**Kennedy/Jenks/Chilton**

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27 July 1989

Ms. Susan Jackson
Champion International Corporation
One Champion Plaza
Stamford, Connecticut 06921

Subject: Supplemental Remedial Investigation/Risk Assessment/
Feasibility Study Work Plan
Champion International Ballard Mill
K/J/C 896016.00

Dear Ms. Jackson:

In accordance with our agreement for consulting services dated 21 November 1988, attached is our Final Supplemental Remedial Investigation/Risk Assessment/Feasibility Study Work Plan for the Champion Ballard Mill, Seattle, Washington.

We have revised this Final Work Plan to reflect the second round of Ecology comments presented in a 1 June 1989 letter from David South of Ecology to Kennedy/Jenks/Chilton. In addition, this Work Plan reflects the required project scope as verbally agreed to during our 16 June 1989 meeting with David South.

If you have any questions regarding the material contained herein, please feel free to contact our offices at (206) 874-0555.

Very truly yours,

KENNEDY/JENKS/CHILTON

Nathan A. Graves
Manager, Industrial Services

NAG:nmh/wp

Attachment

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# WORK PLAN
# SUPPLEMENTAL REMEDIAL INVESTIGATION/ RISK ASSESSMENT/FEASIBILITY STUDY

Champion International
Ballard Mill

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# 1.0 INTRODUCTION

This Supplemental Remedial Investigation Work Plan has been prepared by Kennedy/Jenks/Chilton at the request of Champion International Corporation and the Washington State Department of Ecology (Ecology). This Supplemental Remedial Investigation Work Plan has been prepared so that the nature and extent of specific site problems can be assessed and remedial alternatives evaluated in an expeditious manner. Information utilized to prepare this work plan is based on information gathered from previous site work by Kennedy/Jenks/Chilton and others.

## 1.1 PURPOSE

This Work Plan describes the technical approach to be used in conducting the focused Supplemental Remedial Investigation/Risk Assessment/Feasibility Study, including field sampling activities and subsequent evaluations, at Champion International's Ballard Plywood Mill, Seattle, Washington.

The purpose of the field activities outlined in this Work Plan is to gather sufficient data to identify the nature and extent of site contamination. This data will be used during the assessment of remedial action alternatives for the Risk Assessment and Feasibility Study (RA/FS). The collection and analysis of data will be performed in a manner generally consistent with the following:

- Guidance on Remedial Investigation under CERCLA (EPA/540/G-85/002, June 1985).
- National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300).
- CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).
- The Quality Assurance Project Plan to be developed for this Remedial Investigation.

In addition, the Feasibility Study will be conducted in a manner generally consistent with:

- Guidance on Feasibility Study under CERCLA (EPA/540/G-85/003).
- Handbook of Remedial Action at Hazardous Waste Disposal Sites (Revised)(EPA/65/G-85006).

The Remedial Investigation (RI) will address five major areas:

- Site history and regional hydrology and hydrogeology review
- Summary of Coastal Transportation's Site Development Plan
- Soil/groundwater investigation in the identified problem area of the site
  - Geologic investigation
  - Hydrogeologic investigation
- Site survey
- Characterization and disposal of contaminated waste materials - drums, tanks, soils, groundwater

The Risk Assessment will utilize data generated by the RI and evaluate the data relative to potential human and environmental exposure, the toxicology of each contaminant, and the overall risk posed by the site. Cleanup goals will be developed through these evaluations to assess acceptable levels of site contaminants in the environment.

Finally, the feasibility study will develop and evaluate remedial alternatives to address site contamination that is in excess of cleanup goals.

In general, our evaluations will be specific to identify site problem areas, or operable units. In addition, a general site survey will be conducted to assess if other problem areas are potentially present onsite. Our risk assessment and feasibility study will address other site problems, if identified during our site survey.

## 1.2 BACKGROUND

The Champion International Ballard Mill site is located on 13th Avenue West, southeast of the Ballard Bridge, as shown on Figure 1. To the north of the property is Salmon Bay. Until its closure at the beginning of 1985, the Ballard Mill was utilized for the manufacture of plywood. Logs entering the facility were debarked, peeled, and cut into veneer sheets, which were dried, and composited into plywood in steam glue presses. Detailed site history and background is contained in the two reports of previous site investigations performed by Parametrix, Inc. as referenced and summarized in our Preliminary Remedial Investigation/Feasibility Study/Remedial Action report of December 1988.

## 1.3 SUMMARY OF PREVIOUS INVESTIGATIONS

Two preliminary assessments of the site have been performed by Parametrix, Inc., one in 1985 for the Port of Seattle and one in 1987 for Champion International. The 1985 report identified areas of potential concern to be sampled as:

- Resin mix tank area
- Boiler-ash pile and old glue resin storage tank areas

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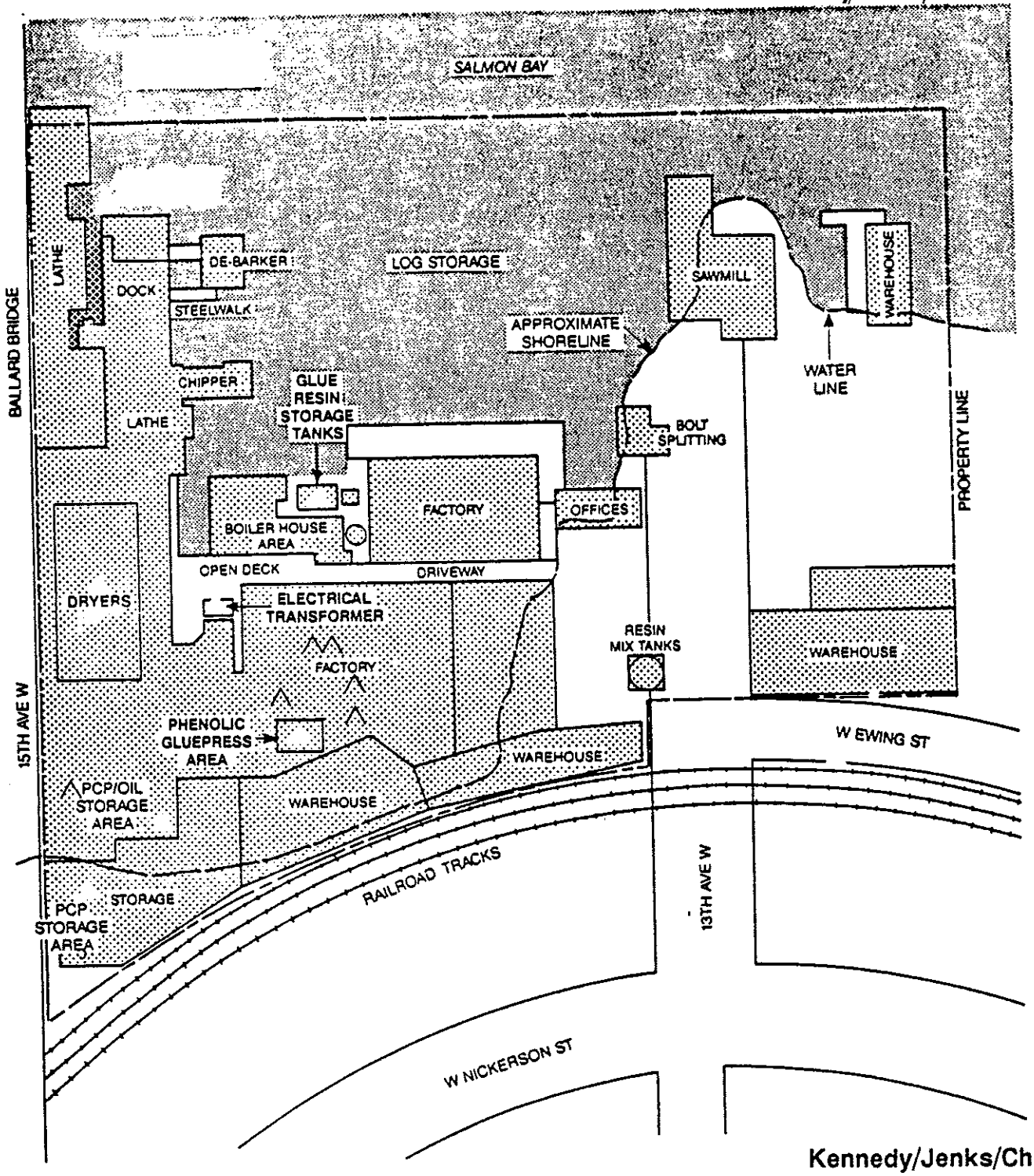


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**Champion International Ballard Mill**

**Site Map**

**K/J/C 876046.02**
**December 1988**
**Figure 1**

N

△—APPROXIMATE LOCATION OF GLUE PILES

SCALE IN FEET

0 75 150

Area explored in vicinity of electrical transformer?

Sawdust storage areas

- Area adjacent to electrical transformers
- Area outside maintenance shop
- Sawdust storage areas

The analysis of five composite soil samples and three air samples indicated that the soil in these areas was not a dangerous waste and that the decomposition of wood fibers contained throughout the site may be a potential long-term source of methane gas.

The 1987 investigation by Parametrix focused on areas identified by Champion as potential areas of contamination. Soil and sediment samples were collected from two separate pentachlorophenol (PCP) and oil storage areas, a glue press drain, glue tank and drying ovens, a debris cone adjacent to the glue press, from below an electrical transformer site and a background sample from offsite. In addition, water samples were collected from Salmon Bay and the mill pond. Based on the analysis of these samples, Parametrix concluded that site chemical contamination was limited to the former PCP storage area, and the glue press drain sediments. PCP was detected in shallow subsurface soil at the PCP storage area, and dibenzofuran was detected in the sediments near one of the glue drain areas. The other soil, sediment, and surface water samples did not show contaminants at levels of regulatory significance. Kennedy/Jenks/Chilton has conducted a review of information contained in the two Parametrix reports and in general, agree with Parametrix's conclusions. We assume that Parametrix's sampling and analytical procedures were completed as documented and that representative samples of possible problem areas were sufficiently characterized.

In 1987, Kennedy/Jenks/Chilton conducted a Supplemental Environmental Assessment of Champion International's Ballard Mill in an effort to characterize chemical compounds in areas of concern identified in the two previous site investigations by Parametrix. Detailed investigations were performed in the vicinity of the loading dock at the southwest corner of the site and in the areas identified as past locations of the glue presses. In addition, preliminary investigation of near shore sediments, glue press oil and glue resin storage tank sludge were conducted. Based on the results of Kennedy/Jenks/Chilton's 1987 study additional investigations/evaluations cleanup activities were conducted in two areas of the site: the PCP Storage Area and the Phenolic Glue Press Waste Area.

