MK-ENVIRONMENTAL SERVICES
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February 28, 1991

Mr. David South
Washington State Department of Ecology
Northwest Region
4350 150th Ave. NE
Bellevue, WA 98052-5301

Dear David:

Enclosed please find five copies of the Draft Phase I Remedial Investigation Report for the Maralco Site, Kent, Washington. Note that the draft does not include the complete analytical laboratory data package. It was decided to omit the full data packages to reduce reproduction costs.

If you should have any questions concerning this report, do not hesitate to contact either myself or Marian Allen. We have enjoyed working with you on this important Ecology Project.

Sincerely,
MK-Environmental Services

C. Susan Evans
Senior Hydrogeologist

cc: Jeri Sivertson, Ecology
Alan Parker, MK-ES

FILE COPY

3.8.1

WASHINGTON STATE
DEPARTMENT OF ECOLOGY

DRAFT REPORT

PHASE I REMEDIAL INVESTIGATION REPORT
MARALCO SITE
KENT, WASHINGTON
WORK ORDER NO. 2121.05.03.320

FEBRUARY 1991

(

SUBMITTED BY:

MK-ENVIRONMENTAL SERVICES
1300 114th Avenue SE, #112
Bellevue, Washington 98004

1.0 INTRODUCTION AND SITE BACKGROUND

Morrison-Knudsen Environmental Services (MK) was contracted by the Washington Department of Ecology (Ecology) to initiate a remedial investigation (RI) of the Maralco Aluminum Site in Kent, Washington. Phase I of the RI sought to commence characterization of the nature and extent of contamination at the site. This document presents the results of the Phase I Remedial Investigation to evaluate environmental contamination in the soil, groundwater, surface water and sediments at the Maralco Aluminum Site.

Maralco is a 13 acre industrial property located at 7730 South 202 Street, Kent, Washington. The Maralco Aluminum Company, Inc. (Maralco) operated an aluminum recycling/refinery facility at the site from 1980 to 1986. The facility produced aluminum alloy ingots from aluminum cans and aluminum metal scrap. Waste products from the operation included black dross, furnace slag, and baghouse dust. During the first year of operation, these wastes were transported off-site to a landfill. After 1981, the waste material was stored on-site.

Maralco filed for bankruptcy in May of 1983, and ceased operations in November, 1986. The property is currently managed by a bankruptcy examiner. The site remediation activities are funded by the State of Washington, Toxic Controls Account. Ecology has entered into a court agreement with the secured creditors on the property to begin remedial investigation and feasibility study (RI/FS) activities. As part of this agreement, Ecology will receive half of the proceeds from any sale of the property.

1.1 REGULATORY HISTORY

In February 1986, Ecology received a complaint from the Metro Industrial Wastewater Section expressing concern that leachate from the dross pile was entering the storm drainage system and/or surface waters due to the large amount of dross and the lack of runoff control and waste containment. Ecology personnel visited the site in March 1986 and collected samples of the black dross, "baghouse dust", later alleged to be Kawecki-Berylco, Inc. (KBI) dross, and creek waters (Ecology Request for Administrative Order DE-86-N228 dated December 3, 1986).

The black dross was "book designated" a Moderate Risk dangerous waste as defined by WAC 173-303-040(55) (1986 citation) by Ecology in accordance with WAC 173-303-101(4) on the basis of oral rat toxicity bioassay results for sodium chloride and potassium chloride. The baghouse dust and the KBI dross are extremely hazardous wastes due to fish bioassay toxicity (Ecology Technical Information Memorandum December 3, 1986).

An enforcement action was never carried out at the site, presumably due to the bankruptcy filing. Ecology performed a surface water and runoff control remediation project to prevent contaminants from washing into the ditches from the main black dross pile in 1987. This action consisted of lining the ditch adjacent to the north end of the dross pile, and of re-routing the drainage ditch along a portion of the pile. However, surface water has continued to flow in the old channel adjacent to the dross pile, and the southern end of the new lined channel is consistently dry.

In 1987, Ecology and Environment, Inc. (E & E) performed a Site Assessment of Maralco for the U.S. Environmental Protection Agency (EPA). The results of this assessment are discussed in Section 4.2.

In the winter of 1990, Ecology contracted MK to perform a Phase I Remedial Investigation/Feasibility Study (RI/FS) at the site and to oversee the operation of a pilot plant to test remediation of the black dross. International Aluminum Inc. (IAI) designed and operated the pilot plant.

1.2 WASTE GENERATION PROCESSES

The Maralco recycling process involved melting and processing the aluminum scrap in rotary barrel and reverberatory furnaces. The rotary barrel furnace was charged with aluminum scrap and salt (KCL and NaCl). The salt acted as a flux to remove impurities and to prevent oxidation of the aluminum. When the charge was melted, the rotary barrel furnace was stopped and the salt and combined impurities (black dross) were separated from the molten aluminum. The fresh black dross is approximately 50% salts (E & E, June, 1987). Weathering of the dross, especially in the Pacific Northwest, may reduce the salt content in the dross pile by simple washing. The black dross was taken from the furnace and placed in an outside pile, on unpaved soils. Particulate materials from the smelting operations were collected in a baghouse. Baghouse materials were also placed on the black dross pile. The baghouse, with partially filled bags, remains inside the Maralco building.

Metallic silicon, copper and zinc were added to the melt in the approximate percentages of 7%, 1% and 1.5% to produce aluminum alloys (E & E, June, 1987). Alloys comprised about one-half of the product line. The other half of the product line was aluminum sows produced from used beverage containers. The scrap used contained varying amounts of associated heavy metals. Average production was 1.5 million pounds of product per month over 69 months of operation. Chlorine was used to remove magnesium from the product by the formation of magnesium chloride (MgCl), which was also discharged to the waste pile.

During the later part of operations, salt was recovered from the black dross in a process called a "salt saver". In this process, the dross was mixed with water in three concrete holding ponds, where the KCl and NaCl were removed from the metal oxides by a series of washes. The brine was subsequently flashed over a bed of hot salt to remove the water and recover the salt for reuse. The insoluble metal oxide residues from the ponds were disposed on-site in the "oxide lagoon," an unlined lagoon at the north end of the dross pile. Berms for the "oxide lagoon" were formed of black dross.

Components of the black dross combined with water to produce gases according to the following reactions (Reynolds & Olper, 1990):

Hydrogen: $Al + 3H_2O \rightarrow Al(OH)_3 + 3/2H_2$

Ammonia: $AlN + 3H_2O \rightarrow Al(OH)_3 + NH_3$

Methane: $Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

Phosphene: $AlP + 3H_2O \rightarrow Al(OH)_3 + PH_3$

Hydrogen Sulfide: $Al_2S_3 + 6H_2O \rightarrow 2Al(OH)_3 + H_2S$

The amounts of these gases produced depends on the concentrations of impurities and the availability of water. Collection and analyses of dross samples is discussed in Section 4.5.

The findings of the preliminary assessment performed by E & E (1987) and the assessment of Ecology indicated that four types of waste materials are present at Maralco. They include an estimated 25,000 tons of black dross, 10 tons of KBI dross, 1,400 tons of aluminum oxide (in the "oxide lagoon"), and 500 pounds of baghouse dusts.

2.0 OBJECTIVES AND SCOPE

The objectives of the Phase I RI were to determine if soils, groundwater, and surface water have been affected by past practices at the site, and to begin characterization of the nature and extent of contamination, if present. The objectives of this report are to present and interpret the Phase I investigation data and to design a second phase environmental investigation. The Phase II investigation will determine the nature and extent of contamination on- and off-site, support an evaluation of the threat to human health and the environment posed by the site, and yield data to determine the need for remediation of environmental media. The Phase II investigation will conclude the RI.

The scope of the Phase I RI environmental investigation was based on an initial Sampling Plan outlined by Ecology in discussions on November 29, 1989, and described in the Work Plan dated May, 1990. The investigation included the following tasks:

1) Land Survey: An aerial and land-based survey was conducted to develop a site topographic map for volumetric calculations of the black dross pile and to define property boundaries. Soil boring locations and monitoring wells were included in the survey.

2) Evaluation of Soil and Groundwater Contamination: This task included sampling and analyses of waste, soil, groundwater, surface water, and sediment as well as a review of existing data. As part of this evaluation, the eastern portion of the property was examined and sampled to determine if it could be easily remediated and released for sale.

3) Evaluate Proposed Interim Response: At the time MK became involved with investigations at Maralco, an interim response to remediate the black dross had been proposed. The proposed treatment removed the salts from the dross with a series of water washes, discharging the saline wash waters to Puget Sound via the Metro sewer lines and recycling the remaining aluminum oxides. A preliminary evaluation of the proposed interim response was performed prior to start up of the pilot treatment plant. This evaluation is discussed in the Phase I Feasibility Study Report.

4) Pilot Study: A pilot plant to remediate the black dross pile was operated from July 18, 1990 to December 18, 1990. The evaluation of the pilot plant is discussed in the Phase I Feasibility Study Report.

5) Prepare Recommendations and Summary Report: This report fulfills the fifth task, and includes recommendations in the form of a preliminary work plan outline for the Phase II RI.

3.0 ENVIRONMENTAL AND GEOLOGIC SETTING

3.1 SITE DESCRIPTION

The approximately 13 acre Maralco Site is located in the Kent Valley, Washington within the NE 1/4 of the SE 1/4 of Section 1, Township 22 North, Range 4 East. Surrounding land use is light industrial. The location of the site is shown in Figure 3-1. Topography at the site is generally flat, with elevations of approximately 24-26 feet above mean sea level (MSL). The black dross pile forms a hill up to 61 ft. MSL to the east and to the south of the Maralco building (Figure 3-2).

The site is bounded on the north by South 202 Street, which ends at the northeast corner of the parking lot, and by the Christopher Ditch along the western edge of the northern boundary. On the east, the site is bordered by 80th Avenue South to about the middle of the site, and by a light industrial building containing Lifetime Doors, Inc. and the PK Fencing Company. To the south, an open field is adjacent to the eastern portion of the property, and the Colonial Cedar mill borders the site just south of the Maralco building and the dross pile. To the west, the site is bounded by Northern Pacific Railroad tracks.

A farmhouse and outbuildings are located to the northeast of the Christopher Ditch at the west end of S. 202 St. The farmhouse has been on the site since at least 1968, and is currently occupied by Mr. Philip Stansfeld of IAI. A stand of dense blackberry bushes curves around to the east and south of the house. This brush contains scrap wood, broken bottles, paint cans, appliances, and other miscellaneous items.

The Maralco processing facilities were located to the west of the drainage ditches and included a parking lot and truck scales, the refinery building, five metal, above-ground, vertical water storage tanks, and three concrete basins (just east of the building). A 35,000 gallon underground diesel storage tank is located beneath the northwest corner of the parking lot. In addition, several empty 55 gallon drums are present in the northwest corner of the parking lot, and outside the northwest corner of the fence.

A rail spur runs along the west edge of the building and ends at the "chlorine area," a metal shed at the northwest corner of the building, where chlorine gas was handled from rail cars. A release of chlorine gas in 1981 killed several trees about 100 ft north of the chlorine area. Due to this release, liquid chlorine entered a storm water runoff holding pond located to the northwest of the Maralco building. Following the release, chlorine handling was switched from rail cars to 1 ton containers of liquid chlorine. Chlorine gas was used to extract magnesium from the metal by formation of MgCl. The MgCl was discharged to the dross pile. According to Phil Stansfeld of IAI, pipes from the chlorine area are still filled with chlorine gas.

3.2 CLIMATE

Kent Valley has a predominately temperate, west coast marine climate characterized by cool, dry summers and mild, rainy winters. The two weather stations nearest the Maralco site are located at Kent, Washington and at the Seattle-Tacoma Airport. Published weather data for the period of record from 1931 to 1960 at these stations reported an annual mean temperature of approximately 51°F; temperatures during the summer months average in the 70's (°F) while the winter temperature ranges from the upper 30's to lower 40's (°F). Average annual precipitation is 38 to 39 inches, with approximately 85 percent occurring between October and April. (Washington State University, 1968).

3.3 GEOLOGIC SETTING

3.3.1 Regional Geology

The Maralco site is located in the lower Green River Valley, referred to as the Kent Valley, which was formerly a deep marine embayment that has filled with sediments since the end of the most recent glaciation (Vashon Glaciation). The valley extends north to Renton and south to Auburn and is bounded by glacial drift uplands to the west and the east. Geologic history of the valley (Luzier, 1969) is summarized below.

Tertiary sedimentary and volcanic rocks of the Puget Group were deposited in a subsiding coastal plain which occupied the Puget Sound lowland area. This bedrock forms the base of the thick unconsolidated glacial and non-glacial deposits in the area. Bedrock outcrops intermittently near Tukwila and Renton along the east valley wall and occurs at depth in the east upland.

Advance of the glaciers into western Washington deeply carved the Kent Valley while depositing meltwater outwash chiefly composed of sand and gravel, and dense compacted glacial till in the upland areas. Dense glacially overridden deposits at depths of roughly 500 ft in the valley near Auburn (Hart-Crowser, 1982) are believed to mark the original valley floor. Retreat of the glaciers left the valley as a deep marine embayment. The Green, White (pre-Osceola course) and Cedar Rivers deposited a thick accumulation of fluvial sediments, which were eroded from the glacial drift uplands, into the valley. The sediments consist of coarse sand and gravel near the mouth of the rivers at Auburn (Green River) and Renton (Cedar River), and become finer toward the Kent area.

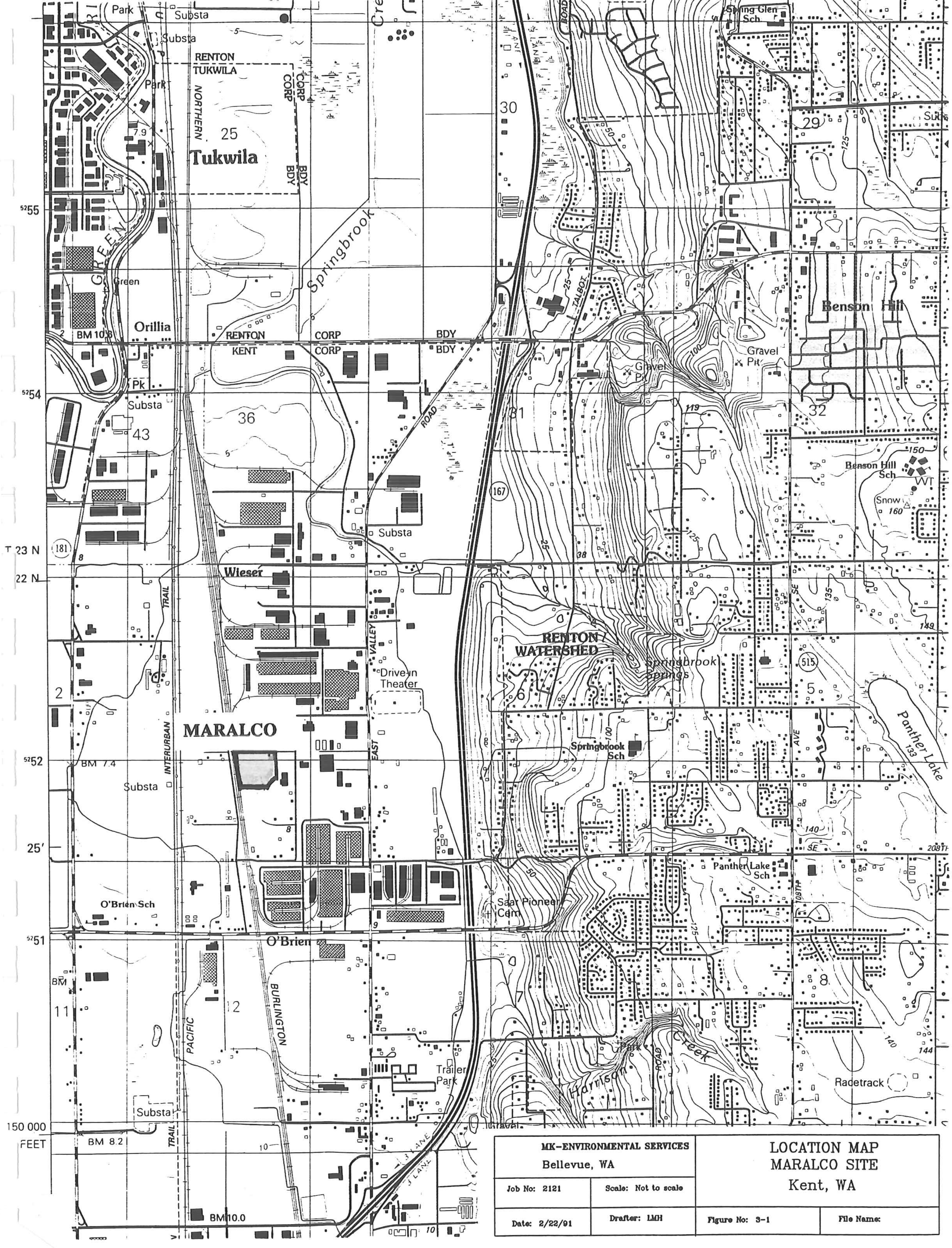
The Osceola Mudflow of Mount Rainier origin flowed down the former White River valley and into the embayment, covering much of the older alluvial deposits. As a result of the mudflow, the White River changed course to its present mouth near Auburn. Deposits of the newly eroding White River filled the marine embayment to above sea level. The White and Green Rivers continued depositing sediments until the White River was rerouted to the south in 1906. Currently, only the Green River occupies the valley.

3.3.2 Site Geology

This discussion of site geology is based on soil borings for installation of monitor wells, hand auger borings for collection of shallow soil samples, and review of data from nearby sites. Results of soil sampling and analyses are discussed in Section 4.5. Boring logs are included in Appendix I.

The soils immediately underlying the site are composed of fluvial fine to medium grained sands, interbedded with discontinuous clayey sands and clays. A thick clay unit was encountered in boring MW-1, between 6.5 to 13 feet below grade. The clay unit appears to thin, or pinch out, towards the borings to the north and northwest. Borings MW-2, 3, and 4 contain multiple thin, 0.2 to 2 feet, clay intervals. The continuity of the clays below the dross pile is unknown.

Borings and cross sections from the HYTEK site, north and east of the Maralco site, indicate generally sandy sediments with discontinuous lenses of silt and clay to depths of 80-100 ft (Sweet Edwards, January 1988). A continuous silty clay layer was encountered at this depth in all deep borings at the HYTEK site. This clay may be continuous beneath the Maralco site as well.



MK-ENVIRONMENTAL SERVICES Bellevue, WA		LOCATION MAP MARALCO SITE Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 2/22/91	Drafter: LMH	Figure No: 3-1	File Name:

3.4 HYDROLOGY

3.4.1 Surface Water

Two drainages trisect the site (Figure 3-2). Christopher Ditch enters the northeast edge of the site from 80th Avenue South, bends to the southwest, and is joined by a small, unnamed north-flowing ditch at the center of the site. The Christopher Ditch then flows northwest, is culverted beneath the driveway, and exits the site at the northwest corner. Christopher Ditch discharges into Mill Creek approximately 3/4 mile northwest of the site. Mill Creek is a tributary to the Green River. These two drainages pre-date construction and have been in the same position since at least the late 1940s, as documented by historical aerial photographs.

The unnamed ditch formerly flowed through the western portion of the area now covered by the cedar mill and the mill yard. Although the southern portion of this ditch has been covered, it may have been culverted beneath the cedar mill and may influence shallow groundwater flow. The southern end of the ditch is lined with wood chips from the cedar mill, and the ditch is stained red from the south end of the Maralco property to where it was dammed for the Ecology surface water remediation.

In 1987, Ecology performed a runoff control remediation project to prevent contaminants from washing into the ditches from the main black dross pile. Plastic tarps were installed at the base of the dross pile along the ditch in an attempt to prevent dross runoff sediments from entering the ditch. In December of 1989, these tarps had blown down, leaving no barrier to dross washing into the ditch.

During site visits in December, 1989 and March, 1990, an estimated three feet of standing water was present in the area south of the Maralco building. This standing water extended from the rail spur to the southeast corner of the building and covered all areas where dross was not piled. Standing water was again present in this area from mid-November, 1990 onward.

A holding pond for storm water runoff from the parking lots is located to the northwest of the Maralco building. Sediments in this pond are white to light grey and very fine grained. They are unlike the natural sandy soils found elsewhere on the site. The holding pond drains north to the Christopher Ditch via a culvert. Light colored sediments were also observed at the mouth of the culvert where it discharges into the ditch.

3.4.1.1 Wetlands

The U.S. Fish and Wildlife Service - National Wetland Inventory (NWI) has identified the drainage areas on the Maralco site as wetlands. Aerial photography for the NWI listing for the Kent area was conducted in 1980 and 1981, and maps were updated in 1987 and 1988. The City of Kent Planning Department, with the support of Ecology and the National Oceanic and Atmospheric Administration, directed a field investigation to identify and evaluate wetlands within the city limits. The City of Kent Wetlands Inventory Report (Phase I, Shapiro and Associates, Inc., June 1990) confirmed the NWI designation. The Maralco property drainage areas were classified as wetlands based on the vegetation and hydrologic indicators. Implications of this designation in regards to the Maralco property will be discussed in Section 5.

3.4.2 Groundwater

The regional groundwater flow in the Kent Valley area is towards the Green River (Figure 3-3). Five geologic units are important in the understanding of the aquifer systems as shown in cross section in Figure 3-4). Information on these hydrogeologic units has been extracted from the October 1984 report by Hart-Crowser & Associates. They are, from youngest to oldest:

White River Alluvium. Till deposits comprised of sandy gravels, silt, and clay that extend to depths of over 360 feet. The White River Alluvium is not considered to be a major groundwater source because of generally low permeability and poor water quality.

Vashon glacial deposits. Surficial gravel, sand, silt and clay deposits of the upland areas that are estimated to be between 100 to 200 feet thick. The glacial deposits consist of coarse, permeable recessional outwash sediments overlying poorly sorted, low permeability till, which rests on permeable advance outwash sands. The Vashon deposits occur above sea level and are saturated in the west upland area. The aquifer is used for domestic water supply.

Salmon Springs deposits. Sand and gravel deposits underlying the Vashon comprise a major aquifer. The Salmon Springs occurs predominantly above sea level with the base near the elevation of the Kent Valley floor.

Older Undifferentiated Glacial and Interglacial deposits. Thick sequences of low permeability silt and sand with interbeds of more permeable sand and gravel occur below the Salmon Springs. A deep permeable unit occurs within the undifferentiated deposits at approximate depths of 100 to 200 feet below sea level. This zone is a major aquifer for the City of Kent and King County. The aquifer does not appear to be continuous across the valley; it was likely eroded by a subsequent glacial advance.

Bedrock of the Puget Group. Sedimentary and volcanic rocks that are eroded and overlain by the younger glacial and interglacial deposits. These rocks are not a significant aquifer in the Kent Valley region.

The preliminary investigation of the shallow aquifer at the Maralco site indicates that the soils are saturated at very shallow depths below grade. The potentiometric surface changes in shape and elevation to reflect changes in seasonal rainfall (Table 3.1). Potentiometric surface elevations measured on October 1, 1990, at the end of the 1990 dry season, indicate groundwater flow is to the north (Figure 3-5). Groundwater levels on November 27, 1990, after nearly 2 months of heavy rainfall, measured a signifcant rise in the potentiometric surface (Figure 3-6). Flow is generally to the north-northwest, with some mounding observed near monitoring well MW-3. The mounding may be related to the surface water ponding observed south of the Maralco plant. The surface water drainage ditches on the site most likely influence the potentiometric surface. However, surface water elevation data is not available at this time to support this hypothesis.

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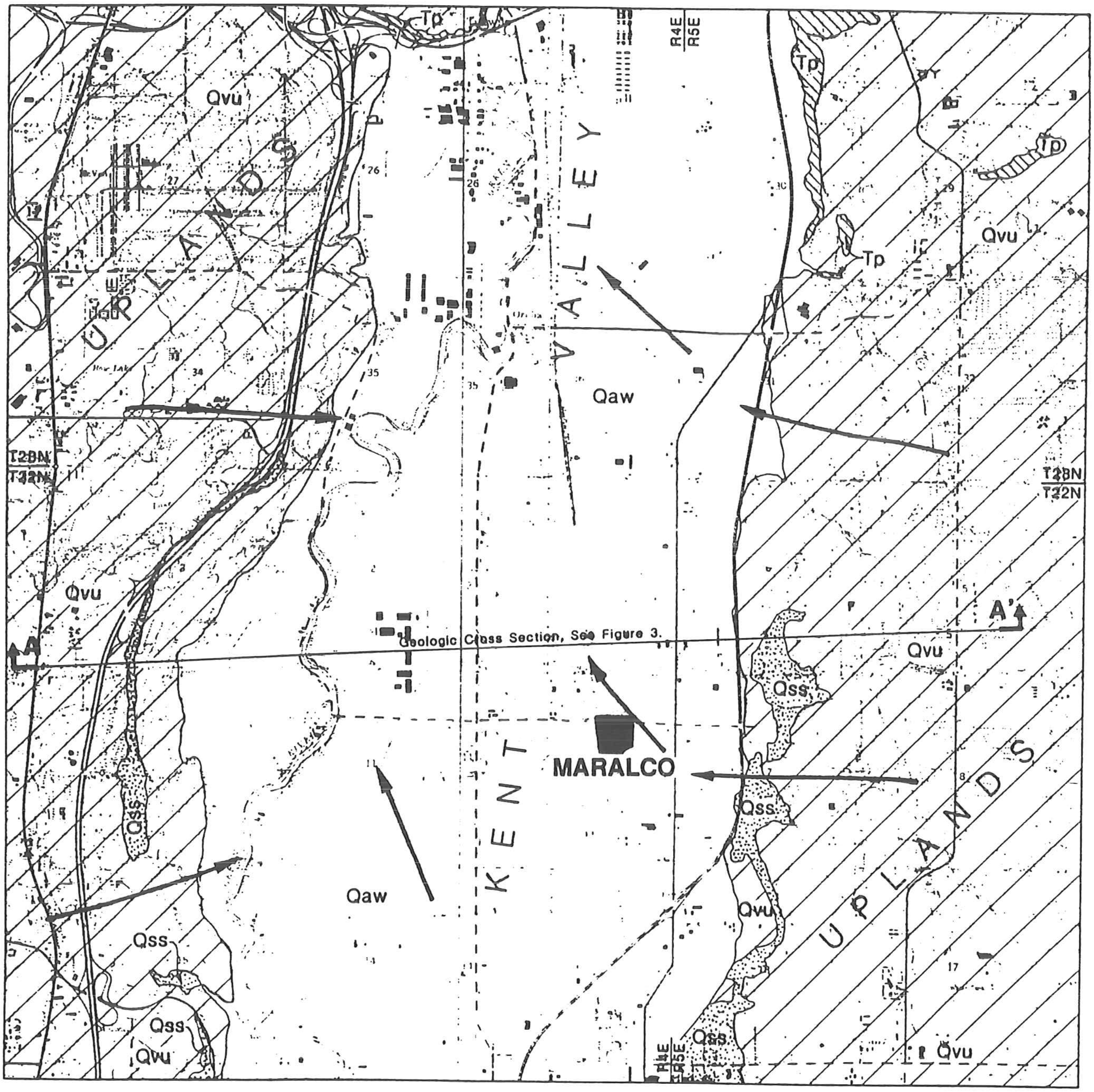
FIGURE 3-2
MARALCO TOPOGRAPHIC MAP

HORTON DENNIS & ASSOC. INC. 320 SECOND AVENUE SOUTH KIRKLAND, WASH. 98033-6687	MARALCO ALUMINUM SITE 1' CONTOURS	DEGROSS AERIAL MAPPING 17520 BOTHELL WAY N.E. BOTHELL, WASH. 98011	JOB# 90-536 SHEET 1/1



Qaw	**Recent White River and Older White River/Green River Alluvial Deposits** Valley deposits consisting predominantly of interbedded Sand, Silt, Peat and Clay near the Western Processing Site. Includes coarse Sand and Gravel river channel deposits in other areas of the valley.
Qvu	**Vashon Undifferentiated Glacial Deposits** Surficial glacial sequence on the uplands consisting of Till and Outwash Deposits of Sand and Gravel with interbedded Silt and Clay, may include non-glacial deposits near base.
Qss	**Salmon Springs Glacial Deposits** Deeper glacial sequence in uplands consisting of Sand and Gravel with interbedded Silt, Clay, Till and some non-glacial sediments. Outcrops along flanks of the valley.
Tp	**Bedrock of Puget Group** Consists of interbedded Sandstone, Shale and Coal occurring at depth in the uplands on the eastern side of the valley and outcropping near the city of Renton.

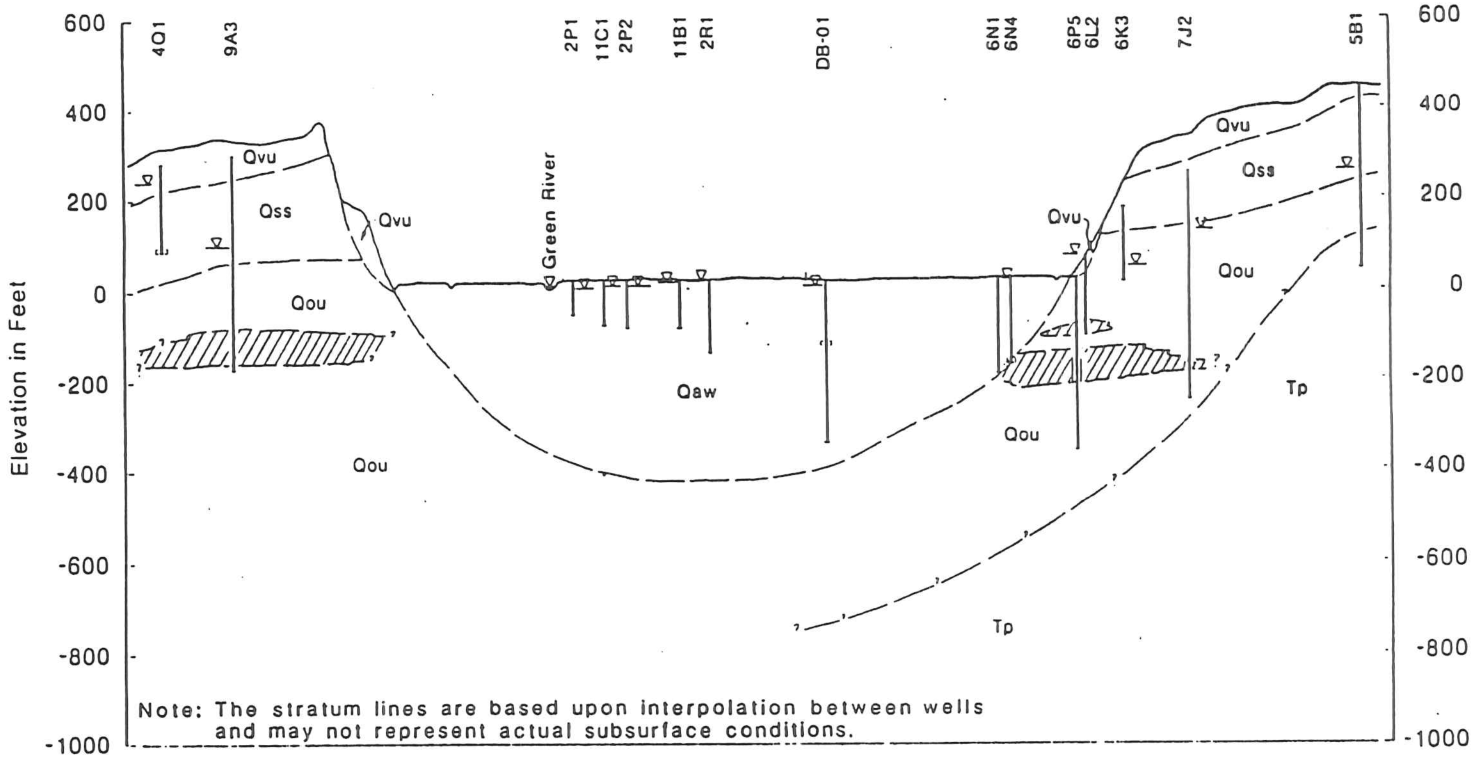
Regional Ground Water Flow Direction Trends

0 4000 8000
Scale in Feet

N

SOURCE: Hydrogeologic Assessment for the Western Processing Site, Kent, WA

MK-ENVIRONMENTAL SERVICES Bellevue, WA		REGIONAL GROUNDWATER FLOW IN THE KENT VALLEY Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 1/25/91	Drafter: LMH	Figure No: 3-3	File Name:



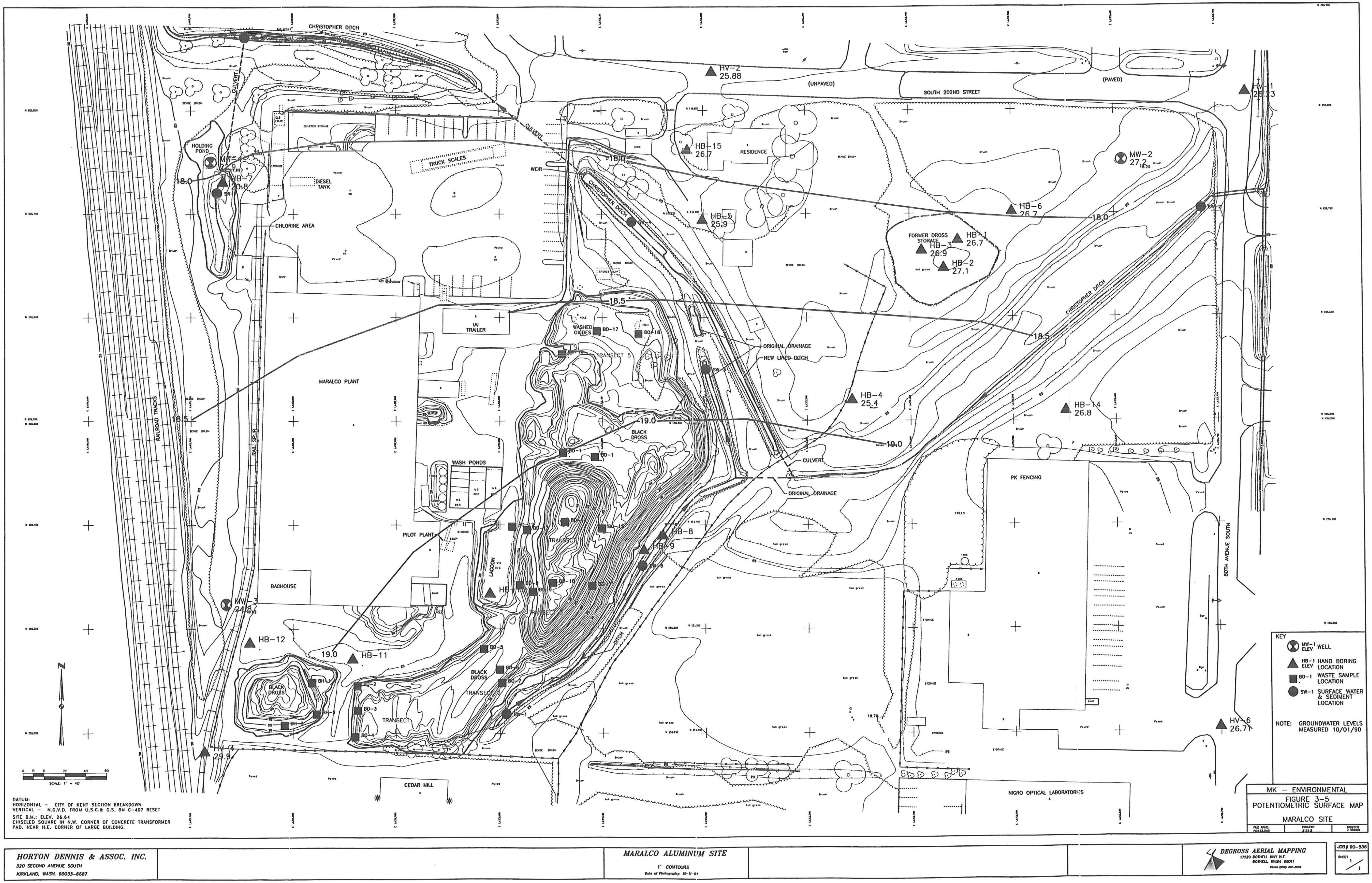
Qaw	Recent White River and Older White River/Green River Alluvial Deposits Valley deposits consisting predominantly of interbedded Sand, Silt, Peat and Clay near the Western Processing Site. Include coarse Sand and Gravel channel deposits in other areas of the valley.
Qvu	Vashon Undifferentiated Glacial Deposits Surficial glacial sequence in the uplands consisting of Till and Outwash deposits of Sand and Gravel with interbedded Silt and Clay, may include non-glacial deposit.
Qss	Salmon Springs Glacial Deposits Deeper glacial sequence in the uplands consisting of Sand and Gravel with interbedded Silt, Clay, Till and some non-glacial sediments. Outcrops along flanks of the valley.
Qou	Older Undifferentiated Glacial and Interglacial Deposits Deeper unconsolidated deposits in the uplands consisting of Sand and Gravel with interbedded Silt, Clay and Till.
Tp	Bedrock of the Puget Group Consists of interbedded Sandstone, Shale and Coal occurring at depth in the uplands on the eastern side of the valley and outcropping near the city of Renton.

