REPORT OF PHASE 2 SUBSURFACE INVESTIGATION
FORMER BARGE WASTE DISPOSAL AREA
VANCOUVER, WASHINGTON
FOR
COLUMBIA MARINE LINES

GeoEngineers
Incorporated

GeoEngineers Incorporated

(206) 881-7900
2020 124th Ave. N.E.
P.O. Box 6325
Bellevue, WA 98008

Consulting Geotechnical
Engineers and Geologists

April 9, 1985

Crowley Environmental Services Corp.
3400 East Marginal Way South
Seattle, Washington 98134

Attention: Mr. Wally Semon

Gentlemen:

We are submitting five copies of our subsurface investigation report for the CML Barge Waste Disposal Area near Vancouver, Washington.

We appreciate the opportunity to be of service on this project. Please call if you have any questions regarding this report or if we may be of additional service.

Yours very truly,

GeoEngineers, Inc.

James A. Miller

James A. Miller
Associate

JHB:JAM:wd

File No. 698-01

TABLE OF CONTENTS

List of Figures

APPENDIX

List of Appendix Figures

REPORT OF PHASE 2 SUBSURFACE INVESTIGATION
FORMER BARGE WASTE DISPOSAL AREA
VANCOUVER, WASHINGTON
FOR
COLUMBIA MARINE LINES

INTRODUCTION

This presents the results of our Phase 2 subsurface investigation at the site of the former barge waste disposal area operated by Columbia Marine Lines (CML) near Vancouver, Washington. This report has been prepared, in part, for submittal to the Washington State Department of Ecology (WDOE) as requested in their letter to CML dated June 25, 1984. We understand that this report will be submitted to Mr. Patrick Wicks, Hazardous Materials Management Consultant, for review and development of a final report.

SITE LOCATION

The CML facility is located immediately north of the Columbia River and approximately three miles west of Vancouver in Section 44, Township 2N, Range 1E, as indicated on the Location Map, Figure 1. Section 44 is designated as Section 19 on Metsker's Clark County map and in WDOE's water well files. The CML facility consists of an office building, an equipment storage garage, a maintenance building, dock, and paved parking area. The former barge waste disposal area is located immediately west of the CML facility and about 300 feet north of the Columbia River, as shown on Figure 1.

PHASE 1 HYDROGEOLOGIC STUDY

A Phase 1 hydrogeologic study of the former waste disposal area was completed by our firm during 1983 to provide an initial evaluation of subsurface soil and ground water conditions. The results of our Phase 1 study are presented in our report of November 28, 1983. The Phase 1 study included the installation of eight borings/monitor wells in the immediate disposal area and collection of soil and ground water samples.

PURPOSE AND SCOPE OF PHASE 2 STUDY

The purpose of this Phase 2 study is to further delineate the type, extent and concentration of shallow soil and ground water contamination at the CML barge waste disposal area. Study objectives include evaluation of the shallow ground water regime, determination of soil and ground water chemical parameters, and evaluation of remedial actions that may be appropriate.

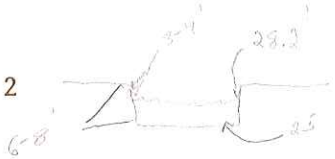
Specifically, our scope of services includes:

1. Locate six additional boring sites and prepare boring logs based on field examination of soils.
2. Direct the construction of monitor wells upon completion of each boring.
3. Provide equipment and assistance for soil and ground water sample collection.
4. Determine monitor well casing elevations to the nearest 0.01 foot with an engineers level.
5. Evaluate the shallow ground water flow regime through measurement of fluid levels in the monitor wells.
6. Recommend remedial actions.

DISPOSAL SITE HISTORY AND USE

Two excavated pits have been used in the past by CML for disposal of water and related wastes from barge cleaning and maintenance activities. Former disposal pit locations are shown on Figure 2.

The date of construction and commencement of disposal activities in the west pit is unknown. Available topographic maps indicate that this pit was backfilled between 1969 and 1971. Prior to backfilling, the west pit was approximately 100 feet wide and 180 feet long, as measured at the crest of the soil berm which surrounded the pit. Available mapping indicates that the water surface in the west pit was at Elevation 28.2 feet in 1969. This corresponds to a depth of 3 to 4 feet below the present ground surface and about 5 to 7 feet above present ground water levels in the pit area. The elevation of the base of the west pit is unknown but appears to be about Elevation 25, which is approximately 6 to 8 feet below the present ground surface.



The east pit appears to have been constructed between 1969 and 1971. Disposal in the east pit was terminated during 1983 and the pit was backfilled during January 1984. The east pit was approximately 100 feet wide and 150 feet long, as measured at the crest of the surrounding soil berm. Available mapping indicates that the water surface in the east pit was at Elevation 24.6 feet in 1971. The water surface in the east pit was at approximately Elevation 21 feet during our Phase 1 study in November 1983 (prior to backfilling the pit). These water surface elevations correspond to approximately one-half to four feet below the present ground surface in the east pit area. The base of the east pit was at approximately Elevation 19 to 20 during November 1983, which corresponds to a depth of about 5 to 6 feet below the present ground surface. Information obtained from the soil borings suggests that the base of the east pit may have extended to about Elevation 15 during an earlier period of its operation.

SITE CONDITIONS

SURFACE CONDITIONS

The CML facility is located on the relatively flat Columbia River flood plain where the ground surface elevation generally ranges from 20 to 35 feet (U.S. Army Corps of Engineers datum). Topography in the immediate site vicinity is gently rolling to hummocky and has been influenced by past activities related to dredging, levee construction, disposal pit operation, and road construction. The past disposal area is located on a relatively high portion of a levee.

Vegetation in and surrounding the disposal area consists primarily of grass and weeds with scattered brush and trees. Little or no vegetation exists around the perimeter of the former west pit. Very sparse vegetation exists over the east pit.

A parking area paved with asphaltic concrete is located immediately east of the disposal area, as indicated on the Site Map, Figure 2. The western portion of this paved area slopes downward toward the east disposal pit. Discharge ponds for ALCOA's process water are located just west of the disposal area, and ALCOA's aluminum plant is located immediately east of the CML facility. A cattle feed lot is located about 200 feet north of the east disposal pit. We understand that water for the feed lot is

supplied by ALCOA's deep wells and that all feed for the lot is imported. ALCOA's representatives indicate that a former sawmill was located immediately north of the CML facility.

SUBSURFACE CONDITIONS

General: The uppermost surficial soils along the Columbia River in the vicinity of CML facility generally consist of fine to medium sand which was placed during past dredging activities. These soils generally range from zero to over fifteen feet thick.

The surficial dredge fill is underlain by relatively recent Columbia River flood plain deposits which generally consist of silt and silty fine sand. The flood plain soils overlie older alluvial deposits of sand and silt. Driller's logs for ALCOA's wells indicate that the alluvial deposits overlie the gravel and sand of the upper member of the Troutdale formation at depths of approximately 90 to 100 feet. The upper Troutdale formation is a major aquifer in the Vancouver area.

Disposal Area: A total of 14 borings have been completed within and surrounding the former disposal area. Eight of these borings were drilled during November 1983 for our Phase 1 hydrogeologic study, and six of the borings were drilled during December 1984 as part of this investigation. Monitor wells were installed in each boring. In addition, we have obtained logs of eight test pits completed in the area immediately west of the disposal area. Boring/monitor well and test pit locations are indicated on Figure 2. Details of the drilling and sampling program, boring logs, monitor well construction and field measurements are given in Appendix A.

The results of the drilling programs and a review of available data indicate that the shallow soils of the disposal area can be grouped into two hydrogeologic units based on their grain size characteristics and relative permeabilities. The surficial soils range in thickness from less than 2 feet to at least 15 feet and consist of brown to gray, loose to dense, fine to medium sand. We understand that this sand is dredged fill which was derived from the Columbia River. This fill has been reworked during construction and backfilling of the disposal pits and during road building and other construction activities. Based on our field observations, the dredge fill appears to be moderately to highly permeable.

Native Columbia River flood plain deposits underlie the dredge fill. These flood plain soils include very soft to soft gray silt and loose to dense silty fine sand with organic matter. The flood plain soils are at least 20 feet thick in the vicinity of the disposal area. The flood plain soils have a much lower permeability than the overlying dredge fill.

Generalized subsurface cross sections are shown on Figure 3. The dredge fill appears to reach a maximum thickness in the disposal pit area and decreases in thickness toward the north, south and east. The contact between the dredge fill and and the underlying flood plain soils in the former pit disposal area appears to range between about Elevations 15 and 19 and slopes downward slightly toward the northeast. Cross Sections A-A' and B-B' on Figure 3 show a low area in the dredge fill/flood plain soil contact beneath the east disposal pit. This irregularity beneath the east pit suggests that the base of that pit may have extended into the flood plain soils at one time. The base of the east disposal pit during November 1983 was observed to be at approximately Elevation 19 to 20, which is approximately 5 feet higher than the top of the flood plain soils beneath the east pit.

SURFACE WATER

Major surface water features in the study area include the Columbia River and a pond-stream system located about 1,000 feet northeast of the former disposal pits. ALCOA's process water ponds are located west and northwest of the former disposal area. ALCOA representatives have indicated that the base of these ponds are sealed with an impermeable liner. Vancouver Lake is located about 5,000 feet north of the former disposal area. Surface water features in the study area are shown on Figure 4.

Little surface water runoff occurs from the immediate disposal area because of the moderate to high permeability and infiltration rate of the surficial dredge fill sand. Precipitation which falls on the disposal area generally infiltrates into the fill or is lost to evapotranspiration.

Runoff from the paved area located east of the former disposal area flows westward toward the east disposal pit area. This runoff collects

and ponds in the vicinity of the backfilled east disposal pit and a large percentage of this ponded water infiltrates into the sand fill in the east pit area.

Surface water runoff and infiltration are prevented within the area encompassed by ALCOA's process water ponds because of the presence of perimeter dikes and impermeable liners. We understand that these ponds discharge excess water to the Columbia River through a tight pipeline.

A stream-pond system which is located northeast of the former disposal area receives water from shallow ground water seepage and from surface runoff.

GROUND WATER

General: The gravel of the upper member of the Troutdale formation comprises the primary ground water aquifer along the Columbia River flood plain west of Vancouver, Washington. Available reports and water well logs indicate that this aquifer is highly permeable and that wells completed in this formation are capable of producing as much as 3,000 gpm during pump tests. The depth to the aquifer at the ALCOA plant ranges from about 90 to over 150 feet (approximately Elevation -60 to -120 feet).

Ground water within the Troutdale aquifer appears to be semi-confined by the overlying, less permeable, alluvial silt and sand deposits. Available reports indicate that the piezometric surface of the Troutdale aquifer is between about sea level and Elevation 30, averaging about Elevation 15.

The State of Washington Water Supply Bulletin No. 9 (1964) indicates that the alluvial deposits which overlie the Troutdale aquifer become coarser and more permeable in an easterly direction and that water wells have been completed in these alluvial deposits near Vancouver, Washington.

Disposal Site: Our site explorations indicate the presence of a shallow, perched ground water system within the surficial dredge fill sand in the vicinity of the former disposal area. We have found no records of water wells which are developed in the dredge fill. All available information indicates that wells in the region are relatively deep and are completed in the Troutdale formation.

Evaluation of the perched ground water flow system at the CML site is complicated by its relatively small saturated thickness and large changes

in the level of the ground water table in response to intermittent recharge. Ground water contours based on fluid level measurements in the monitor wells indicate that ground water flow within the fill occurs in a semi-radial direction from the former disposal area. Ground water contours based on measurements made on December 12, 1984 and January 23, 1985 are indicated on Figures 5 and 6, respectively.

Recharge to the shallow, perched ground water system occurs by direct infiltration of precipitation and by infiltration of runoff which originates from the paved surfaces located east of the former disposal area. Little or no recharge occurs to the shallow ground water system beneath the paved areas and ALCOA's process water ponds. In our opinion, reduced recharge outside of the disposal pit area accentuates the formation of a recharge mound and the development of a semi-radial flow pattern in the vicinity of the former disposal area.

Recharge and ground water flow patterns in the immediate disposal area may be affected by the differing permeabilities between the undisturbed dredge fill and dredge fill sand which has been disturbed during excavation and backfilling of the disposal pits. The response of ground water levels to intermittent recharge near the center of the disposal area, as measured in Monitor Well 1, appears to lag behind ground water levels in nearby areas.

The native flood plain soils which underlie the dredge fill are relatively impermeable and are considered to be an aquitard within the shallow ground water flow system. However, they are saturated and are capable of transmitting water at a slow rate. At the time of our field measurements on December 12, 1984 and January 23, 1985, ground water levels in Monitor Wells 13 and 14 (located near the Columbia River) were below the base of the silty flood plain soils. Ground water levels appear to be within the flood plain soils in the area located between the west pit and the river, as indicated on Cross Section A-A' on Figure 3. We expect that the rate of ground water flow toward the river from the disposal area is generally slow because the ground water must pass through these silty flood plain soils.

Very slow ground water seepage at the fill sand/flood plain soil contact was observed along the bank of the Columbia River at the time of our

measurements. Most of this seepage was observed west of the CML dock. The localized seepage appears to originate from areas where the dredge fill sand is saturated with perched ground water. We expect that seepage quantities along the river would increase following periods of heavy precipitation.

Small areas of seepage were observed within the cattle feed lot located north of the disposal area. Based on the ground water contours shown on Figures 5 and 6, the recharge in the disposal pit area could provide the source of some of this seepage.

FREE HYDROCARBON CONTAMINATION

Free (floating) hydrocarbon liquid is present in MW-2, MW-6, and MW-9 near the east pit area, and in MW-7 and MW-8 near the west pit area.

The measured thickness of free hydrocarbons on December 12, 1984 ranged from less than 0.005 feet to 0.18 feet in MW-2, MW-6 and MW-9. Prior to ground water sampling, these wells were developed by pumping with a vacuum truck. Only a trace (globules) of free hydrocarbons was observed in these wells during ground water measurements which were conducted after well development.

The measured thickness of free hydrocarbons on December 12, 1984 was 0.20 feet and 6.62 feet in MW-7 and MW-8, respectively. Due to the relatively thick accumulation of free hydrocarbons in these two wells, they were not developed with the vacuum truck. However, free hydrocarbons were bailed from these wells on January 23, 1985. The free hydrocarbon thickness recovered to 0.08 feet and 1.35 feet in MW-7 and MW-8, respectively, within 5 hours after bailing.

The field data suggest that the free hydrocarbon plume is centered around MW-8. Free hydrocarbon saturation extends into the silty flood plain soils in this area. The free hydrocarbon plume may extend west from MW-8 and include the west pit disposal area.

How do you know that

A sample of free hydrocarbons from MW-8 was collected and analyzed by Laucks Testing Laboratories, Inc. This analysis indicates the presence of a large number of hydrocarbon compounds. Most of the specific compounds

were not identified, but a number of napthalene compounds were found. The available data suggest that the free hydrocarbons in MW-8 are a mixture of hydrocarbon fuel products.

GROUND WATER CONTAMINATION

Ground water samples were collected from MW-1 through MW-5 and MW-7 and MW-8 during our Phase 1 study. Ground water samples have been collected from MW-1 through MW-6, MW-9 and MW-11 through MW-14 as part of this study. Details of the ground water sampling program are given in Appendix A. Ground water samples were analyzed by Laucks Testing Laboratories, Inc. Analytical reports are given in Appendix B. Evaluation of the analytical results will be made by Mr. Patrick Wicks.

SOIL CONTAMINATION

Soil samples from Boring 1 through Boring 10 and Boring 12 were analyzed by Laucks Testing Laboratories, Inc. as part of the Phase 1 and Phase 2 studies. Analytical data are given in Appendix B. Evaluation of the soil data will be done by Mr. Patrick Wicks.

RECOMMENDATIONS

We recommend that a subsurface hydrocarbon recovery program be initiated to remove free subsurface hydrocarbons in the former disposal area. The recovery system should consist of a backfilled trench with a base at Elevation 17. The trench should be backfilled to Elevation 25 with pea gravel and above Elevation 25 with excavated soils. We recommend that the trench be constructed generally in the vicinity of MW-8.

A CMP recovery well with a minimum diameter of 30 inches is recommended. The recovery well should be perforated from the base of the well (Elevation 17) to Elevation 27.

A submersible pump capable of delivery at least 20 gpm on a sustained basis should be installed in the recovery well. Controls should be provided within the well such that the submersible pump cannot pump free hydrocarbons. A wick-type hydrocarbon recovery unit is recommended for removing hydrocarbons which accumulate in the recovery well.

Water which is pumped from the well should be routed to an on-site recharge trench. We recommend that the recharge trench have a length of

60 feet and a uniform base at Elevation 29. The recharge trench should be oriented southeast-northwest and located approximately 150 feet south or southwest of MW-8. The trench should have a minimum base width of 2 feet and should be backfilled completely with pea gravel. A perforated pipe should be placed at the base of the trench to distribute water along its entire length.

Water infiltration from the recharge trench should assist in driving free hydrocarbons to the recovery trench and well. Furthermore, the recharge will create a hydrodynamic dam which precludes southward migration of free hydrocarbons from the vicinity of the west pit toward the Columbia River.

Free hydrocarbons recovered at the site should be stored and disposed of in accordance with prevailing regulatory requirements. Excess soil spoils from construction of the recovery trench and the recharge trench should be disposed of in the immediate vicinity of the former disposal pits. Appropriate health-and-safety procedures should be followed during all construction work at the site, and construction equipment should be steam-cleaned before it is removed from the site.

LIMITATIONS

We have prepared this report for use by Columbia Marine Lines, Crowley Environmental Services, Corp., Mr. Patrick H. Wicks and the Washington State Department of Ecology for the purpose of evaluating subsurface contamination at the subject study site. Information in this report is not intended for use by others or for purposes other than described above.

Subsurface conditions at the study site were found to be relatively complex and variable. Our interpretations of subsurface conditions should not be construed as a warranty of accuracy, since variations in conditions undoubtedly exist between the boring sites.

The laboratory analytical data referenced herein were developed by an independent testing laboratory under contract to Crowley Environmental Services Corp. We are not responsible for the accuracy or completeness of the laboratory data.

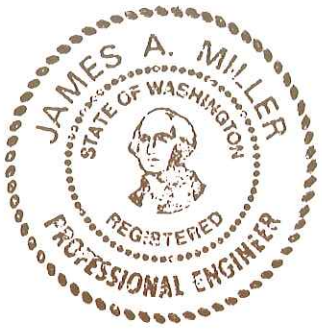
Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No other conditions, express or implied, should be understood.

- o O o -

We appreciate the opportunity to be of service. Please call if you have any questions regarding this report.

Respectfully submitted,

GeoEngineers, Inc.



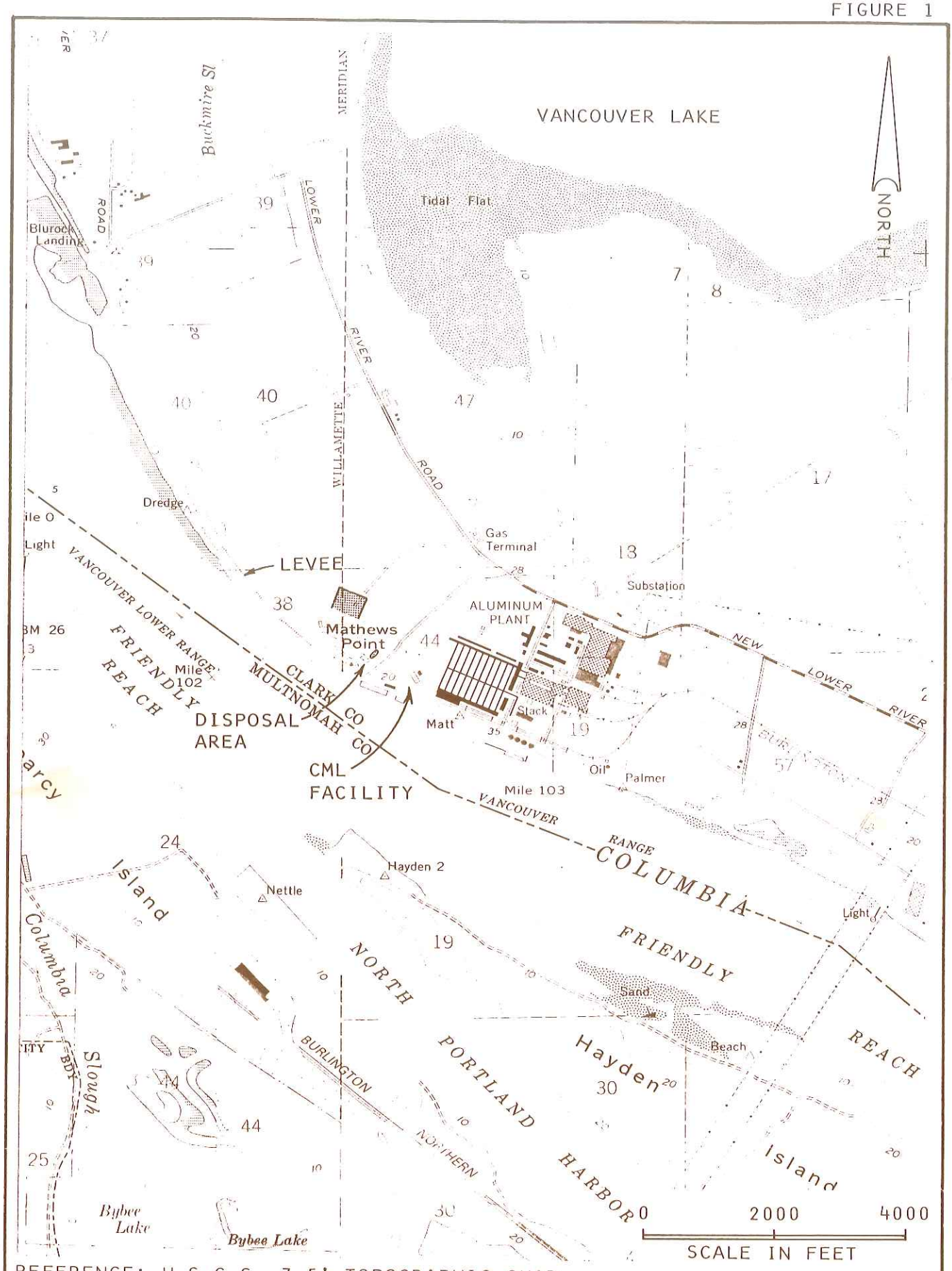
John H. Biggane
Geological Engineer/Hydrogeologist