PCP Storage Area

Pentachlorophenol (PCP), chlorinated dibenzodioxins and dibenzofurans were detected in soil in a very limited area at the PCP storage area. Soil samples were collected and analyzed from five borings and numerous surface samples in close proximity to the former location where wood treating activities had been conducted. An evaluation of the laboratory results indicated that only PCP was detected in soil samples collected adjacent to a concrete pad on the loading dock. This

concrete pad may have been the former location of a wood treating tank where PCP was used to treat lumber. Boring B-1 was one of five borings installed in the vicinity of the loading dock. It was drilled close to the edge of the concrete slab and was the only boring location where PCP was detected. PCP concentrations were greater in shallow subsurface soils (0-1.5 feet) with decreasing concentrations at greater depths (2.5-4 feet) with no detectable concentrations below a depth of four feet.

Dioxins/furans were detected in the soil samples found to be contaminated with higher concentrations of PCP. Dioxin/furan contamination are probably associated with the PCP contamination; however, the levels were below those of regulatory concern based on available information. Further surface soil sampling and analysis was conducted in an effect to further delineate the area with detectable PCP concentrations. Based on the sampling and analyses conducted, the area contaminated with PCP was limited to an area estimated to be 15 feet by 15 feet by six feet in depth. Sampling/analyses locations and results are presented in Appendix D of the Preliminary Remedial Investigation/Feasibility Study/Remedial Action Report.

In August and September 1988, soil from this area was removed in an area approximately 15 feet by 15 feet by 6 feet deep. It was transported to Chem Securities in Arlington, Oregon, for disposal. Groundwater from the excavation was pumped and transported to Chemical Processors in Seattle for disposal.

Phenolic Glue Press Waste Area

Five sediment samples in the phenolic glue press area were collected with a hand auger. These samples were analyzed for acid/base/neutral extractable organics. The only acid/base/neutral extractable organics detected in high concentrations was anthracene, which ranged from 85 ppm to 770 ppm. Pyrene was the only other compound detected at one location at 4.1 ppm. The sediment samples from this group were collected from the sediments at the edge of the largest glue pile.

In February 1988, additional boring and sampling was conducted. The purpose of the additional work was to visually assess the extent of the glue piles. The location of the boring and sampling points are shown in the report titled "Remedial Alternative Evaluation, Glue Press Waste" presented in Appendix E of the Preliminary Remedial Investigation/Feasibility Study/Remedial Action Report. The dimensions of the glue piles were measured and information concerning the building structure was recorded. This information was later used to assess the extent of the spread of the glue piles and anthracene contamination.

The results showed the area outside of a ten-foot radius from the glue piles contain less than three mg/kg anthracene in most sediment

samples. Cost comparisons for four alternatives to deal with the glue piles and anthracene were presented in the report.

Underground Tanks

During excavation activities for removal of the soil contaminated with PCP, evidence was discovered which lead to finding two underground storage tanks. The contents of the tanks were subsequently sampled, analyzed, and disposed of at permitted facilities. The tanks were removed from the ground, cleaned, and taken to a metal recycler.

One of the tanks contained solvent and had a capacity of approximately 350 gallons. The other tank had been abandoned and was approximately half-full of sand and water. Laboratory tests indicated it had previously contained gasoline. The tank had a capacity of approximately 1,000 gallons.

When piping was discovered leading from the PCP area toward the concrete slab, building permits and drawings from City of Seattle microfilm archives were reviewed in an attempt to learn the nature of the tanks and the possible existence of other tanks at the site. None of the drawings provided any useful information. A list of building permit applications kept at Champion indicated the loading dock was built in June 1954. The underground tanks appear to have been abandoned before that time.

When the tank containing the solvent was pumped, it refilled with groundwater. As the tank was removed from the excavation, the odor of carbon disulfide was noticeable. In an effort to mitigate any solvent release, approximately 750 gallons of water from the excavation were immediately pumped into drums.

Soil from the excavation was stockpiled, analyzed, and disposed at a permitted disposal facility. The groundwater in the excavation was pumped into drums before being backfilled. A nonstandard four-inch diameter monitoring well was installed in the excavation as it was backfilled.

A 6,500-gallon tank was delivered to the site and the well pumped on two separate days. The well was pumped for about six hours each day. During pumping, the well was pumped dry and would require several minutes to recharge before pumping could continue.

After pumping, on both occasions, groundwater samples from the well were collected with a Teflon bailer and analyzed for carbon disulfide, carbon tetrachloride, chloroform, and tetrachloroethylene.

Other Investigations

Several other investigations have been performed that are not directly related to site contamination issues, or have not been formally documented in a project report. The results of these investigations, where applicable are also described in this report and are utilized for data evaluation. These reports/data are specifically referenced and included in the 1988 Preliminary Remedial Investigation/Feasibility Study/Remedial Action Report.

## 1.4 ASSESSMENT OF NEED FOR ADDITIONAL INVESTIGATIONS/EVALUATIONS

Based on what is known regarding operations that have occurred on the site, as well as the results from previous site investigations, there are several areas/issues related to the site that may need to be addressed during the Supplemental Remedial Investigation/Risk Assessment/Feasibility Study. In addition, several concerns have been identified by Ecology during our previous discussions/meetings. Summarized below are various site issues that may be necessary to address to complete the remedial investigation for the site.

- Hydrogeology/soil and groundwater chemistry related to the solvent tank area.
- Glue press wastes (glue piles)
- Characterization/disposal of onsite containers
- Underground tank search
- Boiler-ash fill
- PCP area
- Methane investigation
- Surface water drainage
- Overall site investigation
- Offshore sediments

Each of these issues are discussed briefly below relative to results of previous site investigations/actions. In addition, our assessment of the need for additional field investigations or evaluations to adequately address these issues at the site is presented.

• Hydrogeology/Soil and Groundwater Chemistry - Solvent Tank Area

While the apparent source of solvent contamination has been removed from the site, the most recent sampling and analysis data suggest detectable concentrations of three chlorinated solvents and carbon disulfide in shallow groundwater. Additional field investigation is required to assess groundwater hydrology and chemistry, especially to address Ecology's concern regarding the potential for rapid downward migration of contaminants to the base of the aquifer. Additional investigations will be phased and focused on assessing the characteristics of the aquifer in the vicinity of the former solvent tank.

CCl4
Chloroform
TCE

• Glue Press Wastes

Extensive surface sediment sampling and analyses has been conducted in the area of the six glue piles located beneath the floors of the buildings on the site (see Figure 2). Borings installed in the vicinity of one of the glue piles indicate that identified anthracene contamination is primarily limited to visual glue waste and that this glue waste is primarily limited to surface sediments. In addition, the tendency for polycyclic aromatics, such as anthracene, to sorb to particulates, particularly a glue related matrix, suggest that dissolved contaminant mobility will be limited. Other polycyclic aromatics have been detected in the glue waste; however, these compounds are present at very low concentrations (just above detectable limits). These compounds include 2-methylnapthalene, napthalene, and pyrene. Therefore, previous investigations have concentrated on determining the extent of anthracene concentration in glue waste and nearby sediments (as a result of probable particulate transport). The extent of the visible glue waste as well as the associated anthracene contamination in the glue waste and nearby sediments have been generally characterized through previous investigations. Several remedial alternatives to address the glue press wastes have been evaluated and are contained in the April 1988 report "Remedial Alternative Evaluation, Glue Press Wastes, prepared by Kennedy/ Jenks/Chilton and presented in the Preliminary Remedial Investiga-tion/Feasibility Study/Remedial Action Report.

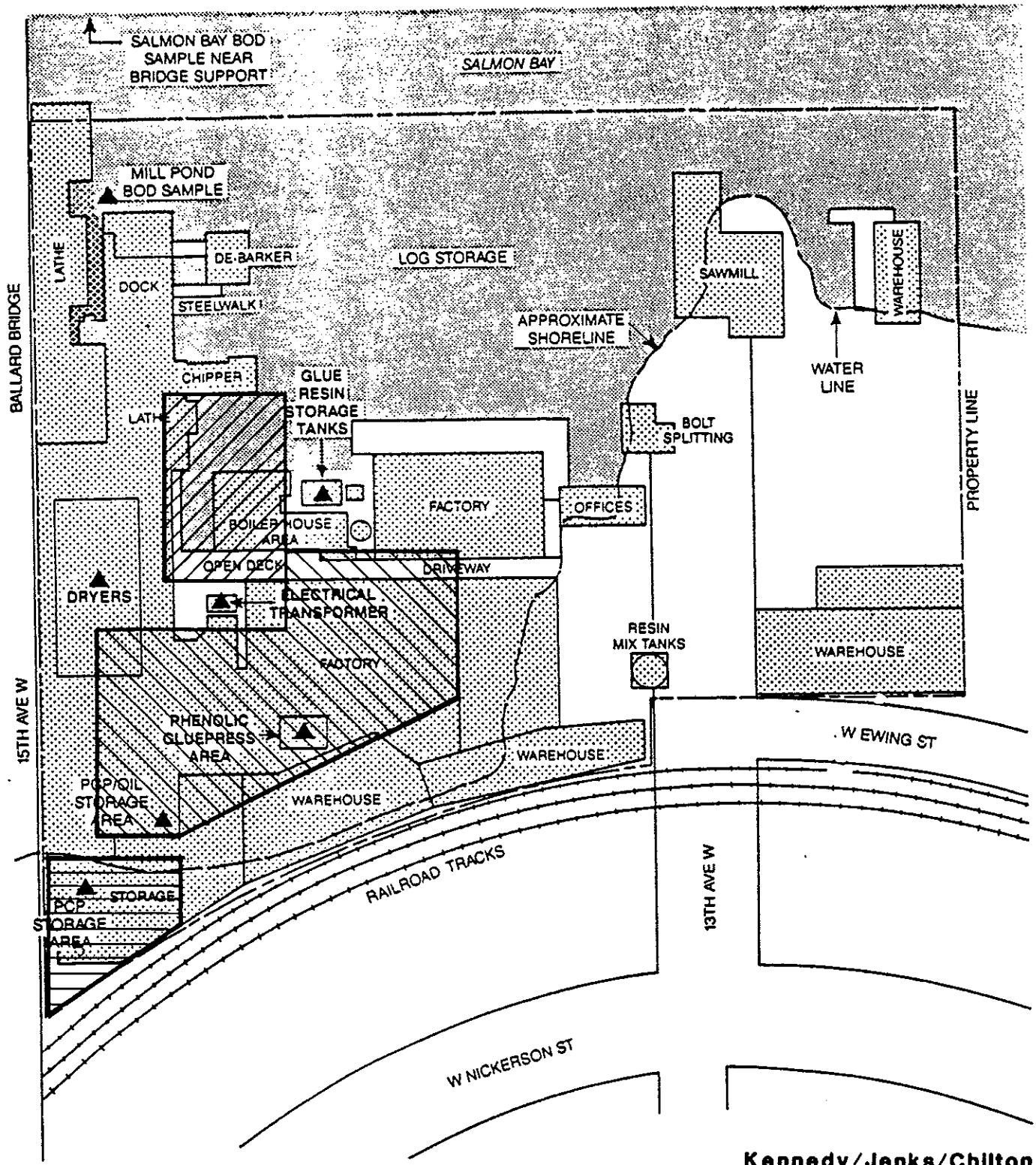
The majority of the work has been completed to effectively select an appropriate alternative to address this material. The supplemental investigation will review evaluated alternatives and will possibly evaluate additional alternatives that could be incorporated into future planned site use. Therefore, the glue press wastes will be included in the risk assessment/feasibility study portions of the supplemental study.