4O1 Well Number
Well Location
Water Level
Screen Section
Aquifer Zone

SOURCE: Hart Crowser Inc.
October 1984, Final Report

Horizontal Scale in Feet
0 4000 8000
0 400 800
Vertical Scale in Feet
Vertical Exaggeration x 10

MK-ENVIRONMENTAL SERVICES Bellevue, WA		GEOLOGIC UNITS OF THE KENT VALLEY Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 1/25/91	Drafter: LMH	Figure No: 3-4	File Name:


CHRISTOPHER DITCH
CULVERT
HOLDING POND
MW-1
HB-7
SW-3
18.0
DIESEL TANK
TRUCK SCALES
WEIR
CHLORINE AREA
HV-2
25.88
(UNPAVED)
SOUTH 202ND STREET
(PAVED)
HV-1
HB-15
26.7
RESIDENCE
MW-2
27.2
HB-6
26.7
HB-5
25.9
FORMER DROSS STORAGE
HB-1
26.7
HB-3
26.9
HB-2
27.1
18.5
IAI TRAILER
WASHED OXIDES
BO-17
BO-18
TRANSECT 5
ORIGINAL DRAINAGE
NEW LINED DITCH
MARALCO PLANT
HB-4
25.4
HB-14
26.8
RAILROAD TRACKS
RAIL SPUR
19.0
BLACK DROSS
BO-1
WASH PONDS
CULVERT
ORIGINAL DRAINAGE
PK FENCING
PILOT PLANT
LAGOON
HB-8
HB-9
BAGHOUSE
MW-3
HB-12
HB-11
BLACK DROSS
TRANSECT
BH-1
BH-2
BH-3
BO-2
BO-3
BO-4
SW-1
HV-4
29.9
80TH AVENUE SOUTH
HV-6
26.7
CEDAR MILL
NIGRO OPTICAL LABORATORIES
SCALE: 1" = 40'
DATUM:
HORIZONTAL - CITY OF KENT SECTION BREAKDOWN
VERTICAL - N.G.V.D. FROM U.S.C.& G.S. BM C-407 RESET
SITE B.M.: ELEV. 26.84
CHISELED SQUARE IN N.W. CORNER OF CONCRETE TRANSFORMER PAD. NEAR N.E. CORNER OF LARGE BUILDING.
KEY
MW-1 ELEV WELL
HB-1 ELEV HAND BORING LOCATION
BO-1 WASTE SAMPLE LOCATION
SW-1 SURFACE WATER & SEDIMENT LOCATION
NOTE: GROUNDWATER LEVELS MEASURED 10/01/90
MK - ENVIRONMENTAL
FIGURE 3-5
POTENTIOMETRIC SURFACE MAP
MARALCO SITE
HORTON DENNIS & ASSOC. INC.
320 SECOND AVENUE SOUTH
KIRKLAND, WASH. 98033-6887
MARALCO ALUMINUM SITE
1' CONTOURS
DEGROSS AERIAL MAPPING
JOB# 90-336
SHEET 1 / 1

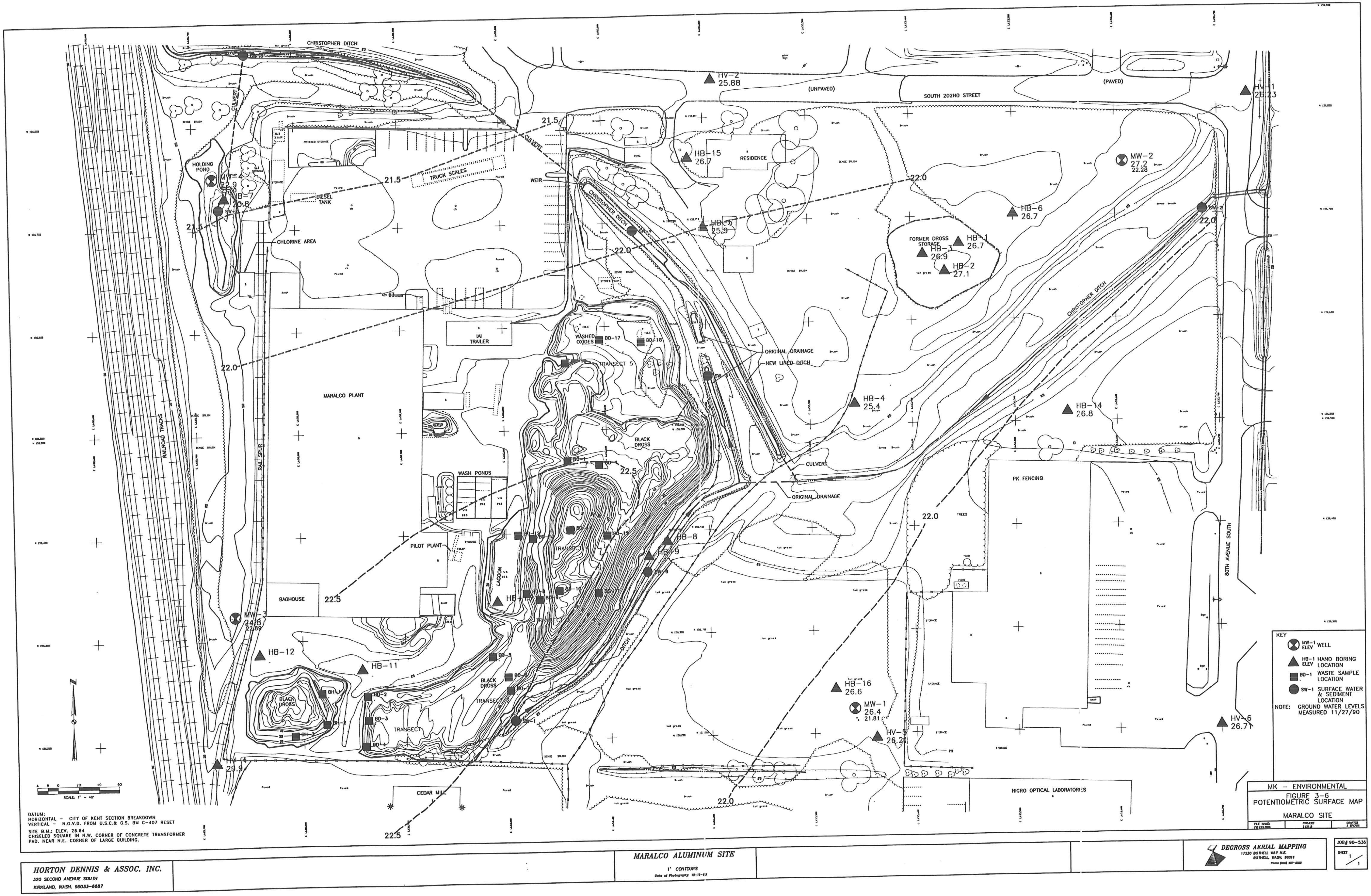


FIGURE 3-6
POTENTIOMETRIC SURFACE MAP
MARALCO SITE

TABLE 3-1
Monitor Well Specifications
And Water Level Data

MARALCO SITE
Federal Way, Washington

Well Number	Date Installed	Screened Interval (feet below grade)	Total Depth (ft)	T.O.C. (MSL)	Water Elev. 01-Oct-90	Water Elev. 27-Nov-90
MW-1	25-Sep-90	6.0 -16.0'	17	26.26	19.76	21.81
MW-2	25-Sep-90	6.0 -16.0'	17	26.99	18.20	22.28
MW-3	24-Sep-90	6.0 -16.0'	17	24.81	18.92	22.89
MW-4	24-Sep-90	6.0 -16.0'	17	25.01	17.99	21.30

4.0 EVALUATION OF HISTORICAL INFORMATION

4.1 HISTORICAL AERIAL PHOTOGRAPH REVIEW

Historic aerial photographs of the site and adjacent properties dating from 1946 to 1985 were reviewed to document the site history. From 1946 to 1960, the area was all farmland; no buildings were present on-site, and the drainages trisecting the site were in approximately the present day positions. The 1946 photo showed the drainages as very faint, not well developed. The farm buildings were first noted in the 1968 photograph. Farm buildings included the existing house and barn, and two other buildings. The drainages can be seen clearly in this photograph (Figure 4-1). A 1974 photograph showed the same farm buildings prior to industrial development of the area. The 1985 photograph shows the site before operations ceased. The black dross pile is visible, but not at maximum height. The holding pond northwest of the building is visible.

Aerial photographs of the site were taken on October 10, 1990 as part of the site survey for development of the topographic map. The recent photographs show the revised site drainage and the dross pile (Figure 4-2). Pilot plant operations and processing of part of the dross have re-arranged the pile somewhat since this photograph was taken. An area of stressed vegetation in the northeast quadrant of the site (east of the farmhouse) was used for dross storage during plant operations.

4.2 REVIEW OF HISTORIC ENVIRONMENTAL DATA

Samples collected by Ecology in 1986 were analyzed for fish toxicity. The 96-hour fish toxicity test on the KBI dross resulted in mortality rates of 90% and 100% at concentrations of 100 ppm and 1000 ppm, respectively. An undiluted sample of surface water collected from the creek adjacent to the black dross pile resulted in a mortality rate of 100% (E & E, 1987).

E & E conducted a one-day sampling program in 1987 for a Site Assessment. They collected soil samples, sediment samples, surface water samples, and composite samples of black dross, washed oxides, KBI dross, holding pond brine, and baghouse dust. The E&E summary tables of analytical results and sampling locations are included as Appendix II.

Antimony, chromium, copper, lead, nickel, and zinc were used by E&E as indicator parameters for the black dross. Elevated levels of some or all of these metals were found in off-site creek sediments. Slightly elevated concentrations of chromium, copper and nickel were noted in sample S2, collected south of the site, and an increase in lead concentration above background was noted in sample S3, from the northeast quadrant of the site (near 80th Avenue). It was not stated in the E & E report how background was defined. None of the dross or soils samples exceeded the maximum contamination limits for the EP Toxicity test for metals. It was concluded in the E&E report that air transport was not appreciable.

The samples of holding pond brine and off-site surface water from the creek indicated lead concentrations (0.092 ppm and 0.087 ppm, respectively) which exceeded the Primary Drinking Water Standard for lead of 0.05 ppm. The reported concentrations of antimony (0.27 ppm) and arsenic (0.026 ppm) in the brine and arsenic (0.0038 ppm) in the surface water exceeded the Water Quality Criteria for these metals (0.146 ppm Sb and 0.000022 ppm As). The report did not state whether the samples were analyzed for total or dissolved metals.

4.3 AGENCY FILE REVIEW OF SURROUNDING HAZARDOUS WASTE SITES

EPA files were reviewed to identify nearby potential industrial sites that may contribute to contamination at Maralco and to gain information about the local geologic and hydrologic setting. Sites for which EPA had information are shown in relationship to Maralco in Figure 4-3 and are discussed below.

4.3.1 Western Processing

Information on the Western Processing site is summarized from Hart Crowser, 1984. The report was reviewed for regional of geology and groundwater issues. Reports discussing the remedial actions at Western Processing were not reviewed.

The Western Processing site is located approximately 2,000 ft northwest of Maralco, and is approximately 4,000 feet east of the Green River. Surface water drains to Mill Creek on the west and to two drainage ditches on the east. One of the eastern ditches is the Christopher Ditch which flows from Maralco to the south end of the Western Processing site prior to entering Mill Creek.

Western Processing purchased the site and began operations in 1961. A variety of industrial waste products were produced, including solvents, flue dust, battery chips, acids and cyanide solutions. In 1982, the EPA identified the Western Processing Property for cleanup under CERCLA by placing the property on the National Priorities List (NPL). In April, 1983, the EPA initiated an emergency response program which resulted in the removal of drums and impounded liquids from the site. This was followed by a 1984 cleanup of the surface. A second phase of remedial action to address subsurface contamination began at the site in the summer of 1987.

The site has been used for storage, treatment and disposal facilities, including:

- Storage Lagoons (acidic, caustic, cyanide, methylene chloride, and phenolic wastes)
- Drum Storage Areas
- Solvent Recovery Plant and Storage Area (halogenated and non-halogenated solvents distillation)
- Fertilizer Plant (heavy metals extraction from shrimp exoskeletons, cadmium, chromium, copper, iron, and zinc)
- Bulk Storage Tanks (solids, naphtha, petroleum products, cyanides, ketones, acids or caustics and formaldehyde, ethylamine, and chlorinated organics)
- Scrap metal, foundry sand and construction debris
- Chromic Hydroxide Sludge Ponds
- Solids Ponds (heavy metals from electroplating and pickle liquor wastes)
- Flue Dust Piles
- Cooling Water Lagoons

According to the Hart-Crowser (1984) report, the greatest amount of soil contamination occurred on-site. Soils contamination (up to 1000 times background) of lead, zinc, and chromium have been found in soils on the Western Processing site. Shallow groundwater beneath the site was contaminated, but groundwater from deeper than approximately 40 feet was not seriously affected. Remediation included removal of drums and soil and groundwater remediation.

4.3.2 Liquid Waste Disposal Company, Incorporated

Information on the Liquid Waste Disposal Company (LIDCO) site was obtained from E & E, September 1987, TDD F10-8708-23. The former LIDCO site is located at 7133 South 196th Street in Kent, Washington, Section 1, Township 22 North, Range 4 East. The facility was used for temporary storage of liquid industrial wastes, including waste plating solutions, solvents and oils , prior to shipment of wastes to approved treatment or disposal facilities. The site occupied approximately two acres on the north side of Mill Creek, adjacent to the northwest corner of Western Processing Company.

PCBs were detected in four surface soil samples at concentrations ranging from 0.5 to 14 ug/l. The presence of PCBs on-site may be the result of contamination from the site or from wind-blown PCB laden dusts from the adjacent Western Processing site. E&E recommended no further CERCLA action at the site because no hazardous wastes were disposed of or remained on-site.

4.3.3 HYTEK/Heath-Tecna

The HYTEK site is located at the northwest corner of 84th Avenue South and South 200th street. A solvent plume is present in shallow groundwater beneath the site, and a groundwater extraction system has been installed (Sweet Edwards, January 1988; February, 1990). Shallow groundwater below the HYTEK site flows to the north-northeast. Organic contaminant concentrations are generally an order of magnitude higher in the uppermost aquifer than in underlying layers. Low to moderate levels of solvent contamination are present in the alley north of the HYTEK building. Arsenic concentrations are below the Primary Drinking Water Maximum Contaminant Level of 0.05 mg/l and cyanide is below the Washington State Water Quality Standards of 22.0 ug/l (acute) and 5.2 ug/l chronic for freshwater (WAC 173-201). Benzene/toluene and xylene contamination beneath HYTEK may be due to the former service station site at the northwest corner of 200th and 84th Avenue.

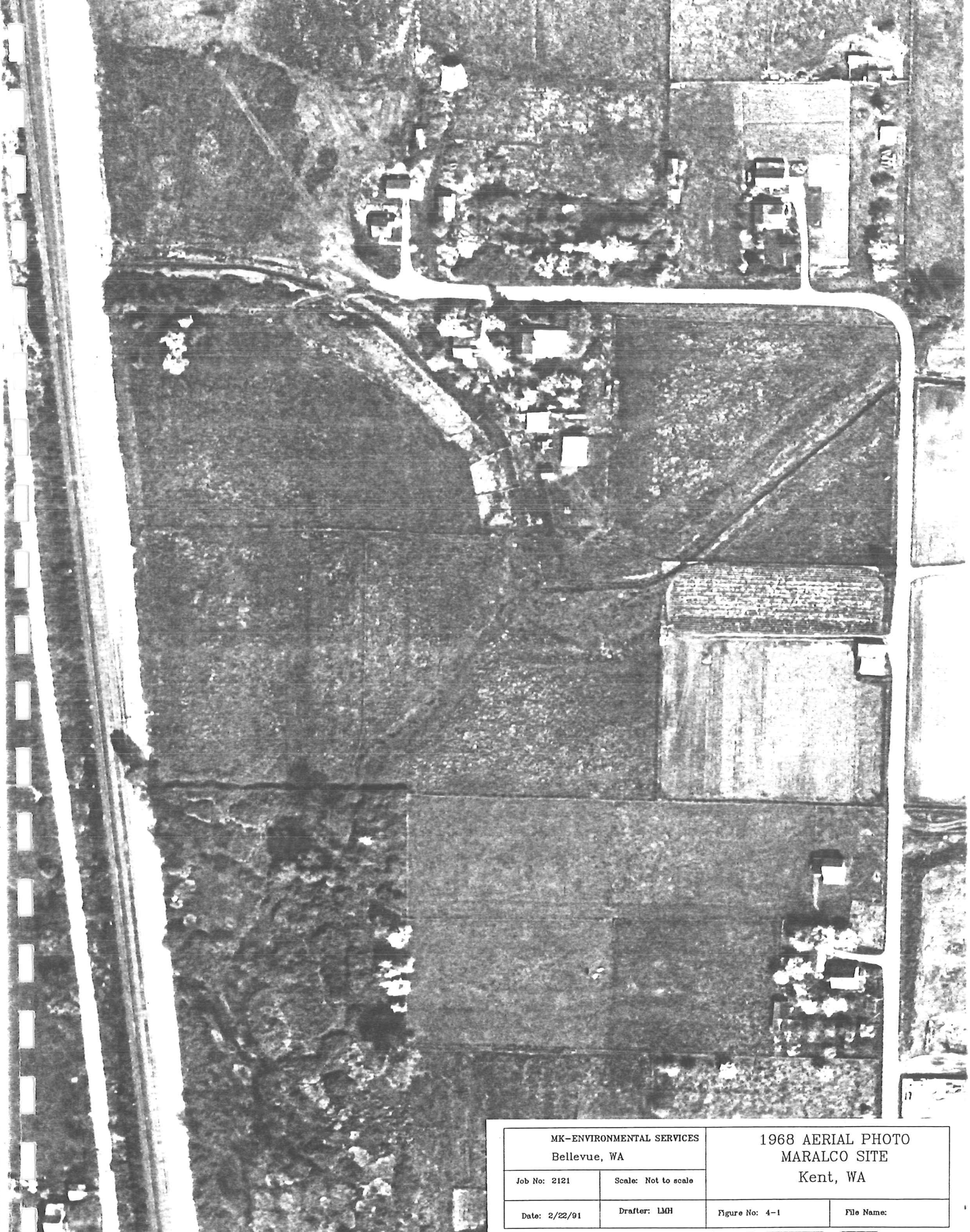
4.3.4 Boeing Company-Kent Space Center

The E & E, June 8, 1988 memo on the Preliminary Assessment Reassessment/Preliminary Hazardous Ranking System (HRS) Score for Boeing Kent Space Center was reviewed for information on this site. The Boeing Company Kent Space Center manufactures circuit boards. The facility has been in operation since 1966 or 1967. The process requires metal finishing, plating, and painting. The site is regulated and monitored by Ecology and Metro. Hazardous wastes are stored on-site in tanks and containers prior to off-site disposal. Wastes include spent solvents, spent plating baths/strippers containing cyanide, corrosives, ignitables, and chromium. The site received a low HRS score because the wastes are stored in above ground tanks within bermed areas and in underground tanks. For purposes of the assessment, it was assumed that the underground storage tanks were in good condition.

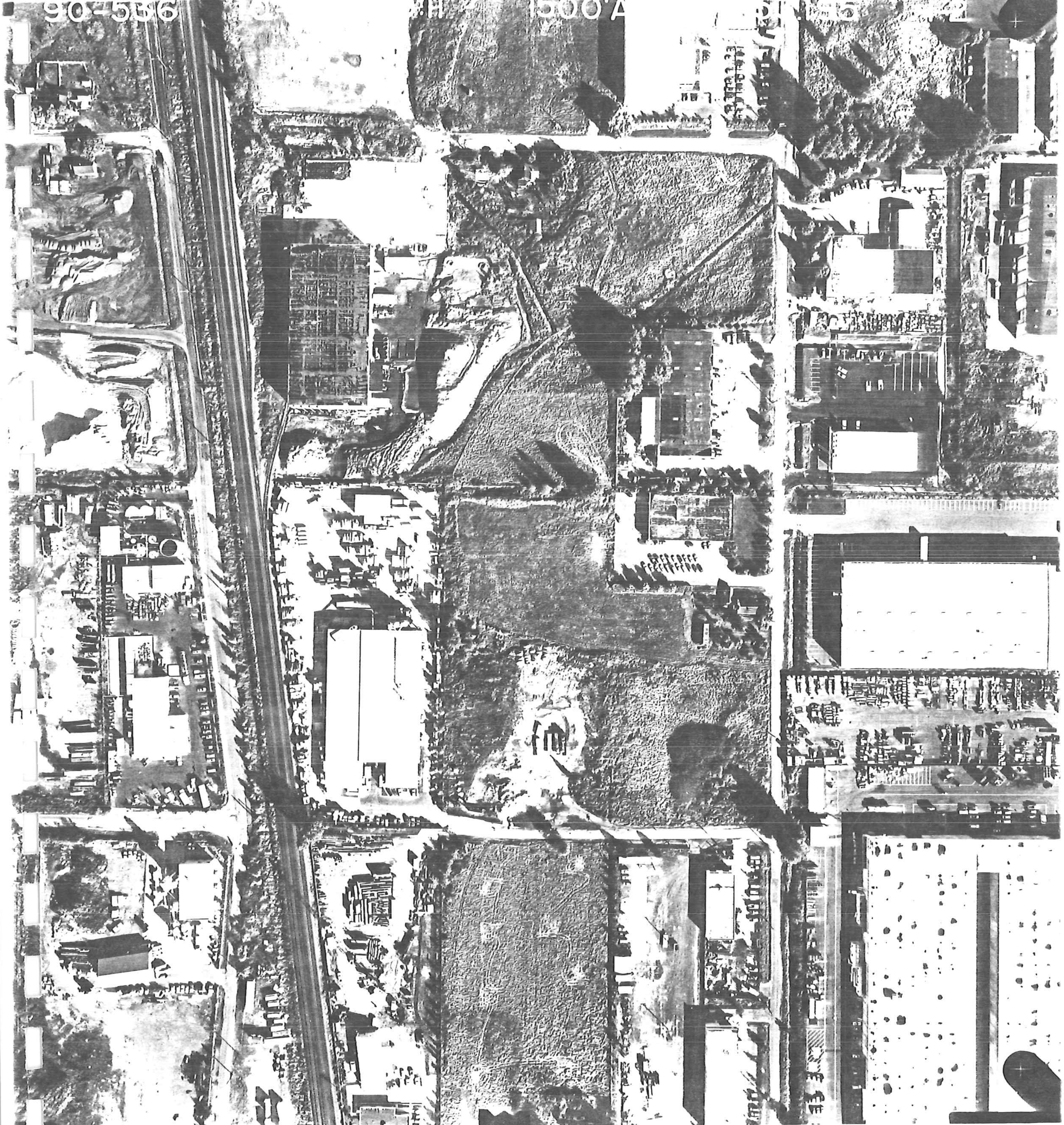
4.3.5 Boeing Company Kent Benaroya

The Preliminary Assessment Reassessment report by E & E, dated May 27, 1988, was reviewed for information on this site. The Boeing Company Kent Benaroya site is located at 20651 84th Avenue South, Kent, Washington.

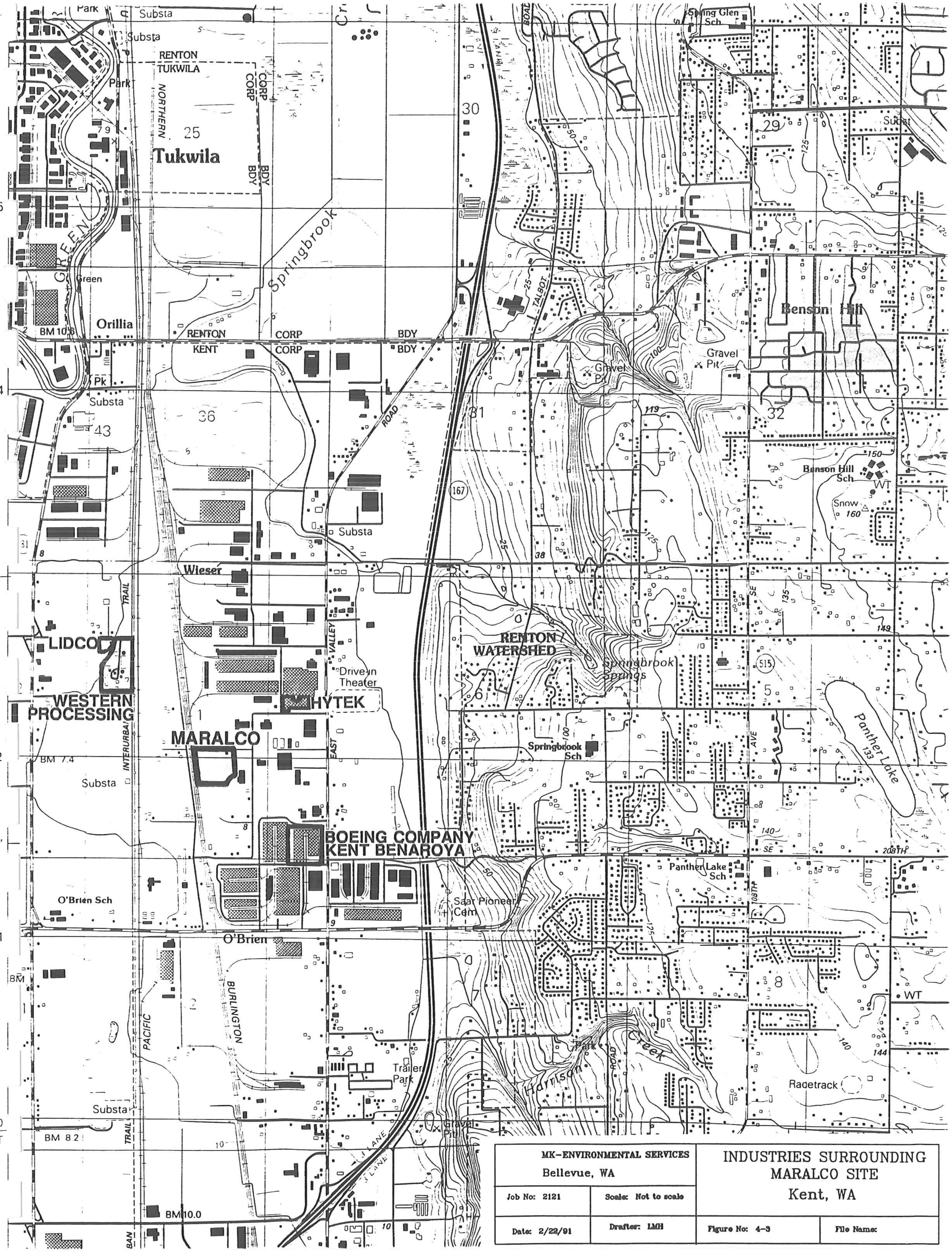
The site was used as a temporary storage depository for hazardous wastes collected from other Boeing facilities from 1978 through approximately 1986. The E&E report recommended no further action because: 1) the site is no longer involved with the temporary storage of hazardous waste, 2) when in operation, wastes were stored in a separate building with an EPA- approved spill containment system, and 3) the site never generated any hazardous waste.



MK-ENVIRONMENTAL SERVICES Bellevue, WA		1968 AERIAL PHOTO MARALCO SITE Kent, WA
Job No: 2121	Scale: Not to scale	
Date: 2/22/91	Drafter: LMH	Figure No: 4-1 File Name:



MK-ENVIRONMENTAL SERVICES Bellevue, WA		1990 AERIAL PHOTO MARALCO SITE Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 2/22/91	Drafter: LMH	Figure No: 4-2	File Name:



MK-ENVIRONMENTAL SERVICES Bellevue, WA		INDUSTRIES SURROUNDING MARALCO SITE Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 2/22/91	Drafter: LMH	Figure No: 4-3	File Name:

5.0 RESULTS AND CONCLUSIONS OF PHASE I REMEDIAL INVESTIGATION

5.1 STAGE 1 SAMPLING

MK conducted a two part field investigation for the Phase I RI of the Maralco site. This approach was used to address the multiple aspects of environmental concern at the site in a cost-effective manner. Stage 1 was performed in May 1990 and consisted of an initial site walkthrough for confirmation of sample locations and limited sampling of shallow soils and surface water and sediments in drainage areas potentially affected by past practices of the aluminum recycling facility. One composite sample of the black dross waste pile was also collected at this time. Samples were submitted for a spectrum of analyses in order to elucidate the contaminants of concern and to select a subset of indicator parameters for the Stage 2 investigation. The following sections provide details of field conditions and analytical results.

To assure quality control (QC), blind duplicate and equipment blank samples were collected to check the accuracy and precision of the sampling methods and analytical techniques. The following QC samples were collected: one duplicate per 20 samples or less for each media sampled and one equipment blank per day for each type of equipment used. In addition, chain-of-custody and proper preservation procedures were followed by field personnel. Samples collected for fixed-laboratory analyses were submitted to the Ecology-EPA Manchester Laboratory in Port Orchard, Washington. Quality control was insured by laboratory procedures that include method blanks, standard reference, and matrix spike and surrogate recovery. Data packages were certified by Ecology Manchester Laboratory personnel. However, a number of concerns with laboratory QA/QC for the Stage 1 analytical data were raised (MK Memorandum, August 1, 1990). In addition to exceeded holding times, data values delivered by facsimile prior to the August 1 Memorandum were notably different from the hard copy laboratory report delivered August 15, 1990. Values for dissolved metals in surface waters differed by orders of magnitude in an inconsistent manner. These data discrepancies were not flagged in the final laboratory report.

5.1.1 Stage 1 Soil Sampling Event

During Stage 1, MK personnel collected a total of six discrete shallow soil samples from three locations within the region of the former eastern waste pile and one composite sample from the black dross waste pile. Locations are shown in Figure 5-1. The surface soils in the region of the former black dross pile were void of the tall, grassy vegetation found in the undeveloped areas of the Maralco site. Ground cover consisted of low orange-toned mossy growth, similar to flora observed on parts of the black dross pile on the western region of the site. The soils in the shallow boreholes consisted of 0.3 to 0.5 ft. dark grey to black fine granular material identified by MK field personnel as metallic waste material. The waste was underlain by dark brown sandy soils. Two soil samples were collected between 0 and 2 ft. below grade from each location using a 3-inch diameter, stainless steel hand auger. Samples were described and preserved for fixed laboratory analyses through the Ecology-EPA Manchester Laboratory.

Sample splits were tested in the field for qualitative analyses of total volatile organic vapors and pH. Organic vapors were measured by a field adapted headspace reading using a Foxboro Organic Vapor Monitor (Model 128) inserted into sample containers that had been sealed for 3 minutes. Soil sample pH readings were made using a field technique developed by Ecology in which an aliquot of the sample is placed in a volumetric container with distilled water, agitated, and allowed to settle. After 5 minutes, the pH of the water was measured using a field pH meter. Measurements ranged from 7.2 ppm to 12 ppm total organic vapors and from 4.3 to 6.7 pH units. Although pH values were low, one container of commercial distilled water had a pH value of 4.3. Only one sample, HB-3, 0-0.5 ft., caused a significant change in the pH of the water; the distilled water had a pH value of 6.2, and the sample water had a pH of 5.3.

5.1.2 Stage 1 Sediment and Surface Water Sampling Event

Sediments were sampled from five locations in drainage areas on the Maralco site and one location immediately off-site. Surface waters were sampled from the same locations, except for site SW-1 in which no water was present during the sampling event. All sampling locations are shown in Figure 5-1. Samples were described and preserved for fixed-laboratory analyses in accordance with regulatory requirements. Sediment sample splits were analyzed in the field for total volatile organic vapors and pH using the instruments and techniques described above for soils. Field parameters measured for surface waters included temperature, pH, specific conductivity, dissolved oxygen, and sulfide and chlorine concentrations. These data are summarized in Table 5.1.

5.1.3 Stage 1 Soil Analytical Results

Soils were analyzed for total metals (Target Analyte Metals), volatile organic compounds (Priority Pollutant List), semivolatile organics (Priority Pollutant List), and selected geochemical parameters, including cyanide, ammonia, total Kjeldahl nitrogen, and cation exchange capacity. The analytical results have been compiled in Tables 5.2 through 5.5. Laboratory reports and chain-of-custody forms are included in Appendix III. A limited discussion of the results follows as a base for selection of indicator parameters. A site-wide discussion of the analytical results is deferred to Section 5.3.

Soils from the black dross waste pile and the region where the eastern waste pile was formerly located contained very high metal concentrations (Table 5.2). Elevated levels of aluminum, barium, chromium, copper, lead, magnesium, manganese, potassium, sodium, and zinc were reported in the upper six inches of the shallow soil borings and in the composite black dross sample. Metal concentrations decreased significantly in the deeper, 1.5 to 2.0 ft., sample of the soil borings. Aluminum oxides and salts, both sodium chloride (NaCl) and potassium chloride (KCl), are principal components of the Maralco refining waste. Copper and zinc are minor waste components. Other heavy metals, such as chromium and lead, were most likely derived from other scrap metals that were mixed in with the bulk ore that entered the Maralco mill.

The geochemical parameters measured are presented in Table 5.3. Cyanide concentrations reported are low, with detected values only in the dross-containing surface soils in the shallow-borings. Total ammonia contents in soils correlate loosely with the presence of dross material; ammonia values are higher in the surficial soils. Similarly, higher total Kjeldahl nitrogen (TKN) concentrations and cation exchange capacity are found in the surficial soils in the shallow borings.

Two soil samples were analyzed for Priority Pollutant volatile organic compounds (Table 5.4). Minor amounts of 1,1,1-trichloroethane (TCE) were detected in one sample, HB-1, 0-0.5 ft. However, the quantity of TCE increased following a subsequent dilution, suggesting that the source may be from laboratory contamination. Similarly, silanol, silane, disiloxane, and unknown hydrocarbons reported are thought to be laboratory contaminants, possibly from plastic membrane material.

Priority Pollutant base/neutral/acid extractables (BNA) results for Stage 1 soil samples are included in Table 5.5. 4-nitroaniline was detected in the black dross composite sample at 8600 ug/kg. Although holding times were exceeded by the laboratory, 4-nitroaniline was also detected in the HB-1 soil sample.

5.1.4 Stage 1 Sediment and Surface Water Analytical Results

Sediments collected from drainage ditches were analyzed for total metals (Target Analyte List), selected geochemical parameters, including cyanide, ammonia, total Kjeldahl nitrogen, and cation exchange capacity, volatile organic compounds (Priority Pollutant List), and BNAs (Priority Pollutant List). The analytical results are summarized in Tables 5.2 through 5.10. The laboratory reports and chain-of-custody forms have been included in Appendix III. As with the previous section, a discussion of the results is included in the following.

Sediment samples from the drainage ditch southeast and east of the Maralco black dross pile contained elevated total metal concentrations (Table 5.2). Total metal results from these samples indicate aluminum concentrations up to 77,900 mg/Kg (SW-6), barium to 130 mg/Kg (SW-6), chromium to 87.5 mg/Kg (SW-6), copper to 883 mg/Kg (SW-6), lead to 89 mg/Kg (SW-4), zinc to 1200 mg/Kg (SW-4), potassium to 4,900 mg/Kg (SW-1), and sodium to 330,000 mg/Kg (SW-6). Very high metals were also observed in sediments from a shallow seasonal pond in the area of a former holding pond, near SW-7, and in the ditch to the north of the Maralco plant. SW-8 was located in this ditch by the outfall of a small culvert that appeared to serve as drainage for the pond by SW-7. Aluminum concentrations were reported to 132,000 mg/Kg (SW-7), barium to 188 mg/Kg (SW-8), chromium to 150 mg/Kg (SW-7), copper to 1330 mg/Kg (SW-7), lead to 261 mg/Kg (SW-8), zinc to 1150 mg/Kg (SW-7), potassium to 4500 mg/Kg (SW-8), and sodium to 6270 mg/Kg (SW-8). Sediments collected from site SW-2 are upstream of the present and former black dross piles. Metals concentrations from SW-2 were considerably lower; aluminum concentrations were 9,970 mg/Kg, potassium 525 mg/Kg, and sodium 1700 mg/Kg.

