
**BC BUILDINGS CORPORATION
DETAILED SITE INVESTIGATION
HIGHWAYS MAINTENANCE YARD
UCLUELET, BC**

Project No. 0802-2840068

October, 2003



DETAILED SITE INVESTIGATION
HIGHWAYS MAINTENANCE YARD
HIGHWAY 4 JUNCTION
UCLUELET, BC

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EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. (EBA) was retained by the British Columbia Buildings Corporation (BCBC) to conduct a Detailed Site Investigation (DSI) of the highways maintenance yard located on Highway 4, approximately 8 km northwest of Ucluelet, BC (herein referred to as the "Property"). The primary purpose of this DSI was to assess both soil and groundwater on the Property for potential salt impacts. The secondary purpose of the DSI was to provide additional assessment information to supplement the previous Stage 1 and Stage 2 Preliminary Site Investigations (PSI) completed on the Property by AGRA Earth and Environmental (AGRA) in 1999. At the time of this investigation, the highways maintenance yard was active.

Based on the results of the DSI, EBA concludes the following:

- Based on current use of the site as a highways maintenance yard, the BC *Contaminated Sites Regulation*¹ (CSR) standards for soil applicable to the Property are those for Commercial Land use (CL).
- Ten drinking water wells are located within 1.5 km of the Property in the BC MWLAP database, including the District of Ucluelet's drinking water wells, which are located to the immediate west, across Highway 4. The nearest aquatic life receptor is Lost Shoe Creek, which is located within 1 km northeast of the Property. A swamp and wetland area, which is also considered to be an aquatic life receptor is located immediately east of the Property. Therefore, the groundwater standards deemed applicable to the Property are the CSR standards for the protection of drinking water (DW) and freshwater aquatic life (AW).
- Evidence of salt impacted soil (as defined by chloride concentrations exceeding the draft CSR salt standards) has been identified west, southwest and east of the salt shed. The total volume of salt impacted soil has been estimated by EBA from all existing data to be approximately 2500 m³. The draft salt standards for soil have not been finalized into the BC CSR to date.
- The Stage 2 PSI completed by AGRA in 1999 identified soils containing polycyclic aromatic hydrocarbons (PAHs) concentrations that exceeded the CSR CL standards in the vicinity of the former leaky drum storage and treated timbers area. One soil sample from this area was also found to exceed the BC Special Waste Regulation (SWR) for mineral, oil and grease.

¹ Waste Management Act, *Contaminated Sites Regulation* (CSR), BC Reg. 375/96, deposited 1996 12 16, O.C. 1480/96, effective 1997 04 01 (includes amendments BC Reg. 244/99, deposited 1999 07 19 and BC Reg. 17/2002, deposited 2002 02 04).

During the DSI, approximately 2.5 m³ of suspect waste soils were excavated from this area under the direction of EBA and stockpiled on site. Analytical testing indicated that the soils remaining in-situ after the minor excavation in this area contained concentrations of hydrocarbons below the CSR CL standards.

- The Stage 2 PSI by AGRA in 1999 also identified soils containing light extractable petroleum hydrocarbons (LEPH) greater than CSR CL standards in the vicinity of the waste oil collection drum. The soil in this area was re-sampled during this DSI by EBA and found to meet with the CSR CL standards for hydrocarbons.
- During this DSI, the benzene concentration in one soil sample collected from a borehole (EBA BH 12 @ 3.9 m below grade), drilled in the vicinity of the oil/water separator was found to exceed the CSR CL standard of 0.04 ppm for protection of drinking water. A duplicate sample (Duplicate 3) of this sample was also found to exceed the CSR CL standard. Both sample results were only nominally over the 0.04 ppm limit by .02 ppm and .01 ppm, respectively.
- A surface sample (Sand SP @ 0.1 m) collected from near the former loading ramp and beneath the outlet pipe from the oil/water separator was also found to contain a concentration of LEPH exceeding the CSR CL standard.
- No regulated parameters were found in any of the groundwater samples collected from the monitoring wells during this DSI, at concentrations exceeding the applicable CSR DW and/or AW standards.
- The soils located beneath the outlet of the oil/water separator unit that were found to contain LEPH concentrations exceeding the CSR CL standards will have to be removed and transported offsite for disposal. This step could be accomplished at the same time as the offsite removal of the stockpile of material generated from the minor excavation of soil completed in the former leaking drum and treated timbers storage area.
- EBA will resample the soils located near BH12 @ 3.9 m below grade to verify the miner exceedence of the CSR benzene standard for the protection of drinking water.

1.0 INTRODUCTION

1.1 General

This report is intended to provide Detailed Site Investigation (DSI) information to compliment the results of the previous Stage 1 and 2 Preliminary Site Investigation (PSI) completed by AGRA Earth & Environmental (AGRA), in 1999. The investigations were carried out for BC Buildings Corporation (BCBC) at the Ministry of Transportation (MoT) highway maintenance yard located at the Highway 4 junction, approximately 8 km north of Ucluelet, BC.

The primary objective of the DSI was to further investigate the Property for hydrocarbon related contamination and to delineate any salt related contamination present in the soil and groundwater on the Property at concentrations exceeding the draft site standards for the BC *Contaminated Sites Regulation*² (CSR). The submission and subsequent review of all reports by BC MWLAP is required as part of the process for an application of an Approval in Principle (AiP) or for issuance of a Certificate of Compliance (CoC) under the CSR, after all site remediation has been completed.

1.2 Scope of Work

The basis for the scope of work completed during this project is outlined in EBA's Review of Previous Investigations 0802-2840068, dated July 2003. The scope of work is to:

1. Collection of a shallow soil samples using a shovel on a 10 m grid spacing in the vicinity of the salt shed. These samples were screened in the field for electrical conductivity (EC) values to help determine lateral extent of salt contamination.
2. Test pitting in the vicinity of the former leaking drum storage area, the treated timbers storage area and the aboveground used oil storage tank to further assess hydrocarbon and metals impacts.

