HARTCROWSER

Earth and Environmental Technologies

Preliminary Environmental Site Evaluation and Focused Pentachlorophenol Explorations Merrill and Ring, Inc. Port Angeles, Washington

Volume I

Prepared for
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and
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EXECUTIVE SUMMARY

The major findings and conclusions detailed in this report are as follows:

- In general, the M&R site appears to be a relatively clean piece of industrial property. The PCP-related contamination at the old planer mill location is the most significant contamination identified. Low levels of contamination identified at other locations on the site have either been mitigated by M&R or they are insignificant enough that additional investigation or mitigation does not appear warranted.

- PCP-related contamination was detected in surface soils, subsurface soils, and groundwater near the old planer building. It appears the contamination is from pre-1972 activities, is at moderately low levels, and forms a plume extending north just short of the bay. Although we found traces of PCP in marine sediments, values are low and questionable. Marine water samples detected no PCP. Therefore, this PCP contaminant plume does not appear to pose an imminent health or environmental hazard.

- Data indicate that a significant dioxin contamination problem is unlikely in the PCP contaminated area, near the old planer mill.

- Based on our experience, we would expect that Ecology would likely require a hydrogeologic study and possibly a risk assessment at the old planer mill location. But with no data indicating toxic PCP concentrations in marine water, further remediation is not expected.

- PCP-related contamination was detected in surface soil samples taken west of the new planer building. Based on the available information the contamination at the new planer building appears to be surficial and does not appear to be migrating to the groundwater.

- The surface stains identified at the M&R site appear to be primarily petroleum products and are limited in extent based on visual observations, laboratory data, and discussions with M&R employees. In order to reduce potential sources of subsurface contamination we recommend that all surface stains be removed down to a depth where visual evidence and odors no longer exist. It is our understanding that M&R has removed stained soils identified during the preliminary site assessment for disposal at the Port Angeles landfill with the landfill operator's permission.

- Sample TR-5 from the transformer located at the alder chip wall loading facility contained low levels of PCB at 4,800 ug/kg (Aroclor 1260). Conversations with M&R employees indicates that visual stains have been removed from around the alder chip wall transformer. 1 ug/kg ≅ 1 ppb

- Test results indicated that the diesel tank at the scale house area leaked. The gasoline tank at the kiln appeared to be sound. Hart Crowser has been informed by M&R that the underground diesel tank located in the log scale house area has been removed along with an unspecified amount of contaminated soil.

- The monitoring wells located in the shallow saturated zone on the 13th and M Street Pen Ply Landfill site are unlikely to intercept leachate if it migrated from the M&R landfill. Therefore, impacts from M&R's landfill are not known.

- We were unable to determine what the COE dredging permit meant by "Polluted Material." It is likely that "polluted material" refers to suspended solids and/or biological oxygen demand (BOD) from fresh dredge spoils which could adversely affect water quality in the harbor if runoff were not controlled.

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PRELIMINARY ENVIRONMENTAL SITE EVALUATION
AND FOCUSED PENTACHLOROPHENOL EXPLORATIONS
MERRILL AND RING, INC.
PORT ANGELES, WASHINGTON

1.0 INTRODUCTION

1.1 PROJECT UNDERSTANDING

Hart Crowser understands that Daishowa America Company, Ltd. (Daishowa) is conducting negotiations with Merrill and Ring, Inc. (M&R) for property owned by M&R for future expansion of Daishowa pulp mill operations. M&R has contracted with Hart Crowser to provide an environmental assessment to evaluate whether the M&R property is potentially contaminated due to current or past activities. We have also contracted with M&R to further explore selected areas of contamination found during our assessment.

We understand past activities on the facility have primarily involved wood products and included a former lumber planer and a former Fiberboard pulp mill, both of which have generally been removed, except for slabs and foundations. Current operations continue to involve wood products and related activities.

We also understand that M&R owns a landfill located at 13th and M Streets in Port Angeles. The landfill is permitted to accept wood wastes.

The surrounding properties are not included in the assessment except to the extent that their activities may have caused potential environmental liabilities for M&R due to their proximity. Also, a small strip of land that is leased by PA Shake from the Port of Port Angeles, located at the approximate boundary of M&R's leased and fee lands, was not assessed.

This work was performed and this report prepared in accordance with generally accepted professional practices for the nature of the work completed in the same or similar localities, at the time the work was performed and within the allotted time frame. It is intended for the exclusive use of M&R and Davis Wright & Jones for specific application to the job site. No other conditions, express or implied, should be understood.

1.2 PLANT LOCATION AND DESCRIPTION

The M&R site consists of approximately 50 acres of land located adjacent to the shoreline of Port Angeles Harbor. It is located near the base of Ediz Hook, a long, thin, sand spit forming a natural breakwater for the harbor (see Figure 1). Approximately 30 acres of the site consist of leased lands and the remaining 20 acres are fee lands. The M&R site is bordered to the northwest by Daishowa and on the southeast by a marina. Port Angeles Harbor occupies the northeastern border of M&R and a steep bank is located approximately 200 yards to the southwest. In this report, plant north is toward the harbor. Major facilities on the site include a sawmill, lumber and log storage, lumber planing mill and sap stain control treatment operation, dry kiln, hog fuel boiler, alder chipper and chip storage, end seal line, machine shop, above-ground and underground fuel storage areas, electrical transformers associated with facility operations, and a truck maintenance shop (see Figure 2).

1.3 SCOPE OF WORK

Our evaluation of the M&R site was conducted in three phases. The work, accomplished in each phase is described below.

1.3.1 Preliminary Site Assessment (Phase I)

The preliminary assessment contract signed on May 9, 1988, was conducted in two parts consisting of 1) information gathering, and 2) a subsurface boring and groundwater monitoring program.

The information gathering work consisted of three tasks as follows:

- Historical Background Search - A brief historical search of past uses and activities at the site and adjacent properties was conducted using information provided by M&R employees and retired personnel, historic maps, aerial photographs, city land-use maps, and other data as available. The information was used to evaluate whether past activities may have introduced contaminants into the soil and/or groundwater and whether contaminants from adjacent properties may have migrated onto the M&R site. In addition, the historical information was used in the selection of drilling and sampling locations;

- Regulatory Agency File Review - Currently available files related to the M&R site were reviewed at the Washington State Department of Ecology, Southwest Regional Office. Particular attention was given to inspection reports, permits, enforcement actions, waste disposal records, underground storage tank notifications, and site assessment activities. Information from the review was used in selecting subsurface boring locations and for identifying areas of potential concern that required special emphasis during the site reconnaissance task; and

- Site Reconnaissance - Two Hart Crowser personnel experienced in site inspection procedures toured the M&R site in the presence of knowledgeable M&R employees. A visual reconnaissance of the site and its buildings and operations was conducted in order to identify signs of potential soil and groundwater contamination resulting from current or past practices. During the reconnaissance, the presence of drums, spills, stained soils, or stressed vegetation were noted. Photographs and field notes were taken to document our observations. Particular attention was paid to the two known underground storage tanks, the two known areas of past and current wood treatment operations, and transformers. Surface grab and composite samples were collected as deemed appropriate by the site reconnaissance team.

The second part of the preliminary assessment consisted of subsurface borings, well installations, and soil and groundwater sampling in order to evaluate potentially contaminated areas. Samples were analyzed primarily for screening parameters by a contract laboratory. The parameters were selected based on information collected during the first part of the assessment.

Subsurface borings and groundwater monitoring wells were placed at the two underground storage tank locations (B-5/MW-5A and MW-7) and the two suspected wood treatment areas (MW-8 and B-3/MW-3A). One boring was placed in the vicinity of the two former above-ground bulk petroleum storage tanks (B-4/MW-4A) and one boring was placed in the vicinity of the old planer building (B-6/MW-6A). Several borings were converted to monitoring wells and identified with a MW-(boring number)A.

Information gathered was analyzed and the findings and conclusions are included in this final report. Methods and procedures are described in the appendices. Suspected or detected contamination are discussed with respect to the possible magnitude of the contamination. Information on potential costs for additional evaluations and explorations, cleanup, or waste disposal recommendations were provided to M&R, as appropriate.

Per contract between M&R and Hart Crowser, dated May 25, 1988, the initial scope of work was amended to include a review and evaluation of available information concerning M&R's landfill located at 13th and M Streets. We were asked to review records at the Clallam County Health Department regarding an assessment of the groundwater aquifer in the vicinity of the M&R landfill. A site tour was also performed and observations were documented.

1.3.2 Additional Site Assessment Work (Phase II)

As a result of the findings and recommendations of the preliminary site assessment, additional site assessment work was authorized by M&R on May 31, 1988.

The purpose of the additional site assessment work was to further evaluate the potential environmental impacts to areas of concern identified in Phase I and to further assess whether the two known underground storage tanks were leaking. In addition, Hart Crowser assisted M&R in defining visually identified areas of contamination for cleanup and appropriate disposal.

Specifically, tasks performed to accomplish this additional work include the following:

- A total of four soil borings were drilled in presumed downgradient locations from each of four areas of interest identified as a result of the preliminary assessment (Phase I). One boring was advanced in an area north of the new truck shop and power wash area (B-13), one in the vicinity of the old truck maintenance shop (B-12), one in the vicinity of the old above-ground fuel oil storage tanks (B-11), and one north of the presumed location of the former Fiberboard mill (B-14). Each boring was converted into a groundwater monitoring well and designated with an MW- prefix. Soil samples were collected during drilling operations and groundwater samples were collected from each new monitoring well. Samples were analyzed by contract laboratory for screening parameters selected on the basis of information collected during the preliminary assessment.

- A tank testing firm was subcontracted to evaluate the potential for leaks in the two known underground storage tanks located at the M&R site.

- Hart Crowser met on-site with Mr. Paul Hopkins of M&R to point out areas requiring mitigation of visible surface contamination.

- Upon receipt of the analytical data from this additional work, Hart Crowser met with M&R to discuss the data and their significance. In addition, data from the preliminary assessment were presented and discussed. Recommendations for appropriate follow-up actions were made.

1.3.3 Focused Pentachlorophenol-Related Contamination Exploration (Phase III)

This section provides a summary of the contracted scope of work, dated June 14, 1988, to conduct a focused exploration of apparent pentachlorophenol(PCP)-related contamination at M&R identified during Phases I and II.

The purpose of this additional work was to evaluate apparent PCP-related contamination identified at two locations found during the preliminary assessment, the old and new planer mills, and to present selected options for potential mitigation.

This focused exploration was not intended to be a comprehensive evaluation of the PCP-related contamination at the site. Rather, it was intended to provide information as to the general extent of vertical and horizontal PCP-related contamination at the two suspect locations.

Tasks performed to accomplish this exploration included the following:

- Borings were advanced and monitoring wells were installed near the old planer mill (MW-15, B-16, MW-16A, B-17, B-18, MW-18, B-19, MW-19, MW-21, and MW-22). Soil and groundwater samples were collected and analyzed for PCP-related contamination in an on-site mobile laboratory using gas chromatography electron capture detection (GC-ECD) and thin-layer chromatography (TLC) methods. This provided quick turnaround on sample results which aided in the selection of subsequent boring locations. Surface soil grab samples were also collected and analyzed (SS-1 through SS-11);

- The presence of apparently shallow subsurface soil contamination was evaluated near the new planer mill using a hand auger and a hollow-stem auger to collect soil samples (HA-1 through HA-6). One groundwater monitoring well was installed in the assumed downgradient location from the contaminated area (MW-20). All samples were analyzed for PCP-related contaminates in the on-site mobile laboratory;

- Marine surface water and surface sediment samples were collected adjacent to the old planer mill site and at a background location on Ediz Hook for on-site analysis (OSS-1 through OSS-6 and OSW-1 through OSW-4 and OSSBG-1);

- Five samples were collected for dioxin and dibenzo furan analysis including three soil samples from the PCP-contaminated area in the vicinity of the old planer mill, one off-site background soil sample, and one groundwater sample;

- Five soil samples were split between the on-site laboratory and a contract laboratory in Seattle for verification analysis; and

- Data collected were analyzed and the results were verbally presented to M&R and Daishowa.

We did not perform a hydrogeologic analysis of the site, i.e. groundwater flow directions were not determined, aquifers were not characterized, etc.

1.4 GENERAL GEOLOGY AND HYDROGEOLOGY

The property is situated on filled ground. A 150- to 200-foot-high bluff, located just south of the property, forms the boundary of the uplands to the south. The site area was part of the intertidal zone prior to being filled. The bluffs, composed of glacially consolidated sediments, were formed by wave erosion and originally formed the boundary between the beach and the uplands. The geologic map and regional cross section, Figure 3, illustrates the overall geologic relationships.

The bluff and the soils underlying the original beach deposits consist of an interlayered and very dense sequence of glacially derived sediments ranging from relatively permeable sands and gravels to silts of very low permeability.

The fill was placed over the original beach deposits prior to the 1920s. Much of the fill is reported to be dredge material, and at the site, consists of sandy gravel and gravelly sand. Based upon the explorations at the site, the upper portions of the fill (generally above 5 feet in depth) consist of a loose to medium dense mixture of sand with silt and gravel, and containing varying amounts of bark and wood debris, coarse gravel, and angular riprap used as ballast on the dirt log haul roads. The most recent fill is reported to have been placed in the mid- to late-1970s, in the vicinity of the alder chipper and chip stockpile, in the eastern portion of the site. The more detailed site geologic conditions are illustrated on Figures 4, 5, and 6.

Regional maps indicate that the fresh groundwater system is largely contained within confined and semi-confined aquifers distributed within the glacial sediments forming the bluffs and underlying the fill and beach deposits beneath the site. Regionally, flow of the upland groundwater system is north toward the harbor.

The groundwater flow system at the site has two major components, fresh water flowing from within the glacial sediments, and tidal waters from the harbor. Within the shallow flow system, these waters mix beneath the property.

The shallow groundwater system was encountered in borings on the site from between 3.5 and 7 feet in depth. The direction of flow within the shallow system is likely to be relatively complex, with flow reversals, depending upon the tidal conditions and other factors such as existing drain lines or other buried features that can act as conduits.

1.5 SITE HISTORY

Historical commercial and industrial activities on and adjacent to the site were researched in order to identify potential sources of contamination. For this history, the following documents were reviewed: historical maps (Sanborn, 1917, 1924, and 1924 corrected to 1949), aerial photographs

(USACOE, 1972; USDA, 1981; M&R, 1959 - 1967, 1970, 1973 - 1975, and 1987), city atlases (Metsker, 1925 and 1935), topographic maps (USGS, 1950, 1961, and 1978), city directories (Polk, 1941/42, 1958, 1962, 1966, 1971, 1976/77, 1981, 1986/87), and two histories of Port Angeles (Lauridsen, 1937 and Welsh, 1968). In addition, interviews were conducted with Virginia Fitzpatrick of the Port Angeles Historical Society, Ken Sweeny of the Port of Port Angeles, and Ed dosRemedios and Jim Hendrickson of M&R. Figure 7 presents historical features associated with the site.

1.5.1 Historic Site Use

Although early settlers were present in the late 1850s, Port Angeles was officially established in 1862 as a lighthouse and military and naval reserve station. The first attempt at formal settlement occurred in 1887, when the Puget Sound Co-Operative Colony was established near Ennis Creek. However, wide ranging commercial development did not occur until the Seattle, Port Angeles, and Western Railroad was constructed in 1912 to 1913.

The first known commercial development on the leased part of the site were the saw, shingle, and planing mills of the Puget Sound Mill & Timber Company. Established on fill around World War I, operational structures associated with the saw, shingle, and planing mills, were machine shops, employee housing and offices, steam dry kilns, log storage areas, a lathe mill and finishing mill, brick-lined iron waste burner, box factory, boiler house and engine room, and a lumber shipping dock. The 1917 Sanborn map showed ruins of a fire. The Seattle, Port Angeles, and Western Railroad ran along the south side of the property and sidings served the mills' shipping dock and log storage areas.

Over the next several years facilities remained basically the same, although in the mid-1920s, much of the employee housing was gone and a new box factory was in operation on the northwest end of the site. An overhead covered fuel conveyor was erected. By the late 1940s, however, the Puget Sound Lumber & Mill Company no longer existed and the few remaining structures belonged to Port Angeles Forest Products. Included were a few

lumber storage areas, a small saw mill, planer shed, used machinery storage, dry kiln, sawdust bin, and two above-ground fuel oil tanks--one with a capacity of 5,000 gallons and the other with a capacity of perhaps 10,000 to 15,000 gallons. Apparently, the company was on-site until M&R leased the land in the late 1950s.

The first known commercial development on the fee side of the site, was Paraffine Companies' Crescent Boxboard Paper and Cardboard Mill. Established on fill around World War I, on-site operations included a machine shop, finishing and packing room, pulp beaters, digester, paper warehouse, sulphite manufacturing shop; acids and stock pulp tanks, pulp wood grinding shop, fuel house, engine room, chipping mill, cutoff mill, oil house, and dock. On-site structures remained the same through the late 1940s and early 1950s, although the site had changed ownership to Fiberboard Products Inc. Apparently, the mill was closed in the late 1950s and the property purchased by M&R in the late 1960s or early 1970s.

Since the late 1950s, M&R Lumber Company has conducted sawmill related activities on-site. Facilities on the leased land include a sawmill and green chain, a parts and maintenance shop, a former planing mill now occupied by log storage, shake plant, dry kiln and boiler house, a lumber dock, and acres of log and lumber storage. Facilities on the fee land include a planing mill, lumber storage shed, heavy vehicle maintenance shop and truck depot, and a chipping yard. Aerial photographs from 1965 to 1966 show that two above-ground storage tanks (estimated capacity of 1,000,000 and 270,000 gallons) were erected on the site in the early 1960s; they were removed in 1973 or 1974. The M&R head office is located on land leased from Daishowa. According to long-time employee Jim Hendrickson (1988) the central portion of the site, which includes the shake plant, is leased from the city of Port Angeles.

According to historic Sanborn Fire Insurance maps from 1917 to 1951, M&R and its predecessors were the primary commercial occupants of the property. However, earliest available city directories show that Hanson's Boat Yard and Peninsula Shingle Company occupied the address in the late

1950s and early 1960s. A restaurant also occupied that address in the mid-1970s. Apparently, Port Angeles Shake has leased a small strip of land located between M&R's fee and lease acreage for about 10 years -- unconfirmed information indicates that it used to be the Peninsula Shingle Company. Yet, aerial photographs do not show any structures on that strip of land until the early 1970s. Appendix A contains a list of on-site non-residential uses.

1.5.2 Historic Uses of Adjacent Property

The character of surrounding development is similar to that of the site. Early twentieth century residential development occurred along the bluff overlooking the site. The lagoon adjacent to the northwest end of the site was probably backfilled around World War I, and in the mid-1920s, a large boarding house occupied the fill. However, by the time M&R moved on-site, the area was apparently used only for log storage.

Perhaps the first commercial activity west of the site was Earles Mill, located at the head of Port Angeles Bay from about 1909 to about mid-1920s. The primary commercial development probably began in the mid-1920s. Washington Pulp and Paper Corporation's paper mill consisted of a sulphite pulp mill, chipping mill, pulp grinding shop, two machine shops, steam fired power plant, cooling shed, paper warehouse, and fuel oil tank and concrete water tank. By the late 1940s, ownership of the property had changed to Crown Zellerbach, and over the years it expanded east along Ediz Hook. Apparently, the first commercial development adjacent to the eastern boundary of the site was the Port Angeles small boat harbor, established in about 1957.

1.5.3 Potential for Contamination

The nature of the on-site commercial use suggests a possibility that contaminants are present in the soils and groundwater at the site. Primary sources of contamination would be associated with sawmill operations that have occurred since about 1917. Secondary sources of contamination would

be associated with sawmill support services, such as machine shops, fuel storage, waste burners, boiler and engine rooms, auto/truck shops, and aboveground and underground fuel storage tanks. Contaminants related to primary sawmill activities might include Permatox (pentachlorophenol and tetrachlorophenol) and other chemicals used to prevent fungus and staining on lumber. Contaminants related to sawmill support services might include petroleum products or solvents used to maintain and repair heavy equipment, and diesel, fuel oil, and other petroleum products stored in underground and above-ground tanks.

Because of the nature of off-site use, there is a possibility that contaminants have migrated to the site. Primary sources of contamination would be associated with sawmill and pulp operations that have occurred west of the site since about 1909. Migratory contaminants might include chemicals used to preserve and protect wood, acids used in pulp manufacturing, and petroleum products stored in tanks and used for machining and repair activities.