Surface waters collected from stations SW-3, SW-4, SW-6, SW-7, and SW-8 also had high total metal concentrations (Table 5.6). Total metals in surface water reach concentrations of aluminum to 216,000 ug/L (SW-7), barium to 3590 ug/L (SW-3), copper to 2,090 ug/L (SW-3), lead to 134 ug/L (SW-3), zinc to 2610 ug/L (SW-3), potassium to 253,000 ug/L (SW-7), and sodium to 163,000 ug/L (SW-7). The laboratory quality control and quality assurance for the dissolved metals data (Table 5.7) has not been accepted, and as such, the data will not be discussed.

The geochemical parameters for sediments and surface waters are reported in Tables 5.3 and 5.8, respectively. Cyanide concentrations in sediments were low except for sample SW-4 from the lined ditch. Total cyanide concentration was 9.54 mg/Kg. There is a great deal of variability in the other parameters: TKN ranges from 340.45 mg/Kg (SW-4) to 990.12 mg/Kg (SW-6) in sediments and 0.88 mg/L (SW-7) to 162.89 mg/L (SW-3) in surface waters, whereas ammonia varies from 20.8 mg/Kg (SW-8) to 263.9 mg/Kg (SW-6) in sediments and <0.5 mg/L to 188.2 mg/L (SW-3) in surface waters. Cation exchange capacity ranges from 160.0 mg/Kg (SW-8) to 481.4 mg/Kg (SW-1).

The priority organic pollutant results for the drainage ditch sediments were similar to those of soils discussed above (Table 5.4). Acetone was reported in all sediment samples, but is a suspected laboratory contaminant. 2-butanone and toluene were also reported in sample SW-4. 2-butanone is also a common laboratory contaminant, although not reported in the method blank. Other volatile organics are reported for SW-4 sediments. Station SW-4 is located in the "rubber"-lined ditch east-northeast of the Maralco plant. It is possible that the source of the low levels of volatile organic compounds reported could have originated from the lining material.

Trace base/neutral/acids were reported in the sediments collected, although most compounds reported were estimated values that were less than the method detection limits (Table 5.5). Bis(2-ethylhexly)phthalate was reported, but is a suspected laboratory contaminant. 4-Nitroamiline was detected in most samples at concentrations up to 2900 ug/kg. Samples SW-4, SW-7, and SW-8 contained polycyclic aromatic hydrocarbons (PAH) above the detection limits. The highest PAH values reported were for SW-7: fluoranthene 2300 ug/Kg, pyrene 3900 ug/Kg, chrysene 1600 ug/Kg, benzo(b)fluoranthene 1600 ug/Kg, and benzo(g,h,i)perylene 1400 ug/Kg.

No volatile organic compounds or base/neutral/acids were detected in the surface water samples in quantities greater than the method detection limits. (Tables 5.9 and 5.10). Chloroform was detected at concentrations of 16 ug/l in an equipment rinsate blank. It is not clear what the source of this contaminant is.

5.1.5 Indicator Parameters

Indicator parameters were selected from the Stage 1 preliminary analytical results for the waste characteristic inorganic and organic priority pollutants for soil, sediment, and surface water (MK Memorandum August 2, 1990). The rationale for creating an analytical subset was to reduce the cost of analyses while still effectively characterizing the nature and extent of contamination at the Maralco site. Metal concentrations reported in all Stage 1 sample matrices immediately adjacent to the waste source or with visible indication of black dross contamination (e.g., black dross sample and shallow borings on the eastern portion of the site) were high. Although no background samples were taken during Stage 1, distinct reductions in metal concentrations were observed with increased distance from source areas. Metals with high sensitivity to the composition of the black dross and proximity to the waste were selected.

The geochemical parameters selected for the Stage 1 sampling were expanded for later sampling. In addition to cyanide, ammonia, and total Kjeldahl nitrogen, chloride was selected as a geochemical indicator. Chloride was selected as an indicator based on the high sodium and potassium concentrations observed in some soils and surface waters. High chloride levels should confirm elevated salt content.

Based on the preliminary Stage 1 results, volatile organic compounds did not appear to be of concern for soils, sediments, or surface waters. Compounds reported above method detection limits do not have likely sources at the Maralco site and are probably due to laboratory contamination as discussed above. Base/neutral/acids may be present at the Maralco site. As discussed in the previous sections, low levels of PAHs were reported in the sediment samples. The PAH compounds were selected as indicator parameters.

Table 5.11 has been included as a summary of indicator parameters selected for each matrix for the Stage 2 sample analyses.

5.2 STAGE 2 SAMPLING EVENT

The Stage 2 investigation was conducted during the fall of 1990. Collection of black dross samples from the Maralco waste pile and soils from shallow hand-augered borings was performed September 6-12, 1990. Installation of soil borings and four monitoring wells was completed September 24-25, 1990. Monitoring wells were developed and sampled September 27 to October 2, 1990. Stage 1 surface waters were resampled on November 27, 1990, once water had again accumulated in the drainage ditches. The following sections discuss the field procedures and analytical results for the Stage 2 sampling.

As was done during Stage 1 sampling, blind duplicate and equipment rinsate samples were collected for quality control. Duplicate samples were collected at the rate of 5% or more of the total samples for each media sampled, and equipment blanks were collected at the rate of one per day for each type of equipment used. One trip blank was also submitted for volatile organic compound analyses during the groundwater sampling event. Chain-of-custody and preservation procedures were adhered to by the field personnel. Samples collected for fixed-laboratory analyses were submitted to the Ecology-EPA Manchester Laboratory in Port Orchard, Washington.

5.2.1 Stage 2 Black Dross Sampling

MK personnel collected a total of 23 samples from five transects established across the black dross waste pile, including one transect across the washed oxides, and an additional 2 samples from the smaller pile immediately south of the baghouse. Thirteen of these were selected for analysis. Sample and transect locations are shown in Figure 5-1. Black dross samples were collected at varying vertical depths using a stainless steel hand auger. The sediments encountered were described at 0.5 foot intervals to the base of the hole. The black dross was visually described, in general, as a black to dark grey friable, fine-grained to clayey sediment with 1 to 15 percent disseminated salt crystals (based on visual estimates). The salts ranged in color from white to blue-green to pink. Thick crusts of salt, presumably from vertical migration of salts by downward percolating rainwater, were encountered at different depths from 1 to 5 feet below the pile surface. Deeper salt crust layers were also observed in cuts or collapsed areas of the dross pile. Ammonia vapors were also encountered in many of the boreholes.

Following the collection of all discrete samples, separate composite samples were amalgamated for each of the five transects for toxicity characteristic leaching procedure (TCLP) and hexavalent chromium analyses. Discrete and composite samples were preserved at 4°C and submitted for fixed-laboratory analyses.

5.2.2 Stage 2 Shallow Soil Borings

Shallow soils were collected from 14 locations using a stainless steel auger. Locations HB-4 through HB-16 are shown in Figure 5-1. Samples HB-4, 5, 6, and 15 augmented the three locations sampled during Stage 1 on the eastern portion of the property. Sample HB-7 is located adjacent to the Stage 1 sediment/surface water station at the pond northwest of the plant. Samples HB-8 through HB-13 were collected in the vicinity of the black dross pile, the drainage southeast of the pile, and the process staging areas north and west of the pile. Locations HB-14 and 16 were selected as background samples. All soil samples collected were sent for fixed-laboratory analyses of indicator metals and geochemical parameters. Laboratory reports and chain-of-custody forms are included in Appendix III.

5.2.3 Stage 2 Soil Borings and Monitoring Wells

Four soil borings were drilled for the installation of monitoring wells at the Maralco site (Figure 5-1). Boreholes were drilled by Tacoma Pump and Drilling Company, Inc., using a 4.25 inch hollow stem auger. Drilling advanced to 10 feet below visually verified saturated soils. All borings were completed between 15 and 18 feet below grade. All soil borings were sampled continuously with an 18 inch split spoon sampler for soil description. Sampling equipment was decontaminated between samples using a trisodium phosphate (TSP) solution followed by a triple rinse with distilled water. Sampling equipment and auger flights were decontaminated between boreholes with a high pressure steam cleaner. Soil cuttings and decontamination rinsate were contained in drums and stored on-site for later disposal.

Samples for fixed-laboratory analyses were collected from the upper 5 feet of the borehole, from within the saturated zone to be screened, and from the base of the borehole. Additional samples were collected from each borehole based on decisions by the field geologist. Soil samples were preserved at 4°C and submitted for fixed-laboratory analyses.

All monitoring wells were installed within the same stratigraphic interval according to regulatory specifications for monitoring wells (Chapter 173-160 WAC), with the exception of the grout footage between the filter pack seal and the surface seal. Enviroplug bentonite chips were used for the filter pack seal and as grouting material to one foot below grade for flush-mounted monuments and to 3 feet below grade for stick up monuments. The filter pack seals for all wells are intact. A variance application for the monitoring well installation was filed by the Tacoma Pump and Drilling, Inc. licensed driller on-site. The soil boring and well installation logs are included in Appendix I.

The monitoring wells were developed beginning 48 hours after installations were completed. Well development was performed using dedicated bailers at each well. 30 to 35 well volumes were bailed from each well except for MW-1, which was bailed dry numerous times for a total of 16 well volumes. Development was considered complete when temperature, pH, and specific conductivity measurements were stabilized. The monitoring wells were sampled immediately following development. Groundwater samples were preserved in accordance with analytical requirements and submitted for fixed-laboratory analyses. Laboratory reports and chain-of-custody forms are included in Appendix III.

5.2.4 Stage 2 Surface Water

Surface water was resampled at locations 3,4,6,7, and 8 on November 27, 1990. Sampling and preservation procedures used during Stage 1 were followed during the resampling event. Field parameters measured for surface water are appended to Table 5.1. Location 5 was eliminated prior to the Stage 1 sampling. Locations 1 and 2 did not have surface water present during Stage 2. Location 2 remained dry during the later sampling event.

5.2.5 Stage 2 Black Dross Analytical Results

The black dross samples were analyzed for the indicator metals, TAL metals, and selected geochemical parameters, including cyanide, ammonia, TKN, and chloride. The analytical results have been compiled in Tables 5.12 and 5.14. Laboratory reports and chain-of-custody forms are included in Appendix III.

Total metal results (Table 5.12) for the indicator and TAL metals indicates a broad range of potassium and sodium concentrations. Potassium contents range from 70,700 mg/Kg (BD-9) to 115,000 mg/Kg (BD-8) and sodium contents range from 33,000 mg/Kg (BD-9) to 93,100 mg/Kg (BH-1). The two samples from the washed oxides area of the waste pile, BD-17 and BD-18, do not have notably lower potassium and sodium contents than the samples of the unwashed oxides. The other indicator metals are high and are comparable to the Stage 1 composite black dross sample: aluminum concentrations range from 130,000 mg/Kg (BH-2, BD-8) to 211,000 mg/Kg (BD-5), barium ranges from 65.2 mg/Kg (BH-1) to 289 mg/Kg (BD-18), calcium concentrations vary from 2840 mg/Kg (BH-1) to 23,000 mg/Kg (BD-10), chromium ranges from 119 mg/Kg (BD-6) to 1860 mg/Kg (BD-12), copper ranges from 746 mg/Kg (BD-9) to 5400 mg/Kg (BD-14), lead varies from 70 mg/Kg (BD-15) to 214 mg/Kg (BD-12), magnesium varies from 15,000 mg/Kg (BH-2) to 45,000 mg/Kg (BD-18), manganese ranges from 827 mg/Kg (BD-11) to 1960 mg/Kg (BD-5), and zinc concentrations range from 643 mg/Kg (BD-9) to 6100 mg/Kg (BD-10).

The results from the TCLP metals and hexavalent chromium analyses for the composite black dross samples are compiled in Table 5.13. All TCLP metal concentrations were below detectable levels, except for TC-1, which contained 0.2 mg/Kg lead. Hexavalent chromium ranged from less than detectable quantities to 0.092 mg/Kg in four composite samples.

The geochemical parameter analytical results for the black dross samples are located in Table 5.14. Chloride concentrations are high in most samples, with concentrations as high as 150,755 mg/Kg (BH-2) in the high potassium and sodium group and ranging from 80 mg/Kg (BD-16) to 59,427 mg/Kg (BD-6) in the lower potassium and sodium group. Ammonia and TKN concentrations ranged from 26 mg/Kg (BD-10) to 686 mg/Kg (BD-6) and 398 mg/Kg (BD-10) and 4089 mg/Kg (BD-5), respectively. Cyanide content was less than 2 mg/Kg in all dross samples.

5.2.6 Stage 2 Shallow Boring Analytical Results

Soils sampled from the shallow hand borings were analyzed for the indicator metals and selected geochemical parameters. The results are presented in Tables 5.14 and 5.15. Laboratory reports and chain-of-custody forms are compiled in Appendix III.

Indicator metal results for background samples (HB-14, 16, Table 5.15) allow the extent of black dross waste to be more accurately defined in terms of the magnitude of metal concentrations. Background metal concentrations are approximately: 9800 mg/Kg aluminum, 60 mg/Kg barium, 3750 mg/Kg calcium, 30 mg/Kg chromium, 25 mg/Kg copper, 15 mg/Kg lead, 2500 mg/Kg magnesium, 45 mg/Kg zinc, 350 mg/Kg sodium, and 800 mg/Kg potassium. Soils collected from the vicinity of the black dross piles (HB-8,9,11,12,13), from drainage areas emanating from the Maralco Plant (HB-7), and from the yard of the residence east of the plant (HB-5) have elevated indicator metals.

The geochemical parameters (Table 5.14) results identify chloride as highly sensitive to the presence of dross contamination. Values greater than 10 mg/Kg (background samples HB-14 and HB-16) indicate contamination by either mass or solute transport.

5.2.7 Stage 2 Soil Boring Analytical Results

Soils sampled from borings drilled for monitoring well installations were analyzed for indicator metals, geochemical parameters, volatile organic compounds, and polynuclear aromatic hydrocarbons. Analytical results have been summarized in Tables 5.14 and 5.16 through 5.18. Laboratory reports and chain-of-custody forms are attached in Appendix III.

Soils from borings MW-3 and MW-4, located near the western boundary of the site, are elevated in metals, especially potassium and sodium, as opposed to borings MW-1 and MW-2 located on the eastern portion of the property (Table 5.16). Maximum potassium and sodium concentrations in MW-3 (6.5 - 7.5') and MW-4 soils are 5750 mg/Kg and 3690 mg/Kg, respectively as compared to a maximum for MW-1 and MW-2 (15.6 - 16.5') of 924 mg/Kg and 1790 mg/Kg, respectively. The sodium and potassium in the eastern boring soils are thought to be held primarily in the clay minerals and in some minerals comprising the sands and silts as well.

Chloride concentrations from the selected geochemical parameters (Table 5.14) clearly show a distinction between the eastern and western soil boring samples. Soils from MW-3 and MW-4 have chloride contents up to 3974 mg/Kg, as compared to concentrations less than 10 mg/Kg in soils from MW-1 and MW-2.

Table 5.17 summarizes the results of the volatile organic analyses for the soil borings. Acetone was the only volatile organic compound recovered at levels above the method detection limits. Acetone is a common laboratory contaminant, although it is suspected that the glass sample jars may have contained trace amounts of acetone left from the supplier cleaning procedure. As shown in Table 5.18, no polynuclear aromatic hydrocarbons were quantified in the soil samples. Trace amounts of perylene were detected as indicated by the estimated values tabulated.

5.2.8 Stage 2 Groundwater Analytical Results

Groundwater samples from the four monitoring wells were analyzed for TAL metals, geochemical parameters, and Priority Pollutant volatile organic compounds and base/neutral/acid extractable organics. Analytical results have been summarized in Tables 5.19 through 5.22. Laboratory reports and chain-of-custody forms are attached in Appendix III.

The total metal analytical results for groundwater are shown in Table 5.19. Copper was detected at 29.7 ug/L in the equipment blank sampled from an unused dedicated, disposable bailer prior to sampling the well. However, the quantities of the indicator metals detected in the analyses are significant as compared to those detected in the blank. Therefore, these results will be considered and discussed.

Groundwater from the western monitoring wells, MW-3 and MW-4, contains elevated sodium and potassium concentrations compared with the wells installed on the eastern portion of the site. MW-3 contains the greatest concentrations of these anions, 2130 ug/L and 659 ug/L, respectively. The eastern monitoring wells, MW-1 and MW-2, contain less than 10 ug/L sodium and less than 3 ug/L potassium. Barium, calcium, and magnesium follow similar concentration patterns. Groundwater from MW-3 is also elevated in iron, manganese, and chromium and has a low pH. These excess metals and pH values may be a result of weak humic acids leaching into the shallow groundwater from the cedar mill south of the well location.

The geochemical parameters analyzed for the groundwater samples are compiled in Table 5.20. Ammonia and total dissolved solids (TDS) concentrations are elevated in monitoring wells MW-3 and MW-4. The MW-3 water sample also contains an anomalously low alkalinity. This is also thought to be caused from the weak humic acids emanating from the cedar mill.

Results of the Priority Pollutant volatile organic and BNA scans are summarized in Tables 5.21 and 5.22. Trace quantities of acetone were detected in the MW-1 groundwater sample (Table 5.21). Acetone is a suspected laboratory contaminant. Chloroform was also quantified at 2 ug/L in the equipment blank sample. The source of the chloroform is not known. No BNAs were quantified in the Maralco site groundwater, although trace acids, hydrocarbons, and perylene were detected. Estimated concentrations are flagged with the letter "J".

5.2.9 Stage 2 Surface Water Analytical Results

Surface water samples from the fire sampling stations were analyzed for indicator metals (total and dissolved), selected geochemical parameters, and BNA extractable organics. Analytical results have been tabulated and appended to the Stage 1 Surface water results in Tables 5.6 through 5.10. Laboratory reports and chain-of-custody forms are attached in Appendix III.

The total metal analytical results for surface waters collected from stations SW-3, SW-4, SW-6, SW-7 and SW-8 indicated elevated concentrations of sodium, potassium, manganese, calcium, aluminum, and in some samples, barium (Table 5.6). Stage 2 values do not correlate well with the Stage 1 total metal analytical results.

Dissolved metal concentrations in the surface waters are elevated in sodium and potassium, with values up to 10,500 mg/L (SW-3R) and 9,210 mg/L (SW-6R) respectively (Table 5.7). Concentrations of dissolved metals that were elevated in the total metals analyses are also found above detectable levels in most samples.

The selected geochemical and field analytical results indicated high concentrations of chloride and high specific conductivities in the surface waters. These are linked to the high salt content of adjacent black dross material.

No base/neutral/acid extractable organics were detected in the surface waters collected during the resampling event (Table 5.10).

5.3 SUMMARY OF RESULTS

The results of the Phase I Stage 1 and Stage 2 sampling events are discussed in terms of site-wide distribution of indicator parameters in soils, sediments, surfacewater, and groundwater. Although the investigation is still preliminary in scope and coverage, inferences can be made as to areas of waste disposal, modes of transport of waste constituents, and approximate lateral extent of contaminants within the Maralco site boundaries.

The areas identified where the recycled aluminum waste has been placed for storage or other purposes are: 1) the current black dross pile east and south of the Maralco plant, 2) working areas of the Maralco plant,

3) the former dross storage area on the eastern portion of the site, and 4) the former holding pond northwest of the Maralco plant (Figure 5-1). Minor amounts of dross material were also identified in the yard of the residence east of the plant parking area.

Erosion from run-off from the black dross piles transports the waste material to the drainage that travels along the southern and eastern margins of the current piles. Results of analyses of sediments in the adjacent ditch confirm the presence of dross material. The plastic barricade erected by Ecology in 1987 to prevent dross runoff sediments from entering the ditch was no longer in place in December 1989. Similarly, run-off erosion from the eastern storage pile most likely transported dross material a short distance from the former pile.

During the dry summer season, wind was observed to have eroded the principal black dross piles. Wind transport was not evaluated during Phase I, but undoubtedly has contributed to dispersion of the waste material. The dry black dross is very fine grained and easily carried by moderate winds. Wind speed and directional data, along with surface soil samples, are needed to more fully evaluate the impact of wind on contaminant transport.

Surface water and culverted surface water were observed to be a transport medium for the waste material. Analytical results indicate that surface waters, especially in the drainage adjacent to the Maralco dross pile, were high in specific conductivity, salinity, and chloride. These elevated parameters result from the high salt content of the black dross. Analyses also reveal high total metal contents, especially sodium and potassium. At sampling station SW-8 located in Christopher Ditch north of the site and adjacent to a culvert outlet, light colored sediments, similar in appearance to those in the former holding pond, were observed. Results of total metals in sediments and total metals and chloride content of surface water at SW-8 confirm that high salinity material is being transported off-site to the ditch via the north running culvert.

The site-wide distribution of some indicator parameters concentrations in sediments and surficial to shallow soils is illustrated in Figures 5-2 and 5-3. Total copper, lead, and zinc concentrations have been plotted in Figure 5-2. Similarly, total aluminum and sodium plus potassium concentrations have been plotted in Figure 5-3. With the sample coverage to date, the indicator parameters elevated over background concentrations (HB-14, HB-16) illustrate the transport mechanisms discussed in the previous paragraphs. Indicator metal concentrations remain elevated where erosion due to run-off transports dross material (SW-1, SW-3, SW-6, HB-8, HB-9) and where surface water is a transport medium (SW-4, SW-8). Samples HB-4 and HB-6, located east of the current black dross pile and former storage pile, respectively, have greatly reduced concentrations of the indicator metals. These two samples do not adequately address the potential for air-borne transport, but suggest that transport to the east by wind is not significant.

The shallow groundwater results indicate elevated concentrations of sodium, potassium, and other indicator metals in monitoring wells MW-3 and MW-4. In addition, sodium, potassium, and chloride are elevated in soil samples from the base of the MW-3 and MW-4 boreholes. The soils beneath and adjacent to the black dross pile are expected to be primarily sands, similar to those logged in the borings, with fairly high hydraulic conductivities. These transmissive units would allow for transport of brines percolating downward through the black dross piles. Potentiometric surface measurements indicate northward flowing groundwater during the dry and wet seasons (Figures 3-5 and 3-6). The contaminant plume or plumes also extend northward. It is not known at this time whether the concentrations reported in wells MW-3 and MW-4 are resultant from a single plume emanating from the black dross pile area or separate plumes originating from the black dross area and the former holding pond immediately south of well MW-4.

Arsenic and lead in groundwater from monitoring wells MW-1 (upgradient) and MW-4 exceed compliance cleanup levels established for groundwater under the Model Toxics Control Act (WAC 173-340-720). Barium concentrations in wells MW-3 and MW-4 exceed the 1.0 mg/L federal primary drinking water standard (40 CFR 141). The contamination of groundwater is of concern. The plume boundaries need to be established, including the vertical extent. Groundwater beneath the black dross pile is expected to have very high salinities. Brines have higher densities than the natural groundwaters, and have the potential to sink through the shallow aquifer. Such brines are likely to transport excess heavy metals to depth as well.

5.3.1 MTCA Implications

The Model Toxics Control Act, which will be promulgated in late February 1991, establishes clean up standards for soils, groundwater and surface water (WAC 173-340-740, 720, 730). The Maralco site was listed because of the book designation of the wastes on site. As such, the method cleanup level determinations for soils, MTCA specifically states that for individual hazardous substances or mixtures, [cleanup] concentrations should equal to or less than one hundred (100) times the groundwater cleanup level established in accordance with WAC-173-340-720 unless it can be established that a higher soil concentration is protective of groundwater at the site. MTCA does, however, recognize that there may be sites where there is an extremely low probability that groundwater classified as a potential source of drinking water will actually be used for that purpose. At such sites, the department may approve groundwater cleanup levels that are based on protecting beneficial uses of adjacent surface water. Maralco will need an integrated approach to groundwater surface water and soils in order to determine the appropriate approaches to cleanup under MTCA.

5.4 EVALUATION OF EASTERN PORTION OF PROPERTY

The court agreement between the secured creditors of the Maralco property and Ecology allows for the proceeds received from any sale of the property to be split equally between both parties. In an effort to recover costs of the environmental assessment and feasibility study, and to fund the remedial activities, a plan to divide the property was proposed. The eastern portion of the property was assessed during the preliminary phase of the investigation for possibility of sale prior to the complete remediation of the entire site. The majority of the eastern part of the site appears to have minimal impact resultant from the Maralco operations. However, environmental concerns do affect some areas, including the former black dross storage area, the miscellaneous debris around the residence, the potential for laboratory wastes to have been disposed in the residential sewers, and presence of minor amounts of black dross in the yard near the residence. In addition, the Christopher Ditch and unnamed drainage have been classified as wetlands by the City of Kent and the U.S. Fish and Wildlife Service (Shapiro and Associates, June 1990).

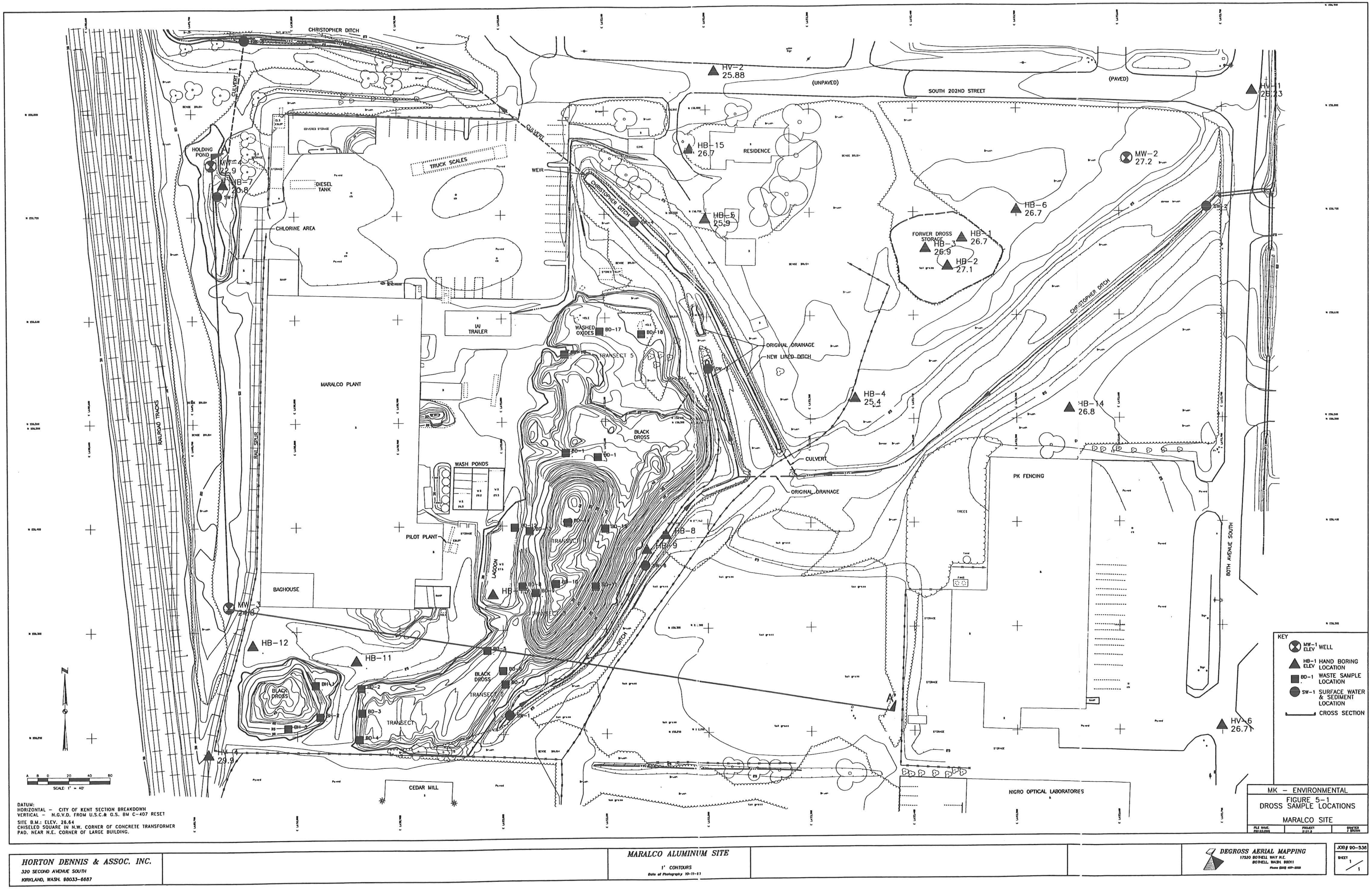
The former dross storage area is roughly circular and approximately 100 feet across. Stage 1 sample results indicated that contamination due to dross was relatively shallow (approximately 1 foot). Removal of the upper 1 ft over the entire area would be approximately 290 cubic yards. It may be possible to remediate these soils with the same process utilized to recycle the dross. Following the removal of the dross-contaminated soils, it would be necessary to replace the soils with clean fill.

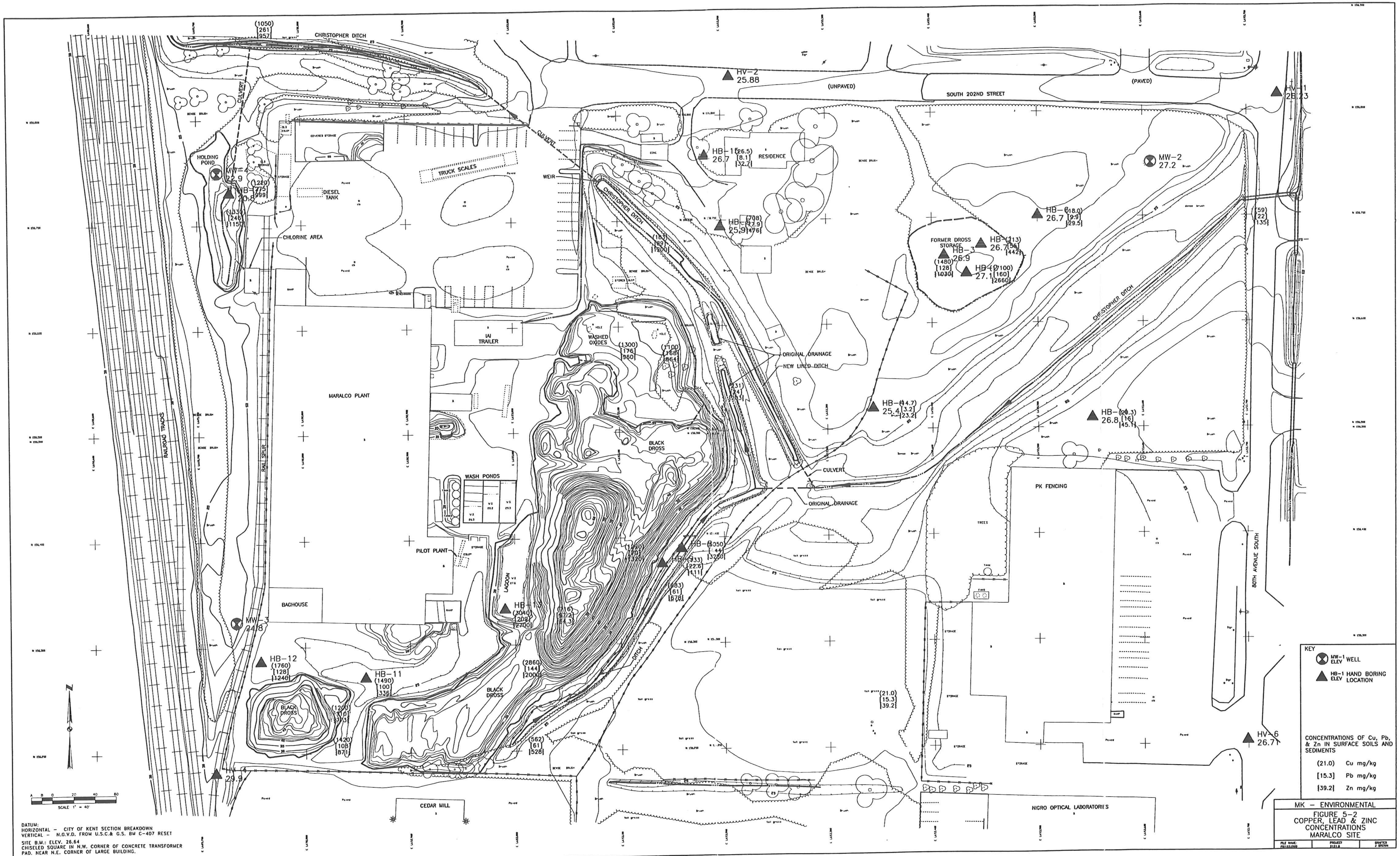
The dense blackberry brush around the residence and outbuildings contains old appliances, bottles, cans and miscellaneous garbage. This brush has been in place since at least the mid 1970s, and may contain old pesticide containers or other hazardous materials. The east ditch bank between the residence and the Maralco building contains most of the garbage, including amber glass jars that may have contained laboratory reagents. It is suggested that the brush be leveled and the garbage be removed. Containers should first be examined for labels to identify their contents. If they are not labeled, their contents, if any, may need to be analyzed to determine their proper disposal.

Phil Stansfeld of IAI has operated a metallurgical laboratory in the residence over a period of several years. A number of reagents have been used in the laboratory, including hydrofluoric acid (HF). Disposal of laboratory wastes to either the sewer lines or the grounds around the residence may have occurred. Contamination related to the laboratory is expected to be minor; however, it should not be overlooked as a potential cause for liability. Suggestions for determining whether laboratory wastes are present are discussed in the preliminary outline of Phase II work, Section 6.

Christopher Ditch divides the eastern portion of the site as it traverses the property from 80th Ave. S. to the southwest, joins the drainage flowing northeast, and continues towards the northwest and off-site at 202nd street. The area has been recently inventoried by the City of Kent during which the National Wetlands Inventory aerial photographic designation as a wetland was confirmed by a field survey (Shapiro and Associates, Inc., June 1990). The wetlands inventory data form specific to the Maralco site from the Phase I Wetland Inventory Report (Appendix B) has been included in Appendix IV. A cursory review of the plant species present in the drainage areas revealed only salt intolerant vegetation on the eastern portion of the property (John Marshall, WDOE Wetlands, personal communication, January 4, 1990). Such a preliminary evaluation suggests that the high salt content in the dross material has not affected the plant growth in those areas.

Designation of the Christopher Ditch and associated drainage as a wetlands will limit the future developmental options of both the eastern and western portions of the site. The City of Kent has denied a permit to subdivide and sell the property southeast of the Maralco site based on its wetlands designation (J. Nigro, personal communication, September 24, 1990). In addition, by Executive Order EO 90-04, all state agencies are directed to assure wetland protection. This order directly impacts future development considerations of the Maralco property by Ecology.