James A. Miller
Associate

JHB:JAM:da

Attachments

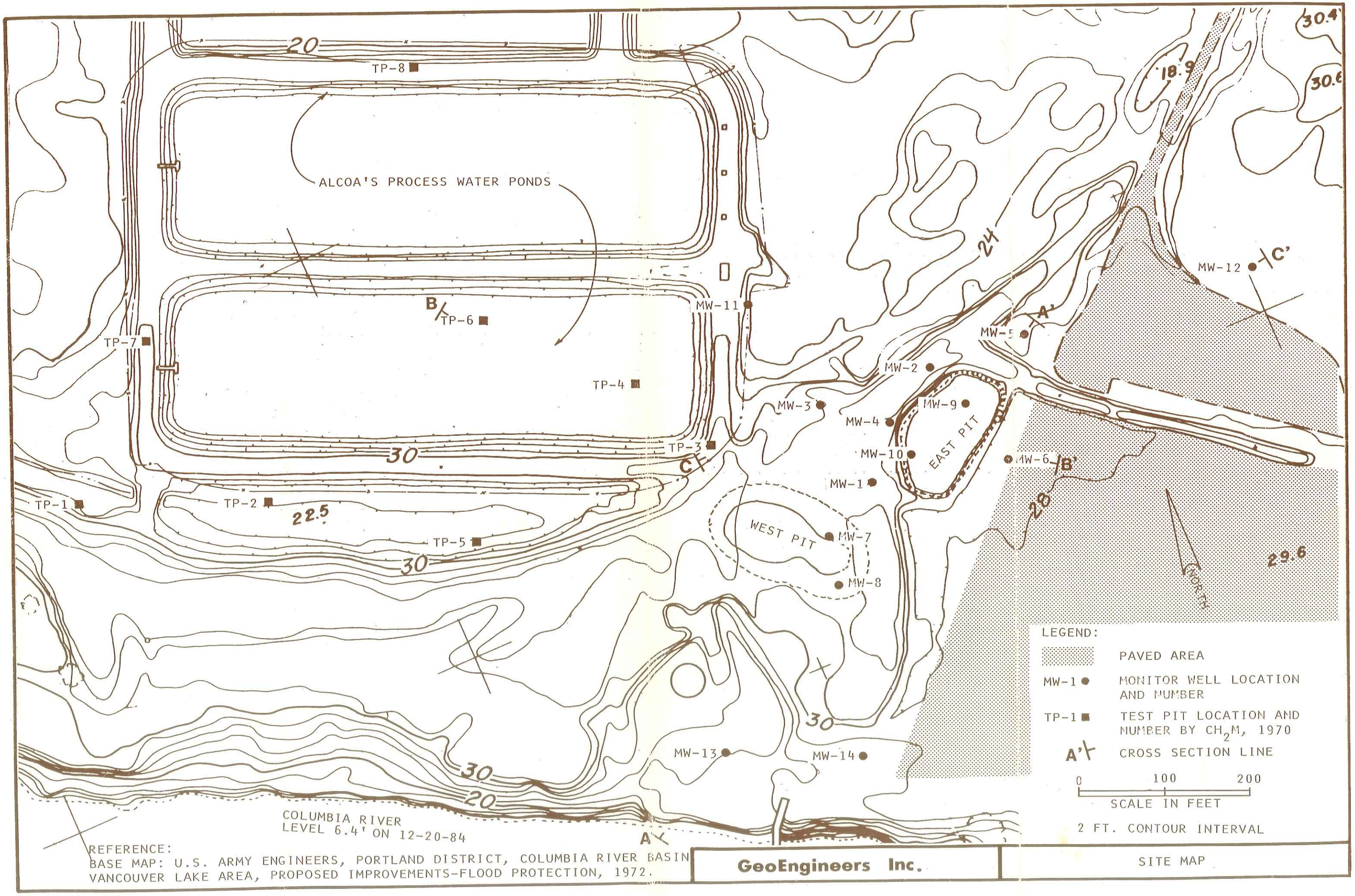
FIGURE 1



REFERENCE: U.S.G.S. 7.5' TOPOGRAPHIC QUAD SHEETS "VANCOUVER" AND "SAUVIE ISLAND"

GeoEngineers Inc.	LOCATION MAP

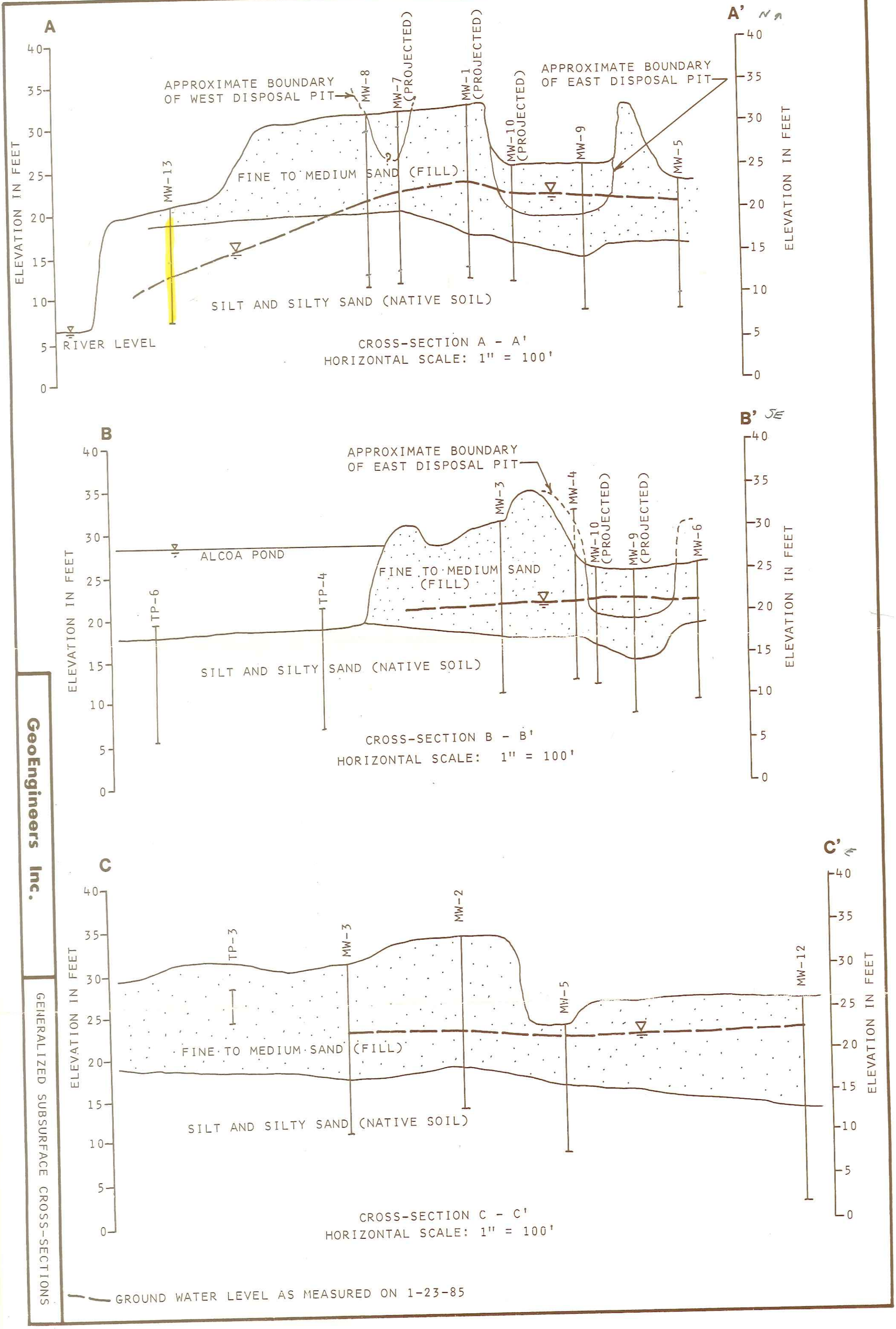
FIGURE 2



REFERENCE:
BASE MAP: U.S. ARMY ENGINEERS, PORTLAND DISTRICT, COLUMBIA RIVER BASIN VANCOUVER LAKE AREA, PROPOSED IMPROVEMENTS-FLOOD PROTECTION, 1972.

GeoEngineers Inc.

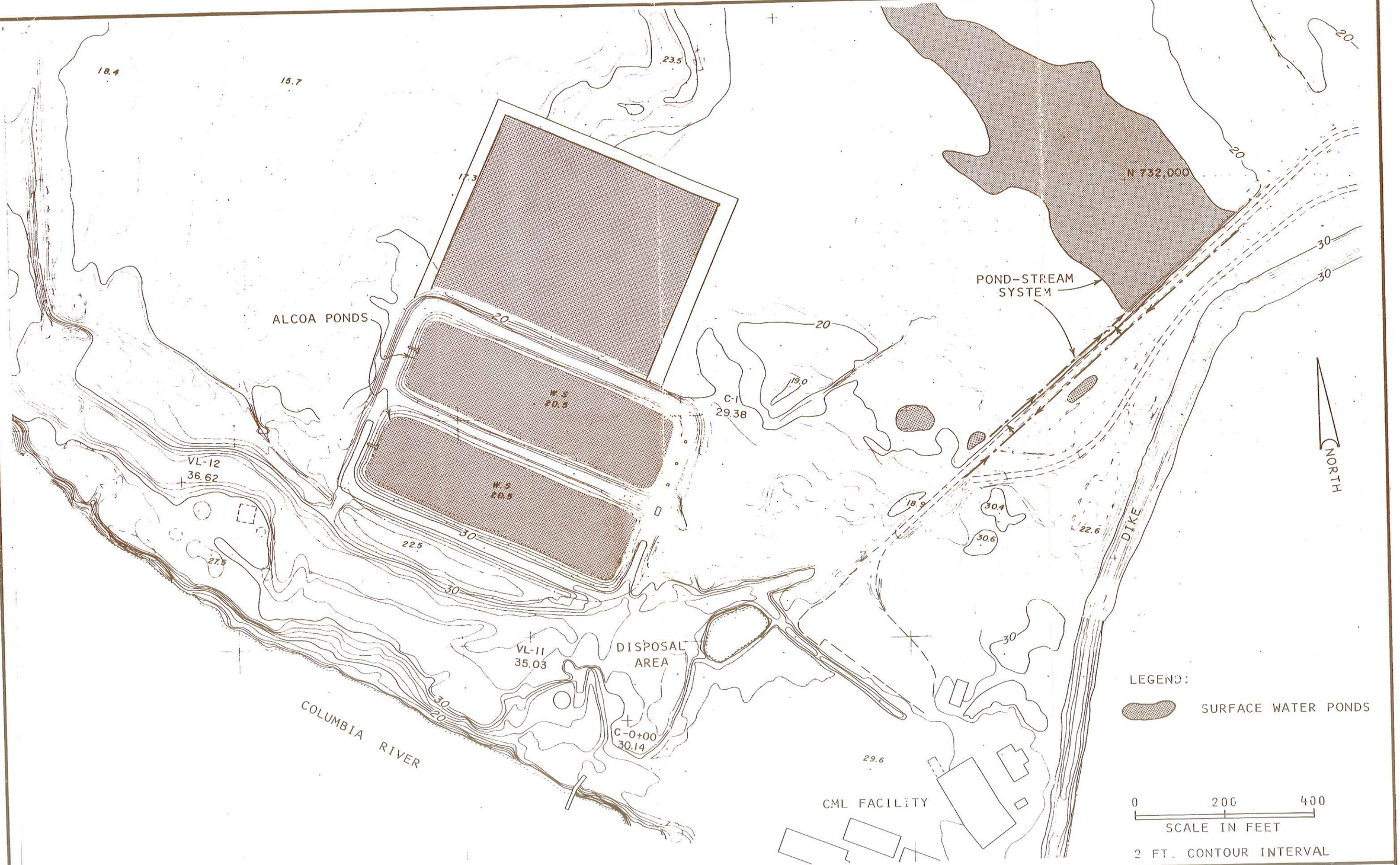
SITE MAP



GeoEngineers Inc.

GENERALIZED SUBSURFACE CROSS-SECTIONS

FIGURE 3



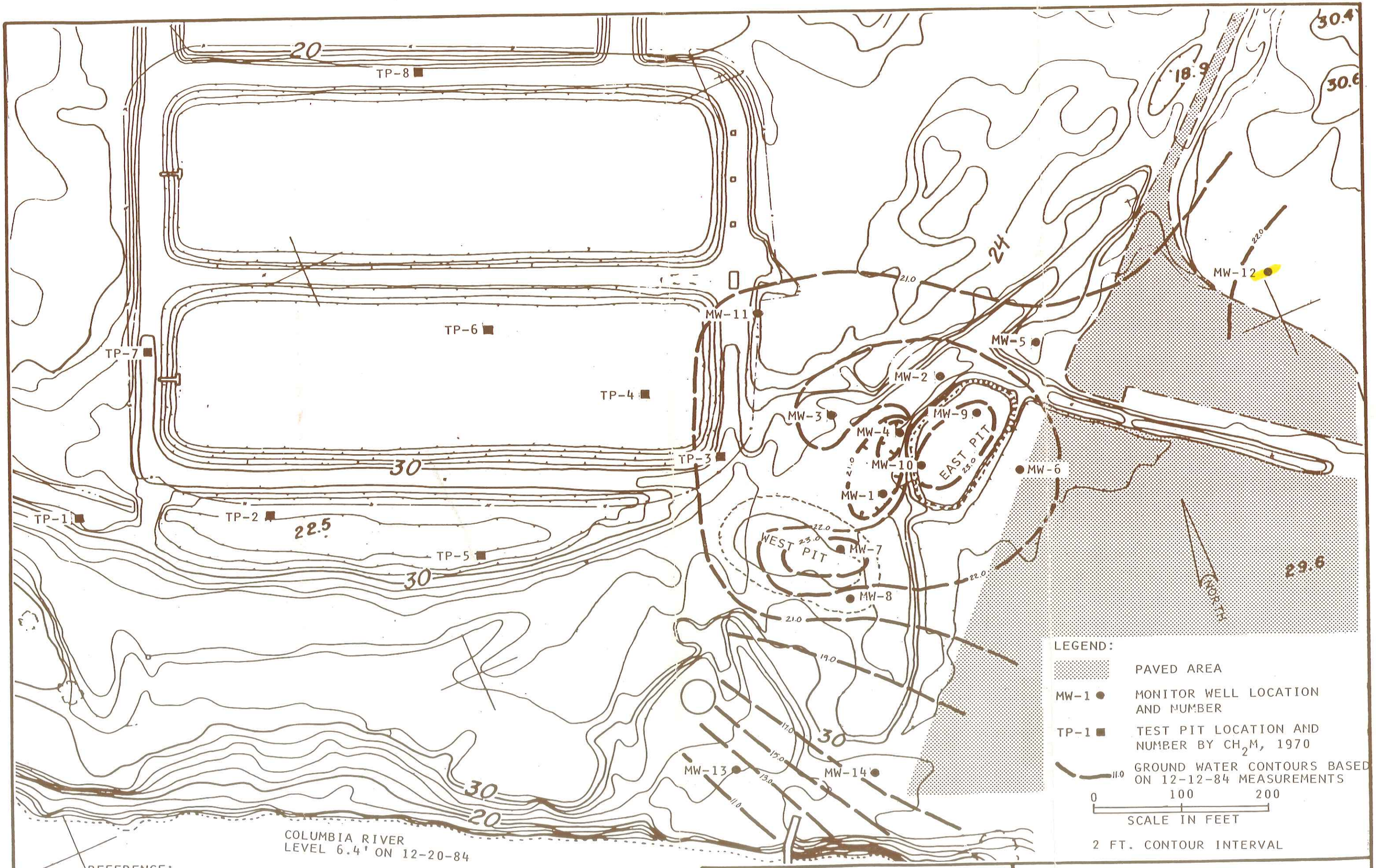
REFERENCE AS PER FIGURE 5.

GeoEngineers Inc.

SURFACE WATER FEATURES

698-01 JB:WJ 3-20-85

FIGURE 5



LEGEND:

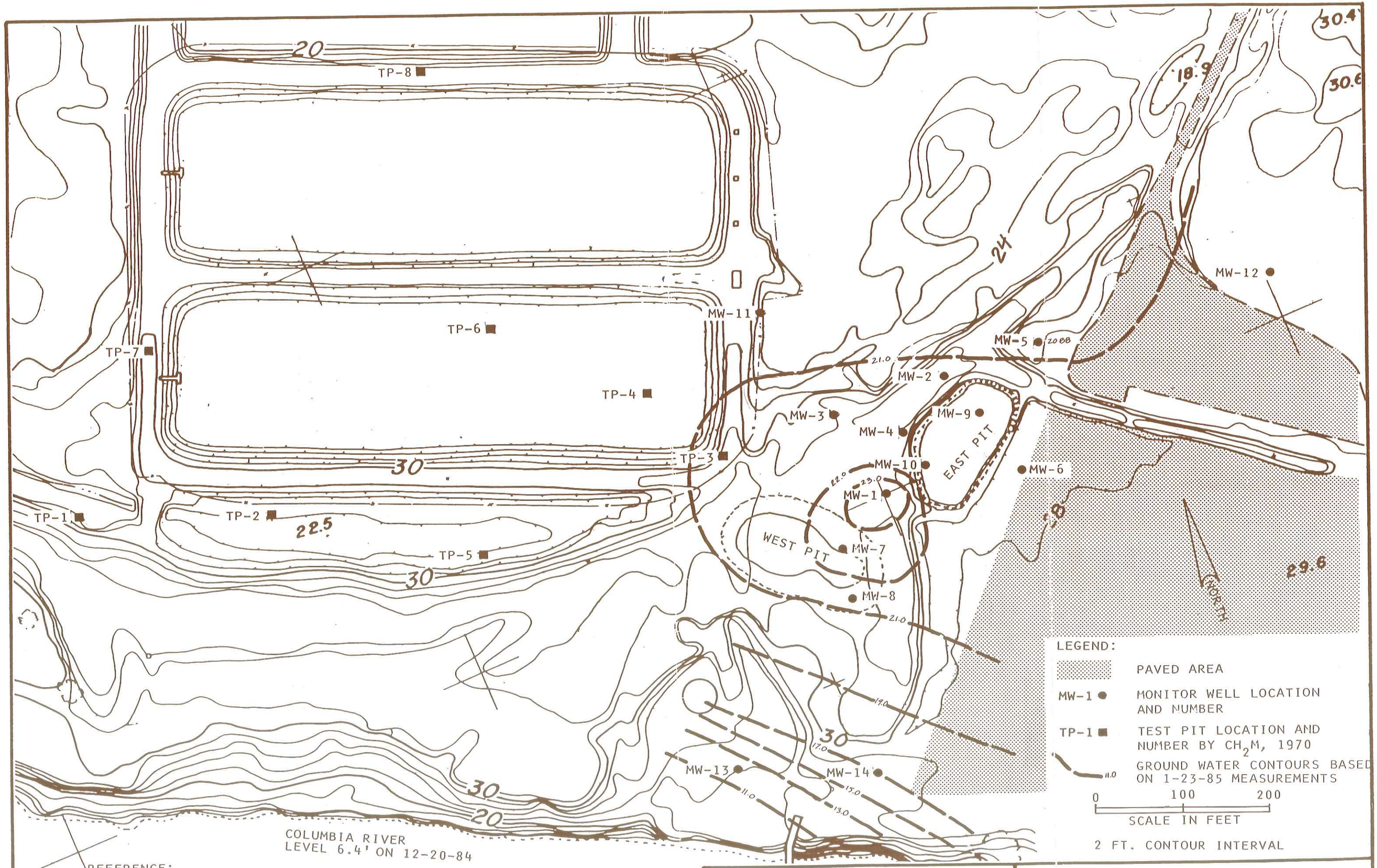
- PAVED AREA
- MW-1 ● MONITOR WELL LOCATION AND NUMBER
- TP-1 ■ TEST PIT LOCATION AND NUMBER BY CH_2M, 1970
- 11.0 GROUND WATER CONTOURS BASED ON 12-12-84 MEASUREMENTS

REFERENCE:
BASE MAP: U.S. ARMY ENGINEERS, PORTLAND DISTRICT, COLUMBIA RIVER BASIN VANCOUVER LAKE AREA, PROPOSED IMPROVEMENTS-FLOOD PROTECTION, 1972.

GeoEngineers Inc.

GROUND WATER CONTOUR MAP 12-12-84

FIGURE 6



REFERENCE:
BASE MAP: U.S. ARMY ENGINEERS, PORTLAND DISTRICT, COLUMBIA RIVER BASIN VANCOUVER LAKE AREA, PROPOSED IMPROVEMENTS-FLOOD PROTECTION, 1972.

GeoEngineers Inc.

GROUND WATER CONTOUR MAP 1-23-85

A P P E N D I X A

FIELD EXPLORATIONS

DRILLING AND SOIL SAMPLING PROGRAM

Borings MW-9 through MW-14 were drilled for this Phase 2 investigation at the locations indicated on Figure 2. The borings were drilled to depths ranging from 11-1/2 to 23-1/2 feet using hollow-stem auger drilling equipment.

A hydrogeologist from our staff determined boring locations, examined and classified the soils encountered, and prepared a detailed log of each boring. Soils encountered were classified visually in accordance with the Unified Soil Classification System which is described on Figure A-1. The logs of borings are presented on Figures A-2 through A-7.

Relatively undisturbed soil samples were obtained from each boring using a Dames & Moore split barrel sampler. The sampler was driven by a 320-pound weight falling a vertical distance of 30 inches. The number of blows required to drive the sampler the final 12 inches is indicated above the corresponding sample notations on the borings logs.