¹ Waste Management Act, *Contaminated Sites Regulation* (CSR), BC Reg. 375/96, deposited 1996 12 16, O.C. 1480/96, effective 1997 04 01 (includes amendments BC Reg. 244/99, deposited 1999 07 19 and BC Reg. 17/2002, deposited 2002 02 04).

3. Excavating and removing the remaining hydrocarbon impacted soils in the vicinity of the former leaky drum storage area and treated timbers area and stockpiling this soil on site. Soil samples were collected at the base of the excavation and analysed for polycyclic aromatic hydrocarbons (PAHs) and glycols.
4. Drilling four boreholes in the vicinity of the gasoline and diesel aboveground storage tank (AST), which was a former underground fuel storage tank (UST) area, the oil/water separator, washdown slab and discharge outlet to further assess hydrocarbon impacts. Two of the boreholes were re-drilled and completed as groundwater monitoring wells. The monitoring wells were sampled for potential hydrocarbon and salt impacts.
5. Drilling ten additional boreholes with a truck-mounted auger rig for the investigation of salt related impacts. The boreholes were located in the vicinity of the salt shed. Two groundwater monitoring wells were later completed adjacent to, and down gradient from, the salt shed. These monitoring wells were sampled for salt impacts (sodium and chloride).
6. Estimating the hydraulic conductivity for groundwater using available data from the regulatory Ucluelet well field.
7. Collecting two surficial soil samples from the fill material located on the site to investigate potential metals contamination in the imported fill.
8. Investigating the exact location of all groundwater wells and aquatic habitat in the area to determine potential receptors for the site and the applicable standards from Schedule 6 of the CSR.
9. Surveying the major characteristics of the site including all buildings, surface sampling locations, boreholes, groundwater monitoring wells and the locations, where possible, of previous boreholes and monitoring wells completed by AGRA during the Stage 2 PSI. A local surveying firm was subcontracting by EBA to perform the survey.
10. Preparation of a DSI report that compared all of the additional soil and groundwater testing results to the applicable draft and final CSR standards for the Property.

1.3 Authorization

BCBC issued a Purchase Order (BR019750, revision 2) on May 9, 2003 to carry the DSI.

2.0 SITE DESCRIPTION

The Property is located on the southeast corner of the junction of Highway 4, approximately 8 km north of Ucluelet, BC. The legal description and approximate position of the Property is understood to be as follows:

- Block A, District Lot 445 and 446, Clayoquot District, and
- Block B, District Lot 462 and 483, Clayoquot District
- PID 000-550-299 and 000-550-302
- Latitude: 48 degrees, 59 minutes, 28.9 seconds
- Longitude: 125 degrees, 35 minutes, 12.7 seconds

A site location plan is presented as Figure 1 and a plan showing the general layout of the Property is presented as Figure 2.

The Property has been built up with fill material to level grade across the site however, the local and regional topography slopes gently towards the west in the direction of a the District of Ucluelet municipal well field and a wetland located across Highway 4 from the Property. Another wetland area located east of the Property is also down-gradient from the site.

The Property is located in a mixed residential and commercial area and is approximately 1.2 hectares in size. The Property is bounded by a swamp and wetland to the east, a residential house to the south, a tourist information center across Highway 4 to the north, and the District of Ucluelet Municipal well field and pump station across Highway 4 to the west.

3.0 POTENTIAL CONTAMINANTS OF CORNCERN

All of the identified APECs from the Stage 1 and 2 PSI are listed in the following table along with Potential Contaminants of Concern (PCOCs) and associated regulated parameters.

Areas and Contaminants of Potential Concern

Areas of Potential Environmental Concern (APECs)	ID	Potential Contaminants of Concern (PCOCs)	Regulated Analytical Parameters		Risk to Property
			Soil	Groundwater	
Existing Diesel AST/Former Gasoline and Diesel UST Area/Oil Shed	A	Gasoline, Diesel, Antifreeze	Benzene, ethylbenzene, toluene and xylenes (BETX), volatile petroleum hydrocarbons (VPH), extractable petroleum hydrocarbons (EPH), glycols	BETX, VPHw, VHW ₆₋₁₀ , LEPHw, EHW ₁₀₋₁₉ , methyl-tertiary butyl ether (MTBE), polycyclic aromatic hydrocarbons (PAH)	Moderate
Waste Oil AST	B	Waste Oil, Metals	EPH, Metals	LEPHw	Moderate
Former Leaky Drum and Treated Timbers Area	C	Waste Oil, Grease, Creosote, Metals	EPH, PAH, metals, glycol, MTBE	PAH, VHW ₆₋₁₀ , LEPHw, EHW ₁₀₋₁₉	Moderate
Oil/Water Separator and Washdown Pad	D	Diesel, Waste Oil, Grease, Salt	BETX, VPH, EPH, Sodium (Na), Chloride (Cl)	BETX, VPH, LEPHw, Na, Cl, salinity	High
Salt Shed/Storage Areas	E	Salt	Sodium (Na), Chloride (Cl)	Na, Cl, salinity	High

4.0 ASSESSMENT STANDARDS AND REGULATORY REQUIREMENTS

For the potential contaminants of concern at the site, the analytical results for soil and groundwater samples have been compared to standards contained in the following document:

- Waste Management Act, *Contaminated Sites Regulation* (CSR), BC Reg. 375/96, deposited 1996 12 16, O.C. 1480/96, effective 1997 04 01 (includes amendments BC Reg. 244/99, deposited 1999 07 19 and BC Reg. 17/2002, deposited 2002 02 04); and
- *Derivation of Matrix Soil Standards for Salt Under the British Columbia Contaminated Sites Regulation* (Draft), Royal Roads University, February 2002 (hereby referred to as Draft CSR Salt Standards).

4.1 Soils

Schedules 4 and 5 of the CSR provide generic and matrix numerical standards, respectively, for the assessment and remediation of soils. Generic standards depend solely on land use and matrix standards are risk-based standards that depend on land use

and a number of site-specific factors, for example, the use, if any, of groundwater at the site.

