated on all sides.

Soil and groundwater contamination at the WPC site in the vicinity of the 1991 gasoline tank cluster is in excess of usually accepted limits. Remedial measures are needed to reduce contaminant levels to closure standards. Excavation is not a practical option at the WPC site due to the interfering presence of underground utilities and the main plant building.

Groundwater sparging combined with soil vapor extraction is proposed as a remedial measure at the WPC site. Three factors make this approach attractive: 1). the principal contaminant is gasoline having a high volatility; 2). contamination is shallow; & 3). site soils are predominantly permeable sand.

It is proposed to conduct a pilot test program to determine the effectiveness of sparging combined with soil vapor extraction at the WPC site and, if favorable, to generate full scale system design data. The results of the pilot test program will be submitted in the form of a written report containing a detailed proposal for implementation of remedial measures.

It is also proposed to implement an interim groundwater monitoring program pending startup of full scale remediation. Monitoring and reporting are proposed based on a quarterly schedule.

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 Ms. Jennifer Strachan, mail stop CH 1K29, Tacoma, WA 98477; (206) 924-6511.

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.

In the preparation of this workplan reliance was made on past site work performed by Soil Tech Engineering, Inc. Material in this workplan taken directly from a Soil Tech report is so noted. Mr. Frank Hamedi was the Soil Tech Engineering employee most closely associated with the Weyerhaeuser Alameda site. The address for Soil Tech Engineering is 298 Brokaw Road, Santa Clara, CA 95050; (408) 496-0265.

Analytical work performed during this site investigation was sub-contracted to Coast to Coast Analytical (which merged with Pace Analytical in July 1994). Both Coast to Coast and Pace are certified by the State Department of Health Services for the analyses performed.

Drilling services performed during this site investigation were sub-contracted to Exploration Geoservices in San Jose. Exploration Geoservices has a valid California C57 specialty contractors license.

This workplan was prepared by West & Associates Environmental Engineers, Inc. West & Associates is located at 112 Pepperell Court, Vacaville, CA 95688; mailing address, PO Box 5891, Vacaville 95696; (707) 451-1360. Principal author is Mr. Brian W. West PE. (Registered California Civil Engineer No. 32319 - expires 12/31/96).

WEST ASSOCIATES

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STATEMENT OF LIMITATIONS

The discussion, conclusions and recommendations resulting from this site investigation are based upon a limited amount of sub-surface exploration. It is assumed that soil and groundwater conditions do not deviate significantly from those encountered during the investigation.

Reliance was made on work performed by a previous environmental consultant. Their work appears to have been completed in a competent and professional manner to prevailing industry standards.

All sub-surface work was performed for the purpose of assessing possible soil and groundwater contamination. The results of this investigation should not be used for any other purpose.

This investigation took place during a limited time frame. Site characteristics can change with the passage of time due to both natural and manmade processes. It should be understood that subsequent investigation may encounter altered conditions.

The results of this investigation are based, in large part, on work performed by an independent testing laboratory. The laboratory used is certified by the State Department of Health Services for the analyses performed. Analytical results are presumed to accurately reflect site conditions.

1.0 INTRODUCTION

This report describes results of a series of site investigations completed at the Weyerhaeuser Paper Company (WPC) Alameda Corrugated Box Facility, at 1801 Hibbard Street. Site investigations have been undertaken at three, separate, former underground tank locations. In this Section, the project scope and objectives are described along with a summarized presentation of selected background material.

1.1 Scope

This report is an integrated presentation of results from five separate site investigations performed between January 1992 and December 1994. Included in the scope of this report are descriptions of methods, equipment and techniques used to perform sub-surface and hydrologic investigations including chemical testing.

Three separate study areas at the WPC facility are included in the scope of this report. The three study areas are:

1. Underground gasoline tank cluster (three, 1,000 gallon tanks) removed in 1991
2. Underground diesel tank installation (one, 10,000 gallon tank) removed in 1991
3. Underground diesel tank installation (one, 20,000 gallon tank) removed in 1994

Specific scope items described in this report include:

- Completion of soils borings and associated soil sampling
- Construction of groundwater monitoring wells
- Monitoring of new and existing groundwater wells
  - Depth to groundwater measurements
  - Groundwater sample collection
- Laboratory analysis of soil and groundwater samples
- Hydrologic analysis

The scope of this report also includes a description of proposed measures to remediate both soil and groundwater contamination known to exist at one of the former underground tank locations (1991 gasoline tank cluster).

1.2 Objectives

It is the objective of the Weyerhaeuser Corporation to comply with all local, Regional, State and Federal regulations pertaining to environmental protection and remediation. The overall objective of investigative work at the three former WPC underground tank installations is to develop sufficient technical data to design an effective and efficient remediation program.

The specific objectives of site investigations completed at the WPC site include:

- Fully define the extent of soil contamination near the 1991 gasoline tank cluster
- Develop a specific plan to remediate soil contamination
- Fully define the extent of groundwater contamination near the 1991 gasoline tank cluster
- Acquire hydrologic data allowing the selection of an appropriate groundwater remediation approach
- Assess the magnitude of groundwater contamination near the 1991 diesel tank installation

No soil or groundwater contamination has ever been traced to the underground diesel tank removed in 1994. Contamination from the 1991 gasoline tank cluster overlaps the 1994 diesel tank study area, however. It is the objective of this report to document site conditions in the 1994 diesel tank vicinity.

1.3 Summarized Background

The Weyerhaeuser Paper Company (WPC) Alameda facility at 1801 Hibbard Str. manufacturers corrugated cardboard boxes. The facility was originally constructed in 1946. Underground fuel tanks (UGT) had been historically installed at the facility for vehicle, generator and boiler fuel storage. Both gasoline and diesel fuels were formerly stored. The last remaining UGT was removed from the WPC site in January 1994.

At the end of 1990 the WPC facility was equipped with five underground fuel storage tanks. The five tanks were distributed in three separate installations located along the northwestern side of the facility.

In early 1991 Weyerhaeuser removed a cluster of three, 1,000 gallon gasoline tanks and one, 10,000 gallon diesel tank. Upon removal, the 10,000 gallon diesel tank installation was found to be virtually uncontaminated, however, significant soil and groundwater contamination was encountered at the gasoline tank cluster location.

The tank removal contractor performed overexcavation at the gasoline tank cluster location in an attempt to remediate soil contamination. Between February and April 1991 the tank excavation was enlarged from 460 ft^2 to 640 ft^2 and then to 930 ft^2.

Four soil samples were collected from the gasoline tank cluster pit sidewalls at the conclusion of overexcavation. Only one endpoint sidewall soil sample (Sample No. 11) was non-detectable for all tested chemical constituents. One of the sidewall soil samples (Sample No. 9)

was found to contain only trace levels of toluene. The other two endpoint soil samples (Sample No.'s 8 & 10), were found to contain low levels of TPH and BTXE compounds.

During the time the gasoline tank cluster excavation was open, the standing groundwater level in the pit was observed to rise from greater than 8 feet to less than 4 feet below ground surface. As the pit water level rose, presumably overexcavation became more difficult. The file record indicates endpoint soil samples were collected from higher on the pit sidewalls as the water level rose.

Both the gasoline tank cluster and diesel tank excavations were backfilled with clean soil. Contaminated soil was transported to off-site disposal.

In December 1991 and again in April 1992, Soil Tech Engineering performed soils and groundwater investigations near the former gasoline tank cluster. A total of six groundwater monitoring wells were installed. Soil samples for laboratory analysis were collected during monitoring well installation. Between December 1991 and July 1993 Soil Tech performed groundwater monitoring on six occasions.

In December 1992, Soil Tech constructed one monitoring well (MW-7) adjacent to the former underground diesel tank, increasing the total number of site wells to seven. STE monitored MW-7 a total of 3 times.

Soil Tech's investigations revealed significant remaining soil contamination as well as widespread groundwater contamination in the vicinity of the former gasoline tank cluster. The six soil borings and monitoring wells completed by STE did not fully define the total extent of either soil or groundwater contamination around the former gasoline tank cluster.

In January 1994 the last remaining underground fuel storage tank, (20,000 gallon diesel) was removed from the WPC property. No evidence of any leakage from the diesel tank was encountered, however, soil contamination from the 1991 gasoline tank cluster was observed on the west sidewall of the diesel tank pit.

West & Associates Environmental Engineers submitted a proposed workplan for additional site investigation to the Alameda County Health Care Agency in November 1993. Site investigations were performed in January and February 1994. In May 1994 a supplemental workplan was submitted to conduct further investigation under the main plant building. In June 1994 an interim report of findings was submitted and in October 1994 clarifications to the May supplemental workplan were submitted to the County. Final site investigation field work took place in September and December 1994.

2.0 SITE CHARACTERISTICS

In this Section, physical characteristics pertinent to the proposed site investigation are presented.

2.1 Site Location

The Weyerhaeuser Paper Company, Alameda Corrugated Box facility address is 1801 Hibbard Street. The property is on the northeast corner of Hibbard and Buena Vista Streets. The site is in the city of Alameda and within the County of Alameda. Alameda is in the San Francisco Bay Water Quality Control Region. The WPC site appears on the Oakland West 7.5' USGS topographic map quadrangle.

Figure 2-1 illustrates the WPC regional setting. The immediate site vicinity is presented in Figure 2-2. Figure 2-3 illustrates the three separate study areas at the WPC site.

2.1 Topography and Surface Runoff

The WPC site is on an island in San Francisco Bay. Ground surface at the project site is only about 15 feet above mean sea level.

The Weyerhaeuser Alameda facility site and surrounding terrain are essentially flat. There is a slight slope from west to east, ie towards the Oakland Inner Harbor. The site and surrounding property are completely developed. The area contains a mix of industrial, commercial and residential land use.

Drainage in and around the project site has been modified to promote runoff to storm drains emptying directly into the Oakland Inner Harbor. The harbor shoreline is less than 0.25 miles east of the WPC property.