• Characterization/Disposal of Onsite Containers

Numerous containers containing unknown products/waste materials are present at the site. The supplemental study will address characterization of this material and subsequent offsite recycling and/or disposal at an appropriate and permitted disposal facility.

• Underground Tank Search

Previous evaluations of site history by Parametrix did not indicate the presence of underground tanks at the site. Subsequent investigation/cleanup activities by Kennedy/Jenks/Chilton have resulted in the identification and removal of two tanks at the southwest corner of the property, one formerly containing solvents and the other formerly containing apparently gasoline (the latter tank was apparently filled with sand many years ago).




Boiler Ash Area

Glue Press Waste Area

Solvent Tank Area

N

SCALE IN FEET

0 75 150

**Kennedy/Jenks/Chilton**

**Champion International Ballard Mill**

**Approximate Locations of Areas to be Investigated During Supplemental RI/FS**

K/J/C 876046.02
December 1988

Figure 2

Therefore, additional investigations should be conducted to assess the existence of other underground tanks, if any, located on the property. An extensive survey does not appear warranted since the majority of the site is located over water and the land surface associated with the site has probably increased over the years. We anticipate that the underground tank search will consist of additional records review, further interviews with former site personnel and a detailed site inspection to identify surface appurtenances which would indicate the presence of underground tanks. Ground penetrating radar or magnetometry investigations do not appear practical due to the existence of extensive piping below floors and subsurface utilities at the site.

• Boiler-Ash Fill

Analyses of boiler ash samples collected by Parametrix in 1985 did not indicate high levels of priority pollutant compounds which should significantly impact the environment. However, this ash did exhibit a relatively high pH. In addition, recent sampling of offshore sediments in the vicinity of the ash pile indicated the presence of several polycyclic aromatic compounds at low concentrations. These compounds include napthalene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, chyrsene, benzo (a) anthracene, benzo(k)fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, and benzo(ghi)perylene. To assess if the ash is homogeneous and/or if it may be contributing to sediment contamination, limited additional field investigation will be conducted within the ash pile.

• PCP Area

Extensive soil sampling and analyses has been conducted in the vicinity of known PCP contamination beneath the loading dock at the southwest corner of the site. The apparent extent of contamination was previously assessed and a soil/groundwater removal program was initiated to mitigate the PCP contaminated material. These actions are documented in our Preliminary RI/FS/RA report. As a result of these action, no further work is required in this area.

• Methane Investigation

The production of methane due to the decomposition of wood materials has been suspected since Parametrix's initial investigation in 1985. While methane generation may not be a significant problem at the site, assuming existing site use in the future, information regarding the extent of materials that could potentially produce methane may be desirable. Therefore, both a Foxboro Organic Vapor Analyzer (sensitive to methane) and HNU Systems photoionizer (not sensitive to methane) will be utilized to monitor organic vapors during drilling operations to be initiated in the solvent tank area. While solvent materials may also produce a response on the monitoring equipment, the relative response of the OVA versus the HNU will be recorded. In

addition, low levels of methane (i.e. below several hundred parts per million) should not be a significant concern and investigation will concentrate on assessing whether organic vapor concentrations reach above 1,000 ppm.

During excavation and removal of soil contaminated with PCP and during removal of the two underground storage tanks, a considerable amount of wood debris was found. This material appeared to be building materials and driftwood buried before construction of the plywood mill in the early years of the century. Because of the large amount of wood debris found in this area, generation of methane, if occurring, would be found in concentrations which should be generally representative of other areas of the property. Therefore, additional methane investigations other than in the solvent tank area are not planned. Our proposed investigations, in conjunction with data available from Parametrix investigations in 1985, should be sufficient to assess the relative concentrations of methane in shallow soils onsite.

• Surface Water Drainage

Very little ground surface area appears to drain to Salmon Bay from the site since the majority of the site is covered by buildings or by the waterway. The roof drains discharge directly to Salmon Bay. However, offsite drainage may flow over the land surface of the site and discharge into Salmon Bay. Two potential surface contamination sources at the site may be impacted by surface water drainage, the first being the PCP storage area and the second being the glue press waste. Since the PCP contaminated appears to have been removed from the site, surface water drainage should not be transporting PCP to Salmon Bay. The glue piles do not appear to be impacted by surface drainage from our visual observations during our previous site work. However, surface water drainage onsite and into Salmon Bay from offsite sources is not readily known. Therefore, our supplemental investigation will include an assessment of surface water flow patterns at the site based on visual observation during two storm events.

According to Jay Spearman, consultant to Coastal Transportation, planned grading and construction activities for the site should not have an impact on overall surface water drainage patterns. Filling and grading of nearshore areas (including the glue pile and ash pile areas) are being considered should regulatory agencies be willing to permit these activities and if they can be incorporated into ultimate site remedial actions.

• Overall Site Investigation

We strongly advocate that our previous investigations as well as our proposed investigations as presented herein constitute a comprehensive investigation of the site by addressing numerous "operable

units". An extensive evaluation of site geology/hydrogeology does not appear warranted except in the solvent tank area since the majority of known site operations occurred in buildings constructed over Salmon Bay. An overall site hydrogeologic study would more likely define groundwater movement and quality from within Lake Union (and therefore other sources of contamination) rather that the impact of the former operations of the site. In addition, sufficient data should be available following our solvent tank area investigation and utilizing the RZA study to assess general site geology and hydrogeology, suspected groundwater movement, and potential transport mechanisms associated with known site contaminants.

• Offshore Sediments

Based on sampling and analysis conducted on nearshore sediments by Kennedy/Jenks/Chilton and others, it appears that localized contamination exists in the vicinity of the glue piles and boiler-ash pile. While available data suggests contaminants to be at relatively low concentrations, additional sediment sampling appears warranted, especially in areas proposed for dredging by potential future site occupants. Proposed sediment sampling and analysis will be conducted in two phases, 1) a comprehensive assessment of chemical compounds at depth in the area proposed for dredging and, 2) in widely spaced areas of the site, DNR property and the Ship Canal to assess nearshore and background sediment chemical concentrations.

## 2.0 SCOPE OF WORK

The following section describes our proposed scope of work to complete the RI/FS at the site. Major areas of the site to be investigated during the RI/FS are shown on Figure 2.

### PHASE I - REMEDIAL INVESTIGATION

The following describes our proposed scope of work to conduct the supplemental remedial investigation/risk assessment/feasibility study at Champion International's Ballard Mill in Seattle, Washington.

#### Task I-1 - Prepare Support Plans

In order to effectively manage the RI investigative effort, project guidelines will be established in the form of focused work plans. The development and adherence to these plans will help maintain consistency in the approach and quality of the work. The following section describes the various plans to be developed for this RI.

Subtask 1.1 - Sampling and Analysis Plan. A separate sampling and analysis plan will not be developed for this investigation. This Work Plan addresses the field activities. This Plan includes descriptions of equipment, analyses, sample types, locations and frequency of sampling and descriptions of expected work products. Proposed activities are discussed in detail in other sections.

Subtask 1.2 - Quality Assurance Project Plan. A Quality Assurance Project Plan will be developed so that the entire project and its individual components are conducted in a technically correct and defensible manner. The Plan will encompass the review of existing data, field program development and implementation, sampling techniques, instrument calibration, laboratory analysis, and data interpretation.

Subtask 1.3 - Health and Safety Plan. A Remedial Investigation Health and Safety Plan will be written so that proposed field activities may be evaluated to identify potentially hazardous operations and exposures. The plan will include a detailed site description and maps, results of previous sampling activities, and proposed field activities.

The Health and Safety Plan will be prepared in accordance with EPA's Guidance on Remedial Investigations Under CERCLA (June 1985) and Standard Operating Safety Guides (November 1984) and provisions of the Superfund Amendments and Reauthorization Act of 1986 (SARA), with the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH/OSHA/USCG/USEPA, October 1985), and with the 29 CFR Part 1910-.120, Hazardous Waste Operations Occupational

Safety and Health Standards. Specifically, the plan includes the following elements:

- Site Description
- Application of the Plan
- Work Activities
- Hazard Assessment
- General Safety Directives
- Personnel Protection
- Monitoring Requirements
- Authorized Personnel/Team Member Responsibilities
- Decontamination Procedures
- Emergency/Accident Information
- Maps: Site Location, Hospital Routes

Task I-2 - Conduct Background Review

Site history and existing environmental data will be reviewed. We will collect, compile, and evaluate all readily available site information including, but not limited to, the following:

- Published hydrogeological maps and reports, if available

- Sampling and chemical testing results from previous investigations on the site, and nearby sites, if available

We will contact the U.S. Army Corps of Engineers to determine the availability of information about the Ship Canal. In addition, we will contact the Port of Seattle to ask for access to information on work completed at Fishermen's Terminal.

Following the background review, we will submit an outline to Ecology listing potential remedial technologies for cleanup of the types of contamination which have been found at this site. Short description of the technologies will be provided along with the outline. The information will be presented and discussed during the early stage of the field investigation at a meeting to be scheduled at a mutually convenient time, between Ecology and Champion representatives.

Task I-3 - Conduct Field Investigation

Subtask 3.1 - Conduct Hydrologic/Chemical Investigation - Solvent Tank Area. A field investigation will be conducted to assess the potential extent of soil and groundwater contamination due to the release of chemicals from the solvent tank which was buried below the loading dock at the southwest corner of the site. Information developed from this investigation will be used to perform a risk assessment to identify threats posed to human health and the

environment from the presence of contaminants in soil and groundwater and to evaluate remedial alternatives during the feasibility study.

The information necessary to perform the Risk Assessment and to perform a Feasibility Study will be developed by obtaining groundwater and subsurface soil samples. A groundwater monitoring system will be installed to determine groundwater quality and flow directions. Groundwater monitoring wells will be surveyed so depths can be converted to elevations relative to an established datum. Table 1 presents a summary of sampling, analytical test methods, and information regarding construction of the proposed monitoring wells and borings.

Rittenhouse Zeman and Associates recently completed a geotechnical investigation at the Champion site. This work included installation of four soil borings and eight test pits. Three of the soil borings encountered fine grained materials identified as silty clay and clayey silt. The depths of these layers were 25 feet, 22 feet, and 15-1/2 feet, respectively. One boring was terminated at 20 feet and encountered sand. This information is not definitive enough to predict the depth or presence of a confining layer under the area of the solvent tank. Therefore, the exact depth of soil borings or monitoring well installation will be defined based on conditions encountered during field activities.