For present land use at the Property, the CSR Commercial Land Use (CL) soil standards apply to the Property. Four site-specific factors of the matrix soil standards also apply to the site. These are:

- Human Health Protection, intake of contaminated soil;
- Environmental Protection, toxicity to soil invertebrates and plants;
- Groundwater used for drinking water; and
- Groundwater flow to surface water used by freshwater aquatic life.

Since the completion of the Stage 2 PSI investigation in 1999, draft matrix numerical standards have been developed for sodium and chloride in soil. BCBC has requested that these standards are to be used to determine salt contamination and EBA understands that BCBC wishes to use an adsorption coefficient (K_d) of 0 for all their sites. If approved, the draft matrix standards will become part of the Contaminated Sites Regulation (CSR). The draft matrix standards are risk-based standards that depend on a number of site-specific factors, for example, the use, if any, of groundwater at the site.

4.2 Groundwater

Ten water wells are listed within 1.5 km of the site in the BC MWLAP database. There are no wells on the Property used for drinking water or domestic purposes. The District of Ucluelet production wells are located immediately west across Highway 4, within 250 m from the site. The majority of the municipal drinking and domestic water for Ucluelet is supplied from these production wells. The District of Ucluelet currently operates 5 high capacity wells in this wellfield. Copies of the well completion details and the groundwater well location map are included in Appendix A. Also included is a hydrograph from BC MWLAP Observation Well 329 (located within 500 m from the Property), which includes graphs on precipitation data and piezometric trends that illustrate the seasonal fluctuation of the groundwater table.

According to the Stage 2 PSI, the nearest surface water body is a swamp located adjacent to the site 4.0 m down gradient. An unnamed creek drains the swamp towards the north. A swampy area also exists to the west of the site that also drains towards the north. Lost

Shoe Creek is located within 1 km northeast of the site and Florencia Bay is located 2 km west of the site.

Based on our assessment, the appropriate regulatory standards for groundwater are for the protection of drinking water (DW) and freshwater aquatic life (AW), whichever is most stringent. The CSR DW and AW standards are outlined in the CSR Schedule 6 *Generic Numerical Water Standards* and CSR Protocol 7 – *Regulation of Petroleum Hydrocarbons in Water under the Contaminated Sites and Special Waste Regulation*.

All applicable CSR soil and groundwater standards have been included in Tables 2, 4, 5 and 6, respectively.

4.3 Stage 2 Amendments to the CSR

On February 4, 2002, the CSR was amended to include recent changes and numerous substances were added and standards changed. The following substances are potentially associated with the Property and will require investigation:

4.3.1 Director Standards for Methyl-Tertiary Butyl Ether (MTBE)

MTBE is an additive formerly found in gasoline prior to 2000, is very soluble in water and resists natural degradation, and has an aesthetic standard for drinking water. Sites that have previously had gasoline storage now require MTBE characterization for groundwater. Currently, soils are not regulated for MTBE. MWLAP has established a temporary process for characterization of MTBE in soil that will be in effect until October 31, 2003. After October 31, 2003 the target will be non-detect MTBE in compliance with the existing nonscheduled toxic substance (NSTS) regulation.

4.3.2 Glycols

Glycols, specifically ethylene glycol and 1,2-propylene glycol, are associated with antifreeze and are regulated in soil and/or groundwater. Vehicle maintenance shops, waste oil tanks and oil/water separators are considered potential sources of glycol contamination.

5.0 SUBSURFACE INVESTIGATION

5.1 Borehole Drilling and Sampling

On August 19 and 20, 2003, fourteen boreholes (EBA BH 1 to EBA BH 14) were drilled on the Property using a truck mounted auger rig supplied and operated by Beck Drilling and Environmental Services Ltd. (Beck) of Richmond, BC. All drilling works were completed under the direction of Mr. Mike Gallo, B.Sc., of EBA.

The boreholes were drilled in the vicinity of the former gasoline UST/existing gasoline and diesel AST, the washdown slab, oil/water separator, the former loading ramp area and in the vicinity of the salt shed. Groundwater was not encountered in any of the boreholes drilled on August 19 and 20, 2003 due to the coarseness of the soil media that did not allow for monitoring wells to be installed, following completion of the boreholes. The following Table A outlines the general locations of the boreholes and the potential contaminants to the subsurface. The exact locations, as surveyed, are shown on the attached Figure 2 and the borehole logs are attached in Appendix B.

Table A
Borehole Locations and Purpose

ID	Location	APEC	Purpose
EBA BH 1	West of Salt Shed	E	Salt Impacts
EBA BH 2	West of Salt Shed	E	Salt Impacts
EBA BH 3	Southwest of Salt Shed	E	Salt Impacts
EBA BH 4	West of Salt Shed	E	Salt Impacts
EBA BH 5	West of Salt Shed	E	Salt Impacts
EBA BH 6	West of Salt Shed	E	Salt Impacts
EBA BH 7	East of Salt Shed	E	Salt Impacts
EBA BH 8	East of Salt Shed	E	Salt Impacts
EBA BH 9	East of Salt Shed	E	Salt Impacts
EBA BH 10	Southeast of Salt Shed	E	Salt Impacts
EBA BH 11	East of Washdown Slab	D	Hydrocarbon Impacts
EBA BH 12	West of Oil/Water Separator	D	Hydrocarbon Impacts
EBA BH 13	Former Loading Ramp Area	D	Salt and Hydrocarbon Impacts
EBA BH 14	West of Former UST Basin	A	Hydrocarbon Impacts

The groundwater table was expected to be encountered around 10 m below ground surface. Beck advised EBA that an odex hammering drill rig would be better suited for the installation of monitoring wells at the Property. Therefore Beck and EBA returned at a later date to install the monitoring wells (see following section 5.2 of report). The locations of the drilled boreholes are shown on Figure 2, attached and the borehole logs are included in Appendix B. Boreholes EBA BH 1 through EBA BH 10 were drilled in the vicinity of the salt shed to a maximum depth of 7.62 m below ground surface. Boreholes EBA BH 11 through EBA BH 14 were drilled in the vicinity of the hydrocarbon impacted soils identified in the Stage 2 PSI and in any suspect areas found during this DSI program.