2.2 Soils

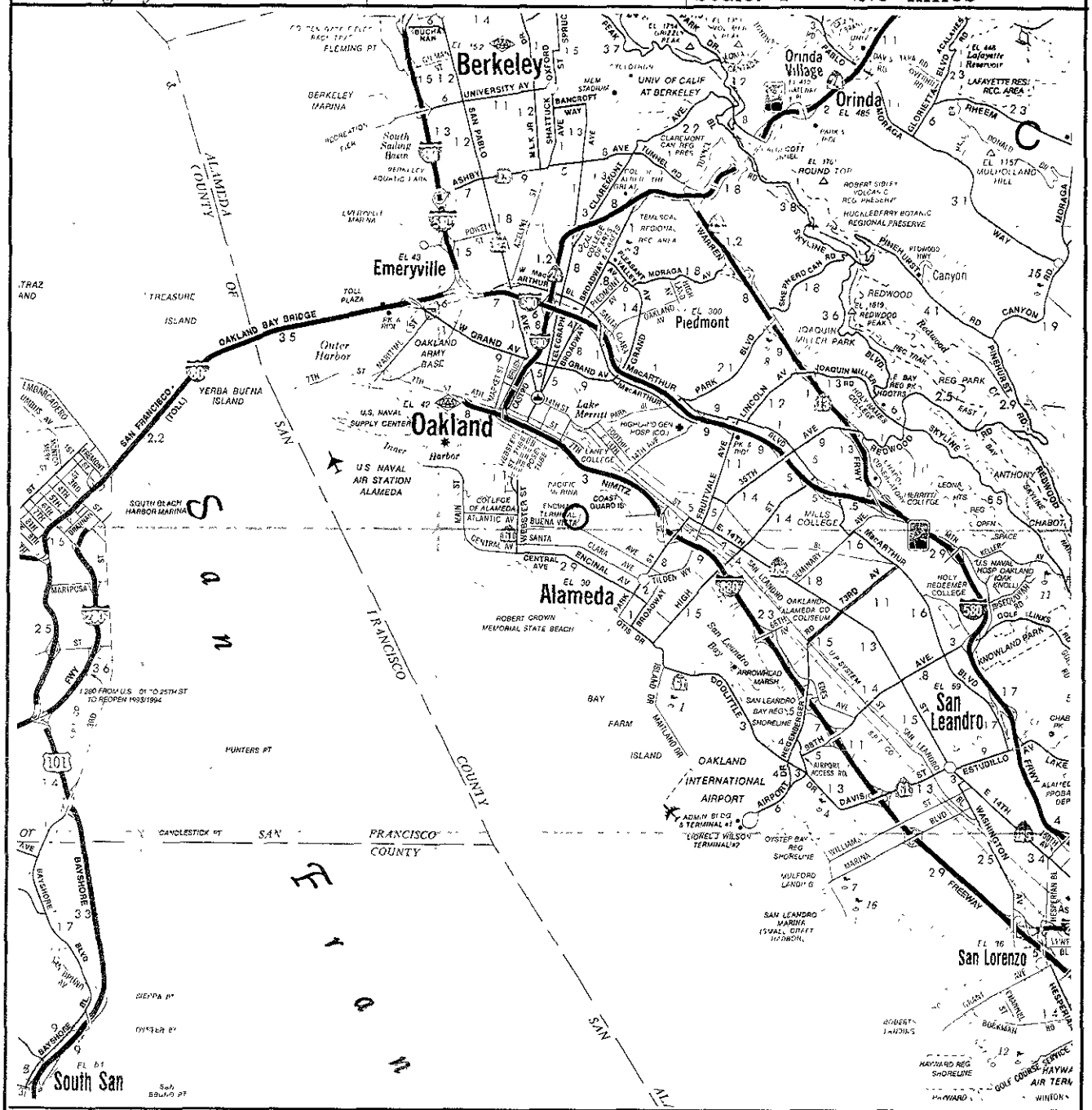
Shallow soil characteristics at the WPC site are well known due to the many borings completed during site investigation. Horizontally, soil conditions throughout the 1991 gasoline tank cluster study area are fairly uniform. Site soils are predominantly fine grained silty sands with minor clay stringers. WPC soil is falls into the CL classification based on the USCS system. The prevalence of clay increases slightly from north to south.

Vertically, soil conditions under the WPC site are also fairly uniform, although it is only possible to retrieve representative soil samples down to about 12 feet BGS due to groundwater conditions. Vertical pit sidewalls were observed to be quite stable during the 1994 diesel tank removal and it has been noted that borings remain open after auger removal, at least in the vadose zone.

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 2-1

WPC ALAMEDA FACILITY - REGIONAL SETTING

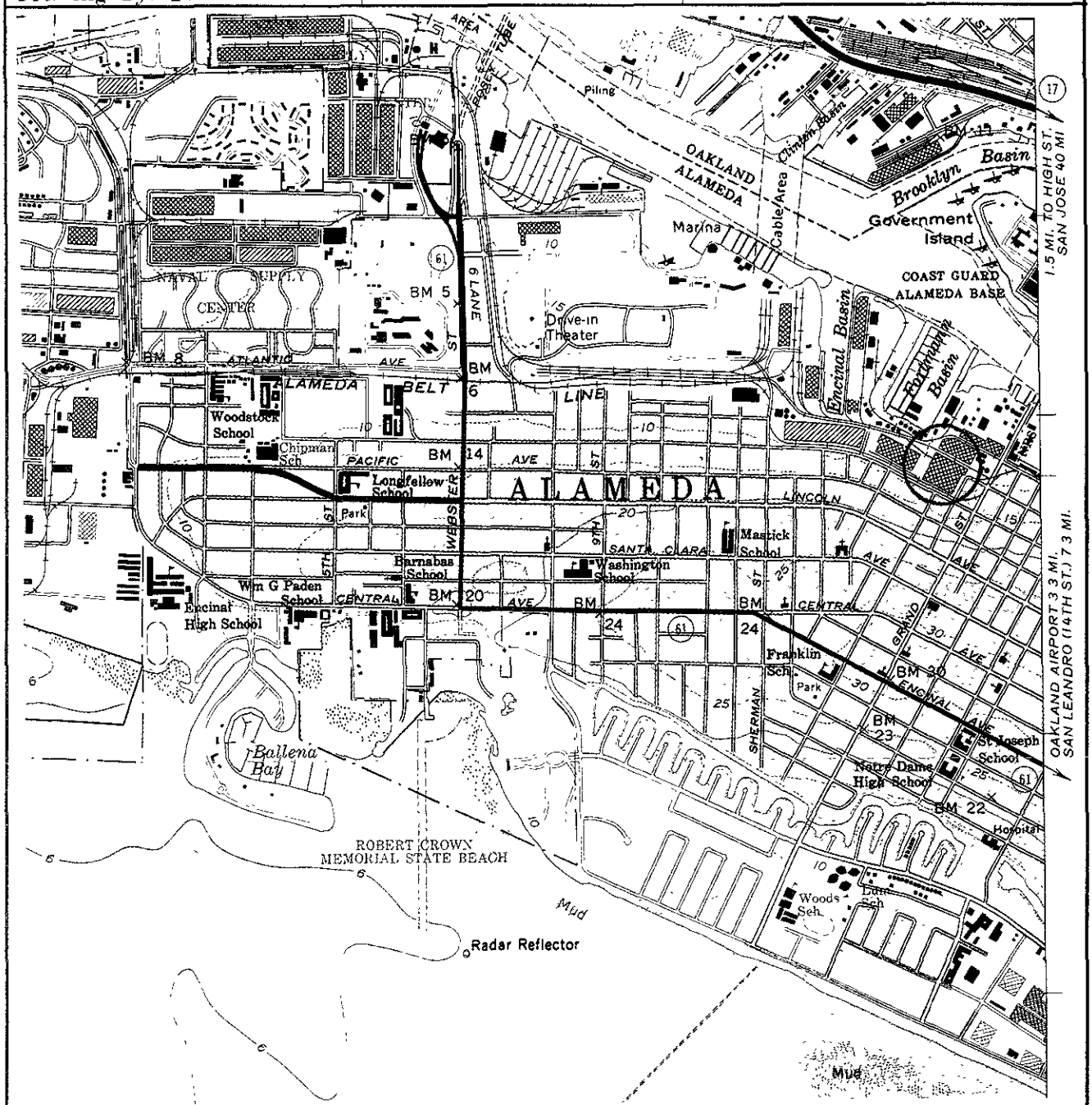
WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS, INC.

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

O SITE LOCATION

Figure 2-2

WPC ALAMEDA FACILITY - SITE LOCATION

WEST & ASSOCIATES ENVIRONMENTAL ENGINEERS, INC.

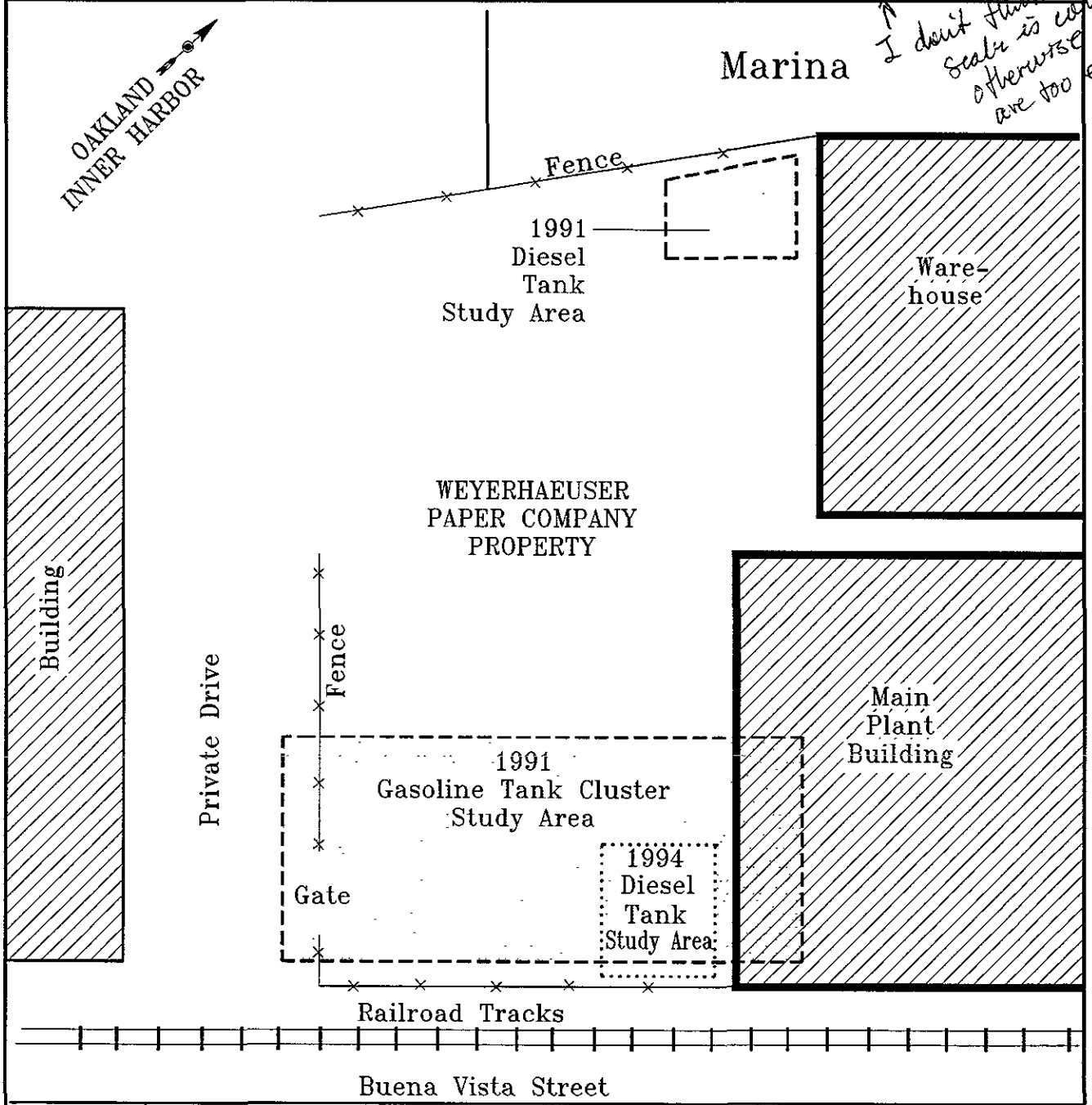
PO Box 5891, Vacaville, California 95696

Project Name: WPC ALAMEDA FACILITY | Date: Jan. 1995

Location: 1801 Hibbard Str., Alameda, California 94501

Drawing By: BWW | Scale: 1" = 100'

I don't think this scale is correct, otherwise tank pits are too enormous



LEGEND

Figure 2-3

SITE INVESTIGATION STUDY AREAS

2.3 Hydrology

Groundwater is shallow under the Weyerhaeuser Alameda site. Depth to groundwater has been measured as shallow as 2.12 feet (well MW-7, January 8, 1993) BGS and as deep as 8.14 feet BGS (well MW-6, July 31, 1992). Groundwater becomes shallower as one approaches the Oakland Inner Harbor (east of the facility). In general, groundwater levels under the site exhibit the expected seasonal variation of rising during the winter and spring, then falling during the summer and fall.