Drilling equipment (auger flights, sample rods and drill rig) were steam cleaned prior to drilling each boring and prior to leaving the site at completion. The soil samplers and other sampling equipment were steam cleaned, rinsed with hexane, and then rinsed with distilled water prior to each sampling attempt and after completion of drilling. A total of 27 soil samples were collected. Four of these samples were analyzed and the remaining 23 are in storage at Laucks Testing Laboratories, Inc., Seattle, Washington.

Two soil samples from MW-9 (9-2 and 9-3), one sample from MW-10 (10-2), and one sample from MW-12 (12-2) were analyzed. Samples 9-2 and 10-2 were collected near the base of the east pit. Sample 9-3 was collected at the dredge fill/flood plain soil contact. Sample 12-2 was collected and analyzed for background soil quality.

The drilling and sampling program during the Phase 1 study are described in our 1983 report.

MONITOR WELL CONSTRUCTION AND GROUND WATER MEASUREMENTS

Two-inch-diameter PVC pipe was installed in each boring at the completion of drilling. The PVC pipe was steam cleaned prior to installation. The lower 10 to 20 feet of PVC pipe is machine slotted (0.02 inch slot width) to allow entry of water and/or floating hydrocarbons into the well casings. (The PVC pipe in MW-14 was slotted with a hacksaw.) Coarse sand was placed in the borehole annulus to approximately one foot above the slotted portion of the wells. A one-half- to one-foot-thick bentonite seal was placed above the sand backfill, followed by native soil to the surface.

Elevations of the well casings were determined to the nearest 0.01 foot by GeoEngineers on December 20, 1984 and checked on January 23, 1985. Water table elevations in the wells were measured from the monitor well rims using a weighted fiberglas tape and water finding paste.

GROUND WATER SAMPLING PROGRAM

Each monitor well except MW-7 and MW-8 was developed by pumping approximately 150 to 200 gallons with a vacuum truck. Monitor well development occurred on December 4 through December 6, 1985.

Ground water samples were collected on December 12 through December 19, 1985 from MW-1 through MW-6, MW-9, and MW-11 through MW-14. Ground water samples were not collected from MW-7 and MW-8 because of presence of free (floating) hydrocarbons in the wells at the time of sampling. MW-10 was not sampled because the well became plugged with silt during well development.

Samples were analyzed by Laucks Testing Laboratories, Inc. Analytical data is given in Appendix B.

Ground water samples were obtained using an Industrial and Environmental Analysts, Inc. "Poseidon" model submersible bladder pump. The pump was disassembled and steam cleaned prior to each sampling attempt. Before the pump was reassembled, all metal parts were rinsed with hexane. The hexane rinse was followed by a distilled water rinse for the entire pump.

At least 3 gallons of distilled water were circulated through the pump and discharge lines after the pump was assembled and prior to placing the pump into the well. The sampling pump was then positioned about 3 feet above the well bottom and approximately 5 gallons of ground water was circulated through the pump and discharge lines prior to sample collection.

That portion of the water sample to be analyzed for metals was field-filtered through 0.45-micron filter paper. The glassware and filtering equipment were steam cleaned and rinsed with distilled water prior to use.

A sample of distilled water was circulated through the pump and collected to determine if pump cleaning and sampling procedures has introduced contaminants to the sample. Analysis of this sample indicated the presence of hexane, methlycyclopentane and 3-methylpentane, but no priority pollutants (Laucks Testing Laboratory, Inc., Report 87876-b). It appears that the detected contaminants may have been introduced during the cleaning or sampling procedure. The test data for this sample are included in Appendix B.

A duplicate ground water sample was collected from MW-12 and submitted to Analytical Technologies, Inc. to check laboratory procedure. A review of the analytical data for MW-12 reported by Laucks Testing Laboratories, Inc. and Analytical Technologies, Inc. indicates that similar results were obtained.

The ground water sampling program for the Phase 1 study is described in our 1983 report.

FIGURE A-1

BORING LOG AND SAMPLE DATA KEY

DRIVEN SAMPLES

MOISTURE CONTENT → 11.2%

28 ← BLOWS REQUIRED TO DRIVE SAMPLER ONE FOOT OR INDICATED PENETRATION USING 320 POUND HAMMER FALLING 30 INCHES
"P" INDICATES SAMPLER PUSHED WITH WEIGHT OF HAMMER

111 ← DRY DENSITY IN PCF

■ INDICATES LOCATION OF UNDISTURBED SAMPLE

⊠ INDICATES LOCATION OF DISTURBED SAMPLE

□ INDICATES LOCATION OF SAMPLING ATTEMPT WITH NO RECOVERY

OTHER TYPES OF SAMPLES

I INDICATES LOCATION OF THIN WALL, PITCHER, OR OTHER TYPES OF SAMPLES (SEE TEXT)

GRAPHIC LOG

SM — LETTER SYMBOL SOIL TYPE

DISTINCT CONTACT BETWEEN SOIL STRATA

GRADUAL CHANGE BETWEEN SOIL STRATA

BOTTOM OF BORING

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			LETTER SYMBOL	DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS, AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

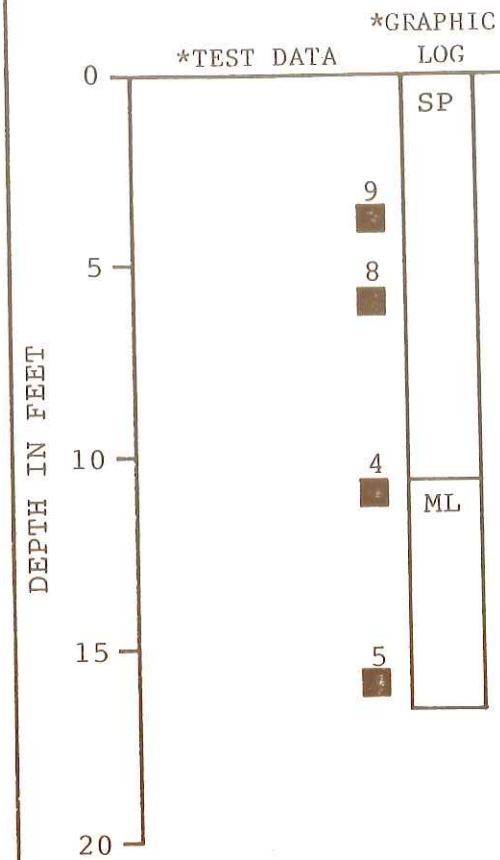
NOTE: DUAL SYMBOLS INDICATE BORDERLINE SOIL CLASSIFICATION

GeoEngineers Inc. | UNIFIED SOIL CLASSIFICATION SYSTEM AND KEY TO SAMPLE DATA

G.. 15.. CR..SEL ,-83,

BORING NO. 9

TOP OF CASING ELEVATION: 26.54 FEET



BROWNISH-GRAY FINE TO MEDIUM SAND WITH A TRACE OF SILT (LOOSE, MOIST TO WET) (FILL)

GRADES TO WET

STRONG HYDROCARBON ODOR

GRAY SILT WITH A TRACE OF ORGANIC MATTER AND HYDROCARBON SHEEN AND STRONG HYDROCARBON ODOR (SOFT, WET) (NATIVE SOIL)

BORING COMPLETED AT 16½ FEET ON 12/4/84

2-INCH PVC MONITOR WELL INSTALLED TO A DEPTH OF 11½ FEET. SLOTTED INTERVAL EXTENDS FROM 1½ TO 11½ FEET.

STATIC WATER LEVEL MEASURED AT ELEVATION 23.43 ON 12/12/84 AND ELEVATION 21.51 ON 1/23/85

*SEE KEY FOR EXPLANATION OF SYMBOLS

GeoEngineers Inc.	LOG OF EXPLORATION

1/24/85

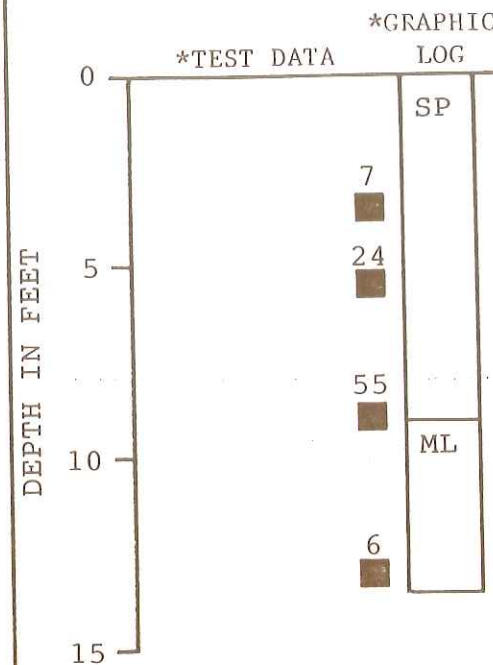
JHB:PM

698-01

GEI 41-81

BORING NO. 10

TOP OF CASING ELEVATION: 26.01 FEET



BROWNISH-GRAY FINE TO MEDIUM SAND WITH A TRACE OF SILT (LOOSE, MOIST) (FILL)

GRADES TO WET

GRADES TO MEDIUM DENSE

GRAY SILT WITH SOME FINE SAND AND A TRACE OF ORGANIC MATTER (SOFT, WET) (NATIVE SOIL)

BORING COMPLETED AT 13½ FEET ON 12/5/84

2-INCH PVC MONITOR WELL INSTALLED TO A DEPTH OF 12 FEET. SLOTTED INTERVAL EXTENDS FROM 2 TO 12 FEET.

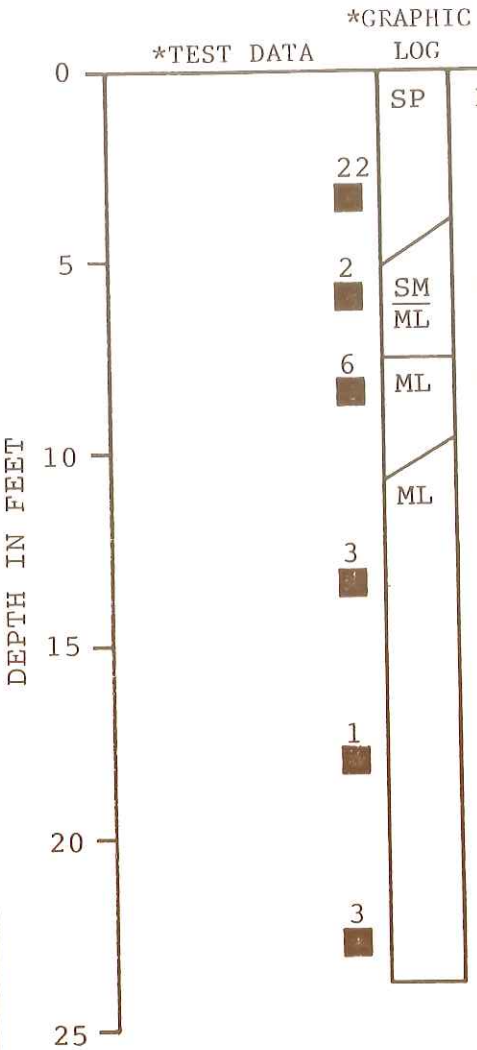
STATIC WATER LEVEL MEASURED AT ELEVATION 23.21 ON 12/12/84 AND ELEVATION 21.73 ON 1/23/85

*SEE KEY FOR EXPLANATION OF SYMBOLS

GEI 41-81 698-01 JHB:PM 1/22/85

BORING NO. 11

TOP OF CASING ELEVATION: 26.03 FEET



BROWN FINE TO MEDIUM SAND WITH A TRACE OF SILT (LOOSE, MOIST) (FILL)

GRADES TO MEDIUM DENSE

GRADES TO WET

GRAY SILTY FINE SAND AND SANDY SILT (VERY LOOSE, WET) (NATIVE SOIL)

GRAY SILT WITH SOME FINE SAND (SOFT, WET) (NATIVE SOIL)

GRAY SILT WITH A TRACE OF ORGANIC MATTER (VERY SOFT, WET) (NATIVE SOIL)

BORING COMPLETED AT 23½ FEET ON 12/5/84

2-INCH PVC MONITOR WELL INSTALLED TO A DEPTH OF 22½ FEET. SLOTTED INTERVAL EXTENDS FROM 2½ TO 22½ FEET.

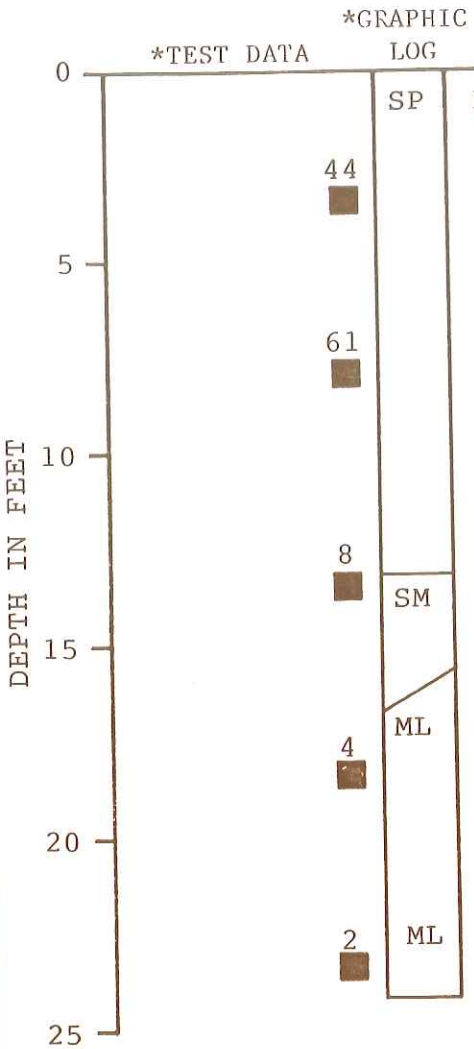
STATIC WATER LEVAL MEASURED AT ELEVATION 21.37 ON 12/12/84 AND ELEVATION 20.17 ON 1/23/85

*SEE KEY FOR EXPLANATION OF SYMBOLS

GeoEngineers Inc.	LOG OF EXPLORATION

BORING NO. 12

TOP OF CASING ELEVATION: 28.40 FEET



BROWN FINE TO MEDIUM SAND WITH A TRACE OF SILT (LOOSE, MOIST) (FILL)

GRADES TO DENSE

GRADES TO WET

GRAY SILTY FINE SAND WITH A TRACE OF ORGANIC MATTER (SOFT, WET) (NATIVE SOIL)

GRAY SILT (VERY SOFT, WET) (NATIVE SOIL)

GRADES TO VERY SOFT WITH A TRACE OF FINE SAND

BORING COMPLETED AT 24 FEET ON 12/6/84

2-INCH PVC MONITOR WELL INSTALLED TO A DEPTH OF 23½ FEET. SLOTTED INTERVAL EXTENDS FROM 3½ TO 23½ FEET.

STATIC WATER LEVEL MEASURED AT ELEVATION 22.14 ON 12/12/84 AND ELEVATION 21.54 ON 1/23/85

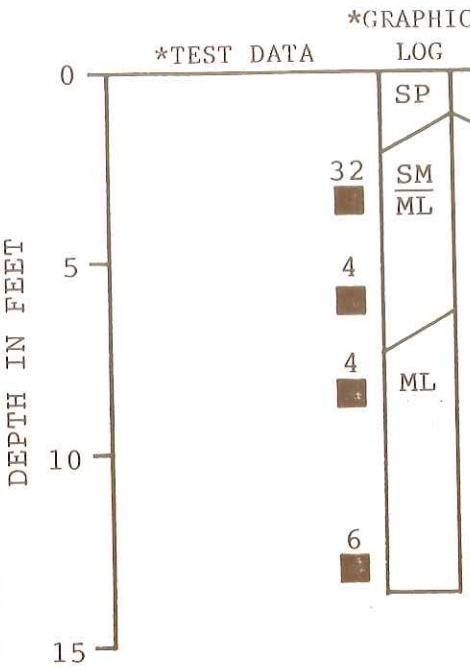
*SEE KEY FOR EXPLANATION OF SYMBOLS

GeoEngineers Inc. | LOG OF EXPLORATION

GEI 41-81 698-01 JHB:PM 1/22/85

BORING NO. 13

TOP OF CASING ELEVATION: 22.91 FEET



BROWN FINE TO MEDIUM SAND WITH A TRACE OF SILT (LOOSE, MOIST TO WET) (FILL)

BROWN AND GRAY SILTY FINE SAND WITH A TRACE OF ORGANIC MATTER (DENSE, WET) (NATIVE SOIL)

GRADES TO SANDY SILT WITH INCREASING AMOUNT OF ORGANIC MATTER

GRAY AND MOTTLED BROWN SILT WITH A TRACE OF ORGANIC MATTER (VERY SOFT, WET) (NATIVE SOIL)

BORING COMPLETED AT 13½ FEET ON 12/6/85

2-INCH PVC MONITOR WELL INSTALLED TO A DEPTH OF 13½ FEET. SLOTTED INTERVAL EXTENDS FROM 3½ TO 13½ FEET.

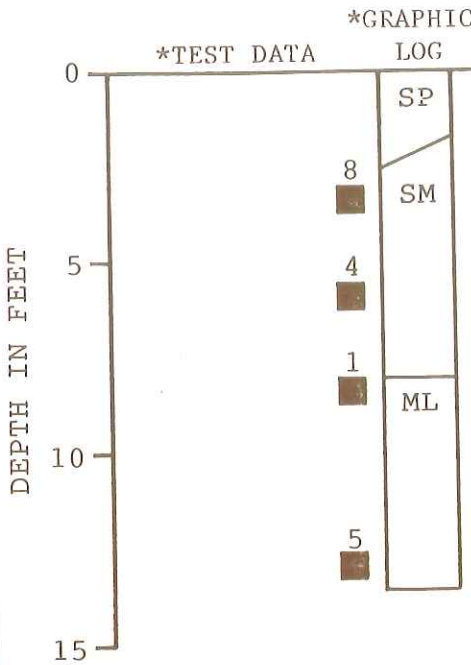
STATIC WATER LEVEL MEASURED AT ELEVATION 12.76 ON 12/12/84 AND ELEVATION 12.42 ON 1/23/85

*SEE KEY FOR EXPLANATION OF SYMBOLS

GeoEngineers Inc.	LOG OF EXPLORATION

BORING NO. 14

TOP OF CASING ELEVATION: 26.40 FEET



BROWN FINE TO MEDIUM SAND WITH A TRACE OF SILT (LOOSE, MOIST) (FILL)

BROWN SILTY FINE SAND WITH A TRACE OF ORGANIC MATTER (LOOSE, MOIST) (NATIVE SOIL)

GRADES TO WET (NATIVE SOIL)

GRAY SILT (VERY SOFT, WET) (NATIVE SOIL)

BORING COMPLETED AT 13½ FEET ON 12/6/84

2-INCH PVC MONITOR WELL INSTALLED TO A DEPTH OF 13½ FEET. SLOTTED INTERVAL EXTENDS FROM 3 TO 13½ FEET.

STATIC WATER LEVEL MEASURED AT ELEVATION 17.85 ON 12/12/84 AND ELEVATION 16.99 ON 1/23/85

*SEE KEY FOR EXPLANATION OF SYMBOLS

GeoEngineers Inc.	LOG OF EXPLORATION

1/24/85 JHB:PM 698-01 GEI 41-81

A P P E N D I X B

ANALYTICAL DATA - GROUND WATER, SOIL AND FREE HYDROCARBON PRODUCT

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206) 767-5060

Chemistry, Microbiology, and Technical Services

Certificate

FEB 2 8 1985

CLIENT Crowley Environmental Services
3400 East Marginal Way South
Seattle, WA 98134
ATTN: Wally Semon

LABORATORY NO. 87830-b

DATE Feb. 26, 1985

REPORT ON WATER

SAMPLE IDENTIFICATION Samples submitted 12/14/84 and identified as shown:

TESTS PERFORMED AND RESULTS:

1)	MW-6 Vancouver	Biggane	12/12/84 1405	Lab
2)	MW-2 CML-Vancouver	Biggane	12/14/84 954	Widress
3)	MW-4 Vancouver	Biggane	12/12/84 1600	Lab
4)	MW-1 Vancouver	Biggane	12/13/84 1546	Widress
5)	MW-9 CML-Vancouver	Biggane	12/13/84 1110	W. Semon

Samples were analyzed for the priority pollutants according to the methodology of Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A., 1982. Base/neutral/acids were performed under method 8270, volatile organics under 8240, pesticides & PCB's under method 8090.

Note: This report supplements report #87830-a, dated Feb. 9, 1985.