CHRISTOPHER DITCH
HV-2 25.88
(UNPAVED)
SOUTH 202ND STREET
(PAVED)
HV-1 26.23
CULVERT
TRUCK SCALES
WEIR
HOLDING POND
MW-4 22.9
HB-7 20.8
DIESEL TANK
CHLORINE AREA
HB-15 26.7
RESIDENCE
MW-2 27.2
HB-5 25.9
HB-6 26.7
FORMER DROSS STORAGE
HB-1 26.7
HB-3 26.9
HB-2 27.1
TRAILER
WASHED OXIDES
BD-17
BD-18
TRANSECT 5
ORIGINAL DRAINAGE
NEW LINED DITCH
MARALCO PLANT
RAILROAD TRACKS
RAIL SPUR
HB-4 25.4
HB-14 26.8
BLACK DROSS
WASH PONDS
PK FENCING
ORIGINAL DRAINAGE
PILOT PLANT
HB-8
HB-9
LAGOON
BAGHOUSE
MW-3
HB-12
HB-11
BLACK DROSS
TRANSECT
80TH AVENUE SOUTH
HV-6 26.71
HV-4 29.9
SW-1
CEDAR MILL
NIGRO OPTICAL LABORATORIES
SCALE: 1" = 40'
KEY
MW-1 ELEV WELL
HB-1 ELEV HAND BORING LOCATION
BD-1 WASTE SAMPLE LOCATION
SW-1 SURFACE WATER & SEDIMENT LOCATION
CROSS SECTION
DATUM:
HORIZONTAL - CITY OF KENT SECTION BREAKDOWN
VERTICAL - N.G.V.D. FROM U.S.C.& G.S. BM C-407 RESET
SITE B.M.: ELEV. 26.64
CHISELED SQUARE IN N.W. CORNER OF CONCRETE TRANSFORMER PAD. NEAR N.E. CORNER OF LARGE BUILDING.
MK - ENVIRONMENTAL
FIGURE 5-1
DROSS SAMPLE LOCATIONS
MARALCO SITE
HORTON DENNIS & ASSOC. INC.
320 SECOND AVENUE SOUTH
KIRKLAND, WASH. 98033-6887
MARALCO ALUMINUM SITE
1' CONTOURS
DEGROSS AERIAL MAPPING
JOB# 90-536



HORTON DENNIS & ASSOC. INC.
320 SECOND AVENUE SOUTH
KIRKLAND, WASH. 98033-8887

MARALCO ALUMINUM SITE
1' CONTOURS
Date of Photography 10-11-91

DEGROSS AERIAL MAPPING
17520 BOTHELL WAY N.E.
BOTHELL, WASH. 98011

JOB# 90-536
SHEET 1/1

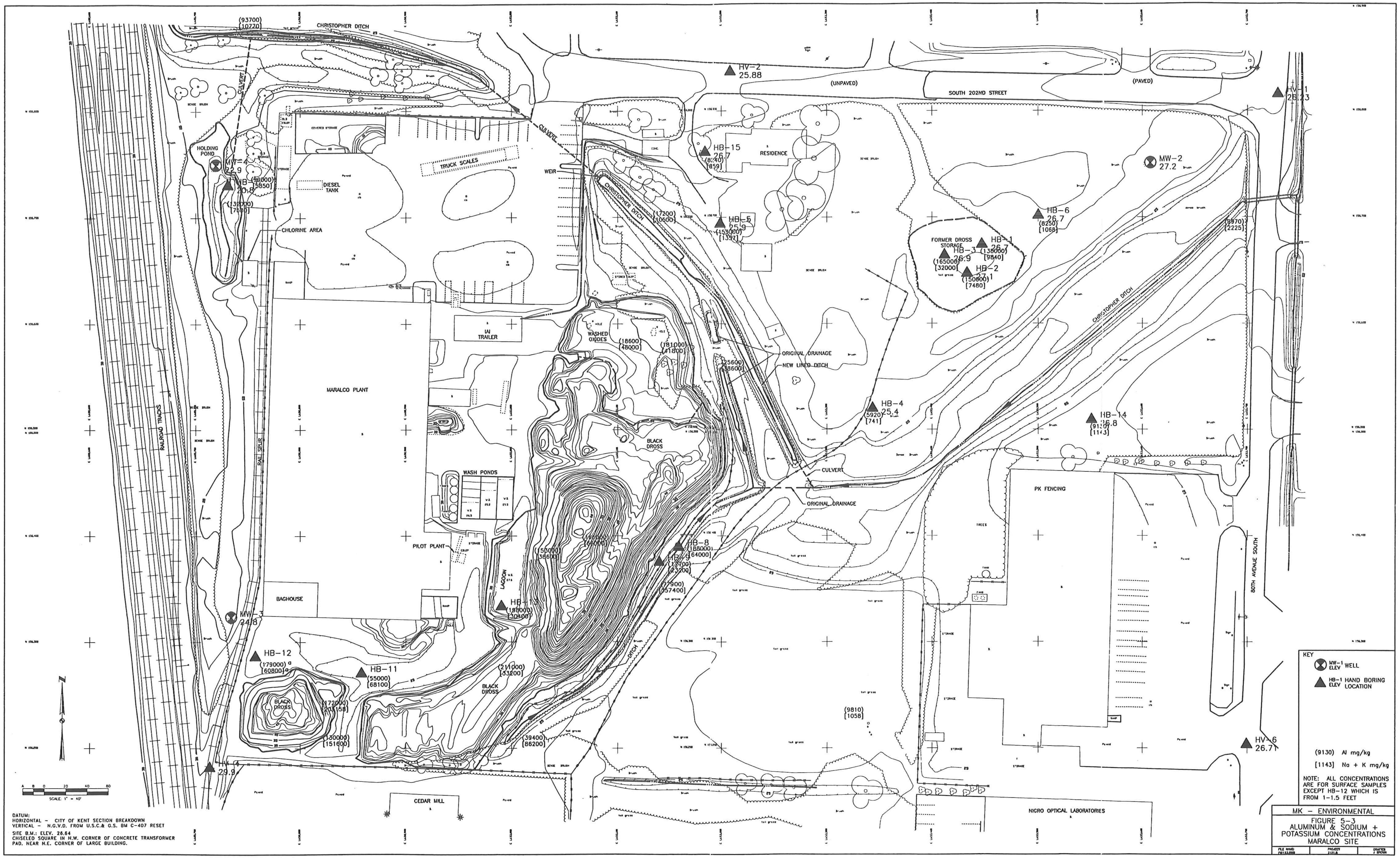


FIGURE 5-3
ALUMINUM & SODIUM + POTASSIUM CONCENTRATIONS
MARALCO SITE

HORTON DENNIS & ASSOC. INC. 320 SECOND AVENUE SOUTH KIRKLAND, WASH. 98033-6887	MARALCO ALUMINUM SITE 1' CONTOURS	DEGROSS AERIAL MAPPING 17520 BOTHELL WAY N.E. BOTHELL, WASH. 98011

JOB# 90-536
SHEET 1/1

Table 5.1
Stage 1 and 2 Surface Water Field Parameters
Maralco Site, Kent, Washington

Sample Location	Sample No.	Date	Time	Temp. (C)	PH	Specific Conduct. (umhos)	Salinity (o/oo)	Dissolved Oxygen (mg/L)
SW-3	19-8300	5/10/90	14:15	NR	4.6	>20000		5.6
SW-4	19-8298	5/10/90	14:45	NR	6.4	590		6.3
SW-6	19-8295	5/10/90	11:30	NR	6.2	>20000		6.4
SW-7	19-8293	5/10/90	8:40	NR	4.6	2460		7.7
SW-8	19-8287	5/9/90	14:45	24.9	6.0	330		
SW-3R	478589	11/27/90	11:45	8	6.29	36500	35	
SW-4R	478588	11/27/90	10:50	9	6.01	750	0.5	
SW-6R	478590	11/27/90	13:00	8	6.9	49000	> 40	
SW-7R	478591	11/27/90	14:00	9	5.1	3000	2.5	
SW-8R	478594	11/27/90	15:30	8	4.45	1000	1	

C:\WDOE\INORG.WK2

Table 5.2
Results of Stage 1 Laboratory Analyses of Sediment and Soil Samples
Total Metals Analyses (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-1		SW-2		SW-3		SW-4		SW-6		SW-7		SW-8	
SAMPLE ID:	198294		198280		198299		198297		198296		198292		198289	
DESCRIPTION:	sediment		sediment		sediment		sediment		sediment		sediment		sediment	
SAMPLE DATE:	5-10-90		5-09-90		5-10-90		5-10-90		5-10-90		5-10-90		5-09-90	
ANALYSIS DATE:	6-21-90		6-21-90		6-21-90		6-21-90		6-21-90		6-21-90		6-21-90	
UNITS:	mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Aluminum	39400		9970		25600		17200		77900		132000		93700	
Antimony	4.1	N	0.2	N	0.83	N	4.09	N	1.5	N	7.4	N	6.6	N
Arsenic	3.1		2.2		3.9		53.4		4.4		4.4		6.8	
Barium	74.9		45.0		59.1		115		130		169		188	
Beryllium	0.8		0.2		0.5		0.5	U	1.0		3.5		3.7	
Cadmium	1.4		1.0		0.9		6.9		1.3		6.0		7.4	
Calcium	4140	BN	3860	B	5060	BN	6350	BN	6970	BN	6110	BN	4260	BN
Chromium	54.7	N	15.7	N	27.7	N	58.5	N	87.5	N	150	N	127	N
Cobalt	5.8		4.8		5.6		11.2		5.6		7.4		5.4	
Copper	562		59.0		231		183		883		1330		1050	
Iron	10600	N	18700	N	19500	N	43300	N	17700	N	21000	N	40600	N
Lead	61		22		24		89		61		246		261	
Magnesium	7060		3030		4530		5420		8860		17400		12100	
Manganese	285		201		286		396		608		539		305	
Mercury	0.10		0.03		0.1	U	0.27	U	0.06	U	0.49		0.73	
Nickel	22		13		15		31		33		65		46	
Potassium	41900	B	525	B	17900	B	2600	B	27400	B	3390	B	4500	B
Selenium	1.2	NU	0.6	NU	0.7	NU	3.3	NU	0.7	NU	0.8	NU	2.2	NU
Silicon	2570	BN	1570	BN	1830	BN	4590	BN	2410	BN	2880	BN	4480	BN
Silver	0.9		0.3	U	0.3	U	1.5	U	0.5		1.3		1.2	
Sodium	44300	B	1700	B	20700	B	7900	B	33000	B	4190	B	6270	B
Thallium	0.5	NU	0.2	NU	0.3	NU	1.3	NU	0.3	NU	0.3	NU	0.9	NU
Tin	17	B	5	B	7	B	25	B	19	B	42	B	39	B
Vanadium	91.2		43.2		58.3		58.1		166		196		205	
Zinc	528		135		203		1200		678		1150		957	

C:\WDOE\INORG.WK2

Table 5.2
Results of Stage 1 Laboratory Analyses of Sediment and Soil Samples
Total Metals Analyses (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-18	BD-1	HB-1, 0-0.5'	HB-1, 1.5-2'	HB-2, 0-0.5'	HB-2, 1.5-2'	HB-3, 0-0.5'	HB-3, 1.5-2'
SAMPLE ID:	198290	198301	198281	198282	198283	198284	198285	198286
DESCRIPTION:	sediment	black dross	soil	soil	soil	soil	soil	soil
SAMPLE DATE:	5-09-90	5-10-90	5-09-90	5-09-90	5-09-90	5-09-90	5-09-90	5-09-90
ANALYSIS DATE:	6-21-90	6-21-90	6-08-90	6-21-90	6/21/90	6-21-90	6-21-90	6-21-90
UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	82400	188000	138000	12800	150000	19700	165000	13000
Antimony	8.2 N	20.6 N	1.79 N	0.2 N	5.4 N	0.2 N	8.0 N	0.1 N
Arsenic	6.0	8.7	3.0	1.0	6.2 U	1.9	6.6 U	1.6
Barium	123	167	133	33.0	123	50.6	125	39.1
Beryllium	3.0	2.9	1.4	0.2	3.3	0.3	2.3	0.2
Cadmium	4.4	4.5	0.7	0.2 U	1.5	0.2 U	1.0	0.2 U
Calcium	4090 BN	10400 BN	6660 BN	3780 BN	8140 BN	4920 BN	7260 BN	3780 BN
Chromium	95.0 N	380 N	83.0 N	12.4 N	167 N	26.3 N	228 N	12.4 N
Cobalt	5.3	6.1	5.0	4.0	5.6	4.9	5.1	4.6
Copper	851	2940	713	24.1	17100	91.8	1480	35.2
Iron	40100 N	7700 N	10900 N	11400 N	9620 N	13300 N	8690 N	11600 N
Lead	172	373	55	1.7	160	6.2	128	2.3
Magnesium	9900	27000	21800	2500	23500	3540	33800	2510
Manganese	260	1200	1220	141	1530	209	2340	151
Mercury	0.24 U	0.06 U	0.05 U	0.04 U	0.04 U	0.05 U	0.06 U	0.04 U
Nickel	31	160	24	9.0	71	12	59	9.0
Potassium	4160 B	19700 B	3300 B	2210 B	6360 B	2420 B	12400 B	2100 B
Selenium	2.7 NU	0.6 NU	0.6 NU	0.5 NU	0.6 NU	0.6 NU	0.7 NU	0.5 NU
Silicon	6020 BN	2090 BN	2030 BN	1710 BN	2220 BN	1430 BN	2530 BN	1700 BN
Silver	1.8 U	5.0	0.4 U	0.3 U	1.8 B	0.2 U	0.7	0.3 U
Sodium	9000 B	18500 B	6540 B	2390 B	11200 B	3360 B	19600 B	2290 B
Thallium	1.1 NU	0.2 NU	0.2 NU	0.2 NU	0.2 NU	0.2 NU	0.3 NU	0.2 NU
Tin	40 B	51 B	13 B	5 B	61 B	5 B	43 B	4 B
Vanadium	149	117	60.1	39.6	78.9	44.0	112	39.3
Zinc	813	1960	442	27.9	2660	67.8	1030	34.3

NOTES:

(1) Analyses performed and reviewed by Analytical Resources, Inc. in Seattle, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. The following USEPA Analytical Methods were employed: Arsenic: 760; Lead: 7421, 239.2; Mercury: 7471; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7.

(2) Data qualifiers:
U = not detected above these levels
N = SRM recovery not within control limits
B = compound detected in blank (sample value is less than 10 times that value)

(3) SW-18 is a duplicate of SW-8

Table 5.3
Results of Stage 1 Laboratory Analyses of Groundwater Samples
Priority Pollutant Semivolatile Organic Analysis (PP VOA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-1	MW-2	MW-3	MW-330	MW-4	MW-E	MW-TRIP BLANK
SAMPLE ID:	408586	408584	408589	408583	408588	408585	408587
DESCRIPTION:	water	water	water	water	water	water	water
SAMPLE DATE:	10/2/90	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90	10/2/90
ANALYSIS DATE:	10/10/90	10/9/90	10/9/90	10/9/90	10/9/90	10/10/90	10/9/90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1
Dichlorodifluoromethane	REJ	REJ	REJ	REJ	REJ	REJ	REJ
Bromomethane	1 U	REJ	REJ	REJ	REJ	1 U	2 J
Vinyl Chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	1 U	1 U	1 U	1 U	1 U	1 U	0.9 J
Acetone	6 U	1 U	1 U	1 U	1 U	1 U	3
Carbon Disulfide	1 U	1 U	1 U	1 U	1 U	1 U	0.3 J
1,1-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	1 U	1 U	1 U	1 U	1 U	2	1 U
1,2-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone	1 U	1 U	1 U	1 U	2 U	1 U	1 U
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	1 U	0.5 J	1 U
Carbon Tetrachloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Acetate	NAR	NAR	NAR	NAR	NAR	NAR	NAR
Bromodichloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromomethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane (EDB)	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Hexanone	1 U	1 U	1 U	1 U	1 U	1 U	1
4-Methyl-2-Pentanone	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	1 U	1 U	1 U	1 U	1 U	1 U	0.09 J
Ethane, 1,1,2,2-Tetrachloro-	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethane, 1,1,1,2-Tetrachloro-	1 U	1 U	1 U	1 U	1 U	1 U	1 U

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Table 5.3
Results of Stage 1 Laboratory Analyses of Groundwater Samples
Priority Pollutant Semivolatile Organic Analysis (PP VOA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-1	MW-2	MW-3	MW-330	MW-4	MW-E	MW-TRIP BLANK
SAMPLE ID:	408586	408584	408589	408583	408588	408585	408587
DESCRIPTION:	water	water	water	water	water	water	water
SAMPLE DATE:	10/2/90	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90	10/2/90
ANALYSIS DATE:	10/10/90	10/9/90	10/9/90	10/9/90	10/9/90	10/10/90	10/9/90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Toluene	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
Chlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene, Ethyl-	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
Benzene, Ethenyl-(Styrene)	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromobenzene	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
1,2,3-Trichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Chlorotoluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Chlorotoluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Xylenes	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J
1,2,4-Trimethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J
Tert-Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
1,3,5-Trimethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sec-Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J
p-Isopropyltoluene	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J
Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
DBCP	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	0.4 J
Isopropylbenzene (Cumene)	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene, Propyl-	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	0.1 J
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	0.4 J
Naphthalene	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	0.7 J
Hexachlorobutadiene	1 U	1 U	1 U	1 U	1 U	1 U	0.3 J
Surrog: 1-Bromo-2-Fluoroetha	100	104	107	112	98	86	107
d8-Toluene	103	99	103	106	98	88	105
p-Bromofluorobenzene	102	100	106	109	99	88	106
d4-1,2-Dichloroethane	103	110	109	115	102	86	111

NOTES:
(1) Analyses performed and reviewed by Weyerhauser Laboratories and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. USEPA Analytical Method 8270 was used.
(2) Data qualifiers:
U = not detected above these levels
J = estimated value between the detection limit and the reporting limit)
REJ =

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Table 5.4
Results of Stage 1 Laboratory Analyses of Sediment Samples
Priority Pollutant Volatile Organic Analysis (PP VOA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-1	SW-1	SW-2	SW-4	SW-4	SW-7	SW-8	SW-18
SAMPLE ID:	198294	198294 (RE)	198280	198297	198297 (DL)	198292	198289	198290
DESCRIPTION:	sediment	sediment	sediment	sediment	sediment	sediment	sediment	sediment
SAMPLE DATE:	5-10-90	5-10-90	5-09-90	5-10-90	5-10-90	5-10-90	5-09-90	5-09-90
ANALYSIS DATE:	5-22-90	5/23/90	5-22-90	5-23-90	5-23-90	5-23-90	5-23-90	5-23-90
UNITS:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Chloromethane	26 U	26 U	13 U	59 U	290 U	18 U	43 U	50 U
Bromomethane	26 U	26 U	13 U	59 U	290 U	18 U	43 U	50 U
Vinyl chloride	26 U	26 U	13 U	59 U	290 U	18 U	43 U	50 U
Chloroethane	26 U	26 U	13 U	59 U	290 U	18 U	43 U	50 U
Methylene chloride	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
*Acetone	48	34	26	1700 E	5400 D	33	230	190
Carbon disulfide	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
1,1-Dichloroethene	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
1,1-Dichloroethane	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
1,2-Dichloroethene (total)	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
Chloroform	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
1,2-Dichloroethane	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
*2-Butanone	26 U	26 U	13 U	240	820 DJ	18 U	43 U	50 U
1,1,1-Trichloroethane	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
Carbon tetrachloride	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
Vinyl acetate	26 U	26 U	13 U	59 U	290 U	18 U	43 U	50 U
Bromodichloromethane	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
1,2-Dichloropropane	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
cis-1,3-Dichloropropene	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
Trichloroethene	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
Dibromochloromethane	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
1,1,2-Trichloroethane	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
Benzene	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
trans-1,3-Dichloropropene	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
Bromoform	13 U	13 U	7 U	29 U	150 U	9 U	22 U	25 U
4-Methyl-2-pentanone	26 UJ	26 UJ	13 U	59 U	290 U	18 U	43 U	50 U
2-Hexanone	26 UJ	26 UJ	13 U	59 U	290 U	18 U	43 U	50 U
Tetrachloroethene	13 UJ	13 UJ	7 U	29 U	150 U	9 U	22 U	25 U
1,1,2,2-Tetrachloroethane	13 UJ	13 UJ	7 U	29 U	150 U	9 U	22 U	25 U
Toluene	13 UJ	13 UJ	7 U	74	63 DJ	9 U	22 U	25 U
Chlorobenzene	13 UJ	13 UJ	7 U	29 U	150 U	9 U	22 U	25 U
Ethylbenzene	13 UJ	13 UJ	7 U	17 J	150 U	9 U	22 U	25 U
Styrene	13 UJ	13 UJ	7 U	29 U	150 U	9 U	22 U	25 U
Xylene (total)	13 UJ	13 UJ	7 U	170	160 D	9 U	22 U	25 U
Silanol, trimethyl	360 J							
Silane methylenebis[trimeth]								
Octane				120 J	180 J			
Nonane				310 J	350 J			
Unknown C9H16				88 J	180 J			
Unknown C9H18					240 J			
Unknown C9H18					290 J			
Cyclohexane, propyl-				190 J	350 J			
Unknown hydrocarbon				190 J	350 J			
Unknown hydrocarbon					290 J			
Unknown C10H22				650 J				
Unknown C10H22				190 J				
Unknown C10H20				220 J	760 J			
Benzene, trimethyl-				460 J	290 J			
Decane				1300 J	1400 J			
Disiloxane, hexamethyl-								

Table 5.4
Results of Stage 1 Laboratory Analyses of Sediment Samples
Priority Pollutants & Volatile Organic Analyses (PP VOA)
Maralco Site, Kent, Washington

SAMPLE LOCATION: SAMPLE ID: DESCRIPTION: SAMPLE DATE: ANALYSIS DATE: UNITS:	BD-1 198301 black dross 5-10-90 5-23-90 ug/Kg	BD-1 198301 (RE) black dross 5-10-90 5-23-90 ug/Kg	HB-1, 0-0.5ft 198281 soil 5-09-90 5-23-90 ug/Kg	HB-1, 0-0.5 ft 198281 (DL) soil 5-10-90 5-23-90 ug/Kg
Chloromethane	14 U	14 U	13 U	66 U
Bromomethane	14 U	14 U	13 U	66 U
Vinyl chloride	14 U	14 U	13 U	66 U
Chloroethane	14 U	14 U	13 U	66 U
Methylene chloride	7 U	7 U	7 U	33 U
Acetone*	14 U	14 U	13 U	66 U
Carbon disulfide	7 U	7 U	7 U	33 U
1,1-Dichloroethene	7 U	7 U	7 U	33 U
1,1-Dichloroethane	7 U	7 U	7 U	33 U
1,2-Dichloroethene (total)	7 U	7 U	7 U	33 U
Chloroform	7 U	7 U	7 U	33 U
1,2-Dichloroethane	7 U	7 U	7 U	33 U
2-Butanone*	14 U	14 U	13 UJ	66 U
1,1,1-Trichloroethane	7 U	7 U	5 J	150 D
Carbon tetrachloride	7 U	7 U	7 UJ	33 U
Vinyl acetate	14 U	14 U	13 UJ	66 U
Bromodichloromethane	7 U	7 U	7 UJ	33 U
1,2-Dichloropropane	7 U	7 U	7 UJ	33 U
cis-1,3-Dichloropropene	7 U	7 U	7 UJ	33 U
Trichloroethene	7 U	7 U	7 UJ	33 U
Dibromochloromethane	7 U	7 U	7 UJ	33 U
1,1,2-Trichloroethane	7 U	7 U	7 UJ	33 U
Benzene	7 U	7 U	7 UJ	33 U
trans-1,3-Dichloropropene	7 U	7 U	7 UJ	33 U
Bromoform	7 U	7 U	7 UJ	33 U
4-Methyl-2-pentanone	14 UJ	14 U	R	66 U
2-Hexanone	14 UJ	14 U	R	66 U
Tetrachloroethene	7 UJ	7 U	R	33 U
1,1,2,2-Tetrachloroethane	7 UJ	7 U	R	33 U
Toluene	7 UJ	7 U	R	33 U
Chlorobenzene	7 UJ	7 U	R	33 U
Ethylbenzene	7 UJ	7 U	R	33 U
Styrene	7 UJ	7 U	R	33 U
Xylene (total)	7 UJ	7 U	R	33 U
Silanol, trimethyl	85 J	82 J	290 J	6100 J
Silane methylenebis[trimeth			46 J	170 J
Octane				
Nonane				
Unknown C9H16				
Unknown C9H18				
Unknown C9H18				
Cyclohexane, propyl-				
Unknown hydrocarbon			32 J	
Unknown hydrocarbon			99 J	
Unknown C10H22				
Unknown C10H22				
Unknown C10H20				2200 J
Benzene, trimethyl-				
Decane				
Disiloxane, hexamethyl-	9.7 J	29 J		

NOTES:

1) Analyses performed and reviewed by Weyerhauser Laboratories and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. USEPA Analytical Method 8240 was used.
2) Data qualifiers:
   - U = not detected above these levles
   - B = compound detected in blank
   - J = estimated value (between the detection limit and the reporting limit)
   - R = data unusable; resampling and reanalysis necessary for verification
   - E = concentration exceeded instrument calibration range
   - D = surrogates out
   - * = common laboratory contaminant
3) SW-18 is a duplicate sample of SW-8.
4) The initial analyses of samples 198281, 198294 and 198301 showed surrogate recoveries and/or internal standard recoveries outside QC limits. The samples were reanalyzed (RE) and showed the same recovery problems, indicating a matrix problem. Sample 198281 contained a high ash content and it's rerun was at a 5:1 dilution (DL). This dilution did not help the internal standard/surrogate problem. All results are included in the table.
5) The initial analysis of 198297 contained acetone at a concentration greater than the calibration range of the instrument. The sample was reanalyzed at a 5:1 dilution (DL). Both results are included in this table.

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Table 5.5
Results of Stage 1 Laboratory Analyses of Sediment, Dross & Soil Samples
Priority Pollutant Semivolatile Organic Analysis (PP BNA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-1	SW-2	SW-4	SW-7	SW-8	SW-18	BD-1	HB-1, 0.0-0.5
SAMPLE ID:	198294	198280	198297	198292	198289	198290	198301	198281
DESCRIPTION:	sediment	sediment	sediment	sediment	sediment	sediment	black dross	soil
SAMPLE DATE:	5/10/90	5/9/90	5/10/90	5/10/90	5/9/90	5/9/90	5/10/90	5/9/90
EXTRACTION DATE:	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90
ANALYSIS DATE:	6/1/90	6/4/90	6/1/90	6/4/90	6/4/90	6/1/90	6/4/90	6/8/90
UNITS:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Phenol	1700 U	880 U	3800 U	140 J	2800 U	3300 U	900 U	870 U
bis(2-Chloroethyl)Ether	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2-Chlorophenol	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
1,3-Dichlorobenzene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
1,4-Dichlorobenzene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Benzyl Alcohol	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
1,2-Dichlorobenzene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2-Mehtylbenzene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
bis(2-Chloroisopropyl)Ether	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
4-Mehtylphenol	1700 U	880 U	3800 U	1200 U	340 J	590 J	900 U	870 U
N-Nitroso-Di-n-Propylamine	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Hexachloroethane	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Nitrobenzene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Isophorone	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2-Nitrophenol	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2,4-Dimethylphenol	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Benzoic Acid	8200 U	4300 U	19000 U	320 J	14000 U	16000 U	4300 U	4200 U
bis(2-Chloroethoxy)Methane	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2,4-Dichlorophenol	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
1,2,4-Trichlorobenzene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Naphthalene	1700 U	880 U	3800 U	1200 U	520 J	520 J	900 U	870 U
4-Chloroaniline	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Hexachlorobutadiene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
4-Chloro-3-Methylphenol	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2-Mehtylnaphthalene	1700 U	880 U	1900 U	270 J	590 J	890 J	900 U	870 U
Hexachlorocyclopentadiene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2,4,6-Trichlorophenol	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2,4,5-Trichlorophenol	8200 U	4300 U	19000 U	5700 U	14000 U	16000 U	4300 U	4200 U
2-Chloronaphthalene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2-Nitroniline	8200 U	4300 U	19000 U	5700 U	14000 U	16000 U	4300 U	4200 U
Dimethyl Phthalate	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Acenaphthylene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2,6-Dinitrotoluene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
3-Nitroaniline	8200 U	4300 U	19000 U	5700 U	14000 U	16000 U	4300 U	4200 U
Acenaphthene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
2,4-Dinitrophenol	8200 U	4300 U	19000 U	5700 U	14000 U	16000 U	4300 U	4200 U
4-Nitrophenol	8200 U	4300 U	19000 U	5700 U	28000 U	16000 U	4300 U	4200 U
Dibenzofuran	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U

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Table 5.5
Results of Stage 1 Laboratory Analyses of Sediment, Dross & Soil Samples
Priority Pollutant Semivolatile Organic Analysis (PP BNA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-1	SW-2	SW-4	SW-7	SW-8	SW-18	BD-1	HB-1, 0.0-0.5
SAMPLE ID:	198294	198280	198297	198292	198289	198290	198301	198281
DESCRIPTION:	sediment	sediment	sediment	sediment	sediment	sediment	black dross	soil
SAMPLE DATE:	5/10/90	5/9/90	5/10/90	5/10/90	5/9/90	5/9/90	5/10/90	5/9/90
EXTRACTION DATE:	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90	5/21/90
ANALYSIS DATE:	6/1/90	6/4/90	6/1/90	6/4/90	6/4/90	6/1/90	6/4/90	6/8/90
UNITS:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
2,4-Dinitrotoluene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Diethylphthalate	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
4-Chlorophenyl-phenylether	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Fluorene	1700 U	880 U	1100 J	1200 U	2800 U	340 J	900 U	870 U
4-Nitroaniline	12000 U	8600 U	29000 U	8700 U	14000 U	24000 U	8600 U	6300 U
4,6-Dinitro-2-Methylphenol	8200 U	4300 U	19000 U	5700 U	14000 U	16000 U	4300 U	4200 U
N-Nitrosodiphenylamine*	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
4-Bromophenyl-phenylether	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Hexachlorobenzene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Pentachlorophenol	8200 U	4300 U	19000 U	5700 U	14000 U	16000 U	4300 U	4200 U
Phenanthrene	1700 U	880 U	3100 J	1100 J	890 J	2100 J	900 U	870 U
Anthracene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Di-n-Butylphthalate	1700 U	880 U	3800 U	170 J	2800 U	3300 U	900 U	870 U
Fluoranthene	1700 U	120 J	1900 J	2300	1100 J	1800 J	900 U	870 U
Pyrene	210 J	160 J	3300 J	3900	2200 U	3800	900 U	870 U
Butylbenzeylphthalate	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
3,3-Dichlorobenzidine	3400 U	2700 U	7700 U	2400 U	5700 U	6600 U	1800 U	1700 U
Benzo(a)Anthracene	1700 U	880 U	690 J	910 J	2800 U	3300 U	900 U	870 U
Chrysene	1700 U	880 U	3800 U	1600	1400 U	1400 J	900 U	870 U
bis(2-Ethylhexyl)phthalate	510 J	510 J	14000 U	11000	11000	22000	290 J	870 U
Di-n-Octyl Phthalate	1700 U	880 U	3000 J	1200 U	2800 U	3300 U	900 U	870 U
Benzo(b)Fluoranthene	1700 U	880 U	3800 U	1600 C**	2800 U	790 JC**	900 U	870 U
Benzo(k)Fluoranthene	1700 U	880 U	3800 U		2800 U		900 U	870 U
Benzo(a)Pyrene	1700 U	880 U	3800 U	840 J	2800 U	3300 U	900 U	870 U
Indeno(1,2,3-cd)Pyrene	1700 U	880 U	3800 U	1100 J	2800 U	3300 U	900 U	870 U
Dibenz(a,h)Anthracene	1700 U	880 U	3800 U	1200 U	2800 U	3300 U	900 U	870 U
Benzo(g,h,i)Perylene	630 J	880 U	3800 U	1400	2800 U	3300 U	900 U	870 U

NOTES:

(1) Analyses performed and reviewed by Weyerhauser Laboratories and EPA/Ecology.
Manchester Laboratory in Port Orchard, WA, respectively. USEPA Analytical Method 8270 was used.

(2) Data qualifiers:
U = not detected above these levels
J = estimated value between the detection limit and the reporting limit

(3) * = cannot be separated from diphenylamine.

(4) ** = includes Benzo(k)Fluoranthene

(5) SW-18 is a duplicate of SW-8

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Table 5.6
Results Stage 1 of Laboratory Analyses of Surface Water Samples
Total Metal Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-3	SW-4	SW-6	SW-7	SW-8	SW-18	SW-28
SAMPLE ID:	198300	198298	198295	198293	198287	198288	198291
DESCRIPTION:	water	water	water	water	water	water	water
SAMPLE DATE:	5/10/90	5/10/90	5/10/90	5/10/90	5/9/90	5/9/90	5/9/90
ANALYSIS DATE:	6/21/90	6/21/90	6/21/90	6/21/90	6/21/90	6/21/90	6/21/90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	24000	315	662	216000	5620	1570	10 U
Antimony	100 U	1 U	200 U	1.2 J	1 U	1 U	1 U
Arsenic	100 U	2 J	100 U	83 J	1.5 U	1.5 U	1.5 UJ
Barium	3590	48.7	1200	33.9	22.7	13.4	2.7 J
Berylium	2 U	2 U	2 U	2.2 J	2 U	2 U	2 U
Cadmium	28.9	0.25 J	33.7 J	11.1	0.59	0.16 J	0.1 U
Calcium	540	24400	18900	94100	16300	15700	89 B
Chromium	5 U	5 U	5 U	18 J	5 J	5 U	5 U
Cobalt	1500 U	15 U	1500 U	51.1 J	15 U	15 U	15 U
Copper	2090	10.6 JB	268	268	35.6	14.7	99.7
Iron	78000	16.6	796	3230	23200	13500	18 JB
Lead	134	3.7 JB	180 U	14.2	8.1	1.8 J	1 U
Magnesium	176000	5850	159000	31700	6230	6030	2 UJ
Manganese	24200	1040	5260	3170	747	233	15.8 B
Mercury	0.02 U	0.02 U	1.4	0.06 J	0.02 U	0.02 U	0.02 U
Nickel	40 U	40 U	40 U	121 J	40 U	40 U	40 U
Potassium	16500	73700	15700	253000	31300	33400	300 U
Selenium	200 U	2 U	200 U	2 U	2 U	2 U	2 U
Silicon	9960	6750	1500 U	16900	12000	10300	44.5 J
Silver	7.4 J	3 U	5.1 J	3 U	3 U	3 U	3 U
Sodium	20900	88500	19600	163000	33400	34900	81.7
Thallium	200 U	2.5 U	250 U	2.5 U	2.5 U	2.5 U	2.5 U
Tin	5000 U	104 J	5000 U	50 U	50 UJ	50 U	54 J
Vanadium	4 U	4 U	4 U	7 B	4.6 J	6.7 JB	6.7 JB
Zinc	2610	56.1	65.4	1740	95.6	33.8	94.9

NOTES:

(1) Analyses performed and reviewed by Weyerhauser Laboratories and EPA/Ecology Manchester Laboratory, respectively. USEPA Analytical Method _____ was used.

(2) Data qualifiers:

U = not detected above these levels

J = estimated value (between the detection limit and the reporting limit)

B = compound detected in blank (sample value is less than 10 times that value)

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Table 5.6
Results Stage 2 of Laboratory Analyses of Surface Water Samples
Total Metal Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-3R	SW-4R	SW-6R	SW-7R	SW-8R	SW-17R	EQ. BLNK
SAMPLE ID:	478589	478588	478590	478591	478594	478593	478592
DESCRIPTION:	water	water	water	water	water	water	water
SAMPLE DATE:							
ANALYSIS DATE:	1/29/91	1/29/91	1/29/91	1/29/91	1/29/91	1/29/91	1/29/91
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	2750 E	254 E	4200	1930 E	754	2640 E	20 U
Barium	1150	47.9	1250	27.7	39.8	27.7	1.0 U
Calcium*	143	13.7	133	17.2	13.4	16.1	0.099
Chromium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	6.0 J	2.0 J
Copper	74.3 B	13 B	146 E	27.2	17.7 B	54.2 B	4.8 JB
Lead	1.0 U	1.2 J	2.0 U	3.3 J	2.7 J	4.1 J	1.0 U
Magnesium	59.7	4.45	64.3	17.6	4.56	17.2	0.002 J
Manganese	6090	446	5050	208	485	223	1.0 U
Potassium*	6650	248	9300	499	162	463	.40 U
Sodium*	7130	258	10100	487 E	170	422	0.157
Zinc	285 E	96.3 E	198 E	50.2 E	94.1	60.5 E	4.0 U

NOTES:
(1) Resampling of the Stage 1 Surface Waters
(2) Analyses performed and reviewed by EPA/Ecology Manchester Laboratory in Port Orchard, WA.
(3) SW-17R is a duplicate of SW-7R.
(4) Data qualifiers:
* = units are in mg/L
E = concentration exceeded instrument calibration range.
U = not detected above these levels.
J = estimated value (between the detection limit and the reporting limit).
B = compound detected in blank (sample value is less than 10 times that value).