1.6 AGENCY FILE REVIEWS

Several sets of regulatory agency records and/or files were reviewed during the performance of the environmental assessment. These are discussed below.

1.6.1 Ecology

We conducted a file review of the Washington State Department of Ecology (Ecology), Southwest Regional Office file on M&R. The file review was conducted in Olympia on Thursday May 5, 1988. Files on adjacent properties were not reviewed. The M&R files were reviewed in an effort to identify areas of concern from inspections, permits, complaints, penalties, or enforcement actions.

The agency's file on M&R was mainly an NPDES permit-related file. The earliest information in the file was dated 1974. The file contained three NPDES inspection reports dated 1979, 1983, and 1984. All three inspections

found the facility's operations to be satisfactory. The 1979 inspection report noted, however, that the facility's oil barrel storage needed improvement and suggested that a storage house be constructed. The 1983 inspection report addresses the use of Permatox on the wood, but stated there were no problems because it was applied in a fully-enclosed spray booth. The overspray and drippings were reportedly fed back into a containment tank. The report did note, however, that "in the past" sludge from the bottom of the Permatox tank did go to the garbage until an inspector instructed them not to do this. After that time the sludge was burned in the hog fuel boiler. This disposal method appeared to be approved by the regulatory agency.

Millbrite 50 was also noted as a chemical used on-site but no details on its use were provided.

The file contained a 1980 NPDES permit summary for four discharge points into the harbor. The 1974 application for an NPDES permit said that the facility had been discharging since June 1958.

The file also contained a 1978 application for a Disposal Site Permit. The wastes to be disposed of were characterized as "construction and demolition wastes" and unspecified "industrial wastes." The industrial wastes were reported as 500 cubic yards as the 1978 volume with an estimated 275,000 cubic yards projected through 1988. The landfill application also stated the facility would include "dewatered dredge spoils" as they developed.

No details were given in the file on the location of the landfill which was being permitted in the 1978 application. In December of 1983, however, the Clallam County Health Department issued a solid waste landfill permit for a site located at 13th and M Streets in Port Angeles.

A 1977 letter from Ecology to M&R stated there were no problems with contamination of storm water from the log yard and that M&R's plans to improve the ditch system would help prevent future problems. M&R planned, at that time, to improve the ditch system and "place a weir at the

downstream end to trap floating debris and oils". The letter also mentioned that log handling in some areas was pushed on or close to the beach and that this should be stopped and the debris cleaned up.

Effluent monitoring records since issuance of the NPDES permit stated there were no problems and at one point the agency suggested they eliminate the monitoring and reporting requirements in the permit except for weekly inspections for visible oils.

Both known underground storage tanks at M&R have had notifications filed with Ecology.

1.6.2 Clallam County Health Department

At M&R's request we obtained from Clallam County Health Department copies of Landau Associates' well locations, boring logs, and groundwater data from Pen Ply's 13th and M Streets Landfill. Pen Ply's landfill is immediately adjacent to the M&R landfill (Figure 1). We reviewed this material to get an overview of the hydrogeology of this area and to see if monitoring wells associated with Pen Ply's site are likely to intercept leachate if it migrates from M&R's adjacent landfill. Our conclusions based on information in the Landau report follow.

1.6.2.1 Local Hydrogeology

The landfill hydrogeology is presented here, separated from Section 1.4 because the landfill is not adjacent to the M&R landfill.

- Soils are predominantly sand and gravel with subordinate layers of clay and silt.

- Laterally discontinuous perched water-bearing zones exist at shallow depths (12 to 80 feet below the ground surface).

- The shallow configuration of saturated and unsaturated zones probably changes seasonally. Therefore, the volume of water, the direction of flow, and the rate of flow all change with time.

- The flow direction in the shallow saturated zone is generally north to northeast.

- Estimated average hydraulic conductivity of the shallow saturated zone is 5.8×10^{-4} ft/min.

- Estimated seepage velocity of the shallow saturated zone is 106.1 ft/yr.

- An aquifer near sea level exists 218 to 268 feet below ground surface. Preliminary information indicates groundwater in this aquifer flows in a westerly direction beneath this site.

- Some chemical analyses were done in April 1987. Manganese, chloride, sulfate, pH, COD, and TOC exceeded water quality guidelines.

1.6.2.2 Pen Ply's Landfill Monitoring System

Based on the above information and conclusions we received from the county, the monitoring wells located in the shallow saturated zone on the Pen Ply site are unlikely to intercept leachate if it migrated from the M&R landfill. The basis for this is that the groundwater in this zone generally flows toward the north-northeast and therefore when groundwater leaves M&R property it will flow away from the Pen Ply landfill.

With regard to the monitoring wells in the deeper "sea level aquifer", because of the northeasterly flow of the shallow groundwater system, any potential contaminant from the M&R landfill would likely be picked up by the shallow flow system. The contaminant would move northeasterly. In the unlikely event the contaminant eventually reached the sea level aquifer, it would be a considerable distance northeast of the site before moving within the sea level aquifer. Therefore the chance any deep monitoring well on

the 13th and M Street site would detect a contaminant in the deep zone is very remote.

1.6.3 Corps of Engineers

During the performance of the environmental assessment, Army Corps of Engineers (COE) permits to construct a bulkhead and buildings and place fill and riprap at the M&R site were reviewed. These permits stated that "polluted dredge material" would be placed as fill on-site. The COE was contacted to access those associated permits concerning the "polluted dredge material". Review of associated permits showed the source of the polluted materials (also described as "unsuitable dredge materials") to be from the Port of Port Angeles, near Terminals 1 and 3, adjacent to the M&R site. No chemical data on the materials were presented in the associated permits; the materials were described in the permits only as being "silty material" and "granular material".

As part of our investigations, a boring was advanced through this fill (B-11) and a monitoring well was installed (MW-11). Soil and groundwater samples were taken and analyzed. No BTEX was found in soil or groundwater (all < 1 ug/kg or ug/L). A GC/FID screen showed soil to have 16,000 ug/kg solvent extractable hydrocarbons. Less than 200 ug/L solvent extractable hydrocarbons were detected in the water. The boring is within 200 feet of a fuel oil tank (now removed) which may have leaked. These data are not considered significant.

Hart Crowser was unable to determine what the COE dredging permit meant by "polluted material". However, based on the date of the permits (circa 1970) it is likely that "polluted material" refers to suspended solids and/or biological oxygen demand (BOD) from fresh dredge spoils which could adversely affect water quality in the harbor if runoff were not controlled.

2.0 PRELIMINARY SITE ASSESSMENT AND FOCUSED EXPLORATION

The discussion of our site assessment is broken into four major groupings: surface stained soils, transformer leakage, underground storage tanks, and pesticide spray areas. Other miscellaneous items are contained in Appendix J. Each discussion includes the rationale for assessments, reconnaissance/ exploration, sample data evaluation results, recommendations or options, and any appropriate follow-up actions. The discussions for the site assessments are introduced through a review of potential contamination sources.

2.1 POTENTIAL CONTAMINATION SOURCE REVIEW

Potential sources of environmental contamination were identified prior to conducting the site reconnaissance. This was accomplished using the following sources:

- Hart Crowser's experience with lumber mill operations;
- Hart Crowser's experience with other projects in the Port Angeles area;
- Historical search;
- Agency file reviews; and
- Interviews with M&R employees and retired personnel.

Sawmill operations normally have log yards, planers, kilns, painting shops, maintenance and machine shops, fuel storage, chemical storage, transformers, boilers, packaging areas, and finished product storage. These types of operations may result in environmental contamination from petroleum products, solvents and thinners, paints, wood treatment operations, boiler ash, log sort yard runoff, lead/acid batteries, and PCB.

Through the historical search, agency file review, and employee interviews we learned of two underground fuel storage tanks, the former Fiberboard mill, the old truck maintenance shop, the old planer building, and a landfill at M Street and 13th Street. These areas are all potential sources of environmental contamination.

Potential contamination source areas were selected for relatively intensive evaluation during the site reconnaissance. This information was also used to preliminarily select environmental boring locations.

In order to make a reasonable attempt to identify other potential areas of concern the site reconnaissance included a walk through the entire 50-acre site, except where operational hazards prevented observation.

2.2 SURFACE STAINS

2.2.1 Assessment Rationale

Evidence of leaks and spills, such as stained soil, discoloration, stressed vegetation, proximity to suspected spill sources, and unexplained mounds or swales can provide information for use in focused evaluations or in determining appropriate mitigative measures. As part of the site reconnaissance we made detailed observations of suspected surface contamination during tours of buildings, operations, areas adjacent to operations, and the water front area. Observations included photographs, notes on suspected sources, and probable contaminants. These observations lead to recommendations for mitigative action and additional field exploration activities including the installation of additional borings and groundwater monitoring wells as well as hand auger borings and surface samples.

2.2.2 Reconnaissance

The areas of noticeable surface stains observed during the site reconnaissance are shown on Figure 8 and are discussed below. Appendix B contains photographic documentation of the reconnaissance including stained soils. Appendix C contains sampling procedures and exploration logs.

- The drum disposal yard ("boneyard"), west of the sawmill, was covered with heavy vegetation and small trees. Rusted machinery, scrap metal, wood debris, and miscellaneous 55-gallon drums were observed at the

site. Corroded, rusted, and dented drums were scattered around the area. Small (i.e., ten square foot) visible soil stains and vegetation distress were also observed under the corroded/leaking drums. A drum of assumed green end-paint with visible soil stains was observed.

- o There are two product storage areas west of the sawmill. Approximately twenty 55-gallon drums of product were stored at this location. Visible signs of minor staining were noted on soils in this area. Across the drive an oil storage area was located with 55-gallon drums lying prone on a wooden tip rack. The tip rack was stained with an oil-like material as was the surrounding soil under the drum spigots.

  South of the sawmill, several drums of assumed lubricating oil were located under a cherry picker. The surrounding soil was heavily stained with an oil-like material. The stains on the soil appeared to be from leaking hydraulics associated with the cherry picker.

- o An oil-like stain (approximately nine feet square) was observed on the machine shop concrete floor. No obvious floor drains were noted and the spilled material did not appear to have exited the building.

- o The western portion of the old alder mill/old truck maintenance shop contained drums of assumed waste oils. The 55-gallon drums were rusted, dented, and appeared to have leaked. The surrounding soil was heavily stained with an oil-like material.

- o Several areas of potential concern noted during the tour of the new planer building were:

  - A large, brown puddle of liquid at the NP-1 storage area was observed the day after the site tour with M&R employees. It appears the NP-1/Millbrite overspill at the spray room (in the planer mill) was swept outside directly onto the concrete and asphalt. A surface soil sample (SS-1) was retrieved for potential analysis at a subcontracted laboratory;

- A section stained with an oil-like material was observed along the northwest side of the planer building, just north of the door entering the treatment area. Unknown green and brown stained soil were also noted at this location. Several open drums, a dumpster, and a wooden box were also observed. A surface soil sample (SS-2) was retrieved from the stained areas for potential analysis at a subcontracted laboratory;

- The surrounding soil and vegetation at the two above-ground tanks west of the planer showed evidence of minor staining with an oil-like material.

o During a later site visit to the new planer mill, a Hart Crowser representative noticed a green material on the soil along the northwest corner of the planer building at the approximate location of sampling site SS-2. The green material appeared to be rainwater runoff from the dumpster located in the area.

o Adjacent to the alder chip yard, minor leakage from four 55-gallon drums labeled lubricating oil and/or hydraulics associated with the alder chipper were observed on the asphalt along the south side of the chipper. Two 55-gallon drums lying prone on a tip rack also appeared to be lubricating oils. The surrounding asphalt was stained with an oil-like material.

o West of the new truck maintenance shop, several drums contained an unknown material, some of which appeared to have leaked onto the soil. A leaking truck saddle tank had stained the surrounding soil and vegetation with an oil-like material.

A pressure wash area was observed at the northwest entrance to the truck shop. Emulsified oils and standing water were observed on the surrounding soils. Although most of the shop area is covered with asphalt or concrete, the pressure wash area drains into a wedge of soil with no apparent containment.

North of the truck shop were drums of waste oils. The soil around the drums was stained with a black, oil-like material. A surface soil sample (SS-3) was retrieved from this stained area for laboratory analysis.

2.2.3 Sample Data Evaluation

Two surface soil samples were analyzed by Laucks Testing Laboratories, Inc. in Seattle (SS-2 and SS-3). Sample SS-1 (a grab sample of the NP-1 solution) was not analyzed; refer to subsection 2.5.1.1 for the rational. Laboratory certificates containing raw data sheets and laboratory QA/QC results are presented in Appendix D. Table 1 presents analytical results.

Visual observations revealed stained soils at a number of locations shown on Figure 8. The surface soil sample (SS-2) collected near the new planer mill was found to contain phenols. Pentachlorophenol (270,000 ug/kg) and tetrachlorophenol (40,000 ug/kg) were measured at relatively high concentrations as were sodium tetrachlorophenate (4,000 ug/kg) and sodium pentachlorophenate (17,000 ug/kg). Data evaluation of sample SS-2 is discussed in subsection 2.5.3.2. The other surface soil sample (SS-3), obtained at the east end of the property, was analyzed using the GC/FID screen. A concentration of 2,400,000 ug/kg, was detected indicating that significant levels of solvent extractable compounds exist in the surface soil at this location.

After identifying areas of potential concern during Phase I of the field work based on reconnaissance and analytical results as presented in Table 2, additional sampling and analysis were authorized. Our Phase II work involved installation of additional borings in four locations as indicated on Figure 4 (MW-12 through MW-14). Two of the four locations were associated with surface stain identification (MW-12 and MW-13). The borings were converted to monitoring wells. These borings/wells are in presumed downgradient positions of identified surface stain sources of contamination. Five soil samples at each boring, obtained during drilling, were composited into a single sample for each location and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and other selected

volatile organic compounds using GC-FID technique. Groundwater samples from the two monitoring wells were analyzed for BTEX, solvent extractable compounds and total organic halogens (as chlorine). Table 3 presents analytical results.

The only halogenated volatile compound detected in soil samples was methylene chloride, where MW-13 had the highest concentrations at 170 ug/kg. Methylene chloride is a common laboratory solvent. Contamination from laboratory procedures is possible but two method blanks analyzed at the same time as the soil samples did not detect any contamination from this source. GC/FID screens of the composited soil samples detected solvent extractable hydrocarbons at 4,500 ug/kg in MW-13.

Solvent extractable compounds were measured at 420 ug/L in MW-13. No total organic halogens, measured as chlorine, were detected in wells MW-12 or MW-13.

The concentrations of solvent extractable organic compounds detected in the areas of surface staining are typical of industrial property around Puget Sound. If the subject soils are within an area of proposed excavation, special handling and disposal (such as at a sanitary landfill) may be appropriate.

The presence of methylene chloride in the composite soil sample from MW-12 and MW-13 is likely because of contamination introduced to the sample in the laboratory. However, since this compound did not show up in laboratory blank samples, its presence in the site soils cannot be ruled out at this time.

2.2.4 Recommendations

The surface stains identified at the M&R site appear to be primarily petroleum products and are limited in extent based on visual observations, laboratory data, and discussions with M&R employees. In general, the sizes of the stains ranged from approximately 5 to 400 square feet at the

surface. In order to reduce potential sources of subsurface contamination we recommend that all surface stains be removed down to a depth where visual evidence and odors no longer exist.

As discussed with M&R, disposal of stained soils should be in accordance with federal, state, and local regulations governing solid waste. The majority of the soils can probably go to the Port Angles landfill with the permission of the Clallam County Health Department and the landfill operator. Prior to disposal, the county or landfill operator may require some of the soils that are highly contaminated with petroleum products be aerated for a period of time to reduce volatile organic concentrations and to provide additional biodegradation to reduce the overall hydrocarbon content. Unknown materials may require testing to indicate proper disposal.

We recommended that PCP-contaminated soils be removed from the area just west of the new planer building and placed in drums for disposal at a permitted hazardous waste disposal facility. Preliminary laboratory data indicate this material probably meets the definition of a state dangerous waste due to persistence per WAC 173-303-084(6). Additional details on this area are contained in subsection 2.5.

We suggested that representative samples be collected from the bottom of the excavations prior to backfilling with clean fill. These samples should be kept cool in a secure location in the event that Daishowa requests verification analysis.

2.2.5 Follow-Up Actions

At the request of M&R, Hart Crowser met with Mr. Paul Hopkins of M&R on June 2, 1988, to tour the site and point out areas of visual surface staining identified during the preliminary assessment. Areas addressed during this follow-up tour included the following:

- Power wash area near the new truck shop;
- Waste oil storage north of the new truck shop;

- Drum and debris storage area west of the new truck shop;
- Oil-like stains at the alder chipper;
- Transformer at the alder chipper;
- Transformer at the alder chip wall loading facility;
- Paint spray booth;
- West end of the new planer mill;
- Transformer at the west end of the new planer mill;
- Old truck maintenance shop area;
- Underground diesel storage tank near the scale house;
- Cherry picker at the south end of the sawmill;
- Empty Permatox tank at the head of the green chain;
- Transformers on the east and west ends of the sawmill;
- Lube oil product storage area west of the sawmill; and
- Boneyard located on the western boundary of the property.

During the tour stained soil removal and disposal methods were discussed. Procedures for collecting verification samples after removing stained soils were also discussed.

It is our understanding that M&R has removed stained soils identified during the preliminary site assessment for disposal at the Port Angeles landfill with their permission. Verification samples apparently were not collected.

Soils located on the west end of the new planer building that were found to be contaminated with PCP have been removed and placed in a container. During excavation a concrete slab was discovered underlying the area of contamination at a depth of approximately six inches. This concrete barrier along with the surrounding asphalt may have prevented the migration of significant levels of PCP to the underlying soils. At last report the ultimate disposal of this material is being evaluated by M&R. Additional information on this area is contained in subsection 2.5.

2.3 TRANSFORMER LEAKAGE

2.3.1 Assessment Rationale

Polychlorinated biphenyls (PCB) have historically been used as transformer and capacitor dielectric fluids due to their stability and low flammability. Subsequent to the development of PCB in the early 1930s, it was discovered that PCB presented a significant threat to human health and the environment due to persistence, bioaccumulation, and suspected human carcinogenicity.

The Toxic Substances Control Act (TSCA) administered by the EPA regulates the use and disposal of PCB in Washington State. By definition, oils containing less than 50 mg/kg PCB are considered to be non-PCB oils and are not subject to TSCA regulation. PCB transformers that have been flushed and refilled with non-PCB dielectric fluids often contain residual PCB below the 50 mg/kg threshold. Even though PCB are no longer manufactured in the United States many transformers and capacitors contain PCB oils or PCB-contaminated oils.

The regulations require transformers containing more than 500 mg/kg PCB be labeled as PCB transformers. We cannot assume that the transformer owner is aware of this labeling requirement. Leaks from PCB-contaminated transformers (i.e., 50 to 500 mg/kg PCB) or non-PCB transformers (i.e., < 50 mg/kg PCB) may present a substantial threat to human health or the environment due to residual levels of PCB depending on site specific conditions.

During the preliminary assessment, Hart Crowser observed all transformers known to be on site. Samples for PCB analysis were obtained, if possible, adjacent to transformers that appeared to be leaking. Figure 9 shows transformer locations and sampling points. Documentation of transformer identification label information and close observation of the transformers were not possible due to electrical hazard.

2.3.2 Reconnaissance

The transformer reconnaissance results are shown on Figure 9 and are discussed below. Appendix B contains photographic documentation of the walk through and any leaking transformers. We do not know whether all transformers on-site have been analyzed for PCBs. Appendix C contains sampling procedures.

- Three transformers were located in a locked vault on the west side of the new planer building. The transformers sat on a bermed, concrete floor covered with sawdust. Two of the transformers appeared to be leaking, evidenced by staining on the sides of the transformers and on the surrounding concrete floor. A sample for PCB analysis (TR-1) was obtained from the center transformer.

- A bermed, concrete vault containing three transformers was located at the west end of the sawmill near the product storage areas. The metal vault door was locked to restrict access to the transformers. The transformers stood on a concrete floor that was covered with sawdust. The center and eastern-most transformers showed evidence of leakage. There were visible oil-like stains on the floor around the two transformers. A sample (TR-2) was collected from the stained area for PCB analysis. Jim Hendrickson thought the transformers had been tested for PCBs and the oil changed approximately five or six years ago. The City Light employee stated that the transformers were tested around that time period.