Volatile Organics (by GC/MS)	1 (mw-6)	2 (mw-2)	3 (mw-4)	4 (mw-1)	5 (mw-9)	Field Blank
	parts per billion (ug/L)					
Chloromethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Bromomethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Vinyl Chloride	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Chloroethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Methylene Chloride (resolve)	25.	42.	19.	24.	26.	26.
Acrolein	L/10.	L/50.	L/10.	L/50.	L/10.	L/1.
*Acetone	112.	160.	57.	200.	29.	19.
Acrylonitrile	L/10.	L/50.	L/10.	L/50.	L/10.	L/10.
*Carbon Disulfide	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
1,1-Dichloroethylene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060

Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87830-b

	1	2	3	4	5	Field Blank
	parts per billion (ug/L)					
1,1-Dichloroethane	21.	L/5.	L/1.	L/5.	L/1.	L/1.
trans-1,2-Dichloroethylene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Chloroform	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
*2-Butanone	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
1,2-Dichloroethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
1,1,1-Trichloroethane	139.	210.	trace	L/5.	trace	L/1.
*Vinyl Acetate	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Bromodichloromethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Carbon Tetrachloride	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
1,2-Dichloropropane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Trichloroethylene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Benzene	L/1.	74.	L/1.	L/5.	L/1.	L/1.
Chlorodibromomethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
1,1,2-Trichloroethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
2-Chloroethyl vinyl ether	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Bromoform	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
*4-Methyl-2-pentanone	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
*2-Hexanone	L/1.	12.	L/1.	10.	L/1.	L/1.
1,1,2,2-Tetrachloroethane	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Tetrachloroethylene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Toluene	L/1.	83.	L/1.	L/5.	L/1.	L/1.
Chlorobenzene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
trans-1,3-Dichloropropene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Ethylbenzene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
cis-1,3-Dichloropropene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Styrene	L/1.	L/5.	L/1.	L/5.	L/1.	L/1.
Total Xylenes	L/1.	122.	L/1.	L/5.	L/1.	L/1.
Methylcyclopentane	L/1.	1100.	790.	600.	L/1.	L/1.
3-Methylpentane	L/1.	69.	25.	L/5.	L/1.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87830-b

parts per billion (ug/L)

Extractables (by GC/MS)	1	2	3	4	5	Method Blank
N-nitrosodimethylamine	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Bis(2-chloroethyl)ether	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2-Chlorophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Phenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
1,3-Dichlorobenzene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
1,4-Dichlorobenzene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
1,2-Dichlorobenzene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Bis(2-chloroisopropyl)ether	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Hexachloroethane	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
N-nitroso-di-n-propylamine	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Nitrobenzene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Isophorone	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2-Nitrophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2,4-Dimethylphenol	11.	11.	L/1.	L/1.	L/1.	L/1.
Bis(2-chloroethoxy)methane	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2,4-Dichlorophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
1,2,4-Trichlorobenzene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Naphthalene	10.	66.	L/1.	150.	L/1.	L/1.
Hexachlorobutadiene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
4-Chloro-m-cresol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Hexachlorocyclopentadiene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2,4,6-Trichlorophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2-Chloronaphthalene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Acenaphthylene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Dimethylphthalate	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2,6-Dinitrotoluene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Acenaphthene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2,4-Dinitrophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2,4-Dinitrotoluene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
4-Nitrophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Fluorene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
4-Chlorophenyl phenyl ether	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Diethylphthalate	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
4,6-Dinitro-o-cresol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
1,2-Diphenylhydrazine	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060

Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO 87830-b

parts per billion (ug/L)

	1	2	3	4	5	Method Blank
4-Bromophenyl phenyl ether	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Hexachlorobenzene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Pentachlorophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Phenanthrene	L/1.	trace	L/1.	L/1.	L/1.	L/1.
Anthracene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Dibutylphthalate	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Fluoranthene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Pyrene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Benzidine	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Butyl benzyl phthalate	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Benzo(a)anthracene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Chrysene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
3,3'-Dichlorobenzidine	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Bis(2-ethylhexyl)phthalate	11.	17.	15.	trace	trace	trace
N-nitrosodiphenylamine	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Di-n-octyl phthalate	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Benzo(b)fluoranthene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Benzo(k)fluoranthene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Benzo(a)pyrene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Indeno(1,2,3-cd)pyrene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Dibenzo(ah)anthracene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
Benzo(ghi)perylene	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*Aniline	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*Benzoic Acid	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*Benzyl Alcohol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*4-Chloroaniline	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*Dibenzofuran	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*2-Methylnaphthalene	L/1.	35.	L/1.	75.	L/1.	L/1.
*2-Methylphenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*4-Methylphenol	72.	100.	18.	L/1.	L/1.	L/1.
*2-Nitroaniline	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*3-Nitroaniline	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*4-Nitroaniline	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.
*2,4,5-Trichlorophenol	L/1.	L/1.	L/1.	L/1.	L/1.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060

Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87830-b

parts per billion (ug/L)

Pesticides (by GC/ECD)	1	2	3	4	5
alpha-BHC	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
beta-BHC	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
delta-BHC	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
gamma-BHC (lindane)	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
heptachlor	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
aldrin	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
heptachlor epoxide	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
dieldrin	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
4,4'-DDE	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
4,4'-DDD	L/0.4	L/0.4	L/0.4	L/0.4	L/0.4
endosulfan sulfate	L/0.4	L/0.4	L/0.4	L/0.4	L/0.4
4,4'-DDT	L/0.4	L/0.4	L/0.4	L/0.4	L/0.4
chlordane	L/0.4	L/0.4	L/0.4	L/0.4	L/0.4
alpha endosulfan	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
beta endosulfan	L/0.2	L/0.2	L/0.2	L/0.2	L/0.2
endrin	L/0.4	L/0.4	L/0.4	L/0.4	L/0.4
endrin aldehyde	L/0.4	L/0.4	L/0.4	L/0.4	L/0.4
toxaphene	L/10.	L/10.	L/10.	L/10.	L/10.
PCB 1016	L/4.	L/4.	L/4.	L/4.	L/4.
PCB 1221	L/4.	L/4.	L/4.	L/4.	L/4.
PCB 1232	L/4.	L/4.	L/4.	L/4.	L/4.
PCB 1242	L/4.	L/4.	L/4.	L/4.	L/4.
PCB 1248	L/4.	L/4.	L/4.	L/4.	L/4.
PCB 1254	L/4.	L/4.	L/4.	L/4.	L/4.
PCB 1260	L/4.	L/4.	L/4.	L/4.	L/4.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87830-b

Crowley

Key

L/ indicates "less than"
* indicates additional compounds from the EPA's Hazardous Substances List.
** indicates additional compounds of interest.
trace indicates 1/10 ug/L

Note: All samples contained significant amounts of aliphatic hydrocarbons.

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:veg

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO.

Crowley

APPENDIX A

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utlized in the analysis of volatile and organic compounds. The surrogates are added to every sample prior extraction and analysis to monitor for matrix effects, purging efficiency, and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
1	d4-1,2-Dichloroethane	50.0	52.5	105.0	77-120
	d8-Toluene	50.0	49.5	99.0	86-119
	p-Bromofluorobenzene	50.0	52.6	105.2	85-121
2	d4-1,2-Dichloroethane	50.0	51.3	102.6	77-120
	d8-Toluene	50.0	49.3	98.6	86-119
	p-Bromofluorobenzene	50.0	52.0	104.0	85-121
3	d4-1,2-Dichloroethane	50.0	51.9	103.8	77-120
	d8-Toluene	50.0	50.2	100.4	86-119
	p-Bromofluorobenzene	50.0	55.0	110.0	85-121
4	d4-1,2-Dichloroethane	50.0	50.8	101.6	77-120
	d8-Toluene	50.0	49.9	99.8	86-119
	p-Bromofluorobenzene	50.0	51.7	103.4	85-121
5	d4-1,2-Dichloroethane	50.0	51.5	103.0	77-120
	d8-Toluene	50.0	49.7	99.4	86-119
	p-Bromofluorobenzene	50.0	52.0	104.0	85-121
5-matrix-spike	d4-1,2-Dichloroethane	50.0	50.3	100.6	77-120
	d8-Toluene	50.0	48.8	97.6	86-119
	p-Bromofluorobenzene	50.0	52.2	104.4	85-121

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

Crowley

LABORATORY NO. 87830-b

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
Method Blank	d4-1,2-Dichloroethane	50.0	49.6	99.2	77-120
	d8-Toluene	50.0	49.8	99.6	86-119
	p-Bromofluorobenzene	50.0	51.8	103.6	85-121
1	2-Fluorophenol	101.	70.2	69.5	23-121
	d5-Phenol	101.	53.9	53.4	15-103
	2-Bromophenol	100.	102.	102.	---
	d5-Nitrobenzene	50.5	41.2	81.6	41-120
	2-Fluorobiphenyl	49.8	41.9	84.1	44-119
	2,4,6-Tribromophenol	101.	107.	106.	10-130
	d14-p-Terphenyl	50.3	57.1	114.	33-128
2	2-Fluorophenol	100.	59.3	59.3	23-121
	d5-Phenol	100.	41.8	41.8	15-103
	2-Bromophenol	99.9	78.3	78.4	---
	d5-Nitrobenzene	50.2	38.3	76.3	41-120
	2-Fluorobiphenyl	49.6	37.9	76.4	44-119
	2,4,6-Tribromophenol	100.	88.0	88.0	10-130
	d14-p-Terphenyl	50.0	51.1	102.	33-128
3	2-Fluorophenol	100.	75.3	75.3	23-121
	d5-Phenol	100.	62.6	62.6	15-103
	2-Bromophenol	99.9	98.9	99.0	---
	d5-Nitrobenzene	50.2	28.9	57.6	41-120
	2-Fluorobiphenyl	49.6	33.9	68.3	44-119
	2,4,6-Tribromophenol	100.	105.	105.	10-130
	d14-p-Terphenyl	50.8	40.7	81.4	33-128
4	2-Fluorophenol	101.	69.7	69.1	23-121
	d5-Phenol	101.	36.8	36.4	15-103
	2-Bromophenol	100.	86.6	86.6	---
	d5-Nitrobenzene	50.5	23.5	46.5	41-120
	2-Fluorobiphenyl	49.8	46.6	93.6	44-119
	2,4,6-Tribromophenol	101.	107.	106.	10-130
	d14-p-Terphenyl	50.3	43.6	86.8	33-128

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87830-b

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
4-matrix-spike	2-Fluorophenol	112.	75.9	67.8	23-121
	d5-Phenol	112.	71.8	64.1	15-103
	2-Bromophenol	112.	105.	93.8	---
	d5-Nitrobenzene	56.4	41.4	73.4	41-120
	2-Fluorobiphenyl	55.7	49.7	89.2	44-119
	2,4,6-Tribromophenol	112.			10-130
	d14-p-Terphenyl	56.2	46.6	82.9	33-128
5	2-Fluorophenol	101.	45.3	44.9	23-121
	d5-Phenol	101.	29.9	29.6	15-103
	2-Bromophenol	100.	48.1	48.1	---
	d5-Nitrobenzene	50.5	32.4	64.2	41-120
	2-Fluorobiphenyl	49.8	49.0	98.4	44-119
	2,4,6-Tribromophenol	101.	76.9	76.2	10-130
	d14-p-Terphenyl	50.3	51.1	102.	33-128
Method Blank	2-Fluorophenol	100.	50.4	50.4	23-121
	d5-Phenol	100.	32.8	32.8	15-103
	2-Bromophenol	99.9	53.5	53.6	---
	d5-Nitrobenzene	50.2	28.2	56.2	41-120
	2-Fluorobiphenyl	49.6	32.9	66.4	44-119
	2,4,6-Tribromophenol	100.	76.9	76.9	10-130
	d14-p-Terphenyl	50.0	43.5	87.0	33-128
1	dibutylchlorendate	1.0	0.846	84.6	48-136
2	dibutylchlorendate	1.0	0.688	68.8	48-136
3	dibutylchlorendate	1.0	0.372	37.2	48-136
4	dibutylchlorendate	1.0	0.408	40.8	48-136
5	dibutylchlorendate	1.0	0.422	42.2	48-136
Blank	dibutylchlorendate	1.0	0.698	69.8	48-136
Matrix Spike	dibutylchlorendate	1.0	1.03	103.	48-136
Matrix-Spike-Duplicate	dibutylchlorendate	1.0	0.483	48.3	48-136

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206) 767-5060
Chemistry. Microbiology. and Technical Services

Certificate

Crowley

LABORATORY NO. 87830-b

APPENDIX B

Spike Quality Control Report

Sample	Analyte	Sample Found	Spike Level	Spike Found	% Recovery	Control Limits
1-matrix-spike	Lindane	L/0.2	0.20	0.037	18.4	56-123*
	Heptachlor	L/0.2	0.200	L/0.2	0.	40-131*#
	Aldrin	L/0.2	0.200	0.046	22.9	40-131*
	Dieldrin	L/0.2	0.500	0.140	28.0	52-126*
	Endrin	L/0.4	0.500	0.148	29.6	56-127*
	DDT	L/0.4	0.500	0.219	43.7	38-127
1-matrix-spike-duplicate	Lindane	L/0.2	0.200	0.033	16.2	56-123*
	Heptachlor	L/0.2	0.200	L/0.2	0.	40-131*#
	Aldrin	L/0.2	0.200	0.041	20.6	40-131*
	Dieldrin	L/0.2	0.500	0.100	19.9	52-126*
	Endrin	L/0.4	0.500	0.163	32.6	56-121*
	DDT	L/0.4	0.500	0.259	51.8	38-127

* Low recoveries are believed due to a matrix effect of the sample. Spiking level was too low for the matrix background encountered for the samples.

\# Matrix interference.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87830-b

Crowley

APPENDIX C

Matrix Spike Analysis

Compound	Conc Spike	Conc Samp	Conc MS	% REC	RPD Limit	REC Limit
1,1-Dichloroethene	0.125	0.	0.120	96.4	14	61-145
Trichloroethene	0.125	0.	0.128	102.4	14	71-120
Chlorobenzene	0.125	0.	0.138	110.8	13	75-130
Toluene	0.125	0.	0.131	104.6	13	76-125
Benzene	0.125	0.	0.124	99.9	11	76-127
1,2,4-Trichlorobenzene	50.0	0.	31.7	63.4	28	39-98
Acenaphthene	50.0	0.	37.2	74.4	31	46-116
2,4-Dinitrotoluene	50.0	0.	35.6	71.2	38	24-96
Di-n-Butylphthalate	50.0	0.	38.5	77.0	40	11-117
Pyrene	50.0	0.	28.6	57.2	31	26-127
N-Nitrosodipropylamine	50.0	0.	57.8	116.	38	41-116
1,4-Dichlorobenzene	50.0	0.	37.3	74.6	28	36-97
Pentachlorophenol	100.	0.	95.8	95.8	50	9-103
Phenol	100.	0.	59.7	59.7	42	12-89
2-Chlorophenol	100.	0.	83.0	83.0	40	27-123
P-Chloro-m-cresol	100.	0.	71.1	71.1	42	23-97
4-Nitrophenol	100.	0.	26.6	26.6	50	10-80

Key

Conc = Concentration
Samp = Sample
MS = Matrix Spike
REC = Recovery
RPD = Relative Percent Difference

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206) 767-5060

Chemistry. Microbiology. and Technical Services

Certificate

CLIENT

Crowley Environmental Services
3400 E. Marginal Way South
Seattle, WA 98134
REPORT ON ATTN: Wally Semon

LABORATORY NO 87830-a

DATE Feb. 9, 1985

SAMPLE IDENTIFICATION

WATER

Submitted 12/14/84 and identified as shown below:

TESTS PERFORMED AND RESULTS.

1)	MW-6	Vancouver	Biggane	12/12/84	1405	Lab
2)	MW-2	CML-Vancouver	Biggane	12/14/84	954	Widress
3)	MW-4	Vancouver	Biggane	12/12/84	1600	Lab
4)	MW-1	Vancouver	Biggane	12/13/84	1546	Widress
5)	MW-9	CML-Vancouver	Biggane	12/13/84	1110	W. Semon

Samples were analyzed for the priority pollutants according to the methodology of Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A., 1982. Metals analyses were performed under the 7000 series of methods; cyanide analysis followed method 9010; and phenol analysis was in accordance with Method 420.2, Methods for Chemical Analysis of Water and Wastes, U.S.E.P.A., March, 1979.

parts per billion (ug/L)

	1 MW-6	2 MW-2	3 MW-4	4 MW-1	5 MW-9
Antimony	L/5.	L/5.	L/5.	L/5.	L/5.
Arsenic	7.	6.	L/5.	11.	L/5.
Beryllium	L/5.	L/5.	L/5.	L/5.	L/5.
Cadmium	L/1.	L/1.	L/1.	L/1.	L/1.
Chromium	L/2.	L/2.	L/2.	L/2.	L/2.
Copper	2.	3.	L/2.	4.	2.
Lead	L/5.	L/5.	6.	L/5.	8.
Mercury	L/1.	L/1.	L/1.	L/1.	L/1.
Nickel	L/5.	L/5.	18.	L/5.	L/5.
Selenium	L/5.	L/5.	L/5.	L/5.	L/5.
Silver	L/1.	L/1.	L/1.	L/1.	L/1.
Thallium	L/5.	L/5.	L/5.	L/5.	L/5.
Zinc	78.	76.	150.	89.	110.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87830-a

Crowley Environmental Services

parts per billion (ug/L)

	1	2	3	4	5
Total Cyanide	5.	L/5.	5.	5.	L/5.
Total Phenol	47.	60.	23.	22.	8.

Note: Balance of results (base/acid/neutral, volatile and pesticide fractions) to follow upon completion.

Key

L/ indicates "less than"

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:bg

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO 87830-a

Crowley Environmental Services

APPENDIX A

Replicate Quality Control Report

Sample No.	Analyte	Replicate 1	Replicate 2	Relative Error, %
		parts per billion (ug/L)		
1	Cyanide	5.	4.	(1.)
1 spk	Arsenic	10.	11.	9.1
1 spk	Selenium	15.	15.	(0.)
1	Chromium	L/2.	L/2.	(0.)
1	Copper	2.	2.	(0.)
1	Cadmium	L/1.	L/1.	(0.)
1	Silver	L/1.	L/1.	(0.)
1	Lead	7.	L/5.	(2.)
1	Phenol	47.	46.	(1.)
1	Zinc	78.	81.	4.
1	Nickel	L/5.	L/5.	(0.)
1	Thallium	L/5.	L/5.	(0.)
1	Beryllium	L/5.	L/5.	(0.)
1	Antimony	L/5.	L/5.	(0.)
5 spk	Mercury	6.	6.	(0.)

spk = Spike. In some instances, where sample levels are near or below the detection limits, the spiked sample is analyzed in duplicate as a better check for replication.

Parentheses () indicate absolute, not relative, error.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87830-a

Crowley Environmental Services

APPENDIX B

Spike Quality Control Report

Sample No.	Analyte	Sample Found	Spike Level	Spike Found	% Recovery	Control Limit
		parts per billion (ug/L)				
2	Cyanide	L/5.	50.	58.	108.	*
1	Arsenic	7.	20.	11.	20.	55-160
1	Selenium	L/5.	20.	15.	75.	16-116
2	Chromium	L/2.	25.	21.	84.	52-134
2	Copper	3.	25.	30.	108.	66-122
2	Cadmium	L/1.	5.	5.	100.	64-116
2	Silver	L/1.	1.	1.	100.	43-130
2	Lead	L/5.	25.	27.	104.	54-140
2	Phenol	60.	50.	**	**	*
4	Phenol	25.	50.	68.	86.	*
2	Zinc	76.	50.	115.	78.	58-124
2	Nickel	L/5.	25.	23.	92.	67-123
2	Thallium	L/5.	25.	19.	76.	20-110
2	Beryllium	L/5.	10.	7.	70.	61-161
2	Antimony	L/5.	50.	43.	86.	45-165
5	Merucry	L/1.	6.	6.	100.	52-138

*No control limit established.
**Peak off scale.

The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

Laucks
Testing Laboratories, Inc.
940 South Harney Street Seattle, Washington 98108 (206)767-5060

Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

CLIENT Crowley Environmental Services
3400 East Marginal Way South
Seattle, WA 98134
ATTN: Wally Semon

DATE Mar. 6, 1985

REPORT ON WATER

SAMPLE IDENTIFICATION Samples submitted 12/19/84 and identified as shown below:

TESTS PERFORMED AND RESULTS

1) MW-5 CML-Vancouver Biggane 12/17/84 1325 Widress
2) MW-11 CML-Vancouver Biggane 12/17/84 1515 Widress
3) MW-3 CML-Vancouver Biggane 12/17/84 0925 Widress
4) MW-12 CML-Vancouver Biggane 12/18/84 1426 Widress
5) Field Blank — already have one

Samples were analyzed for priority pollutants according to the methodology of Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A., 1982. Base/neutral/acids were performed under method 8270, volatile organics under 8240, pesticides and PCB's under method 8090.