Soil Tech Engineering computed a groundwater gradient direction on six occasions; once using three wells (MW-1,2 & 3); twice using six wells (MW-1 - MW-6); and three times using data from all seven wells. The calculated gradient direction has varied as much as 55° if the first measurement (three wells in December 1991) is included or as much as 30° if the first measurement is neglected.

The groundwater gradient direction under the Weyerhaeuser Alameda site is generally to the west. The calculated gradient direction has ranged from a compass heading of 235° to 290°. Monitoring well MW-3 should be in the upgradient direction, with respect to the former gasoline tank cluster, based on these gradient direction calculations.

Observed differences in groundwater elevation between adjacent monitoring wells is surprisingly great considering the topography, homogeneous soil strata, low elevation above mean sea level and close proximity of the Weyerhaeuser site to San Francisco Bay. For instance, there is a consistent differential of one foot in groundwater elevation between monitoring wells MW-5 and MW-6, despite the fact they are only 35 feet apart.

It has been noted that groundwater under the WPC site is slightly confined. Soil borings completed 1-2 feet below the piezometric surface are consistently dry. Once the top of the saturated zone is penetrated, groundwater rises rapidly within the boring.

3.0 SITE INVESTIGATION

The site investigation performed at the WPC facility was essentially performed as proposed in "Proposed Site Assessment Workplan, Weyerhaeuser Paper Company, Alameda Corrugated Box Facility" dated November 1993. In this Section, a summary of investigative methods used during the site investigation is presented. Investigative results are presented in Section 4, Contaminant Profile.

3.1 Soil Sampling

Site investigation was conducted to fully define the extent and magnitude of soil contamination.

Objectives

- Define the lateral and vertical extent of soil contamination
- Identify potential non-gasoline contaminants
- Acquire data to design an effective and efficient remediation

Scope

- Complete soils borings and associated soil sampling
- Analyze soil samples in a DHS certified testing laboratory
- Abandon borings not intended as monitoring wells

Approach

A total of twelve soil borings were completed in the course of the site investigation. Ten of the borings were completed in January 1994 (B-1, B-2, B-3, B-4, B-5, B-MW8, B-MW10, MW-9, MW-10 & MW-11), one of the borings (SB-2) was completed in September 1994 and one boring (MW-12) was completed in December 1994. All borings with the exception of SB-2 were completed utilizing a powered continuous flight auger. Boring SB-2 was a hand augered boring angled under the building foundation.

All borings (with the exception of SB-2) were completed utilizing a powered, continuous flight, hollow stem auger drill rig. Boring SB-2 was completed utilizing a hand auger. Undisturbed soil samples were collected using a split spoon sampler fitted with new brass inserts. Drilling and soil sampling specifications complied with State Water Board and "Tri-Regional Board Staff Recommendations For Preliminary Evaluation and Investigation of Underground Tank Sites".

All borings were logged by a civil engineer licensed in California. Boring logs for each hole are presented in the Appendix.

During the drilling process, both soil cuttings and core samples were field screened for the presence of obvious contamination. Field screening was performed by visual inspection, the presence of odor and with a calibrated photoionization detector (PID).

Borings were continuously sampled from 2 feet BGS to the capillary fringe at about 12 feet BGS. All soil samples were sealed, labeled, chilled and entered on a chain of custody form as specified in the workplan. Soil samples were transferred to Coast to Coast Analytical for laboratory testing. Selected samples were discreetly analyzed for TPH in the gas/kerosene/diesel range and BTXE by EPA method 8260, GC/MS and total oil & grease by EPA method 5520. Selected soil samples were also tested for semi-volatile chlorinated organics by EPA method 8270 and heavy metals (Cr, Cd, Pb, Zn & Ni). Minimum detection limits were in conformance with specifications as listed in the Tri-Regional Guidelines.

Soil cuttings were containerized, labeled and stored on-site pending receipt of laboratory analysis and arrangements for proper disposal. Each boring not converted to a groundwater monitoring well was abandoned filling with hydrated bentonite hole plug.

3.2 Monitoring Wells & Groundwater Sampling

Groundwater investigation was performed through the construction of monitoring wells and the collection of groundwater samples.

Objectives

- Define the extent of contaminated groundwater
- Identify any non-gasoline groundwater contaminants
- Acquire hydrologic data sufficient to select an appropriate remedial approach

Scope

- Obtain monitoring well construction permits
- Convert four soil borings into groundwater monitoring wells
- Develop new monitoring wells
- Collect groundwater samples from all monitoring wells
- Analyze groundwater samples for contaminants of interest
- Survey monitoring well locations horizontally and vertically
- Make precise depth to groundwater measurements and perform hydrologic analysis

Approach

Monitoring well construction work at the WPC Alameda facility was performed under two separate permit authorizations. Both permits were issued by the Alameda County Flood Control and Water Conservation District, Zone 7. Permit No. 93693, issued December 15, 1993, authorized construction of wells No. 9, 10 & 11. Permit No. 94719, issued November 7, 1994, authorized well No. 12.

Four soil borings were converted into permanent groundwater monitoring wells. The new wells are coded: MW-9, MW-10, MW-11 & MW-12. No well was coded MW-8 in order to maintain consistency with the workplan.

Each groundwater monitoring well was constructed to State and Tri-Regional guidelines. Well casing is 4" diameter, schedule 40 PVC. A well screen slot size of 0.020" was used. The filter pack consists of Monterey No. 3 sand. Cement/bentonite grout was used for the sanitary seal. Each well top is protected with a water tight, locking cap and traffic rated steel cover.

Completed monitoring wells were developed by surging and pumping. A surge block was used to churn the water column. After surging, the wells were de-watered with a high capacity submersible pump. The development process was continued until visible turbidity was absent. Purge water was containerized on site pending receipt of laboratory analyses and arrangement for proper disposal.

All new and existing well tops were surveyed. Both horizontal and vertical coordinates were established. Well locations were surveyed horizontally to an accuracy of 0.10 feet. Well tops were surveyed vertically to an accuracy of 0.01 feet.

Both new and existing groundwater wells were monitored. Monitoring at each well will consist of checking for floating product, measuring depth to groundwater and groundwater sample collection.

A period of at least one week was allowed to elapse between new well development and groundwater sampling to allow for well stabilization. Important elements of monitoring well sampling include:

- Test for floating product by bailing with a transparent bailer
- Measure depth to groundwater with an electronic sounding probe
- Purge at least 3 well volumes of water prior to sample collection
- Monitor and record groundwater temperature, ph and conductivity while purging
- Avoid cross-contamination during sample collection

Purge data forms were used to record groundwater parameters during the sampling process. Purge data forms for each monitoring cycle are presented in the Appendix.

Groundwater samples were analyzed in a testing laboratory certified by the State DHS. During the course of the site investigation groundwater samples from each well were analyzed for:

- TPH - gas/kerosene/diesel
- Oil & Grease
- BTXE
- Volatile chlorinated organics
- Semi-volatile chlorinated organics
- CAM 17 Metals

Minimum detection limits comply with the most recent Tri-Regional guidelines and are specified for each chemical constituent on the original laboratory report forms appearing in the Appendix.

TABLE 4-1
SOIL CONTAMINANT CONCENTRATIONS
TANK REMOVAL & STE SOIL SAMPLES
1991 GASOLINE TANK CLUSTER AREA
All values in ug/kg

SAMPLE ID	TPH GAS	BENZENE	TOLUENE	XYLENES	ETHYL BENZENE
SOIL - 8	1,100	38	16	5.0	ND
SOIL - 9	ND	ND	21	ND	ND
SOIL - 10	1,200	100	19	26	21
SOIL - 11	ND	ND	ND	ND	ND
MW-2 (3')	ND	ND	ND	ND	ND
MW-2 (7')	370,000	560	1,000	6,700	1,500
MW-3 (3')	74,000	160	6	790	240
MW-3 (7')	550,000	440	1,000	8,500	1,300

NOTES

1. Sidewall soil samples SOIL-8 thru SOIL-11 collected at 4.5' BGS
2. Sample MW-3 (3') contained 1,000 ug/kg total oil & grease
3. ND: Non-detectable

Although soil removed during the overexcavation was found to contain semi-volatile chlorinated organics and heavy metals, STE did not test any soil samples for these compounds in any of their site investigations.

The presence of non-gasoline compounds in the gasoline tank cluster soils may be the result of waste oil leakage or surface spillage. Table 4-2 lists the non-gasoline compounds and concentrations detected. The soil from which samples in Table 4-2 were collected has been removed from the site. The only non-gasoline compound verified to still exist in the former gasoline tank cluster area soils is oil & grease, naphthalene and methylnapthalene. (see footnote to Table 1).

Detectable concentrations of Cadmium, Chromium, Lead, Nickel and Zinc were found in samples SOIL #1 - SOIL #7, however the measured levels were orders of magnitude less than established State Total Threshold Limit Concentration (TTLC) limits. Soluble Threshold Limit Concentration (STLC) analyses were not performed. Soil metals concentrations encountered during the West & Associates site investigation were similarly low.

LEDGEND

- Pit Sidewall Locations
- Soil Borings

MAIN PLANT BUILDING

BOILER ROOM

MACHINE SHOP

REST ROOM

OFFICES

1,200/63

MW-4 (0)

HOT WAX TANK

MANHOLE

SOIL 10

4" SS

MW-3

5400/8900

ND/1.8

MW-5

PIPE TRENCH

FIRST OVEREXCAVATION

2nd OVEREXCAVATION

3rd OVEREXCAVATION

SOIL 9

GAS TANK

GAS TANK

GAS TANK

MW-1

SOIL 11

CANOPY

OIL STORAGE BUILDING

1994 DIESEL TANK

PROPANE ENCLOSURE

ND/1.5

ND/2.6

PLATE

MW-6

SOIL 8

MW-2

200/890

1,000/54

MW-4

PIPING TRENCH

8" SEWER

BUENA VISTA ST. →

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

DISPENSER

GATE

N

N.O Samples

TPHg 18 (ppb)

PRIVATE DRIVE

WEYERHAEUSER - ALAMEDA		
SCALE: 1"= 10'	APPROVED BY:	DRAWN BY BWW
DATE: FEB. 94		REVISED
SOIL SAMPLE LOCATIONS: 1991-1993		
1801 HIBBARD ST.		DRAWING NUMBER FIG. 4-1

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

4.0 CONTAMINANT PROFILE

In the following Section, a compilation of all available data describing the contaminant profile in each study area is presented. Information from all site investigations dating back to January 1992 is included.

4.1 1991 Gasoline Tank Cluster

Both soil and groundwater contamination have been confirmed in the vicinity of the former gasoline tank cluster. Each is discussed separately in the following sub-sections.

4.1.1 Soil

Apparently, one of the three tanks formerly in the gasoline tank cluster was once used to store waste oil. Soil sampling performed during the overexcavation identified not only detectable levels of the expected gasoline compounds but also total petroleum hydrocarbons (TPH) as diesel; kerosene; oil & grease; some semi-volatile chlorinated organics; and heavy metals. Soils analysis for volatile chlorinated organics was also performed however none were detected.