Correct selection of locations for installation of monitoring wells and soil borings must be based on the groundwater gradient and direction at the former solvent tank location.

Monitoring wells have reportedly been installed west of the solvent tank area located on property belonging to the Port of Seattle. The groundwater gradient direction reportedly calculated from these wells is southwest.

In the early part of this century, before construction of the Hiram M. Chittenden Locks (Ballard Locks) and extensive dredging and filling, a creek probably flowed south from the area of Fishermen's Terminal to its discharge into Puget Sound in the Smith Cove area. Groundwater below the Champion site and in the Salmon Bay Terminal may be following this old drainage channel, as is suggested by the reported gradient direction in the monitoring wells at Fishermen's Terminal.

Our proposed monitoring well locations as presented below are based upon the preceding information available regarding the site. Site specific information will be obtained through measurements from monitoring wells installed during the investigation described below. Depending on the results of the investigation, additional wells or borings may be installed to assess the limits of contamination.

TABLE 1

MONITORING WELL & SOIL BORING SUMMARY

CHAMPION INTERNATIONAL BALLARD MILL
SEATTLE, WASHINGTON

| | Existing Shallow M.W. | Solvent Tank Shallow M.W. | Solvent Tank Shallow Boring | Solvent Tank Deep Boring [d] | Boiler-Ash Pile Boring |
|---|---|---|---|---|---|
| Boring Depth | NA | Water Table + 7' | Water Table + 7' | To Confining Layer or 60' | Bottom of Boiler-Ash Pile |
| Sampling Interval | NA | Continuous Below 6' | 3.5' to 5', 7.5' to 9', 12' to 13.5' [f] | 3.5' to 5', 7.5' to 9', 12' to 13.5' Continuous Below 17.5' | 0' to 1.5' Continuous Below 3.5' |
| Soil Sampling Method | NA | S.T.S. [a] | S.T.S. [a] | S.T.S. [a] | S.T.S. [a] |
| Analysis to be Performed on Soil Sample | NA | [b] | [c] Deepest Sample Only | [c] | [e] |
| Analysis to be Performed on Water Sample | [c] or [d] | [c] | [c] or [d] | NA | NA |
| Number of Installations | 1 | 2 | 3 | 1 | 2 [g] |

NA Not Applicable
[a] 2" diameter split tube sampler with brass rings, Teflon caps.
[b] None
[c] Volatile Organics by EPA Method 624
[d] After estimating the groundwater gradient direction using data from the three monitoring wells, one of the shallow borings will be completed as a monitoring well. A water sample will be analyzed for the following EPA Method 624, (As, Ba, bicarbonate, Cd, Ca, Chloride, Cr, color, Cu, Fluoride, Fe, Pb, Mg, Mn, Hg, nitrate, K, Se, silca, Ag, Na, specific conductivity, sulfate, total dissolved solids, total hardness, turbity, Zn, and Polynuclear Aromatic Hydrocarbons by EPA Method 610.
[e] Priority pollutant heavy metals by ICAP or AA; base/neutral/acid extractable priority pollutants by EPA Method 8270 on samples collected from top, middle and base of ash pile.
[f] Assumes that top of groundwater table is six feet below grade. Final sample will actually be sampled seven feet below the apparent water table surface.
[g] Three to five additional borings will be installed for visual assessment only.

Field Program. Our field investigation of the solvent tank area will be as described below.

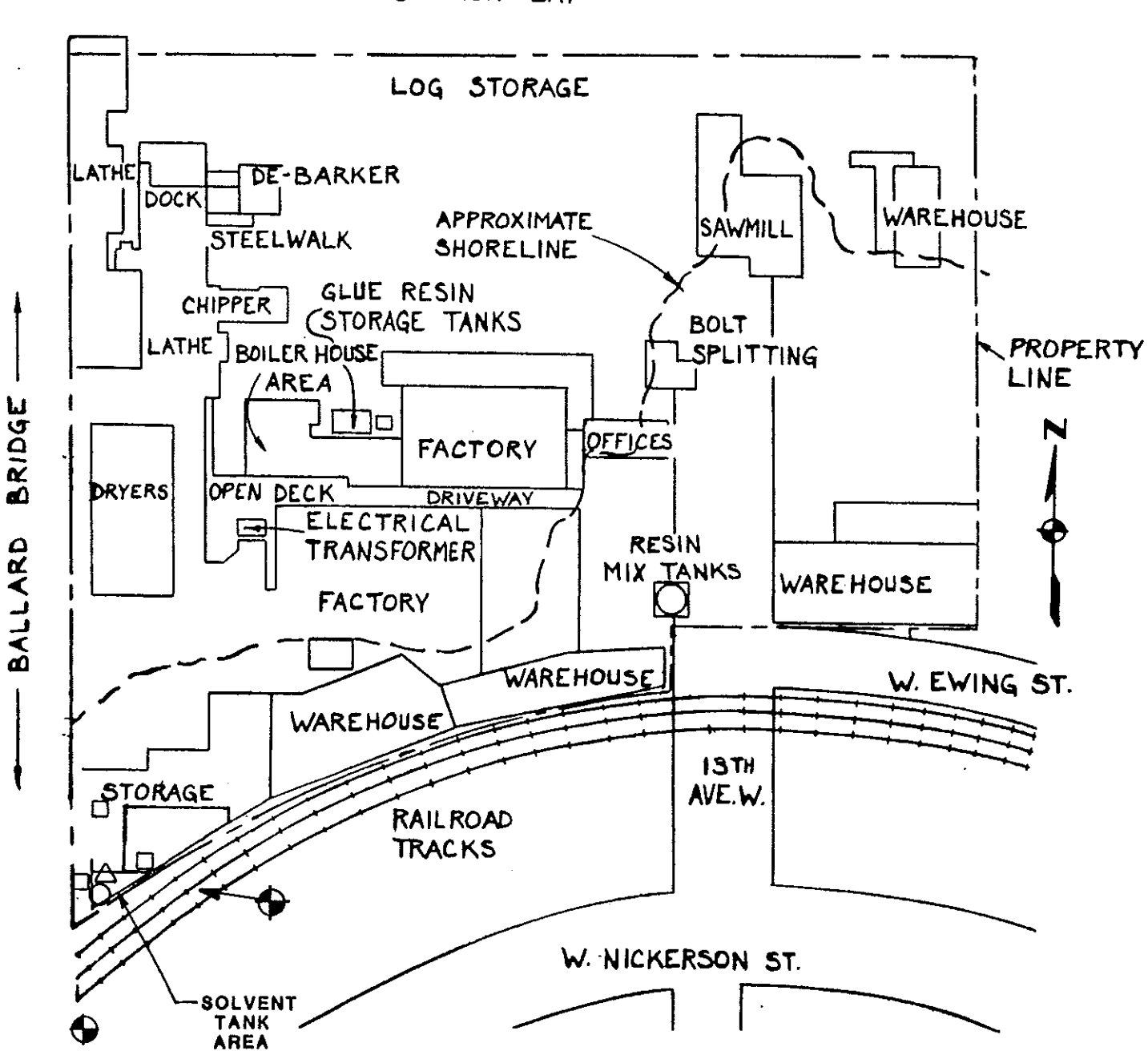
- Install two shallow monitoring wells to a depth of seven feet below the water table surface.
- Install two shallow soil borings and one monitoring well surrounding the previously installed monitoring/recovery well, to a depth of seven feet below the water table surface.
- Install one deep soil boring which will be terminated at the first layer of relatively impermeable material (silty clay, or clay) which is at least three feet thick, in close proximity to the previous location of the solvent tank.

The proposed locations of the monitoring wells and soil borings are shown on Figure 3. This figure shows three potential locations to install the monitoring wells. Two of these three locations will be selected as monitoring well locations following the background review and depending on accessibility. The two new monitoring wells along with the well previously installed in the solvent tank excavation will be used to estimate groundwater gradient direction. All wells and borings shall be installed on property owned or leased by Champion International or Coastal Transportation. In the event that groundwater gradient direction and contaminant concentrations indicate the possibility of offsite migration of contaminants, the work plan and schedule will be reevaluated.

The two shallow soil borings will be installed so that soil samples can be collected to assess if contaminants of concern are present in soil in the area surrounding the former location of the solvent tank. Each boring will be installed to a depth of approximately seven feet below the top of the water table. One of the borings will be completed as a monitoring well, and sampled. Analytical parameters are listed in Table 1.

The deep soil boring will be used to define soil type below the solvent tank location. Samples will be collected at five-foot intervals for analysis of volatile organic priority pollutants and carbon disulfide by EPA Method 8240. Below a depth of 17.5 feet, continuous sampling will be conducted to assess the location of a confining layer. After sampling is completed, the boring will be backfilled with bentonite. The boring and, if necessary, subsequent boring and installation of a monitoring well as described in this Work Plan will be terminated before penetrating a confining layer to prevent possible contamination of the lower water table.

If analytical results of soil samples taken in the borings adjacent to the solvent tank indicate the presence of volatile organics below the base of the boring, or if the initial investigations do not adequately assess the extent of contamination, a work plan for




- POSSIBLE SHALLOW MONITORING WELL LOCATIONS*
- PROPOSED DEEP BORING LOCATION
- PROPOSED SHALLOW BORING LOCATION
- EXISTING MONITORING/ RECOVERY WELL

* Two of the three locations will be selected following the background review.

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Champion International
Ballard Mill

**Proposed Monitoring Well/Boring Locations**

K/J/C 896016.00 S90 PASK002
July 1989
Figure 3

additional investigations will be submitted to Ecology for amendment to this Work Plan.

Soil Disposal

Soil cuttings from the drilling activities will be collected in drums stored until they can be tested to determine the appropriate disposal method.

Monitoring Wells/Soil Borings

Monitoring wells or soil borings will be completed in compliance with current Washington State regulations. Installation will be completed by a licensed driller at the direction of a Kennedy/Jenks/Chilton geologist or engineer. The description of soil sampling procedures, and decontamination procedures are presented in Appendix A.

A hydrogeologist will design each monitoring wells based on the actual subsurface conditions encountered. Consequently, the actual location of wells, depth of screened intervals, and thickness of sand pack and seals may vary. A typical boring log and monitoring well installation are presented in Figure 4.

The monitoring wells will be constructed using two-inch diameter, threaded, PVC pipe. Each well will be screened over the bottom five feet using two-inch diameter 0.02-inch factory milled slots. The selection and location of the five-foot well screen is based on expected characteristics of the aquifer and seasonal deviation in the water table due to changes in the lake level. Should different conditions be encountered in the field, the hydrogeologist may change the design.

Groundwater Elevation Monitoring.

Once the wells and borings have been completed, reference point elevations on each well (typically the top of the casing) will be surveyed to the nearest 0.01 foot to an appropriate USGS datum, if available, or to a local datum. Ground surface elevations adjacent to each well and each boring will also be surveyed.

All water levels will be measured to the nearest 0.01 foot using a calibrated electric water level indicator.