- South of the sawmill, a transformer on a concrete pad was located east of the cherry picker. The transformer did not appear to be leaking and so no samples were taken, in keeping with our scope of work.

- Five transformers were located just north of the green chain. Four of the transformers are small pole-mounted types and one is a large transformer mounted on a concrete slab without berms. All of the

transformers are located inside a fenced area with a locked gate. Hart Crowser was unable to gain access to these transformers.

Minor signs of leakage were observed at the drain valve on the large transformer, but no noticeable stains were observed on the concrete pad. Two of the four pole transformers showed signs of leakage, evidenced by black stains down the sides of the transformers. The transformers are located in a high traffic area and much of the soil within the fenced area was covered with water during our site tour. No obvious signs of transformers oil were observed on the surrounding soil or surface water. However, recent leakage from the pole transformers may have been obscured due to traffic and/or surface water.

- A transformer mounted on a concrete pad was located at the old alder mill/old truck maintenance shop. The transformer was surrounded by approximately twenty drums of assumed waste oil. It was difficult to detect if the transformer leaked due to the amount of soil stainage. We assumed the oil-like residue on the transformers was from the drums. However, a sample for PCB analysis (TR-3) was retrieved from the stained area adjacent to the transformer to verify this assumption.

- Three transformers were located north of the alder chipper on a concrete pad with metal railings on three sides. Several compressed gas cylinders were also stored in the vicinity of the transformers. It was difficult to ascertain if the transformers showed evidence of leaking due to the amount of sawdust accumulated on the pad. A sample for PCB analysis (TR-4) was retrieved from the base of two transformers. The stains that were observed on the concrete pad may have been from an open-top, 5-gallon bucket containing what appeared to be lubricating oil and which appeared to have overflowed.

- A transformer was located along the waterfront in the northeast section of the property, behind the concrete wall used as a backstop for chip loading operations at the eastern-most pier on the M&R site. The transformer was mounted on a concrete pad and appeared to be leaking,

evidenced by stains coming from near the top of the transformer. The surrounding concrete pad was stained with an oily material that may have splashed onto the transformer base. The oily material at the base may have come from two 55-gallon drums of assumed lubricating oil that were situated on a tip rack adjacent to the transformer pad. A sample for PCB analysis (TR-5) was scraped from the side of the transformer.

2.3.3 Sample Data Evaluation

The five PCB samples collected were analyzed by Laucks Testing Laboratories, Inc. in Seattle using Method 8080, described in Test Methods for Evaluating Solid Waste (SW-846), EPA. 1986.

Laboratory certificates containing raw data sheets and laboratory QA/QC results are presented in Appendix D. Table 1 presents analytical results.

All five samples contained a large amount of wood debris which presented matrix interferences in the initial low level extraction. The remaining sample materials were then subjected to medium level extraction in an attempt to generate valid data. However, sample TR-1, collected at the west end of the new planer building was exhausted during initial low level extraction and no data are available. In addition, the medium level extraction increased the detection limits for the remaining samples to approximately 2,400 ug/kg instead of the 100 ug/kg level that should have been obtainable with low level extraction. However, the medium extraction detection limit appears to be adequate for the purposes of this preliminary assessment.

PCB was not detected in samples TR-2 (west of the sawmill), TR-3 (northwest of the kiln), and TR-4 (alder chipper). Sample TR-5 from the transformer located at the alder chip wall loading facility contained low levels of PCB at 4,800 ug/kg (Aroclor 1260), twice the detection limit.

The EPA guidelines for PCB acute and chronic criteria for protection of saltwater aquatic organisms are 0.030 ug/kg and 10.0 ug/kg, respectively,

on a 24-hour average. These criteria are 5 and 2 orders of magnitude lower than the concentration reported in sample TR-5. However, due to the extremely low water solubility of PCB it normally requires massive contamination for a long duration to produce PCB concentrations in the water that approach the published criteria.

The National PCB Spill Cleanup Policy (52FR10688), issued on April 2, 1987, sets requirements for the reporting of spills involving PCB-contaminated materials and sets cleanup performance standards. This policy only applies to spills of PCB at concentrations that are above the regulated concentration (i.e. > 50 mg/kg). The most stringent cleanup standard in the policy for solid surfaces located at other than indoor or residential areas is that the affected area receive a double rinse/wash. For soil cleanup standards involving new spills containing PCB between 50 to 500 mg/kg the EPA requires the removal of visible traces plus a one-foot lateral buffer.

The Washington State Department of Ecology (Ecology) has had an unwritten policy that soils contaminated with PCB should be cleaned up until the remaining residue is at 1 mg/kg or less.

The leaking transformer at the alder chip wall loading area does not appear to be in a concentration or volume to require reporting under federal regulation. No imminent or substantial endangerment to human health or the environment has been identified at the site.

2.3.4 Recommendations

We suggest transformers that have not been tested should be evaluated. Appendix E contains the results of testing done on transformer oils from M&R site. This testing was done in 1982 on four transformers. Trace levels (less than 1 mg/kg) of Arachlor were detected in one transformer. Leaking transformers should be replaced or repaired to eliminate a potential source of contamination to the environment, regardless of their PCB content.

It does not appear that the minor PCB contamination discovered at the alder chip wall loading facility requires cleanup under federal regulation. The State Department of Ecology, however, may require removal of PCB contaminated debris down to a level of 1 mg/kg or less. Accordingly, the transformer, transformer pad, and any visually stained soils should be removed from around the transformer located at the alder chip wall loading facility. This can probably be accomplished by removing visual stains and washing the transformer with a strong detergent. The work should be performed by an individual familiar with PCB cleanups and the residue should be properly disposed of at the Port Angeles Landfill, with the permission of the Health Department and the landfill operator, or at a facility permitted by the EPA to handle PCB waste.

2.3.5 Follow-Up Actions

Conversations with M&R employees indicates that visual stains have been removed from around the alder chip wall transformer. The debris was placed in a plastic bag and deposited in the drum containing PCP contaminated soil removed from the west end of the new planer mill. Although various conversations have occurred between M&R and Hart Crowser regarding transformers located at the site, we are unaware of any other actions.

2.4 UNDERGROUND STORAGE TANKS

2.4.1 Assessment Rationale

The potential for an underground tank to leak depends on a variety of factors such as construction materials, soil type, tank contents, and age of the tank. We have evaluated hundreds of underground storage tanks for a variety of clients. The vast majority of the tanks over 10 years of age that we have evaluated have been found to leak to some degree. Thus, it is important to address potential leaking underground storage tanks in any environmental assessment.

It is often difficult to adequately evaluate underground tanks without installing borings. On occasion there may be surficial evidence of leakage from such things as corroded piping, subsidence, or unexplained product loss from daily inventory logs. Tank integrity testing is also often employed to detect leaks in underground tanks.

During the site reconnaissance known underground storage tank (UST) locations were viewed and available information was obtained as to tank size, age, construction materials, installation procedures, leak monitoring methods, and spill or leak history. The site reconnaissance team looked for evidence of unreported underground tanks while touring the remainder of the site.

2.4.2 Reconnaissance

During the site visit, the locations of the USTs were observed. These locations are shown on Figure 8. M&R employees were interviewed about the existence of additional tanks at the site. In addition, we looked for visual signs of additional tanks (i.e. swales, vent pipes, fill ports). No signs of additional underground tanks were observed.

The underground storage tank areas observed are shown on Figure 8 and are discussed below:

- At the log scale house area a metered pump mounted on a concrete pad was located in the middle of the dirt turn-around road. No visible signs of soil stains were observed in this area during our site tour.

  Jim Critchfield and Jim Hendrickson stated the tank had been previously used for unleaded gasoline. Reportedly, three to four years ago, the tank was converted to diesel. The tank size was thought to be 500-gallon capacity. We asked M&R to contact Texaco and the tank size was determined to be 2,000 gallons.

A rupture in the pump hose was later observed by a Hart Crowser representative while conducting drilling operations at the site. An unknown quantity of diesel was pumped directly onto the surrounding soil. The spilled diesel left an oily sheen in surface puddles of water.

- At the dry kiln an underground storage tank that was thought to contain leaded gasoline was located south of the kiln. A metered pump was mounted on a concrete pad surrounded by asphalt. The size of the tank was unknown by Mr. Hendrickson. M&R employees contacted Texaco and determined the tank capacity to be 1,000 gallons. Obvious signs of potential environmental concern were not observed at the underground gasoline tank during the site tour.

To further assess conditions associated with the two underground storage tanks, borings B-5, and B-7 were installed to assess contamination from these tanks. Boring B-7 was converted to a monitoring well and monitoring well MW-5A was installed immediately adjacent to boring B-5. Appendix C contains field investigation procedures and boring logs. See Figure 4 for these boring locations.

2.4.3 Sample Data Evaluation

The soil and groundwater samples collected during the preliminary assessment were analyzed by Laucks. Laboratory certificates containing raw data sheets and laboratory QA/QC results are presented in Appendix D. Table 2 presents analytical results.

Xylenes were detected in soil samples from B-5 (34 ug/kg) and in water samples from MW-5A (2 ug/L) and MW-7 (2 ug/L) indicating the presence of low level volatile organic compounds at these locations. Qualitative GC/FID screens indicated the presence of solvent extractable compounds in soil from B-5 (4,700 ug/kg).

Chemical Data Conclusions

The xylenes detected in the composite soil sample from boring B-5 and in the groundwater samples collected from wells MW-5A and MW-7 are well below the EPA Water Quality Criteria (400 ug/L) and the Maximum Concentration Limit (MCL) of 440 ug/L proposed by the EPA. Based on the data available it does not appear that xylenes detected at these two well locations present a threat to human health or the environment.

GC-FID screen data collected from the vicinity of the underground diesel tank at B-5/MW-5A are slightly elevated above background values we normally see at industries of this type (i.e., 1,000 to 2,500 ug/kg). These data indicate that soil and groundwater near the underground diesel tank contain minor amounts of solvent extractable organic compounds.

2.4.4 Underground Storage Tank Testing

The two known petroleum underground storage tanks were tested for "tightness" by Petroleum Equipment Maintenance Company (Pemaco) under subcontract to Hart Crowser using the "Petro-Tite" system to evaluate the tanks potential for leaks. The Petro-tite system is capable of detecting losses as small as 0.05 gallon per hour. This detection limit is recommended by the National Fire Protection Association (NFPA). NFPA guidelines state that if detected losses exceed 0.05 gallon per hour, a leak is likely and corrective action is warranted.

Both tanks use a suction pump system to retrieve fuel from the tank through the supply lines to the dispensor nozzle. Suction systems limit the amount of supply vent line testing since the lines are often buried. Back pressurizing lines assumes that in-line check valves will hold pressure which may or may not be the case.

The 1000-gallon gasaline tank vent was removed and plugged to the lower elbow, located just above the pipes entrance into the concrete

ground-surface slab. The supply lines connected to the pump were left intact during testing.

The 2000-gallon diesel tank supply line running at a 45° angle from the concrete surface slab above the tank to the pump dispensor was slightly loose. Initial connection of the tank testing gear indicated these connections leaked. After discussions with M&R, this piping was disconnected, and plugged at the 45° elbow. The vent pipe was disconnected and plugged near ground surface.

Testing commenced on the tanks and the buried vent supply/line piping. Groundwater monitoring wells installed adjacent to both tanks during Phase I were used to record groundwater levels during tank testing.

Test results indicated that the diesel tank at the scale house area leaked. The gasoline tank at the kiln appeared to be sound. A description of the "Petro-Tite" test system, and test results are included in Appendix F.

2.4.5 Recommendations

The underground diesel tank located in the log scale house area should be removed and contaminated soils should be excavated for proper disposal. In that only minor soil and groundwater contamination was detected in well MW-5A, an indication of either a minor or short term leak, contamination can probably be adequately mitigated by removing soils with visual stains or obvious petroleum odors. Representative verification samples should be collected from the bottom of the excavation in case Daishowa requests to have them analyzed to verify that adequate cleanup has been conducted.

2.4.6 Follow-up Actions

Hart Crowser has been informed by M&R that the underground diesel tank located in the log scale house are has been removed along with an unspecified amount of contaminated soil. Disposal was apparently at the Port Angeles Landfill. Verification samples were not collected.

2.5 PESTICIDE SPRAY AREAS

2.5.1 Assessment Rationale

Lumber mills often have wood treating operations to control sap stain discoloration prior to reaching the consumer. Historically these types of operations have used various formulations of chlorinated phenol pesticides to produce desired results. Due to increased restrictions placed on chlorinated phenol use by the EPA, less persistent substitutes have recently appeared on the market, such as NP-1.

All pesticides are designed to kill unwanted organisms and, as a result, they are all toxic to one degree or another and can present an environmental concern. Pesticide use areas are a prime target for evaluation when conducting environmental assessments.

In order to assess the potential for contamination from known and suspected pesticide use area, surface grab samples were taken at the new planer mill. Borings and groundwater monitoring wells were installed at three locations on the M&R site:

- The new planer mill (known use area) - B-3/MW-3A;
- The green chain (known use area) - B-8/MW-8; and
- The old planer mill, currently a log sort yard (suspected use area) - B-6A/MW-6A.

The initial assessment detected elevated levels of PCP-related contamination in surface soil samples collected near the new planer building and soil and groundwater samples collected in the vicinity of the old planer mill. The source of the contamination near the old planer mill was not clear at that time. Further communication with retired M&R personnel revealed that the old planer mill was the site of a Permatox treatment operation until approximately 1971 or 1972 when the building was

severely damaged in a fire. If PCP was burned in the fire, dioxin could be generated, in addition to the potential burst drum spillage.

Based on this information, Hart Crowser was contracted to initiate a fast-tracked investigation to obtain information as to the approximate vertical and horizontal extent of the contamination at both locations. The investigation was not intended to characterize the site, rather it was designed to obtain data on the general magnitude to the problem on a very short time frame so that decisions could be made by M&R and Daishowa with respect to the sale of the property.

Because the pesticide spray areas were of greatest concern during the site assessments, we have provided limited human health/environmental assessments of NP-1, PCP, and TCP. More detailed assessments can further the understanding of the impacts these pesticides may have on any property transfers.

2.5.1.1 Limited Assessment of NP-1

We originally intended to sample and analyze for the active ingredients in NP-1, the current sap stain control chemical used at the new alder mill. In consultation with Laucks Laboratories, Inc., we were informed that standard analytical methods were not readily available for the active ingredients in NP-1 and that researching the methods would be time consuming and costly. In lieu of sampling and testing, Hart Crowser agreed to conduct a brief literature review into the potential environmental hazards associated with NP-1.

The current wood treatment operation at the new planer mill is conducted using a 200:1 mixture of water:NP-1. Usually this water/NP-1 mixture is mixed with a wood toner called Millbrite 50 Brown 583 at a ratio of 75 parts water/NP-1 to one part Millbrite. The resultant mixture is then sprayed onto each board as it comes out of the planer.

According to the Material Safety Data Sheet (MSDS) supplied to M&R by the manufacturer (Koppers Company, Inc.) NP-1 contains the following hazardous ingredients:

o Didecyl dimethyl ammonium chloride	65%
o Iodopropanyl butyl carbamate	20%
o Petroleum naphtha	5%
o Ethanol	10%
o Dimethyl sulfoxide	5%

The MSDS for NP-1 states that the DOT hazard class is "corrosive material". Health warnings include corrosive to eyes, causes severe burns, and it may be fatal if inhaled, ingested, or absorbed through the skin. The pure undiluted product would be a designated hazardous waste due to ignitability (flash point - 104^{o} F - TCC) if it were being disposed.

Millbrite 50 contains the following hazardous ingredients according to the manufacturer (Chapman Chemical Company):

o Amino-2 meth-2 propanol-1	1-10%
o Proprietary surfactant	1-10%
o Proprietary dispersion pigments	2-20%
o Alkanolamine	1-10%

The MSDS states that Millbrite can cause severe irritation to the eyes, may cause skin irritation, and causes gastrointestinal irritation upon ingestion.

Appendix G contains copies of the MSDS for NP-1 and Millbrite.

Review of the chemical information supplied in the MSDS indicates that Millbrite is relatively innocuous with respect to human health concerns and it does not appear to be a major environmental threat, especially in the concentrations used in the working solution. Accordingly, we concentrated our limited assessment efforts on NP-1.

The primary ingredient in NP-1 with respect to pesticide activity is the carbamate compound. Carbamates are relatively new substitutes for PCP in the wood treatment area. Carbamates are a class of aliphatic compounds that have a triple carbon-carbon bond. Iodopropanyl butyl carbamate has the following structure:

I-C≡C-CH2O-CO-NH-Bu

We conducted searches of three computer databases in an attempt to obtain information on the carbamate of concern. No information pertinent to our limited assessment was available in any of the searches. NIOSH and the EPA Spill Table were reviewed for pertinent toxicity information without success. We contacted Koppers repeatedly and requested toxicity information on their product. Koppers was less than cooperative, but they informed us that the half-life of NP-1 is four days and that some mammalian toxicity information on NP-1 was available and that they would send it to us. At this writing we have not received the information from Koppers.

In summary, we were unable to obtain information that would allow us to conduct a conclusive limited assessment of NP-1. An exhaustive search for pertinent information concerning toxicity, environmental fate, and transport mechanisms would probably produce some useful information. This level of effort was not possible due to time constraints. However, some general statements can be made based on our experience:

- NP-1 appears to be much less persistent than PCP based on the chemical structure and reports from Koppers;

- The carbamate is probably the most toxic ingredient in the product;

- NP-1 is probably fairly mobile in the soil based on the probable water solubility of the compound; however, information on the octanol/water partition coefficient was not available.

With available information, Hart Crowser designated the NP-1/Millbrite working solution in accordance with the State Dangerous Waste designation procedures per WAC 173-303-070(3)(a). The only designation procedure that was of real concern was the toxicity procedure per WAC 173-303-084(5). Hart Crowser calculated the toxicity of the NP-1/Millbrite working solution and arrived at an Equivalent Concentration (EC) of 0.0003458 percent. Based on the Toxic Dangerous Waste Mixtures Graph (WAC 173-303-9906) the wood treatment working solution is not a toxic dangerous waste and, thus, it does not appear to be a state dangerous waste. Testing against the Dangerous Waste Criteria is not necessary unless Ecology specifically requires it per WAC 173-303-070(4). Appendix H presents the calculations and assumptions used in determining the toxicity calculations.

2.5.1.2 Limited Assessments of PCP and TCP

M&R used Permatox 180 for a number of years to control sap stain on lumber prior to changing to NP-1, approximately three years ago. Permatox 180 is a mixture of sodium pentachlorophenate and sodium tetrachlorophenate and is manufactured by Chapman Chemical Company. Unlike the phenol forms, these sodium salts have the advantage of being water soluble at high pH ranges alleviating the need to use a solvent carrier which is the normal method of applying pentachlorophenol.

During the initial preliminary assessment soil samples from three areas were analyzed for both the phenol and phenate forms because of uncertainties in which forms might be present. This required two different extraction methods on each soil sample.

Extraction methods for the groundwater samples converted the sodium salts, if present, to the phenol forms. Thus, analysis for sodium salts on groundwater samples was not necessary.

Biodegradation of PCP normally proceeds with the removal of chlorine atom from the phenol ring. It is not uncommon to find tetra-, di-, and chlorophenol in decreasing concentrations at sites with historic PCP

releases. Chromatograms from the mobile laboratory used during the focused investigation gave indications that these biodegradation products may be present in low concentrations in soils analyzed near the old planer building. However, this was not verified due to time constraints.

In general, the more chlorine atoms attached to the phenol ring the more toxic the compound. Highly chlorinated compounds are normally more persistent in the environment than compounds with fewer chlorine atoms. The marine chronic criteria for PCP is more restrictive than published marine criteria for the other chlorophenols. Thus, PCP was selected as a relative datum for the purposes of this investigation.

2.5.2 Preliminary PCP Reconnaissance and Sample Data Evaluation

Locations where pesticides have been used on-site are as follow:

- The green chain area was an open-sided building located on the east end of the sawmill and was surrounded by asphalt and pallets of lumber. Jim Hendrickson informed us that the green chain was the former location of a PCP treatment operation for rough cut lumber. PCP treatment at the green chain ceased in 1974 according to Dick Stroble. The operation consisted of a spray booth and, for a short period of time, a dip tank PCP treatment operation. A metal storage tank used during the former PCP operation appeared to be empty and was observed sitting in a wooden cradle on the asphalt at the west end of the green chain line. No visible signs of leakage or damage to the PCP storage tank was observed. The former treatment line had been removed from the green chain area, with the exception of the storage tank.