High contaminant concentrations were encountered in the former gasoline tank cluster backfill. Some soil samples collected from the excavation tested as high as 3,000 PPM TPH gas and 21 PPM benzene. Based on soil sample results obtained by STE it appeared that the most highly contaminated soil had been removed during the overexcavation. Their soil sample analytical results were orders of magnitude less than those obtained from the tank bedding. However, it was observed during the most recent site investigation that standard laboratory analytical techniques resulted in soil contaminant concentrations significantly less than that measured in the field with a PID. When soil samples were re-analyzed utilizing a headspace "fuel fingerprint in air" method, significantly greater contaminant levels were measured. Apparently, STE's soil analytical results understate actual contaminant levels.

Table 4-1 presents soil analytical results from the tank excavation sidewalls and from borings completed by STE during their investigations of 1992-1993. Figure 4-1 illustrates the soil sample locations.

With reference to Figure 4-1, two soil sample anomalies are readily apparent. Sidewall sample SOIL-8, was found to contain only 1,100 ug/kg TPH compared to 370,000 ug/kg TPH for sample MW-2 (7'), although the SOIL-8 sample location is closer to the former tank cluster. ← doesn't necessarily have to be coming from tank pit

Both samples MW-3 (3' & 7') and MW-2 (7') contained much more contamination than sample SOIL-11, although the location of sample SOIL-11 is in between MW-2 and MW-3 and is closer to the former tank cluster. Apparently, the observed difficulty in accurately testing volatile compounds from sandy site soils is the cause of these discrepancies.

TABLE 4-2
TANK REMOVAL & STE SOIL SAMPLES
NON-GASOLINE SOIL CONTAMINANTS
1991 GASOLINE TANK CLUSTER
All values in mg/kg

SAMPLE ID	DIESEL	OIL & GREASE	KEROSENE	NAPHTHA-LENE	METHYL NAPTHA-LENE	BENZOIC ACID
GAS-S	22	NA	NA	NA	NA	NA
SOIL #1	ND	29	ND	2.2	2.2	ND
SOIL #2	ND	13	ND	0.7	0.8	ND
SOIL #3	ND	55	ND	2.4	1.9	ND
SOIL #4	ND	57	57	35	20	3.1
SOIL #5	ND	ND	ND	7.6	6.5	ND
SOIL #6	ND	73	17	30	27	2.8
SOIL #7	ND	ND	ND	2.0	1.5	ND

NOTES
NA: Not Analyzed
ND: Not Detected

During 1994, West & Associates completed a total of twelve soil borings in and around the 1991 gasoline tank cluster area. Ten of the borings were completed in January 1994 (B-1, B-2, B-3, B-4, B-5, B-MW8, B-MW10, MW-9, MW-10 & MW-11), one of the borings (SB-2) was completed in September 1994 and one boring (MW-12) was completed in December 1994. All borings with the exception of SB-2 were completed utilizing a powered continuous flight auger. Boring SB-2 was a hand augered boring angled under the building foundation. Figure 4-2 depicts the West & Associates soil sampling locations. Boring logs for all twelve holes are presented in the Appendix.

Boring B-1 was sited 50 feet east of the former 1991 gasoline tank cluster. No soil contamination was observed in B-1 based on field screening techniques. Soil samples from 5' & 10' BGS (B1-5 & B1-10) were submitted for laboratory analysis.

Boring B-2 was sited 25 feet northeast of the former 1991 gasoline tank cluster. No soil contamination was observed in B-2 based on field screening techniques. Soil samples from 5' & 10' BGS (B2-5 & B2-10) were submitted for laboratory analysis.

Boring B-3 was sited 20 feet north of the former 1991 gasoline tank cluster. No soil contamination was observed in B-3 based on field screening techniques. Soil samples from 5' & 11.5' BGS (B3-5 & B3-11.5) were submitted for laboratory analysis.

LEDGEND

- ▲ Soil Boring
- ⊕ Monitoring Well
- ○ Pit Sidewall or Bottom

MW-12

MAIN PLANT BUILDING

BOILER ROOM

MACHINE SHOP

REST ROOM

OFFICES

SB-1

SB-2

B-4

B-MW 8

MW-9

MW-3

B-1

HOT WAX TANK

MANHOLE

SOIL 10

4" SS

PIPE TRENCH

B-5

MW-5

FIRST OVEREXCAVATION

2nd OVEREXCAVATION

3rd OVEREXCAVATION

SOIL 9

GAS TANK

GAS TANK

GAS TANK

MW-1

SOIL 11

CANOPY

OIL STORAGE BUILDING

PIT WALL

1994 DIESEL TANK EXCAVATION

PIT MIDDLE

NORTH TANK PIT

SOUTH TANK PIT

PROPANE ENCLOSURE

B-2

PLATE

MW-6

SOIL 8

MW-2

B-3

MW-11

MW-4

8" SEWER

PIPING TRENCH

BUENA VISTA ST.

B-MW 10

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

FORMER DISPENSER

GATE

MW-10

PRIVATE DRIVE

N

WEYERHAEUSER - ALAMEDA

SCALE: 1"= 10'	APPROVED BY:	DRAWN BY BWW
DATE: FEB. 94		REVISED

ALL SOIL SAMPLE LOCATIONS: 1991-1994

1801 HIBBARD ST.

DRAWING NUMBER FIG. 4-2

Boring B-4 was sited 25 feet south of the former 1991 gasoline tank cluster. Obvious soil contamination was observed in B-4 continuously from 2.5' BGS down to the capillary fringe at 10' BGS. One soil sample from 5.5' BGS (B4-5.5) was submitted for laboratory analysis.

Boring B-5 was sited 20 feet east of the former 1991 gasoline tank cluster. Obvious soil contamination was observed in B-5 continuously from 3.5' BGS to 5.5' BGS. No soil samples from boring B-5 were submitted for laboratory analysis.

Boring BMW-8 was sited 40 feet south of the former 1991 gasoline tank cluster. Obvious soil contamination was observed in BMW-8 continuously from 6' BGS to 9' BGS. It was originally intended to construct a groundwater well at this location but do to the presence of soil contamination the boring was abandoned. One soil sample from 7' BGS (MW-8-7) was submitted for laboratory analysis.

Boring BMW-10 was sited 35 feet northwest of the former 1991 gasoline tank cluster. Obvious soil contamination was observed in BMW-10 continuously from 6' to 9' BGS. It was originally intended to construct a groundwater well at this location but do to the presence of soil contamination the boring was abandoned. Soil samples from 5' and 10' BGS (MW-10-5 & MW-10-10) were submitted for laboratory analysis.

Boring MW-9 was sited 15 feet southeast of the former 1991 gasoline tank cluster. Obvious soil contamination was observed in MW-9 continuously from 4' to 9' BGS. A soil sample from 9' BGS (MW9-5) was submitted for laboratory analysis.

Boring MW-10 was sited 50 feet northwest of the former 1991 gasoline tank cluster. No soil contamination was observed in MW-10 based on field screening techniques. Soil samples from 7.5' & 11.5' BGS (MW10-7.5 & MW10-11.5) were submitted for laboratory analysis.

Boring MW-11 was sited 45 feet northeast of the former 1991 gasoline tank cluster. No soil contamination was observed in MW-11 based on field screening techniques. Soil samples from 6' & 11' BGS (MW11-6 & MW11-11) were submitted for laboratory analysis.

Boring MW-12 was sited (inside the main plant building) 50 feet south of the former 1991 gasoline tank cluster. No soil contamination was observed in MW-12 based on field screening techniques. Soil samples from 5' & 10' BGS (MW12-5 & MW12-10) were submitted for laboratory analysis.

Two slant borings under the main plant building were attempted at the WPC facility on September 28, 1994. Pavement corings were made adjacent to existing monitoring well MW-3 for boring SB-1 and next to existing monitoring well MW-9 for SB-2. Utilizing hand auger equipment, angled borings under the building foundation were attempted. Refusal was encountered within the upper two feet in boring SB-1, however boring SB-2 was successfully completed.

Ten feet of hole was completed in boring SB-2. The boring was completed to groundwater (8.5 feet BGS). The angled hole terminated laterally two feet under the building foundation. The boring terminus was 25 feet south of the 1991 gasoline tank cluster.

Obvious gasoline contamination was encountered throughout the entire length of slant boring SB-2. Soil cuttings registered over 1,000 PPM on a calibrated PID. No soil sample was collected for laboratory analysis.

As listed in the preceding paragraphs, a total of eighteen soil samples collected from the borings were submitted for laboratory analysis. Additionally, one soil sample was collected from the pit sidewall of the 1994 diesel tank excavation west of the oil storage building.

Soil samples were submitted to Coast to Coast Analytical Laboratories (later Pace Analytical) for total petroleum hydrocarbon and benzene, toluene, xylene & ethyl benzene analysis. Soil samples were also tested for metals, volatile organics and semi-volatile organics.

Seven of the eighteen soil samples submitted for analysis had registered significant total volatile contamination based on field testing with a photoionization detector. However, no significant gasoline contamination was reported by Coast to Coast Analytical in any of the eighteen soil samples submitted.

Eventually it was determined that in-lab handling of the sandy site soils resulted in the loss of volatiles observed in the analytical results. Consequently, the seven suspect soil samples were re-analyzed utilizing a head space "fuel fingerprint in air" technique which minimized sample handling and resultant volatile loss. Significant gasoline contamination was detected in six of the suspect soil samples utilizing the head space technique.

Soil samples from borings B-MW10, B-4 and from monitoring well MW-9 were found to contain elevated levels of gasoline contamination. Soil samples from borings B-5 and B-MW8 were found to be moderately contaminated. Soil samples from borings B-1, B-2, B-3 and monitoring wells MW-10 and MW-11 were uncontaminated. Table 4-3 presents the original soils analysis including those from samples collected in boring MW-12 (December 1994), Table 4-4 presents the results of the "fuel fingerprint in air tests. Figure 4-3 illustrates the estimated limits of soil contamination.

In addition to testing for petroleum compounds, selected soil samples were analyzed for volatile organics, semi-volatile organics and metals. No significant concentrations of these compounds were detected. Table 4-5 presents soil semi-volatile analysis results and Table 4-6 presents results of soil metals analysis.