During drilling, solid stem augers were advanced and then removed in 1.5 metre lengths for soil sampling and logging. Drilling was completed when the coarseness of the soil media prevented the augers from further advancement, or until visual, olfactory and field screening methods indicated that hydrocarbons and/or salt impact to the soil media were unlikely present. Soil samples were collected directly from the auger flights where changes in stratigraphy were observed or at 1.0 m intervals.

5.2 Monitoring Well Installation

EBA and Beck returned to the site on September 3 and 4, 2003 to install monitoring wells using an odex hammering drilling rig to drill through the coarse soil media. Groundwater monitoring well EBA MW 1 was completed down gradient from the salt shed and near the property boundary. EBA MW 2 was installed adjacent to previous borehole EBA BH 2 and immediately down gradient of the salt shed. EBA MW 3 was installed adjacent to EBA BH 14 and immediately downgradient of the former fuel USTs. EBA MW 4 was installed adjacent to EBA BH 13 near the former loading ramp. The groundwater monitoring wells installed were constructed of 50 mm diameter, screw-jointed schedule 40 PVC and comprised a length of machine slotted screen on the end of unslotted riser pipe. The annulus of the pipe was backfilled with silica sand just above the screened section. The annulus of the solid pipe was backfilled with slough and drill cuttings to a depth of approximately 1.5 m below ground surface. A bentonite seal was placed above the backfilled material in the borehole to prevent infiltration of surface water. The bentonite seal was placed near surface rather than above the silica sand because the seasonal fluctuation of the water table rises to approximately 1 to 2 m below ground surface in the winter months. The well completion details are shown on the borehole logs, Appendix B.

5.3 Test Pit, Excavation and Surface Sampling

Three test pits were advanced to further assess the potential on-site hydrocarbon impacts associated with the historical usage of the Property as a highway maintenance yard. During the test pitting program, all surficial soils in the areas identified by AGRA's Stage 2 PSI in 1999 as containing hydrocarbons exceeding the CSR CL standards (i.e. former leaky drum and treated timbers areas), were excavated and stockpiled on site. A number of surface soil samples (SS1-SS17) were also collected by EBA in suspect salt impacted areas. The following Table B outlines the general locations of the test pits, excavations and, surface sampling completed and the potential contaminants assessed. The exact locations, as surveyed, are shown on the attached Figure 2 and the test pit logs are attached in Appendix B.

Table B
Test Pit Locations and Purpose

ID	Location	APEC	Purpose
TP 1	Former Leaky Drum Storage	C	Hydrocarbon Impacts
TP 2	Former Treated Timbers Area	C	Hydrocarbon Impacts
TP 3	Waste Oil Storage Area	B	Hydrocarbon Impacts
EXC 1	Former Leaky Drum	C	Hydrocarbon Impacts
EXC 2	Treated Timbers Area	C	Hydrocarbon Impacts
Sand SP	Former Loading Ramp Area	D	Hydrocarbon Impacts
SS1	North of Salt Shed	E	Salt Impacts
SS2	North of Salt Shed	E	Salt Impacts
SS3	Northeast of Salt Shed	E	Salt Impacts
SS4	North of Salt Shed	E	Salt Impacts
SS5	Northeast of Salt Shed	E	Salt Impacts
SS6	South of Salt Shed	E	Salt Impacts
SS7	South of Salt Shed	E	Salt Impacts
SS8	Southeast of Salt Shed	E	Salt Impacts
SS9	North of Salt Shed	E	Salt Impacts
SS10	North of Salt Shed	E	Salt Impacts
SS11	South of Salt Shed	E	Salt Impacts
SS12	South of Salt Shed	E	Salt Impacts
SS13	Southeast of Salt Shed	E	Salt Impacts
SS14	Southeast of Salt Shed	E	Salt Impacts
SS15	Northeast of Salt Shed	E	Salt Impacts
SS16	West of Salt Shed	E	Salt Impacts
SS17	West of Salt Shed	E	Salt Impacts

5.3.1 Soil Sampling Methodology – Hydrocarbons

During the test pitting program, soil samples were collected from the excavation walls or directly off the bucket of the backhoe. A clean stainless steel trowel was used to place soil into duplicate, teflon[®]-lidded glass sample jars supplied by ALS Environmental (ALS). All soil samples were stored in ice-chilled coolers and submitted to ALS main laboratory in Vancouver, BC for selected analysis of PCOC. All samples were shipped under chain of custody to ALS.

A split from each sample was field screened for combustible vapour concentrations using the dry headspace technique. A consistent volume of soil was placed into a sealable plastic bag and allowed to sit for a set amount of time (i.e. 5 minutes). The hydrocarbon vapour in the headspace was then measured with a Gastech[®] TraceTector vapour analyzer calibrated to a hexane standard.

5.3.2 Soil Sampling Methodology – Salt

Soil samples collected for salt analysis were initially collected from surface locations in the vicinity of the salt shed using a hand shovel and stainless steel trowel. In addition, soil sample from borehole drilled in the salt shed area were also collected for field conductivity analysis. Soil samples were placed directly into sealable plastic bags.

A split from each sample was field screened using an electrical conductivity (EC) screening methodology to help assess potential salt impacts. A constant volume of soil (250 ml) was placed into a plastic container and 250 ml of distilled water was added. The water and soil mixture was then mixed and the water mixture above the soil was then measured for EC using a hand held conductivity meter. Sampling equipment was washed between sample locations to minimize the potential for cross-contamination. The attached Table 1 lists the conductivity measurements completed on all soil samples collected during the salt investigation.