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Table 5.7
Results of Stage 1 Laboratory Analyses of Surface Water Samples
Dissolved Metals Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-3		SW-4		SW-6		SW-7		SW-8		SW-18	
SAMPLE ID:	198300		198298		198295		198293		198287		198288	
DESCRIPTION:	water		water		water		water		water		water	
SAMPLE DATE:	5-10-90		5-10-90		5-10-90		5-10-90		5-09-90		5-09-90	
ANALYSIS DATE:	5-23-90		5-23-90		5-23-90		5-23-90		5-23-90		5-23-90	
UNITS:	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Aluminum	25600		55	B	420		207000		85	B	71	B
Antimony	200	U			200	U	1.0	U	1.0	U	1.0	U
Arsenic	107	J	1.5	U	100	U	1.5	U	1.5	U	1.5	U
Barium	3480	J	33.3		1140		32		9.1	B	8.9	B
Beryllium	2	UJ	2	U	2	UJ	4.3	J	2	U	2	U
Cadmium	38	J	0.1	U	38.6	J	10.9		0.10	J	0.17	J
Calcium*	565		25.9		196		96.3		15.8		15.7	
Chromium	5	U	5	U	5	U	9.0	J	5	U	5	U
Cobalt	70	J	15	U	15	U	45.9	J	15	U	15	U
Copper	2150	J	2	U	364	J	308	J	6.2	JB	4.5	JB
Iron	77000		3130		14.7	JB	716		2530		1330	
Lead	127	J	2.0	JB	60	U	16.2	B	1.4	JB	3.6	JB
Magnesium*	192		5.79		171		32.0		5.71		5.76	
Manganese	24.9		583		5350		3195		41.5		43.9	
Mercury	0.21		0.02	U	0.02	U	0.02	J	0.02	U	0.02	U
Nickel	44	J	40	U	40	U	121	J	40	U	1.0	U
Potassium*	17910		69.7		16240		239		28.2		30.0	
Selenium	200	U			200	U	2.0	U	2.0	U	2.0	U
Silicon	NA		6.74	J	6970	J	19.3	J	10.4	J	10.7	J
Silver	3	U	3	U	3	U	3	U	3	U	3	U
Sodium*	22120		88.2		19700		166		32.8		34.1	
Thallium	304	J	2.5	U	250	U	2.5	U	2.5	U	2.5	U
Tin	NA		40	U	4000	U	50	U	5050	U	50	U
Vanadium	4	U	4	U	4	U	4	U	4	U	4	U
Zinc	2680	J	19.1	J	52	BJ	1810		12.2	J	10.9	J

NOTES:

(1) Analyses performed and reviewed by Weyerhaeuser Laboratories and EPA/Ecology Manchester Laboratory, respectively. The following USEPA analytical methods were employed: Arsenic: 760; Lead: 7421, 239.2; Mercury: 7471; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7.

(2) Data qualifiers:
 - U = not detected above these levels
 - J = estimated value (between the detection limit and the reporting limit)
 - B = compound detected in blank (sample value is less than 10 times that value)

(3) * units = mg/l

(4) SW-18 is a duplicate of SW-8

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Table 5.7
Results of Stage 2 Laboratory Analyses of Surface Water Samples
Dissolved Metals Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-3R	SW-4R	SW-6R	SW-7R	SW-8R	SW-17R	EQ. BLNK
SAMPLE ID:	478589	478588	478590	478591	478594	478593	478592
DESCRIPTION:	water	water	water	water	water	water	water
SAMPLE DATE:	11/27/90	11/27/90	11/27/90	11/27/90	11/27/90	11/27/90	11/27/90
ANALYSIS DATE:	2/05/91	2/05/91	2/05/91	2/05/91	2/05/91	2/05/91	2/05/91
UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	0.803	<0.20	1.31	0.279	0.326	0.361	<0.20
Barium	0.947	0.075	1.04	0.070	0.088	0.074	0.055
Calcium	166	12.1	158	20.2	13.1	15.6	0.318
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	0.093	<0.025	0.080	<0.025	<0.025	<0.025	0.038
Lead*	1.41	<0.005	0.44	<0.005	<0.005	<0.005	<0.005
Magnesium	63.8	4.19	72.2	19.9	4.45	14.8	<0.10
Manganese	5.78	0.379	5.10	0.211	0.382	0.19	<0.015
Potassium	7230	339	9210	550	224	408	2.68
Sodium	10500	319	9630	571	264	472	2.55
Zinc	0.256	0.068	0.219	<0.02	0.038	<0.02	<0.02

NOTES:
(1) * = Resampling of the Stage 1 Surface Waters
(2) Analyses performed and reviewed by Sound Analytical Services of Tacoma, Washington and EPA/Ecology Manchester Laboratory, Port Orchard, Washington, respectively.
(3) SW-17R is a duplicate of SW-7R

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Table 5.8
Results of Stage 1 Laboratory Analyses of Surface Water Samples
Selected Parameters
Maralco Site, Kent, Washington

SAMPLE LOCATION: SAMPLE ID: DESCRIPTION: SAMPLE DATE: ANALYSIS DATE: UNITS:	SW-3 198300 water 5-10-90 6-08-90 mg/L	SW-4 198298 water 5-10-90 6-08-90 mg/L	SW-6 198295 water 5-10-90 6-08-90 mg/L	SW-7 198293 water 5-10-90 6-08-90 mg/L	SW-8 198287 water 5-09-90 6-08-90 mg/L	SW-18 198288 water 5-09-90 6-08-90 mg/L
Total Cyanide	0.020	<0.004	0.013	<0.004	<0.004	<0.004
Total Kjeldahl Nitrogen	162.89	2.06	93.83	0.88	1.60	1.41
Total Ammonia	188.2	<0.5	108.4	0.6	<0.5	<0.5

NOTES:
(1) Analyses performed and reviewed by Analytical Resources, Inc. and EPA/Ecology Manchester Laboratory, respectively.
(2) SW-18 is a duplicate of SW-8

Table 5.8
Results of Stage 2 Laboratory Analyses of Surface Water Samples*
Selected Parameters
Maralco Site, Kent, Washington

SAMPLE LOCATION: SAMPLE ID: DESCRIPTION: SAMPLE DATE: ANALYSIS DATE: UNITS:	SW-3R 478589 water 11/27/90 12/10 - 18/90 mg/L	SW-4R 478588 water 11/27/90 12/10 - 18/90 mg/L	SW-6R 478590 water 11/27/90 12/10 - 18/90 mg/L	SW-7R 478591 water 11/27/90 12/10 - 18/90 mg/L	SW-8R 478594 water 11/27/90 12/18/90 mg/L	SW-17R 478593 water 11/27/90 12/10 - 18/90 mg/L	EQ. BLANK 478592 water 11/27/90 12/18/90 mg/L
Total Cyanide	0.065	<0.010	0.108	<0.010	<0.010		
Chloride	17600	643	24900	1130	440	1070	0.1 U
Total Ammonia	64.5	2.13	83.5	0.68	1.23		

NOTES:
(1) * = resampling of the Stage 1 Surface Waters.
(2) Analyses performed and reviewed by EPA/Ecology Manchester Laboratory in Port Orchard, WA.
(3) SW-17R is a duplicate of SW-7R

C:\WDOE\WS-VOA.WK2

Table 5.9
Results of Stage 1 Laboratory Analyses of Surface Water Samples
Priority Pollutant Volatile Organic Analyses (PP VOA)
Maralco Site, Kent, Washington

SAMPLE LOCATION: SAMPLE ID: DESCRIPTION: SAMPLE DATE: ANALYSIS DATE: UNITS:	SW-7 198293 water 5-10-90 5-17-90 ug/L	SW-8 198287 water 5-09-90 5-17-90 ug/L	SW-18 198288 water 5-09-90 5-17-90 ug/L	SW-28 198291 water 5-09-90 5-17-90 ug/L	BD-21 198302 water 5-10-90 5-17-90 ug/L
Chloromethane	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U
Methylene chloride	5 U	5 U	5 U	5 U	5 U
*Acetone	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene (total)	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U
Chloroform	5 U	5 U	5 U	2 J	16
1,2-Dichloroethane	5 U	5 U	5 U	5 U	5 U
*2-Butanone	10 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5 U	5 U	5 U	5 U	5 U
Vinyl acetate	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5 U	5 U	5 U	5 U	5 U
Benzene	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U
Bromoform	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5 U	5 U	5 U	5 U	5 U
Toluene	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5 U	5 U	5 U	5 U	5 U
Styrene	5 U	5 U	5 U	5 U	5 U
Xylene (total)	5 U	5 U	5 U	5 U	5 U

NOTES:
1) Analyses performed and reviewed by Weyerhauser Laboratories and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. USEPA Analytical Method 8240 was used.
2) Data qualifiers:
   U = not detected above these levels
3) SW-18 is a duplicate of SW-8
   SW-28 and BD-21 are equipment blanks
4) * = common laboratory contaminant

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Table 5.10
Results of Stage 1 Laboratory Analyses of Surface Water Samples
Priority Pollutant Semivolatile Organic Analysis (PP BNA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-7	SW-7	SW-7R**	SW-8	SW-8R**	SW-17R**	SW-18	SW-24	SW-28	BD-21
SAMPLE ID:	198293	198293 (RE)	478591	198287	478594	478593	198288	198303	198291	198302
DESCRIPTION:	water	water	water	water	water	water	water	water	water	water
SAMPLE DATE:	5-10-90	5-10-90	11-27-90	5-09-90	11-27-90	11-27-90	5-09-90	5-10-90	5-09-90	5-10-90
EXTRACTION DATE:	5-18-90	6-5-90	11-30-90	5-18-90	11-30-90	11-30-90	5-18-90	5-18-90	6-5-90	5-18-90
ANALYSIS DATE:	5-25-90	6-08-90	12-12-90	5-25-90	12-12-90	12-12-90	5-25-90	5-25-90	6-08-90	5-25-90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Phenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)Ether	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Benzyl Alcohol	10 UJ	16 U	2 U	10 U	34 U	8 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2-Methylphenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl)Ether	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
4-Methylphenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
N-Nitroso-Di-n-Propylamine	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Nitrobenzene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Isophorone	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2-Nitrophenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Benzoic Acid	50 UJ	78 U	6 U	50 U	84 U	21 U	50 U	50 U	50 U	50 U
bis(2-Chloroethoxy)Methane	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Naphthalene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	16 U	REJ	10 U	REJ	REJ	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Naphthalene, 1-Methyl-			1 U		17 U	4 U				
Hexachlorocyclopentadiene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50 UJ	78 U	2 U	50 U	34 U	8 U	50 U	50 U	50 U	50 U
2-Chloronaphthalene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2-Nitroaniline	50 U	78 U	2 U	50 U	34 U	8 U	50 U	50 U	50 U	50 U
Dimethyl Phthalate	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10 UJ	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
3-Nitroaniline	50 U	78 U	REJ	50 U	REJ	REJ	50 U	50 U	50 U	50 U
Acenaphthene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	50 UJ	78 U	6 U	50 U	84 U	21 U	50 U	50 U	50 U	50 U
4-Nitrophenol	50 U	78 U	6 U	50 U	84 U	21 U	50 U	50 U	50 U	50 U
Dibenzofuran	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
2,4-Dinitrotoluene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U

Table 5.10
Results of Stage 1 Laboratory Analyses of Surface Water Samples
Priority Pollutant Semivolatile Organic Analysis (PP BNA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	SW-7	SW-7	SW-7R**	SW-8	SW-8R**	SW-17R**	SW-18	SW-24	SW-28	BD-21
SAMPLE ID:	198293	198293 (RE)	478591	198287	478594	478593	198288	198303	198291	198302
DESCRIPTION:	water	water	water	water	water	water	water	water	water	water
SAMPLE DATE:	5-10-90	5-10-90	11-27-90	5-09-90	11-27-90	11-27-90	5-09-90	5-10-90	5-09-90	5-10-90
EXTRACTION DATE:	5-18-90	6-5-90	11-30-90	5-18-90	11-30-90	11-30-90	5-18-90	5-18-90	6-5-90	5-18-90
ANALYSIS DATE:	5-25-90	6-08-90	12-12-90	5-25-90	12-12-90	12-12-90	5-25-90	5-25-90	6-08-90	5-25-90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Diethylphthalate	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Fluorene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
4-Nitroaniline	50 U	78 U	6 U	50 U	84 U	21 U	50 U	50 U	50 U	50 U
4,6-Dinitro-2-Methylphenol	50 UJ	78 U	2 U	50 U	34 U	8 U	50 U	50 U	50 U	50 U
N-Nitrosodiphenylamine*	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
4-Bromophenyl-phenylether	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Pentachlorophenol	50 UJ	78 U	6 U	50 U	84 U	21 U	50 U	50 U	50 U	50 U
Phenanthrene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Anthracene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Carbazole			1 UJ		17 UJ	4 UJ				
Di-n-Butylphthalate	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Fluoranthene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Pyrene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Retene			1 U		17 U	4 U				
Butylbenzylphthalate	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
3,3-Dichlorobenzidine	20 U	31 U	1 U	20 U	17 U	4 U	20 U	20 U	20 U	20 U
Benzo(a)Anthracene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Chrysene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Di-n-Octyl Phthalate	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Benzo(b)Fluoranthene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Benzo(k)Fluoranthene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Benzo(a)Pyrene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Dibenz(a,h)Anthracene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	16 U	1 U	10 U	17 U	4 U	10 U	10 U	10 U	10 U

NOTES:

(1) Analyses performed and reviewed by Weyerhauser Laboratories and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. USEPA Analytical Method 8270 was used.

(2) Data qualifiers:
U = not detected above these levels

(3) * = Cannot be separted from diphenylamine.

(4) (RE) = Re-extract. The initial analysis of the sample showed surrogate recoveries and/or internal standard recoveries outside QC limits, so the sample was re-analyzed. Both the initial and re-extract analyses are presented in the table.

(5) SW-18 is a duplicate of SW-8
SW-24, SW-28 and BD-21 are equipment blanks

(6) ** = Resampling of the Stage 1 surfacewaters

(7) SW-17R is a duplicate of SW-7R

TABLE 5.11
INDICATOR PARAMETERS

WASTE CHARACTERISTIC INORGANICS: INDICATOR PARAMETERS

Soil / Sediment	Surface Water
Aluminum	Aluminum
Barium	Barium
Calcium	Calcium
Chromium	Copper
Copper	Lead
Lead	Magnesium
Manganese	Manganese
Potassium	Potassium
Sodium	Sodium
Zinc	Zinc
Cyanide	Cyanide
Total Kjeldahl Nitrogens	Total Kjeldahl Nitrogens
Ammonia	Ammonia
Chloride	Chloride

ORGANIC PRIORITY POLLUTANTS: INDICATOR PARAMETERS

Soil / Sediment	Surface Water
Polycyclic Aromatic Hydrocarbons	Polycyclic Aromatic Hydrocarbons

NOTES:
(1) No indicator parameters were selected for groundwater.
The Target Analyte List for metals, volatile organics, and base neutral acids, and the selected geochemical parameters were analyzed for Stage 2 groundwater sampling.

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Table 5.12
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Total Metal Analysis
Target Analyte Metals and Indicator Metals
Maralco Site, Kent, Washington

SAMPLE LOCATION:	BH-1	BH-2	BD-5	BD-6	BD-8	BD-9
DEPTH INTERVAL (ft., BGS):	2.3-2.6	2.1-2.7	2.4-2.5	3.5-4.0	1.0-1.5	1.5-2.0
SAMPLE ID:	368501	368502	368507	368509	368511	368512
DESCRIPTION:	baghouse dust	baghouse dust	black dross	black dross	black dross	black dross
SAMPLE DATE:	9/6/90	9/6/90	9/6/90	9/7/90	9/7/90	9/7/90
UNITS:	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
Aluminum*	172000 B,N	130000 B,N	211000 B,N	155000 B,N	130000 B,N	140000 B,N
Antimony	<3.15		<2.88	<2.89		<2.78
Arsenic	<0.633		0.722	2.75		1.94
Barium*	65.2 N	81.2 N	91.5 N	66.1 N	91.5 N	76.4 N
Beryllium	1.26		2.6	1.88		1.94
Cadmium	2.05		5.19	2.31		2.36
Calcium*	2840	4200	6800	4340	5120	5000
Chromium*	153 B,N	189 B,N	196 B,N	119 B,N	412 B,N	120 B,N
Cobalt	4.1		7.36	3.47		11
Copper*	1200	1420	2860	1660	1200	746
Iron	3630 B		8100 B	3040 B		6700 B
Lead*	110	108	144	115	93.1	97.2
Magnesium*	19200 N	15000 N	21600 N	20500 N	24800 N	22800 N
Manganese*	1510 B	1100 B	1960 B	1070 B	1000 B	986 B
Mercury	0.26		0.351	0.064		0.059
Nickel	31.5 B,N		67.9 B,N	39.1 B,N		36.1 B,N
Potassium*	109000 N	86600 N	17300 N	43400 N	115000 N	70700 N
Selenium	<0.633		<0.577	<0.578		<0.555
Silver	<1.57		<1.44	<1.45		<1.39
Sodium*	93100	65000	15900	27500	45000	33000
Thallium	<0.633		<0.577	<0.578		<0.555
Vanadium	84.7		137	84.8		197
Zinc*	773 B	871 B	2000 B	1060 B	952 B	643 B

Table 5.12
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Total Metal Analysis
Target Analyte Metals and Indicator Metals
Maralco Site, Kent, Washington

SAMPLE LOCATION:	BD-10	BD-11	BD-12	BD-13	BD-113	BD-14	BD-15
DEPTH INTERVAL (ft., BGS):	3.5-4.0	2-2.5	0-1.0	1.5-2.5	1.5-2.5	3.5-4.0	2.5-3.5
SAMPLE ID:	368513	368514	368515	368516	368517	368518	368519
DESCRIPTION:	black dross	black dross	black dross	black dross	black dross	black dross	black dross
SAMPLE DATE:	9/7/90	9/7/90	9/7/90	9/7/90	9/7/90	9/7/90	9/7/90
UNITS:	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
Aluminum*	194000 B,N	147000 B,N	185000 B,N	153000 B,N	191000 B,N	166000 B,N	175000 B,N
Antimony	4.65		3.9				3.5
Arsenic	8.61		4.87				5.25
Barium*	120 N	128 N	152 N	66.8 N	96.6 N	86.6 N	105 N
Beryllium	8.377		5.65				2.8
Cadmium	6.98		7.8				5.07
Calcium*	23000	7600	12500	4700	6300	6700	7350
Chromium*	349 B,N	140 B,N	1860 B,N	1200 B,N	176 B,N	324 B,N	146 B,N
Cobalt	6.28		8.38				7.52
Copper*	4600	2100	2180	1600	2850	5400	1290
Iron	6500 B		6000 B				7200 B
Lead*	116	129	214	103	149	81.1	70
Magnesium*	30000 N	27500 N	39600 N	19700 N	29000 N	24300 N	33200 N
Manganese*	893 B	827 B	1060 B	1200 B	1400 B	841 B	1220 B
Mercury	0.238		0.155				0.076
Nickel	116 B,N		56.5 B,N				57.7 B,N
Potassium*	27900 N	57000 N	29000 N	22400 N	29800 N	33600 N	17500 N
Selenium	<0.931		<0.780				<0.700
Silver	<2.33		<1.95				<1.75
Sodium*	25600	21000	18900	16200	21500	32400	16500
Thallium	<0.931		<0.780				<0.700
Vanadium	98.4		280				124
Zinc*	6100 B	1730 B	2000 B	780 B	1200 B	2820 B	1320 B

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Table 5.12
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Total Metal Analysis
Target Analyte Metals and Indicator Metals
Maralco Site, Kent, Washington

SAMPLE LOCATION:	BD-16	BD-17	BD-18	BB-1	BB-2	BB-3
DEPTH INTERVAL (ft., BGS):	3.0-4.0	3.5-4.0	3.0-4.0			
SAMPLE ID:	378522	378525	378527	368508	368520	368534
DESCRIPTION:	black dross	black dross	black dross	water	water	water
SAMPLE DATE:	9/10/90	9/10/90	9/10/90	9/7/90	9/7/90	9/10/90
UNITS:	ug/g	ug/g	ug/g	ug/ml	ug/ml	ug/ml
Aluminum*	145000 B,N	18600 B,N	181000 B,N	0.36 B	0.25 B	0.18 B
Antimony						
Arsenic						
Barium*	167 N	236 N	289 N	<0.003	<0.003	<0.003
Beryllium						
Cadmium						
Calcium*	13900	10100	10000	1.8 B	1.7 B	0.59 B
Chromium*	322 B,N	207 B,N	172 B,N	<0.006	<0.006	<0.006
Cobalt						
Copper*	2100	1300	1100	0.027 B	0.016 B	0.01 B
Iron						
Lead*	172	176	168	0.01 B	0.002 B	0.004 B
Magnesium*	38200 N	61700 N	45000 N	0.24	<0.10	<0.10
Manganese*	879 B	1270 B	1100 B	0.005 B	0.004 B	0.002 B
Mercury						
Nickel						
Potassium*	42000 N	22000 N	21700 N	<1.0	<1.0	<1.0
Selenium						
Silver						
Sodium*	30600	26000	20100	0.72 B	0.69 B	0.6 B
Thallium						
Vanadium						
Zinc*	1870 B	960 B	864 B	0.043 B	0.024 B	0.032 B

NOTES:

(1) Analyses performed and reviewed by AM Test, Inc. in Redmond, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. The following USEPA Analytical Methods were employed: Arsenic: 7060; Lead: 7421, 239.2; Mercury: 7470; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7. Dates of analyses were: Mercury: 9/21/90; Lead: 9/25 and 10/2/90; Selenium, Thallium, Arsenic: 10/3/90; Antimony: 10/4/90; all others (ICP): 9/29/90.

(2) Data qualifiers:

< = less than detection limit noted.

B = compound detected in blank. For the black dross and baghouse dust matrix, the blank values are not significant in comparison to the sample values.

N = recovery not within control limits.

(3) * = indicator metals

(4) BD-113 is a duplicate of BD-13.
BB-1, BB-2, and BB-3 are equipment blanks.

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Table 5.13
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Composite Samples From Waste Pile Transects
TCLP Metals and Hexavalent Chromium Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	TC–1 Composite	TC–3 Composite	TC–5 Composite	TC–1 Composite	TC–3 Composite	TC–4 Composite	TC–5 Composite
SAMPLE ID:	378535	378539	378538	378536	378540	378541	378537
DESCRIPTION:	black dross	black dross	black dross	black dross	black dross	black dross	black dross
SAMPLE DATE:	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90
ANALYSIS DATE:	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90
UNITS:	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Arsenic	<0.02	<0.02	<0.02				
Barium	<1.0	<1.0	<1.0				
Cadmium	<0.05	<0.05	<0.05				
Chromium	<0.10	<0.10	<0.10				
Lead	0.2	<0.10	<0.10				
Mercury	<0.001	<0.001	<0.001				
Selenium	<0.05	<0.05	<0.05				
Silver	0.07	<0.05	<0.05				
Hexavalent Chromium				<0.062	<0.056	0.087	0.092

NOTES:

(1) Analyses performed and reviewed by AM Test, Inc. in Redmond, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. The following USEPA Analytical Methods were employed: Toxicity Characteristic Leaching Procedure: 1311; Arsenic: 7060; Lead: 7421, 239.2; Mercury: 7470; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7.

(2) Data qualifiers:
< = less than detection limit noted.

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Table 5.14
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Samples
Selected Parameters
Maralco Site, Kent, Washington

SAMPLE LOCATION	DEPTH INTERVAL (ft., BGS)	SAMPLE ID	DESCRIPTION	SAMPLE DATE	AMMONIA (mg/Kg)	TOTAL KJELDAHL NITROGEN (mg/Kg)	CHLORIDE (mg/Kg)	CYANIDE (mg/Kg)
BH-1	2.3-2.6	368501	black dross	9/6/90	292	884	140,642	0.67
BH-2	2.1-2.7	368502	black dross	9/6/90	188	677	150,755	0.42
BD-5	2.4-2.5	368507	black dross	9/6/90	153	4089	15,752	1.30
BD-6	3.5-4.0	368509	black dross	9/7/90	686	3006	59,427	1.50
BD-8	1.0-1.5	368511	black dross	9/7/90	149	554	131,988	0.66
BD-9	1.5-2.0	368512	black dross	9/7/90	95	664	95,593	0.56
BD-10	3.5-4.0	368513	black dross	9/7/90	26	398	2,025	1.04
BD-11	2.0-2.5	368514	black dross	9/7/90	109	824	41,901	1.07
BD-12	0.0-1.0	368515	black dross	9/7/90	46	684	20,541	1.53
BD-13	1.5-2.5	368516	black dross	9/7/90	101	856	30,614	1.08
BD-113	1.5-2.5	368517	black dross	9/7/90	84	3768	30,265	0.96
BD-14	3.5-4.0	368518	black dross	9/7/90	197	879	5,728	1.51
BD-15	2.5-3.5	368519	black dross	9/7/90	145	777	1,655	0.70
BD-16	3.0-4.0	368522	black dross	9/10/90	61	646	80	0.74
BD-17	2.0-3.0	368525	black dross	9/10/90	109	795	108	1.49
BD-18	3.0-4.0	368527	black dross	9/10/90	64	658	81	1.43
HB-4	0.0-1.0	378552	soil	9/11/90	57	760	4	0.25
HB-4	2.0-3.0	378553	soil	9/11/90	13	102	3	<0.21
HB-5	0.0-0.2	378548	soil	9/11/90	109	1098	17	0.65
HB-5	1.0-2.0	378549	soil	9/11/90	28	331	3	0.29
HB-6	0.0-1.0	378550	soil	9/11/90	108	1110	6	0.22
HB-6	2.0-3.0	378551	soil	9/11/90	13	6	4	<0.22
HB-7	0.5-1.3	378533	soil	9/10/90	347	1479	30	1.32
HB-8	0.0-1.0	378544	soil	9/11/90	341	631	65743	0.33
HB-8	2.5-3.0	378545	soil	9/11/90	222	316	42001	0.29
HB-9	0.0-1.0	378542	soil	9/11/90	53	1754	21092	0.51
HB-9	3.0-4.0	378543	soil	9/11/90	206	690	41498	<0.25
HB-11	0.0-0.75	378529	soil	9/10/90	164	1171	58535	0.55
HB-11	1.5-2.5	378530	soil	9/10/90	97	237	17874	<0.22
HB-11	2.5-4.0	378531	soil	9/10/90	64	173	12726	0.33
HB-12	1.0-1.5	378532	soil	9/10/90	201	2373	45153	0.71
HB-13	1.5-2.5	378528	soil	9/10/90	38	593	4175	1.04
HB-14	0.0-1.0	378555	soil	9/12/90	120	1753	5	0.22
HB-14	2.0-3.3	378556	soil	9/12/90	23	298	2	<0.21
HB-114	2.0-3.3	378557	soil	9/12/90	22	279	3	<0.21
HB-15	0.0-0.5	378546	soil	9/11/90	93	885	6	0.30
HB-15	2.0-3.0	378547	soil	9/11/90	27	255	7	<0.18
HB-16	0.0-1.0	378558	soil	9/12/90	128	1807	10	0.21
HB-16	2.0-3.0	378559	soil	9/12/90	21	241	5	<0.18

Table 5.14
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Samples
Selected Parameters
Maralco Site, Kent, Washington

SAMPLE LOCATION	DEPTH INTERVAL (ft., BGS)	SAMPLE ID	DESCRIPTION	SAMPLE DATE	AMMONIA (mg/Kg)	TOTAL KJELDAHL NITROGEN (mg/Kg)	CHLORIDE (mg/Kg)	CYANIDE (mg/Kg)
MW-1	3.0-4.0	398576	soil	9/25/90	12	154	3	<0.21
MW-1	6.0-7.5	398577	soil	9/25/90	33	343	4	<0.27
MW-1	12.0-13.5	398578	soil	9/25/90	55	193	3	<0.25
MW-1	15.0-16.5	398579	soil	9/25/90	46	137	<3	<0.25
MW-2	2.0-3.0	398571	soil	9/25/90	15	169	3	<0.21
MW-2	6.0-7.5	398572	soil	9/25/90	7	72	3	<0.22
MW-2	10.5-12.0	398573	soil	9/25/90	10	90	4	<0.25
MW-2	15.5-16.5	398574	soil	9/25/90	148	693	8	<0.25
MW-3	3.0-4.5	398565	soil	9/24/90	10	81	1936	<0.25
MW-3 dup	3.0-4.5	398567	soil	9/24/90	13	154	1932	<0.25
MW-3	6.5-7.5	398568	soil	9/24/90	47	258	3608	<0.24
MW-3	12.5-13.5	398569	soil	9/24/90	62	155	2517	<0.24
MW-3	15.0-16.5	398570	soil	9/24/90	72	281	2860	<0.23
MW-4	1.5-3.0	398561	soil	9/24/90	34	266	120	<0.27
MW-4	4.5-6.0	398562	soil	9/24/90	12	67	83	<0.23
MW-4	9.0-10.5	398563	soil	9/24/90	97	415	3974	0.73
MW-4	12.0-13.5	398564	soil	9/24/90	13	43	765	<0.22

NOTES:
(1) Analyses performed and reviewed by Analytical Resources, Inc. in Seattle, WA and EPA/Ecology Manchester Laboratory, in Port Orchard, WA, respectively. The following USEPA Analytical Methods were employed: Cyanide: 335.2; Ammonia: 350.1; TKN: 351.1; Chloride: 325.3
(2) Dates of analyses are as follows: Ammonia: 10/7 – 10/23/90, Total Kjeldahl Nitrogen: 10/8 – 11/15/90, Chloride: 10/7 – 17/90, Cyanide: 9/27 – 11/2/90.
(3) BD-113 and HB-114 are duplicates of BD-13 and HB-14 (2.0-3.3).

Table 5.15
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Samples
Total Metal Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	HB–4	HB–4	HB–5	HB–5	HB–6	HB–6	HB–7	HB–8	HB–8	HB–9	HB–9
DEPTH INTERVAL (ft. BGS):	0.0–1.0	2.0–3.0	0.0–0.2	1.0–2.0	0.0–1.0	2.0–3.0	0.5–1.3	0.0–1.0	2.5–3.0	0.0–1.0	3.0–4.0
SAMPLE ID:	378552	378553	378548	378549	378550	378551	378533	378544	378545	378542	378543
DESCRIPTION:	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil
SAMPLE DATE:	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90	9/10/90	9/11/90	9/11/90	9/11/90	9/11/90
ANALYSIS DATE:	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90
UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	5920	5280	153000	5380	8250	7530	99000	188000	9770	17700	15200
Barium	30.5	26.7	69.5	28.5	42.3	41.9	115	79.9	15.3	50.1	63.7
Calcium	2800	2700	3870	2620	2990	2890	8850	4220	1870	2370	2570
Chromium	62.6 J	90.8 J	72.5 J	68.2 J	41.5 J	17.5 J	111 J	154 J	15.0 J	28.0 J	18.4 J
Copper	14.7 B	14.6 B	708	14.7 B	18.0 B	19.4 B	1220	6050	153	133	38.7
Lead	3.2 J	2.0 U	77.9	2.7 J	9.9 J	2.0 J	275	144	6.8 J	22.6	5.7 J
Magnesium	2000	1870	10800	1860	2250	2390	15800	6240	1790	3030	3750
Manganese	137	91.0	1320	114	175	157	693	1520	101	376	238
Potassium	442	600	975	573	791	752	4330	30500	21000	12400	22100
Sodium	299	338	382	302	277	251	1520	33900	20100	10800	20400
Zinc	23.2	17.4	476	23.9	29.5	20.6	999	3280	78.7	111	36.5

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Table 5.15
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Samples
Total Metal Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	HB–11	HB–11	HB–11	HB–12	HB–13	HB–14	HB–14	HB–114	HB–15	HB–15	HB–16	HB–16
DEPTH INTERVAL (ft. BGS):	0.0–0.75	1.5–2.5	2.5–4.0	1.0–1.5	1.5–2.5	0.0–1.0	2.0–3.3	2.0–3.0	0.0–0.5	2.0–3.0	0.0–1.0	2.0–3.0
SAMPLE ID:	378529	378530	378531	378532	378528	378555	378556	378557	378546	378547	378558	378559
DESCRIPTION:	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil
SAMPLE DATE:	9/10/90	9/10/90	9/10/90	9/10/90	9/10/90	9/12/90	9/12/90	9/12/90	9/11/90	9/11/90	9/12/90	9/12/90
ANALYSIS DATE:	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90	9/26/90
UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	55000	10900	4930	179000	198000	9130	5080	5710	8240	7290	9810	5880
Barium	81.2	21.0	12.3	80.0	125	54.8	26.9	30.2	43.2	38.0	56.1	27.7
Calcium	6410	1980	1670	6360	9190	3740	2110	2810	3090	2930	3340	2630
Chromium	66.0 J	40.2 J	107 J	165 J	2.36 J	26.6 J	54.2 J	11.8 J	20.1 J	35.6 J	28.2 J	80.6 J
Copper	1490	59.0	25.6 B	1760	3040	20.3 B	22.6 B	11.4 B	26.5 B	21.6 B	21.0 B	14.7 B
Lead	100	7.6 J	2.0 U	128	209	16	2.5 J	3.4 J	8.1 J	5.1 J	15.3	2.0 U
Magnesium	11500	2190	1640	17900	32400	2480	1420	1970	2570	2250	2540	1910
Manganese	488	111	62.2	2390	1090	223	90.6	107	183	134	269	113
Potassium	38800	9880	5830	35500	18000	790	30 U	347	676	634	765	409
Sodium	29300	12200	5340	25300	12400	353	250	232	183	273	293	345
Zinc	336	32.4	18.0	1240	2700	45.1	16.9	18.8	32.7	36.3	39.2	19.1

NOTES:

(1) Analyses performed and reviewed by AM Test, Inc. and EPA/Ecology Manchester Laboratory, respectively. The following USEPA Analytical Method were employed:
Arsenic: 7060; Lead: 7421, 239.2; Mercury: 7470; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7.
Dates of analyses were: Mercury: 9/21/90; Lead: 9/25 and 10/2/90; Selenium, Thallium, Arsenic: 10/3/90;
Antimony: 10/4/90; all others (ICP): 9/26/90.