Note: This report supplements report #87867-a dated Feb. 9, 1985.

parts per billion (ug/L)

Volatile Organics (by GC/MS)	1 (MW-5)	2 (MW-11)	3 (MW-3)	4 (MW-12)	5	Field Blank	Method Blank
Chloromethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Bromomethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Vinyl Chloride	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Chloroethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Methylene Chloride	380.	17.	18.	24.	14.	21.	19.
Acrolein	<200.	<10.	<10.	<10.	<10.	<10.	<10.
*Acetone	trace*	trace	10.	16.	trace	trace	20.
Acrylonitrile	<200.	<10.	<10.	<10.	<10.	<10.	<10.
*Carbon Disulfide	<20.	<1.	<1.	<1.	<1.	<1.	<1.
1,1-Dichloroethylene	<20.	<1.	<1.	<1.	<1.	<1.	<1.
1,1-Dichloroethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
trans-1,2-Dichloroethylene	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Chloroform	<20.	<1.	<1.	<1.	<1.	<1.	<1

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

parts per billion (ug/L)

	1	2	3	4	5	Field Blank	Method Blank
*2-Butanone	<20.	<1.	<1.	<1.	<1.	trace	<1.
1,2-Dichloroethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
1,1,1-Trichloroethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
*Vinyl Acetate	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Bromodichloromethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Carbon Tetrachloride	<20.	<1.	<1.	<1.	<1.	<1.	<1.
1,2-Dichloropropane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Trichloroethylene	trace*	<1.	<1.	<1.	14.	trace	<1.
Benzene	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Chlorodibromomethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
1,1,2-Trichloroethane	<20.	<1.	<1.	<1.	<1.	<1.	<1.
2-Chloroethyl vinyl ether	<20.	<1.	trace	<1.	<1.	<1.	<1.
Bromoform	<20.	<1.	21.	<1.	<1.	<1.	<1.
*4-Methyl-2-pentanone	<20.	<1.	<1.	<1.	<1.	<1.	<1.
*2-Hexanone	<20.	<1.	<1.	<1.	<1.	<1.	<1.
1,1,2,2-Tetrachloroethane	<20.	<1.	<1.	<1.	trace	24.	<1.
Tetrachloroethylene	380.	<1.	<1.	<1.	<1.	<1.	<1.
Toluene	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Chlorobenzene	<20.	<1.	<1.	<1.	trace	trace	<1.
trans-1,3-Dichloropropene	<20.	<1.	<1.	<1.	<1.	<1.	<1.
Ethylbenzene	<20.	<1.	<1.	<1.	<1.	<1.	<1.
cis-1,3-Dichloropropene	<20.	<1.	<1.	<1.	trace	17.	<1.
**Styrene	490.	<1.	<1.	<1.	<1.	21.	<1.
**o-Xylene	410.	<1.	1,600.	<1.	1,200.	15.	<1.
***m-&p-Xylene	420.	<1.	180.	<1.	100.	trace	<1.
***Methylcyclopentane	trace*	<1.	1,200.	<1.	1,200.	trace	<1.
***3-Methylpentane	420.	<1.					
***Hexane							

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

parts per billion (ug/L)

Extractables (by GC/MS)	1	2	3	4	5	Method Blank
N-nitrosodimethylamine	<1.	<1.	<1.	<1.	<1.	<1.
Bis(2-chloroethyl)ether	<1.	<1.	<1.	<1.	<1.	<1.
2-Chlorophenol	<1.	<1.	<1.	<1.	<1.	<1.
Phenol	<1.	<1.	<1.	<1.	<1.	<1.
1,3-Dichlorobenzene	<1.	<1.	<1.	<1.	<1.	<1.
1,4-Dichlorobenzene	<1.	<1.	<1.	<1.	<1.	<1.
1,2-Dichlorobenzene	<1.	<1.	<1.	<1.	<1.	<1.
Bis(2-chloroisopropyl)ether	<1.	<1.	<1.	<1.	<1.	<1.
Hexachloroethane	<1.	<1.	<1.	<1.	<1.	<1.
N-nitroso-di-n-propylamine	<1.	<1.	<1.	<1.	<1.	<1.
Nitrobenzene	<1.	<1.	<1.	<1.	<1.	<1.
Isophorone	<1.	<1.	<1.	<1.	<1.	<1.
2-Nitrophenol	<1.	<1.	<1.	<1.	<1.	<1.
2,4-Dimethylphenol	<1.	<1.	<1.	<1.	<1.	<1.
Bis(2-chloroethoxy)methane	<1.	<1.	<1.	<1.	<1.	<1.
2,4-Dichlorophenol	<1.	<1.	<1.	<1.	<1.	<1.
1,2,4-Trichlorobenzene	<1.	<1.	<1.	<1.	<1.	<1.
Naphthalene	150.	<1.	20.	<1.	<1.	<1.
Hexachlorobutadiene	<1.	<1.	<1.	<1.	<1.	<1.
4-Chloro-m-cresol	<1.	<1.	<1.	<1.	<1.	<1.
Hexachlorocyclopentadiene	<1.	<1.	<1.	<1.	<1.	<1.
2,4,6-Trichlorophenol	<1.	<1.	<1.	<1.	<1.	<1.
2-Chloronaphthalene	<1.	<1.	<1.	<1.	<1.	<1.
Acenaphthylene	<1.	<1.	<1.	<1.	<1.	<1.
Dimethylphthalate	<1.	<1.	<1.	<1.	<1.	<1.
2,6-Dinitrotoluene	<1.	<1.	<1.	<1.	<1.	<1.
Acenaphthene	<1.	<1.	<1.	<1.	<1.	<1.
2,4-Dinitrophenol	<1.	<1.	<1.	<1.	<1.	<1.
2,4-Dinitrotoluene	<1.	<1.	<1.	<1.	<1.	<1.
4-Nitrophenol	<1.	<1.	<1.	<1.	<1.	<1.
Fluorene						

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

parts per billion (ug/L)

	1	2	3	4	5	Method Blank
4-Chlorophenyl phenyl ether	<1.	<1.	<1.	<1.	<1.	<1.
Diethylphthalate	<1.	<1.	<1.	<1.	<1.	<1.
4,6-Dinitro-o-cresol	<1.	<1.	<1.	<1.	<1.	<1.
1,2-Diphenylhydrazine	<1.	<1.	<1.	<1.	<1.	<1.
4-Bromophenyl phenyl ether	<1.	<1.	<1.	<1.	<1.	<1.
Hexachlorobenzene	<1.	<1.	<1.	<1.	<1.	<1.
Pentachlorophenol	<1.	<1.	<1.	<1.	<1.	<1.
Phenanthrene	<1.	<1.	<1.	<1.	<1.	<1.
Anthracene	<1.	<1.	<1.	<1.	<1.	<1.
Dibutylphthalate	<1.	<1.	<1.	<1.	<1.	<1.
Fluoranthene	<1.	<1.	<1.	<1.	<1.	<1.
Pyrene	<1.	<1.	<1.	<1.	<1.	<1.
Benzidine	<1.	<1.	<1.	<1.	<1.	<1.
Butyl benzyl phthalate	<1.	<1.	<1.	<1.	<1.	<1.
Benzo(a)anthracene	<1.	<1.	<1.	<1.	<1.	<1.
Chrysene	<1.	<1.	<1.	<1.	<1.	<1.
3,3'-Dichlorobenzidine	<1.	<1.	<1.	<1.	<1.	<1.
Bis(2-ethylhexyl)phthalate	trace	trace	<1.	trace	trace	trace
N-nitrosodiphenylamine	<1.	<1.	<1.	<1.	<1.	<1.
Di-n-octyl phthalate	<1.	<1.	trace	<1.	<1.	<1.
Benzo(b)fluoranthene	<1.	<1.	<1.	<1.	<1.	<1.
Benzo(k)fluoranthene	<1.	<1.	<1.	<1.	<1.	<1.
Benzo(a)pyrene	<1.	<1.	<1.	<1.	<1.	<1.
Indeno(1,2,3-cd)pyrene	<1.	<1.	<1.	<1.	<1.	<1.
Dibenzo(ah)anthracene	<1.	<1.	<1.	<1.	<1.	<1.
Benzo(ghi)perylene	<1.	<1.	<1.	<1.	<1.	<1.
*Aniline	<1.	<1.	<1.	<1.	<1.	<1.
*Benzoic Acid	<1.	<1.	<1.	<1.	<1.	<1.
*Benzyl Alcohol	<1.	<1.	<1.	<1.	<1.	<1.
*4-Chloroaniline	<1.	<1.	<1.	<1.	<1.	<1.
*Dibenzofuran						

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

parts per billion (ug/L)

	1	2	3	4	5	Method Blank
*2-Methylnaphthalene	30.	<1.	14.	<1.	<1.	<1.
*2-Methylphenol	<1.	<1.	63.	<1.	<1.	<1.
*4-Methylphenol	<1.	<1.	24.	<1.	<1.	<1.
*2-Nitroaniline	<1.	<1.	<1.	<1.	<1.	<1.
*3-Nitroaniline	<1.	<1.	<1.	<1.	<1.	<1.
*4-Nitroaniline	<1.	<1.	<1.	<1.	<1.	<1.
*2,4,5-Trichlorophenol	<1.	<1.	<1.	<1.	<1.	<1.

parts per billion (ug/L)

Pesticides (by GC/ECD)	1	2	3	4	5	Method Blank
alpha-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC (lindane)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
aldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
heptachlor epoxide	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDE	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
4,4'-DDD	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
endosulfan sulfate	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
4,4'-DDT	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
chlordane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
alpha endosulfan	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
beta endosulfan	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
endrin	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
endrin aldehyde	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
toxaphene						

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

parts per billion (ug/L)

	1	2	3	4	5	Method Blank
PCB 1016	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
PCB 1221	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
PCB 1232	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
PCB 1242	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
PCB 1248	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
PCB 1254	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
PCB 1260						

Key

*trace = 20-200 ug/L.
**Additional compounds from the EPA's Hazardous Substances List.
***Other compounds of interest identified, in estimated amounts.
< indicates "less than"
trace = an unquantifiable amount between 1-10 ug/L.

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:rtv

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

APPENDIX A

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to analysis and extraction to monitor for matrix effects, purging efficiency and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
VOLATILES					
1	d4-1,2-Dichloroethane	50.0	47.3	94.6	77-120
1	d8-Toluene	50.0	49.5	99.0	86-119
1	p-Bromofluorobenzene	50.0	53.3	107.	85-121
2	d4-1,2-Dichloroethane	50.0	48.1	96.2	77-120
2	d8-Toluene	50.0	49.1	98.2	86-119
2	p-Bromofluorobenzene	50.0	54.2	108.	85-121
3	d4-1,2-Dichloroethane	50.0	47.7	95.4	77-120
3	d8-Toluene	50.0	49.0	98.0	86-119
3	p-Bromofluorobenzene	50.0	53.6	107.	85-121
4	d4-1,2-Dichloroethane	50.0	51.7	103.	77-120
4	d8-Toluene	50.0	50.8	102.	86-119
4	p-Bromofluorobenzene	50.0	50.2	100.	85-121
5	d4-1,2-Dichloroethane	50.0	45.7	91.4	77-120
5	d8-Toluene	50.0	48.6	97.2	86-119
5	p-Bromofluorobenzene	50.0	52.5	105.	85-121
2MS	d4-1,2-Dichloroethane	50.0	47.7	95.4	77-120
2MS	d8-Toluene	50.0	48.7	97.4	86-119
2MS	p-Bromofluorobenzene	50.0	52.0	104.	85-121

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
FB	d4-1,2-Dichloroethane	50.0	46.7	93.4	77-120
FB	d8-Toluene	50.0	48.7	97.4	86-119
FB	p-Bromofluorobenzene	50.0	53.7	107.	85-121
MB	d4-1,2-Dichloroethane	50.0	50.4	101.	77-120
MB	d8-Toluene	50.0	50.8	102.	86-119
MB	p-Bromofluorobenzene	50.0	49.4	98.8	85-121
EXTRACTABLES					
MB	2-Fluorophenol	100.	62.8	62.8	23-121
MB	2-Fluoroaniline	50.2	48.1	95.8	---
MB	d5-Phenol	100.	30.4	30.4	15-103
MB	2-Bromophenol	99.9	61.8	61.9	---
MB	d5-Nitrobenzene	50.2	31.6	63.0	41-120
MB	2-Fluorobiphenyl	49.6	42.1	84.9	44-119
MB	2,4,6-Tribromophenol	100.	73.9	73.9	10-130
MB	d14-p-Terphenyl	50.0	45.1	90.2	33-128
1*	2-Fluorophenol	101.	<1.	0.	23-121
1	2-Fluoroaniline	50.5	50.7	100.	---
1*	d5-Phenol	101.	4.7	4.7	15-103
1*	2-Bromophenol	100.	<1.	0.	---
1	d5-Nitrobenzene	50.5	55.1	109.	41-120
1	2-Fluorobiphenyl	49.8	63.8	128.	44-119
1*	2,4,6-Tribromophenol	101.	<1.	0.	10-130
1	d14-p-Terphenyl	50.3	50.8	101.	33-128

*Failure to recover acid surrogates on sample #1 may have been due to matrix effect or lab error. No sample was available for re-extraction.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
2	2-Fluorophenol	100.	63.1	63.1	23-121
2	2-Fluoroaniline	50.2	32.6	65.0	---
2	d5-Phenol	100.	38.3	38.3	15-103
2	2-Bromophenol	99.9	64.2	64.3	---
2	d5-Nitrobenzene	50.2	34.3	68.3	41-120
2	2-Fluorobiphenyl	49.6	37.2	75.0	44-119
2	2,4,6-Tribromophenol	100.	75.7	75.7	10-130
2	d14-p-Terphenyl	50.0	39.3	78.7	33-128
2MS	2-Fluorophenol	112.	66.6	59.5	23-121
2MS	2-Fluoroaniline	56.4	39.5	70.0	---
2MS	d5-Phenol	112.	52.4	46.8	15-103
2MS	2-Bromophenol	112.	76.2	68.0	---
2MS	d5-Nitrobenzene	56.4	38.4	68.1	41-120
2MS	2-Fluorobiphenyl	55.7	48.9	87.8	44-119
2MS	2,4,6-Tribromophenol	112.	99.2	88.6	10-130
2MS	d14-p-Terphenyl	56.2	52.7	93.9	33-128
3	2-Fluorophenol	96.2	40.8	42.4	23-121
3	2-Fluoroaniline	48.3	26.7	55.3	---
3	d5-Phenol	96.2	26.8	27.9	15-103
3	2-Bromophenol	96.1	60.6	63.1	---
3	d5-Nitrobenzene	48.3	27.5	57.0	41-120
3	2-Fluorobiphenyl	47.7	35.9	75.3	44-119
3	2,4,6-Tribromophenol	96.2	80.4	83.6	10-130
3	d14-p-Terphenyl	48.1	36.3	75.5	33-128
4	2-Fluorophenol	100.	48.1	48.1	23-121
4	2-Fluoroaniline	50.2	37.1	74.0	---
4	d5-Phenol	100.	28.3	28.3	15-103
4	2-Bromophenol	99.9	52.1	52.2	---
4	d5-Nitrobenzene	50.2	30.4	60.6	41-120
4	2-Fluorobiphenyl	49.6	39.0	78.6	44-119
4	2,4,6-Tribromophenol	100.	65.0	65.0	10-130
4	d14-p-Terphenyl	50.2	44.2	88.1	33-128

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley Environmental Services

LABORATORY NO 87876-b

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
5	2-Fluorophenol	101.	65.7	65.1	23-121
5	2-Fluoroaniline	50.5	36.7	72.7	---
5	d5-Phenol	101.	36.5	36.1	15-103
5	2-Bromophenol	100.	65.6	65.6	---
5	d5-Nitrobenzene	50.5	29.6	58.7	41-120
5	2-Fluorobiphenyl	49.8	41.9	84.1	44-119
5	2,4,6-Tribromophenol	101.	78.5	77.7	10-130
5	d14-p-Terphenyl	50.3	46.2	91.8	33-128
PESTICIDES					
1	dibutylchlorendate	1.0	0.500	50.0	48-136
2	dibutylchlorendate	1.0	0.459	45.9	48-136
3	dibutylchlorendate	1.0	0.406	40.6	48-136
4	dibutylchlorendate	1.0	0.532	53.2	48-136
5	dibutylchlorendate	1.0	0.560	56.0	48-136
4MS	dibutylchlorendate	1.0	0.623	62.3	48-136
4MSD	dibutylchlorendate	1.0	0.531	53.1	48-136
MB	dibutylchlorendate	1.0	0.471	47.1	48-136

MB = Method Blank
MS = Matrix Spike
MSD = Matrix Spike Duplicate
< = Less than

The control limits are a statistically derived measure of the level of confidence in the measurement. These control limits determine the range within which the analytical value will fall 95% of the time.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

APPENDIX B

Spike Quality Control Report

Sample #	Analyte	ug/L Sample Found	ug/L Spike Level	ug/L Spike Found	% Recovery	Control Limit
MS	Lindane	<0.1	0.200	0.1532	76.6	56-123
MS	Heptachlor	<0.1	0.200	0.136	67.8	40-131
MS	Aldrin	<0.1	0.200	0.141	70.4	40-131
MS	Dieldrin	<0.1	0.500	0.263	52.5	52-126
MS	Endrin	<0.2	0.500	0.311	62.1	56-121
MS	DDT	<0.2	0.500	0.392	78.3	38-127
MSD	Lindane	<0.1	0.200	0.155	77.6	56-123
MSD	Heptachlor	<0.1	0.200	0.132	65.8	40-131
MSD	Aldrin	<0.1	0.200	0.149	74.4	40-131
MSD	Dieldrin	<0.1	0.500	0.273	54.6	52-126
MSD	Endrin	<0.2	0.500	0.329	65.7	56-121
MSD	DDT	<0.2	0.500	0.392	78.3	38-127

The control limits are a statistically derived measure of the level of confidence in the measurement. These control limits determine the range within which the analytical value will fall 95% of the time.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley Environmental Services

LABORATORY NO 87876-b

APPENDIX C

Matrix Spike/Matrix Spike Duplicate Quality Control Report

Reported below are the results of additional QC compounds utilized in the analysis of organic compounds. Compounds of interest are spiked into two additional sample aliquots prior to extraction and/or analysis to monitor for matrix effects, sample processing errors, and to calculate percent recoveries of compounds of interest and relative error in the analysis. The control limits represent the 95% confidence interval established in the laboratory through repetitive analysis of samples.

	ug/L					
Compound	Spike Added	Sample Result	MS Result	% Rec	QC Limits RPD	REC
VOLATILES						
1,1-Dichloroethene	25	0	24.2	96.8	14	61-145
Trichloroethene	25	0	26.4	106.	14	71-120
Chlorobenzene	25	0	25.9	104.	13	75-130
Toluene	25	0	26.3	105.	13	76-125
Benzene	25	0	26.1	104.	11	76-127
BASE/NEUTRALS						
1,2,4-Trichloro-benzene	50	0	35.9	71.8	28	39-98
Acenaphthene	50	0	48.8	97.7	31	46-116
2,4-Dinitrotoluene	50	0	41.7	83.4	38	24-96
Di-n-Butylphthalate	50	0	40.5	79.8	40	11-117
Pyrene	50	0	35.0	70.0	31	26-127
N-Nitrosodipropylamine	50	0	47.7	95.5	38	41-116
1,4-Dichlorobenzene	50	0	41.3	82.6	28	36-97

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO 87876-b

Crowley Environmental Services

Compound	Spike Added (ug/L)	Sample Result (ug/L)	MS Result (ug/L)	% Rec	QC Limits RPD	QC Limits REC
ACIDS						
Pentachlorophenol	100	0	102.	102.	50	9-103
Phenol	100	0	47.6	47.6	42	12-89
2-Chlorophenol	100	0	79.3	79.3	40	27-123
P-Chloro-m-cresol	100	0	80.0	80.0	42	23-97
4-Nitrophenol	100	0	58.0	58.0	50	10-80

RPD = Relative Percent Difference
REC = Recovery
MS = Matrix Spike

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060

Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO 87876-a

CLIENT Crowley Environmental Services
3400 E. Marginal Way South
Seattle, WA 98134
ATTN: Wally Semon

1 3 1985

DATE Feb. 9, 1985

REPORT ON WATER

SAMPLE IDENTIFICATION

Submitted 12/19/84 and identified as shown below:

TESTS PERFORMED AND RESULTS:

1) MW-5	CML-Vancouver	Biggane	12/17/84	1325	Widress
2) MW-11	CML-Vancouver	Biggane	12/17/84	1515	Widress
3) MW-3	CML-Vancouver	Biggane	12/17/84	0925	Widress
4) MW-12	CML-Vancouver	Biggane	12/18/84	1426	Widress
5) Field Blank		Biggane	12/18/84	1215	Widress

Samples were analyzed for the priority pollutants according to the methodology of Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A., 1982. Metals analyses were performed under the 7000 series of methods; cyanide analysis followed method 9010; and phenol analysis was in accordance with Method 420.2, Methods for Chemical Analysis of Water and Wastes, U.S.E.P.A., March, 1979.

parts per billion (ug/L)

	1 mw-5	2 mw-11	3 mw-3	4 mw-12	5 blank
Antimony	L/5.	L/5.	L/5.	L/5.	L/5.
Arsenic	52.	5.	12.	L/5.	L/5.
Beryllium	L/2.	L/2.	L/2.	L/2.	L/2.
Cadmium	L/1.	L/1.	L/1.	L/1.	L/1.
Chromium	L/2.	L/2.	L/2.	L/2.	L/2.
Copper	2.	8.	2.	3.	3.
Lead	L/5.	L/5.	L/5.	L/5.	L/5.
Mercury	L/1.	L/1.	L/1.	L/1.	L/1.
Nickel	L/5.	L/5.	9.	L/5.	L/5.
Selenium	L/5.	L/5.	L/5.	L/5.	L/5.
Silver	L/1.	L/1.	L/1.	L/1.	L/1.
Thallium	L/5.	L/5.	L/5.	L/5.	L/5.
Zinc	28.	36.	44.	17.	20.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87876-a

Crowley Environmental Services

parts per billion (ug/L)

	1	2	3	4	5
Total Cyanide	5.	L/5.	L/5.	L/5.	L/5.
Total Phenol	61.	L/5.	120.	L/5.	L/5.

Note: Balance of results (base/acid/neutral, volatile and pesticide fractions) to follow upon completion.

Key

L/ indicates "less than"

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:bg

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87876-a

Crowley Environmental Services

APPENDIX A

Replicate Quality Control Report

Sample No.	Analyte	Replicate 1	Replicate 2	Relative Error, %
		parts per billion (ug/L)		
1 spk	Cyanide	55.	53.	4.
3	Arsenic	12.	11.	(1.)
5	Arsenic	L/5.	L/5.	(0.)
3	Selenium	L/5.	L/5.	(0.)
5	Selenium	L/5.	L/5.	(0.)
1	Chromium	L/2.	L/2.	(0.)
1	Copper	2.	2.	(0.)
1	Cadmium	L/1.	L/1.	(0.)
1	Silver	L/1.	L/1.	(0.)
1	Lead	L/5.	L/5.	(0.)
2 spk	Phenol	49.	50.	2.
1	Zinc	28.	28.	(0.)
1	Nickel	L/5.	L/5.	(0.)
1	Thallium	L/5.	L/5.	(0.)
1	Beryllium	L/5.	L/5.	(0.)
1	Antimony	L/5.	L/5.	(0.)

spk = Spike. In some instances, where sample levels are near or below the detection limits, the spiked sample is analyzed in duplicate as a better check for replication.

Parentheses () indicate absolute, not relative, error.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87876-a

Crowley Environmental Services

APPENDIX B

Spike Quality Control Report

Sample No.	Analyte	Sample Found	Spike Level	Spike Found	% Recovery	Control Limit
		parts per billion (ug/L)				
1	Cyanide	5.	50.	55.	100.	*
**	Arsenic	L/5.	20.	24.	120.	55-160
**	Selenium	L/5.	20.	19.	95.	16-116
2	Chromium	L/2.	25.	27.	108.	52-134
2	Copper	8.	25.	29.	84.	66-122
2	Cadmium	L/1.	5.	6.	120.	64-116
2	Silver	L/1.	1.0	0.5	50.	43-130
2	Lead	L/5.	25.	28.	112.	54-140
2	Phenol	L/5.	50.	50.	100.	*
2	Zinc	36.	50.	74.	76.	58-124
2	Nickel	L/5.	25.	23.	92.	67-123
2	Thallium	L/5.	25.	21.	84.	20-110
2	Beryllium	L/2.	10.	7.2	72.	61-161
2	Antimony	L/5.	50.	38.	76.	45-165

*No control limit established.
**Samples submitted from another source were analyzed together with these samples. The data indicates QC conditions present when your samples were analyzed.