TABLE 4-3
PETROLEUM CONTAMINATION ANALYSES - SOIL
All Values in mg/Kg

SAMPLE ID	OIL & GREASE	TPH (diesel)	TPH (gas)	BENZENE	TOLUENE	XYLENES	ETHYL BENZENE
B-1, 5'	ND	ND	ND	ND	0.011	ND	ND
B-1, 10'	ND	ND	ND	ND	ND	ND	ND
B-2, 5'	ND	ND	ND	ND	ND	ND	ND
B-2, 10'	ND	ND	ND	ND	0.09	ND	ND
B-3, 5'	ND	ND	ND	ND	ND	ND	ND
B-3, 11.5'	ND	ND	ND	ND	ND	ND	ND
B-4, 5.5'	ND	ND[1]	ND	ND	ND	1.2	ND
MW-8, 7'	ND	ND	ND	ND	ND	ND	ND
MW-9, 5'	ND	ND	ND	ND	ND	ND	ND
MW-9, 9'	ND	ND	ND	0.017	ND	ND	0.099
MW-10, 5'	ND	ND	ND	ND	ND	ND	ND
MW-10, 9'	ND	ND	ND	ND	ND	ND	ND
MW-10b,7.5'	ND	ND	ND	ND	ND	ND	ND
MW-10b,11.5'	ND	ND	ND	ND	ND	ND	ND
MW-11, 6'	50	ND	ND	ND	ND	ND	ND
MW-11, 11'	ND	ND	ND	ND	ND	ND	ND
MW-12, 8'	NA	NA	ND	ND	ND	ND	ND
MW-12, 12'	NA	NA	ND	ND	ND	ND	ND
NORTH END WALL	50	ND	ND	ND	ND	ND	ND

ND: Not Detected, Minimum detection limits for each compound listed on original laboratory report forms

[1] Heavier molecular weight hydrocarbon compounds were detected

LEDGEND

- ▲ SOIL BORING LOCATION
- ⊕ MONITORING WELL

MW-12

MAIN PLANT BUILDING

BOILER ROOM

MACHINE SHOP

REST ROOM

OFFICES

HOT WAX TANK

▲ B-1

▲ SB-2

17/ND
MW-9

▲ B-4
9.7
ND

B-MW 8
ND
ND

MW-3
550
.44

MANHOLE

VENT LINES

4" SS

▲ B-5

PIPE TRENCH

MW-5

1994 DIESEL TANK EXCAVATION

MW-1

FORMER GASOLINE TANK CLUSTER EXCAVATION

CANOPY

OIL STORAGE BUILDING

PROPANE ENCLOSURE

▲ B-2

Estimated Extent of Detectable Soil Contamination

PLATE

MW-6

MW-2
370
.56

MW-11

▲ B-3

MW-4

8" SEWER

PIPING TRENCH

TPHg (ppm)
B

BUENA VISTA ST. →

▲ B-10

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

FORMER DISPENSER

GATE

MW-10
34
.97

PRIVATE DRIVE

N

WEYERHAEUSER - ALAMEDA		
SCALE: 1" = 10'	APPROVED BY:	DRAWN BY BWW
DATE: FEB. 94		REVISED
ESTIMATED EXTENT OF SOIL CONTAMINATION		
1801 HIBBARD ST.		DRAWING NUMBER FIG. 4-3

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

TABLE 4-4
SOIL SAMPLE ANALYTICAL RESULTS
"FUEL FINGERPRINT IN AIR"
January 1994
all values in PPB by volume

SAMPLE ID	TPH	BENZENE	TOLUENE	XYLENES	ETHYL BENZENE
B-4, 5.5'	9,700	ND	12	440	160
B-MW8, 7'	ND	ND	ND	ND	ND
B-MW10, 5'	34,000	970	130	620	150
B-MW10, 9'	5,700	ND	1.2	100	35
MW-9, 5'	17,000	ND	70	370	60
MW-9, 9'	6,000	180	50	300	280
NORTH END WALL	ND	ND	ND	250	40

NOTES
ND: Not Detected (Minimum detection limit specified on original laboratory report forms appearing in Appendix)
PPB: Parts Per Billion
Analysis by EPA test method TO-14

TABLE 4-5
SEMI-VOLATILE ORGANIC ANALYSIS - SOIL

SAMPLE ID	COMPOUND	CONCENTRATION ug/l
B-4, 5.5'	NAPHTHALENE	35
	METHYLNAPTHALENE	10

Copies of chain of custody forms and original laboratory reports are contained in the Appendix.

In summary, gasoline contamination in soil extends under the main plant building south of the 1991 gasoline tank cluster and almost to the property line north of the former tank cluster location. Traces of soil contamination from the 1991 gasoline tank cluster were detected on the east pit sidewall of the 1994 diesel tank excavation west of the former gasoline tank cluster. Soil contamination appears to have been largely removed east of the 1991 gasoline tank cluster.

TABLE 4-6
METALS ANALYSIS - SOIL
JANUARY 1994
all values in mg/KG

METAL	B-4, 5.5'	MW-8, 7'	MW-9, 5'	MW-9, 9'	MW-10, 5'	MW-10, 9'	NORTH END WALL
CADMIUM	ND	ND	ND	ND	ND	ND	ND
CHROMIUM	23	21	24	24	19	26	21
LEAD	8	6	4	6	8	6	6
NICKEL	28	27	16	24	10	28	22
ZINC	17	60	25	21	21	30	16

NOTES:

ND: Not Detected, minimum detection limits for each metal listed on original laboratory report forms

4.1.2 Groundwater

In this Section the three separate phases of groundwater investigation at the 1991 gasoline tank cluster are presented; 1) during the tank cluster removal; 2) site investigation performed by STE between December 1992 and July 1993; and 3) site investigation performed by West & Associates in 1994.

4.1.2.1 1991 Gasoline Tank Cluster Removal

There was, apparently, two samples of pit water collected during the overexcavation project; Water-1 and Water-2. The file record does not indicate the method by which either sample was collected or whether the pit was purged and allowed to recharge prior to sampling.

Pit water sample Water-1 was collected on February 28, 1991. Water-1 was analyzed for TPH in the gas/kerosene/diesel range; oil & grease; BTXE, heavy metals; semi-volatile chlorinated organics and volatile chlorinated organics. Analytical results are presented below.

PIT WATER SAMPLE: WATER-1
1991 GASOLINE TANK CLUSTER
February 28, 1991

TPH - gas:	22,000 ug/l
TPH - kerosene:	ND
TPH - diesel:	190 ug/l
Oil & Grease:	5,100 ug/l
Benzene:	1,000 ug/l
Toluene:	570 ug/l
Xylenes:	410 ug/l
Ethyl Benzene	130 ug/l
Cadmium:	ND
Chromium:	160 ug/l
Lead:	130 ug/l
Nickel:	200 ug/l
Zinc:	240 ug/l
Naphthalene:	430 ug/l
Methylnaphthalene	160 ug/l

Gasoline tank cluster pit water sample Water-2 was collected on April 3, 1991. Sample Water-2 was only analyzed for TPH-gas and BTXE. The results of that analysis are presented below.

PIT WATER SAMPLE: WATER-2
1991 GASOLINE TANK CLUSTER
April 3, 1991

TPH - gas:	13,000 ug/l
Benzene:	580 ug/l
Toluene:	130 ug/l
Xylenes:	400 ug/l
Ethyl Benzene	29 ug/l

Apparently, accumulated water in the gasoline tank cluster pit was purged just prior to backfilling the hole.

4.1.2.2 STE Site Investigation

As discussed in Section 1.3, Soil Tech Engineering constructed a total of six groundwater monitoring wells around the 1991 gasoline tank cluster and performed groundwater monitoring on three occasions. Table 4-7, taken directly from Soil Tech's most recent groundwater monitoring report (July 19, 1993), presents a summary of groundwater analytical results prior to January 1994.

4.1.2.3 West & Associates Site Investigation

In January 1994 West & Associates Engineers installed three new groundwater monitoring wells (MW-9, MW-10 & MW-11). All site wells were sampled in February and June 1994. In December 1994 West & Associates installed one final well (MW-12) and sampled all site wells.

New monitoring well MW-9 is sited 20 feet southeast of the 1991 gasoline tank cluster. Well MW-9 was located as close as practical to the main building outer wall and was intended to determine the magnitude of groundwater contamination under the building foundation.

New monitoring well MW-10 is sited 50 feet northwest and new monitoring well MW-11 50 feet north of the 1991 gasoline tank cluster. Both of these wells are intended to define the contaminant plume on the north.

New monitoring well MW-12 is sited 50 feet south of the 1991 gasoline tank cluster. Well MW-12 is inside the main plant building. Well MW-12 is intended to define the edge of the contaminant plume on the south.

Groundwater samples collected in February 1994 were analyzed for gasoline contaminants as well as metals, volatile organics and semi-volatile organics. Table 4-8 presents analytical results for petroleum constituents; Table 4-9 presents analytical results for metals; Table 4-10 presents analytical results for volatile organics and Table 4-11 presents analytical results for semi-volatile organics.

TABLE 4-7
GROUNDWATER ANALYTICAL RESULTS
1991-1993
(All values in mg/l)

Date	Well #	TPHd	TPHg	B	T	E	X	TOG
12/23/91	STMW-1	ND	ND	ND	ND	ND	ND	NA
	STMW-2	0.08	2.3	0.72	0.066	0.0015	0.24	NA
	STMW-3	1.7	14	3.0	0.54	0.37	1.2	NA
4/27/92	STMW-1	ND	0.15	0.0015	0.0012	0.0018	0.002	ND
	STMW-2	ND	1.1	0.0094	0.0053	0.002	0.024	ND
	STMW-3	2.0	9.4	0.057	0.05	0.0046	0.22	ND
	STMW-4	ND	0.79	0.0077	0.0026	0.002	0.011	ND
	STMW-5	ND	ND	ND	ND	ND	ND	ND
	STMW-6	ND	ND	ND	ND	ND	ND	ND
7/31/92	STMW-1	ND	0.31	0.002	0.0018	0.0012	0.0045	0.6
	STMW-2	ND	1.5	0.0033	0.0053	0.01	0.026	4.4
	STMW-3	ND	1.4	0.0019	0.0051	0.0083	0.023	0.6
	STMW-4	ND	1.3	0.0061	0.0043	0.0073	0.021	ND
	STMW-5	ND	ND	ND	ND	ND	ND	0.7
	STMW-6	ND	ND	ND	ND	ND	ND	ND

Source: Soil Tech Engineering, Inc.

TABLE 4-7 Con't.
GROUNDWATER ANALYTICAL RESULTS
1991-1993
(All values in mg/l)

Date	Well #	TPHd	TPHg	B	T	E	X	TOG
1/08/93	STMW-1	ND	0.14	0.006	0.0012	0.0006	0.0022	0.8
	STMW-2	ND	0.07	ND	ND	0.0005	0.0014	0.9
	STMW-3	ND	15	0.038	0.04	0.064	0.14	19
	STMW-4	ND	0.86	0.0015	0.0045	0.0096	0.017	1.4
	STMW-5	ND	ND	ND	ND	ND	ND	ND
	STMW-6	ND	ND	ND	ND	ND	ND	ND
	STMW-7	ND	NA	ND	ND	ND	ND	NA
4/06/93	STMW-1	1.3	ND	ND	ND	ND	ND	1.6
	STMW-2	0.21	ND	ND	ND	ND	ND	0.6
	STMW-3	0.33	21	0.062	0.076	0.084	0.2	0.7
	STMW-4	ND	2.5	0.0052	0.0063	0.011	0.017	ND
	STMW-5	ND	ND	ND	ND	ND	ND	ND
	STMW-6	ND	ND	ND	ND	ND	ND	ND
	STMW-7	0.19	NA	ND	ND	ND	ND	NA

Source: Soil Tech Engineering, Inc.