- The old planer area is presently used as a log sort yard. Current M&R employees were not aware of any wood treatment operations at the old planer mill.

- The new planer building is located east of the boiler/dry kiln. M&R employees stated that the kiln-dried lumber used to be treated with PCP

(i.e., Permatox 180). Approximately three years ago they stopped using PCP. According to the employees, NP-1, a carbamate based, sapstain control chemical is presently used. A product called Millbrite 50 is often added to the NP-1 as a wood toner. The employees explained that all planed lumber is normally treated with NP-1 and/or Millbrite.

During the preliminary investigation surface samples were taken and three borings/wells (i.e., B-3/MW-3A, B-8/MW-8, and B-6A/MW-6A) were placed in the vicinity of three areas of suspected or known PCP use (Figure 4). PCP-related contamination was detected in surface soil samples west of the new planer building (discussed in subsection 2.2) and in soil and groundwater samples obtained from boring B-6A and well MW-6A, respectively (see Table 2). A composite soil sample from B-6A showed levels of PCP and TCP of 11,000 ug/kg and 3,600 ug/kg, respectively. PCP and TCP concentrations in groundwater were 5,700 ug/L and 7,400 ug/L, respectively. This turn of events initiated a focused investigation at both planer mill locations (old and new) to establish a rough outline of the contaminant plumes, both horizontally and vertically.

Field methods, boring logs, procedures, and rationale for the preliminary and focused investigations are provided in Appendices C and I.

2.5.3 Focused PCP Exploration

2.5.3.1 Sample Data Evaluation

Field work during the third phase provided a focused exploration of apparent PCP-related contamination at two locations. An on-site mobile laboratory operated by Farr Friedman & Bruya, Inc. (FFB), of Seattle, Washington was utilized to analyze for PCP and TCP. Discrete soil samples from 11 surface soil locations (SS-1 through SS-11) and at 1.5 foot intervals from 7 borings located near the site of the old planer mill (B-15 through B-19, B-21 and B-22) were collected and analyzed for PCP and TCP (Figure 10). Water from monitoring wells associated with these borings was also analyzed for these compounds. Marine water and sediment samples were obtained at four

locations just offshore from the site, and one background location, and analyzed for PCP and TCP as well. Figure 4 presents these sampling locations.

Table 4 presents a summary of the data from the focused investigation.

The highest concentration of PCP (34 mg/kg) was found in soil from MW-16 at a depth of 10 to 11.5 feet. Concentrations in the upper 10 feet at this location ranged from 0.48 mg/kg to 3.0 mg/kg. Below 12 feet concentrations ranged from 6.3 mg/kg to 1.6 mg/kg at a depth of 20 feet. Duplicate samples run a few days later confirmed these findings. The only other significant PCP findings with depth were found at 12 to 14.5 feet in soil from a boring at MW-17 (6.8 mg/kg). PCP concentrations at all other depths in soil from this boring ranged from 0.33 mg/kg to < 0.05 mg/kg. Lower PCP concentrations (0.05 to 0.62 mg/kg) were detected in soil at all depths at MW-18 with the highest concentration once again observed at the 12.5 to 14 foot interval. PCP was also detected in soil at low concentrations (0.18 to 0.25 mg/kg) at all depths at MW-15. Little or no PCP was found in soil from MW-21 or MW-22. PCP may be found with depth at MW-6A. A composited soil sample analyzed from the preliminary investigation work resulted in a PCP concentration of 11 mg/kg but lack of depth-specific results make it difficult to define concentrations with depth at this location. TCP concentrations generally followed the same trends as PCP but was detected at lower concentrations, ranging from < 0.05mg/kg to 4.5 mg/kg.

PCP concentrations in surface soil samples collected in this same general area ranged from < 0.05 mg/kg to 0.67 mg/kg. The highest concentrations occured at locations SS-1 and SS-4. TCP was detected in only four locations at concentrations ranging from a .09 mg/kg to 0.62 mg/kg.

The highest concentration of PCP in groundwater, 5.7 mg/L, was obtained from MW-6A during the initial sampling (Table 2). This sample was analyzed at Laucks Testing Laboratories. Somewhat lower concentrations of 0.1 mg/L (sampled 6/8/88) and 0.09 mg/L (sampled 6/12/88) were obtained by from MW-6A by FFB, Inc., during focused investigation work. PCP was detected in

groundwater from two other wells, MW-16A (0.59 mg/L) and MW-22 (0.01 mg/L). No PCP was found in groundwater samples from any other monitoring wells in this area. TCP was detected at detection limits (0.01 mg/L) at MW-6A only.

A possible explanation for the variability noted in PCP concentration at well MW-6A is that the PCP detected may be associated with suspended solids in the sample. We know that PCP is more likely to be associated with soil and organic particles than to remain soluble in water.

The wells were installed, developed to the extent possible to remove the majority of the fine-grained material in the sand pack, and then purged and sampled. Normally we would attempt to develop the wells to a point where little or no suspended solid remained in the sand pack. However, in fine-grained materials and under time constrains this is not always possible. The field sampling team noted that the groundwater samples contained a significant amount of suspended sediment during the focused phase of the investigation at M&R.

In reviewing the groundwater data from well MW-6A we noted that the PCP concentration decreased by about one order of magnitude each time the well was purged and sampled. Purging of the wells prior to each sample would provide further development of the wells and would reduce the amount of solids in each subsequent sample. If the PCP detected in the groundwater samples were associated with suspended solid, and if the solid fraction was being reduced with each subsequent sample, one would expect to see a decrease in the PCP concentration with each successive sample.

Current information does not allow us to substantiate this theory. In order to obtain the information needed to do this, split samples would need to be obtained for analysis and one of the splits would need to be centrifuged to remove suspended solids before extraction.

Marine sediment samples taken at location OSS-1 and OSS-2 (Figure 4) were found to contain PCP at concentrations of 0.3 mg/kg and 0.08 mg/kg

respectively. TCP was detected in only one sediment sample, OSS-1, at a concentration of 0.09 mg/kg. Neither PCP nor TCP were detected in any marine water samples.

Both marine sediment samples were subjected to duplicate analysis on the day after they were collected. Duplicate results were less than 0.05 mg/kg for both PCP and TCP in OSS-1 with 0.08 mg/kg PCP and less than 0.05 mg/kg TCP in OSS-2. Data from marine sediment sample OSS-1 are questionable based on the inconsistant duplicate results.

Marine sediment station OSS-1 and OSS-2 were resampled due to the apparent detection of PCP-related contamination. OSS-5, collected at the approximate location of OSS-1, and OSS-6, collected at the approximate location of OSS-2, did not contain detectable levels of PCP or TCP.

The presence of PCP-related contamination in marine sediments adjacent to the old planer mill is questionable based on inconsistent data. In addition, these two marine stations are not in the vicinity of where one would expect to find contamination based on the plume location.

A second potentially contaminated PCP site, located near the new planer mill was also investigated. Previous testing indicated a high concentration of PCP and TCP in surface soils at this location (SS-2; 270 mg/kg PCP and 40 mg/kg TCP (Table 1)). Sodium salts of PCP and TCP were also identified at 17 mg/kg and 4 mg/kg, respectively. One additional soil boring (MW-20) was installed at this location and discrete soil samples from this boring were analyzed on-site for PCP and TCP, as was water from the corresponding monitoring well. Surface soil samples from 6 locations at this site were obtained by hand auger to a depth of approximately 2 to 3 feet and also analyzed for PCP and TCP.

No PCP or TCP was detected in soil or groundwater obtained from MW-20. PCP was found in soils at only one location, HA-1, which was the location nearest to prior site SS-2. The concentration decreased from 0.25 mg/kg at

the surface to 0.06 mg/kg at a depth of 2.5 feet. TCP was detected in the surface interval only, at 0.6 mg/kg. See Table 4 for analytical results.

Based on these data significant amounts of PCP and TCP appear to be isolated to a small soil area that is located between the new planer building and the adjacent asphalt road. Based on the available information the contamination appears to be surficial and does not appear to be migrating in the groundwater.

2.5.3.2 Focused PCP Exploration - Hydrogeologic Evaluation

Soil Stratigraphy

There are a variety of soil materials underlying the surface between the old planer mill and the harbor. Soils disclosed in auger borings advanced for this investigation are shown on the generalized subsurface cross sections C, D, and E, on Figures 11, 12, and 13, respectively. These cross sections represent our interpretation of subsurface conditions in the area based on limited site-specific and regional information. Actual soil conditions may vary from those depicted.

The area around the old planer building site has been used in the past for log storage. Significant amounts of wood, bark, and log yard debris are present in the near-surface soils. Borings disclosed 0 to 5 feet of fill material composed of damp to wet, black to gray-brown trace to very silty, slightly gravelly to gravelly, fine sand. Explorations conducted with M&R's loader, disclosed areas adjacent to MW-6A containing brick asphalt, and concrete rubble, miscellaneous scrap metal, and charcoal fragments (burned timbers?).

This fill is generally underlain by a gray fine sand containing occasional silt and gravel zones to a depth of approximately 15 feet below ground surface and interpreted to be fill materials.

Underlying the fine sand is an approximately 2- to 5-foot-thick zone of gray, slight silty to silty, fine sand with shell fragments encountered in borings B-16, B-21, and B-22, also interpreted to be fill materials. Below the silty, fine sand unit is a gray, fine sand with shell fragments, interpreted to be natural soils. There appears to be some lateral variability in the described units, which locally may grade silty or gravelly and contain wood debris.

Section C shows that significant amounts of wood were encountered in borings placed near the shoreline, along with varying amounts of angular riprap probably placed as roadway ballast or behind the timber seawall. The shoreline in this area may have undergone several "build-out" phases with successive seawalls placed and backfilled with rocks and wood. Borings B-17 and B-18 disclosed an approximate 25-foot-thick sequence of wood, back, timber, sawdust, and varying amounts of sand.

In summary, there is 5 to 15 feet of miscellaneous fill material immediately below the site surface. Fine sands with interbeds of other materials underlie the fill material. The upper 20 feet of these fine sands grade laterally to riprap and wood toward the harbor. MW-21 intersected a significant pocket of gravelly sand to sandy gravel below the fill.

The hydraulic conductivity of the soils underlying the PCP site is heterogeneous and anisotrophic. Zones of coarser sediments with high permeability will behave as aquifers and zones of finer sediments with relatively low permeability will behave as aquitards. However, without additional groundwater and hydraulic conductivity data, it is not possible to define the configuration of aquifers and aquitards in this hydraulic system. In particular, without further testing, it is not possible to determine if the fine-grained material which occurs approximately 25 feet below surface is an effective impermeable flow boundary.

Groundwater Flow

The overall geomorphology of the site and surrounding area indicates that fresh groundwater will flow generally north toward the harbor under the PCP site. Deviation from the general flow direction will occur when groundwater intersects and travels along high permeability zones. We would need at least three deep groundwater monitoring wells to determine if a vertical gradient exists at the site.

As is common at marine-freshwater interfaces, marine water invades and mixes with the fresh groundwater beneath the site. Saline water was found approximately 15 feet below surface in monitoring wells MW-18 and MW-19.

Estimated Contamination Boundary at Old Planer Mill

Pentachlorophenol is the primary contaminant of concern and other associated contaminants generally follow the same pattern; therefore, for the soils and groundwater discussion, we will refer only to pentachlorophenol.

Soil with pentachlorophenol concentrations above .79 mg/kg occurs at SS-1 and SS-3 in the vicinity of the old planer mill. This is most likely the area where pentachlorophenol and associated chemicals crossed the surface and entered the subsurface soil environment. Pentachlorophenol then migrated as an aqueous phase with the groundwater through the soil matrix. Some pentachlorophenol left the aqueous phase and remained in the soil. Pentachlorophenol and associated chemicals are easily adsorbed by wood, which occurs as disseminated material in soils and in large pockets throughout the site.

The estimated areal extent of soils with pentachlorophenol occurring above .79 mg/kg is outlined on Figure 10. Note that this is a conservative estimate; the true areal extent of soil with pentachlorophenol greater than .79 mg/kg may be smaller.

Vertical extent of the soil contamination is at least to 25 feet as shown on Figures 11, 12, and 13. Note that soil in B-16 contained 1.6 mg/kg at its base. We therefore do not know the maximum vertical extent of soil contamination.

The highest values of pentachlorophenol were found in B-6 and B-16. These locations are directly downgradient of the suspected surface source. The maximum value of pentachlorophenol was found in a wood zone in B-16 between 10 and 15 feet below surface. Excess PCP is probably adsorbed to the wood in this zone.

Soils containing less pentachlorophenol were sampled in B-15, B-18, and MW-21. These probably represent the lateral boundaries of the contaminated zone.

Soils sampled in B-17 contained lower levels of pentachlorophenol than upgradient borings. Possibly the marine waters flushing the soil near the harbor reduce the concentration of pentachlorophenol in B-17 and even in B-18 and B-15. High wood content at these locations may be acting as a sponge to bind PCP and slow its migration.

2.5.3.3 Dioxin Evaluation

Dioxin analyses were performed on 4 soil samples and one water sample by Triangle Labs, North Carolina. Results were reported for total dioxin and total furan for the tetra through octa-homologues. Sampling locations are shown on Figures 14 and 15. Sampling procedures are outlined in Appendix C. Laboratory certificates containing raw data sheets and laboratory QA/QC results are presented in Appendix D. Results were also presented for 6 dioxin isomers with 2,3,7,8 chlorine substitutions and 10 furan isomers with 2,3,7,8 chlorine substitutions. Detection limits in soils ranged from .003 to .07 ug/kg and from .022 to 0.9 ng/L in water.

Low concentrations of the 2,3,7,8 isomer of dioxin were detected in soil from the upper foot of MW-16 (.03 ug/kg) and from the 10 to 11.5 foot

interval at the same location (.273 ug/kg). Only low concentrations of hepta and octa isomers were detected at this location. Soil from the upper 1.5-foot interval from MW-15 contained no 2,3,7,8 TCDD, but higher concentrations of the hepta- and hexa- chlorinated isomers of both dioxin and furan were detected. The concentrations measured for the homologues ranged from 0.018 ug/kg for the hexa-chlorinated furans (HxCDF) to 63.5 ug/kg for the octa-chlorinated dioxins (OCDD) (63.5 ug/kg). No dioxin was detected in the water sample which was taken from MW-16A.

One soil sample was taken to analyze background levels of dioxin in the vicinity of the property. The sample was collected at a site east of the property within the Port Angeles Yacht Harbor (BG-1). Though no 2378-TCDD was detected 2378-TCDF was measured at .013 ug/kg. A number of other TCDD and TCDF isomers containing chlorines at the 2,3,7,8 positions were measured in concentrations ranging from .019 ug/kg to 12.265 ug/kg. The highest concentration was measured for OCDD at 81.462 ug/kg. In general, concentrations of the higher chlorinated isomers, both the individual congeners and the homologue groups, were found at higher levels in the background sample as compared to any of the soil samples obtained on the site.

To better assess the potential risk involved with the presence of dioxin the Environmental Protection Agency (EPA) has published an "Interim Procedure for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzodioxins and Dibenzofurans (CDDs and CDFs)" (EPA, 1986). This procedure involves assigning the various dioxin and furan congeners unique "toxicity equivalence factors (TEFs)" which express the significance of the exposure to each congener as an "equivalent amount of 2,3,7,8-TCDD. These TEFs have been estimated by the EPA using available toxicity data and are presented in the previously referenced document along with toxicity information which can be used to estimate risks associated with the mixture in question. These TEFs and the calculated TCDD equivalents for the three soil samples and the one background soil sample collected are presented in Table 5. Total TCDD equivalents were calculated from the dioxin/furan data obtained by Triangle Labs and found to be less than one for all samples, including the background sample. The highest value was .273, for the sample

at 10 feet in MW-16. The eqiuvalent toxicity of the background sample (.038) was higher than either of the surface soil samples obtained on the site. Overall, these values indicate that the mixtures found on the site are one half to one order of magnitude less toxic than pure 2378-TCDD. These values indicate that a significant dioxin contamination problem is unlikely at the M&R site.

2.5.4 Discussion of Action Options

Based on the information presented in the previous subsections on the PCP contaminant plume, we were asked to develop mitigation options that could be used to address this type of problem. Our review and presentation was not supposed to be exhaustive, and therefore only represents typical options. The options we reviewed did represent what we consider appropriate in this case.

o No action - "do nothing"

  In this option, M&R takes no further action. No monitoring or further characterization would be done.

o Continue monitoring, but perform no mitigation

  Continue to monitor in the existing wells, but take no further actions. This option assumes that PCP concentrations in monitoring wells and in offshore stations do not increase over time. Monitoring would continue indefinitely.

o Refine hydrogeologic and chemical information, monitor, but perform no mitigation

  This option assumes that our investigation is not complete enough to describe the plume. A hydrogeologic investigation could be performed to address the rate and direction of flow. A tidal study would be included to define the tide's effects on the plume. New monitoring locations

might be suggested, based on this new information. More chemical information would increase our confidence level in current data. Without health and environmental effects being noted, no mitigation activities would be planned.

o Perform risk assessment - monitoring identifies significant PCP in marine water

Should repeat monitoring identify significant levels of PCP (approaching 79 ug/kg), a full risk assessment could be warranted. This risk assessment would be used to develop an appropriate risk level for PCP in the environment. This assessment would be based on a comprehensive geohydrologic study and sampling of potentially affected receptors. This option assumes that there are not available standards or that the standards are not feasible.

o Risk levels exceeded - mitigation required

Should risk levels be exceeded, mitigation of the health or environmental risk would begin. There are unlimited variations on standard remedial options. Possibilities include removal, stabilization, isolation, treatment, interception, and solidification. Based on the levels of contamination found at this site, we looked at two in-situ options: isolation and interception/treatment.

Isolation is a method in which the contaminant is immobilized by encapsulation. An example of this type of option is a slurry wall and cap. A clay slurry wall could be installed around the plume to prevent horizontal movement caused by groundwater gradients. A cap over the plume would prevent rain and recharge water from mobilizing the contaminant. This is a passive option, and requires little maintenance.

Treatment is an option used in combination with interception wells. Interception wells would be placed just downgradient and in the path of the plume. Wells would be pumped at a rate that would match the plume's

rate of movement. Pumped water would be treated using a carbon filter or equivalent device. Treated water would need to be discharged through a permitted facility. This option would have a continual operation and maintenance cost.

2.5.5 Conclusions

Based on information available at this time, it appears that cleanup levels for soil and groundwater at the M&R site should be set to achieve water quality criteria standards for protection against marine waters impacts. Penta- and tetrachlorophenols should be based on chronic criteria, and phenol on acute criteria. These levels are as follows:

Substance	Target Standard
Pentachlorophenol	7.9 ug/L[1]
Tetrachlorophenol	440 ug/L
Phenol	5,800 ug/L

[1]Value is a 4-day average concentration, not to be exceeded more than once every three years.

Soil and groundwater cleanup levels (or alternative remedial actions) should be designed to achieve these target levels. Risk assessment to identify alternate remedial action is probably desirable, as long as the assessment is oriented to meeting the water quality target levels.

2.5.6 Summary

In general, the M&R site appears to be a relatively clean piece of industrial property, excepting the PCP-related contamination at the old planer mill location. Low levels of contamination identified at other locations on the site have either been mitigated by M&R or they are insignificant enough that additional investigation or mitigation does not appear warranted.

Through our investigation, as indicated in more detail above, we discovered a plume of PCP contamination in soil and groundwater. The PCP used on-site was a water soluble PCP salt, which has not been used for some years.

Based on available environmental information, construction activities in the vicinity of the PCP-related contamination near the old planer mill should not be adversely effected except for the following possibilities:

- o Worker health and safety concerns should be addressed if workers are in contact with contaminated soils;

- o If soils are excavated in the area where the highest contamination was detected (i.e., > 10 feet) the contaminated soils may require special handling and disposal in accordance with county, state, and federal solid waste regulations.

- o If dewatering is planned near the contaminated plume, precaution should be made to either prevent pulling the plume toward the dewatering activities or monitoring and treating contaminated dewatering flows.