Prior to collection of soil samples for salt screening, a reference grid was established to provide reproducible sample locations. The surface to the west of the salt shed is asphalt, therefore surface samples were not collected in this area.

5.4 Groundwater Sampling

EBA attempted to locate the previous wells drilled on the site by AGRA in 1999 (AGRA MW1, MW2 and MW3) on August 18, 2003. AGRA MW2 was the only remaining well located on site by EBA and was found to be dry. The site foreman indicated to EBA that former MW1 was destroyed and that MW3 was also likely destroyed.

All new wells were first developed by purging approximately 60 L of water from the well using dedicated Waterra[®] tubing and foot valves after drilling. EBA returned to the site to measure groundwater levels and to collect groundwater samples from all of the new monitoring wells on September 4, 2003. All wells were inspected for depth to water and apparent hydrocarbon vapour accumulations. The monitoring wells were then purged of at least three well volumes using dedicated Waterra[®] tubing and foot valves, prior to sample collection.

5.5 Groundwater Sampling

In conjunction with the investigations, a Quality Assurance/Quality Control (QA/QC) program was implemented to ensure the integrity of the soil and groundwater sampling and analytical testing. Blind duplicate soil samples were utilized as a laboratory quality control measure.

5.5.1 Soil Sampling

Soil samples collected for analyses were placed in laboratory prepared containers to ensure cleanliness and to preserve sample quality. After collection, the samples were immediately placed in ice-chilled coolers for storage and shipment to the laboratory. In order to track sample handling, after collection and during transport, chain-of-custody forms were employed. Approximately one blind duplicate soil sample was collected and submitted for analysis for every ten analyzed soil samples submitted or a minimum of one blind duplicate soil sample per cooler shipment.

5.5.2 Groundwater Sampling

Each groundwater monitoring well was purged and sampled utilizing dedicated Waterra[®] tubing, 450 µm filters (for dissolved sodium analysis) and valves. The dedicated materials were used to eliminate the potential for cross contamination resulting from contaminated groundwater sampling materials. Groundwater

samples collected for analyses were placed in laboratory prepared containers to ensure cleanliness and to preserve sample quality. Where applicable, laboratory supplied preservatives were added to samples. After collection, the samples were immediately placed in ice-chilled coolers for storage and shipment to the laboratory. In order to track sample handling, after collection and during transport, chain-of-custody forms were employed. Blind field duplicate samples for groundwater were not collected as only four groundwater samples were collected for the DSI.

5.6 Analytical Testing

The laboratory analyses for hydrocarbon and salt parameters were completed by ALS Environmental (ALS) of Vancouver, BC. All laboratory analyses were completed following methods approved by BC MWLAP. In total, fourteen soil samples and two blind duplicate samples were analysed for hydrocarbon parameters, including, benzene, ethylbenzene, toluene and xylenes (BETX), volatile petroleum hydrocarbons (VPH), and light and heavy extractable petroleum hydrocarbons (EPH₁₀₋₁₉ and EPH₁₉₋₃₂), polycyclic aromatic hydrocarbons (PAHs), methyl tertiary butyl ether (MTBE) and glycols. Seven soil samples and one duplicate sample were analysed for metals parameters. Twenty-four soil samples and two blind duplicate samples were analyzed for salt [sodium (Na) and chloride (Cl)] analyses. Two groundwater samples were submitted for analysis of BETX, VPH, EPw, MTBE and three groundwater samples were submitted for analysis of salinity, Na and Cl.

6.0 RESULTS OF INVESTIGATION

6.1 Stratigraphy

A typical soil profile based on the test pits and boreholes drilled during the DSI consists of sand and gravel fill from surface to 0.3 m to 2.2 m below grade. The deepest fill layer was encountered in the vicinity of the former UST, located adjacent to the existing diesel AST. Underlying the fill layer is silty sand, native material with organics consisting of wood waste and roots, soft, brown and black and moist to wet. This layer is likely the original forest floor. The thickness of this layer extends to a maximum depth of 4.56 m below surface grade. Beneath the silty sand and organic native material is a coarse sand and gravel layer, which extends beyond the depth of the deepest monitoring well

(13.41 m below ground surface). The sand and gravel layer contains the aquifer, which was encountered at approximately 10 m below ground surface.

A detailed description of the soil stratigraphy encountered at each borehole location is presented on the borehole logs in Appendix B. Cross-sections, showing soil stratigraphy across the salt investigated area, are also provided as Figures 3 and 4. The location of the cross-sections are presented on Figure 2.

6.2 Results of Soil Analysis – Salt

A summary of field EC readings is attached in Table 1. Analytical results for soil samples submitted for salt related parameters are attached in Table 2 and Figure 5. The following exceedences of the Draft CSR salt standards in soils were identified after laboratory analysis during the DSI:

- EBA BH1 @ 3.0 – 3.5 m below surface grade (bsg) for Chloride;
- EBA BH1 @ 6.0 – 6.6 m bsg for Chloride;
- EBA BH2 @ 0.5 – 1.0 m bsg for Chloride and Sodium;
- EBA BH2 @ 4.0 – 4.5 m bsg for Chloride and Sodium;
- EBA BH3 @ 4.5 – 5.0 m bsg for Chloride;
- EBA BH5 @ 1.0 – 1.5 m bsg for Chloride;
- EBA BH6 @ 1.0 – 1.5 m bsg for Chloride;
- EBA BH7 @ 1.0 – 1.5 m bsg for Chloride;
- EBA BH8 @ 1.5 – 2.0 m bsg for Chloride; and
- EBA BH8 @ 4.0 – 4.5 m bsg for Chloride and Sodium.

The results of the soil analysis are summarized in Table 2. A summary of soil samples with salt concentrations greater than the CSR draft standards is presented on Figure 5. The laboratory analytical reports for salt parameters are included in Appendix C.