TABLE 4-7 Con't.
GROUNDWATER ANALYTICAL RESULTS
1991-1993
(All values in mg/l)

Date	Well #	TPHd	TPHg	B	T	E	X	TOG
7/12/93	STMW-1	0.14	ND	ND	ND	ND	ND	0.7
	STMW-2	ND	1.6	0.0014	0.0023	0.0025	0.0082	12
	STMW-3	1.6	22	0.022	0.041	0.042	0.12	ND
	STMW-4	ND	2.0	0.0018	0.0038	0.0039	0.011	ND
	STMW-5	ND	0.27	ND	ND	0.0006	0.0014	ND
	STMW-6	NA	NA	NA	NA	NA	NA	NA
	STMW-7	0.08	NA	ND	ND	ND	ND	NA
	SDWS	NL	NL	0.001	0.100*	0.68	1.75	NL

TPHd - Total Petroleum Hydrocarbons as diesel
TPHg - Total Petroleum Hydrocarbons as gasoline
BTEX - Benzene, Toluene, Ethylbenzene, Total Xylenes
TOG - Total Oil & Grease
ND - Not Detected (Below Laboratory Detection Limit)
NA - Not Analyzed
SDWS - State Drinking Water Standards
NL - No MCL Levels established

Source: Soil Tech Engineering, Inc.

TABLE 4-8
PETROLEUM CONTAMINATION ANALYSES - GROUNDWATER
FEBRUARY 1994
All Values in ug/l

WELL ID	OIL & GREASE	TPH (diesel)	TPH (gas)	BENZENE	TOLUENE	XYLENES	ETHYL BENZENE
MW-1	ND	ND	ND	1.5	ND	ND	ND
MW-2	ND	ND	200	390	25	50	7.1
MW-3	ND	ND	5400	3900	680	840	390
MW-4	ND	ND	1000	54	2.7	4.7	1.4
MW-5	ND	ND	ND	1.8	ND	ND	ND
MW-6	ND	ND	ND	2.6	ND	ND	ND
MW-7	ND	ND	ND	ND	ND	ND	ND
MW-9	ND	ND	1,900	63	4.3	14	22
MW-10	ND	ND	ND	ND	ND	ND	ND
MW-11	ND	ND	ND	ND	ND	ND	ND
QC	ND	ND	ND	ND	ND	ND	ND

NOTES

ND: Not Detected, Minimum detection limits for each compound listed on original laboratory report forms

TABLE 4-9
GROUNDWATER METALS ANALYSIS
FEBRUARY 1994
all values in mg/l

METAL	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-9	MW-10	MW-11
ANTIMONY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ARSENIC	ND	ND	0.018	ND	ND	ND	0.005	0.08	ND	0.07
BARIUM	0.17	0.09	0.15	0.11	0.14	0.09	0.14	ND	ND	ND
BERYLLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CADMIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHROMIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COBALT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COPPER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LEAD	ND	ND	0.006	ND	ND	ND	ND	ND	ND	ND
MERCURY	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MOLYBDENUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NICKEL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SELENIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SILVER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THALLIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VANADIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZINC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTES
ND: Not Detected, Minimum detection limits for each metal listed on original laboratory report forms

TABLE 4-10
VOLATILE ORGANIC ANALYSIS - GROUNDWATER
FEBRUARY 1994

WELL IDENITIFICATION	COMPOUND	CONCENTRATION ug/l
MW-1	CARBON DISULFIDE	3.4
	1,1-DICHOLORETHANE	2.5

WELL IDENTIFICATION	COMPOUND	CONCENTRATION ug/l
MW-2	CARBON DISULFIDE	9.2

WELL IDENTIFICATION	COMPOUND	CONCENTRATION ug/l
MW-3	CARBON DISULFIDE	120
	1,1-DICHLOROETHANE	130
	CIS-1,2-DICHLOROETHANE	95

WELL IDENTIFICATION	COMPOUND	CONCENTRATION ug/l
MW-4	CARBON DISULFIDE	4.7
	CHLOROETHANE	1.9
	1,1 DICHLOROETHANE	22
	TRANS-1,2-DICHLOROETHANE	18
	CIS-1,2-DICHLOROETHANE	18
	TRICHLOROETHANE	2.1

WELL IDENITIFICATION	COMPOUND	CONCENTRATION ug/l
MW-5	TETRACHLOROETHANE	1.1
	1,1-DICHOLORETHANE	2.5

TABLE 4-10 Con't.
VOLATILE ORGANIC ANALYSIS - GROUNDWATER
FEBRUARY 1994

WELL IDENTIFICATION	COMPOUND	CONCENTRATION ug/l
MW-6	1,2-DICHLOROETHANE	1.1
	1,1-DICHLOROETHANE	2.6
	CIS-1,2-DICHLOROETHANE	2.1
	TETRACHLOROETHANE	1.3

WELL IDENTIFICATION	COMPOUND	CONCENTRATION ug/l
MW-7	CHLOROETHANE	1.6
	1,1-DICHLOROETHANE	18
	1,2-DICHLOROETHANE	10
	CIS-1,2-DICHLOROETHANE	7.9
	TRICHLOROETHANE	2.0

WELL IDENTIFICATION	COMPOUND	CONCENTRATION ug/l
QC	BROMODICHLOROETHANE	11
	BROMOFORM	1.1
	CHLOROFORM	17
	DIBROMOCHLOROMETHANE	6.2

TABLE 4-11
SEMI-VOLATILE ORGANIC ANALYSIS - GROUNDWATER
FEBRUARY 1994

WELL IDENTIFICATION	COMPOUND	CONCENTRATION ug/l
MW-2	NAPHTHALENE	19
MW-3	NAPHTHALENE	170
	METHYLNAPTHALENE	45

Groundwater samples collected in June and December 1994 were analyzed for gasoline contaminants only. Table 4-12 presents analytical results for groundwater samples collected in June 1994 and Table 4-13 presents analytical results for groundwater samples collected in December 1994.

As indicated by the groundwater analytical data, groundwater samples collected from monitoring wells MW-3 and MW-9 consistently contain the highest levels of contamination. However, neither monitoring well MW-3 or MW-9 is in the apparent upgradient direction from the former gasoline tank cluster. Long time employees report that a fuel dispenser formerly was installed inside the machine shop close to the location of boring SB-2. It is also known that the three gasoline tank vent lines were routed underground to the main building in the vicinity of SB-2.

It is possible that the majority of gasoline leakage may have taken place either from the dispenser, product line or vent lines south of the 1991 tank cluster area. This would explain the apparent upgradient migration of contamination and the limited soil contamination east of the tank cluster.

Groundwater samples from monitoring wells MW-1, 2, 3, 4, 5, 6 & 9 have all been found to contain benzene in excess of the State Maximum Concentration Limit (MCL).

Figure 4-4 presents estimated TPH-gas contours for both 10 PPM and 1 PPM based on the most recent (December 1994) monitoring data. As indicated by Figure 4-4, contamination apparently does not extend off-site, however it has migrated under the main plant building.

Trace levels of some metals were detected in WPC groundwater as indicated in Table 4-9. The concentrations detected are well below applicable State action levels.

Detectable concentrations of some volatile and semi-volatile organic compounds were detected in WPC groundwater, particularly in the vicinity of monitoring well MW-3. Considering the long history of forklift maintenance in the 1991 gasoline tank cluster area, the shallow depth to groundwater and porous sandy soil, it is not surprising that trace solvent contamination in groundwater has been detected.

TABLE 4-12
PETROLEUM CONTAMINATION ANALYSES - GROUNDWATER
JUNE 1994
All Values in ug/l

WELL ID	OIL & GREASE	TPH (diesel)	TPH (gas)	BENZENE	TOLUENE	XYLENES	ETHYL BENZENE
MW-1	NA	ND	50	ND	ND	ND	ND
MW-2	NA	ND	1300	370	44	170	100
MW-3	NA	ND	23000	8500	1700	3800	1600
MW-4	NA	ND	460	46	0.8	8.4	1.1
MW-5	NA	ND	ND	1.0	ND	ND	ND
MW-6	NA	ND	ND	2.2	ND	ND	ND
MW-7	NA	ND	ND	ND	ND	ND	ND
MW-9	NA	ND	5300	150	20	110	380
MW-10	NA	ND	ND	ND	ND	ND	ND
MW-11	NA	ND	ND	ND	ND	ND	ND
QC	NA	ND	ND	ND	ND	ND	ND

NOTES

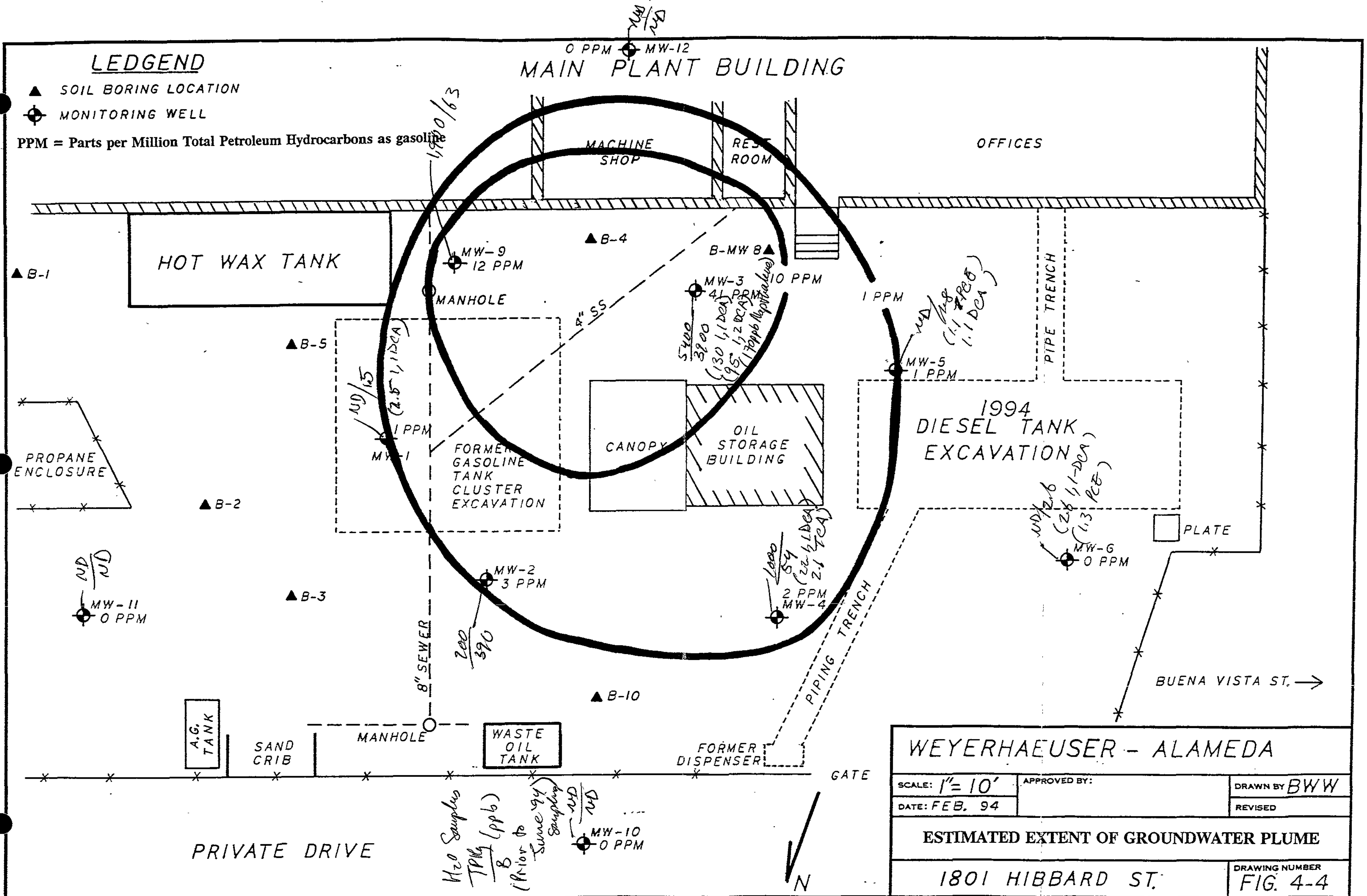
ND: Not Detected, Minimum detection limits for each compound listed on original laboratory report forms