Based on the information gathered, the PCP contamination does not appear to require that M&R or its purchaser report to EPA or Ecology. This conclusion was arrived at because the contamination likely occurred prior to 1972 and our preliminary information indicates a low level of contamination and no imminent threat to health or the environment has been established.

Were Ecology to be notified of the existence of the plume, action might be required by Ecology under RCW 90.48 and RCW 70.105B in an effort to protect health or the environment. The level of action would be dependent on the establishment of a level of protection. Ecology may set protection levels that trigger some type of remediation, based on references or risk assessments.

Protection levels for PCP can be set using appropriate references, such as EPA's "Quality Criteria for Water" (1987) that lists the marine water fish

chronic level at 7.9 ug/kg. Records of other EPA decisions can also be used. For example, a Florida case that used a 10 mg/kg PCP level in soil and 1 mg/kg in drinking water. If the above levels are not feasible, risk assessments can be used to develop more site-specific protection levels.

We have experience with a number of other PCP contamination sites. Of the sites we have investigated, this site is the least contaminated by at least one to two orders of magnitude. Further, we are aware of at least one site with substantially higher PCP concentrations (including a short-term release and fish kill) where Ecology has required no soil cleanup at the source of contamination.

We have been asked to suggest what level of action can be expected from Ecology. At this site, the relatively low levels of PCP contamination would likely trigger a proportionately low level of action by the agency. Our data indicate that the highest value of PCP found in soil was 34 mg/kg, and in groundwater was 5 mg/kg. The presence of PCP contamination in marine sediments is questionable. Based on industrialized bays in the Puget Sound, the native marine life is likely to already be somewhat depressed and therefore we expect the marine population near this contamination to be smaller than normal.

Based on our past experience with Ecology, they will probably go through the following action steps upon discovery of this contamination:

- Ecology would probably require more information on the hydrogeology of the area. They would probably want verification of contaminant concentrations, rate of movement, direction, and likely points of entry (if any) to marine water;

- Ecology may next establish protection levels, require a risk assessment to establish protection levels, or the owner may suggest a risk assessment should Ecology establish levels that are not feasible or realistic;

- Based on either of the above steps, Ecology may required remedial action or no action. Continued monitoring is probably the minimum effort that could be expected.

Based on our experience, we would expect that Ecology would likely require a hydrogeologic study and possibly a risk assessment. But with no data indicating toxic PCP concentrations in marine water, further remediation is not expected. Some remediation, however, would likely reduce monitoring requirements.

HART CROWSER, INC.

William B. Abercrombie

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J-2159-03

Table 1 - Phase I - Transformer and Surface Soil Analytical Data

ALL CONSTITUENTS REPORTED
IN UG/KG UNLESS NOTED

SAMPLE:	TR-1	TR-2	TR-3	TR-4	TR-5	SS-2	SS-3
TIME:	8:30	9:25	9:50	10:10	11:40	8:45	10:20
DATE:	MAY 10	MAY 10	MAY 10	MAY 10	MAY 10	MAY 10	MAY 10
PARAMETER	1988	1988	1988	1988	1988	1988	1988
SIEVE ANALYSIS NO. 10							
% RETAINED	<2	<2	<2	<2	<2	45	55
TOTAL SOLIDS (METHOD 209F)							
% TOTAL SOLIDS	41.4	68.5	74.1	47.1	90.2	50.6	66.0
PCB							
AROCLOR *	**	<2,400	<2,400	<2,400	4,800 C		
PHENOLS (METHOD 8150)							
TETRACHLOROPHENOL						40,000	
PENTACHLOROPHENOL						270,000	
SODIUM TETRACHLOROPHENATE						4,000	
SODIUM PENTACHLOROPHENATE						17,000	
GC/FID BAN SCREEN							
CALCULATED ON THE RESPONSE OF PHENANTHRENE							2,400,000

NOTES:

* AROCLOR QUANTITATED

C AROCLOR 1260

** SAMPLE EXHAUSTED IN INITIAL LOW LEVEL EXTRACTION. NO DATA AVAILABLE FROM THAT ANALYSIS. NO SAMPLE REMAINING FOR MEDIUM LEVEL EXTRACTION.

Table 2 - Phase I - Soil and Groundwater Analytical Data

ALL CONSTITUENTS REPORTED
IN UG/KG UNLESS NOTED

SOIL

SAMPLE:	1000*	S-6**	1001*	1002*	1003*	1004*	1005*
BORING:	B-3	B-3	B-4A	B-5	B-6A	B-7	B-8
DATE:	MAY 9 1988	MAY 9 1988	MAY 11 1988	MAY 12 1988	MAY 13 1988	MAY 16 1988	MAY 16 1988
PARAMETER							
SIEVE ANALYSIS NO. 10							
% RETAINED	34	64	43	42	39	<2	40
TOTAL SOLIDS (METHOD 209F)							
% TOTAL SOLIDS	84.2	83.0	84.1	85.1	83.7	86.0	82.4
BETX (METHOD 8020)							
BENZENE			<12	<12		<12	
ETHYLBENZENE			<12	<12		<12	
TOLUENE			<12	<12		<12	
XYLENES			24	34		<12	
PHENOLS (METHOD 8150)							
TETRACHLOROPHENOL	<25	<25			3,600		<25
PENTACHLOROPHENOL	<25	<25			11,000		<25
SODIUM TETRACHLOROPHENATE	<25	<25			25		<25
SODIUM PENTACHLOROPHENATE	<25	<25			47		<25
GC/FID BAN SCREEN							
CALCULATED ON THE RESPONSE OF PHENANTHRENE			9,700	4,700			

NOTES:

* COMPOSITE SAMPLE 1000 = SAMPLES S-1 THROUGH S-5, BORING B-3, 2.5'-13.5'
COMPOSITE SAMPLE 1001 = SAMPLES S-4 THROUGH S-6, BORING B-4A
COMPOSITE SAMPLE 1002 = SAMPLES S-3 THROUGH S-4, BORING B-5
COMPOSITE SAMPLE 1003 = SAMPLES S-1 THROUGH S-5, BORING B-6A
COMPOSITE SAMPLE 1004 = SAMPLES S-1 THROUGH S-5, BORING B-7
COMPOSITE SAMPLE 1005 = SAMPLES S-1 THROUGH S-5, BORING B-8

** SAMPLE S-6, BORING B-3, 15.0'-16.5'

Table 2 - Phase I - Soil and Groundwater Analytical Data

ALL CONSTITUENTS REPORTED
IN UG/L UNLESS NOTED

GROUNDWATER

SAMPLE:	MW-3A	MW-4A	MW-5A	MW-6A	MW-7	MW-8
TIME:	13:10	13:40	10:56	9:50	12:35	10:45
DATE:	MAY 17 1988	MAY 17 1988	MAY 17 1988	MAY 17 1988	MAY 17 1988	MAY 17 1988
PARAMETER						
WELL CASING LENGTH (FEET)	15.50	14.00	14.00	14.00	14.00	14.00
DEPTH TO WATER IN CASING (FEET)	5.59	8.24	6.38	6.55	3.83	7.58
DATE:	JUN 9 1988	JUN 9 1988	JUN 8 1988	JUN 8 1988	JUN 9 1988	JUN 8 1988
pH (-LOG[H+])	6.91	6.97	6.37	6.79	6.62	6.90
CONDUCTIVITY (UMHOS/CM)	320	910	710	1740	770	1092
TEMPERATURE (C)	11	13	13	14	18	15
BETX (METHOD 8020)						
BENZENE		<1	<1		<1	
ETHYLBENZENE		<1	<1		<1	
TOLUENE		<1	<1		<1	
XYLENES		5	2		2	
PHENOLS (METHOD 8150)						
TETRACHLOROPHENOL	<1			7,400		<1
PENTACHLOROPHENOL	<1			5,700		<1
GC/FID BAN SCREEN						
CALCULATED ON THE RESPONSE OF PHENANTHRENE		280	<200			

Table 3 - Phase II - Soil and Groundwater Analytical Data

ALL CONSTITUENTS REPORTED
IN UG/KG UNLESS NOTED

SOIL

SAMPLE:	1000*	1001*	1002*	1003*
BORING:	B-11	B-12	B-13	B-14
DATE:	JUN 2	JUN 2	JUN 2	JUN 3
PARAMETER	1988	1988	1988	1988
SIEVE ANALYSIS NO. 10				
% RETAINED	57	33	39	<2
WATER SOLUBLE SULFITE (MG/KG)				30
BETX (METHOD 8020)				
BENZENE	<1	<1	<1	
ETHYLBENZENE	<1	<1	<1	
TOLUENE	<1	<1	<1	
XYLENE	<1	<1	<1	
HALOGENATED VOLATILE ORGANICS (METHOD 8010)				**
VINYL CHLORIDE		<120	<120	<3
CHLOROMETHANE		<120	<120	<3
BROMOMETHANE		<120	<120	<3
CHLOROETHANE		<120	<120	<9
TRICHLOROFLUOROMETHANE		< 58	< 58	<3
2-CHLOROETHYL VINYL ETHER		<1200	<1200	<3
DICHLORODIFLUOROMETHANE		<1200	<1200	<30
1,1-DICHLOROETHENE		< 12	< 12	<3
METHYLENE CHLORIDE		140	170	5
TRANS-1,2-DICHLOROETHENE		< 12	< 12	<3
1,1-DICHLOROETHANE		< 12	< 12	<3
CHLOROFORM		< 12	< 12	<3
1,1,1-TRICHLOROETHANE		< 12	< 12	<3
CARBON TETRACHLORIDE		< 12	< 12	<3
1,2-DICHLOROETHANE		< 12	< 12	<3
TRICHLOROETHENE		< 12	< 12	<3
1,2-DICHLOROPROPANE		< 12	< 12	<3
BROMODICHLOROMETHANE		< 12	< 12	<3
TRANS-1,3-DICHLOROPROPENE		< 12	< 12	<9
CIS-1,3-DICHLOROPROPENE		< 12	< 12	<9
1,1,2-TRICHLOROETHANE		< 12	< 12	<3
1,1,2,2-TETRACHLOROETHENE		< 12	< 12	<3

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Table 3 - Phase II - Soil and Groundwater Analytical Data

ALL CONSTITUENTS REPORTED
IN UG/KG UNLESS NOTED

SOIL

SAMPLE:	1000*	1001*	1002*	1003*
BORING:	B-11	B-12	B-13	B-14
DATE:	JUN 2	JUN 2	JUN 2	JUN 3
PARAMETER	1988	1988	1988	1988
METHOD 8010 (CONT'D)				
DIBROMOCHLOROMETHANE		< 12	< 12	<9
CHLOROBENZENE		< 12	< 12	<9
BROMOFORM		< 58	< 58	<3
1,1,2,2-TETRACHLORDETHANE		< 12	< 12	<9
1,3-DICHLOROBENZENE		< 12	< 12	<3
1,4-DICHLOROBENZENE		< 12	< 12	<3
1,2-DICHLOROBENZENE		< 12	< 12	<3
GC/FID BAN SCREEN				
CALCULATED ON THE RESPONSE OF PHENANTHRENE	16,000	<3,000	4,500	46,000

NOTES:

* COMPOSITE SAMPLE 1000 = SAMPLES S-1 THROUGH S-3, BORING B-11, 2.5'- 9.0'
COMPOSITE SAMPLE 1001 = SAMPLES S-1 THROUGH S-5, BORING B-12, 2.5'- 14.0'
COMPOSITE SAMPLE 1002 = SAMPLES S-1 THROUGH S-5, BORING B-13, 2.5' - 14.0'
COMPOSITE SAMPLE 1003 = SAMPLES S-1 THROUGH S-5, BORING B-14, 2.5' - 14.0'

** COMPOSITE SAMPLE 1003 WAS ANALYZED BY ALTERNATE METHOD 8240;
INSTRUMENT FAILURE PREVENTED COMPLETION OF METHOD 8010 ANALYSIS

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Table 3 - Phase II - Soil and Groundwater Analytical Data

ALL CONSTITUENTS REPORTED
IN MG/L UNLESS NOTED

GROUNDWATER

PARAMETER	SAMPLE: MW-11	MW-12	MW-13	MW-14	FIELD BLANK
	TIME: 14:00	15:30	16:00	16:30	
	DATE: JUN 3 1988	JUN 3 1988	JUN 3 1988	JUN 3 1988	JUN 3 1988
TOTAL ORGANIC HALOGENS AS CL		<0.02	<0.02	0.03	
SULFITES		--	--	<0.5	
BETX (METHOD 8020)					
BENZENE	<1	<1	<1		<1
ETHYLBENZENE	<1	<1	<1		<1
TOLUENE	<1	<1	<1		<1
XYLENE	<1	<1	<1		<1
GC/FID BAN SCREEN					
CALCULATED ON THE RESPONSE OF PHENANTHRENE	<200	<200	420	240	

Table 4 - Phase III - Soil, Sediment, Groundwater and Off-Shore Water Analytical Data

SOIL

ALL CONSTITUENTS REPORTED IN PPM UNLESS NOTED		PARAMETER	PENTACHLOROPHENOL	TETRACHLOROPHENOL
SAMPLE NUMBER		DATE 1988		
BORING B-15				
S-1,	0.0' - 1.5'	JUN 9	0.25	0.75
S-3,	5.0' - 6.5'	JUN 9	0.23	<0.05
S-4,	7.5' - 9.0'	JUN 9	0.18	<0.05
S-5,	10.0'- 11.5'	JUN 9	0.15	0.19
S-6,	12.5'- 14.0'	JUN 9	0.12	<0.05
S-7,	15.0'- 16.5'	JUN 9	0.20	<0.05
BORING B-16				
S-1,	0.0' - 1.5'	JUN 9	2.70	2.70
S-2,	2.5' - 4.0'	JUN 9	0.48	0.18
S-3,	5.0' - 6.5'	JUN 9	3.00	1.90
S-4,	7.5' - 9.0'	JUN 9	1.80	2.10
S-5,	10.0'- 11.5'	JUN 9	34.00	4.50
S-1,	10.0'- 11.5'	JUN 12	36.00	<0.10
S-6,	12.5'- 14.0'	JUN 9	3.10	0.41
S-6,	DUPLICATE	JUN 10	3.80	<0.10
S-7,	15.0'- 16.5'	JUN 10	6.30	<0.10
S-2,	15.0'- 16.5'	JUN 12	3.20	<0.10
S-8,	17.5'- 19.0'	JUN 10	4.80	<0.10
S-9,	20.0'- 21.5'	JUN 9	1.60	0.13
BORING B-17				
S-1,	0.0' - 1.5'	JUN 10	0.12	<0.05
S-1,	REPLICATE	JUN 10	0.13	<0.05
S-1,	DUPLICATE	JUN 10	<0.05	<0.05
S-2,	2.5' - 4.0'	JUN 10	0.28	<0.05
S-3,	5.0' - 6.5'	JUN 10	0.33	<0.05
S-4,	7.5' - 9.0'	JUN 10	0.18	0.08
S-4,	REPLICATE	JUN 10	0.16	<0.05
S-5,	10.0'- 11.5'	JUN 10	0.12	<0.05
S-6,	12.5'- 14.0'	JUN 9	6.80	0.45
S-6,	DUPLICATE	JUN 9	1.70	0.33
S-6,	DUPLICATE	JUN 12	0.62	
S-6,	DUPLICATE	JUN 12	0.85	
S-7,	15.0'- 17.5'	JUN 10	<0.05	<0.05
S-8,	17.5'- 19.0'	JUN 10	<0.05	<0.05
S-9,	20.0'- 21.5'	JUN 10	<0.05	<0.05
S-10,	22.5'- 24.0'	JUN 10	<0.05	<0.05
S-10,	DUPLICATE	JUN 10	0.09	0.09

Table 4 - Phase III - Soil, Sediment, Groundwater and Off-Shore Water Analytical Data

ALL CONSTITUENTS REPORTED
IN PPM UNLESS NOTED

SOIL

SAMPLE NUMBER	DATE 1988	PENTACHLOROPHENOL	TETRACHLOROPHENOL
PARAMETER			
BORING B-17 (CONT'D)			
S-11, 25.0'- 26.5'	JUN 10	0.09	0.13
S-11, 25.0'- 26.5'	JUN 12	0.05	<0.05
S-12, 27.5'- 29.0'	JUN 10	0.08	<0.05
S-12, 27.5'- 29.0'	JUN 12	<0.05	<0.05
S-13, 30.0'- 31.5'	JUN 10	0.11	<0.05
S-13, REPLICATE	JUN 10	0.10	<0.05
S-13, 30.0'- 31.5'	JUN 12	0.05	<0.05
BORING B-18			
S-1, 0.0' - 1.5'	JUN 10	0.23	<0.05
S-1, REPLICATE	JUN 10	0.17	<0.05
S-2, 2.5' - 4.0'	JUN 10	0.18	<0.05
S-3, 5.0' - 6.5'	JUN 10	0.09	<0.05
S-4, 7.5' - 9.0'	JUN 10	0.11	<0.05
S-5, 10.0'- 11.5'	JUN 10	0.07	<0.05
S-6, 12.5'- 14.0'	JUN 10	0.62	0.06
S-7, 17.5'- 19.0'	JUN 10	0.27	<0.05
S-8, 20.0'- 21.5'	JUN 10	0.10	<0.05
S-9, 22.5'- 24.0'	JUN 10	0.12	<0.05
S-10, 25.0'- 26.5'	JUN 10	0.05	<0.05
S-11, 27.5'- 29.0'	JUN 10	0.05	<0.05
BORING B-19			
S-1, 0.0' - 1.5'	JUN 11	<0.05	<0.05
S-2, 2.5' - 4.0'	JUN 11	<0.05	<0.05
S-3, 5.0' - 6.5'	JUN 11	0.06	<0.05
S-4, 7.5' - 9.0'	JUN 11	<0.05	<0.05
S-5, 10.0'- 11.5'	JUN 11	0.05	<0.05
S-6, 12.5'- 14.0'	JUN 11	0.06	<0.05
S-7, 15.0'- 16.5'	JUN 11	<0.05	<0.05
S-7, DUPLICATE	JUN 11	<0.05	<0.05
S-8, 17.5'- 19.0'	JUN 11	0.11	<0.05
S-8, DUPLICATE	JUN 11	<0.05	<0.05
S-9, 20.0'- 21.5'	JUN 11	<0.05	<0.05
S-10, 22.5'- 24.0'	JUN 11	<0.05	<0.05

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Table 4 - Phase III - Soil, Sediment, Groundwater and Off-Shore Water Analytical Data

ALL CONSTITUENTS REPORTED
IN PPM UNLESS NOTED

SOIL

SAMPLE NUMBER		DATE 1988	PARAMETER: PENTACHLOROPHENOL		PARAMETER: TETRACHLOROPHENOL	
BORING B-20						
S-1,	1.0' - 2.5'	JUN 16	<0.05		<0.05	
S-2,	2.5' - 4.0'	JUN 16	<0.05		<0.05	
S-3,	5.0' - 6.5'	JUN 16	<0.05		<0.05	
S-4,	7.5' - 9.0'	JUN 16	<0.05		<0.05	
S-5,	10.0'- 11.5'	JUN 16	<0.05		<0.05	
S-6,	12.5'- 14.0'	JUN 16	<0.05		<0.05	
S-6,	DUPLICATE	JUN 16	<0.05		<0.05	
BORING B-21						
S-1,	0.0' - 1.5'	JUN 12	<0.05		<0.05	
S-2,	2.5' - 4.0'	JUN 12	<0.05		<0.05	
S-3,	5.0' - 6.5'	JUN 12	<0.20	A		
S-4,	7.5' - 9.0'	JUN 12	0.10		<0.05	
S-5,	10.0'- 11.5'	JUN 12	0.20		<0.05	
S-6,	12.5'- 14.0'	JUN 12	0.10		<0.05	
S-7,	15.0'- 16.5'	JUN 12	<0.05		<0.05	
BORING B-22						
S-1,	0.0' - 1.5'	JUN 12	<0.05		<0.05	
S-2,	2.5' - 4.0'	JUN 12	<0.05		<0.05	
S-3,	5.0' - 6.5'	JUN 12	<0.05		<0.05	
S-4,	7.5' - 9.0'	JUN 12	<0.05		<0.05	
S-5,	10.0'- 11.5'	JUN 12	<0.05		<0.05	
S-6,	12.5'- 14.0'	JUN 12	<0.05		<0.05	
S-6,	DUPLICATE	JUN 12	<0.05		<0.05	
S-7,	15.0'- 16.5'	JUN 12	<0.05		<0.05	
SURFACE SAMPLES						
SS-1		JUN 10	0.64		0.44	
SS-2		JUN 10	0.35		0.62	
SS-3		JUN 10	0.09		0.10	
SS-3	REPLICATE	JUN 10	0.88		0.62	
SS-4		JUN 10	0.67		0.09	
SS-5		JUN 10	0.13	B	<0.05	
SS-5	REPLICATE	JUN 10	0.06		<0.05	
SS-6		JUN 10	<0.05		<0.05	
SS-7		JUN 10	<0.05		<0.05	