6.3 Results of Soil Analysis – Hydrocarbons and Glycols

The field hydrocarbon vapour screening summary is attached in Table 3 and analytical results for soil samples submitted for hydrocarbon testing in the laboratory are attached in Table 4. The majority of the soil samples submitted for laboratory analyses of hydrocarbon parameters were found to be below the CSR CL standards. The only exception was benzene in the soil sample taken from EBA BH12 at 3.9 m and EPH₁₀₋₁₉ in the Sand SP sample. The EBA BH 12 @ 3.9 m sample was collected from the area of the

oil/water separator. The Sand SP sample was collected from the former loading ramp area near the outlet pipe for the oil/water separator. The analytical results from the stockpiled soil generated from the cleanup of soils in the vicinity of the former leaky drum and treated timbers storage areas indicated that hydrocarbon concentrations were below the CSR CL standards for regulated hydrocarbon parameters.

All other soil samples that were tested for various hydrocarbon analyses and glycols meet with CSR CL standards and guideline.

The Sand SP sample was only analysed for EPH rather than LEPH and HEPH. LEPH results do not include testing for select PAHs. However, the EPH₁₀₋₁₉ results recorded for this sample are considered equivalent to LEPH. The results of all soil analysis for hydrocarbons and glycols are presented on Figure 6. The laboratory analytical reports for hydrocarbon parameters are included in Appendix C.

6.4 Results of Soil Analysis – Metals

The analytical results for soil samples submitted for metals parameters are attached in Table 5. All of the samples submitted for laboratory analyses of total metals meet with the CSR CL standards for soil. A summary of soil samples of metals is presented on Figure 6. The laboratory analytical reports for metals are included in Appendix C.

6.5 Estimated Extent of Salt Contamination

Elevated levels of conductivity were found in soils on site during the previous PSI by AGRA, and this DSI. During this investigation, soil samples collected from ten borehole locations, located west, southwest, east and southeast of the salt shed, contained chloride and sodium concentrations exceeding the Draft CSR standards for these two parameters.

The total aerial extent of the salt contaminated plume in soils on the site is estimated at approximately 500 m². The thickness of the salt plume varies between 2.0 m and 8.0 m across the plume area. Using an average depth of 5.0 m across the plume area, the total estimated volume of salt impacted soil containing concentrations of chloride greater than the Draft CSR salt standard is approximately 2500 m³. The drilling to date has not delineated the salt plume in soils completely but reliable estimates can be established from the data obtained to date. Cross-sections through the inferred salt plume area are included on the attached Figures 3 and 4. The approximate aerial extent of soils with salt concentrations greater than the CSR draft CL standards is shown on Figure 5.

6.6 Results of Analysis – Groundwater

The four groundwater monitoring wells were sampled on September 4, 2003. EBA MW1, EBA MW2 and EBA MW4 located either in the area, or down gradient, of the salt shed were analysed for salt related parameters. EBA MW3 and EBA MW4 located near the former fuel UST nest and former loading ramp area were analysed for hydrocarbon related parameters.

The results of the groundwater analyses indicate that concentrations of all salt and hydrocarbon parameters were less than the applicable CSR AW and DW standards. The analytical results are presented on Table 6 attached and illustrated on Figure 7. The laboratory analytical reports for groundwater parameters are included in Appendix C.

Hydraulic conductivity testing in the four monitoring wells installed during this DSI was not performed at this time due to the coarseness of the soil media and the distance to the groundwater table. Performing a rising head test at this time would have been costly and based on the soil conditions on site, not required. Groundwater travel times were instead estimated from information from EBA's recently completed evaluation of the District of Ucluelet's (DoU) well field (EBA File No. 0805-01-86153. March 2002). The geometric mean hydraulic conductivity from seven DoU wells (which are completed into the same aquifer as the monitoring wells at the Property) was 0.003 m/s and the porosity was determined to be 0.25. The hydraulic gradient across the Property is approximately 6 mm/m in a southwesterly direction. The following calculation determines the travel time for groundwater flow across the site:

Travel Time = $K * i / n$ where,

K = Hydraulic Conductivity of the aquifer media (m/s)

i = Hydraulic Gradient (m/m)

N = Porosity of the aquifer media

Travel Time = $(0.003)(0.006)/0.25 = 0.000072$ m/s or 6.2 m/day.

Based on the results of the travel time calculation, contaminants migrating from the Property would reach the District of Ucluelet municipal well field within a 50 year travel time. Therefore, the CSR CL standard for drinking water apply to the Property. The groundwater contour plan and direction of groundwater flow across the site that were used to calculate the travel times are presented on Figure 8.

6.7 QA/QC

In conjunction with the investigations, a Quality Assurance/Quality Control (QA/QC) program was implemented to ensure the integrity of the soil sampling and analytical testing. Blind duplicate soil samples were utilized as a laboratory quality control measure. The results of the QA/QC samples submitted indicated that the results are within acceptable limits of variance. Blind field duplicates for groundwater were not collected based on the limited number of groundwater samples collected during the DSI.

7.0 CONCLUSIONS

EBA has completed a DSI at the Ucluelet Highways Yard, Highway 4 Junction, Ucluelet, BC. Based on the results of the DSI, EBA concludes the following:

- Based on current use of the site as a highways maintenance yard, the BC *Contaminated Sites Regulation* (CSR) standards for soil applicable to the Property are those for Commercial Land use (CL).
- Ten drinking water wells are located within 1.5 km of the Property in the BC MWLAP database, including the District of Ucluelet's drinking water wells, which are located to the immediate west, across Highway 4. The nearest aquatic life receptor is Lost Shoe Creek, which is located within 1 km northeast of the Property. A swamp and wetland area, which is also considered to be an aquatic life receptor is located immediately east of the Property. Therefore, the groundwater standards deemed applicable to the Property are the CSR standards for the protection of drinking water (DW) and freshwater aquatic life (AW).
- Evidence of salt impacted soil (as defined by chloride concentrations exceeding the draft CSR salt standards) has been identified west, southwest and east of the salt shed. The total volume of salt impacted soil has been estimated by EBA from all existing data to be approximately 2500 m³. The draft salt standards for soil have not been finalized into the BC CSR to date.
- The Stage 2 PSI completed by AGRA in 1999 identified soils containing polycyclic aromatic hydrocarbons (PAHs) concentrations that exceeded the CSR CL standards in the vicinity of the former leaky drum storage and treated timbers area. One soil sample from this area was also found to exceed the BC Special Waste Regulation (SWR) for mineral, oil and grease. During the DSI, approximately 2.5 m³ of suspect

waste soils were excavated from this area under the direction of EBA and stockpiled on site. Analytical testing indicated that the soils remaining in-situ after the minor excavation in this area contained concentrations of hydrocarbons below the CSR CL standards.