Groundwater Sampling

Water samples will be collected from each well installed onsite following development and from each shallow boring following installation. Details of the sampling procedures are presented in Appendix A under "Groundwater Sampling".

# Boring & Well Construction Log

**Kennedy/Jenks/Chilton**

| | |
|---|---|
| BORING LOCATION | |
| DRILLING COMPANY: SOIL SAMPLING SERVICES | DRILLER: CHUCK |
| DRILLING METHOD: HOLLOW-STEM AUGER | DRILL BIT(S) SIZE: 9-INCH |
| ISOLATION CASING | FROM ___ TO ___ FT. |
| BLANK CASING: 2-INCH, SCHED 40, PVC | FROM SRFC TO 20 FT. |
| PERFORATED CASING: .02 SLOT, 2-IN PVC | FROM 20 TO 30 FT. |
| SIZE AND TYPE OF FILTER PACK: 10-20 COLORADO SILICA | FROM 17 TO 30 FT. |
| SEAL: 3/8-INCH BENTONITE CHIPS | FROM 10" TO 17 FT. |
| GROUT: JETSET CONCRETE | FROM SRFC TO 10" FT. |

**Boring/Well Name** MW-6

**Project Name**

**Project Number**

| | |
|---|---|
| ELEVATION AND DATUM (REL.): 199.23 | TOTAL DEPTH: 30 |
| DATE STARTED: 9/22/88 | DATE COMPLETED: 9/22/88 |
| STATIC WATER ELEVATION (DEPTH): 12.5 FT | |
| LOGGED BY | |
| SAMPLING METHODS: SPLIT SPOON | WELL COMPLETION: ☒ SURFACE HOUSING ☐ STAND PIPE ___ FT. |

| Hnu | Recovery (Feet) | Penetration Resist (Blows/6 In.) | Depth (Feet) | Well Construction | USCS Log | Lithology | Color | Sample Description and Drilling Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Concrete. |
| 0 | | 8<br>24<br>24 | 5 | | SW | | | Medium dense, brownish gray to greenish gray, fine to coarse SAND, trace to some gravel, moist, no odor. |
| 0 | | 22<br>22<br>25 | 10 | | | | | |
| 0 | | 28<br>32<br>29 | 15 | | | | | Very dense to medium dense, medium gray, fine to medium SAND, trace to no gravel, moist to wet, no odor. |
| 0 | | 16<br>21<br>25 | 20 | | | | | |
| | | | 25 | | sp | | | |
| 0 | | 15<br>29<br>34 | 30 | | | | | |
| 0 | | 50/5.5 | | | ml | | | |

**Kennedy/Jenks/Chilton**

**Champion International Corporation**
**Ballard Mill Seattle, Washington**

**Typical Boring & Well Construction Log**

K/J/C 8 6046.02
December 1988
Figure 4

All groundwater samples will be analyzed for volatile organic priority pollutants by EPA Method 624. In addition, groundwater from one well will be analyzed for major ions, selected metals and other organic compounds as shown in Table 1. Specific conductance, temperature, and pH will be measured in the field.

Subtask 3.2 - Search for Additional Subsurface Tanks. A search of the property will be conducted to assess the existence of aboveground appurtenances which may indicate the existence of other buried tanks. This will include a search for concrete slabs, piping, conduit, or other items which may have been connected to a belowground tank. In addition, Champion personnel whom are familiar with the site will be interviewed concerning the possible locations of underground tanks at the site. If underground tanks are found, abandonment or removal will be undertaken following procedures and requirements of the Seattle Fire Department and the Washington Department of Ecology's Policy & Procedures for Underground Storage Tank Removal, dated 1 August 1988. Sampling of the tank contents will be undertaken before deciding to abandon or remove the tanks.

Subtask 3.3 - Characterization and Disposal of Containerized Waste Materials. Containerized waste materials on the property will be sampled and tested for disposal. These materials may include:

- Drummed soil or water from the boring operations
- Miscellaneous pails or buckets which may contain items left over from the mill operation and may include items such as paint, grease, solvents, etc.
- Drums of unknown chemicals
- Waste materials from several tanks

The process includes: locating, staging, sampling, characterization to assess chemical classification, compositing of similarly classified waste samples, laboratory analysis for parameters required for disposal of the material, review of laboratory results, submission of waste profile and samples to disposal companies, review of contracts and disposal fees, bulk compositing of similar wastes materials and offsite treatment or disposal. Containers with questionable integrity will be sampled in place.

Subtask 3.4 - Characterize Boiler-Ash Pile. The extent of the boiler ash will be assessed by conducting a site inspection beneath the onsite structures and by measuring and sounding depth to canal bottom offshore of the area with visual boiler ash. In addition, three to five boreholes will be installed through and surrounding the ash pile until they encounter native soils or fill material containing no visual indications of ash. This assessment should provide an assessment of the volume of ash located on the site.

In addition to visually assessing the extent of boiler ash onsite, several ash samples will be collected during borehole installation to

chemically characterize the ash. Three samples (surface, midpoint, and base) will be collected from two boreholes and will be analyzed for priority pollutant heavy metals by ICAP and base/neutral/acid extractable priority pollutants by EPA Method 8270 since these compounds have been previously detected in the ash or in nearby sediments.

Subtask 3.5 - Methane Investigation. The extent of apparent methane contamination at the site was fairly well characterized by Parametrix during their 1985 site investigation. However, Kennedy/Jenks/Chilton will conduct additional organic vapor analyses during boring and well installation in the solvent tank area. The purpose of the additional investigation will be to provide additional data to that already available, in areas where other investigations are planned. Our approach is not to define all areas where methane producing material exists; rather, our work will concentrate on evaluating the potential hazards associated with methane producing materials, which appear to be indigenous to the site.

While methane generation may not be a significant problem at the site, assuming existing site use in the future, information regarding the extent of materials that could potentially produce methane may be desirable. Therefore, both a Foxboro Organic Vapor Analyzer (sensitive to methane) and HNU Systems photoionizer (not sensitive to methane) will be utilized to monitor organic vapors during drilling operations to be initiated in the solvent tank area. While solvent materials may also produce a response on the monitoring equipment, the relative response of the OVA vs the HNU will be recorded. In addition, low levels of methane (i.e. below several hundred parts per million) should not be a significant concern and investigation will concentrate on assessing whether organic vapor concentrations reach above 1,000 ppm.

Subtask 3.6 - Surface Water Investigation. The supplemental investigation will include an assessment of surface water flow patterns at the site based on visual observation during two storm events. This assessment will include the impact of surface water flow patterns on known surface contaminant sources, including the glue piles. Surface water fluctuations within the Ship Canal and Salmon Bay will be evaluated to assess when the glue piles are in direct contact with surface waters within Salmon Bay and how these fluctuations may impact contaminant migration from the glue piles. Since the contaminants of concern in the glue pile appear to be polycyclic aromatics, and this material is bound within the glue, both the glue and anthracene are expected to be relatively insoluble in water. Preliminary testing indicates that concentrations of anthracene decrease to low levels close to the glue piles. Particulate transport due to sloughing of loose material from the glue piles appears to be the primary migration pathway of concern; therefore, the likelihood of surface water transport of particulates from the glue piles will be evaluated. Analytical data from sediment

samples collected during previous investigations will be used in conjunction with data from the U.S. Army Corps of Engineers on lake level fluctuations and physical measurements of the glue piles to asses the likelihood of migration.

Subtask 3.7 - Overall Site Geology/Hydrogeology. Utilizing information obtained from previous site investigations (conducted by Rittenhouse Zeman and Associates), the solvent tank investigation (performed in Subtask 3.1) and other readily available information on other sites in the area, overall site geology and hydrogeology will be assessed. This evaluation will include an assessment of regional groundwater quality, use and movement as well as an assessment of potential confining layers which could impact the migration of contaminants from the site.

Subtask 3.8 - Sediment Investigation. A two-phase sediment sampling and analysis program will be performed through our subconsultant, Jay Spearman. This sampling and analysis program was developed by Kennedy/Jenks/Chilton and Jay Spearman and is described in Appendix B. The scope of the Phase I program was verbally approved by Ecology and was completed in support of development of a dredging plan to establish mitigation alternatives for future dredging of a portion of the site by the proposed new site owner, Coastal Transportation. The results of Phase I are presented in the report, "Phase I Sediment Sampling and Analysis Program, Ballard Mill, Seattle, Washington", dated March 1989 and previously submitted to Ecology. Phase II will establish general site and background sediment quality throughout the area. All laboratory analyses for the sediment investigation will be performed by Kennedy/Jenks/Chilton's laboratory division or Laucks Testing Laboratory. Phase II results will be incorporated into the Final Remedial Investigation/Feasibility Study report for the site.

## PHASE II - FEASIBILITY STUDY

### Task II-1 Conduct Risk Assessment

The purpose of this task is to evaluate data generated during the remedial investigation against a framework of regulatory and non-regulatory concerns. It is anticipated that the risk assessment will address environmental concerns associated with the following areas of the site:

- Solvent tank area
- Glue press waste and nearby sediments
- Boiler-ash pile
- Methane generation
- Offshore sediments

Information obtained during the surface water investigation (Subtask 3.6, Phase I) will be utilized to assess risks posed by the contaminant sources identified above. Underground tanks and onsite

containers are expected to be removed or will be in the process of removal from the site and will not be included in the risk assessment unless releases from the tanks have occurred.

The findings of this phase will be the basis for development and evaluation of alternative remedial actions in the Feasibility Study, Tasks II-2 through II-4.

Information to be analyzed in the evaluation of the site's environmental and health issues and risks include the following:

- Nature and properties of identified contaminants,
- Potential for contaminant mobility and suspected exposure pathways,
- Potential human receptors or sensitive biological areas at risk, and
- Regulatory requirements.

Current regulatory criteria will be a significant factor in interpretations of the field data as they relate to possible remedial alternatives to be implemented at the site. Following collection of the data from the above tasks, we will review information concerning residual concentrations of contaminants (total and leachable fraction), contaminant volatility, the beneficial uses of groundwater beneath the site, and the ability of native soils to naturally reduce the mobility of any contaminants (permeability, attenuation capacity, etc.). This key data will be analyzed to address future regulatory concerns. Specific evaluations to be conducted will follow guidance provided in the Superfund Public Health Evaluation Manual.

Risks to the environment or human populations from evaluated areas of the site will be identified and remediation activities presented. Specific cleanup goals will be proposed based on site-specific parameters. The level and type of remedial action required for these identified areas exceeding cleanup goals will be further evaluated during subsequent tasks.

Task II-2 Screen Remedial Technologies

Based on the identification of areas requiring remediation from Task II-1, the remedial technologies applicable to site problems will be identified. Technologies may address remediation of groundwaters and surface and subsurface soils, depending on the contaminants and exposure pathways identified in previous sections. A list will be developed of potentially feasible alternatives which will, in turn, be evaluated for applicability to the site. Those technologies appearing difficult to implement, ineffective, or unproven will be eliminated from further consideration. Justification for our evaluations will also be provided.