(2) Data qualifiers:
U = not detected above these levels
J = estimated value
B = compound detected in blank (sample value is less than 10 times that value)

(3) HB–114 is a duplicate of HB–14

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Table 5.16
Results of Stage 2 Laboratory Analyses of Soils
Total Metal Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW–1	MW–1	MW–1	MW–1	MW–2	MW–2	MW–2
DEPTH INTERVAL (ft., BGS):	3.0–4.0	6.0–7.5	12.0–13.5	15.0–16.5	2.0–3.0	6.0–7.5	10.5–12.0
SAMPLE ID:	398576	398577	398578	398579	398571	398572	398573
DESCRIPTION:	soil	soil	soil	soil	soil	soil	soil
SAMPLE DATE:	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90
ANALYSIS DATE:	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90
UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	13700	14000	14700	9390	10800	10300	8590
Barium	55.8 N	56.6 N	64.4 N	36.4 N	43.2 N	40.0 N	37.3 N
Calcium	5580	5370	5040	4140	4460	4290	3670
Chromium	15.4 N	20.9 N	17.8 N	14.0 N	21.5 N	16.8 N	17.9 N
Copper	21.3 N	22.6 N	28.5 N	17.7 N	16.6 N	14.5 N	15.3 N
Lead	2.97	2.80	3.04	1.85	2.03	1.83	1.94
Magnesium	3040	3270	3100	2210	2480	2130	2010
Manganese	157 N	180 N	128 N	95.2 N	161 N	105	135 N
Potassium	391	528	654	394	449	381	329
Sodium	846	893	807	633	691	822	608
Zinc	27.3 N	30.0 N	31.5 N	25.1	23.0 N	23.2 N	23.7 N

Table 5.16
Results of Stage 2 Laboratory Analyses of Soils
Total Metal Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW–2	MW–3	MW–3 dup	MW–3	MW–3	MW–3	MW–4	MW–4	MW–4	MW–4
DEPTH INTERVAL (ft., BGS):	15.5–16.5	3.0–4.5	3.0–4.5	6.5–7.5	12.5–13.5	15.0–16.5	1.5–3.0	4.5–6.0	9.0–10.5	12.0–13.5
SAMPLE ID:	398574	398565	398567	398568	398569	398570	398561	398562	398563	398564
DESCRIPTION:	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil
SAMPLE DATE:	9/25/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90
ANALYSIS DATE:	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90
UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Aluminum	22900	13500	13400	31800	17100	15300	17100	18200	21800	9770
Barium	88.2 N	45.7 N	51.9 N	124 N	65.3 N	70.2 N	40.7 N	62.7 N	86.1 N	25.8 N
Calcium	7810	5530	5490	7690	6370	5850	5250	5680	7190	5230
Chromium	24.3 N	38.4 N	27.7 N	29.4 N	30.0 N	24.3 N	26.6 N	27.9 N	34.3 N	55.5 N
Copper	54.1 N	18.3 N	21.4 N	38.6 N	20.3 N	25.0 N	22.6 N	20.6 N	34.5 N	10.7 N
Lead	4.26	2.03	2.29	5.88	2.47	3.09	2.67	2.48	3.92	1.23
Magnesium	5180	2070	2060	5950	3110	3530	2870	3010	5430	1590
Manganese	396 N	148 N	172 N	222 N	177 N	204 N	122 N	131 N	250 N	106 N
Potassium	924	2870	2840	5750	1110	857	3380	3910	3820	800
Sodium	1790	2340	2420	3690	2380	2280	1480	1630	3610	1630
Zinc	38.5 N	22.9 N	25.4 N	53.8 N	31.4 N	34.3 N	29.3 N	32.6 N	40.7 N	22.4 N

NOTES:
(1) Analyses performed and reviewed by Weyerhauser Laboratories and EPA/Ecology Manchester Laboratory, respectively. USEPA analytical method 6010 (200.7) was used for ICP determinations. Lead was analyzed by method 7421, 239.2.
(2) Data qualifiers:
N = not within control limits

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Table 5.17
Results of Stage 2 Laboratory Analyses of Soil Samples
Volatile Organic Analysis (VOA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-1	MW-1	MW-1	MW-1	MW-1 dup	MW-2	MW-2	MW-2	MW-2	MW-2E
DEPTH INTERVAL (ft. BGS):	3.0-4.0	6.0-7.5	12.0-13.5	15.0-16.5	15.0-16.5	2.0-3.0	6.0-7.5	10.5-12.0	15.5-16.5	Eq.Blank
SAMPLE ID:	398576	398577	398578	398579	398580	398571	398572	398573	398574	398575
DESCRIPTION:	soil	soil	soil	soil	soil	soil	soil	soil	soil	water
SAMPLE DATE:	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90	9/25/90
ANALYSIS DATE:	10/4/90	10/4/90	10/4/90	10/4/90	10/5/90	10/4/90	10/4/90	10/4/90	10/4/90	10/1/90
UNITS:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/L
Chloromethane	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	15 U	10 U
Bromomethane	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	15 U	10 U
Vinyl Chloride	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	15 U	10 U
Chloroethane	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	15 U	10 U
Methylene Chloride	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Acetone*	13 U	7 J	13 J	13 U	12 J	22 J	98 J	79 J	170 J	10 U
Carbon Disulfide	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
1,1-Dichloroethene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
1,1-Dichloroethane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
1,2-Dichloroethene (total)	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Chloroform	6 U	7 U	7 U	6 U	7 U	2 J	6 U	7 U	7 U	2 J
1,2-Dichloroethane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
2-Butanone	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	21 J	10 U
1,1,1-Trichloroethane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Carbon Tetrachloride	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Vinyl Acetate	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	15 U	10 U
Bromodichloromethane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
1,2-Dichloropropane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
cis-1,3-Dichloropropene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Trichloroethene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Dibromochloromethane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
1,1,2-Trichloroethane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Benzene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Trans-1,3-Dichloropropene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Bromoform	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
4-Methyl-2-Pentanone	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	15 U	10 U
2-Hexanone	13 U	14 U	14 U	13 U	13 U	11 U	13 U	14 U	15 U	10 U
Tetrachloroethene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
1,1,2,2-Tetrachloroethane	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Toluene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Chlorobenzene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Ethylbenzene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Styrene	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U
Xylene (total)	6 U	7 U	7 U	6 U	7 U	6 U	6 U	7 U	7 U	5 U

Table 5.17
Results of Stage 2 Laboratory Analyses of Soil Samples
Volatile Organic Analysis (VOA)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-3	MW-3 dup	MW-3	MW-3	MW-3	MW-4	MW-4	MW-4	MW-4
DEPTH INTERVAL (ft. BGS):	3.0-4.5	3.0-4.5	6.5-7.5	12.5-13.5	15.0-16.5	1.5-3.0	4.5-6.0	9.0-10.5	12.0-13.5
SAMPLE ID:	398565	398567	398568	398569	398570	398561	398562	398563	398564
DESCRIPTION:	soil	soil	soil	soil	soil	soil	soil	soil	soil
SAMPLE DATE:	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90
ANALYSIS DATE:	10/3/90	10/3/90	10/3/90	10/3/90	10/4/90	10/3/90	10/3/90	10/3/90	10/3/90
UNITS:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Chloromethane	14 U	14 U	14 U	14 U	14 U	13 U	15 U	14 U	13 U
Bromomethane	14 U	14 U	14 U	14 U	14 U	13 U	15 U	14 U	13 U
Vinyl Chloride	14 U	14 U	14 U	14 U	14 U	13 U	15 U	14 U	13 U
Chloroethane	14 U	14 U	14 U	14 U	14 U	13 U	15 U	14 U	13 U
Methylene Chloride	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Acetone*	17 UJ	14 U	85 B	80 J	110 J	20 UJ	64 B	190	61 B
Carbon Disulfide	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
1,1-Dichloroethene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
1,1-Dichloroethane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
1,2-Dichloroethene (total)	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Chloroform	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
1,2-Dichloroethane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
2-Butanone	14 U	14 U	10 J	6 J	16 J	13 U	15 U	23	13 U
1,1,1-Trichloroethane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Carbon Tetrachloride	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Vinyl Acetate	14 U	14 U	14 U	14 U	14 U	13 U	15 U	14 U	13 U
Bromodichloromethane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
1,2-Dichloropropane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
cis-1,3-Dichloropropene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Trichloroethene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Dibromochloromethane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
1,1,2-Trichloroethane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Benzene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Trans-1,3-Dichloropropene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Bromoform	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
4-Methyl-2-Pentanone	14 U	14 U	14 U	14 U	14 U	13 U	15 U	14 U	13 U
2-Hexanone	14 U	14 U	14 U	14 U	14 U	13 U	15 U	14 U	13 U
Tetrachloroethene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
1,1,2,2-Tetrachloroethane	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Toluene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Chlorobenzene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Ethylbenzene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Styrene	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U
Xylene (total)	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6 U

NOTES:

(1) Analyses performed and reviewed by Pacific Northwest Environmental Laboratory in Redmond, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. USEPA Analytical Method 8270 was used.

(2) Data qualifiers:

- U = not detected above these levels
- J = estimated value
- B = compound detected in blank
- * = suspected laboratory contaminant

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Table 5.18
Results of Stage 2 Laboratory Analyses of Soil Samples
Semivolatile Organic Analysis: Polynuclear Aromatic Hydrocarbons
Maralco Site, Kent, Washington

SAMPLE LOCATION: DEPTH INTERVAL (ft. BGS): SAMPLE ID: DESCRIPTION: SAMPLE DATE: EXTRACTION DATE: ANALYSIS DATE: UNITS:	MW-1 3.0-4.0 398576 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-1 6.0-7.5 398577 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-1 12.0-13.5 398578 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-1 15.0-16.5 398579 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-2 2.0-3.0 398571 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-2 6.0-7.5 398572 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-2 10.5-12.0 398573 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-2 15.5-16.5 398574 soil 9/25/90 10/2/90 10/5/90 ug/Kg	MW-3 3.0-4.5 398565 soil 9/24/90 10/1/90 10/4/90 ug/Kg	MW-3 dup 3.0-4.5 398567 soil 9/24/90 10/1/90 10/4/90 ug/Kg
Naphthalene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
2-Methylnapthalene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Acenaphthylene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Acenaphthene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Fluorene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Phenanthrene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Anthracene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Fluoranthene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Pyrene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Benzo(a)anthracene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Chrysene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Benzo(b)fluoranthene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Benzo(k)fluoranthene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Benzo(a)pyrene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Indeno(1,2,3-cd)pyrene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Dibenz(a,h)anthracene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Benzo(g,h,i)perylene	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Dibenzofuran	840 U	920 U	940 U	860 U	740 U	850 U	930 U	990 U	890 U	890 U
Perylene*		950 J	340 J			130 J	170 J	330 J		

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Table 5.18
Results of Stage 2 Laboratory Analyses of Soil Samples
Semivolatile Organic Analysis: Polynuclear Aromatic Hydrocarbons
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-3	MW-3	MW-3	MW-4	MW-4	MW-4	MW-4
DEPTH INTERVAL (ft. B	6.5-7.5	12.5-13.5	15.0-16.5	1.5-3.0	4.5-6.0	9.0-10.5	12.0-13.5
SAMPLE ID:	398568	398569	398570	398561	398562	398563	398564
DESCRIPTION:	soil	soil	soil	soil	soil	soil	soil
SAMPLE DATE:	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90	9/24/90
EXTRACTION DATE:	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90
ANALYSIS DATE:	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90
UNITS:	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Naphthalene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
2-Methylnapthalene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Acenaphthylene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Acenaphthene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Fluorene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Phenanthrene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Anthracene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Fluoranthene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Pyrene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Benzo(a)anthracene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Chrysene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Benzo(b)fluoranthene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Benzo(k)fluoranthene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Benzo(a)pyrene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Indeno(1,2,3-cd)pyrene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Dibenz(a,h)anthracene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Benzo(g,h,i)perylene	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Dibenzofuran	960 U	890 U	890 U	880 U	970 U	960 U	860 U
Perylene*	680 J	170 J	230 J	180 J	350 J	400 J	

NOTES:

(1) Analyses performed and reviewed by Pacific Northwest Environmental Laboratory in Redmond, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. USEPA Analytical Method 8270 was used.

(2) Data qualifiers:
U = not detected above these levels
J = estimated value between the detection limit and the reporting limit

(3) * = Tentatively Identified Compound

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MKE W.O.No:	2121.03.320
Date Issued:	12/10/90
Revised:	1/09/91
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Table 5.19
Results of Stage 2 Laboratory Analyses of Groundwater Samples
Total Metal Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION: SAMPLE ID: DESCRIPTION: SAMPLE DATE: ANALYSIS DATE: UNITS:	MW-1 408586 groundwater 10/2/90 10/2/90 ug/L	MW-2 408584 groundwater 10/1/90 10/1/90 ug/L	MW-3 408589 groundwater 10/1/90 10/1/90 ug/L	MW-330 408583 groundwater 10/1/90 10/1/90 ug/L	MW-4 408588 groundwater 10/1/90 10/1/90 ug/L	MW-Eq. Blank 408585 groundwater 10/1/90 10/1/90 ug/L
Aluminum	17800	2350	3850 E	6070 E	27500	33 JB
Antimony	30 U	30 U	30 U	30 U	30 U	30 U
Arsenic	7.96	5.30	5.38	5.12	17.1	1.5 U
Barium	109	33.3	3530	3470	605	1.1 J
Berylium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	2.0 U	2.0 U	2.0 UJ	2.0 UJ	2.0 U	2.0 U
Calcium*	16.8	21.4	700 E	694 E	69.0	0.391
Chromium	16	5.0 U	5.0 U	5.0 U	25	5.0 U
Cobalt	15 J	5.0 U	61.3	60.0	14 J	5.0 U
Copper	33.5	11.9	17.6	23.1	79.9	29.7
Iron	32500	44400	1140000	1140000	65800	13 J
Lead	5.32	2.0 J	1.0 J	1.0 J	9.51	1.0 U
Manganese	974	2150	39100 E	38000 E	2760	1.2 J
Magnesium*	7.82	6.17	195	193	18.3	0.01752
Mercury	0.12 JH	0.04 UH	0.11 JH	0.058 JH	0.077 JH	0.048 JH
Nickel	15 J	10 U	10 U	10 U	28 J	10 U
Potassium*	2.13	1.58	583	659	532	0.3 U
Selenium	2.0 UJ	2.0 UJ	4.0 UJ	4.0 UJ	2.0 UJ	2.0 UJ
Silver	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Sodium*	7.77	9.87	2005	2130	666	0.081 B
Thallium	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vanadium	49.7	12.1	7.3 J	14.1	90.9	2.0 U
Zinc	543	26.0	33.0	52.1	92.2	8.0 JB

NOTES:

(1) Analyses performed by EPA/Ecology Mancester Laboratory in Port Orchard, WA. The following USEPA analytical methods were employed: Arsenic: 760; Lead: 7421, 239.2; Mercury: 7471; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7.

(2) * = units in mg/L

(3) Data qualifiers:

U = not detected above these levels
J = estimated value
H = exceeded holding time
REJ = data unusable
B = compound detected in blank (sample value is less than 10 times that value)
E = suspected physical/character interference.

(4) MW-330 is a duplicate of MW-3

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MK W.O.NO.: 2121.03.320
Date Issued: 11/20/90
Revised: 1/09/91
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Table 5.20
Results of Stage 2 Field and Laboratory Analyses of Groundwater
Selected Parameters
Maralco Site, Kent, Washington

SAMPLE LOCATION	SAMPLE ID	DESCRIPTION	SAMPLE DATE	TEMP (degree C)	pH	SPECIFIC CONDUCTIVITY (umhos)	ALKALINITY (mg/L)	TDS (mg/L)	AMMONIA-N (mgN/L)	TOTAL CYANIDE (mg/L)
MW-1	408586	water	10/2/90	12.0	6.24	165	49.4	103	0.175	<0.004
MW-2	408584	water	10/1/90	12.3	6.51	297	121.7	154	0.124	<0.004
MW-3	408582	water	10/1/90	16.8	5.58	949	<1	14356	14.638	<0.004
MW-330	408583	water	10/1/90	—	—	—	<1	15284	24.024	<0.004
MW-4	408581	water	10/1/90	16.2	6.92	1440	215.4	3729	6.683	<0.004

NOTES:

(1) Analyses performed by MK field personnel include temperature, pH, and specific conductivity.
All analyses performed following well development.

(2) Fixed laboratory analyses performed and reviewed by Analytical Resources, Inc. in Seattle, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively.
Dates of analyses are as follows: Ammonia: 10/7/90, Total Kjeldahl Nitrogen: 10/8/90, Chloride: 10/7/90, Cyanide: 9/27 – 10/16/90.

(3) MW-330 is a duplicate of MW-3

Table 5.21
Results of Stage 2 Laboratory Analyses of Groundwater Samples
Priority Pollutant Volatile Organics
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-1	MW-2	MW-3	MW-330	MW-4	MW-Eq. Blank	Trip Blank
SAMPLE ID:	408586	408584	408589	408583	408588	408585	408587
DESCRIPTION:	groundwater	groundwater	groundwater	groundwater	groundwater	water	water
SAMPLE DATE:	10/2/90	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90	10/2/90
ANALYSIS DATE:	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Carbon Tetrachloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Acetone	6 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	1 U	1 U	1 U	1 U	1 U	2	1 U
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	1 U	0.5 J	1 U
Bromomethane	1 U	REJ	REJ	REJ	REJ	1 U	1 U
Chloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromomethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methane, Dichlorodiflu+	REJ	REJ	REJ	REJ	REJ	REJ	REJ
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ETHANE, 1,1,2,2-TETRAC+	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Hexachlorobutadiene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Naphthalene	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Total Xylenes	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Chlorotoluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
DBCP	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tert-Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene (Cume+	1 U	1 U	1 U	1 U	1 U	1 U	1 U
p-Isopropyltoluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BENZENE, ETHYL-	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BENZENE, ETHENYL-(STYR+	1 U	1 U	1 U	1 U	1 U	1 U	1 U
BENZENE, PROPYL-	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Chlorotoluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane (EDB)	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Acetate	NAR	NAR	NAR	NAR	NAR	NAR	NAR

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Table 5.21
Results of Stage 2 Laboratory Analyses of Groundwater Samples
Priority Pollutant Volatile Organics
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-1	MW-2	MW-3	MW-330	MW-4	MW-Eq. Blank	Trip Blank
SAMPLE ID:	408586	408584	408589	408583	408588	408585	408587
DESCRIPTION:	groundwater	groundwater	groundwater	groundwater	groundwater	water	water
SAMPLE DATE:	10/2/90	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90	10/2/90
ANALYSIS DATE:	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
4-Methyl-2-Pentanone	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Dibromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sec-Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethe+	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Hexanone	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethane, 1,1,1,2-Tetrac+	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloroprop+	1 U	1 U	1 U	1 U	1 U	1 U	1 U

NOTES:

(1) Analyses performed by EPA/Ecology Manchester Laboratory in Port Orchard, WA. USEPA analytical method 8240 was used.

(2) Data qualifiers:
- U = not detected above these levels
- J = estimated value
- REJ = data unusable
- NAR = no analytical results

(3) MW-330 is a duplicate of MW-3

Table 5.22
Results of Stage 2 Laboratory Analyses of Groundwater Samples
Priority Pollutant Semivolatiles
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-1		MW-2		MW-3		MW-330		MW-4		MW-Eq. Blank	
SAMPLE ID:	408586		408584		408589		408583		408588		408585	
DESCRIPTION:	groundwater		groundwater		groundwater		groundwater		groundwater		water	
SAMPLE DATE:	10/2/90		10/1/90		10/1/90		10/1/90		10/1/90		10/1/90	
ANALYSIS DATE:	10/23/90		10/23/90		10/23/90		10/23/90		10/23/90		10/23/90	
UNITS:	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Benzo (a)pyrene	2	U	2	U	2	U	2	U	2	U	2	U
2,4-Dinitrophenol	9	U	11	U	9	U	9	U	9	U	9	U
Dibenzo (a,h)anthracene	2	U	2	U	2	U	2	U	2	U	2	U
Benzo (a)anthracene	2	U	2	U	2	U	2	U	2	U	2	U
4-Chloro-3-Methylphenol	2	U	2	U	2	U	2	U	2	U	2	U
Benzoic acid	REJ	U	REJ		REJ		REJ		REJ		REJ	
Hexachloroethane	2	U	2	U	2	U	2	U	2	U	2	U
Hexachlorocyclopentadi+	4	U	5	U	4	U	3	U	3	U	4	U
Isophorone	2	U	2	U	2	U	2	U	2	U	2	U
Acenaphthene	2	U	2	U	2	U	2	U	2	U	2	U
Diethylphthalate	0.5	J	2	U	0.3	J	0.2	J	2	U	2	U
Di-n-Butylphthalate	2	U	2	U	2	U	2	U	2	U	2	U
Phenanthrene	2	U	2	U	2	U	2	U	2	U	2	U
Butylbenzylphthalate	2	U	2	U	2	U	2	U	2	U	2	U
N-Nitrosodiphenylamine	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ
Fluorene	2	U	2	U	2	U	2	U	2	U	2	U
Carbazole	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ
Hexachlorobutadiene	2	U	2	U	2	U	2	U	2	U	2	U
Pentachlorophenol	9	U	11	U	9	U	9	U	9	U	9	U
2,4,6-Trichlorophenol	2	U	2	U	2	U	2	U	2	U	2	U
2-Nitroaniline	9	U	11	U	9	U	9	U	9	U	9	U
2-Nitrophenol	2	U	2	U	2	U	2	U	2	U	2	U
Napthalene, 1-Methyl-	2	U	2	U	2	U	2	U	2	U	2	U
Naphthalene	2	U	2	U	2	U	2	U	2	U	2	U
2-Methylnaphthalene	2	U	2	U	2	U	2	U	2	U	2	U
2-Chloronaphthalene	2	U	2	U	2	U	2	U	2	U	2	U
3,3'-Dichlorobenzidine	2	U	2	U	2	U	2	U	2	U	2	U
2-Methylphenol	2	U	2	U	2	U	2	U	2	U	2	U
1,2-Dichlorobenzene	2	U	2	U	2	U	2	U	2	U	2	U
o-Chlorophenol	2	U	2	U	2	U	2	U	2	U	2	U
2,4,5-Trichlorophenol	9	U	11	U	9	U	9	U	9	U	9	U
Nitrobenzene	2	U	2	U	2	U	2	U	2	U	2	U
3-Nitroaniline	9	U	11	U	9	U	9	U	9	U	9	U
4-Nitroaniline	9	UJ	11	UJ	9	UJ	9	UJ	9	UJ	9	UJ
4-Nitrophenol	9	U	11	UJ	9	U	9	UJ	9	U	9	U
Benzyl Alcohol	2	U	2	U	2	U	2	U	2	U	2	U
4-Bromophenyl-phenylet+	2	U	2	U	2	U	2	U	2	U	2	U
2,4-Dimethylphenol	2	U	2	U	2	U	2	U	2	U	2	U
4-Methylphenol	0.5	J	0.3	J	2	U	2	U	2	U	2	U
1,4-Dichlorobenzene	2	U	2	U	2	U	2	U	2	U	2	U
4-Chloroaniline	REJ	U	REJ		REJ		REJ		REJ		REJ	
Phenol	2	U	2	U	2	U	2	U	2	U	2	U
bis(2-Chloroethyl)Ether	2	U	2	U	2	U	2	U	2	U	2	U
bis(2-Chloroethoxy)Met+	2	U	2	U	2	U	2	U	2	U	2	U
BIS(2-ETHYLHEXYL) PHTH+	2	U	2	U	2	U	2	U	4	U	2	U

Table 5.22
Results of Stage 2 Laboratory Analyses of Groundwater Samples
Priority Pollutant Semivolatiles
Maralco Site, Kent, Washington

SAMPLE LOCATION:	MW-1	MW-2	MW-3	MW-330	MW-4	MW-Eq. Blank
SAMPLE ID:	408586	408584	408589	408583	408588	408585
DESCRIPTION:	groundwater	groundwater	groundwater	groundwater	groundwater	water
SAMPLE DATE:	10/2/90	10/1/90	10/1/90	10/1/90	10/1/90	10/1/90
ANALYSIS DATE:	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90	10/23/90
UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Di-n-Octyl Phthalate	2 U	2 U	2 U	2 U	2 U	2 U
Hexachlorobenzene	2 U	2 U	2 U	2 U	2 U	2 U
Anthracene	2 U	2 U	2 U	2 U	2 U	2 U
1,2,4-Trichlorobenzene	2 U	2 U	2 U	2 U	2 U	2 U
2,4-Dichlorophenol	2 U	2 U	2 U	2 U	2 U	2 U
2,4-Dinitrotoluene	2 U	2 U	2 U	2 U	2 U	2 U
Pyrene	2 U	2 U	2 U	2 U	2 U	2 U
Dimethylphthalate	0.3 J	2 U	0.1 J	0.1 J	2 U	2 U
Dibenzofuran	2 U	2 U	2 U	2 U	2 U	2 U
Benzo(ghi)perylene	2 U	2 U	2 U	2 U	2 U	2 U
Indeno (1,2,3-cd)pyrene	2 U	2 U	2 U	2 U	2 U	2 U
Benzo (b)fluoranthene	2 U	2 U	2 U	2 U	2 U	2 U
Fluoranthene	2 U	2 U	2 U	2 U	2 U	2 U
Benzo (k)fluoranthene	2 U	2 U	2 U	2 U	2 U	2 U
Acenaphthylene	2 U	2 U	2 U	2 U	2 U	2 U
Chrysene	2 U	2 U	2 U	2 U	2 U	2 U
Retene	2 U	2 U	2 U	2 U	2 U	2 U
4,6-Dinitro-2-methylph+	9 U	11 U	9 U	9 U	9 U	9 U
1,3-Dichlorobenzene	2 U	2 U	2 U	2 U	2 U	2 U
2,6-Dinitrotoluene	2 U	2 U	2 U	2 U	2 U	2 U
N-Nitroso-di-n-Propyla+	2 U	2 U	2 U	2 U	2 U	2 U
4-Chlorophenyl-phenyle+	2 U	2 U	2 U	2 U	2 U	2 U
bis(2-Chloroisopropyl)+	2 U	2 U	2 U	2 U	2 U	2 U

NOTES:
(1) Analyses performed by EPA/Ecology Manchester Laboratory in Port Orchard, WA. USEPA method 8270 was used.
(2) Data qualifiers:
U = not detected above these levels
J = estimated value
R = data unusable; resampling and reanalysis necessary for verification.
E = suspected physical/character interference
(3) MW-330 is a duplicate of MW-3/c

6.0 PRELIMINARY OUTLINE OF WORK FOR PHASE II REMEDIAL INVESTIGATION

6.1 PURPOSE AND SCOPE

Data presented in Sections 1 through 5 of this report confirmed that groundwater, soils, surface water and sediments at the Maralco site have been affected by past practices at the site, and continue to be impacted by the presence of the large pile of black dross remaining on site. The nature of contamination at Maralco is different from most hazardous waste sites. The high salt content of the dross renders it toxic to plant and animal life. Highly saline brines with some heavy metals are the main groundwater contaminant. While these brines are toxic to freshwater fish and other aquatic organisms, they can be mitigated by dilution. Operation of the pilot plant for treatment of the black dross has shown that the dross itself can be remediated and recycled. However, both historic and ongoing effects of the dross on environmental media must be mitigated. In order to determine whether remedial actions are necessary and to design a remediation program, the extent and severity of environmental contamination must be determined.

This preliminary outline contains several elements of a RI/FS Phase II Work Plan, but does not include the detail of a Work Plan or the necessary attachments. The Phase I results have been used to focus this outline of work for Phase II on filling specific data gaps. The data gathering goals of the Phase II Remedial Investigation at Maralco are to:

1) Determine the nature, aerial extent and concentrations of contamination related to past practices at the site.
2) Determine whether the site presents a threat to human health or the environment.
3) Address compliance of the site with regulatory requirements.
4) Expand and confirm the conceptual model of the site.
5) Compile the information necessary to develop and evaluate remedial alternatives and to select preferred alternatives.

Environmental data will be collected to meet the first four objectives, and these data will be utilized to determine remedial options for the site.

6.2 CONCEPTUAL MODEL

Available data have been reviewed and a preliminary conceptual model of contaminant transport and hydrogeology has been developed for the site. This conceptual model has been utilized to anticipate where contaminants will be found and how they are transported.

Elements of the conceptual model are shown in plan view in Figure 6-1 and in a conceptual cross section in Figure 6-2. As shown in Figure 6-1, major surficial sources of contamination are: 1) the black dross pile, 2) the area between the pile and the building, including the entire south end of the property and around the building to the pilot plant area, 3) the wash ponds, 4) the holding pond, 5) the unnamed ditch and Christopher ditch where the drainages are adjacent to the dross pile, and 6) the former dross storage area. Minor sources of contamination include the diesel tank, potential lab wastes near the residence, black dross spillage near the residence, and contamination from domestic and farm wastes disposed near the residence.

6.2.1 Sources

The dross pile is a source to surface water, sediment, and soil contamination. It is also a source to groundwater contamination via infiltration, first through the pile which leaches salts and contaminants, and then through underlying soils to groundwater. Sediment runoff from the pile into the drainages and onto the lot to the west of the pile expands the source area to all surface areas covered with dross. Additionally, air blown dusts from the pile may be a source of contamination to surface soils downwind of the dross pile.

Standing water was and is present south of the building during the rainy season. This water is on top of dross, which covers the entire south end of the property from the building to the south and west fence lines. The continual hydraulic head in this area during the wet season is expected to facilitate waste migration. Results of this migration are seen in the high salinity of water from monitoring well MW-3. The lagoon to the east of the building was created by IAI in the fall of 1990 and was used to contain water from hydroblasting the dross from the pile and from equipment decontamination. Ecology ordered these practices to cease and instructed IAI to immediately pump the water from the lagoon. However, the lagoon was used to contain equipment decontamination water for several more weeks. Sediments on the floor of the lagoon were covered with salt crystals in October 1990. The lagoon filled with rainwater several times and usually emptied by percolation within several days. The lagoon is formed by above-grade berms made of black dross and is floored by black dross. Percolation from the lagoon indicates that it forms a source to groundwater contamination.

The wash ponds, formerly used in the "salt saver" process and currently used by IAI to wash salts from the dross, may also act as a source to groundwater. The concrete ponds are unlined and contain brines and dross sediments.

The cedar mill to the south of the site contributes wood chips and their degradation products to the surface water drainage. The southern end of the ditch is lined with wood chips from the cedar mill, and the upper few centimeters of ditch sediments are stained red from the south end of the Maralco property to where it was dammed for the Ecology surface water remediation. It is expected that humic acids from the cedar chip degradation have affected the creek banks and surface water. The humic acids may complex with metals sourced from the dross pile. They may also lower and/or buffer the pH of surface and groundwater.

6.2.2 Soils and Groundwater

Soils underlying the entire site are sandy, with interbedded sandy clay layers. The continuity of the clay layers is unknown. Soil borings from the HYTEK sites (1000 feet northeast of the Maralco property) identify a continuous silty clay layer between 80 and 100 feet below grade. This unit has not been reached by the shallow borings drilled at the Maralco Site.

Groundwater beneath the site is very shallow, especially in the southwest corner of the site. Potentiometric surface maps based on water level data from the four on-site monitoring wells indicate groundwater flow is to the north (Figures 3-5, 3-6). The standing water on the southwest quadrant of the site may induce groundwater mounding during the wet season. The effect of the lagoon, wash ponds, and drainages on shallow groundwater cannot be determined from the present well placement.

The extent of groundwater contamination is not well defined. Elevated concentrations of inorganic constituents present in shallow wells MW-3 and MW-4 may indicate one plume originating from the southern end of the site, or two plumes; one at the southern end of the site, and one originating from the holding pond. The vertical extent of the plume has not been identified. Monitoring wells installed to date have not been screened at depths greater than 18 feet below grade. The plume identified is elevated in sodium and potassium chloride. A dense fluid or brine could sink and migrate downward to the base of the aquifer(s).

The extent of soil and groundwater contamination beneath the black dross pile and beneath the Maralco building are not known. Flow of groundwater to the north, combined with the historic ponding south of the building implies that contaminated groundwater extends beneath the Maralco building.

Horizontal groundwater gradients are very flat across the site. Vertical gradients are unknown. Since brines are denser than freshwater, the potential exists for downward migration of contaminants due to density contrasts. Mixing and resultant dilution of the brines with freshwater would be expected.

6.3 DATA NEEDS

Table 6.1 summarizes data needs and the rationale for collection of each data type. Focusing on data collection to meet specific purposes will eliminate collection of unnecessary or redundant data. The data needs are focused on the data gathering goals listed in Section 6.1.

DATUM:
HORIZONTAL – CITY OF KENT SECTION BREAKDOWN
VERTICAL – N.G.V.D. FROM U.S.C.& G.S. BM C-407 RESET

SITE B.M.: ELEV. 26.64
CHISELED SQUARE IN N.W. CORNER OF CONCRETE TRANSFORMER PAD, NEAR N.E. CORNER OF LARGE BUILDING.

MK – ENVIRONMENTAL

FIGURE 6–1
COMPONENTS OF CONCEPTUAL MODEL MARALCO SITE

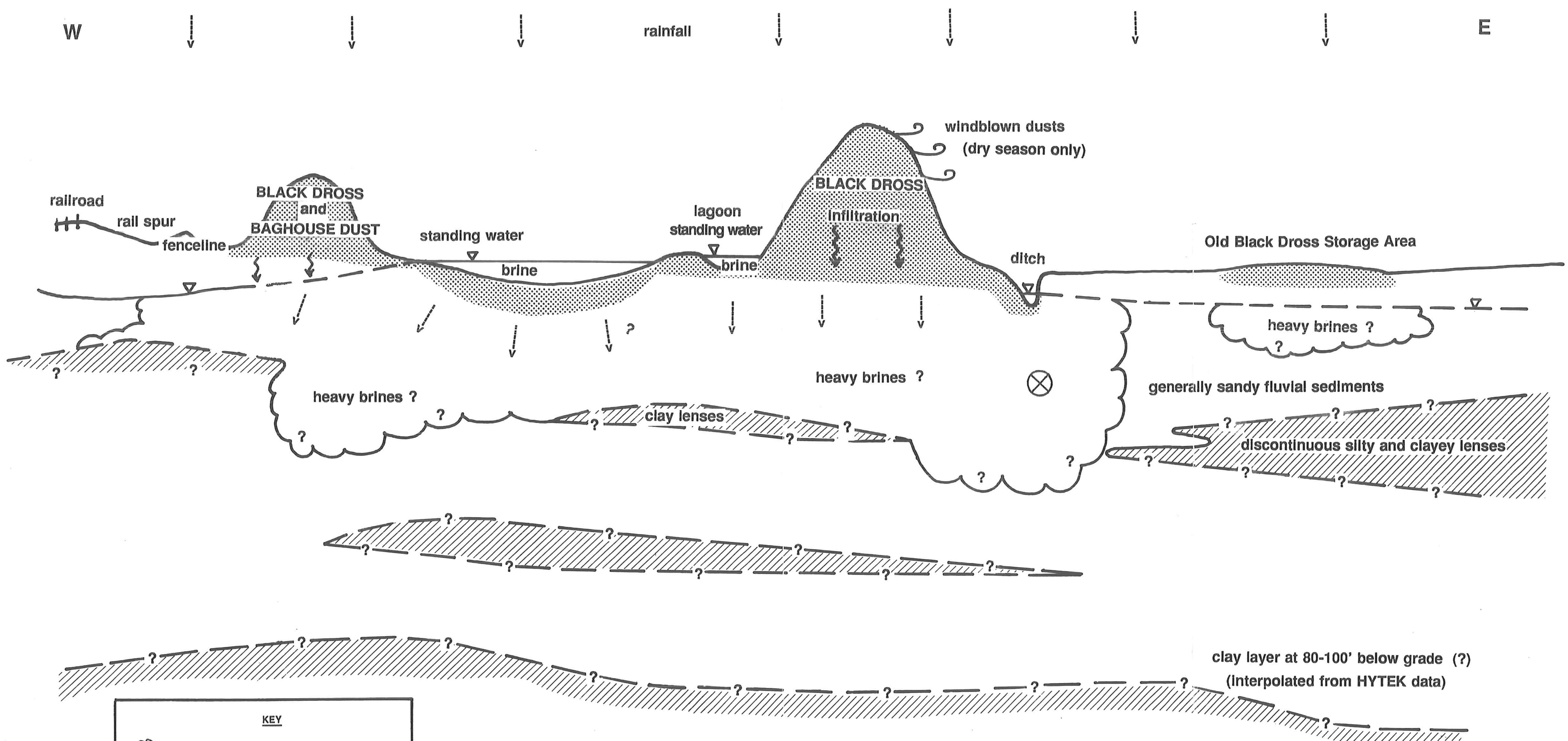
FILE NAME:	PROJECT	DRAFTER
DG123.DWG	3121.8	J BROWN

HORTON DENNIS & ASSOC. INC.
320 SECOND AVENUE SOUTH
KIRKLAND, WASH. 98033-6687

MARALCO ALUMINUM SITE
1' CONTOURS
Date of Photography 10-11-90

DEGROSS AERIAL MAPPING
17520 BOTHELL WAY N.E.
BOTHELL, WASH. 98011

JOB# 90-536
SHEET 1/1



KEY

- Saline KCL and NaCL brines
- Black dross and associated metals contamination
- Clay
- Wet season water level
- Shallow groundwater flow to the north

NOT TO SCALE

MK-ENVIRONMENTAL SERVICES Bellevue, WA		CONCEPTUAL MODEL MARALCO SITE Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 1/09/91	Drafter: LMH	Figure No: 6-2	File Name: FIG6-1

Table 6-1, continued

Cation exchange capacity	X	X			
Groundwater Data: Concentration and distribution of contaminants in groundwater	X	X	X	X	
Presence or absence of off-site contamination	X	X	X	X	
Nature of contamination; heavy brines? Metal ions?	X	X	X		
Hydraulic gradients; horizontal and vertical; flow direction	X	X		X	
Hydraulic conductivity of aquifer(s)	X	X		X	
Underlying aquifers: aquifer interconnections	X	X		X	
Groundwater/surface water interactions	X	X		X	
Surface Water and Sediments: Extent of off-site surface water and sediment contamination	X	X	X	X	
Contribution to surface water from upstream sources	X			X	
Air Transport of dross dusts off-site via air pathway	X	X	X	X	X

7.0 DATA QUALITY OBJECTIVES

Data collected during the Phase II RI shall be of assured quality and defensibility to support decisions concerning cleanup levels and appropriate remedial actions. However, it is important to conduct the investigation in a cost-effective manner that avoids redundant and unnecessary testing. For these purposes, most of the analytical program will be focused on indicator parameters and contaminants of concern, as identified in the Phase I investigation, with a few samples run for full suite analyses to confirm that contaminants are not being missed. The use of indicator parameters will enable the analytical budget to focus on the known contaminants, without extensive analyses for compounds that have not been used on-site. For this preliminary evaluation of contamination, fixed laboratory analytical methods will be utilized, as appropriate.