The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206) 767-5060

Chemistry, Microbiology, and Technical Services

Certificate

CLIENT Crowley Environmental Services
3400 East Marginal Way South
Seattle, WA 98134
ATTN: Wally Semon

LABORATORY NO. 87904

DATE Feb. 11, 1985

REPORT ON WATER

SAMPLE IDENTIFICATION Samples submitted 12/21/85 and identified as shown:

1) MW-13 CML-Vancouver Biggane 12/19 1145 Widness GEI-CES 698-01
2) MW-14 CML-Vancouver Biggane 12-19 1230 Widness GEI-CES 698-01

TESTS PERFORMED AND RESULTS:

Samples were analyzed for the priority pollutants according to the methodology of Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A., 1982. Metals analyses were performed under the 7000 series of methods; Base/neutral/acids under 8270; Volatile organics under 8240; cyanide analysis followed method 9010; and phenol analysis was in accordance with Method 420.2, Methods for Chemical Analysis of Water and Wastes, U.S.E.P.A., March, 1979.

	1 (MW-13)	2 (MW-14)
Inorganics	parts per billion (ug/L)	
Antimony	L/5.	L/5.
Arsenic	L/5.	L/5.
Beryllium	L/2.	L/2.
Cadmium	L/1.	L/1.
Chromium	L/2.	L/2.
Copper	13.	2.
Lead	L/5.	L/5.
Mercury	L/1.	L/1.
Nickel	14.	L/5.
Selenium	L/5.	L/5.
Silver	L/1.	L/1.
Thallium	L/5.	L/5.
Zinc	7.	5.
Total Cyanide	L/5.	L/5.
Total Phenol	L/5.	L/5.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87904

Crowley

Volatile Organics (by GC/MS)	1	2	Field Blank
	parts per billion (ug/L)		
Chloromethane	L/1.	L/1.	L/1.
Bromomethane	L/1.	L/1.	L/1.
Vinyl Chloride	L/1.	L/1.	L/1.
Chloroethane	L/1.	L/1.	L/1.
Methylene Chloride	25.	22.	19.
Acrolein	L/10.	L/10.	L/10.
*Acetone	27.	20.	20.
Acrylonitrile	L/10.	L/10.	L/10.
*Carbon Disulfide	L/1.	L/1.	L/1.
1,1-Dichloroethylene	L/1.	L/1.	L/1.
1,1-Dichloroethane	L/1.	L/1.	L/1.
trans-1,2-Dichloroethylene	L/1.	L/1.	L/1.
Chloroform	L/1.	L/1.	L/1.
*2-Butanone	L/1.	L/1.	L/1.
1,2-Dichloroethane	L/1.	L/1.	L/1.
1,1,1-Trichloroethane	L/1.	L/1.	L/1.
*Vinyl Acetate	L/1.	L/1.	L/1.
Bromodichloromethane	L/1.	L/1.	L/1.
Carbon Tetrachloride	L/1.	L/1.	L/1.
1,2-Dichloropropane	L/1.	L/1.	L/1.
Trichloroethylene	L/1.	L/1.	L/1.
Benzene	L/1.	L/1.	L/1.
Chlorodibromomethane	L/1.	L/1.	L/1.
1,1,2-Trichloroethane	L/1.	L/1.	L/1.
2-Chloroethyl vinyl ether	L/1.	L/1.	L/1.
Bromoform	L/1.	L/1.	L/1.
*4-Methyl-2-pentanone	L/1.	L/1.	L/1.
*2-Hexanone	L/1.	L/1.	L/1.
1,1,2,2-Tetrachloroethane	L/1.	L/1.	L/1.
Tetrachloroethylene	L/1.	L/1.	L/1.
Toluene	L/1.	L/1.	L/1.
Chlorobenzene	L/1.	L/1.	L/1.
trans-1,3-Dichloropropene	L/1.	L/1.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87904

Crowley

	1	2	Field Blank
	parts per billion (ug/L)		
Ethylbenzene	L/1.	L/1.	L/1.
cis-1,3-Dichloropropene	L/1.	L/1.	L/1.
Styrene	L/1.	L/1.	L/1.
o-Xylene	L/1.	L/1.	L/1.

Extractables (by GC/MS)	1	2	Method Blank
N-nitrosodimethylamine	L/1.	L/1.	L/1.
Bis(2-chloroethyl)ether	L/1.	L/1.	L/1.
2-Chlorophenol	L/1.	L/1.	L/1.
Phenol	L/1.	L/1.	L/1.
1,3-Dichlorobenzene	L/1.	L/1.	L/1.
1,4-Dichlorobenzene	L/1.	L/1.	L/1.
1,2-Dichlorobenzene	L/1.	L/1.	L/1.
Bis(2-chloroisopropyl)ether	L/1.	L/1.	L/1.
Hexachloroethane	L/1.	L/1.	L/1.
N-nitroso-di-n-propylamine	L/1.	L/1.	L/1.
Nitrobenzene	L/1.	L/1.	L/1.
Isophorone	L/1.	L/1.	L/1.
2-Nitrophenol	L/1.	L/1.	L/1.
2,4-Dimethylphenol	L/1.	L/1.	L/1.
Bis(2-chloroethoxy)methane	L/1.	L/1.	L/1.
2,4-Dichlorophenol	L/1.	L/1.	L/1.
1,2,4-Trichlorobenzene	L/1.	L/1.	L/1.
Naphthalene	L/1.	L/1.	L/1.
Hexachlorobutadiene	L/1.	L/1.	L/1.
4-Chloro-m-cresol	L/1.	L/1.	L/1.
Hexachlorocyclopentadiene	L/1.	L/1.	L/1.
2,4,6-Trichlorophenol	L/1.	L/1.	L/1.
2-Chloronaphthalene	L/1.	L/1.	L/1.
Acenaphthylene	L/1.	L/1.	L/1.
Dimethylphthalate	L/1.	L/1.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060

Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87904

Crowley

	1	2	Method Blank
	parts per billion (ug/L)		
2,6-Dinitrotoluene	L/1.	L/1.	L/1.
Acenaphthene	L/1.	L/1.	L/1.
2,4-Dinitrophenol	L/1.	L/1.	L/1.
2,4-Dinitrotoluene	L/1.	L/1.	L/1.
4-Nitrophenol	L/1.	L/1.	L/1.
Fluorene	L/1.	L/1.	L/1.
4-Chlorophenyl phenyl ether	L/1.	L/1.	L/1.
Diethylphthalate	L/1.	L/1.	L/1.
4,6-Dinitro-o-cresol	L/1.	L/1.	L/1.
1,2-Diphenylhydrazine	L/1.	L/1.	L/1.
4-Bromophenyl phenyl ether	L/1.	L/1.	L/1.
Hexachlorobenzene	L/1.	L/1.	L/1.
Pentachlorophenol	L/1.	L/1.	L/1.
Phenanthrene	L/1.	L/1.	L/1.
Anthracene	L/1.	L/1.	L/1.
Dibutylphthalate	L/1.	L/1.	L/1.
Fluoranthene	L/1.	L/1.	L/1.
Pyrene	L/1.	L/1.	L/1.
Benzidine	L/1.	L/1.	L/1.
Butyl benzyl phthalate	L/1.	L/1.	L/1.
Benzo(a)anthracene	L/1.	L/1.	L/1.
Chrysene	L/1.	L/1.	L/1.
3,3'-Dichlorobenzidine	L/1.	L/1.	L/1.
Bis(2-ethylhexyl)phthalate	37.	33.	55.
N-nitrosodiphenylamine	L/1.	L/1.	L/1.
Di-n-octyl phthalate	trace	L/1.	trace
Benzo(b)fluoranthene	L/1.	L/1.	L/1.
Benzo(k)fluoranthene	L/1.	L/1.	L/1.
Benzo(a)pyrene	L/1.	L/1.	L/1.
Indeno(1,2,3-cd)pyrene	L/1.	L/1.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87904

Crowley

	1	2	Method Blank
	parts per billion (ug/L)		
Dibenzo(ah)anthracene	L/1.	L/1.	L/1.
Benzo(ghi)perylene	L/1.	L/1.	L/1.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	L/1.	L/1.	L/1.
*Aniline	L/1.	L/1.	L/1.
*Benzoic Acid	L/1.	L/1.	L/1.
*Benzyl Alcohol	L/1.	L/1.	L/1.
*4-Chloroaniline	L/1.	L/1.	L/1.
*Dibenzofuran	L/1.	L/1.	L/1.
*2-Methylnaphthalene	L/1.	L/1.	L/1.
*2-Methylphenol	L/1.	L/1.	L/1.
*4-Methylphenol	L/1.	L/1.	L/1.
*2-Nitroaniline	L/1.	L/1.	L/1.
*3-Nitroaniline	L/1.	L/1.	L/1.
*4-Nitroaniline	L/1.	L/1.	L/1.
*2,4,5-Trichlorophenol	L/1.	L/1.	L/1.

Key

L/ indicates "less than"
* indicates additional compounds from the EPA's Hazardous Substances List.
trace indicates 1/10 ug/L

Note: Balance of results to follow upon completion.

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J.M. Owens

JMO:veg

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87904

Crowley

APPENDIX A

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utlized in the analysis of volatile and organic compounds. The surrogates are added to every sample prior extraction and analysis to monitor for matrix effects, purging efficiency, and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
1	d4-1,2-Dichloroethane	50.0	50.4	101.	77-120
	d8-Toluene	50.0	50.5	101.	86-119
	p-Bromofluorobenzene	50.0	51.2	102.	85-121
2	d4-1,2-Dichloroethane	50.0	52.8	106.	77-120
	d8-Toluene	50.0	51.2	102.	86-119
	p-Bromofluorobenzene	50.0	49.7	99.4	85-121
Method Blank	d4-1,2-Dichloroethane	50.0	50.4	101.	77-120
	d8-Toluene	50.0	50.8	102.	86-119
	p-Bromofluorobenzene	50.0	49.4	98.8	85-121

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87904

Crowley

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
1	2-Fluorophenol	100.	38.1	38.1	23-121
	2-Fluoroaniline	50.2	62.3	124.	---
	d5-Phenol	100.	21.3	21.3	15-103
	2-Bromophenol	99.9	36.1	36.1	---
	d5-Nitrobenzene	50.2	45.9	91.5	41-120
	2-Fluorobiphenyl	49.6	44.3	89.4	44-119
	2,4,6-Tribromophenol	100.	16.3	16.3	10-130
	d14-p-Terphenyl	50.0	45.9	91.8	33-128
2	2-Fluorophenol	100.	105.	105.	23-121
	2-Fluoroaniline	50.2	65.4	130.	---
	d5-Phenol	100.	58.4	58.4	15-103
	2-Bromophenol	99.9	92.0	92.1	---
	d5-Nitrobenzene	50.2	50.1	99.8	41-120
	2-Fluorobiphenyl	49.6	47.4	95.6	44-119
	2,4,6-Tribromophenol	100.	73.7	73.7	10-130
	d14-p-Terphenyl	50.0	43.4	86.7	33-128
Blank	2-Fluorophenol	100.	93.7	93.7	23-121
	2-Fluoroaniline	50.2	60.3	120.	---
	d5-Phenol	100.	50.0	50.0	15-103
	2-Bromophenol	99.9	85.8	85.9	---
	d5-Nitrobenzene	50.2	41.8	83.2	41-120
	2-Fluorobiphenyl	49.6	38.0	76.7	44-119
	2,4,6-Tribromophenol	100.	69.6	69.6	10-130
	d14-p-Terphenyl	50.0	40.6	81.2	33-128

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

FEB 21 1985

LABORATORY NO. 87904-b

CLIENT Crowley Environmental Services
3400 East Marginal Way South
Seattle, WA 98134
ATTN: Wally Semon

DATE Feb. 19, 1985

REPORT ON WATER

SAMPLE IDENTIFICATION Samples submitted 12/21/85 and identified as shown below:

1) MW-13 CML-Vancouver Biggane 12/19 1145 Widness GEI-CES 698-01
2) MW-14 CML-Vancouver Biggane 12/19 1230 Widness GEI-CES 698-01

TESTS PERFORMED AND RESULTS

Samples were analyzed for the priority pollutants (pesticides and PCBs) according to the methodology of Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A. 1982, method 8090.

Pesticides (by GC/ECD)	1	2
alpha-BHC	<0.02	<0.02
beta-BHC	<0.02	<0.02
delta-BHC	<0.02	<0.02
gamma-BHC (lindane)	<0.02	<0.02
heptachlor	<0.02	<0.02
aldrin	<0.02	<0.02
heptachlor epoxide	<0.02	<0.02
dieldrin	<0.02	<0.02
4,4'-DDE	<0.04	<0.04
4,4'-DDD	<0.04	<0.04
endosulfan sulfate	<0.04	<0.04
4,4'-DDT	<0.04	<0.04
chlordane	<0.02	<0.02
alpha endosulfan	<0.02	<0.02
beta endosulfan	<0.04	<0.04
endrin	<0.04	<0.04
endrin aldehyde	<1.0	<1.0
toxaphene		

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87904-b

Crowley Environmental Services

	1	2
PCB 1016	<0.5	<0.5
PCB 1221	<0.5	<0.5
PCB 1232	<0.5	<0.5
PCB 1242	<0.5	<0.5
PCB 1248	<0.5	<0.5
PCB 1254	<0.5	<0.5
PCB 1260	<0.5	<0.5

Key

< indicates "less than"

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:rtv

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87904-b

Crowley Environmental Services

APPENDIX A

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to analysis and extraction to monitor for matrix effects, purging efficiency and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

parts per billion (ug/L)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
1	dibutylchlorendate	1.00	0.919	91.9	48-136
2	dibutylchlorendate	1.00	1.01	101.	48-136
Blank	dibutylchlorendate	1.00	1.16	116.	48-136

Analytical Technologies, Inc. Corporate Offices 225 W 30th Street National City, CA 92050 619.477.4779

I.D. 01-001802

GeoEngineers

January 18, 1985

JAN 28 1985

Routing JAM JHB

File 698-01

Geo Engineers, Inc.
P.O. Box 6325
Bellevue, WA 98008

Attention: James A. Miller

On December 26, 1984 Analytical Technologies, Inc. received one (1) water sample for analyses of Arsenic (As), Lead (Pb), Zinc (Zn), Total Cyanide (CN), Base/Neutral Extractable Organics (BNA), and Volatile Organics (VOA). Analysis of the various metals were performed by inductively coupled plasma spectroscopy and atomic absorption spectroscopy. Total Cyanide was performed by wet methods, BNA and VOA were performed by gas chromatography/mass spectroscopy, in accordance with EPA methods 624 and 625.

Attached are the test results.

John W. Strand
Support Services Manager

Reviewed by
Mark King
Laboratory Manager

JL:mat

cc: Mike Higgins

Attachments

NOTE: Sample from this project will be disposed of in thirty (30) days from the date of this report, unless we are informed otherwise.

I.D. 01-001802

Parameter	MW12 (mg/L)
As	< 0.005
Pb	< 0.005
Zn	< 0.01
Total CN^-	< 0.02

01-001802

SEMI-VOLATILE ORGANIC ANALYSIS
DATA SHEET

Client: Geo Engineers
Sample I.D.: MW12
Sample Matrix: Water
Method No.: EPA 625

Date Sampled: 12-18-84
Date Received by Lab: 12-26-84
Date Extracted/Prepared: 12-22-84
Date Analyzed: 1-4-85

µg/L		µg/L	
< 8.0	Phenol	< 3.7	Indeno (1,2,3-c,d) Pyrene
< 3.3	2-Chlorophenol	< 4.1	Benzo (g,h,i) perylene
< 9.8	2,4-Dichlorophenol	< 2.5	Benzo (a) Pyrene
< 2.7	2,4,6-Trichlorophenol		
< 3.0	4-Chloro-3-methylphenol (p-chloro-m-cresol)		
< 3.6	Pentachlorophenol		
< 9.4	2,4-Dimethylphenol		
<24.0	2-methyl-4,6-dinitrophenol (4,6-dinitro-o-cresol)		
< 3.6	2-Nitrophenol		
< 2.4	4-Nitrophenol		
<42.0	2,4-Dinitrophenol		
< 1.9	Acenapthene		
< 3.5	Acenaphthylene		
<44.0	Benzidine		
< 2.5	Chrysene		
< 2.2	Isophorone		
< 5.4	Phenanthrene		
< 1.9	Anthracene		
< 7.8	Benzo (a) anthracene		
< 2.5	Dibenzo (a,h) anthracene		
< 1.9	Fluorene		
< 2.2	Fluoranthene		
< 2.5	Benzo (b) fluoranthene		
< 2.5	Benzo (k) fluoranthene		
< 1.9	Pyrene		

No Non-Priority Pollutant peaks greater than 10% of internal standards was found.

01-001802

SEMI-VOLATILE ORGANIC ANALYSIS
DATA SHEET

Client: Geo Engineers
Sample I.D.: MW 12
Sample Matrix: Water
Method No.: EPA 625

Date Sampled: 12-18-84
Date Received by Lab: 12-26-84
Date Extracted/Prepared: 12-22-84
Date Analyzed: 1-4-85

µg/L	
< 1.9	Hexachlorobenzene
< 1.9	Nitrobenzene
< 1.9	1,2-Dichlorobenzene
< 1.9	1,3-Dichlorobenzene
< 4.4	1,4-Dichlorobenzene
< 1.9	1,2,4-Trichlorobenzene
<16.5	3,3-Dichlorobenzidine
< 5.7	2,4-Dinitrotoluene
< 2.5	2,6-Dinitrotoluene
< 2.5	N-Nitrosodimethylamine
< 1.9	N-Nitrosodiphenylamine
< 2.5	N-Nitrosodi-n-propylamine
<22.0	Diethyl Phthalate
< 1.6	Dimethyl Phthalate
3.4	Di-n-butyl Phthalate
< 2.5	Butylbenzylphathalate
< 2.5	Bis (2-ethylhexyl) phthalate
< 5.7	Bis (2-chloroethyl) ether
< 5.7	Bis (2-chloroisopropyl) ether
< 4.2	4-Chlorophenyl-phenyl ether
< 5.3	Bis (2-chloroethoxy) methane
< 1.9	4-Bromophenyl-phenyl ether
< 1.6	Hexachloroethane
< 0.9	Hexachlorobutadiene

µg/L	
< 2.5	Hexachlorocyclopentadiene
< 1.6	Napthalene
< 1.9	2-Chloronapthalene
< 5.7	1,2-Diphenylhydrazine
< 2.5	Di-n-Octyl Phthalate

GC/MS
VOLATILE ORGANICS ANALYSIS (VOA)
DATA SUMMARY

Client: Geo Engineers
Sample Matrix: Water
Method No.: EPA 624

Sample I.D. MW-12
Date Rec'vd by Lab: 12-26-84
Date Analyzed: 12-28-84
Analyst: TH/JWS

ug/L	
< 5.0	Chloromethane
< 5.0	Bromomethane
< 5.0	Vinyl Chloride
< 5.0	Chloroethane
< 2.8	Methylene Chloride
< 10.0	Acetone
< 5.0	Carbon Disulfide
< 2.8	1,1-Dichloroethene
< 2.8	1,1-Dichloroethane
< 1.6	Trans-1,2-Dichloroethene
< 1.6	Chloroform
< 2.8	1,2-Dichloroethane
< 5.0	Trichlorofluoromethane
< 5.0	Tetrahydrofuran
< 10.0	Methyl Ethyl Ketone
< 2.8	Carbon Tetrachloride
< 5.0	Vinyl Acetate
< 2.2	Bromodichloromethane
< 6.0	1,2-Dichloropropane
< 5.0	Trans-1,3-Dichloropropene
< 1.9	Trichloroethene
< 3.1	Dibromochloromethane
< 5.0	1,1,2-Trichloroethane
< 4.4	Benzene
< 5.0	Cis-1,3-Dichloropropene
< 5.0	2-Chloroethylvinylether
< 4.7	Bromoform
< 3.8	1,1,1-Trichloroethane

ug/L	
< 10.0	2-Hexanone
< 10.0	Methyl Isobutyl Ketone
< 6.9	1,1,2,2-Tetrachloroethane
< 4.1	Tetrachloroethene
< 6.0	Toluene
< 5.0	Chlorobenzene
< 7.2	Ethylbenzene
< 10.0	Styrene
< 10.0	O,M-Xylene
< 10.0	P-Xylene

Surrogate Recovery (%)	
90	1,2-Dichloroethane-D4
94	Bromofluorobenzene
82	Toluene-D8

01-001802 DUPLICATE

GC/MS
VOLATILE ORGANICS ANALYSIS (VOA)
DATA SUMMARY

Client: Geo Engineers
Sample Matrix: Water
Method No.: EPA 624

Sample I.D. MW-12
Date Rec'vd by Lab: 12-26-84
Date Analyzed: 12-28-84
Analyst: TH/JWS

ug/L	
< 5.0	Chloromethane
< 5.0	Bromomethane
< 5.0	Vinyl Chloride
< 5.0	Chloroethane
< 2.8	Methylene Chloride
< 10.0	Acetone
< 5.0	Carbon Disulfide
< 2.8	1,1-Dichloroethene
< 2.8	1,1-Dichloroethane
< 1.6	Trans-1,2-Dichloroethene
< 1.6	Chloroform
< 2.8	1,2-Dichloroethane
< 5.0	Trichlorofluoromethane
< 5.0	Tetrahydrofuran
< 10.0	Methyl Ethyl Ketone
< 2.8	Carbon Tetrachloride
< 5.0	Vinyl Acetate
< 3.2	Bromodichloromethane
< 6.0	1,2-Dichloropropane
< 5.0	Trans-1,3-Dichloropropene
< 1.9	Trichloroethene
< 3.1	Dibromochloromethane
< 5.0	1,1,2-Trichloroethane
< 4.4	Benzene
< 5.0	Cis-1,3-Dichloropropene
5.3	2-Chloroethylvinylether
< 4.7	Bromoform
3.8	1,1,1-Trichloroethane

ug/L	
< 10.0	2-Hexanone
< 10.0	Methyl Isobutyl Ketone
< 6.9	1,1,2,2-Tetrachloroethane
< 4.1	Tetrachloroethene
< 6.0	Toluene
< 6.0	Chlorobenzene
< 7.2	Ethylbenzene
< 10.0	Styrene
< 10.0	O,M-Xylene
< 10.0	P-Xylene

Surrogate Recovery (%)	
86	1,2-Dichloroethane-D4
98	Bromofluorobenzene
70	Toluene-D8

ANALYTICAL TECHNOLOGIES, INC.