Table 4 - Phase III - Soil, Sediment, Groundwater and Off-Shore Water Analytical Data

ALL CONSTITUENTS REPORTED
IN PPM UNLESS NOTED

SOIL

PARAMETER			PENTACHLOROPHENOL	TETRACHLOROPHENOL
SAMPLE NUMBER		DATE 1988		
SURFACE SAMPLES (CONT'D)				
SS-8		JUN 10	0.06	<0.05
SS-9		JUN 10	<0.05	<0.05
SS-10		JUN 10	<0.05	<0.05
SS-10	DUPLICATE	JUN 10	<0.05	<0.05
SS-11		JUN 10	<0.05	<0.05
HAND AUGER				
HA-1				
S-1,	0.5' - 1.0'	JUN 11	0.25	0.60
S-2,	1.0' - 2.0'	JUN 11	0.10	<0.05
S-3,	2.0' - 2.5'	JUN 11	0.06	<0.05
HA-2				
S-1,	0.5' - 1.0'	JUN 11	<0.05	<0.05
S-2,	1.0' - 2.0'	JUN 11	<0.05	<0.05
HA-3				
S-1,	0.4" - 1.0'	JUN 12	<0.05	<0.05
S-2,	1.0' - 2.0'	JUN 12	<0.05	<0.05
S-3,	2.0' - 2.5'	JUN 12	<0.05	<0.05
HA-4				
S-1,	0.5' - 1.0'	JUN 12	<0.05	<0.05
S-2,	1.0' - 2.0'	JUN 12	<0.05	<0.05
HA-5				
S-1		JUN 12	<0.05	<0.05
HA-6				
S-1		JUN 12	<0.05	<0.05
S-2		JUN 12	<0.05	<0.05

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Table 4 - Phase III - Soil, Sediment, Groundwater and Off-Shore Water Analytical Data

ALL CONSTITUENTS REPORTED
IN PPM UNLESS NOTED

SEDIMENT

SAMPLE NUMBER	PARAMETER	DATE 1988	PENTACHLOROPHENOL	TETRACHLOROPHENOL
BACKGROUND BG-1		JUN 12	<0.05	<0.05
OFF SHORE SEDIMENT BG-1		JUN 12	<0.05	<0.05
OFF SHORE SEDIMENT				
OSS-1		JUN 11	0.30	0.09
OSS-1	DUPLICATE	JUN 12	<0.05	<0.05
OSS-2		JUN 11	0.08	<0.05
OSS-2	REPLICATE	JUN 11	0.08	<0.05
OSS-2	DUPLICATE	JUN 12	0.08	<0.05
OSS-3		JUN 12	<0.05	<0.05
OSS-4		JUN 12	<0.05	<0.05
OSS-5	OSS-1 RESAMPLE	JUN 12	<0.05	<0.05
OSS-6	OSS-2 RESAMPLE	JUN 12	<0.05	<0.05

NOTES:

A MATRIX EFFECTS PREVENTED LOWER LEVEL QUANTITIATION

B VALUE PROBABLY CARRY-OVER FROM THE PREVIOUS INJECTION. THE REPLICATE ANALYSIS GAVE A VALUE OF 0.06.

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Table 4 - Phase III - Soil, Sediment, Groundwater and Off-Shore Water Analytical Data

ALL CONSTITUENTS REPORTED
IN PPM UNLESS NOTED

GROUNDWATER

SAMPLE NUMBER		PARAMETER DATE 1988	PENTACHLOROPHENOL	TETRACHLOROPHENOL	TOTAL HYDROCARBONS	PHENOLS
MW-3A		JUN 11	<0.01	<0.01		
MW-4A		JUN 11	<0.01	<0.01		
MW-5A		JUN 9	<0.01	<0.01		
MW-5A	REPLICATE	JUN 9	<0.01	<0.01		
MW-6A		JUN 8	0.10	<0.10		
MW-6A		JUN 12	0.09	0.01		
MW-7		JUN 11	<0.01	<0.01		
MW-11		JUN 11	<0.01	<0.01		
MW-12		JUN 9	<0.01	<0.01		
MW-13		JUN 11	<0.01	<0.01		
MW-14		JUN 11	<0.01	<0.01		
MW-15		JUN 9	<0.01	<0.01		
MW-16		JUN 12	0.59	<0.01		
MW-16		JUN 16			4.00	<1.00
MW-18		JUN 12	<0.01	<0.01		
MW-19		JUN 12	<0.01	<0.01		
MW-20		JUN 12	<0.01	<0.01		
MW-21		JUN 12	<0.01	<0.01		
MW-22		JUN 12	0.01	<0.01		

OFF SHORE

OFF SHORE WATER						
OSW-1		JUN 11	<0.01	<0.01		
OSW-2		JUN 11	<0.01	<0.01		
OSW-3		JUN 12	<0.01	<0.01		
OSW-4		JUN 12	<0.01	<0.01		

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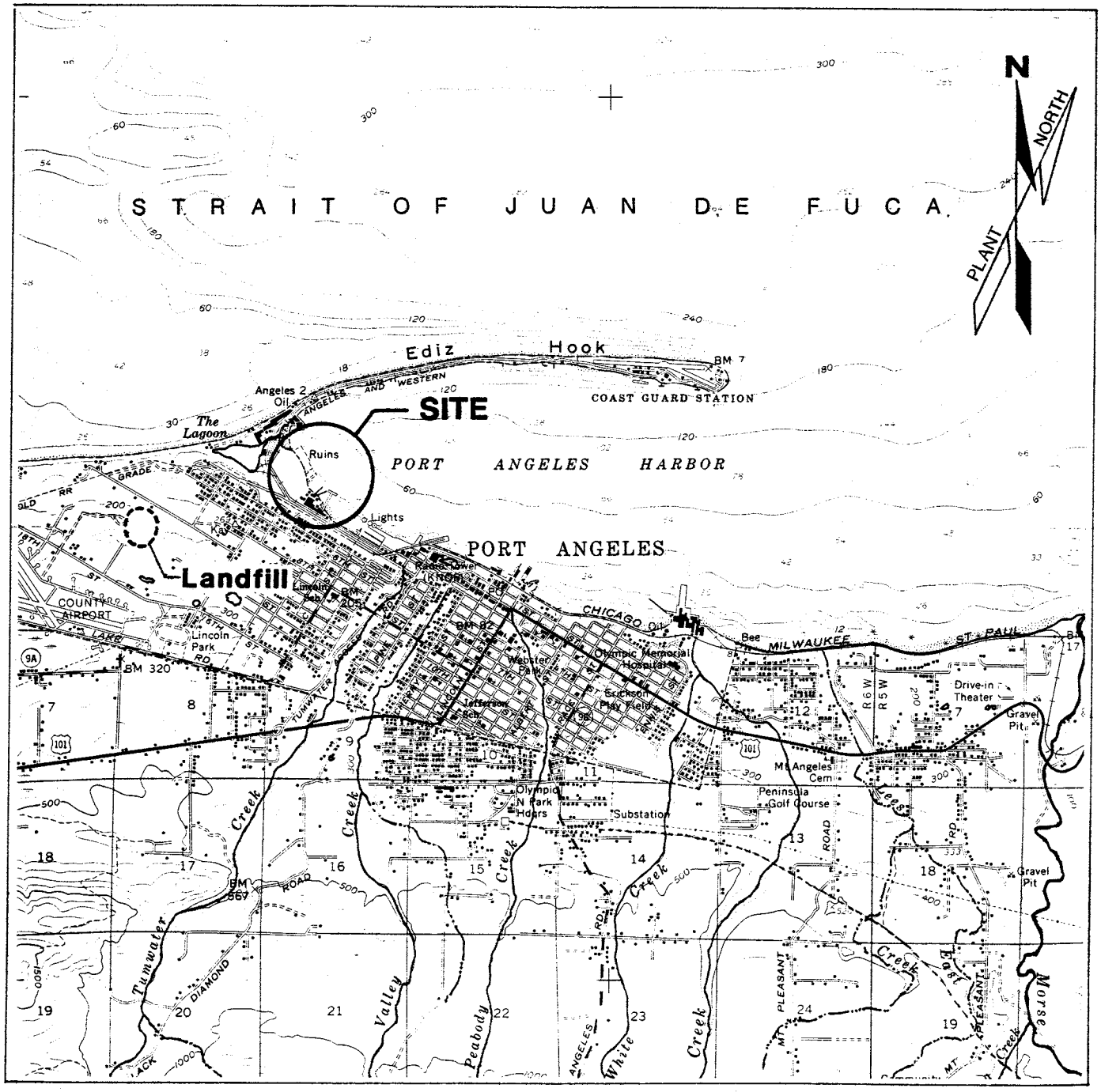
Table 5 - Relative Toxicity Estimates for PCDPs and PCDFs

Compounds	EPA TEFs	MW-15 0-1.5 feet soil (ug/kg)	MW-15 TCDD equivalent	MW-16 0-1.5 ft soil (ug/kg)	MW-16 TCDD equivalent	MW-16 10-11.5 ft soil (ug/kg)	MW-16 TCDD equivalent	Background soil (ug/kg)	Background TCDD equivalent
DIOXINS									
2,3,7,8 TCDD	1.0000	ND	0.0000	0.0300	0.0300	0.2730	0.2730	ND	0.0000
other TCDDs	0.0100	ND	0.0000	0.0300	0.0003	ND	0.0000	ND	0.0000
2378-PeCDDs	0.5000	ND	0.0000	ND	0.0000	ND	0.0000	ND	0.0000
other PeCDDs	0.0050	ND	0.0000	ND	0.0000	ND	0.0000	0.0310	0.0002
2378-HxCDDs	0.0400	0.1490	0.0060	ND	0.0000	ND	0.0000	0.3860	0.0154
other HxCDDs	0.0004	0.7820	0.0003	ND	0.0000	ND	0.0000	1.3750	0.0006
2378-HpCDDs	0.0010	4.9940	0.0050	ND	0.0000	ND	0.0000	12.2650	0.0123
other HpCDDs	0.0000	8.8610	0.0001	ND	0.0000	ND	0.0000	20.8810	0.0002
OCDD	0.0000	63.0560	0.0000	ND	0.0000	0.4300	0.0000	81.4620	0.0000
FURANS									
2378-TCDFs	0.1000	ND	0.0000	ND	0.0000	ND	0.0000	0.0130	0.0013
other TCDFs	0.0010	ND	0.0000	ND	0.0000	ND	0.0000	0.2340	0.0002
2378-PeCDFs	0.1000	ND	0.0000	ND	0.0000	ND	0.0000	0.0190	0.0019
other PeCDFs	0.0010	ND	0.0000	ND	0.0000	ND	0.0000	0.2840	0.0003
2378-HxCDFs	0.0100	0.0300	0.0003	ND	0.0000	ND	0.0000	0.2800	0.0028
other HxCDFs	0.0001	0.8250	0.0001	0.1960	0.0000	ND	0.0000	2.0980	0.0002
2378-HpCDFs	0.0010	1.2170	0.0012	0.1740	0.0002	ND	0.0000	2.7380	0.0027
other HpCDFs	0.0000	3.3330	0.0000	0.5630	0.0000	ND	0.0000	7.4850	0.0001
OCDF	0.0000	2.7400	0.0000	ND	0.0000	ND	0.0000	6.3750	0.0000
TOTAL ESTIMATED TCDD EQUIVALENTS (TEF):			0.0130		0.0305		0.2730		0.0382

Vicinity Map



Base map prepared from USGS 15-minute quadrangle map of Port Angeles, Washington

0 1 2

Scale in Miles

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Figure 1

Current Features Site Plan

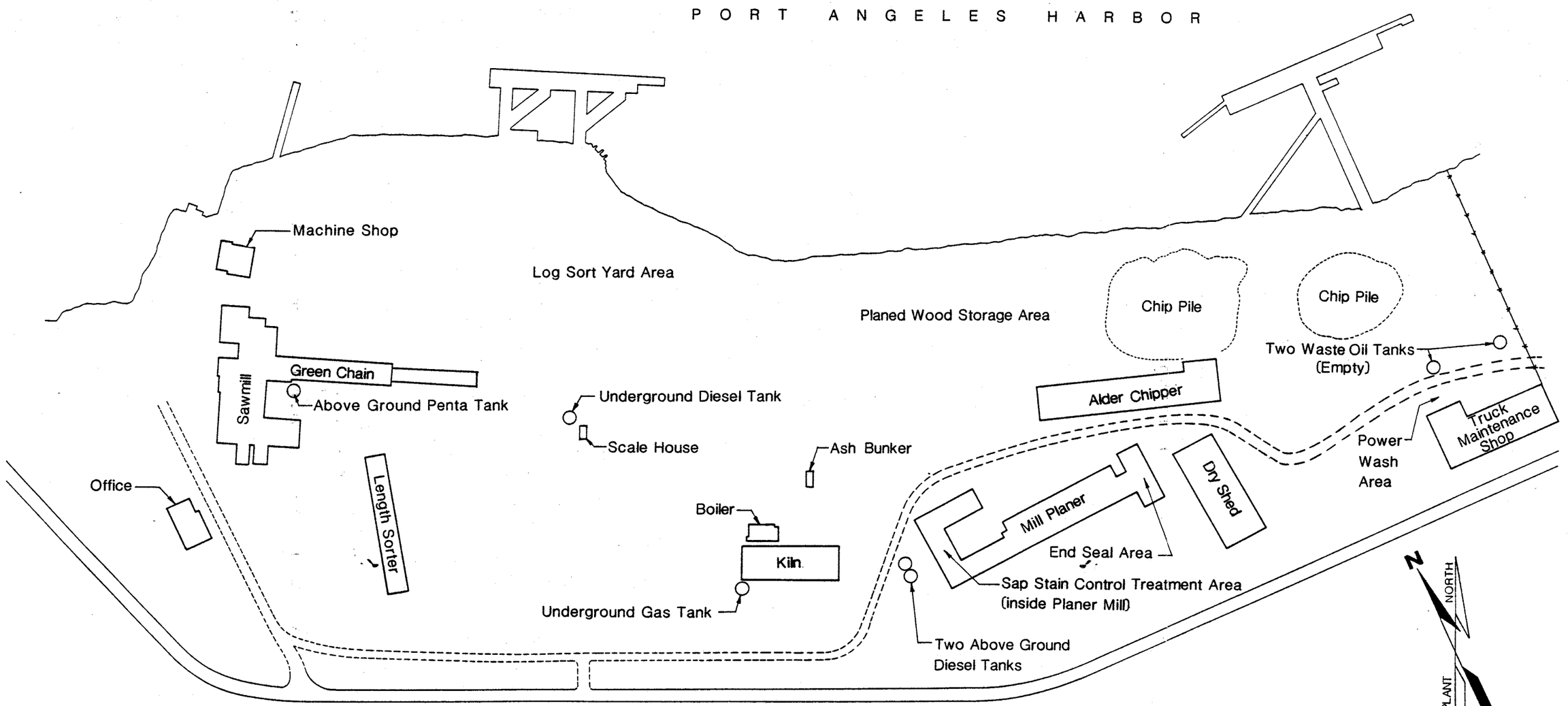

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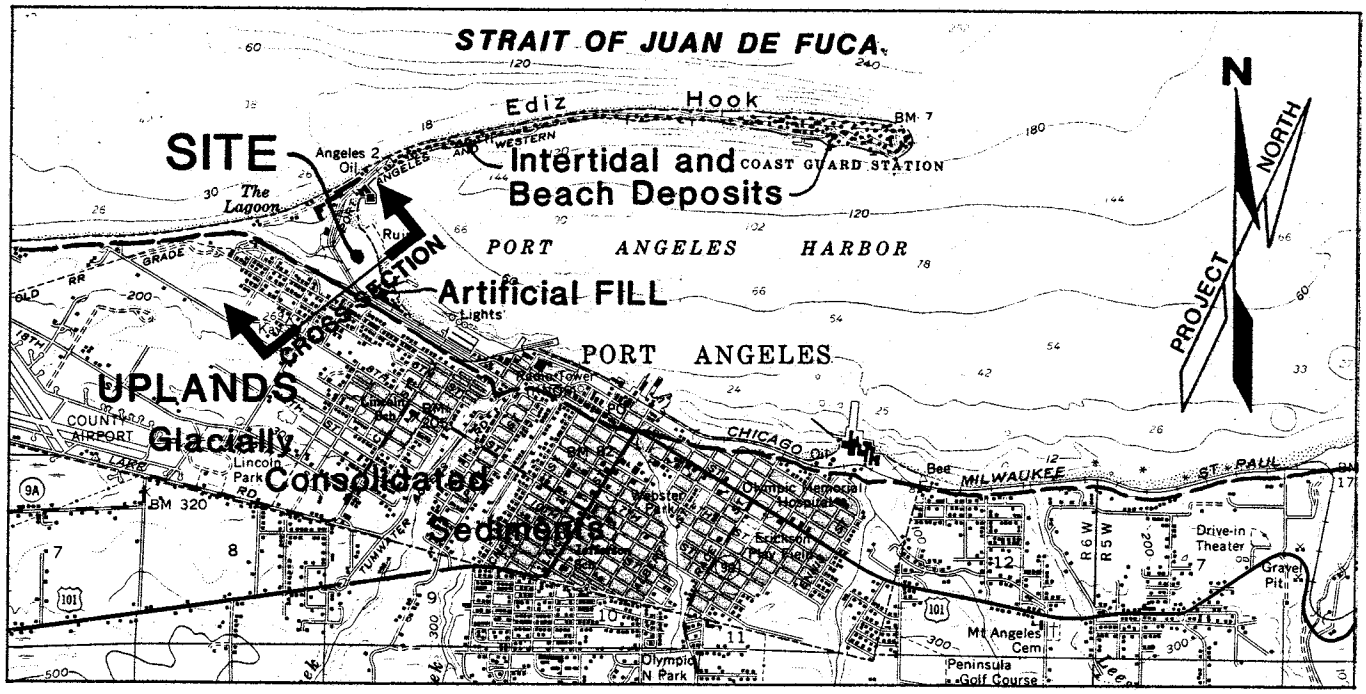
Figure 2