Data quality objectives are the data quantity and data quality levels required to support decisions associated with the remediation process. Data quantity and data quality will be developed and listed in the Phase II RI Work Plan for the types of data (data needs) that have been identified as necessary for the RI.

Analytical data will be generated on different levels of reliability and reproducibility. The terminology for levels of analytical data is based on EPA Data Quality Objectives (DQO) designations (Table 7-1). Field screening methods (Level I) will be utilized to define broad areas of contamination. More stringent fixed laboratory analytical methods (Levels III, IV and V) will be utilized to verify contamination defined by the screening methods.

Geophysical methods, such as conductivity surveys, or surveys utilizing probes to extract groundwater or soil samples will be utilized to outline the main shallow groundwater plume. These surveys would be confirmed by Level III or IV laboratory analyses of soil and groundwater.

TABLE 7-1

EPA ANALYTICAL LEVELS

Level I	Field Data
Level II	Field Data/Mobil Laboratory
Level III	EPA methods, similar to CLP detection limits less rigorous QA/QC
Level IV	CLP, RAS; rigorous QA/QC
Level V	CLP SAS; rigorous QA/QC Data validation

8.0 PROPOSED PHASE II REMEDIAL INVESTIGATION TASKS

The following sections describe the investigative tasks necessary to obtain the data listed in the Data Needs Section to complete the remedial investigation. Additional details on sampling locations, number of samples, and sampling procedures will be described in a Sampling and Analysis Plan to be issued with the Phase II RI/FS Work Plan. The investigation will be divided into four main areas: 1) sources, 2) soils, 3) groundwater, and 4) sediments and surface water. The soil and groundwater investigation will be integrated and will include a preliminary survey utilizing either geophysical techniques or probe techniques to define the extent of highly conductive (saline) groundwater and soils.

8.1 FACILITIES/SOURCES

8.1.1 Diesel Tank

The 35,000 gallon underground diesel storage tank must be closed in accordance with applicable state and federal regulations. Tank closure involves sampling and removing any contents from the tank, inerting the tank, and either closure in place by filling the tank with inert material, or removal of the tank. The Maralco tank will be removed in accordance with Ecology UST guidance. When the tank pit is opened and the tank is removed, the presence or absence of contamination due to leakage can be verified. Removal and clean closure of the tank will improve the property value for resale by eliminating potential sources of contamination.

Following removal of the tank, the tank pit will be examined for the presence of hydrocarbons. If possible, any contamination will be excavated until clean soils are reached, at which time verification samples will be collected and the pit backfilled with clean fill. If contamination appears to be extensive, gross contamination will be removed immediately; a soil vapor survey will then be utilized to determine the extent of soil contamination, and monitor wells will be utilized to determine the extent of groundwater contamination. The soil will be excavated until verification sampling indicates that contamination has been removed. The pit will then be backfilled.

Initially, ten samples will be collected from the tank pit and analyzed for total petroleum hydrocarbons relative to diesel (TPH/diesel). Samples of saturated soils will also be analyzed for indicator parameters for black dross. All samples will be field screened for organic vapor concentrations using either an Organic Vapor Monitor (OVM) or an HNU photoionizer. One soil boring will be installed downgradient of the tank. Samples will be collected from the boring at the level of the base of the tank and at the top of the water table, and the base of the boring. No monitoring well will be installed unless contamination is observed with field-screening techniques.

8.1.2 Baghouse

The baghouse dust is an extremely hazardous waste due to fish bioassay toxicity. The baghouse equipment, bags, and baghouse dust must be removed from the Maralco building and properly disposed.

Removal of the baghouse will involve the following steps:

1) Sealing off the baghouse area from the remainder of the building interior,

2) Sampling the bag contents for waste disposal criteria, removing the bags and associated dusts,
3) Spray washing the walls and equipment in the baghouse area,
4) Collecting wipe samples of the cleaned walls and equipment to verify clean up, and
5) Removal of all baghouse equipment.

If the remaining equipment is clean of baghouse dust residue, removal of the equipment can be delayed.

The baghouse area will be sealed from the rest of the building using 3 mil visqueen draped from floor to ceiling. Red flagging noting "Hazard - Do not enter" will be posted around the sealed area. The interior of the sealed area will be considered an "exclusion zone" for health and safety purposes. Only authorized personnel wearing the proper personal protective equipment will be allowed entrance. Specific health and safety procedures will be described for working in the exclusion zone.

Grab samples of the baghouse dust will be collected and composited into three samples. These samples will be analyzed for TCLP metals, corrosivity, reactivity, and ignitibility for disposal purposes. One of the composite samples will be analyzed for black dross indicator parameters. The partially filled bags and baghouse dusts will be removed and disposed at a permitted facility by a licensed hazardous waste transporter.

8.1.3 Chlorine Facilities

According to Phil Stansfeld of IAI, chlorine gas is still present in the lines leading from the chlorine area into the refinery. These lines will be tested for the presence and concentration of chlorine gas. If chlorine is present, the lines will be purged. The City of Kent and Kent Fire Department will be notified of any actions to purge chlorine gas from the pipes.

8.1.4 Wash Ponds/Lagoon

The three concrete wash ponds will be emptied of sediments and examined for cracks, breaks, or open joints along seams. If any are noted, a soil boring will be placed adjacent to the ponds and soil samples will be collected to below the base of the ponds.

A soil boring completed as a monitor well will be placed at the northern end of the lagoon, to the southeast of the wash ponds. This well will indicate whether groundwater mounding is occurring due to the presence of the lagoon or wash ponds, and will be one of several borings used to determine the depth of soil contamination related to the black dross pile. The boring will be sampled continuously for logging purposes. Samples will be collected every three feet for analysis of indicator parameters. This boring/well will be utilized as a correlation point for geophysical or probe surveys.

8.1.5 Maralco Building

Dusts inside the Maralco building may contain baghouse dusts or other hazardous components. Wipe samples will be collected from interior building surfaces and analyzed for corrosivity and heavy metals. The building will be inspected to identify other potential environmental or health hazards.

8.1.6 Other Potential Sources

Laboratory: Phil Stansfeld has operated a metallurgical laboratory in the on-site residence for several years. Hydrofluoric acid was utilized in the laboratory to perform extractions. Other common acids used for metal extractions include nitric acid and hydrochloric acid. Mr. Stansfeld will be interviewed regarding the laboratory history, chemicals commonly used in the laboratory, and disposal of those chemicals. City records will be examined to verify if and when the residence was hooked up to the city sewer. The septic tank will be sampled if the laboratory was in use prior to hookup to the city sewer. Sludge or sediment samples may be collected from sewage drainlines leading from the house to the City of Kent sewer lines. These samples will be analyzed for pH and for indicator metals from black dross.

Drums: The empty drums stored in the building and on the northwest corner of the property will be examined and removed from the site. Any unlabeled drums that are not empty will be sampled and analyzed for priority pollutants and properly disposed of.

8.2 GEOPHYSICAL OR RECON PROBE SURVEYS

Geophysical techniques are often useful in exploring a large area for specific chemical or physical properties and allow drilling to be focused on anomalous areas. The high conductivity of the brine plume at Maralco and the shallowness of the groundwater make a surface conductivity survey a reasonable option for plume definition.

The RECON system is an in situ geotechnical tool that can be utilized to obtain soil or groundwater samples. The brine plume at Maralco is a good candidate for exploration using the RECON probe to define the general shape and depth of the plume. If this system is utilized, groundwater samples will be collected at up to 30 locations and analyzed for specific conductivity and salinity. These samples could be collected in 1 to 2 days and analyzed in the field. These data will then be used to direct monitoring well locations and depths. Monitoring well locations will be based on results of either the geophysical or RECON probe surveys.

Details on which of the two above techniques is to be utilized will be included in the Phase II RI Work Plan, and a description of the selected technique will be included in the Field Sampling Plan.

8.3 SOIL

Soil contamination related to specific sources was discussed above. The Phase II RI will be designed to determine the nature and extent of soil contamination related to the main black dross pile and to other places where dross has been handled or stored.

Aerial extent and depth of soil contamination beneath and around the black dross pile will be determined by a combination of shallow (less than 15 feet) and deeper borings in the plant area. It is expected that shallow soils near and beneath the dross pile have become contaminated with dross. Five shallow borings near the pile are initially proposed to determine depth of contamination. Additional borings beneath the pile will be necessary when the dross has been removed. Borings will be located around the black dross pile, on the south side of the building, in areas where cuts have been made through the dross pile, in the IAI decontamination lagoon, and alongside the wash ponds. Some of these soil borings will be completed as monitor wells. Monitoring well locations are discussed in Section 8.4.

One soil boring near the black dross pile will be drilled to a depth of 80 to 100 feet to determine the deeper stratigraphy underlying the site and attenuation of contamination with depth. The boring will be continuously sampled to 30 feet, sampled at 5 foot intervals or at every change in lithology for the remaining 70 feet. Four samples from this boring will be submitted for fixed laboratory analyses of indicator parameters.

8.4 GROUNDWATER

The groundwater investigation will be focused on determining the nature and extent of contamination and groundwater flow directions and rates within the uppermost aquifer. The proposed locations of monitoring wells discussed below may be modified based on geophysical or RECON survey results.

Monitoring wells MW-3 and MW-4 have been affected by one or more sources. Installation of additional probe points to sample groundwater to the north and west of the building will help define the extent of this apparent contaminant plume. The necessity for installing wells within the building will be evaluated on the basis of whether the plume can be defined by wells placed outside the building, and whether groundwater remediation measures might require pumping wells placed within the building.

One well will be placed near the dross pile, south of building and north of pile. This well is expected to be indicative of the most contaminated portion of the plume. An additional well will be placed north of the main pile, adjacent to Christopher ditch. A staff gauge will be installed in the ditch near the well. This well and gauging station will help define the relationship between surface water and groundwater.

At least one deep monitoring well will be installed on-site to determine vertical gradients and to investigate possible downward migration of heavy brines.

Groundwater flow directions and surface water/groundwater interactions will be determined by monthly water level measurements for one year. Water level data will be collected from all wells and staff gauges.

Aquifer testing will consist of slug tests performed on all existing wells. Both rising and falling head tests will be performed, and head versus time data will be recorded using pressure transducers tied into an electronic data logger. Data will be evaluated by the Horslev method, or other methods appropriate to aquifer and well configurations. If the need for groundwater remediation is determined, additional piezometers will be installed and pumping tests will be performed on one or two selected wells during the Feasibility Study (FS) process.

Groundwater samples will be analyzed for the list of indicator parameters developed in the Phase I RI. Samples will be analyzed for both total and dissolved metals. Samples will be collected quarterly for one year to determine seasonal variations. Vertical salinity and conductivity profiles will be measured in each well prior to purging and sampling.

8.5 SURFACE WATER AND SEDIMENTS

Surface water and sediment samples will be collected to determine the extent of contamination, the distance of off-site transport of contaminants, and the contribution of upgradient sources to surface water contamination. One additional sampling location will be placed between the culverted portion of the Christopher Ditch and the outlet from the holding pond. Three additional surface water/sediment sampling locations will be located at 50, 100 and 150 ft downstream from the holding pond culvert. These samples will be analyzed for indicator parameters for water and sediments.

8.6 AIR

Air-borne dusts may be transported off-site or to surrounding areas on-site by high winds during the dry season. To determine if fine-grained dross is being transported, two 24-hour air samplers will be proposed to the south and east of the dross pile. The sampler to the south will be place on top of the fence to the cedar mill and the one to the east will be placed approximately 100 feet from the pile in the field east of the pile. A third sampler for background data will be placed in the northeast quarter of the property. Samples will be analyzed for indicator parameters for black dross. Placement of the samplers may change based upon wind rate data that will be obtained from the weather station at SeaTac Airport.

8.7 ARAR ANALYSIS

Data collected during the Phase I and II RI will be compared to applicable or relevant and appropriate existing federal, state, and local regulatory requirements (ARARs). These will include wetland regulations as well as hazardous waste and other environmental regulations.

8.8 BASELINE RISK ASSESSMENT

Based on data collected during the RI, a baseline risk assessment (RA) of the site will be conducted. The RA will address the site prior to remediation of any soils or groundwater, with the assumption that the main pile of black dross will be removed and will focus on determining if the site poses a threat to human health or the environment. The risk assessment will be based on a group of contaminants of concern and will be oriented towards determining what method under MTCA (A, B, or C) can be utilized in determining clean-up standards for the site.

The need for a post-remedial action risk assessment will be determined based upon the baseline risk assessment and data collected following remedial action at the site.

8.9 REMEDIAL INVESTIGATION SUMMARY REPORT

Results from both phases of the RI will be combined into a Remedial Investigation Summary report. This report will summarize chemical and physical data into tables, graphs, and maps of contaminant distribution, piezometric surface maps, and other graphic representations of the site. The report will develop and discuss the revised site conceptual model, which will be utilized to explain contaminant distribution and transport. A cross-section indicating the relationship of contaminants to source units and stratigraphy will be developed. Results of the Risk Assessment, including preliminary determination of clean-up levels will be included in the RI Summary Report.

ARARs will be addressed for groundwater, sediments and soils. The risk assessment will be described and results summarized. The report will include suggestions for remediation of groundwater, soils, surface waters and sediments.

9.0 FEASIBILITY STUDY

Based upon the results of the Phase II RI, including the ARARs and Risk Assessment, a preliminary list of remedial options will be developed and discussed. Potential remedial options for soils include washing to remove salts, similar to the pilot study wash process used to treat the black dross. This washing would not remove heavy metals, which may affect resale potential at the site. Migration of the heavy metals in soils is expected to be limited. A determination of whether soils containing heavy metals must be removed from the site will be based on the levels present and the associated risk to human health and the environment. Determination of soil clean up levels under MTCA will be addressed in the FS.

Groundwater is contaminated primarily by saline brines and some heavy metals. The necessity for remediation of groundwater by flushing with injected water, or flushing by natural infiltration will be evaluated when the extent and concentrations of groundwater contamination are known.

Surface water and sediments in the ditches may also need to be remediated. The wetlands designation may complicate selection of remedial technologies for the sediments.

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APPENDIX I

BORING LOGS

MK-ENVIRONMENTAL SERVICES
A DIVISION OF MK-FERGUSON

BOREHOLE LOG

PROJECT NUMBER:	2121-05
WELL NUMBER:	MW-1

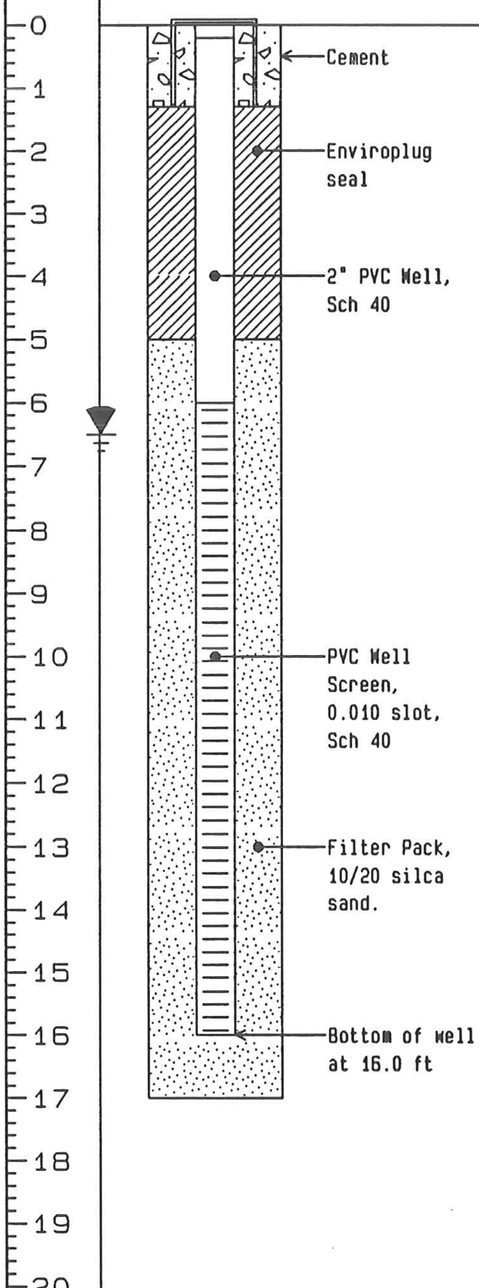
PROJECT: MARALCO SITE	LOCATION: Kent, Washington
COORDINATES: N156223.089 E1653339.344	DRILLING CONTRACTOR: Tacoma Pump and Drilling

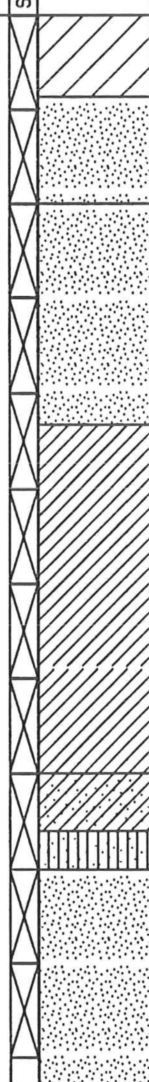
DRILL MAKE AND MODEL:	DEPTH TOP OF ROCK:	DEPTH CASING AND SIZES:
Hollow stem auger	ft.	16.0 ft / 2" PVC

G.S. ELEVATION:	TOP PVC ELEV.:	ANGLE FROM VERTICAL AND BEARING	DEPTH TO BOTTOM OF HOLE:	HOLE SIZE:
26.4	26.26	Vertical	17.0 ft.	4-1/4"

WATER LEVEL (INITIAL):	FLUID AND ADDITIVES:	DATE START:	DATE FINISH:	LOGGER:
6.5 ft.	None	9-25-90	9-25-90	Marian Allen

DEPTH IN FEET | WELL CONSTRUCTION DETAIL | Sample Int. | GRAPHIC SYMBOL | LITHOLOGIC DESCRIPTION | BLOW COUNTS





LITHOLOGIC DESCRIPTION	BLOW COUNTS
0.0-1.3' CLAY; brown, silty soil with mass of rootlets.	6,9,6
1.3-3.0' SAND; brown, slighty clayey, loose dry, minor roots, damp at 2.5-3.0'.	7,6,7
3.0-6.5' SAND; mottled tan and orange brown fine grained, silty, roots and rootlets, no structures, slightly damp.	5,6,5
- Becomes medium sand (gradational) at 4.9', then fines downward to fine sand.	4,3,3
- Fine to medium, brown to 6.5'	
6.5-12.9' CLAY; gray, high plasticity, minor silt, sharp contact, moist, roolets still present, saturated, possible shell fragments.	1,1,3
- 1.5" Brown, clayey sand stringers at 9.3' and 9.8 ft.	2,3,4
- 1" Medium black sand with red grains at 10.0-10.1' (sand contains water)	1,1,1
- Sandy partings at 11.2, 11.4-11.5'	
	1 (to 18")
- Increasing sand content 12.0-12.9'	
- Sharp contact at 12.9'	1,1,5
12.9-13.5' SILTY SAND; rootlets still present, slight pink coloration at contact.	10,11,19
13.5-17.0' SAND; dark gray, fine to medium grained.	
	3,3,6

NOTE: Problems during well installation - Borehole filled with silt/sand slurry. Set well through augers, had to lift up augers. Well development may be slow.

MK-ENVIRONMENTAL SERVICES
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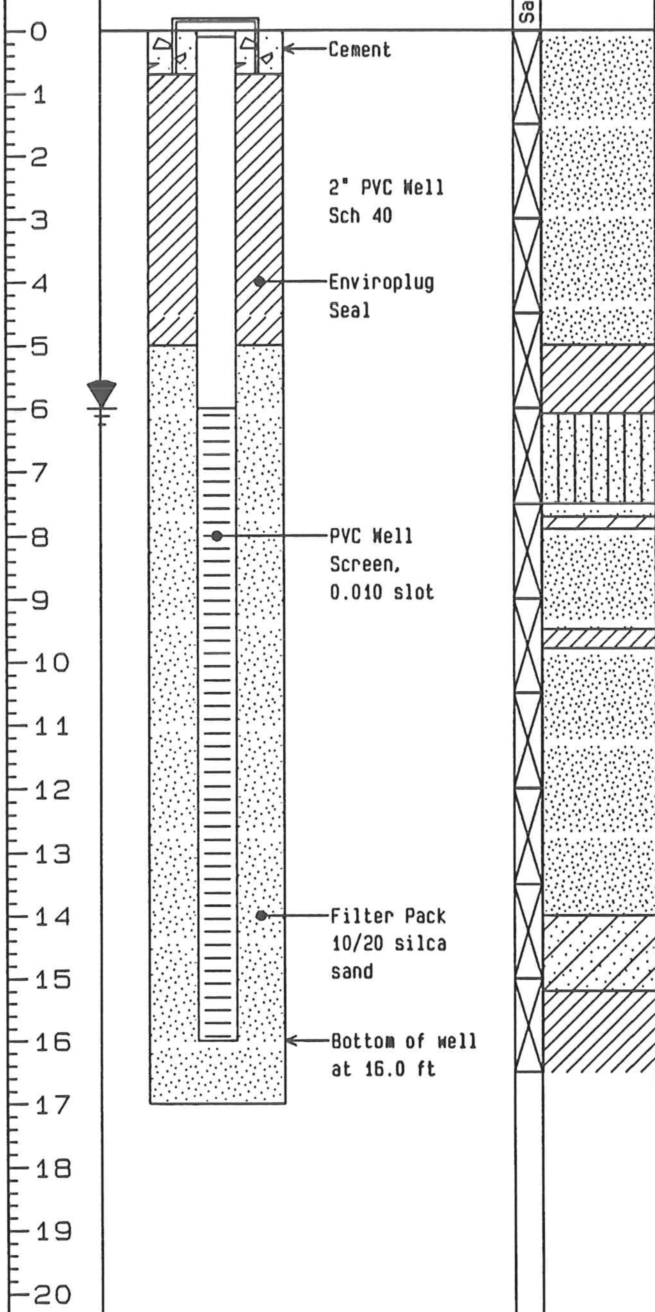
BOREHOLE LOG

PROJECT NUMBER: 2121-05
WELL NUMBER: MW-2

PROJECT: MARALCO SITE	LOCATION: Kent, Washington
COORDINATES: N156749.764 E1653607.129	DRILLING CONTRACTOR: Tacoma Pump and Drilling
DRILL MAKE AND MODEL: Hollow stem auger	DEPTH TOP OF ROCK: ft.
DEPTH CASING AND SIZES: 16.0 ft / 2" PVC	G.S. ELEVATION: 27.2
TOP PVC ELEV.: 26.99	ANGLE FROM VERTICAL AND BEARING: Vertical
DEPTH TO BOTTOM OF HOLE: 17.0 ft.	HOLE SIZE: 4-1/4"
WATER LEVEL (INITIAL): 6.0 ft.	FLUID AND ADDITIVES: None
DATE START: 9-25-90	DATE FINISH: 9-25-90
LOGGER: Marian Allen	

DEPTH IN FEET | WELL CONSTRUCTION DETAIL | Sample Int. | GRAPHIC SYMBOL | LITHOLOGIC DESCRIPTION | BLOW COUNTS



LITHOLOGIC DESCRIPTION

0.0-5.0' SAND; Silty brown soil, with grass roots. 1.2-1.5' medium - fine, loose, becomes fine silty sand 2.6-3.0', damp, slightly clayey, coarsens to medium-fine at 4.0-4.5', damp fine silty sand 4.5-5.0'.

5.0-6.1' CLAY; High plasticity, mottled gray to orange-brown, damp, rootlets. 6.0-6.1' saturated sandy grey clay.

6.1-7.5' SILTY SAND; Dark gray with red grains, saturated, coarsens down to medium-fine sand. (SAMPLE 398572)

7.5-7.7' SAND; Dark gray with red grains, saturated.

7.7-7.9' CLAY; Light to medium brown gray.

7.9-9.5' SAND; Gray with red grains to dark gray, fine, coarsens down to medium-fine.

9.5-9.8' CLAY; Grey-brown, high plasticity.

9.8-14.0' SAND; Medium-dark grey sand with red grains, saturated. 10.5-12.0' fine to medium-fine to silty (SAMPLE 398573). 12.0-14.0' Silty, fine sand, slighty clayey.

14.0-15.2' SILTY SANDY CLAY; Silt content decreases down to 14.7'. 14.7-14.9' wood and and plant material. 14.9-15,0' high plasticity clay. 15.0-15.2' grey, sandy clay.

15.2-17.0' CLAY; Grey, slighty sandy to 15.5', at 15.5' 1/4" layer of plant material. 15.5-16.1' grey, high plasticity (SAMPLE 398574). 16.1-16.3' gray sandy clay to clayey clayey sand, plant material. 16.3-16.5' high high plasticity clay, grey, slightly brownish.

BLOW COUNTS

8,9,7
9,10,8
6,6,7
5,3,3
4,2,3
1,2,2
2,2,3
4,3,3
2,5,8
3,2,2
4,3,2

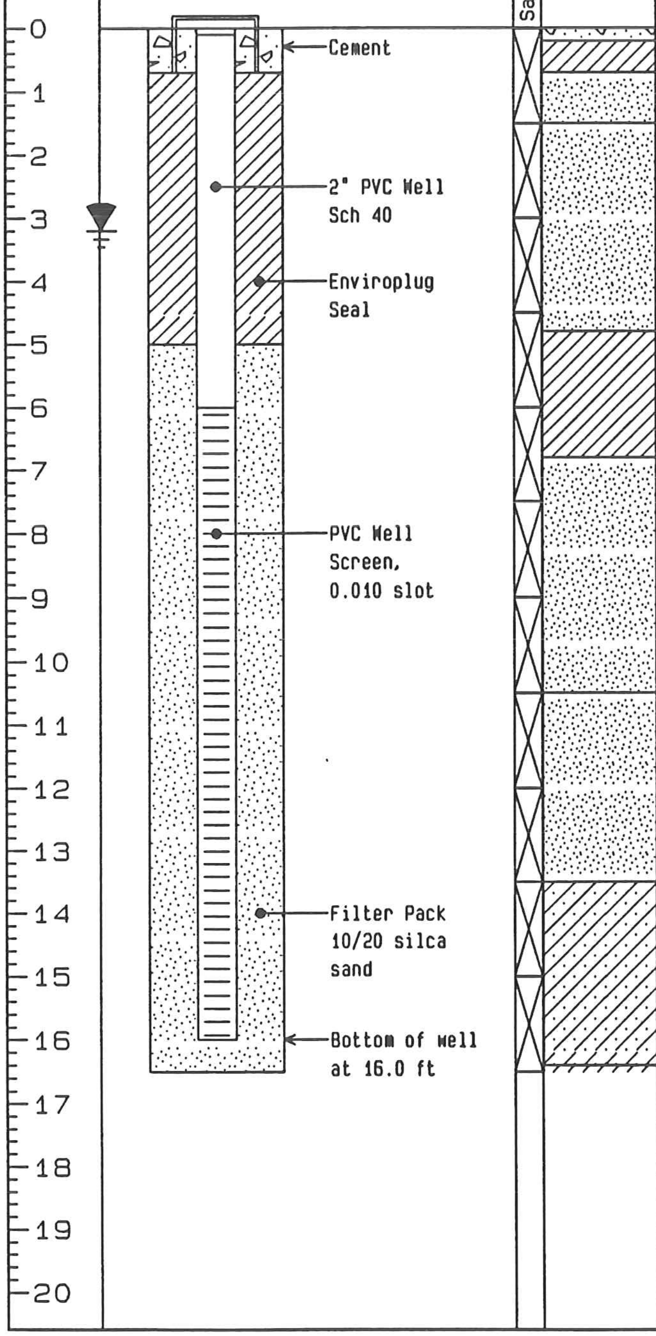
MK-ENVIRONMENTAL SERVICES
A DIVISION OF MK-FERGUSON

BOREHOLE LOG

PROJECT NUMBER:	2121-05
WELL NUMBER:	MW-3

PROJECT: MARALCO SITE	LOCATION: Kent, Washington
COORDINATES: N156323.340 E1652733.647	DRILLING CONTRACTOR: Tacoma Pump and Drilling
DRILL MAKE AND MODEL: Hollow stem auger	DEPTH TOP OF ROCK: ft.
DEPTH CASING AND SIZES: 16.0 ft / 2" PVC	
G.S. ELEVATION: 24.8	TOP PVC ELEV.: 24.81
ANGLE FROM VERTICAL AND BEARING: Vertical	DEPTH TO BOTTOM OF HOLE: 16.5 ft.
HOLE SIZE: 4-1/4"	WATER LEVEL (INITIAL): 3.2 ft.
FLUID AND ADDITIVES: None	DATE START: 9-24-90
DATE FINISH: 9-24-90	LOGGER: Marian Allen

DEPTH IN FEET | WELL CONSTRUCTION DETAIL | Sample Int. | GRAPHIC SYMBOL | LITHOLOGIC DESCRIPTION | BLOW COUNTS



LITHOLOGIC DESCRIPTION

0.0-0.2' GRAVEL, slag fill

0.2-0.7' CLAY; silty

0.7-1.5' SAND; Fine, orange-brown, dry loose.

1.5-4.8' SAND; Fine, silty with pebbles to 2.0', medium-coarse silty sand with rootlets 2.0-2.3', 2.3-2.7' becomes fine, 2.7--3.0', damp at 2.5', coarse to 3.2', saturated, brown, fine, silty, clayey to 3.9' (SAMPLE 39865, 3.0-4.5 ft), 3.9-4.5' medium to medium-coarse, 4.5-4.8 medium-fine, brown.

4.8-6.8' CLAY; Gray, saturated, high plasticity, minor rootlets, sand stringer < 1/2" at 6.4'.

6.8-10.5' SAND; Gray, fine clayey to 7.5', fine gray sand to 8.0'. Clay lense at 8.0-8.1' 8.1-9.0' gray to brown, fine sand, clayey, coarsens down to fine, medium-fine to 9.0'. Clay decreases at 10.0-10.5'.

10.5-13.5' SAND; Dark gray, medium to medium-fine with red grains, saturated, no structures. 1/2" clay lense at 11.2'. Coarsens down to medium-coarse clayey sand at 12.7'. 12.7-13.5' dark gray, medium to fine.

13.5-16.4' CLAYEY SAND; Fine, fining to gray clay at 14.3-14.4'. Fine gray clayey sand to 14.5', cobble at 16.0.

16.4-16.5' CLAY; gray

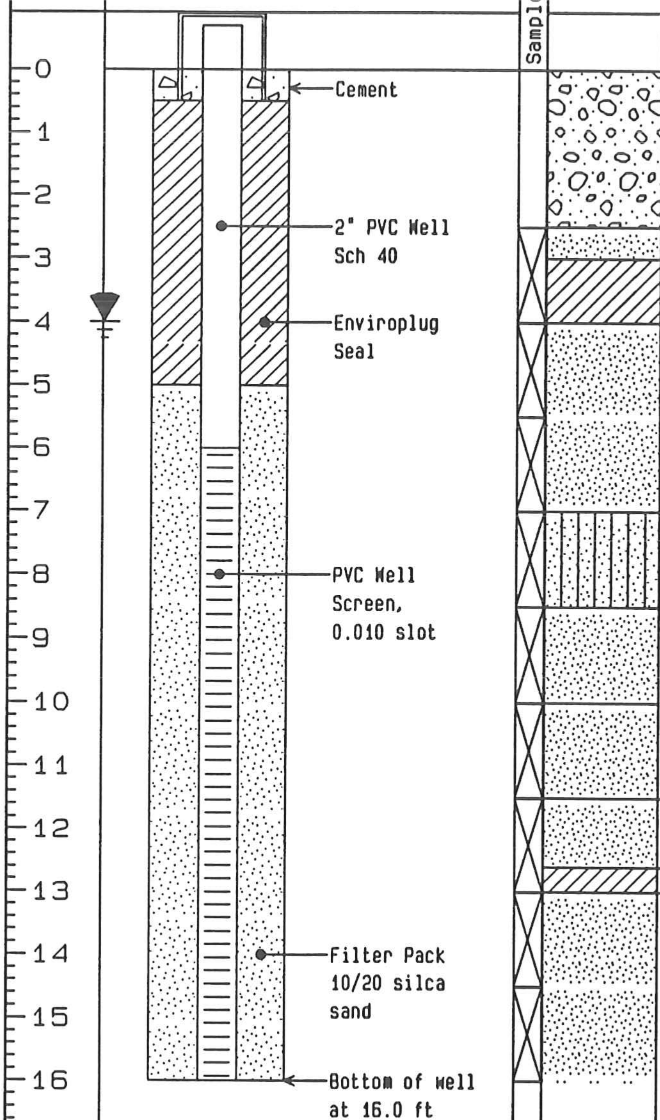
BLOW COUNTS

6,10,13
9,9,9
4,3,3
NA
2,2,3
2,2,3
5,5,9
2,5,7
5,6,13
2,3,9
3,3,4

MK-ENVIRONMENTAL SERVICES
A DIVISION OF MK-FERGUSON

BOREHOLE LOG

PROJECT NUMBER:	2121-05
WELL NUMBER:	MW-4
PROJECT:	MARALCO SITE
LOCATION:	Kent, Washington
COORDINATES:	N156748.788 E1652709.167
DRILLING CONTRACTOR:	Tacoma Pump and Drilling
DRILL MAKE AND MODEL:	Hollow stem auger
DEPTH TOP OF ROCK:	ft.
DEPTH CASING AND SIZES:	16.0 ft / 2" PVC
G.S. ELEVATION:	22.9
TOP PVC ELEV.:	25.02
ANGLE FROM VERTICAL AND BEARING	Vertical
DEPTH TO BOTTOM OF HOLE:	16.0 ft.
HOLE SIZE:	4-1/4"
WATER LEVEL (INITIAL):	4.0 ft.
FLUID AND ADDITIVES:	None
DATE START:	9-24-90
DATE FINISH:	9-24-90
LOGGER:	Marian Allen



DEPTH IN FEET	LITHOLOGIC DESCRIPTION	BLOW COUNTS
0	<u>0.0-2.5'</u> FILL	
2.5	<u>2.5-3.0'</u> SAND; Fine to medium, loose, fill.	
3	<u>3.0-4.0'</u> CLAY; High plasticity at 3.2', moist, orange, no structures (SAMPLE 39851, 3.0-3.5'). Fe stained crust, 2mm at 3.8 ft.	3,2,3
4	<u>4.0-7.0'</u> SAND; Gray, fine, saturated, silty coarsens down from 5.5 to 6.5', with medium sand at 6.5', to fine slighty clayey sand at 7.0'. Oil sheen noted in water, unusual odor.	6,6,7 / 5,7,6
7	<u>7.0-8.5'</u> SILTY SAND; Gray, saturated, oil sheen in water, no odor (SAMPLE 398562)	3,4,9
8.5	<u>8.5-10.0'</u> SAND; Gray, fine grained, coarsens downward. 9.2-9.7' sandy clay lense, saturated.	7,5,2
10	<u>10.0-11.5'</u> SAND; Gray, saturated, silty with minor clay. Coarsens to medium at 11.2'. Sandy clay lense at 11.4-11.5'. Oil sheen.	7,5,9
11.5	<u>11.5-12.6'</u> SAND; Medium to fine, silty to 11.9' (SAMPLE 398563, 11.5-13.0 ft). 11.9-12.0' clay lense, silty, gray, high plasticity. 12.0-12.6' silty, slightly clayey sand, micaceous.	4,3,2
12.6	<u>12.6-13.0'</u> CLAY; Gray, some shells, high plasticity, sharp contact at base.	10,20,23
13	<u>13.0-16.0'</u> SAND; Dark gray to black, with red, medium, coarsens downward, moist, (SAMPLE 388564, 13.5-14.0 ft)	NA

NOTE: Last split spoon covered with greenish-brown film. No oil odor, no indication of unusual material in sample.