I.D. 01-001802

RESULTS OF EPA QUALITY CONTROL SAMPLES
WP 1278, VOLATILE ORGANICS

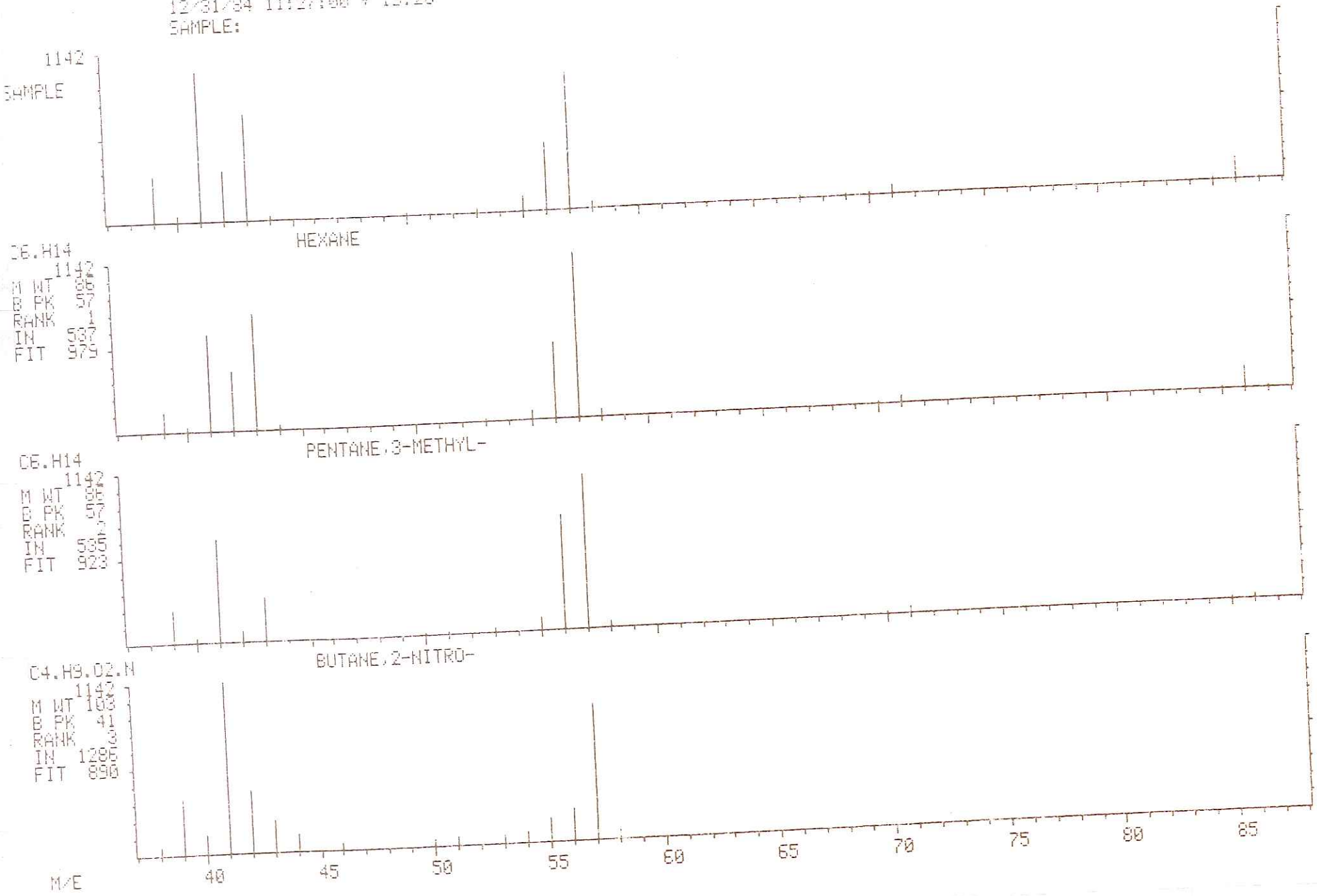
PARAMETER	EPA DATA [1] X	EPA DATA [1] S	EPA DATA [1] 95% C.I. [3]	SAMPLE RESULTS [2] 12-28-84
1,2-dichloroethane (13)	13.7	2.5	8.7-18.7	13.0
Chloroform (12)	68.3	14.9	38.5-98.1	68.2
1,1,1-trichloroethane (14)	8.1	4.2	MDL-16.5	8.3
1,1,2-trichloroethene (29)	10.7	8.1	MDL-26.8	11.6
Carbon Tetrachloride (15)	13.2	3.7	5.8-20.6	15.0
1,1,2,2-Tetrachloroethene (26)	9.6	2.4	4.8-14.4	9.8
Bromodichloromethane (16)	11.2	2.7	5.8-16.6	11.7
Dibromochloromethane (24)	9.2	2.7	4.0-14.4	10.6
Bromoform (25)	14.0	3.0	8.0-20.0	17.4

1 Results of EPA Interlaboratory comparison Studies.
2 Results of QC Materials Run Concurrently with Samples.
3 95 Percent Confidence Interval.

DATA: 1800 # 598

BASE M/E: 41
RIC: 565271.

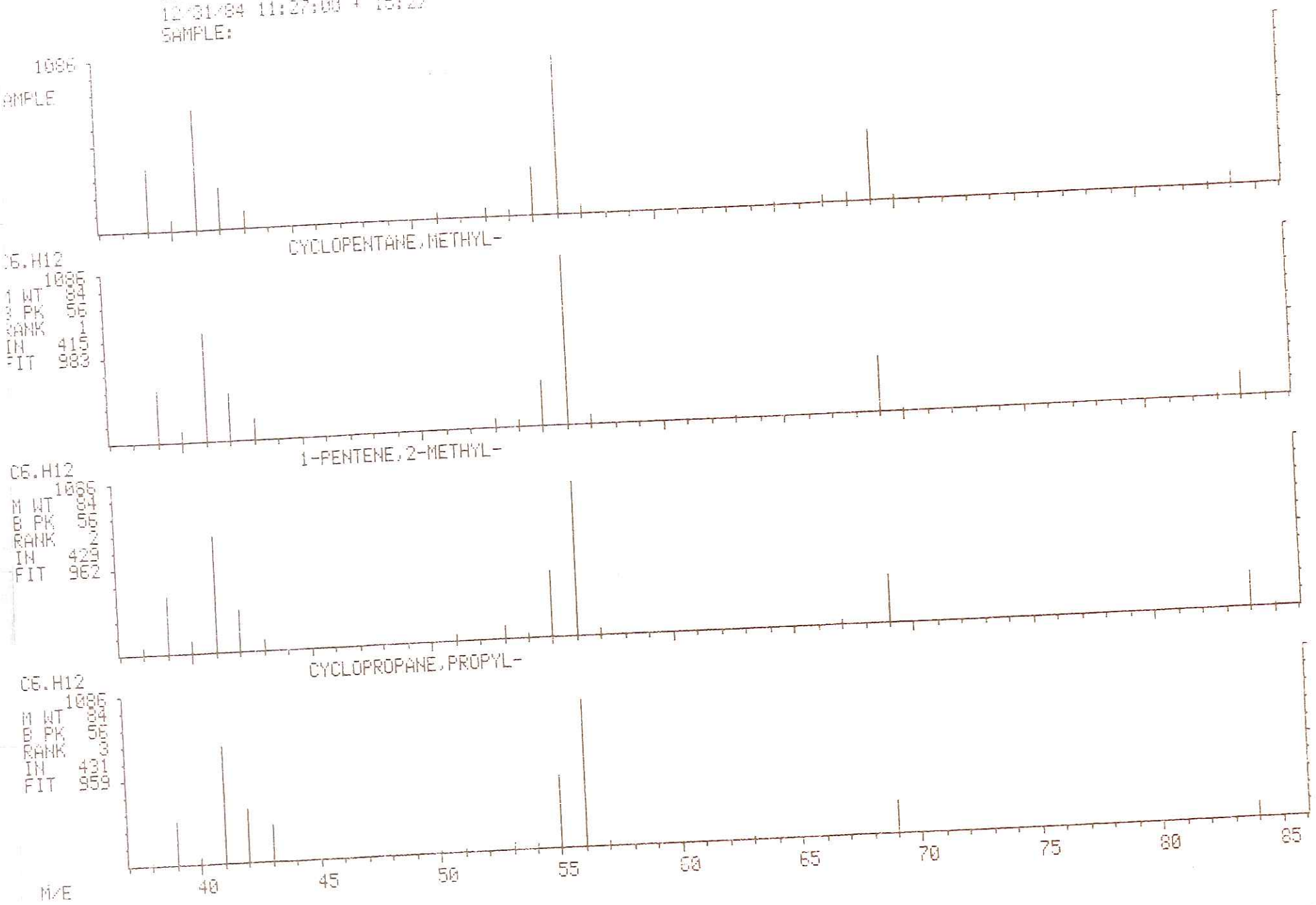
LIBRARY SEARCH
12/31/84 11:27:00 + 19:26
SAMPLE:



LIBRARY SEARCH
12/31/84 11:27:00 + 15:22
SAMPLE:

DATA: 1802 # 473

BASE M/E: 56
RIC: 599039.



Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060

Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

CLIENT Crowley Environmental Services
3400 East Marginal Way South
Seattle, WA 98134
ATTN: Wally Semon

DATE Mar. 20, 1985

PO #350763

REPORT ON SOIL & WATER

SAMPLE IDENTIFICATION

Submitted 12/7/85 and identified as shown:

TESTS PERFORMED AND RESULTS:

1) 9-1 Boring #9 Biggane 12/4/84 1303 Widness GeoEngineers CES
2) 9-2 Boring #9 Biggane 12/4/84 1307 Widness GeoEngineers CES
3) 9-3 Boring #9 Biggane 12/4/84 1315 Widness GeoEngineers CES
4) 9-4 Boring #9 Biggane 12/4/84 1325 Widness GeoEngineers CES
5) 8-698-01 Product #8-P 12/5/84
6) 10-1 Boring 10 Biggane 12/5/84 740 Widness GeoEngineers CES
7) 10-2 Boring 10 Biggane 12/5/84 745 Widness GeoEngineers CES
8) 10-3 Boring 10 Biggane 12/5/84 755 Widness GeoEngineers CES
9) 10-4 Boring 10 Biggane 12/5/84 810 Widness GeoEngineers CES
10) 11-1 Boring 11 Biggane 12/5/84 1055 Widness GeoEngineers CES
11) 11-2 Boring 11 Biggane 12/5/84 1100 Widness GeoEngineers CES
12) 11-3 Boring 11 Biggane 12/5/84 1107 Widness GeoEngineers CES
13) 11-4 Boring 11 Biggane 12/5/84 1110 Widness GeoEngineers CES
14) 11-5 Boring 11 Biggane 12/5/84 1150 Widness GeoEngineers CES
15) 11-6 Boring 11 Biggane 12/5/84 1158 Widness GeoEngineers CES
16) 12-1 Boring 12 Biggane 12/5/84 1530 Widness GeoEngineers CES
17) 12-2 Boring 12 Biggane 12/5/84 1540 Widness GeoEngineers CES
18) 12-3 Boring 12 Biggane 12/5/84 1550 Widness GeoEngineers CES
19) 12-4 Boring 12 Biggane 12/5/84 1600 Widness GeoEngineers CES
20) 12-5 Boring 12 Biggane 12/5/84 900 Widness GeoEngineers CES
21) 13-1 Boring 13 Biggane 12/6/84 1035 Widness GeoEngineers CES
22) 13-2 Boring 13 Biggane 12/6/84 1040 Widness GeoEngineers CES
23) 13-3 Boring 13 Biggane 12/6/84 1045 Widness GeoEngineers CES
24) 13-4 Boring 13 Biggane 12/6/84 1048 Widness GeoEngineers CES
25) 14-1 Boring 14 Biggane 12/6/84 1315 Widness GeoEngineers CES
26) 14-2 Boring 14 Biggane 12/6/84 1321 Widness GeoEngineers CES
27) 14-3 Boring 14 Biggane 12/6/84 1325 Widness GeoEngineers CES
28) 14-4 Boring 14 Biggane 12/6/84 1331 Widness GeoEngineers CES
29) Rinsate Vancouver Biggane 12/5/84 1515 Widness

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

Sample #2 was analyzed in accordance with 40 CFR, Part 261.24 for EP Toxicity, with result as shown below:

	concentration, mg/L (parts per million)	
	2	MCL
Arsenic	L/0.2	5.0
Barium	L/0.5	100.
Cadmium	L/0.02	1.0
Chromium	L/0.1	5.0
Lead	L/0.2	5.0
Mercury	L/0.005	0.2
Selenium	L/0.2	1.0
Silver	L/0.1	5.0

Samples were analyzed for priority pollutants in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1982, Methods 8240 (volatile organics), 8270 (semi-volatile extractables), 8080 (pesticides and PCB's), 9010 (cyanide), and the 7000 series (metals analysis). Phenol analysis was in accordance with Method 420.2, Methods for Chemical Analysis of Water & Wastes, U.S.E.P.A., March, 1979.

	parts per million (mg/kg), dry basis				parts per billion (ug/L
Inorganics	2	3	7	17	29
Antimony	L/2.	L/2.	L/2.	L/2.	L/5.
Arsenic	0.9	18.	1.8	1.8	L/5.
Beryllium	L/0.1	0.7	L/0.1	L/0.1	L/1.
Cadmium	0.2	1.3	0.2	0.1	L/1.
Chromium	9.2	27.	11.	8.6	L/2.
Copper	6.3	46.	7.0	6.3	4.
Lead	4.2	67.	7.1	3.5	L/5.
Mercury	L/0.1	0.1	L/0.1	L/0.1	2.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060

Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

	parts per million (mg/kg), dry basis				parts per billion (ug/L)
	2 (9-2)	3 (9-3)	7 (11-2)	17 (12-2)	29
Nickel	20.	35.	23.	14.	L/5.
Selenium	L/0.5	L/0.5	L/0.5	L/0.5	L/5.
Silver	0.06	0.18	L/0.05	L/0.05	L/1.
Thallium	L/0.5	L/0.5	L/0.5	L/0.5	L/5.
Zinc	29.	560.	34.	34.	L/1.
Total Cyanide	0.1	0.4	0.2	0.2	L/5.
Total Phenol	L/0.1	L/0.1	0.1	L/0.1	L/5.
Total Solids, %	83.2	72.7	83.1	83.9	---

Volatile Organics (by GC/MS)

Sample #29

Results will follow.

Sample #5

Due to nature of sample, analysis for volatile organics by GC/MS is not possible without substantial damage to the instrument.

	parts per billion (ug/kg)				
	2 (9-2)	3 (9-3)	7 (11-2)	17 (12-2)	Method Blank
Chloromethane	L/5.	L/5.	L/5.	L/5.	L/1.
Bromomethane	L/5.	L/5.	L/5.	L/5.	L/1.
Vinyl Chloride	L/5.	L/5.	L/5.	L/5.	L/1.
Chloroethane	L/5.	L/5.	L/5.	L/5.	L/1.
Methylene Chloride	1600.	780.	770.	440.	24.
Acrolein	L/50.	L/50.	L/50.	L/50.	L/10.
*Acetone	700.	290.	300.	100.	22.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle, Washington 98108 (206)767-5060

Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

parts per billion (ug/kg)

	2	3	7	17	Method Blank
Acrylonitrile	L/50.	L/50.	L/50.	L/50.	L/10.
*Carbon Disulfide	L/5.	L/5.	L/5.	L/5.	L/1.
1,1-Dichloroethylene	L/5.	L/5.	L/5.	L/5.	L/1.
1,1-Dichloroethane	L/5.	L/5.	L/5.	L/5.	L/1.
trans-1,2-Dichloroethylene	L/5.	L/5.	L/5.	L/5.	L/1.
Chloroform	L/5.	L/5.	L/5.	L/5.	L/1.
*2-Butanone	L/5.	L/5.	L/5.	L/5.	L/1.
1,2-Dichloroethane	L/5.	L/5.	L/5.	L/5.	L/1.
1,1,1-Trichloroethane	L/5.	L/5.	L/5.	L/5.	L/1.
*Vinyl Acetate	L/5.	L/5.	L/5.	L/5.	L/1.
Bromodichloromethane	L/5.	L/5.	L/5.	L/5.	L/1.
Carbon Tetrachloride	L/5.	L/5.	L/5.	L/5.	L/1.
1,2-Dichloropropane	L/5.	L/5.	L/5.	L/5.	L/1.
Trichloroethylene	L/5.	L/5.	L/5.	L/5.	L/1.
Benzene	L/5.	L/5.	L/5.	L/5.	L/1.
Chlorodibromomethane	L/5.	L/5.	L/5.	L/5.	L/1.
1,1,2-Trichloroethane	L/5.	L/5.	L/5.	L/5.	L/1.
2-Chloroethyl vinyl ether	L/5.	L/5.	L/5.	L/5.	L/1.
Bromoform	L/5.	L/5.	L/5.	L/5.	L/1.
*4-Methyl-2-pentanone	L/5.	L/5.	L/5.	L/5.	L/1.
*2-Hexanone	L/5.	L/5.	L/5.	L/5.	L/1.
1,1,2,2-Tetrachloroethane	L/5.	L/5.	L/5.	L/5.	L/1.
Tetrachloroethylene	L/5.	L/5.	L/5.	L/5.	L/1.
Toluene	L/5.	L/5.	L/5.	L/5.	L/1.
Chlorobenzene	L/5.	L/5.	L/5.	L/5.	L/1.
trans-1,3-Dichloropropene	L/5.	L/5.	L/5.	L/5.	L/1.
Ethylbenzene	L/5.	L/5.	L/5.	L/5.	L/1.
cis-1,3-Dichloropropene	L/5.	L/5.	L/5.	L/5.	L/1.
Styrene	L/5.	L/5.	L/5.	L/5.	L/1.
o-Xylene	38.	L/5.	L/5.	L/5.	L/1.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060

Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

Extractables (by GC/MS)

parts per billion (ug/kg)

	2	3	7
N-nitrosodimethylamine	L/2000.	L/100.	L/1000.
Bis(2-chloroethyl)ether	L/2000.	L/100.	L/1000.
2-Chlorophenol	L/2000.	L/100.	L/1000.
Phenol	L/2000.	L/100.	L/1000.
1,3-Dichlorobenzene	L/2000.	L/100.	L/1000.
1,4-Dichlorobenzene	L/2000.	L/100.	L/1000.
1,2-Dichlorobenzene	L/2000.	L/100.	L/1000.
Bis(2-chloroisopropyl)ether	L/2000.	L/100.	L/1000.
Hexachloroethane	L/2000.	L/100.	L/1000.
N-nitroso-di-n-propylamine	L/2000.	L/100.	L/1000.
Nitrobenzene	L/2000.	L/100.	L/1000.
Isophorone	L/2000.	L/100.	L/1000.
2-Nitrophenol	L/2000.	L/100.	L/1000.
2,4-Dimethylphenol	L/2000.	L/100.	L/1000.
Bis(2-chloroethoxy)methane	L/2000.	L/100.	L/1000.
2,4-Dichlorophenol	L/2000.	L/100.	L/1000.
1,2,4-Trichlorobenzene	L/2000.	L/100.	L/1000.
Naphthalene	L/2000.	L/100.	L/1000.
Hexachlorobutadiene	L/2000.	L/100.	L/1000.
4-Chloro-m-cresol	L/2000.	L/100.	L/1000.
Hexachlorocyclopentadiene	L/2000.	L/100.	L/1000.
2,4,6-Trichlorophenol	L/2000.	L/100.	L/1000.
2-Chloronaphthalene	L/2000.	L/100.	L/1000.
Acenaphthylene	L/2000.	L/100.	L/1000.
Dimethylphthalate	L/2000.	L/100.	L/1000.
2,6-Dinitrotoluene	L/2000.	L/100.	L/1000.
Acenaphthene	L/2000.	L/100.	L/1000.
2,4-Dinitrophenol	L/2000.	L/100.	L/1000.
2,4-Dinitrotoluene	L/2000.	L/100.	L/1000.
4-Nitrophenol	L/2000.	L/100.	L/1000.
Fluorene	L/2000.	L/100.	L/1000.
4-Chlorophenyl phenyl ether	L/2000.	L/100.	L/1000.
Diethylphthalate	L/2000.	L/100.	L/1000.
4,6-Dinitro-o-cresol	L/2000.	L/100.	L/1000.
1,2-Diphenylhydrazine	L/2000.	L/100.	L/1000.
4-Bromophenyl phenyl ether	L/2000.	L/100.	L/1000.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