Geologic Map

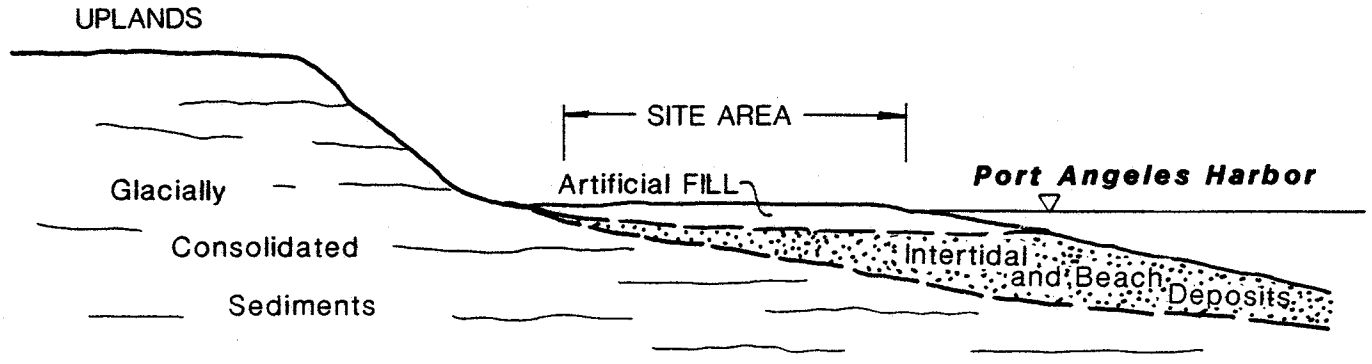


Base map prepared from USGS 15-minute quadrangle map of Port Angeles, Washington

0 1 2

Scale in Miles

Schematic Geologic Cross Section



NOT TO SCALE

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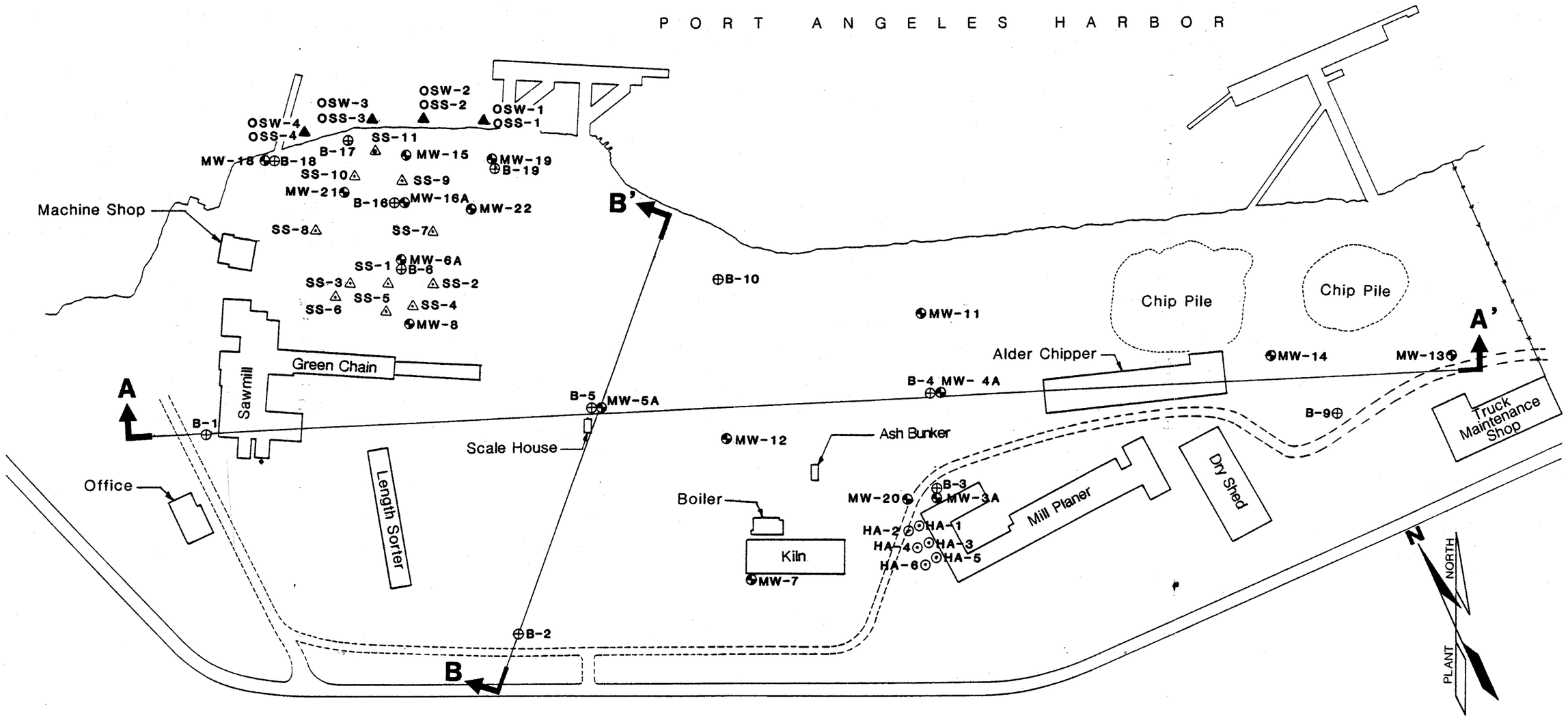
Figure 3

Site and Exploration Plan



Exploration Location and Number

MW-22	Monitoring Well
B-1	Boring
HA-1	Hand Auger Boring
OSW-1 / OSS-1	Offshore Soil and Water Sample
SS-1	Surface Soil Sample

A A' Generalized Subsurface Cross Section Location and Designation

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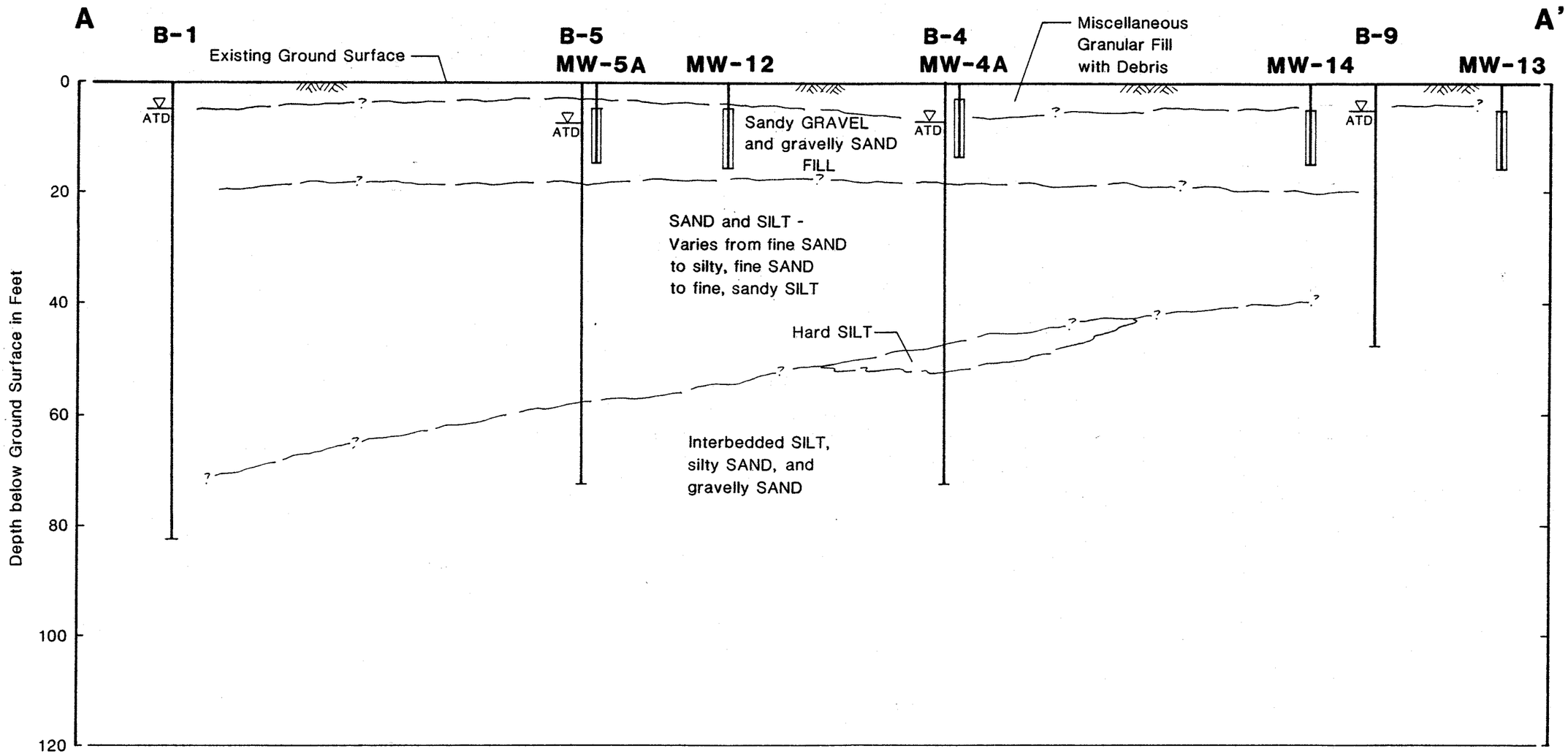
Figure 4

Generalized Subsurface Cross Section A-A'



Note: Contacts between soil units are based on interpolation between explorations and represent our interpretation of subsurface conditions based on currently available data.

B-1 Boring Number

MW-12 Monitoring Well Number

Exploration Location

Screened Section

ATD Groundwater Level At Time of Drilling

Horizontal Scale in Feet
0 200 400
0 20 40
Vertical Scale in Feet
Vertical Exaggeration x 10

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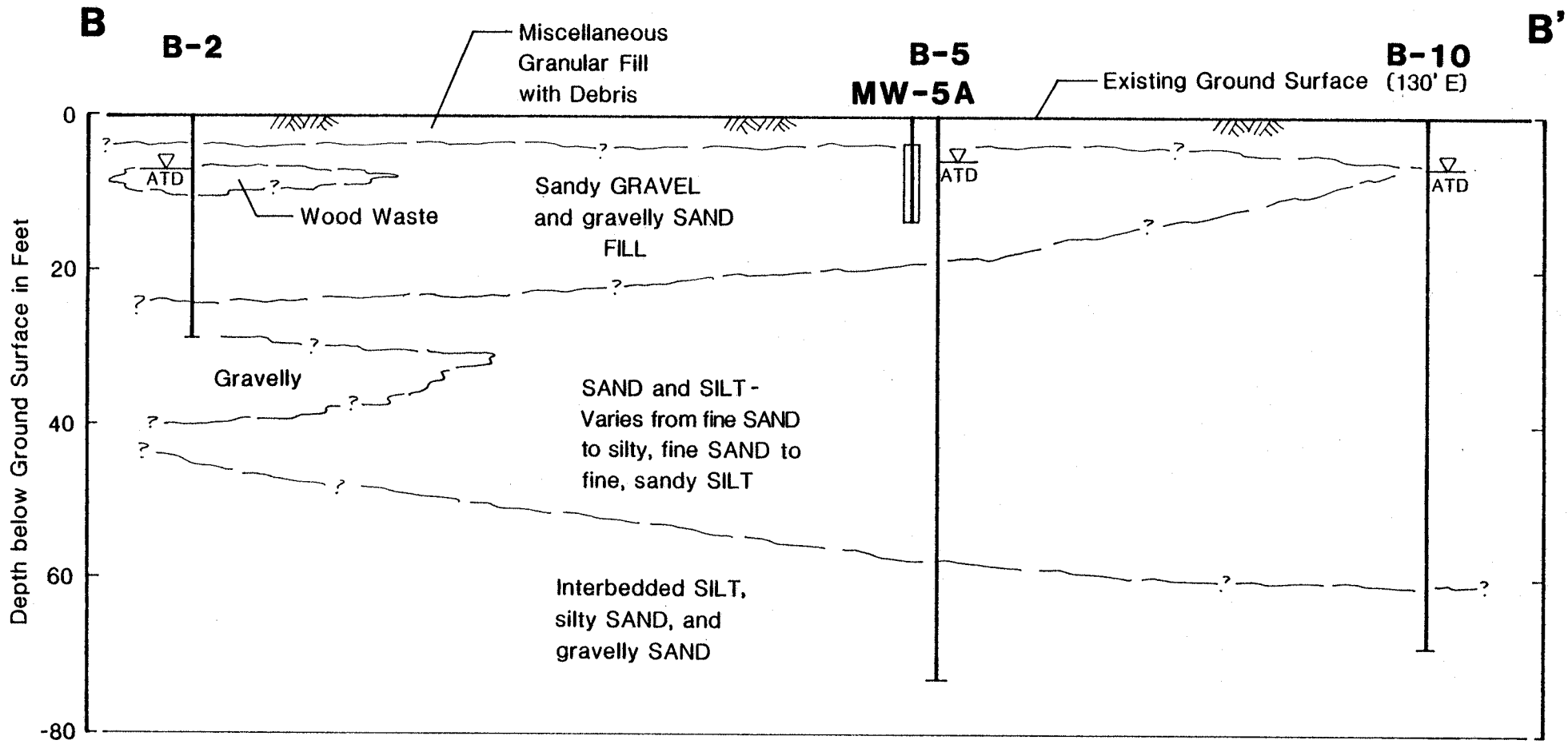
Figure 5

Generalized Subsurface Cross Section B-B'



Note: Contacts between soil units are based on interpolation between explorations and represent our interpretation of subsurface conditions based on currently available data.

B-2 Boring Number

MW-5A Monitoring Well Number

(130' E) Offset Distance and Direction

Exploration Location

Screened Section

ATD Groundwater Level At Time of Drilling

Horizontal Scale in Feet
0 100 200
0 20 40
Vertical Scale in Feet
Vertical Exaggeration x 5

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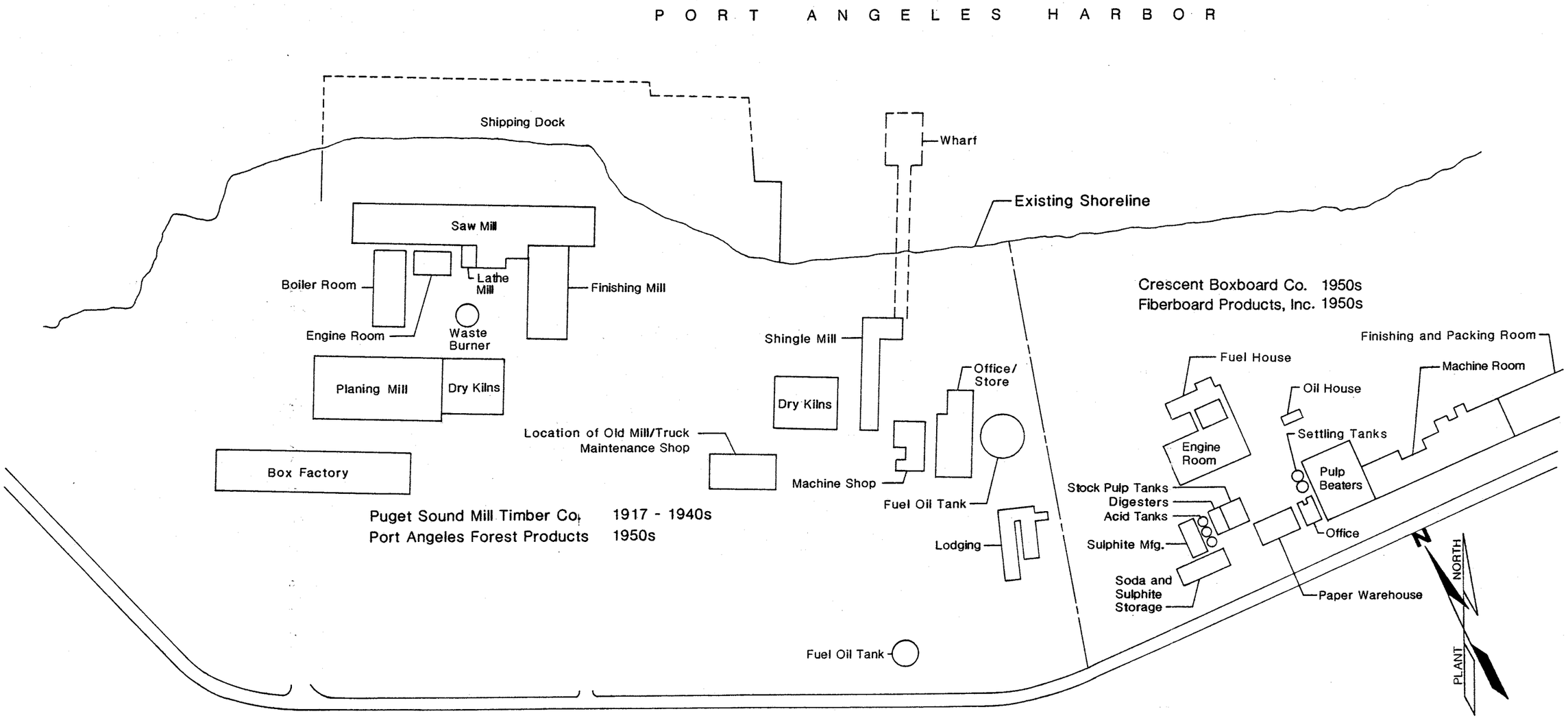
Figure 6

Historical Features Map



Notes: Historical facility locations are approximate.

Historical facility locations based on Sanborn Fire Insurance Co. maps dated 1917 to 1951.

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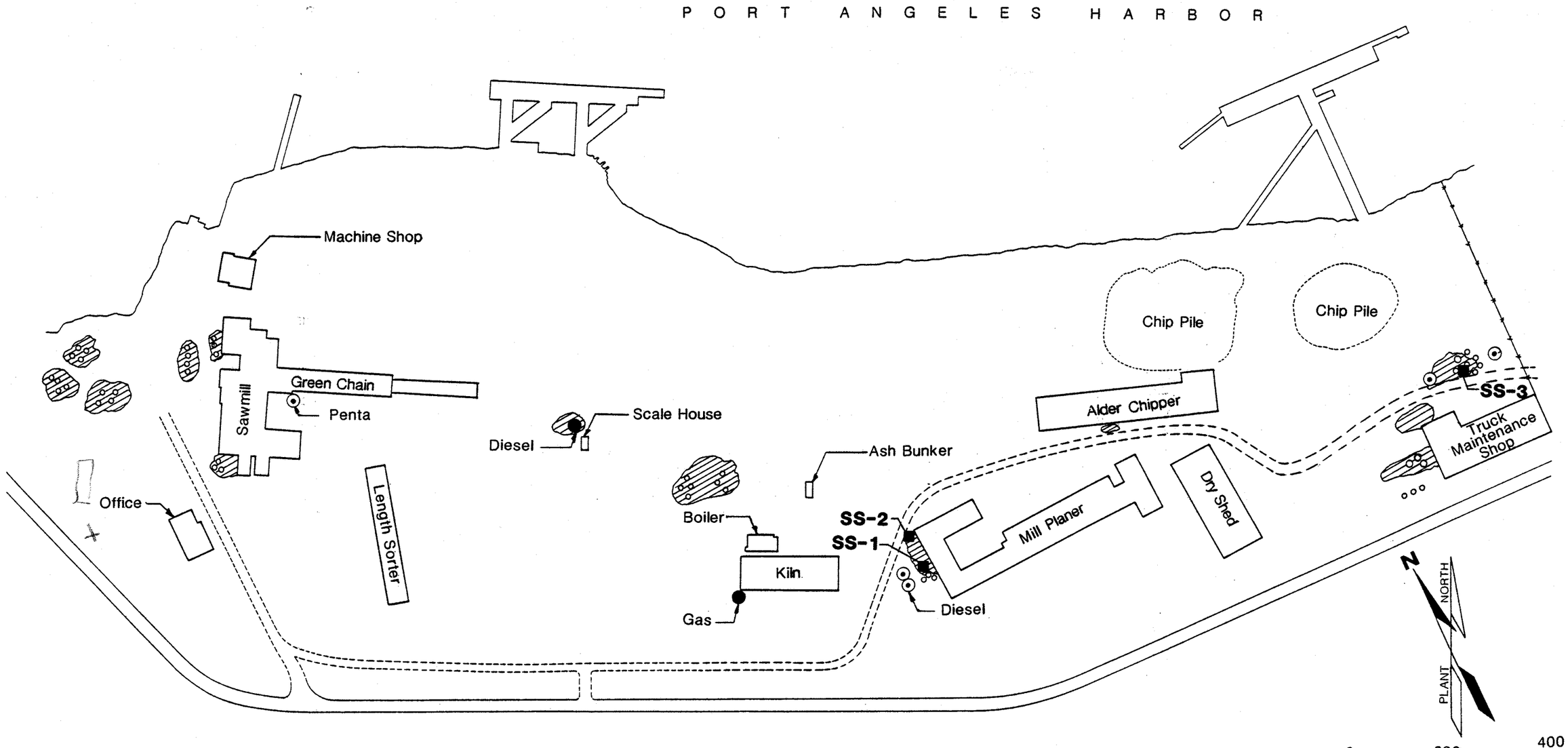
Figure 7

Soil Staining Storage Tanks and Surface Soil Sampling Locations Plan



■ **SS-2** Soil Sample Location and Number

Stained Soil

Drum Area (Product and Waste)

Underground Storage Tank (UST)