TABLE 4-13
PETROLEUM CONTAMINATION ANALYSES - GROUNDWATER
DECEMBER 1994
All Values in ug/l

WELL ID	OIL & GREASE	TPH (diesel)	TPH (gas)	BENZENE	TOLUENE	XYLENES	ETHYL BENZENE
MW-1	NA	NA	93	ND	ND	ND	ND
MW-2	NA	NA	3400	1100	86	190	28
MW-3	NA	NA	41000	9900	2900	3500	1400
MW-4	NA	NA	2400	200	7.5	28	7.5
MW-5	NA	NA	93	3.0	0.9	3.0	0.8
MW-6	NA	NA	ND	1.3	ND	ND	ND
MW-7	NA	3.9	ND	ND	ND	ND	ND
MW-9	NA	NA	12000	600	20	55	120
MW-10	NA	NA	ND	ND	ND	ND	ND
MW-11	NA	NA	ND	ND	ND	ND	ND
MW-12	NA	NA	ND	ND	ND	ND	ND
QC	NA	NA	ND	ND	ND	ND	ND

NOTES

ND: Not Detected, Minimum detection limits for each compound listed on original laboratory report forms



The vertical elevations (well tops) of all four new wells were surveyed to an accuracy of 0.01 feet. The new well tops were surveyed with reference to the existing well top elevations. Those top of casing (TOC) measurements, made by STE, were referenced to an arbitrary 100 foot datum. The TOC elevations relative to mean sea level have never been determined.

Depth to groundwater was measured in all site wells on three occasions during 1994; February 3, June 8 and December 22. Tables 4-14, 4-15 & 4-16 present top of casing (TOC) elevation data and depth to groundwater (DTGW) measurements for all wells on each measurement date.

TABLE 4-14
HYDROLOGIC MEASUREMENTS
FEBRUARY 3, 1994
(All measurements in feet)

WELL ID	TOC	DTGW	GWE	CHANGE[1]
MW-1	99.93	5.82	94.11	+1.34
MW-2	99.65	5.67	93.98	+1.39
MW-3	100.35	6.31	94.04	+0.41
MW-4	97.84	6.00	91.84	-0.32
MW-5	99.98	7.11	91.87	-0.22
MW-6	99.30	7.93	91.37	-0.03
MW-7	97.68	3.06	94.62	+0.18
MW-9	100.60	6.39	94.21	NA
MW-10	99.21	6.19	93.02	NA
MW-11	99.45	5.40	94.05	NA
MW-12	103.27	NA	NA	NA

ABBREVIATIONS
TOC: Top of Casing
DTGW: Depth to Groundwater
GWE: Groundwater Elevation
NA: Not Available
[1] Relative to last available DTGW measurement: July 22, 1993

TABLE 4-15
HYDROLOGIC MEASUREMENTS
JUNE, 8 1994
(All measurements in feet)

WELL ID	TOC	DTGW	GWE	CHANGE[1]
MW-1	99.93	5.61	94.32	+0.21
MW-2	99.65	5.42	94.23	+0.25
MW-3	100.35	6.21	94.14	+0.10
MW-4	97.84	5.77	92.07	+0.23
MW-5	99.98	6.60	92.38	+0.51
MW-6	99.30	7.47	91.83	+0.46
MW-7	97.68	2.81	94.87	+0.25
MW-9	100.60	6.34	94.26	+0.05
MW-10	99.21	6.07	93.14	+0.12
MW-11	99.45	5.37	94.08	+0.03
MW-12	103.27	NA	NA	NA

ABBREVIATIONS
TOC: Top of Casing
DTGW: Depth to Groundwater
GWE: Groundwater Elevation
NA: Not Available
[1] Relative to last available DTGW measurement: February 3, 1994

TABLE 4-16
HYDROLOGIC MEASUREMENTS
DECEMBER 22, 1994
(All measurements in feet)

WELL ID	TOC	DTGW	GWE	CHANGE[1]
MW-1	99.93	5.35	94.58	+0.26
MW-2	99.65	5.24	94.41	+0.18
MW-3	100.35	6.28	94.07	+0.07
MW-4	97.84	4.80	93.04	+0.97
MW-5	99.98	5.60	93.38	+1.00
MW-6	99.30	6.50	92.86	+1.03
MW-7	97.68	3.09	94.59	-0.28
MW-9	100.60	5.99	94.61	+0.35
MW-10	99.21	5.08	94.13	+0.99
MW-11	99.45	4.91	94.54	+0.46
MW-12	102.59	8.32	94.27	NA

ABBREVIATIONS
TOC: Top of Casing
DTGW: Depth to Groundwater
GWE: Groundwater Elevation
NA: Not Available
[1] Relative to last available DTGW measurement: June 8, 1994

Figures 4-5, 4-6 & 4-7 present estimated groundwater elevation contours under the WPC site for the three measurement dates in 1994. In general, the groundwater gradient direction and magnitude determined in 1994 is in conformance with measurements made previously. The apparent groundwater gradient direction is generally west at a rate of approximately one foot per 15 feet.

4.1.2.4 Summary

In summary, moderate groundwater contamination is present in the 1991 gasoline tank cluster area. Gasoline compounds predominate, however trace solvent contamination, probably from surface spillage, is also present. The contaminant plume profile suggests that the release point was not in the tank cluster itself but rather south near the reported vicinity of a former dispenser. Groundwater contamination does not seem to have migrated off-site but does exist under the footprint of the main plant building.

5.6 Summary

An evaluation of known site conditions has identified soil vapor extraction as the most promising technology for soil remediation and air sparging as the most attractive technology for groundwater remediation.

A final assessment of the applicability for these two techniques is dependent on the results of a pilot test program. The test program will also provide information needed for design of a full scale system.

An outline for the pilot test has been developed. A written report of findings, including a detailed proposal for full scale remediation, will be submitted upon pilot test completion.

It is proposed to implement an interim groundwater monitoring program pending startup of full scale remediation. The interim program specifies sampling and reporting on a quarterly basis.

LEDGEND

▲ SOIL BORING LOCATION

⊕ MONITORING WELL

MAIN PLANT BUILDING

BOILER ROOM

MACHINE SHOP

REST ROOM

OFFICES

HOT WAX TANK

▲ B-1

▲ B-4

B-MW 8 ▲

MW-9 94.26'

MW-3 94.14'

MANHOLE

4" SS

94'

93'

PIPE TRENCH

▲ B-5

MW-5 92.38'

1994 DIESEL TANK EXCAVATION

92'

MW-1 94.32'

FORMER GASOLINE TANK CLUSTER EXCAVATION

CANOPY

OIL STORAGE BUILDING

PROPANE ENCLOSURE

▲ B-2

PLATE

MW-6 91.83'

MW-2 94.23'

▲ B-3

MW-11 94.08'

MW-4 92.07'

PIPING TRENCH

94'

8" SEWER

BUENA VISTA ST. →

▲ B-10

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

FORMER DISPENSER

GATE

MW-10 93.14'

PRIVATE DRIVE

93'

N

WEYERHAEUSER - ALAMEDA

SCALE: 1" = 10'	APPROVED BY:	DRAWN BY BWW
DATE: FEB. 94		REVISED

GROUNDWATER CONTOURS - JUNE 1994

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DRAWING NUMBER FIG. 4-6

11 X 17 PRINTED ON ... COOH CLEARPRINT ●

LEDGEND

▲ SOIL BORING LOCATION

⊕ MONITORING WELL

94.27' MW-12

94'

MAIN PLANT BUILDING

BOILER ROOM

MACHINE SHOP

REST ROOM

OFFICES

HOT WAX TANK

▲B-1

▲B-4

B-MW 8▲

MW-9 94.61'

MANHOLE

MW-3 94.07'

8" SS

PIPE TRENCH

▲B-5

MW-5 93.38'

93'

94.58'

MW-1

FORMER GASOLINE TANK CLUSTER EXCAVATION

CANOPY

OIL STORAGE BUILDING

1994 DIESEL TANK EXCAVATION

PROPANE ENCLOSURE

▲B-2

PLATE

MW-6 92.86'

MW-2 94.41'

▲B-3

MW-11 94.54'

MW-4 93.04'

PIPING TRENCH

8" SEWER

BUENA VISTA ST. →

▲B-10

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

93'

FORMER DISPENSER

GATE

MW-10 94.13'

PRIVATE DRIVE

94'

N

WEYERHAEUSER - ALAMEDA

SCALE: 1"= 10'	APPROVED BY:	DRAWN BY BWW
DATE: FEB. 94		REVISED

GROUNDWATER CONTOURS - DEC. 1994

1801 HIBBARD ST.

DRAWING NUMBER FIG. 4-7

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●

4.2 1991 Diesel Tank

Only groundwater contamination has been confirmed in the vicinity of the 1991 diesel tank. A summary of past sampling results for both soil and groundwater is presented in the following sub-sections.

4.2.1 Soil

The file record indicates that the 10,000 gallon diesel tank was removed in good condition with no indications of leakage (Alameda County Health Department, Hazardous Materials Division Inspection Form, Inspector William Faulhalser). There was no observable contamination in the tank backfill or pit sidewalls based on odor or staining. Soil excavated to remove the tank was apparently used to backfill the hole.

Four soil samples were taken from the 1991 diesel tank pit sidewalls, two from the west sidewall (labeled Diesel-NW & Diesel-SW) and two from the east sidewall (labeled Diesel-NE and Diesel-SE). The samples were collected from 6.5 feet below ground surface on February 7, 1991. Each sample was analyzed for TPH-diesel, TPH-gas and BTXE. All four samples were found to be non-detectable for all tested parameters.

In December 1992, Soil Tech Engineering collected two soil samples at depths of three and five feet BGS immediately west of the former 1991 diesel tank pit (boring MW-7). Both samples were analyzed for TPH-diesel and BTXE. Both samples were found to be non-detectable for all tested parameters.

4.2.2 Groundwater

According to the Alameda County Health Department, Hazardous Materials Division Inspection Form completed for the 1991 diesel tank removal, there was "oil on water in hole where 10,000 tank pulled". Although the 10,000 gallon tank was removed on February 7, 1991 and there was evidently water in the hole on that date, a pit water sample was not collected until February 25, 1991.

The file record does not contain any information on how the diesel tank pit water sample was collected and apparently the pit was not purged and allowed to recharge prior to sampling. The pit water sample, labeled Diesel Tank Pit, was analyzed for TPH-diesel and BTXE. Sample "Diesel Tank Pit" was found to contain 3,600 ug/l TPH-diesel but no BTXE.

The file record indicates approximately 1,500 gallons of water was pumped from the 10,000 gallon diesel pit on February 25, 1991 just prior to backfilling.

On December 22, 1992, Soil Tech Engineering constructed a groundwater monitoring well (MW-7) immediately downgradient from the former 10,000 gallon tank pit. No contamination was observed in either soil or groundwater during well construction.

Groundwater well MW-7 was initially sampled January 8, 1993. The groundwater sample was analyzed for TPH-diesel and BTXE. No detectable contamination was found.