Task II-3 Develop Remedial Alternatives

General response actions and appropriate remedial technologies selected in Task II-2 will be developed into specific remedial alternatives appropriate for problem areas of the site. EPA's guidance document, "Handbook of Remedial Action at Waste Disposal Sites (Revised)," will be utilized as part of the remedial alternative development and evaluation process. Prior to developing these site specific alternatives, objectives for acceptable levels of protection to public health and the environment will be identified in the Risk Assessment. These objectives should include, at a minimum:

- Protection of public health and the environment
- Minimization of chemical migration via surface water, groundwater, or air
- Site closure to provide minimal maintenance

Once these objectives are finalized, alternatives that meet these objectives will be developed for specific areas on the site requiring remediation. Site specific data will be used to assess the applicability of these alternatives to the site. Alternatives which cannot be implemented due to site physical/chemical conditions will not be considered.

Task II-4 Evaluate Remedial Alternatives

Feasible alternatives for the identified problem areas will be screened for the following criteria.

- Effectiveness in providing environmental protection
- Potential adverse effects of implementing the alternative
- Technical feasibility of implementing the alternative
- Cost of alternative (capital and O&M)

Cost estimates at the screening level can be very preliminary (-50% to +100%), based on published construction cost factors. Alternatives which achieve the same level of control but are greater in cost by an order of magnitude or more will be eliminated.

Factors to be considered during the detailed evaluation will include cost and non-cost criteria, including technical feasibility, institutional issues, public health issues, environmental impacts, and cost criteria.

Technical feasibility analysis will address performance, reliability, constructability, safety and time constraints involved in remediating the site. The public health analysis will involve an evaluation of the types, toxicity, and potential for release of identified chemicals at the site. The environmental assessment will address each alternative's impact on sensitive environmental areas. Both adverse and beneficial impacts of the analyses described above will be iden-

tified and weighted. In addition, the alternatives will be evaluated for permanence and greater consideration will be provided to alternatives involving a reduction in volume, mobility, or toxicity of contaminated material.

Cost analysis of each feasible alternative will involve an estimation of estimated capital and O&M costs.

Task II-5 Prepare Remedial Investigation/Feasibility Study Report

A preliminary report will be prepared that describes our investigation evaluations, justifications, and preferred remedial alternative for the solvent tank area, glue piles, boiler-ash pile and other areas of the site identified during the supplemental RI.

Specifically, the report will address past and present investigative and cleanup activities related to the following areas of the site:

- Solvent tank area
- Glue press waste (glue piles)
- Characterization/disposal of onsite containers
- Underground tank search
- Boiler-ash fill
- PCP area
- Methane investigation
- Surface water drainage
- Overall site investigation
- Offshore sediments

The risk assessment portion of the report will contain sections which address the following items:

- Fate and mobility of detected contaminants
- Regulatory criteria
- Exposure assessment
- Toxicity evaluation
- Risk evaluation
- Development of cleanup goals

The feasibility study portion of the report will describe our remedial alternative screening, development and evaluations.

Appendix C contains a preliminary outline of information to be provided in the final report.

The draft RI/FS report will be submitted to Champion for review in preparation for submittal to Ecology. Following Ecology review of the draft report, a specific response to the comments will be incorporated into a final RI/FS report covering the areas of concern.

## 3.0 PROJECT SCHEDULE

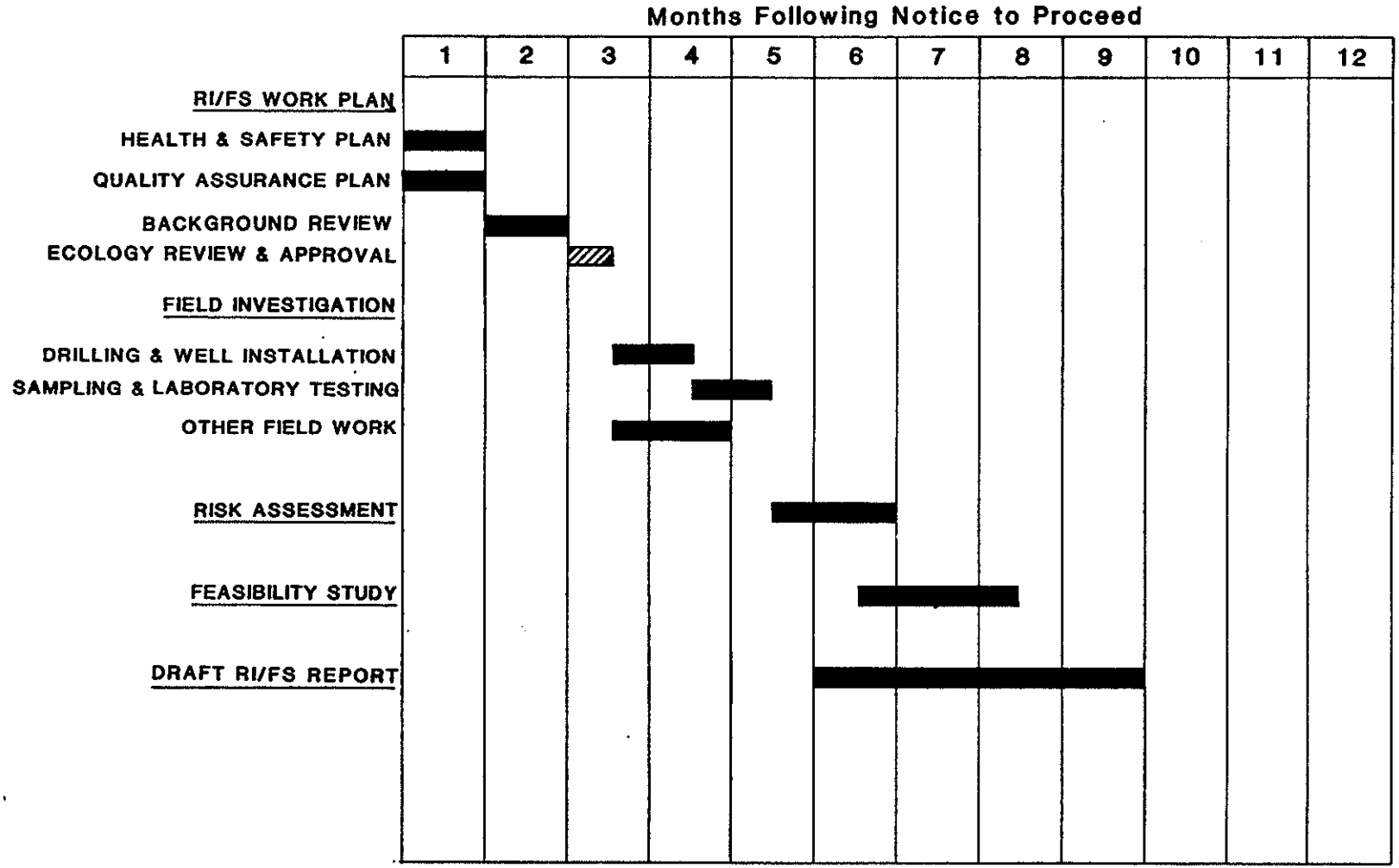
Figure 5 presents the proposed project schedule to implement the RI/FS activities as described in the scope of work (excluding sediment sampling and analysis). A separate schedule for sediment sampling, analysis and Phase I investigation reporting is provided in Appendix B. This schedule assumes that unusual weather conditions or equipment failure are not encountered that could impede completion of the project. In addition, the proposed schedule assumes that no unexpected site conditions are encountered which would require additional investigations and evaluations to adequately characterize the site and allow for the development of remedial actions for identified problem areas.

Furthermore, numerous other assumptions have been made regarding the logistics involved with implementing the field investigations. These assumptions, which directly affect the proposed schedule, are described below.

- A temporary crossing permit can be obtained from Burlington Northern Railroad within 30 days of notice to proceed. This permit is required to allow for drilling equipment to access the site.

- Demolition of the loading dock, if required, above the location of the former solvent tank, can be accomplished under the existing demolition permit obtained by Champion. Demolition of the loading dock may be required to provide access for the drilling equipment.

- Access can be obtained for Champion's lessor to install wells south of the solvent tank area (south of the railroad tracks).




**Kennedy/Jenks/Chilton**

**Champion International Ballard Mill**
**Seattle, Washington**

**Projected Project Schedule**

K/J/C 876046
December 1988
Figure 5

# APPENDIX A

# FIELD INVESTIGATION PROCEDURES

# APPENDIX A

# FIELD INVESTIGATION PROCEDURES

## Drilling and Soil Sampling

Borings in the boiler-ash area will be installed using a post hole digger or hand auger. Borings will be advanced to the desired sampling depth and samples will be collected with a clean stainless steel trowel or post hole digger.

Borings for the proposed monitoring wells will be advanced with a truck-mounted drill rig equipped with an approximately eight-inch outer diameter, continuous-flight, hollow-stem auger. Prior to drilling, boring locations will be checked against available underground utility maps and will also be checked by a commercial utility locating service for possible subsurface obstructions.

All drilling equipment will be cleaned prior to drilling the first boring, between subsequent borings, and after completing the final boring. Drilling equipment will be decontaminated using a high-pressure steam cleaner. Potable water from a nearby source will be used for steam cleaning.

Soil samples will be collected regularly from the ground surface to total boring depth by driving a split spoon sampler. The sampler will be driven 18 inches, when possible, into undisturbed soil ahead of the auger or casing tip using a 140-pound hammer. Blow counts required to drive the sampler will be recorded on the boring logs.

Soil and groundwater conditions will be characterized and logged using the following methods:

- Regularly examining the drill cuttings and split spoon drive samples removed from the borehole.
- Observing the resistance to drilling as indicated by the drilling rate, rig pressure applied, and overall rig behavior.
- Obtaining relatively undisturbed soil samples at regular intervals.

Borings will be carefully logged by a geologist or engineer who will make detailed records of soils encountered during drilling. The soils will be visually described in the field and classified in accordance with the Unified Soil Classification System (ASTM, 1984; ASTM, 1985). A typical boring log is shown on Figure 4.

Soil samples for chemical analyses will be collected at discrete depth intervals. Soil samples will be collected at approximately

five-foot intervals below the ground surface. Visually contaminated soils will also be sampled and will be noted on the boring logs. Photographs of each boring location and of representative visually contaminated soils removed from the boring will be taken and will be retained in Kennedy/Jenks/Chilton storage.

Sample Containers

New sample containers will be provided by the analytical laboratory. Containers will be brass cylinders with Teflon caps or glass sample jars with screw-on lids. Sample containers will be filled to the maximum extent possible to reduce headspace.

Sample Sealing and Labeling

After collection, each sample container will be capped. Brass cylinders will be sealed by taping the perimeter of the teflon caps to the brass cylinders.