Above-ground Storage Tank

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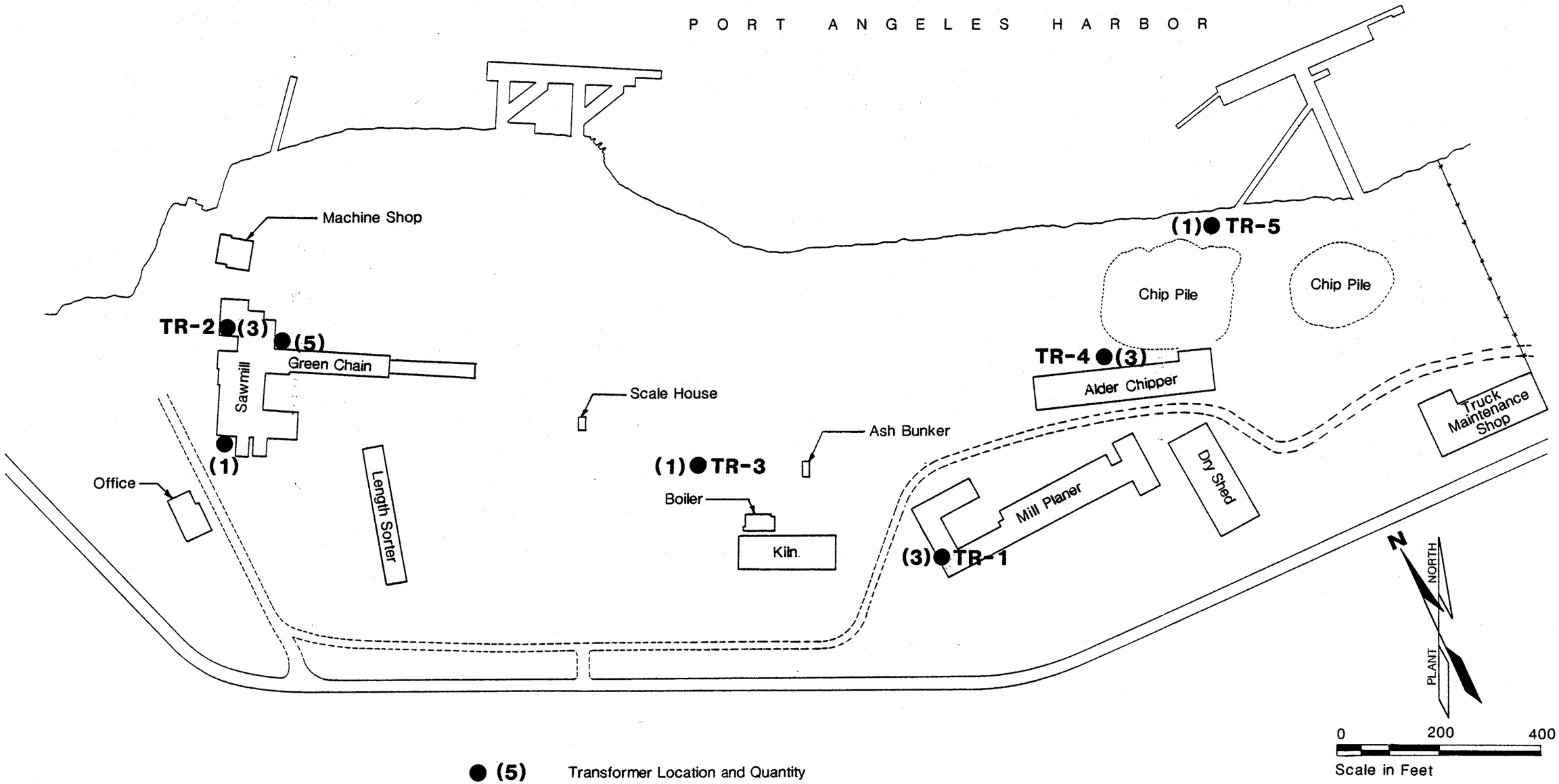
Figure 8

Transformer Sampling Location Plan



● (5) Transformer Location and Quantity

TR-2 Sample Location and Number

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Figure 9

Site and Exploration Plan

Penta Area

PORT ANGELES HARBOR

E'

OSW-3
OSS-3

OSW-2
OSS-2

OSW-1
OSS-1

OSW-4
OSS-4

B-17

D

D'

B-18
MW-18

SS-11

MW-15

MW-19
B-19

?

?

?

SS-10

SS-9

C

C'

MW-21

MW-16A
B-16

MW-22

SS-8

SS-7

Machine Shop

?

Estimated Areal Extent of
Penta in Soil Above .79 ppm

B-6
MW-6A

SS-3

SS-1

SS-2

SS-6

SS-4

SS-5

MW-8

E

Green Chain

Exploration Location and Number

- MW-18 Monitoring Well
- B-18 Boring
- OSW-1 / OSS-1 Offshore Soil and Water Sample
- SS-1 Surface Soil Sample

C — C' Generalized Subsurface Cross Section Location and Designation

N
NORTH
PLANT

0 50 100
Scale in Feet

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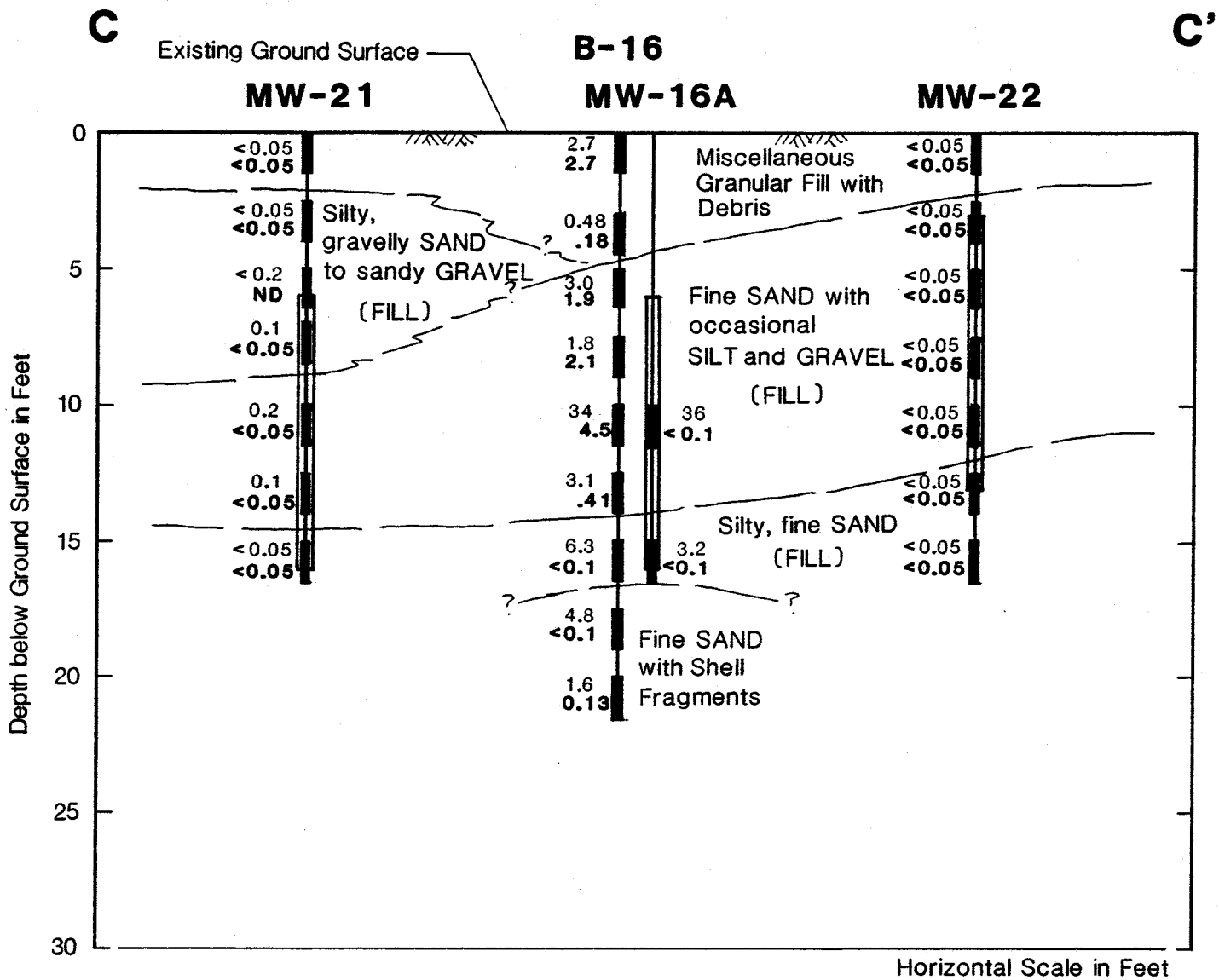
Figure 10

Generalized Subsurface Cross Section C-C'



B-16 Boring Number

MW-21 Monitoring Well Number

Exploration Location

0.12
1.4

Soil Sample Location
Penta in ppm
Tetra in ppm

Screened Section

Horizontal Scale in Feet
0 50 100
0 5 10
Vertical Scale in Feet
Vertical Exaggeration x 10

Note: Contacts between soil units are based upon interpolation between explorations and represent our interpretation of subsurface conditions based on currently available data.

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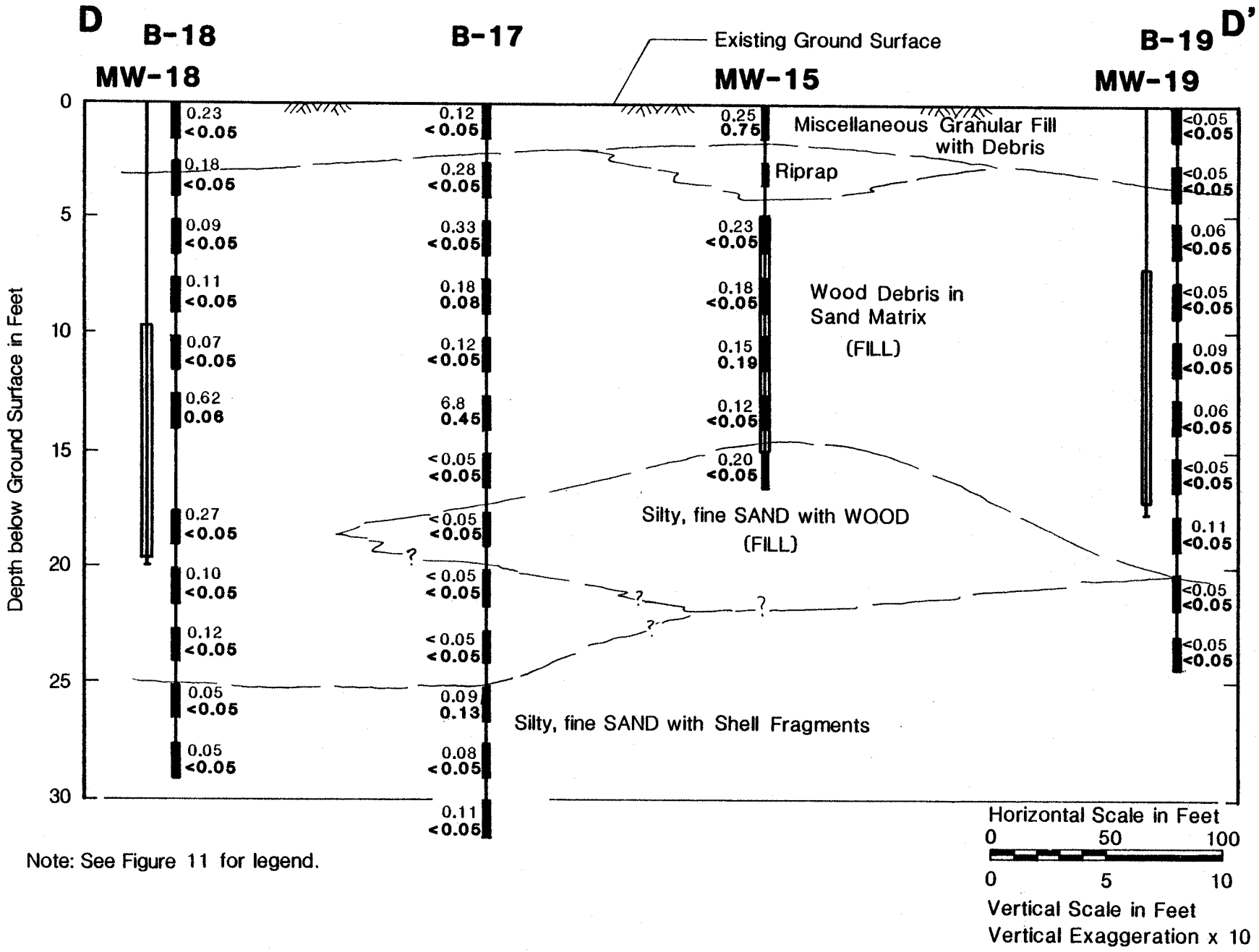
Figure 11

Generalized Subsurface Cross Section D-D'



Note: See Figure 11 for legend.

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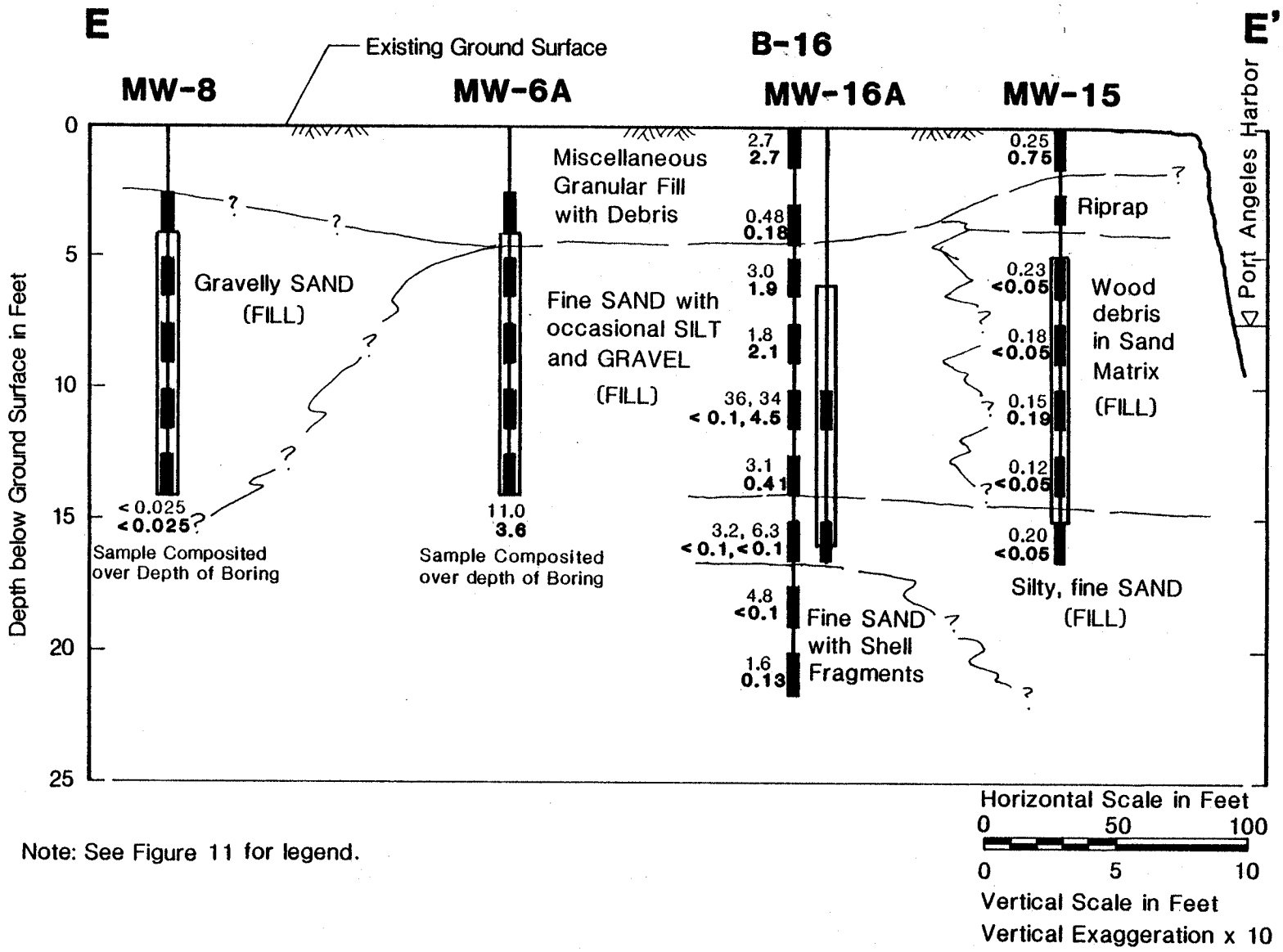
Figure 12

Generalized Subsurface Cross Section E-E'



Note: See Figure 11 for legend.

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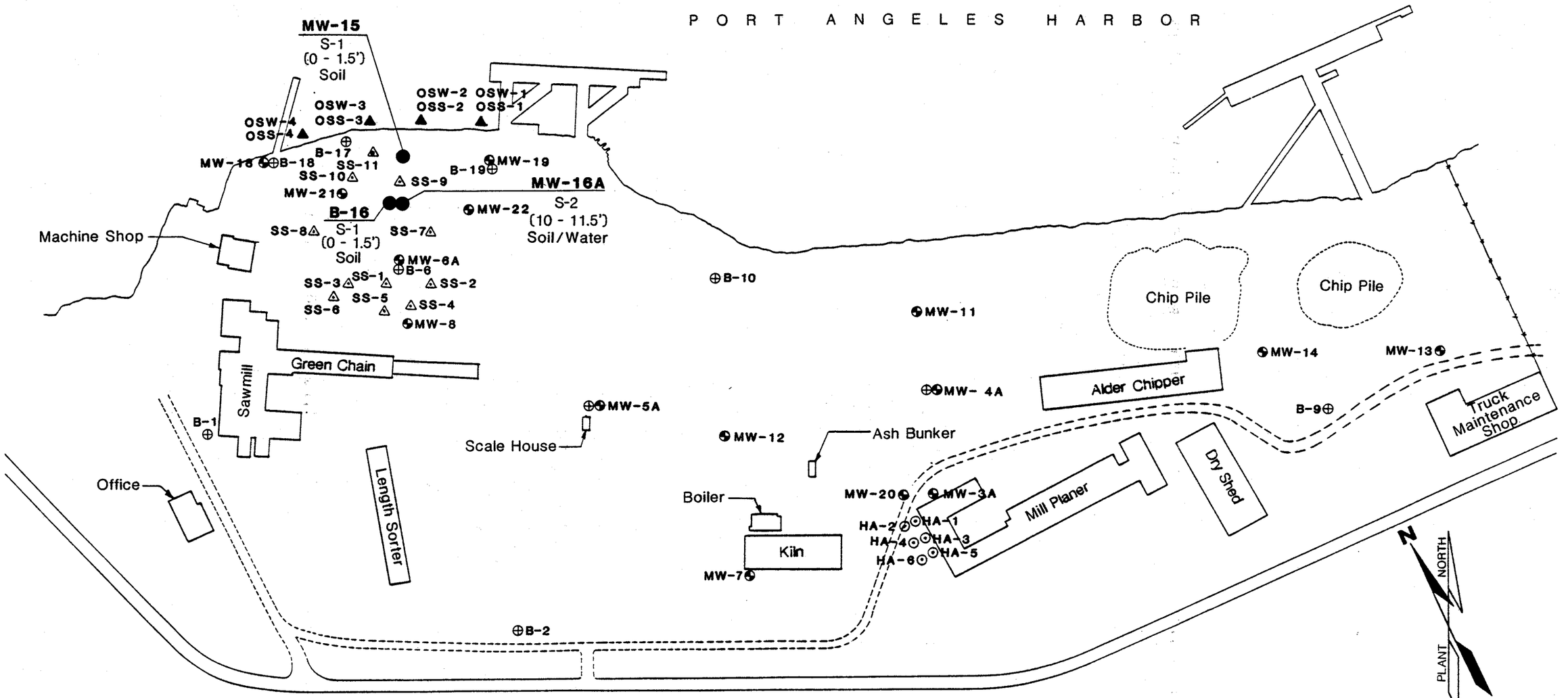
Figure 13

Dioxin Sampling Location Plan



Dioxin Sampling Station Location and Number

MW-15	Monitoring Well
B-16	Boring
S-1	Sample Number
(0 - 1.5')	Sample Depth
Soil	Media

Exploration Location and Number

MW-22	Monitoring Well
B-19	Exploratory Boring
HA-1	Hand Auger Boring
OSW-1 / OSS-1	Offshore Soil and Water Sample
SS-1	Surface Soil Sample

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Figure 14

Background Sediment Sampling Location Plan

Base map prepared from USGS 15-minute quadrangle map of Port Angeles, Washington

Sediment Sample Location and Number

BG-1 ● On-shore

OSSBG-1 ◔ Off-shore

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Figure 15