APPENDIX II

ECOLOGY AND ENVIRONMENT DATA SUMMARY TABLES FOR MARALCO SITE

ecology and environment, inc.
'01 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537
nternational Specialists in the Environment

TECHNICAL ASSISTANCE TEAM

SITE ASSESSMENT REPORT
MARALCO ALUMINUM
KENT, WASHINGTON

TDD T10-8705-003

REPORT PREPARED BY: ECOLOGY AND ENVIRONMENT, INC.
PROJECT MANAGER: THOMAS ASHLEY
DATE: OCTOBER 1987

SUBMITTED TO: CARL G. KITZ, DEPUTY PROJECT OFFICER
SUPERFUND REMOVAL AND INVESTIGATION SECTION
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
SEATTLE, WASHINGTON

ecology and environment, inc.

101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537

International Specialists in the Environment

Site Assessment Report For
Maralco Aluminum
Kent, Washington

TDD T10-8705-003

Site Name/Address:

Maralco Aluminum
Post Office Box 1167
7730 South 202th Street
Kent, Washington 98032-3167

Investigation Participants:

Thomas M. Ashley, TATM-Chemical Engineer,
E&E, Seattle, WA
(206) 624-9537

Priscilla Anderson, TATM-Toxicologist,
E&E, Seattle, WA
(206) 624-9537

Norm Peck, Inspector, Washington State
Department of Ecology, Redmond, WA
(206) 867-7000

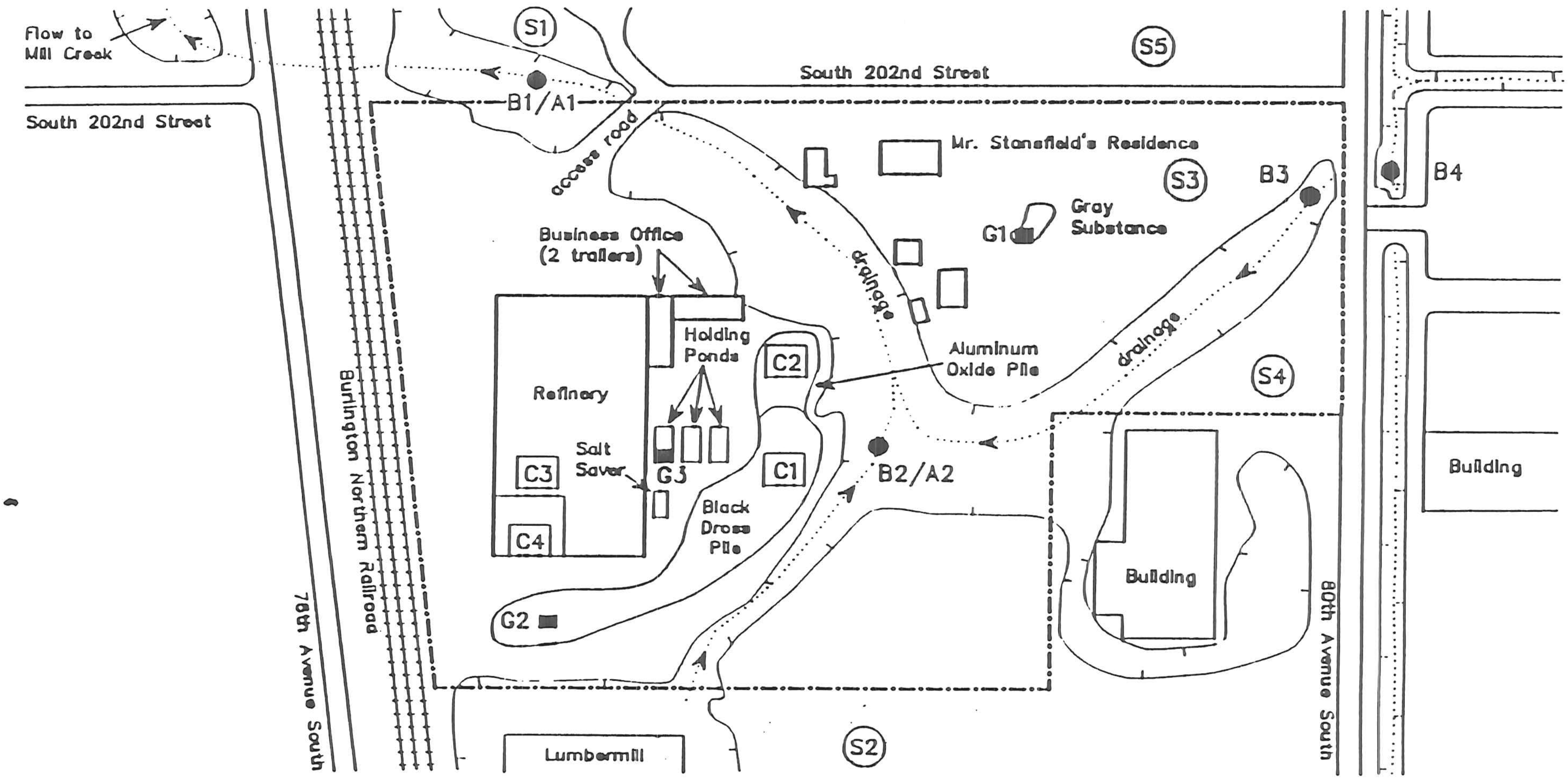
Principal Site Contacts:

Jeffrey H. Reynolds, Assistant Vice President,
Seafirst Bank - Leasco of Washington, Inc.
Seattle, WA.
(206) 358-7221

Quentin Steinberg, Lawyer, U.S. Bankruptcy
Court appointed Bankruptcy Examiner, Seattle, WA
(206) 622-5510

Date of Site Assessment:

June 25, 1987 (0800 to 1900 hours)



LEGEND

- Site boundary
- Drainage direction
- Depressed area
- A# Discrete aqueous sample designator
- B# Discrete sediment sample designator
- C# Composite solid sample designator
- S# Composite surface soil sample designator

ecology & environment, Inc.	
Job: T10-8705-003	Waste Site: WA0518
Drawn by: D. P.	Date: Oct. 8, 1987

FIGURE 3
SAMPLING LOCATIONS

TABLE 1A
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF POTENTIALLY HAZARDOUS SUBTANCES
FOUND AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	C1	C1 (DUPLICATE)	C2	C3	C4	G1	G2
DESCRIPTION	BLACK DROSS COMPOSITE	BLACK DROSS COMPOSITE	ALUMINUM OXIDE COMPOSITE	KBI DROSS COMPOSITE	BAGHOUSE DUST COMPOSITE	GREY POWDER GRAB	YELLOW DROSS GRAB
LOCATION	PILE SOUTH AND EAST OF REFINERY	PILE SOUTH AND EAST OF REFINERY	PILE EAST OF REFINERY	PILE IN SOUTHWEST CORNER OF REFINERY	BAGHOUSE IN SOUTHWEST CORNER OF REFINERY	PILE IN NORTHEAST QUADRANT OF SITE	PILE OF BLACK DROSS SOUTH OF REFINERY
METAL				CONCENTRATION (ppm)			
Antimony	19.0	16.0	57.0	2.9	107.	3.1	20.0
Arsenic	8.6	7.2	4.1	1.5	3.8	3.9	4.5
Beryllium	6.0	7.2	26.0	3.9	< 2.0	14.0	6.0
Cadmium	7.5	6.8	3.4	13.0	19.0	1.2	4.1
Chromium	588.	637.	442.	975.	21.0	233.	186.
Copper	13,300.	27,800.	2,610.	5,120.	198.	2,190.	2,710.
Lead	861.	241.	226.	307.	587.	146.	176.
Mercury	< 0.2	< 0.2	< 0.2	0.44	0.49	<0.1	0.27
Nickel	438.	355.	118.	81.0	15.0	110.	47.0
Selenium	< 0.3	< 0.3	< 0.3	< 0.2	1.5	< 0.3	0.48
Silver	< 3.0	< 3.0	< 3.0	< 2.0	6.9	< 3.0	< 3.0
Thallium	< 0.5	< 0.5	< 0.5	< 0.4	0.71	< 0.5	< 0.5
Zinc	7,600.	6,960.	1,760.	3,020.	16,500.	1,140.	1,130.

TABLE 1B
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF SURFACE SOIL AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	S1	S2	S3	S4	S5
DESCRIPTION	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	BACKGROUND SURFACE SOIL COMPOSITE
LOCATION	OFF SITE - VACANT LOT NORTH OF MARALCO PARKING LOT	OFF SITE - VACANT LOT SOUTH OF BLACK DROSS PILE	ON SITE - NORTHEAST QUADRANT OF SITE	ON SITE - SOUTHEAST QUADRANT OF SITE	OFF SITE - VACANT LOT NORTH OF NORTHEAST QUADRANT OF SITE
METAL			CONCENTRATION (ppm)		
Antimony	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Arsenic	2.8	4.5	12.0	11.0	9.2
Beryllium	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cadmium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	19.0	21.0	10.0	15.0	11.0
Copper	19.0	29.0	21.0	21.0	18.0
Lead	< 10.0	26.0	44.0	27.0	27.0
Mercury	< 0.09	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	25.0	25.0	14.0	15.0	14.0
Selenium	< 0.2	0.34	< 0.2	< 0.2	< 0.2
Silver	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Thallium	< 0.4	< 0.4	< 0.4	< 0.5	< 0.4
Zinc	55.0	57.0	56.0	60.0	66.0

TABLE 2A
EP TOX METALS ANALYSES OF POTENTIALLY HAZARDOUS SUBSTANCES
FOUND AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	C1	C1 (DUPLICATE)	C2	C3	C4	G1	G2	
DESCRIPTION	BLACK DROSS COMPOSITE	BLACK DROSS COMPOSITE	ALUMINUM OXIDE COMPOSITE	KBI DROSS COMPOSITE	BAGHOUSE DUST COMPOSITE	GREY POWDER GRAB	YELLOW DROSS GRAB	MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY (4)
LOCATION	PILE SOUTH AND EAST OF REFINERY	PILE SOUTH AND EAST OF REFINERY	PILE EAST OF REFINERY	PILE IN SOUTHWEST CORNER OF REFINERY	BAGHOUSE IN SOUTHWEST CORNER OF REFINERY	PILE IN NORTHEAST QUADRANT OF SITE	PILE OF BLACK DROSS SOUTH OF REFINERY	
METAL	CONCENTRATION IN LEACHATE (ppm)							
Arsenic	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	5.0
Barium	0.82	0.82	0.01	0.60	0.30	0.29	0.66	100.0
Cadmium	0.14	0.01	0.016	0.01	0.25	0.01	0.05	1.0
Chromium	0.10	0.08	0.05	0.047	0.024	0.03	0.014	5.0
Copper	38	27.0	6.20	15.0	0.29	1.10	2.50	N/A
Lead	1.60	1.50	0.11	0.20	0.12	0.05	< 0.05	5.0
Mercury	< 0.001	0.002	< 0.001	0.001	0.002	0.001	< 0.001	0.2
Selenium	< 0.002	< 0.002	< 0.002	< 0.002	0.004	0.002	< 0.002	1.0
Silver	< 0.01	< 0.01	< 0.01	< 0.01	0.08	0.01	< 0.01	5.0
Zinc	78.0	16.0	16.0	23.0	605.	2.20	7.70	N/A

TABLE 2B
EP TOX METALS ANALYSES OF SURFACE SOIL
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	S1	S2	S3	S4	S5	
DESCRIPTION	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	BACKGROUND SURFACE SOIL COMPOSITE	MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY (4)
LOCATION	OFF SITE - VACANT LOT NORTH OF MARALCO PARKING LOT	OFF SITE - VACANT LOT SOUTH OF BLACK DROSS PILE	ON SITE - NORTHEAST QUADRANT OF SITE	ON SITE - SOUTHEAST QUADRANT OF SITE	OFF SITE - VACANT LOT NORTH OF NORTHEAST QUADRANT OF SITE	
METAL	CONCENTRATION IN LEACHATE (ppm)					
Arsenic	0.002	< 0.002	< 0.002	< 0.002	0.003	5.0
Barium	< 0.01	0.01	0.13	0.04	< 0.01	100.0
Cadmium	< 0.01	< 0.01	0.01	< 0.01	< 0.01	1.0
Chromium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Copper	0.04	0.035	0.04	0.002	0.03	N/A
Lead	< 0.05	< 0.05	0.05	< 0.05	< 0.05	5.0
Mercury	0.001	< 0.001	< 0.001	0.001	< 0.001	0.2
Selenium	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	1.0
Silver	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Zinc	0.087	0.042	6.20	1.50	0.002	N/A

TABLE 3A
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF SEDIMENT
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	B1	B2	B3	B4
DESCRIPTION	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE
LOCATION	OFF SITE - NORTH OF MARALCO PARKING LOT	ON SITE - ADJACENT TO BLACK DROSS PILE	ON SITE - EASTERN SITE BOUNDRY	OFF SITE - DRAINAGE DITCH EAST OF SITE
METAL		CONCENTRATION (ppm)		
Antimony	1.2	3.2	< 0.6	< 0.6
Arsenic	19.0	5.8	4.4	5.2
Beryllium	< 3.0	5.0	< 2.0	< 3.0
Cadmium	< 2.0	4.5	< 1.0	< 2.0
Chromium	36.0	232.	14.0	14.0
Copper	262.	1,500.	16.0	21.0
Lead	64.0	144.	14.0	20.0
Mercury	0.26	< 0.2	< 0.2	< 0.1
Nickel	31.0	74.0	12.0	15.0
Selenium	0.35	< 0.3	< 0.2	< 0.3
Silver	< 3.0	< 3.0	< 2.0	< 3.0
Thallium	< 0.6	< 0.6	< 0.5	< 0.5
Zinc	365.	1,300.	58.0	67.0

TABLE 3B
EX TOX METALS ANALYSES OF SEDIMENT
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	B1	B2	B3	B4	
DESCRIPTION	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE	MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY (4)
LOCATION	OFF SITE - NORTH OF MARALCO PARKING LOT	ON SITE - ADJACENT TO BLACK DROSS PILE	ON SITE - EASTERN SITE BOUNDRY	OFF SITE - DRAINAGE DITCH EAST OF SITE	
METAL	CONCENTRATION IN LEACHATE (ppm)				
Arsenic	< 0.002	< 0.002	< 0.002	< 0.002	5.0
Barium	0.20	0.48	0.098	< 0.01	100.0
Cadmium	0.69	0.02	< 0.01	< 0.01	1.0
Chromium	< 0.01	0.01	< 0.01	< 0.01	5.0
Copper	0.15	0.81	0.034	0.026	N/A
Lead	< 0.05	< 0.05	< 0.05	< 0.05	5.0
Mercury	0.003	< 0.001	< 0.001	< 0.001	0.2
Selenium	< 0.002	< 0.002	< 0.002	< 0.002	1.0
Silver	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Zinc	3.20	3.40	0.90	0.04	N/A

TABLE 4
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF AQUEOUS SAMPLES
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	A1	A2	G3	BLANK			
DESCRIPTION	DISCRETE SURFACE WATER SAMPLES	DISCRETE SURFACE WATER SAMPLES	HOLDING POND BRINE	TRANSPORT BLANK - CARBON-FREE WATER	PRIMARY DRINKING WATER STANDARD (13)	SECONDARY DRINKING WATER STANDARD (14)	CLEAN WATER ACT WATER QUALITY CRITERIA (15)
LOCATION	OFF SITE - CREEK NORTH OF MARALCO PARKING LOT	ON SITE - CREEK ADJACENT TO BLACK DROSS PILE	WESTERNMOST OF (3) HOLDING PONDS	(NOT APPLICABLE)			
METAL				CONCENTRATION (ppm)			
Antimony	0.0058	< 0.002	0.27 (B)	< 0.002	N/A	N/A	0.146
Arsenic	0.0038 (B)	< 0.001	0.026 (B)	< 0.001	0.05	N/A	0.000022
Beryllium	< 0.01	< 0.01	< 0.01	< 0.01	N/A	N/A	0.000037
Cadmium	< 0.005	< 0.005	< 0.005	< 0.005	0.01	N/A	0.010
Chromium	< 0.01	< 0.01	0.014	< 0.01	0.05	N/A	0.050
Copper	0.18	0.19	0.48	0.089	N/A	1.0	1.0
Lead	0.087 (A)	< 0.05	0.092 (A)	< 0.05	0.05	N/A	0.050
Mercury	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.002	N/A	0.000144
Nickel	< 0.05	< 0.05	< 0.05	< 0.05	N/A	N/A	0.0134
Selenium	< 0.001	< 0.001	0.0045	< 0.001	0.01	N/A	0.010
Silver	< 0.01	< 0.01	< 0.01	< 0.01	0.05	N/A	0.050
Thallium	< 0.002	< 0.002	< 0.002	< 0.002	N/A	N/A	0.013
Zinc	0.15	0.16	0.45	< 0.01	N/A	5.0	5.0

(A) - Values exceed Primary Drinking Water Standards
(B) - Values exceed CWA Water Quality Criteria

APPENDIX III

LABORATORY REPORTS AND CHAIN-OF-CUSTODY FORMS

To save on reproduction costs, full laboratory reports are not included in this draft report. They will be included in the final report.

APPENDIX IV

WETLANDS INVENTORY DATA FORM FOR MARALCO

Draft

KENT WETLANDS INVENTORY DATA FORM
GENERAL DATA

Wetland Name: ____________

Wetland location:
1/4 1/4 1/~~2~~4 S T R
CTR W½ SE 1 22N 4E

Wetland Number: 52

Sub-basin/watershed: Millcreek subbasin

Date: 5/24/90 Inventory Team: MC, OB-L
Time Begin 10:30 Time End 11:40
Completion Time: Travel Time to the Site: 0 min - adjacent
Time to Make Determination 40
Time to Collect Additional Data 10
Time to Fill Out Data Form 26
Weather Conditions: partly cloudy
Access Point/s ____________

Landowner Permission: ____________

EVALUATION

1. Is the site a wetland? no ____ justification: ____________

yes X : What sources is the wetland identified on?:
NWI YES Soils Yes Aerial ✓ Flood Plain ____
Field Survey X Other: ____________

2. List the human impacts in the wetland: Indicate veg. unit #
A. filling 52.1, .2, .3
B. grazing ____
C. grading ____
D. garbage 52.3
E. trails ____
F. cultivation ____
G. clearing ____
H. vegetation removal ____
I. draining 52.2, 52.3
K. exotic veg 52.2
L. other: 52.2 pasture

3. Are any of the vegetation units significantly disturbed by these impacts so that they would be considered "unusual conditions"?
no __ yes X List veg. unit: 52.2, 52.3

4. Do natural "unusual conditions" exist such as seasonal wetland in dry months?
no X yes ____: type ____________

5. Was reference site used for evaluation?
no X yes ___: Location ____________

" 2/12

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City of Kent WETLANDS INVENTORY DATA FORM
VEGETATION DATA/HYDROLOGY INDICATORS

Wetland Number: 52.1

Swale

Vegetation Unit (#) 52.1
Evaluated using: Direct Obs. X Binoc. ___ PI ___

Plant Species:	Stratum	% cover	Dom?	Ind. Status
1. Carex sp.	H	3	*	FAC
2. Festuca sp. (tall)	H	1		FACU-
3. JUEF	H	2	*	FAC
4. PHAR	H	2		FACW
5. Agrostis sp.	H	2		FAC-FACU
6. RUDI	S	1		FACU-
7. POA sp.	H	1		FAC-FACU
8. Salix sp	S	1		FAX
9.				
10.				

Percent of dominant species that are OBL, FACW, and/or FAC 100%

Hydrology Indicators: ✓ yes ___ inconclusive

1. Ditch in center - with 2-6" water
2.
3.
4.
5.

Is soils analysis necessary? ___ no ✓ yes - describe: ________

Is the unit a wetland? ✓ yes ___ no

---

field

Vegetation Unit (#) 52.2
Evaluated using: Direct Obs. X Binoc. ___ PI ___

Plant Species:	Stratum	% cover	Dom?	Ind. Status
1. EQAR	H	2		FAC
2. Agropyron sp.	H	3	X	FACU
3. DAGL	H	2		FACU
4. FE sp	H	3	X	FACU - FAC
5. Poa sp.	H	2		FACU- FAC
6. Grass 1	H	3	X	?
7. RARE	H	1		FACW
8. Carex sp.	H	2		FAC
9. PHAR	H	1		FACW
10.				

Percent of dominant species that are OBL, FACW, and/or FAC undetermined

Hydrology Indicators: X yes ___ inconclusive

1. glistening / saturated
2. drainage ditch on south border
3.
4.
5.

Is soils analysis necessary? ___ no X yes-describe: ________
vegetation insufficient to designate wetland.

Is the unit a wetland? X yes ✓ no

10/SS

Vegetation Unit (#) 523
Evaluated using: Direct Obs. X Binoc. ____ PI ____

Plant Species:	Stratum	% cover	Dom?	Ind. Status
1. POTR2	T	4	X	FAC
2. SA sp.	S	2		FAC
3. COST	S	1		FACW
4. RUDI	S	1		FACU+
5.				
6.				
7.				
8.				
9.				
10.				

Percent of dominant species that are OBL, FACW, and/or FAC 100%
Hydrology Indicators: X yes ___ inconclusive
1. water stained leaves
2.
3.
4.
5.

Is soils analysis necessary? X no ___ yes-describe:________

Is the unit a wetland? X yes ___no

Vegetation Unit (#) ______
Evaluated using: Direct Obs. ____ Binoc. ____ PI ____

Plant Species:	Stratum	% cover	Dom?	Ind. Status
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Percent of dominant species that are OBL, FACW, and/or FAC____
Hydrology Indicators: ___ yes ___ inconclusive
1.
2.
3.
4.
5.

Is soils analysis necessary? ___ no ___ yes-describe:________

Is the unit a wetland? ___ yes ___no

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KENT WETLANDS INVENTORY DATA FORM
SOILS DATA

Wetland Number: 52

Vegetation Unit (#): ______________ Pit (#): ________

Soil Survey Data: series/phase ______________
sub-group __________
Is the soil on hydric soil list? no___ yes___

Field Data:
matrix color - chroma ______ hue ______ value ______
mottled? no___ yes___ if yes: mottle color____________
gleyed? no___ yes___ gley color__________

entisol w mottling? no___ yes___
histosol? no___ yes___
histic epipedon present? no___ yes___

sulfur smell no___ yes___
saturated no___ yes___ water in pit______
glistening______
squeeze test______
seepage______
other:______

Is soil undrained hydric soil: no___ yes___

Vegetation Unit (#): ______________ Pit (#): ________

Soil Survey Data: (series/phase) ______________
Is the soil on hydric soil list? no___ yes___

Field Data:
matrix color - chroma ______ hue ______ value ______
mottled? no___ yes___ if yes: mottle color____________
gleyed? no___ yes___ gley color__________

entisol w mottling? no___ yes___
histosol? no___ yes___
histic epipedon present? no___ yes___

sulfur smell no___ yes___
saturated no___ yes___ water in pit______
glistening______
squeeze test______
seepage______
other:______

Is soil undrained hydric soil: no___ yes___

Vegetation Unit (#): 52.1 Pit (#): 1

Soil Survey Data: (series/phase) Renton Silt Loam
Is the soil on hydric soil list? no___ yes ✓

Field Data:
matrix color - chroma 4 hue 7.5YR value 3
mottled? no ✓ yes___ if yes: mottle color___
gleyed? no ✓ yes___ gley color___

entisol w mottling? no ✓ yes___
histosol? no ✓ yes___
histic epipedon present? no ✓ yes___

sulfur smell no___ yes ✓
saturated no___ yes ✓ water in pit___ saturated from 0-18" standing water in ditch
glistening ✓
squeeze test ✓
seepage___
other:___

Is soil undrained hydric soil: no ✓ yes___

Vegetation Unit (#): 52.2 Pit (#): 2

Soil Survey Data: (series/phase) Renton Silt Loam
Is the soil on hydric soil list? no___ yes___

Field Data:
matrix color - chroma 2 hue 10YR value 3
mottled? no___ yes X if yes: mottle color 10YR4/6
gleyed? no X yes___ gley color___

entisol w mottling? no___ yes ✓
histosol? no X yes___
histic epipedon present? no X yes___

sulfur smell no X yes___
saturated no___ yes X water in pit___
glistening X - 16"(+)
squeeze test___
seepage___
other:___

Is soil undrained hydric soil: no ✓ yes___

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KENT WETLANDS INVENTORY DATA FORM
HYDROLOGICAL DATA

Wetland Number: 52

Office Data:
1. What is the size of the wetland in acres? 5.90 ac.

2. What is the wetland's location within the sub-basin or watershed? A. upper B. upper middle (C.) middle D. lower middle E. lower

---

Field Data:
3. Does the wetland have:

	yes	no	seasonal
standing water			X
running water			X
saturated soils			X
tidal influence		X	

4. Does the wetland have one or more inlets? ___ no X yes- describe:

A. seep
B. spring
C. wetland (via culvert)
D. stream or river
E. storm water drainage pipe
(F.) Ditch
G. ____________
H. undetermined

5. Does the wetland have one or more outlets: ___ no X yes- describe:

A. stream
(B.) ditch
C. river
C. culvert/pipe
D. beaver dam
E. ____________
F. undetermined

6. If the outlet is a culvert or pipe, what does the outflow enter? A. stream B. river C. lake D. wetland E. ditch F. stormwater conduit system (closed)

7. Is the outlet: A. open B. partially blocked C. totally blocked D. modified to control water level

8. Describe impoundment capability?
A. wetland is on a slope
(B.) wetland is flat and is not a depression-(52.2 + 52.3)
C. wetland is a depression, filled to capacity
D. wetland is a depression, partially filled
(E.) wetland is a depression, minimally or not filled-(52.1)

9. Is there water movement through the wetland?

A. no movement and/or no outlet

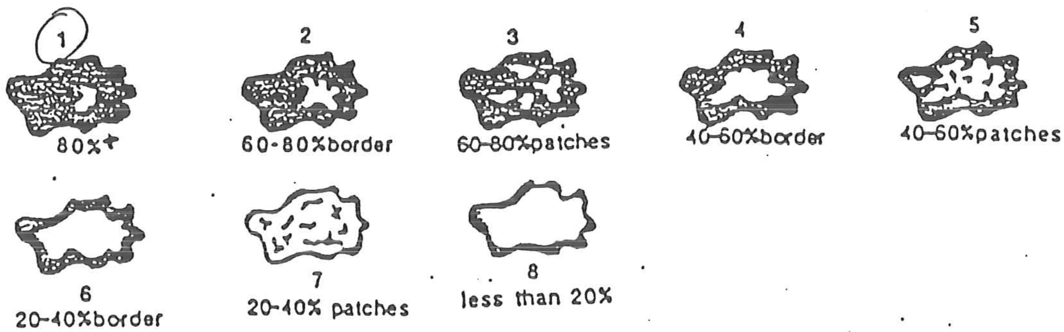
B. no visible water movement in the wetland but water moving from the outlet

(C.) slow movement through the wetland

D. moderate movement through the wetland

E. rapid movement through the wetland

10. Which of the following illustrations represents the amount of vegetative cover on the wetland? (Hab and Cul/Aes data also)



11. What is the extent of pollution or sediment discharge(s) into the wetland: indicate if pollution and/or sediment

A. no known discharges:__________

B. probable discharge:__________

(C.) visible discharge: pollution/sediment

D. undetermined:__________

12. If there are probable or visible discharges into the wetland, list actual or probable source(s) and location by cardinal direction and approximate distance from wetland.

Source	Location: Ajacent	Not Adjacent but Hydro. Connected
Spoilage piles (gravel?)	W~25'	

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KENT WETLAND INVENTORY DATA FORM
HABITAT DATA

Wetland Number: 52

NOTE: Some habitat data has been recorded on hydrological data and cultural/aesthetric forms.

1. What is the FWS wetland classification(s):

I. System: Palustrine
   Class Emergent % of wetland 90%
   Class Forested % of wetland 8
   Class Scrub shrub % of wetland 2
   Class ______ % of wetland ______

II. System: ______
   Class ______ % of wetland ______
   Class ______ % of wetland ______
   Class ______ % of wetland ______
   Class ______ % of wetland ______

III. System: ______
   Class ______ % of wetland ______
   Class ______ % of wetland ______
   Class ______ % of wetland ______
   Class ______ % of wetland ______

2. Is the wetland/portion of the wetland a bog no X yes ___ or peat system no X yes ___?

3. Were any sensitive, threatened or endangered plants or animals observed? no X yes ___ List: ______

4. What is the surrounding habitat within 200 ft.:

	% of total	cardinal direction
A. Agricultural - cultivated		
(B.) Agricultural - grazing	5	S
C. Commercial		
(D.) Industrial	64%	W, E, S
(E.) Residential abandoned	1	N
F. Forest		
G. Grass		
H. Shrub		
I. Unvegetated		
(J.) Roadway - paved	30%	N, S, E
K. Roadway - gravel		
L. Railroad		
M. Other		

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5. Describe special habiitat features:

A. Snags >25' high ✓ 0 ___ 1-5 ___ 5-10 ___ 10-20 ___ >30

B. Snags <25' high ✓ 0 ___ 1-5 ___ 5-10 ___ 10-20 ___ >30

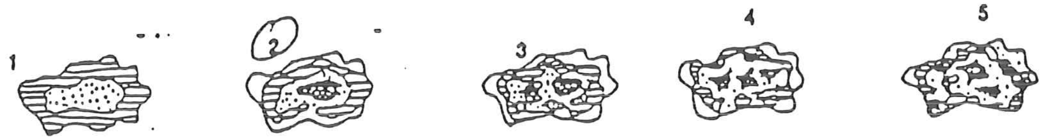
C. Rock outcrop ✓ 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 or >

D. Perches ✓ 0 ___ 1-5 ___ 5-10 ___ 10-20 ___ >30

E. Fallen logs ✓ 0 ___ 1-5 ___ 5-10 ___ 10-20 ___ >30

F. Lodges/Dams ✓ 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 or >

6. Which of the following best represents the variation in vegetation types within the wetland? (also aes. data)



7. Animal species observed on site:

Birds: pheasant

Mammals: striped skunk

Others:

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KENT WETLANDS INVENTORY DATA FORM
CULTURAL/AESTHETICS DATA

Wetland Number: 52

NOTE: Some cultural/aestetic data has already been collected on hydrological or habitat data forms.

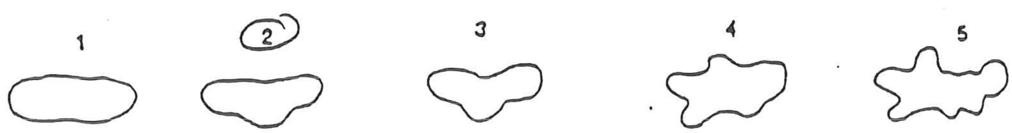
Office Data:

1. Distance in miles to nearest school: < 1 mile

2. Distance in miles to nearest park: < 1 mile

Field Data:

3. Which of the following best represents the wetland shape? (Hab. data also)



4. Are there distant scenic vistas such as mountains, oceans, etc.?
no ___ yes X List them: Mt. Rainier
Cascades

5. What types of land forms are adjacent to the wetland?
   - A. cliff or bluff
   - B. mountain or ridge
   - C. hill
   - D. valley
   - E. canyon
   - (F.) flat, level plain
   - G. other: ______

6. Types of access to/within the wetland: Indicate compass direction

	to	within
A. Pedestrian Trail (formal)		
B. Pedestrian Trail (informal)		
(C.) Road	X N, S, E	
D. Railroad		
E. Boatable watercourse		
F. Other: ______		

7. What recreational activities is the wetland or its immediate upland perimeter used for?

	actual	potential
A. hiking		
B. biking		
C. hunting		
D. bird watching		X
E. swimming		
F. boating		
G. others:________		

8. Can you clearly see a majority of the wetland's classes from the perimeter? ___ no _X_ yes

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WETLAND SKETCH:

Sketch the general wetland shape, vegetation units, location of soil pits, as well as wetland features such as inlets/outlets, access, and human impacts, etc.

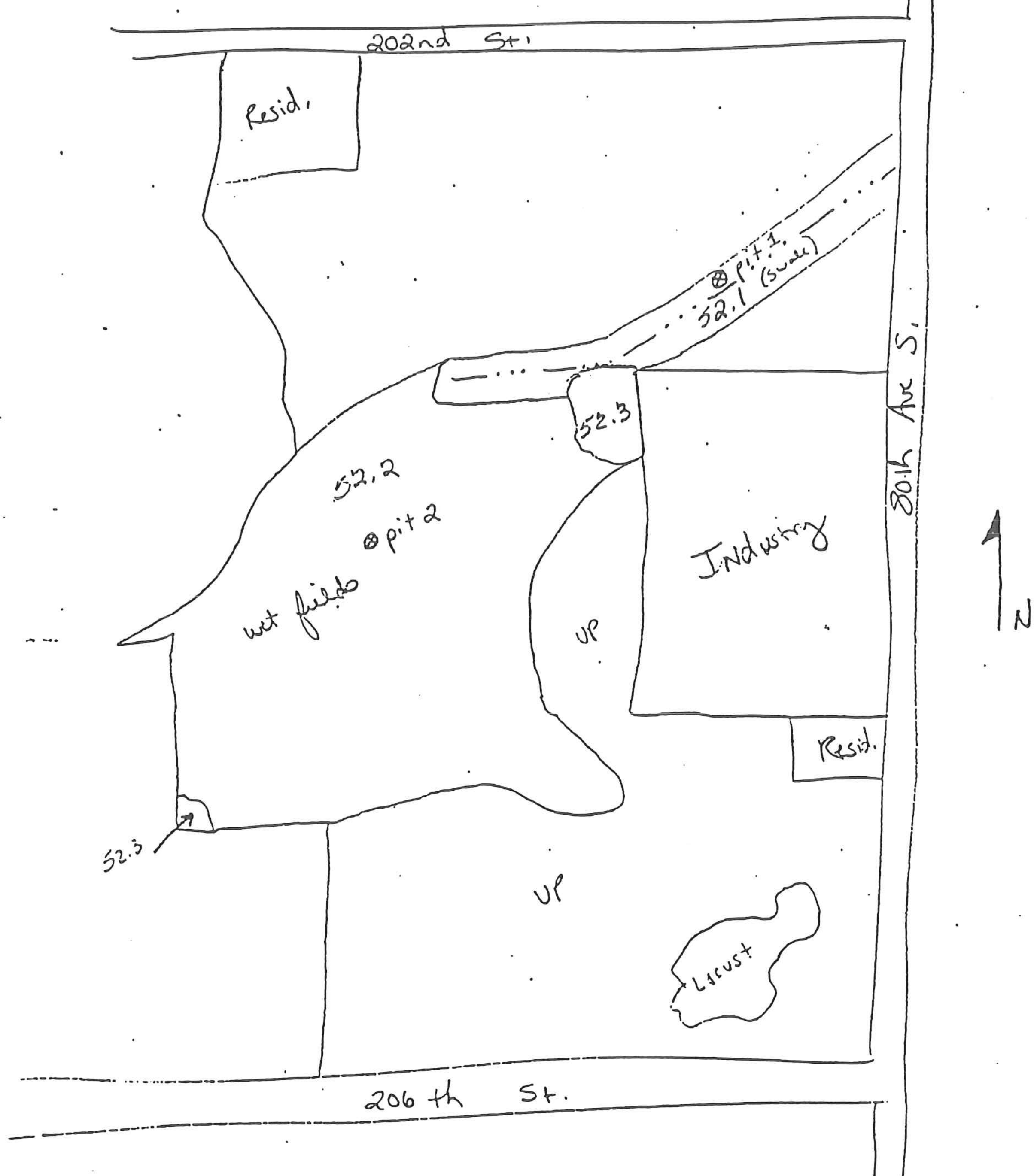

Table 6-1
Data Needs Summary

Data Needs	Refine Conceptual Site Model	Conduct Feasibility Study or perform Interim Remedial Action	Address ARARs	Conduct Risk Assessment	Health and Safety
Source Data: **Diesel Tank:** Contents of tank presence or absence of related soil contamination		X	X		X
Baghouse: Precise locations, dimensions and state of equipment		X	X		X
Quantities and concentration of baghouse dusts		X	X		X
Chlorine Area: Condition of equipment/piping. Are pipes filled with Cl_2 gas?		X			X
Holding Pond, Wash Ponds: Condition of ponds, presence of contamination beneath ponds, presence or absence of groundwater contamination beneath ponds	X	X	X	X	
Residence (Laboratory): Potential contamination of drainlines and sewer system related to metallurgic laboratory in the house.		X	X		X
Soils Data: Depth to groundwater, thickness of vadose zone	X	X			
Soil/sediment lithologies (extent and thickness)	X	X			
Concentrations and distribution of contaminants in soils	X	X	X	X	