Each sample container will also have an affixed label identifying the contents. The label will be completed with the following information:

- Project name
- Sample identification number
- Date and time of collection
- Initials of person collecting the sample
- Sample depth

Sample Shipment

Following proper sealing and labeling, sample containers will be placed on ice in a cooler. The cooler will be sealed. Samples will be delivered to the laboratory within 48 hours of collection.

Sample Custody

A Chain-of-custody record for each set of samples will be maintained throughout sampling activities. Chain-of-Custody records will be filled out and will accompany every sample and every shipment to the laboratory. Chain-of-Custody procedures are necessary to trace each sample possession.

Record Keeping

Field personnel will maintain a detailed log of each exploratory boring and each soil sampling event.

Monitoring Well Installation

The proposed wells will be advanced and installed by a Washington State licensed well driller. The general procedure to be used for well construction follows. Minor departures from prescribed construction techniques may be occasionally required. As-built well construction diagrams will be presented in the RI/FS Report.

- Completed boreholes will be backfilled to achieve the desired base depth for the PVC screen. Bentonite will be used as backfill below the well casings. The backfill depth is anticipated to be generally one-half foot to one foot.

- The PVC well screen and blank sections will be screwed together at land surface and lowered through the hollow auger stem. Well casing will be two-inch diameter, flush-thread coupled, PVC pipe with .020-inch wide milled slots for screened intervals. Bottom caps will also be flush-thread coupled. Casing used to construct the wells will be precleaned by the supplier. The screened interval is anticipated to be five feet long in all wells. The casing caps will be vented.

- Wells will be backfilled with silica sand, bentonite (granular or pellets), and concrete surface seals, as described below. The depth to the top of backfill materials within the annulus will be measured frequently with a steel tape to maintain strict control of the well construction and prevent overfilling the hollow-stem auger.

- The annulus surrounding the slotted portion of the well casing will be backfilled using silica sand. The sand will be placed in two to three-foot lifts as the auger is withdrawn. Sand will be placed from land surface at a controlled rate to avoid bridging. This method will minimize the potential for native materials collapsing into the boring and possibly plugging the well screen slots.

- After the annulus surrounding the slotted portion of the well casing has been backfilled, the hole will be sealed from possible surface water contamination with a bentonite pellet or granular bentonite plug. A Portland cement surface seal will be constructed below land surface.

- Steel monument cases with locking caps will be installed over the stainless steel well casing. Well casings will be set approximately two feet above land surface to facilitate sampling and avoid accidental destruction. In traffic areas, wells will be completed at the ground surface with water tight locking caps. Steel monument cases will be set in concrete.

- A permanent marking or notch will be made at the top of the well casing which will serve as the point from which all subsequent water level measurements are made. This mark and a reference point on the ground surface adjacent to the well will be surveyed to within 0.01-foot elevation against an appropriate USGS datum, if available; otherwise, a local datum will be used.

Well Development

The monitoring wells will be developed by bailing using a teflon bailer or by pumping. Equipment used in well development activities will be cleaned in accordance with the decontamination procedures outlined in this Appendix prior to placement in each well. The wells will be bailed or pumped until the turbidity of the discharge water stabilizes and the water is relatively sediment-free. All discharge water from the wells will be placed in DOT-approved 55-gallon drums and stored onsite pending laboratory results. Drums will be labeled.

Groundwater Elevation Monitoring

Depths to water will be measured to within 0.01-foot using a calibrated electric water level indicator.

Groundwater Quality Sampling

Water quality sampling will be conducted in general accordance with EPA specifications and recommendations as presented in the "Ground Water Technical Enforcement Guidance Document" (EPA, 1986), and "Practical Guide for Ground Water Sampling" (Barcelona, et al, 1985). The following field sampling procedures will be adhered to throughout the sampling program.

Initial Measurements. Water levels in the wells will be measured prior to purging the wells for sampling to the nearest 0.01 foot using a calibrated electric water level indicator.

Well Purging. Each monitoring well will be purged using either a precleaned bailer or appropriate pump. Low yield wells will be bailed dry and sampled immediately upon recovery. During the purging activities, pH, temperature, and electrical conductivity will be monitored and recorded.

The well will be considered purged when these indicator parameters have stabilized so that three successive measurements vary less than ten percent, or five well casing volumes have been removed. Water purged from the wells will be placed in DOT-approved drums and handled according to the procedures previously outlined.

Groundwater Well Sampling. Samples will be obtained using a bailer suspended on a nylon cord. The nylon cord will be discarded after each well is sampled. The sampler will be slowly lowered into the water column to the desired depth. The sampler will be carefully emptied to avoid degasing the sample.

Decontamination. All sampling equipment will be thoroughly decontaminated between each sampling in accordance with the decontamination procedures outlined in this Appendix.

Field Measurements. Field personnel will measure water levels and water quality parameters in a consistent manner. Water levels will be measured to the nearest 0.01 foot from the top of the well casing using an electric water level indicator. Specific conductance, temperature, and pH of each sample will be measured during purging and immediately after sample removal from the well using commercially available meters. The conductance device will be calibrated on a daily basis prior to sampling. The pH meter will be calibrated in the field using standard solutions prior to sampling each well.

Sample Containers. Surface and groundwater samples will be placed in clean bottles. Sample containers will be chosen so that they will not adsorb or otherwise affect the concentrations of the parameters of interest. Samples will be placed in ice chests immediately after sampling.

Sample Custody. Each sample will be labeled and sealed as described previously. Chain-of-custody records will be maintained with all samples from time of collection through arrival at the analytic laboratory. The analytic laboratory has an internal record keeping and chain-of-custody system.

Record Keeping. Field personnel will maintain a detailed log of each sampling, including water level, method of well purging, volume of water removed, and odor and appearance of the sample.

## Decontamination Procedures

All drilling equipment and materials will be decontaminated prior to the start of drilling and between each drilling location. This includes the auger flight, drill rods, and any other equipment which could conceivably contaminate the soil, groundwater or surface water.

The drill rig and drilling equipment will be decontaminated using a steam cleaner or hot water wash. If oil is visible from a previous drilling operation, a solvent such as methanol or hexane will be used prior to steam cleaning. A decontamination area will be established onsite outside of the sampling area.

The following describes the decontamination procedures to be used on soil and water sampling equipment. All equipment will be decontaminated prior to and after each use.

Step 1: Rinse and preclean in potable water.
Step 2: Wash in solution of laboratory grade non-phosphate based soap and potable water.
Step 3: Rinse with potable water.
Step 4: Rinse with distilled water.

All solutions will be renewed frequently. Sponges and nylon scrubbers will be used. All equipment will be air dried.

Solutions generated during decontamination procedures will be placed in DOT-approved 55-gallon drums and stored onsite prior to disposal. These solutions will be disposed of in accordance with state and federal regulations.

# APPENDIX B

# SEDIMENT SAMPLING AND ANALYSIS PLAN

*JAY W SPEARMAN*
CONSULTING ENGINEER
• MARINE
• STRUCTURAL
• ENVIRONMENTAL PERMITS

**Kennedy/Jenks/Chilton**
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88-16

February 13, 1989

State of Washington
Department of Ecology
4350 150th Avenue NE
Redmond, Washington 98052

Attention: Ms. Lee Dorigan
Mr. David South

Subject: Sediment Sampling Plan
Champion Ballard Mill Site

Ladies & Gentlemen:

The purpose of this letter is to confirm the points discussed at our meeting of January 27, 1989, regarding subject sediment sampling plan. Following is a recapitulation of the plan, including a list of modifications with clarifications:

1. The grain size analysis will include use of a hydrometer, in accordance with ASTM D-421.
2. The volatile organics analysis will be performed with CS2 as target analyte.
3. Two additional sample sites have been added in the ship canal as part of the Phase II effort. These sample sites will be approximately in line with the westernmost on-site transect previously proposed, parallel to the eastern edge of the bridge. See the sample site location diagram.
4. One additional sample will be analyzed from the DNR lease area. It will be composited from samples taken at three locations within the DNR area and identified on the sample site location diagram.

   The composite sample will be formed in the following manner:
   - Approximately the same quantity of material will be recovered from each sample site.
   - The material recovered from each sample site will be homogenized independently, in the field.
   - The laboratory will homogenize the material from each sample site.
   - Representative samples of laboratory homogenized material from each sample site (equal weight) will be combined to form the composite sample for analysis. This step will be performed in the laboratory.

5. Sample site locations will be position reproducible as possible.
6. A complete time history, including photographs of bottom sediments will be provided for sediment samples taken by Van Veen grab sampler, in the DNR lease area. Specimen photographs will be taken at all Van Veen sample sites.
7. Photographs will be taken of all sediment core specimens.
8. The analysis method to detect PCP will be EPA method 8040.
9. The analysis methods for other chemicals are as proposed in the table of Enclosure 2.
10. QA/QC will be limited to the following:
    A. Phase I
        1. A background reference sample taken near the northeast corner of the DNR lease area. Presumably this will contain lower levels of the chemicals of interest than the on site samples.
        2. A duplicate analysis of the background sample site specimen.
        3. A duplicate analysis of a specimen from the boiler waste area deep boring.
        4. A duplicate analysis of a sediment sample from the log pond area. Selection to be based on visual appearance and professional judgment.
    B. Phase II
        1. Two duplicate analyses based on visual appearance and professional judgment.
11. Field sampler decontamination procedures are described in Enclosure 3.
12. Precautionary safety measures are described in Enclosure 3.