	2	3	7
	parts per billion (ug/kg)		
Hexachlorobenzene	L/2000.	L/100.	L/1000.
Pentachlorophenol	L/2000.	L/100.	L/1000.
Phenanthrene	L/2000.	L/100.	L/1000.
Anthracene	L/2000.	L/100.	L/1000.
Dibutylphthalate	L/2000.	L/100.	L/1000.
Fluoranthene	L/2000.	L/100.	L/1000.
Pyrene	L/2000.	L/100.	L/1000.
Benzidine	L/2000.	L/100.	L/1000.
Butyl benzyl phthalate	L/2000.	L/100.	L/1000.
Benzo(a)anthracene	L/2000.	L/100.	L/1000.
Chrysene	L/2000.	L/100.	L/1000.
3,3'-Dichlorobenzidine	L/2000.	L/100.	L/1000.
Bis(2-ethylhexyl)phthalate	L/2000.	120.	L/1000.
N-nitrosodiphenylamine	L/2000.	L/100.	L/1000.
Di-n-octyl phthalate	L/2000.	L/100.	L/1000.
Benzo(b)fluoranthene	L/2000.	L/100.	L/1000.
Benzo(k)fluoranthene	L/2000.	L/100.	L/1000.
Benzo(a)pyrene	L/2000.	L/100.	L/1000.
Indeno(1,2,3-cd)pyrene	L/2000.	L/100.	L/1000.
Dibenzo(ah)anthracene	L/2000.	L/100.	L/1000.
Benzo(ghi)perylene	L/2000.	L/100.	L/1000.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	L/2000.	L/100.	L/1000.
*Aniline	L/2000.	L/100.	L/1000.
*Benzoic Acid	L/2000.	L/100.	L/1000.
*Benzyl Alcohol	L/2000.	L/100.	L/1000.
*4-Chloroaniline	L/2000.	L/100.	L/1000.
*Dibenzofuran	L/2000.	L/100.	L/1000.
*2-Methylnaphthalene	4500.	L/100.	L/1000.
*2-Methylphenol	L/2000.	L/100.	L/1000.
*4-Methylphenol	L/2000.	L/100.	L/1000.
*2-Nitroaniline	L/2000.	L/100.	L/1000.
*3-Nitroaniline	L/2000.	L/100.	L/1000.
*4-Nitroaniline	L/2000.	L/100.	L/1000.
*2,4,5-Trichlorophenol	L/2000.	L/100.	L/1000.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060

Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

	17	5 (product)	Method Blank
	parts per billion (ug/kg)		
N-nitrosodimethylamine	L/100.	L/1,400,000.	L/100.
Bis(2-chloroethyl)ether	L/100.	L/1,400,000.	L/100.
2-Chlorophenol	L/100.	L/1,400,000.	L/100.
Phenol	L/100.	L/1,400,000.	L/100.
1,3-Dichlorobenzene	L/100.	L/1,400,000.	L/100.
1,4-Dichlorobenzene	L/100.	L/1,400,000.	L/100.
1,2-Dichlorobenzene	L/100.	L/1,400,000.	L/100.
Bis(2-chloroisopropyl)ether	L/100.	L/1,400,000.	L/100.
Hexachloroethane	L/100.	L/1,400,000.	L/100.
N-nitroso-di-n-propylamine	L/100.	L/1,400,000.	L/100.
Nitrobenzene	L/100.	L/1,400,000.	L/100.
Isophorone	L/100.	L/1,400,000.	L/100.
2-Nitrophenol	L/100.	L/1,400,000.	L/100.
2,4-Dimethylphenol	L/100.	L/1,400,000.	L/100.
Bis(2-chloroethoxy)methane	L/100.	L/1,400,000.	L/100.
2,4-Dichlorophenol	L/100.	L/1,400,000.	L/100.
1,2,4-Trichlorobenzene	L/100.	L/1,400,000.	L/100.
Naphthalene	L/100.	L/1,400,000.	L/100.
Hexachlorobutadiene	L/100.	L/1,400,000.	L/100.
4-Chloro-m-cresol	L/100.	L/1,400,000.	L/100.
Hexachlorocyclopentadiene	L/100.	L/1,400,000.	L/100.
2,4,6-Trichlorophenol	L/100.	L/1,400,000.	L/100.
2-Chloronaphthalene	L/100.	L/1,400,000.	L/100.
Acenaphthylene	L/100.	L/1,400,000.	L/100.
Dimethylphthalate	L/100.	L/1,400,000.	L/100.
2,6-Dinitrotoluene	L/100.	L/1,400,000.	L/100.
Acenaphthene	L/100.	L/1,400,000.	L/100.
2,4-Dinitrophenol	L/100.	L/1,400,000.	L/100.
2,4-Dinitrotoluene	L/100.	L/1,400,000.	L/100.
4-Nitrophenol	L/100.	L/1,400,000.	L/100.
Fluorene	L/100.	L/1,400,000.	L/100.
4-Chlorophenyl phenyl ether	L/100.	L/1,400,000.	L/100.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206) 767-5060
Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

	17	5	Method Blank
	parts per billion (ug/kg)		
Diethylphthalate	L/100.	L/1,400,000.	L/100.
4,6-Dinitro-o-cresol	L/100.	L/1,400,000.	L/100.
1,2-Diphenylhydrazine	L/100.	L/1,400,000.	L/100.
4-Bromophenyl phenyl ether	L/100.	L/1,400,000.	L/100.
Hexachlorobenzene	L/100.	L/1,400,000.	L/100.
Pentachlorophenol	L/100.	L/1,400,000.	L/100.
Phenanthrene	L/100.	L/1,400,000.	L/100.
Anthracene	L/100.	L/1,400,000.	L/100.
Dibutylphthalate	L/100.	L/1,400,000.	L/100.
Fluoranthene	L/100.	L/1,400,000.	L/100.
Pyrene	L/100.	L/1,400,000.	L/100.
Benzidine	L/100.	L/1,400,000.	L/100.
Butyl benzyl phthalate	L/100.	L/1,400,000.	L/100.
Benzo(a)anthracene	L/100.	L/1,400,000.	L/100.
Chrysene	L/100.	L/1,400,000.	L/100.
3,3'-Dichlorobenzidine	L/100.	L/1,400,000.	L/100.
Bis(2-ethylhexyl)phthalate	L/100.	L/1,400,000.	L/100.
N-nitrosodiphenylamine	L/100.	L/1,400,000.	L/100.
Di-n-octyl phthalate	L/100.	L/1,400,000.	L/100.
Benzo(b)fluoranthene	L/100.	L/1,400,000.	L/100.
Benzo(k)fluoranthene	L/100.	L/1,400,000.	L/100.
Benzo(a)pyrene	L/100.	L/1,400,000.	L/100.
Indeno(1,2,3-cd)pyrene	L/100.	L/1,400,000.	L/100.
Dibenzo(ah)anthracene	L/100.	L/1,400,000.	L/100.
Benzo(ghi)perylene	L/100.	L/1,400,000.	L/100.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	L/100.	L/1,400,000.	L/100.
*Aniline	L/100.	L/1,400,000.	L/100.
*Benzoic Acid	L/100.	L/1,400,000.	L/100.
*Benzyl Alcohol	L/100.	L/1,400,000.	L/100.
*4-Chloroaniline	L/100.	L/1,400,000.	L/100.
*Dibenzofuran	L/100.	L/1,400,000.	L/100.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060

Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

	17	5 (product)	Method Blank
	parts per billion (ug/kg)		
*2-Methylnaphthalene	L/100.	4,800,000.	L/100.
*2-Methylphenol	L/100.	L/1,400,000.	L/100.
*4-Methylphenol	L/100.	L/1,400,000.	L/100.
*2-Nitroaniline	L/100.	L/1,400,000.	L/100.
*3-Nitroaniline	L/100.	L/1,400,000.	L/100.
*4-Nitroaniline	L/100.	L/1,400,000.	L/100.
*2,4,5-Trichlorophenol	L/100.	L/1,400,000.	L/100.

Pesticides (by GC/ECD)	2	3	7	17	5
	parts per billion (ug/kg)				
alpha-BHC	L/1.	L/1.	L/1.	L/1.	L/200.
beta-BHC	L/1.	L/1.	L/1.	L/1.	L/200.
delta-BHC	L/1.	L/1.	L/1.	L/1.	L/200.
gamma-BHC (lindane)	L/1.	L/1.	L/1.	L/1.	L/200.
heptachlor	L/1.	L/1.	L/1.	L/1.	L/200.
aldrin	L/1.	L/1.	L/1.	L/1.	L/200.
heptachlor epoxide	L/1.	L/1.	L/1.	L/1.	L/200.
dieldrin	L/1.	L/1.	L/1.	L/1.	L/200.
4,4'-DDE	L/1.	L/1.	L/1.	L/1.	L/200.
4,4'-DDD	L/1.	L/1.	L/1.	L/1.	L/200.
endosulfan sulfate	L/1.	L/1.	L/1.	L/1.	L/200.
4,4'-DDT	L/1.	L/1.	L/1.	L/1.	L/200.
chlordane	L/1.	L/1.	L/1.	L/1.	L/200.
alpha endosulfan	L/1.	L/1.	L/1.	L/1.	L/200.
beta endosulfan	L/1.	L/1.	L/1.	L/1.	L/200.
endrin	L/1.	L/1.	L/1.	L/1.	L/200.
endrin aldehyde	L/1.	L/1.	L/1.	L/1.	L/200.
toxaphene	L/50.	L/50.	L/50.	L/50.	L/10,000.

Laucks
Testing Laboratories, Inc.
940 South Harney Street. Seattle. Washington 98108 (206)767-5060

Chemistry. Microbiology. and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

	2	3	7	17	5
		parts per billion (ug/kg)			
PCB 1016	L/20.	L/20.	L/20.	L/20.	L/4000.
PCB 1221	L/20.	L/20.	L/20.	L/20.	L/4000.
PCB 1232	L/20.	L/20.	L/20.	L/20.	L/4000.
PCB 1242	L/20.	L/20.	L/20.	L/20.	L/4000.
PCB 1248	L/20.	L/20.	L/20.	L/20.	L/4000.
PCB 1254	L/20.	L/20.	L/20.	L/20.	L/4000.
PCB 1260	L/20.	L/20.	L/20.	L/20.	L/4000.

Key

L/ indicates "less than"
* indicates Additional compounds from the EPA's Hazardous Substances List.
MCL = Maximum Contamination Level allowed per regulation.

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:veg

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

APPENDIX A

MATRIX SPIKE/MATRIX SPIKE DUPLICATE REPORT
Inorganic Metals Analyses

Sample	Analyte	Spike Added	Sample Result	MS Result	% Rec	MSD Result	% Rec	RPD	QC Limits* RPD	QC Limits* REC
17	Chromium	100.	8.6	102.	93.	110.	101.	8.	20.0	75-1
2	Cyanide	1.0	0.1	0.9	80.	0.9	80.	0.	20.0	75-1
17	Antimony	10.	L/2.	12.	120.	12.	120.	0.	20.0	75-1
17	Silver	0.25	L/0.05	0.34	136.*	0.13	52.*	89.*	20.0	75-1
17	Lead	5.0	3.5	9.0	110.	9.0	110.	0.	20.0	75-1
17	Zinc	100.	34.	150.	116.	155.	121.	4.	20.0	75-1
17	Nickel	50.	14.	55.	82.	59.	90.	9.	20.0	75-1
17	Cadmium	0.5	0.1	0.8	140.*	0.9	160.*	13.	20.0	75-1
17	Beryllium	1.0	L/0.1	1.1	110.	1.3	130.*	17.	20.0	75-1
17	Thallium	2.5	L/0.5	1.8	72.*	1.8	72.*	0.	20.0	75-1
2	Phenol	0.6	L/0.1	0.61	102.	0.67	112.	9.	20.0	75-1
17	Mercury	0.5	L/0.1	0.49	98.	0.48	96.	2.	20.0	75-1
17	Arsenic	2.5	1.8	3.9	84.	3.9	84.	0.	20.0	75-1
17	Selenium	2.5	L/0.5	2.6	104.	2.4	96.	8.	20.0	75-1
17	Copper	1.0	6.3	7.0	70.	7.0	70.	0.	20.0	75-1
EP. Tox. Extracts										
2	Mercury	0.025	L/0.005	0.025	100.	0.025	100.	0.	20.0	75-1
2	Barium	10.0	L/0.5	10.0	100.				20.0	75-1
2	Cadmium	1.0	L/0.02	1.16	116.				20.0	75-1
2	Chromium	1.0	L/0.1	1.1	110.				20.0	75-
2	Lead	5.0	L/0.2	5.2	104.				20.0	75-
2	Silver	1.0	L/0.1	0.9	90.				20.0	75-
2	Arsenic	0.2	L/0.1	0.2	100.				20.0	75-
2	Selenium	0.2	L/0.1	0.2	100.				20.0	75-

MS = Matrix Spike
Rec = Recovery
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference

* Asterisked values are outside of QC limits.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206) 767-5060
Chemistry, Microbiology, and Technical Services

Certificate

LABORATORY NO. 87722

Crowley

APPENDIX B

Spike Quality Control Report

Sample #	Analyte	ug/kg Sample Found	Spike Level	Samp & Spike Found	% Recovery	Control Limit
7 matrix spike	Lindane	L/1.	8.00	4.64	58.0	46-127
	Hptachlor	L/1.	8.00	6.25	78.1	35-130
	Aldrin	L/1.	8.00	9.20	115.	34-132
	Dieldrin	L/1.	20.00	10.9	54.3	31-134
	Endrin	L/1.	20.00	11.8	59.0	42-139
	DDT	L/1.	20.00	11.5	57.3	23-134
7 matrix spike dupe	Lindane	L/1.	8.00	5.08	62.9	46-127
	Hptachlor	L/1.	8.00	6.58	82.2	35-130
	Aldrin	L/1.	8.00	10.24	128.	34-132
	Dieldrin	L/1.	20.00	12.5	62.6	31-134
	Endrin	L/1.	20.00	13.6	67.8	42-139
	DDT	L/1.	20.00	13.6	67.8	23-134

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87722

APPENDIX C

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utlized in the analysis of volatile and organic compounds. The surrogates are added to every sample prior extraction and analysis to monitor for matrix effects, purging efficiency, and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

parts per billion (ug/kg)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
2	dibutylchlorendate	4.00	3.20	79.9	20-150
3	dibutylchlorendate	4.00	4.12	103.	20-150
7	dibutylchlorendate	4.00	4.20	105.	20-150
17	dibutylchlorendate	4.00	3.36	84.1	20-150
5	dibutylchlorendate	8300.	8549.	103.	20-150
Blank	dibutylchlorendate	4.0	4.00	100.	20-150
7 matrix-spk	dibutylchlorendate	4.0	3.70	92.4	20-150
7 matrix-spk-dupe	dibutylchlorendate	4.0	5.76	144.	20-150*
2	d4-1,2-Dichloroethane	584.	578.2	99.0	50-160
	d8-Toluene	584.	589.8	101.	50-160
	p-Bromofluorobenzene	584.	677.4	116.	50-160
3	d4-1,2-Dichloroethane	231.	235.6	102.	50-160
	d8-Toluene	231.	233.3	101.	50-160
	p-Bromofluorobenzene	231.	224.5	97.2	50-160
7	d4-1,2-Dichloroethane	266.	263.3	99.0	50-160
	d8-Toluene	266.	271.3	102.	50-160
	p-Bromofluorobenzene	266.	585.2	220.*	50-160

* Matrix interference

SUMMARY OF UNKNOWNS
GC/MS Tentative Identification of Peaks

87722
Crowley Env.

ug/kg

Approx. scan #	Tentative Identification	Sample 5	Sample 2	Sample 7
479	Bromofluorobenzene and unknown (Coelution)	3,200,000	-	-
514	UNKNOWN (Substituted cyclohexane)	3,200,000	-	-
639	Hydrocarbon	3,100,000	-	-
671	Alkylbenzene	5,300,000	-	-
710	UNKNOWN and Hydrocarbon (coelution)	6,800,000	-	-
731	UNKNOWN (Subst. alcohol or aldehyde)	2,900,000	-	-
751	Substituted decahydronaphthalene	3,300,000	-	-
783	Alkylbenzene	2,200,000	-	-
831	Hydrocarbon and alkylbenzene (coelution)	3,000,000	-	-
837	Alkylbenzene	2,400,000	-	-
844	Substituted decahydronaphthalene	3,600,000	-	-
876	Alkylbenzene	5,500,000	-	-
932	Alkylbenzene	4,800,000	-	-
932	Hydrocarbon	-	20,000	17,000
946	Hydrocarbon	6,800,000	-	-
957	UNKNOWN	3,200,000	-	-
975	UNKNOWN	4,600,000	-	-
1011	Hydrocarbon	10,200,000	13,000	11,000
1042	Hydrocarbon	8,900,000	43,000	35,000
1061	Methylnaphthalene	5,800,000	-	-
1089	UNKNOWN	4,100,000	-	-
1121	Hydrocarbon	10,400,000	19,000	17,000
1149	Hydrocarbon	7,400,000	60,000	52,000
1159	Dimethylnaphthalene	5,100,000	11,000	-
1178	Dimethylnaphthalene	12,300,000	27,000	-
1195	UNKNOWN	5,500,000	16,000	14,000
1207	Hydrocarbon	10,100,000	31,000	28,000
1215	UNKNOWN	1,500,000	-	-
1224	UNKNOWN (Hydrocarbon or alcohol)	3,400,000	-	-
1244	Hydrocarbon	-	72,000	63,000
1258	Alkylnaphthalene	2,500,000	-	-
1279	Alkylnaphthalene	3,300,000	-	-
1284	Alkylnaphthalene	3,000,000	-	-
1294	UNKNOWN	4,700,000	16,000	15,000
1302	Alkylnaphthalene	6,300,000	17,000	12,000
1315	Alkylnaphthalene	3,300,000	-	-
1338	UNKNOWN	2,500,000	-	-
1338	Hydrocarbon	-	63,000	56,000
1347	UNKNOWN	5,600,000	-	-
1379	Hydrocarbon	21,600,000	28,000	24,000
1426	Hydrocarbon	-	48,000	47,000
1430	Hydrocarbon	21,600,000	34,000	40,000
1469	Hexenoicacid, alkyl substituted	2,700,000	-	-
1508	Hydrocarbon	-	61,000	48,000
1516	Hydrocarbon	11,800,000	16,000	20,000
1587	Hydrocarbon	-	20,000	27,000
1663	Hydrocarbon	-	15,000	33,000
1736	Hydrocarbon	-	-	21,000

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87722

parts per billion (ug/kg)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
17	2-Fluorophenol	8000.	10768.	135.	24-133
	2-Fluoroaniline	4000.	777.	19.4	---
	d5-Phenol	8000.	9048.	113.	20-122
	2-Bromophenol	8000.	4315.	53.9	---
	d5-Nitrobenzene	4000.	3632.	90.8	20-140
	2-Fluorobiphenyl	4000.	3143.	78.6	20-140
	2,4,6-Tribromophenol	8000.	5501.	68.8	10-114
	d14-p-Terphenyl	4000.	3463.	86.6	20-150
7 (re-inject)	2-Fluorophenol	8000.	8504.	106.	24-133
	2-Fluoroaniline	4000.	1142.	28.6	---
	d5-Phenol	8000.	6457.	80.7	20-122
	2-Bromophenol	8000.	3651.	45.6	---
	d5-Nitrobenzene	4000.	3320.	83.0	20-140
	2-Fluorobiphenyl	4000.	4046.	101.	20-140
	2,4,6-Tribromophenol	8000.	7369.	92.1	10-114
	d14-p-Terphenyl	4000.	4726.	118.	20-150
5*	2-Fluorophenol	4,492,135.	4,606,180.	103.	24-133
	2-Fluoroaniline	2,253,933.	2,293,258.	102.	---
	d5-Phenol	4,494,382.	3,847,753.	85.6	20-122
	2-Bromophenol	4,492,135.	5,794,382.	129.	---
	d5-Nitrobenzene	2,253,933.	2,017,416.	89.5	20-140
	2-Fluorobiphenyl	2,229,213.	2,565,169.	115.	20-140
	2,4,6-Tribromophenol	4,494,382.	3,342,135.	74.4	10-114
	d14-p-Terphenyl	2,247,191.	2,490,449.	111.	20-150

* High level extraction procedure.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87722

APPENDIX D

Tentatively Identified Compounds

The following compounds were tentatively identified in estimated amounts in samples 2, 5, and 7. They were not found in other samples.

Laucks
Testing Laboratories, Inc.
940 South Harney Street, Seattle, Washington 98108 (206)767-5060
Chemistry, Microbiology, and Technical Services

Certificate

Crowley

LABORATORY NO. 87722

parts per billion (ug/kg)

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
17	d4-1,2-Dichloroethane	178.	177.6	99.8	50-160
	d8-Toluene	178.	178.0	100.	50-160
	p-Bromofluorobenzene	178.	169.1	95.0	50-160
Method Blank	d4-1,2-Dichloroethane	50.	49.9	99.8	50-160
	d8-Toluene	50.	47.2	94.4	50-160
	p-Bromofluorobenzene	50.	46.4	92.8	50-160
Method Blank	2-Fluorophenol	8000.	10695.	134.	24-133
	2-Fluoroaniline	4000.	1041.	26.0	---
	d5-Phenol	8000.	9425.	118.	20-122
	2-Bromophenol	8000.	4624.	57.8	---
	d5-Nitrobenzene	4000.	3556.	88.9	20-140
	2-Fluorobiphenyl	4000.	3273.	81.8	20-140
	2,4,6-Tribromophenol	8000.	6132.	76.7	10-114
	d14-p-Terphenyl	4000.	3697.	92.4	20-150
2	2-Fluorophenol	8000.	5727.	71.6	24-133
	2-Fluoroaniline	4000.	278.	7.0	---
	d5-Phenol	8000.	3202.	40.0	20-122
	2-Bromophenol	8000.	1462.	18.3	---
	d5-Nitrobenzene	4000.	3295.	82.4	20-140
	2-Fluorobiphenyl	4000.	3638.	91.0	20-140
	2,4,6-Tribromophenol	8000.	5315.	66.4	10-114
	d14-p-Terphenyl	4000.	3654.	91.4	20-150
3 (re-inject)	2-Fluorophenol	8000.	8939.	112.	24-133
	2-Fluoroaniline	4000.	507.	12.7	---
	d5-Phenol	8000.	8155.	102.	20-122
	2-Bromophenol	8000.	4123.	51.5	---
	d5-Nitrobenzene	4000.	3018.	75.5	20-140
	2-Fluorobiphenyl	4000.	3011.	75.3	20-140
	2,4,6-Tribromophenol	8000.	6130.	76.6	10-114
	d14-p-Terphenyl	4000.	3165.	79.1	20-150