- The Stage 2 PSI by AGRA in 1999 also identified soils containing light extractable petroleum hydrocarbons (LEPH) greater than CSR CL standards in the vicinity of the waste oil collection drum. The soil in this area was re-sampled during this DSI by EBA and found to meet with the CSR CL standards for hydrocarbons.
- During this DSI, the benzene concentration in one soil sample collected from a borehole (EBA BH 12 @ 3.9 m below grade), drilled in the vicinity of the oil/water separator was found to exceed the CSR CL standard of 0.04 ppm for protection of drinking water. A duplicate sample (Duplicate 3) of this sample was also found to exceed the CSR CL standard. Both sample results were only nominally over the 0.04 ppm limit by .02 ppm and .01 ppm, respectively.
- A surface sample (Sand SP @ 0.1 m) collected from near the former loading ramp and beneath the outlet pipe from the oil/water separator was also found to contain a concentration of LEPH exceeding the CSR CL standard.
- No regulated parameters were found in any of the groundwater samples collected from the monitoring wells during this DSI, at concentrations exceeding the applicable CSR DW and/or AW standards.
- The soils located beneath the outlet of the oil/water separator unit that were found to contain LEPH concentrations exceeding the CSR CL standards will have to be removed and transported offsite for disposal. This step could be accomplished at the same time as the offsite removal of the stockpile of material generated from the minor excavation of soil completed in the former leaking drum and treated timbers storage area.
- EBA will resample the soils located near BH12 @ 3.9 m below grade to verify the miner exceedence of the CSR benzene standard for the protection of drinking water.

8.0 PROFESSIONAL STATEMENT

As required under Part 16, Section 63 of the Waste Management Act, *Contaminated Sites Regulation* (CSR), BC Reg. 375/96, deposited 1996 12 16, O.C. 1480/96, effective



1997 04 01 (includes amendments BC Reg. 244/99, deposited 1999 07 19 and BC Reg. 17/2002, deposited 2002 02 04), EBA acknowledges that the person(s) signing this report has(have) demonstrable experience and is(are) familiar in completing the work, as described, for the type of contamination at this site. The documentation provided has been prepared in accordance with the applicable regulations in the Act.

9.0 CLOSURE

Conclusions presented in this report are based on site observations made by EBA, soil sampling, and analytical testing of selected samples. This report has been prepared for the use of British Columbia Buildings Corporation, which includes distribution as required by British Columbia Buildings Corporation for the purposes for which this assessment was commissioned. The BC Ministry of Water, Land and Air Protection may rely upon this report for the purposes of review and comment. It has been prepared in accordance with generally accepted engineering practices. No other warranty is made, either express or implied. This report is subject to the "Environmental Report – General Conditions" which are contained in Appendix D.

Respectfully Submitted,

EBA ENGINEERING CONSULTANTS LTD.

Prepared by:

Reviewed by:

Mike Gallo, B.Sc.
EBA Site Manager

Martin Jarman, P.Geo.
Project Manager



EBA Engineering Consultants Ltd.