Groundwater well MW-7 was subsequently monitored on April 6, 1993. On that occasion, the groundwater sample was found to contain 190 ug/l TPH-diesel but no detectable BTXE. On July 12, 1993 a groundwater sample was collected from MW-7 and found to contain 80 ug/l TPH-diesel and no BTXE.

West & Associates Engineers has sampled monitoring well MW-7 on three occasions (February, June and December 1994). In February and June, no detectable contamination was found. In December 3.9 ug/l of TPH-diesel was detected but not BTXE compounds. Table 4-17 presents all available analytical results for monitoring well MW-7.

TABLE 4-17
GROUNDWATER PETROLEUM CONTAMINATION ANALYSES
1991 DIESEL TANK - MONITORING WELL MW-7
All Values in ug/l

DATE	OIL & GREASE	TPH (diesel)	BENZENE	TOLUENE	XYLENES	ETHYL BENZENE
1/8/93	NA	ND	ND	ND	ND	ND
4/6/93	NA	190	ND	ND	ND	ND
7/12/93	NA	80	ND	ND	ND	ND
2/3/94	ND	ND	ND	ND	ND	ND
6/8/94	NA	ND	ND	ND	ND	ND
12/22/94	NA	3.9	ND	ND	ND	ND

NOTES

ND: Not Detected, Minimum detection limits for each compound listed on original laboratory report forms
NA: Not Analyzed

In summary, trace diesel contamination has been intermittently detected at monitoring well MW-7. No BTXE contamination has ever been detected.

4.3 1994 Diesel Tank

The 20,000 gallon diesel tank removed from the WPC property on January 13, 1994 was the newest and most modern UGT installed at the facility. The tank system had passed yearly precision leak tests and was electronically leak monitored. It was removed as a part of a corporate wide policy to eliminate underground hazardous substance storage.

Three soil samples were collected from the tank pit bottom under supervision of the Alameda County Health Department ("North Tank Pit", "Middle", and "South Tank Pit"). The three tank pit bottom soil sample locations are indicated on Figure 4-2. All three soil samples were analyzed and found to be non-detectable for petroleum compounds.

Two groundwater monitoring wells, MW-5 & MW-6 are immediately adjacent to the 1994 diesel tank pit. Both of these monitoring wells have been tested for the presence of diesel on six occasions between July 1992 and December 1994. On no sampling occasion has diesel contamination been detected in groundwater at either well.

Additional details describing the 1994 diesel tank removal project are presented in the closure report contained in the appendix. It is concluded that no contamination originated from that installation and that no further actions are necessary.

5.0 REMEDIAL PROPOSAL

In this Section a conceptual remedial program addressing contamination in both soil and groundwater is presented. The remedial proposals presented in this Section are specific to the 1991 gasoline tank cluster study area. No remediation is proposed at this time for the 1991 diesel tank study area.

A proposal for interim monitoring of both the 1991 gasoline tank study area and the 1991 diesel tank study area study area is presented in Section 5.5. Interim monitoring will continue until startup of soil and groundwater remediation.

5.1 General

Several site specific factors constrain remedial alternatives at the WPC site. In particular, the migration of soil contamination under the main plant building limits the potential effectiveness of excavation as a remedial option. Excavating the WPC site would have been difficult under any circumstances due to the presence of underground utilities and surface obstructions. An excavation project would also have been disruptive to facility operations - which are ongoing 24 hours a day, 7 days a week.

5.2 Soil Remediation

With the elimination of excavation as a practical alternative, soil vapor extraction (SVE) becomes the leading remedial candidate. WPC site conditions are conducive to SVE in that: 1) the predominant contaminant, gasoline, has a high volatility; 2) soil contamination is relatively shallow; 3) soil permeability is thought to be high; and 4) there are no known barriers to lateral soil vapor migration.

A soil vapor extraction system can be installed and operated with minimum facility disruption. A SVE system also offers the potential for complimenting the proposed groundwater remediation technology, air sparging.

5.3 Groundwater Remediation

Three alternatives were considered for groundwater remediation.

1) Groundwater extraction, treatment and discharge
2) In-situ bioremediation
3) In-situ air sparging

Excavation was not considered due to the constraints described in Section 5.1. The advantages and disadvantages of applying each remediation alternative to the WPC Alameda site is discussed in the following Sections.

5.3.1 Groundwater Extraction, Treatment and Discharge

This approach, commonly referred to as pump & treat, has the advantage of simplicity. Electricity and a sewer discharge point are conveniently located in the 1991 gasoline tank cluster study area. The pump & treat alternative can be rapidly implemented without the need for pilot testing. Conditions are generally favorable for pump & treat at the WPC site in that well recharge (and presumably soil transmissivity) is rapid and soil is predominantly inorganic. Existing monitoring well MW-9 could be utilized as an extraction well reducing the needed number of new, dedicated, extraction wells to one (existing wells MW-1 thru MW-6 are only 2 inches in diameter and therefore unsuitable for effective groundwater extraction).

Pump & treat has the inherent disadvantage of poor efficiency. Pumping of thousands of gallons of groundwater over a lengthy time period would probably be required to achieve satisfactory remediation. The resultant cost would be high due to long term monitoring and sewer fees (based on gallons discharged).

5.3.2 In-situ Bioremediation

All in-situ techniques have the advantage of eliminating the need for sewer discharge or NPDES permits. Bioremediation has the potential advantages of low cost coupled with high efficiency.

Several factors work against bioremediation at the WPC Alameda site, however. Aromatic hydrocarbon (BTXE) concentrations in WPC groundwater have been measured as high as 20 PPM (of which 10 PPM is benzene). Maintenance of a biologically viable microbial population would be difficult do to the toxicity of these compounds. Additionally, a number of chlorinated organic and PNA compounds are present in WPC groundwater. It would probably take two or more inoculations of carefully speciated microbes to effectively bioremediate the range of contaminants found at the WPC site. Complicating the situation further is the brackish quality of WPC groundwater. In short, no guarantee of remedial success could be made if bioremediation was the selected technique.

5.3.3 In-situ Air Sparging

In-situ air sparging consists of injecting pressurized air into the saturated zone to create air bubbles which then rise to the groundwater surface. Dissolved contaminants volatilize into the bubbles and are thus moved into the vadose zone. Usually a soil vapor extraction system is employed to finally remove volatiles from the vadose zone.

WPC Alameda site conditions are favorable for in-situ air sparging; 1) the contaminants to be removed are relatively volatile; 2) groundwater is shallow; and 3) soil is fairly permeable. One advantage for air sparging is the potential for remediating the site rapidly in coordination with the proposed soil vapor extraction system.

An air sparging system could utilize existing groundwater well MW-9 but would probably require at least three additional injection wells. Alternatively, a grid of horizontal air injection lines could be installed throughout the contaminant plume.

The primary disadvantage to air sparging is the potential for minimal radius of influence from each injection point. The resultant need for additional injection points can raise costs significantly. Fortunately, pilot test data can reliably be used to predict radius of influence and therefore allow an accurate estimate of project costs to be developed in advance.

5.3.4 Summary

In summary, air sparging is the preferred alternative due to its potential to provide quick and effective groundwater remediation. Pump & treat would eventually provide satisfactory remediation but not within an acceptable time frame. Bioremediation could potentially provide rapid remediation, however the technical uncertainties regarding its effective application at the WPC Alameda site render it an unacceptable gamble. It is therefore proposed to select in-situ air sparging as a conceptual approach for groundwater remediation pending completion of a pilot test program to better define its specific applicability.

5.4 Pilot Test Program

It is proposed to perform a pilot test program in order to assess the applicability of both soil vapor extraction and air sparging to the WPC site. If favorable, results of the pilot test program will also provide data for design of a full scale remedial system.

The proposed pilot test program will be performed in two parts. Part one will involve soil vapor extraction alone. Part two will consist of SVE combined with air sparging. The overall pilot test program will include the following elements:

PART 1

1). Construct a dedicated soil vapor extraction well (SVE-1) midway between existing MW-3 and MW-9

2). Temporarily connect a vacuum extraction unit to SVE-1

3). Operate the SVE unit for a period not to exceed 5 days as per BAAQMD regulations (compliance with BAAQMD regulations requires use of two activated carbon canisters in series)

4). Monitor:
- well head vacuum
- induced negative pressure in adjacent monitoring wells
- exhaust gas flow rate as a function of time
- untreated exhaust volatile concentration as a function of time

5). Collect treated and untreated soil vapor samples for laboratory analysis

PART 2

6). Connect an air compressor to existing well MW-3

7). Inject air into the aquifer through MW-3 at a variety of pressures and flowrates

8). Monitor the effect of air injection at MW-3 on vapor extraction system parameters at SVE-1

Air injection through well MW-3 should have the effect of sparging gasoline contamination dissolved in groundwater and thus increase the rate of volatile extraction from SVE-1.

A written report of findings will be prepared and submitted within 30 days of pilot test program completion. The pilot test program report will include a specific and detailed proposal for either full scale system construction, or a proposal for alternative remediation.

5.5 Interim Monitoring

It is proposed to continue groundwater monitoring at the WPC site pending construction and startup of remedial activities. An interim groundwater monitoring program is proposed. Proposed monitoring activities include:

1. Measure depth to groundwater in each monitoring well
2. Check each monitoring well for the presence of floating product
3. Purge and sample each well
4. Analyze each groundwater sample in a DHS certified laboratory for:
   - total petroleum hydrocarbons - gas (TPH-diesel for MW-7)
   - BTXE
   - Naphthalene (well MW-3 only)
5. Prepare and submit a written monitoring report

All procedures, methods and equipment used to perform groundwater monitoring will conform to Tri-regional guidelines.

It is proposed to monitor groundwater at the WPC site on a quarterly schedule. The interim monitoring program will commence with the first quarter of 1995. Quarterly monitoring reports will be submitted to Alameda County and the San Francisco Bay Regional Water Quality Board within 30 days of the close of each quarter. Upon startup of active remediation, the interim monitoring program will be superceded by a long term program to be specified in the pilot test program report.

LEDGEND

▲ SOIL BORING LOCATION

⊕ MONITORING WELL

MAIN PLANT BUILDING

BOILER ROOM

MACHINE SHOP

REST ROOM

OFFICES

HOT WAX TANK

▲B-1

▲B-2

▲B-3

▲B-4

▲B-5

▲B-10

B-MW 8▲

MW-9 94.21'

MW-3 94.04'

MANHOLE

8" SS

MW-1 94.11'

FORMER GASOLINE TANK CLUSTER EXCAVATION

CANOPY

OIL STORAGE BUILDING

PROPANE ENCLOSURE

MW-11 94.05'

MW-2 93.98'

MW-4 91.84'

MW-5 91.87'

MW-6 91.37'

MW-10 93.02'

1994 DIESEL TANK EXCAVATION

PIPE TRENCH

PLATE

PIPING TRENCH

BUENA VISTA ST. →

8" SEWER

A.G. TANK

SAND CRIB

MANHOLE

WASTE OIL TANK

FORMER DISPENSER

GATE

PRIVATE DRIVE

94'

93'

92'

N

WEYERHAEUSER - ALAMEDA

SCALE: 1"= 10'	APPROVED BY:	DRAWN BY BWW
DATE: FEB. 94		REVISED

GROUNDWATER CONTOURS - FEB. 1994

1801 HIBBARD ST.

DRAWING NUMBER FIG. 4-5

11 X 17 PRINTED ON NO. 1000H CLEARPRINT ●