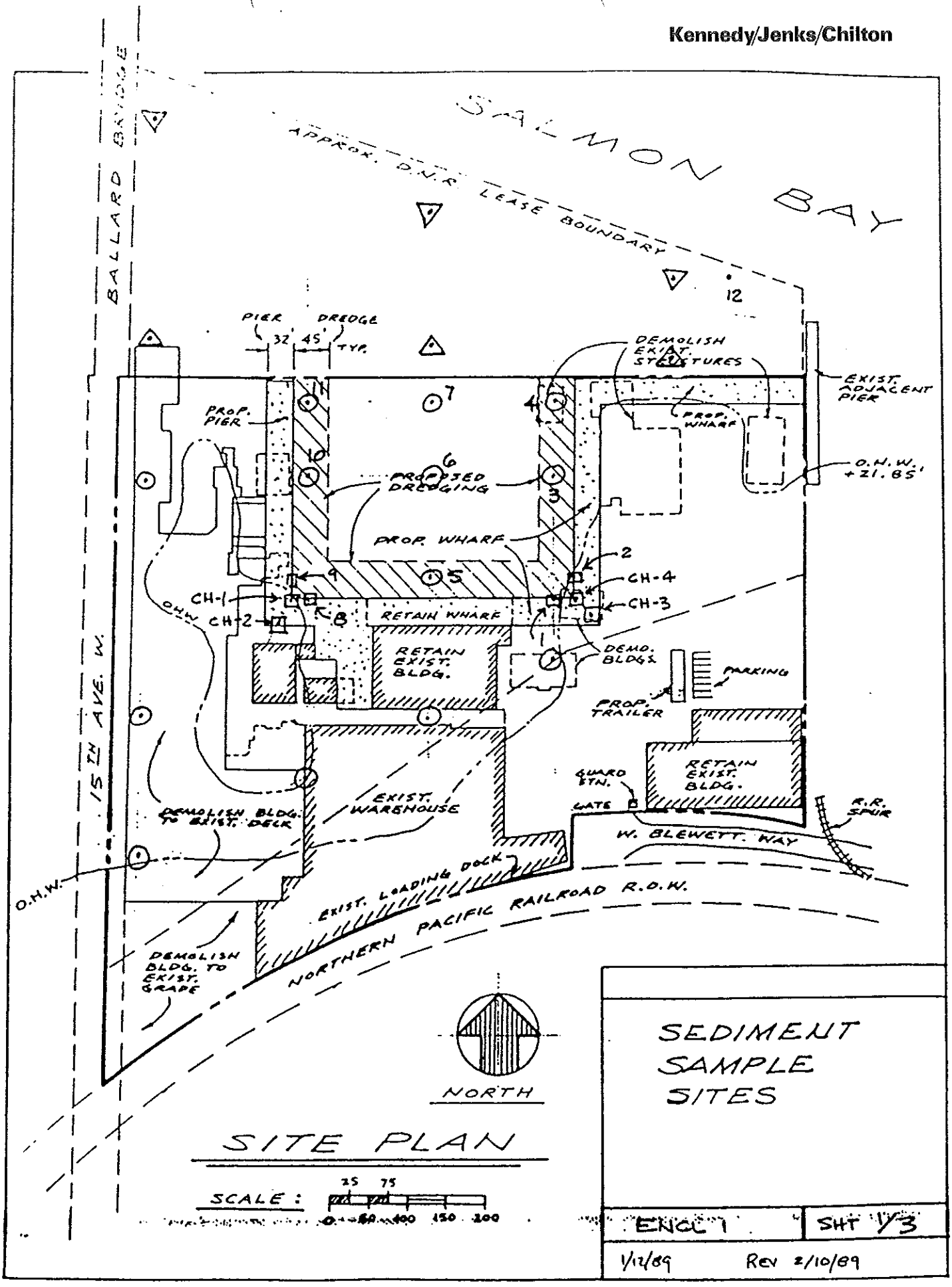
If I can be of any further assistance, please don't hesitate to call. Based on your verbal approval of this document, it is our plan to proceed immediately with Phase I sediment sampling. The date of the Phase II sampling is yet to be determined.

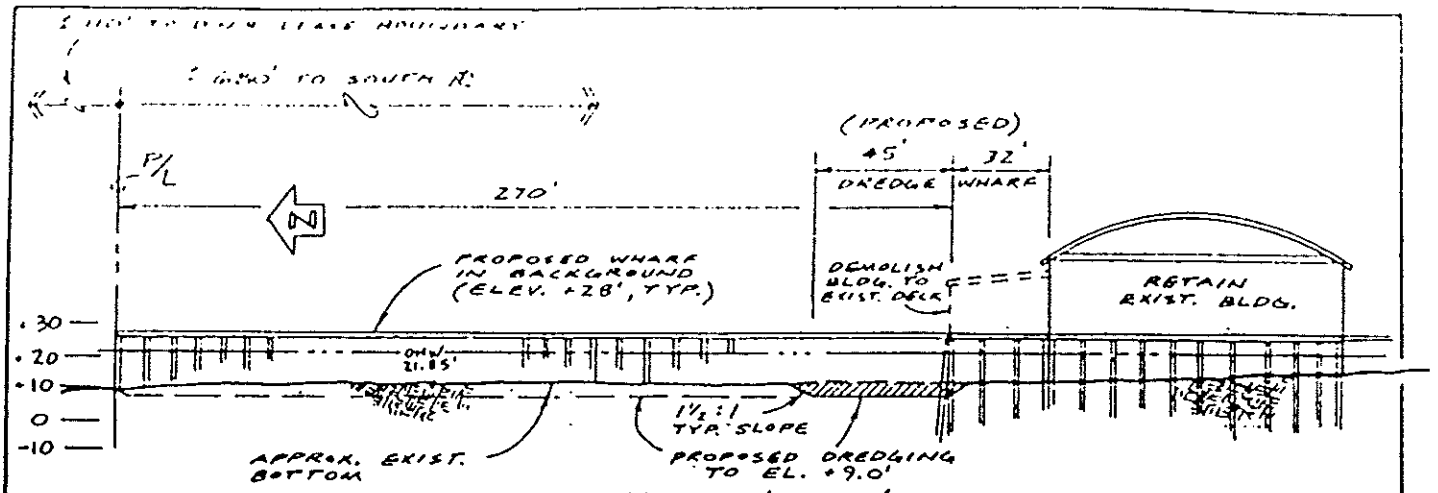
Very truly yours,

Jay W. Spearman, Consulting Engineer


JWS/lms
Encl: (1) Proposed sampling plan with sample site map
(2) Table I - Analyses to be Performed
(3) QA/QC procedures and safety plan
CC: Kennedy/Jenks/Chilton, Attn: Mr. Nathan Graves
Salmon Bay Terminals, Attn: Mr. Peter Strong
Preston, Thorgrimson, Attn: Mr. Ross MacFarlane
Eisenhower, Carlson, Attn: Mr. Michael Thorp
Ref: (1) "Toxicants in Urban Runoff," Report #2, Metro Toxicity Program
(2) EPA Field Sampler Training Course Manual
(3) Guidance Under Remedial Investigations Under CERCLA

Kennedy/Jenks/Chilton



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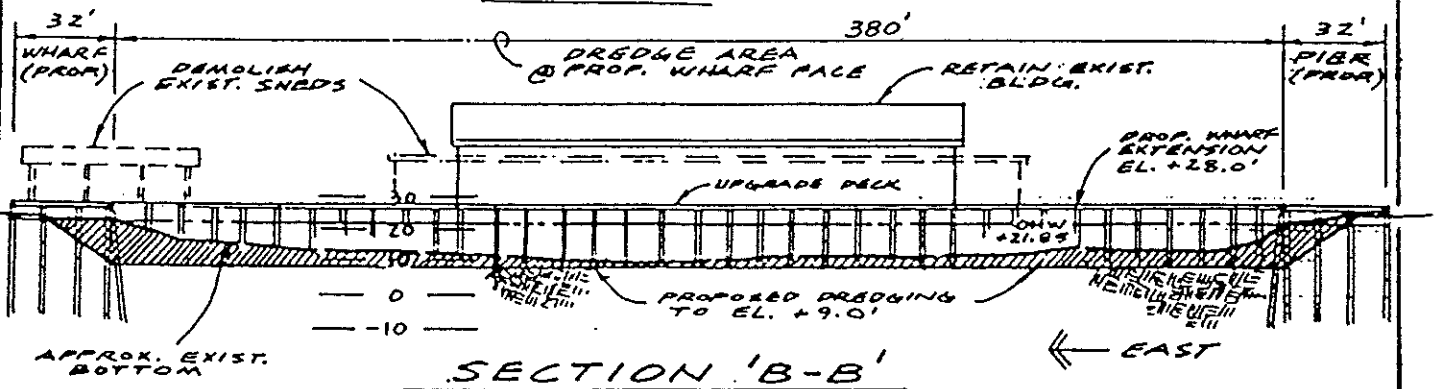


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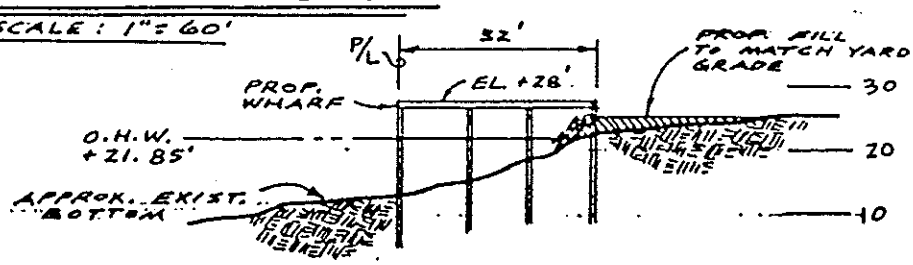


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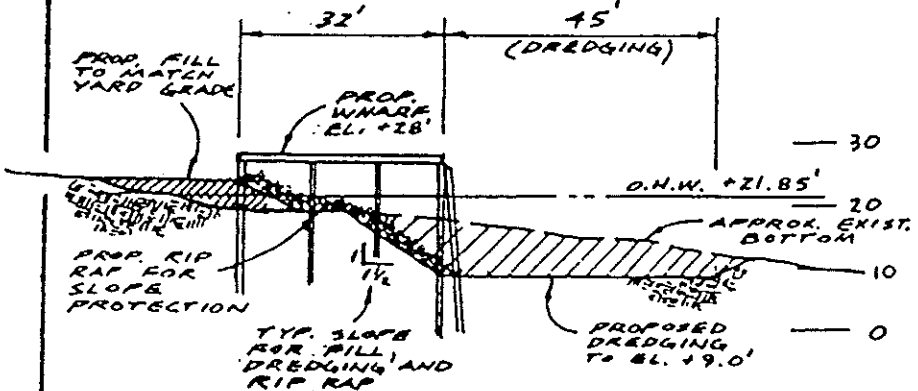


SECTION 'D-D'

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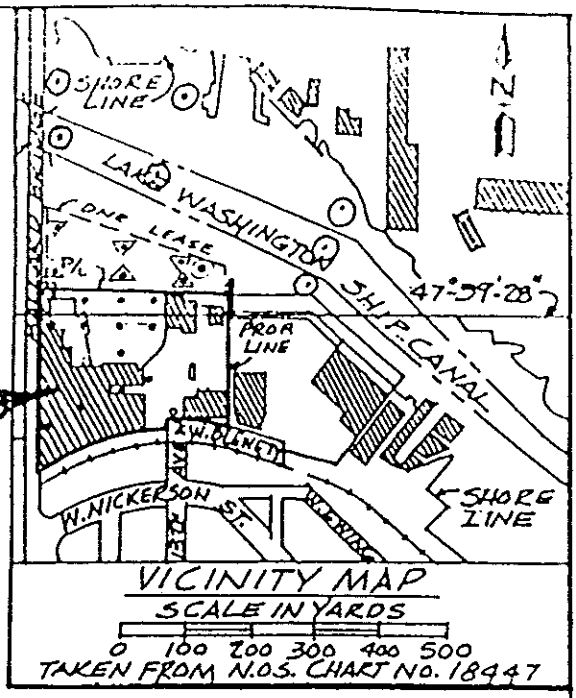
SEDIMENT SAMPLE SITES

ENCL 1 | SHT 2/3

1/12/89




SEDIMENT SAMPLE SITES

ENCL 1 | SHT 3/3

1/12/89 Rev 2/10/89