CLIENT

BRITISH COLUMBIA BUILDINGS CORPORATION

PROJECT

DETAILED SITE INVESTIGATION
UCLUELET HIGHWAYS YARD

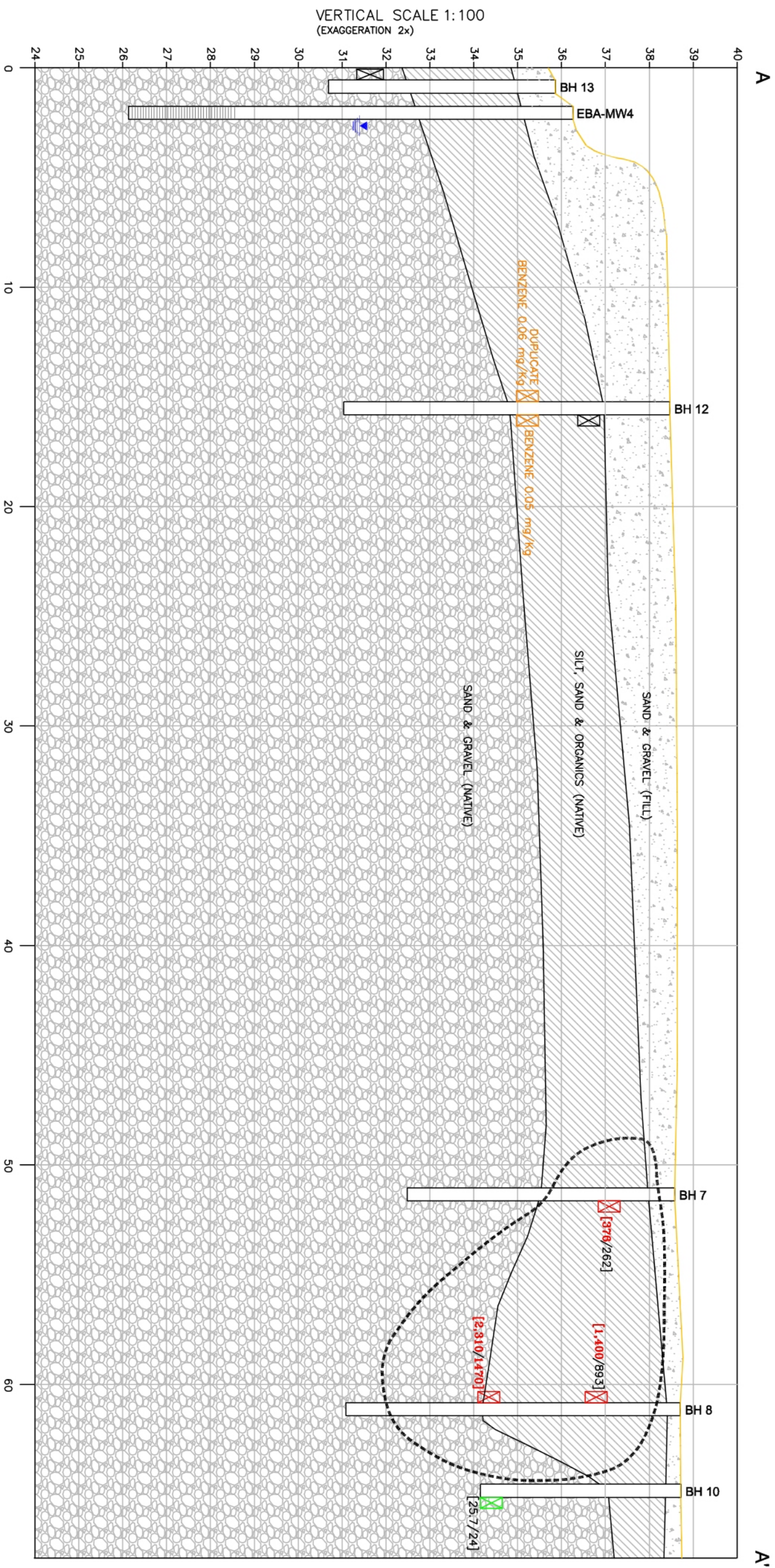
TITLE

SITE LOCATION

DATE SEPT. 06, 2003 DWN. SG/LP CHKD. MG

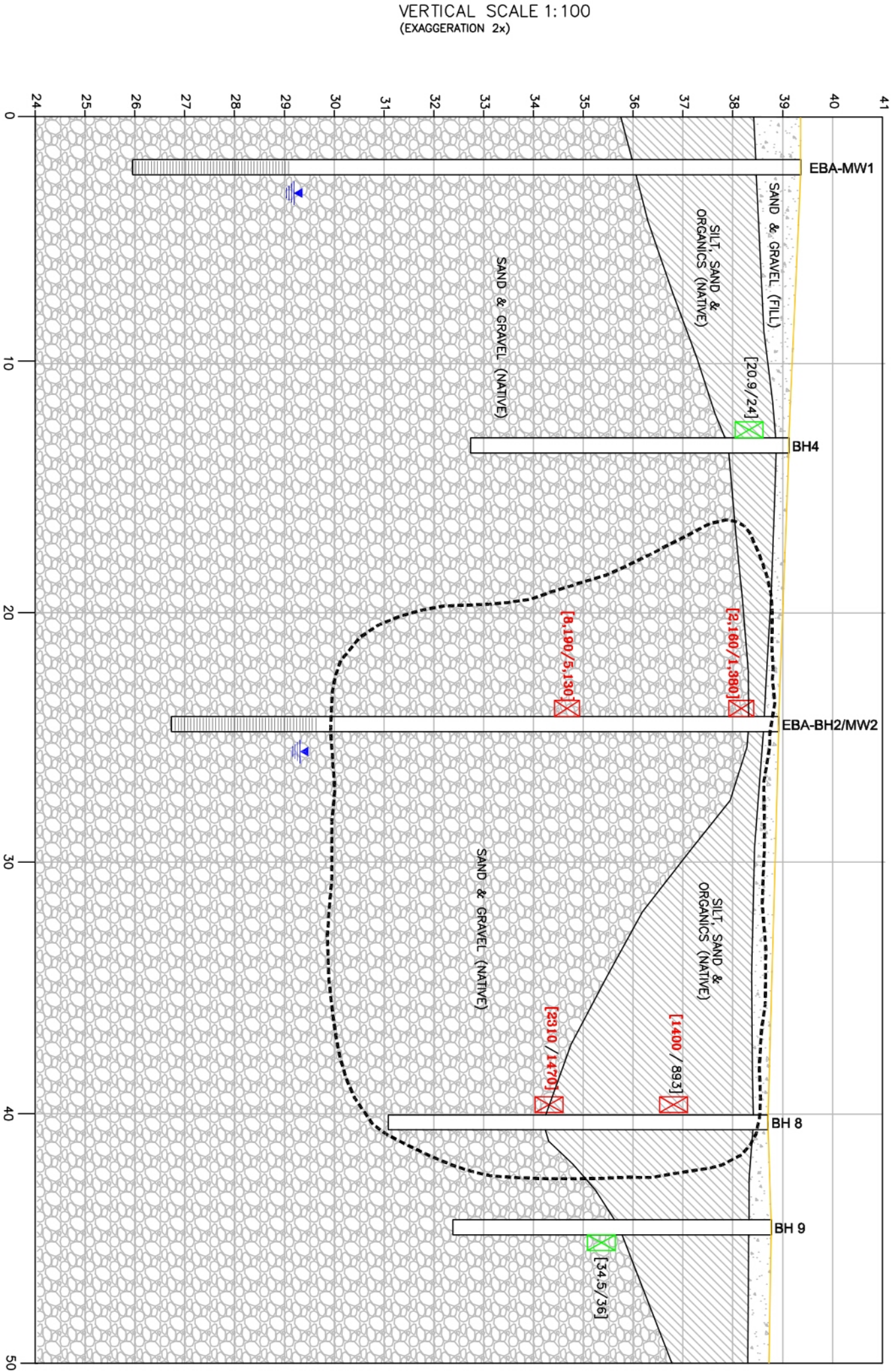
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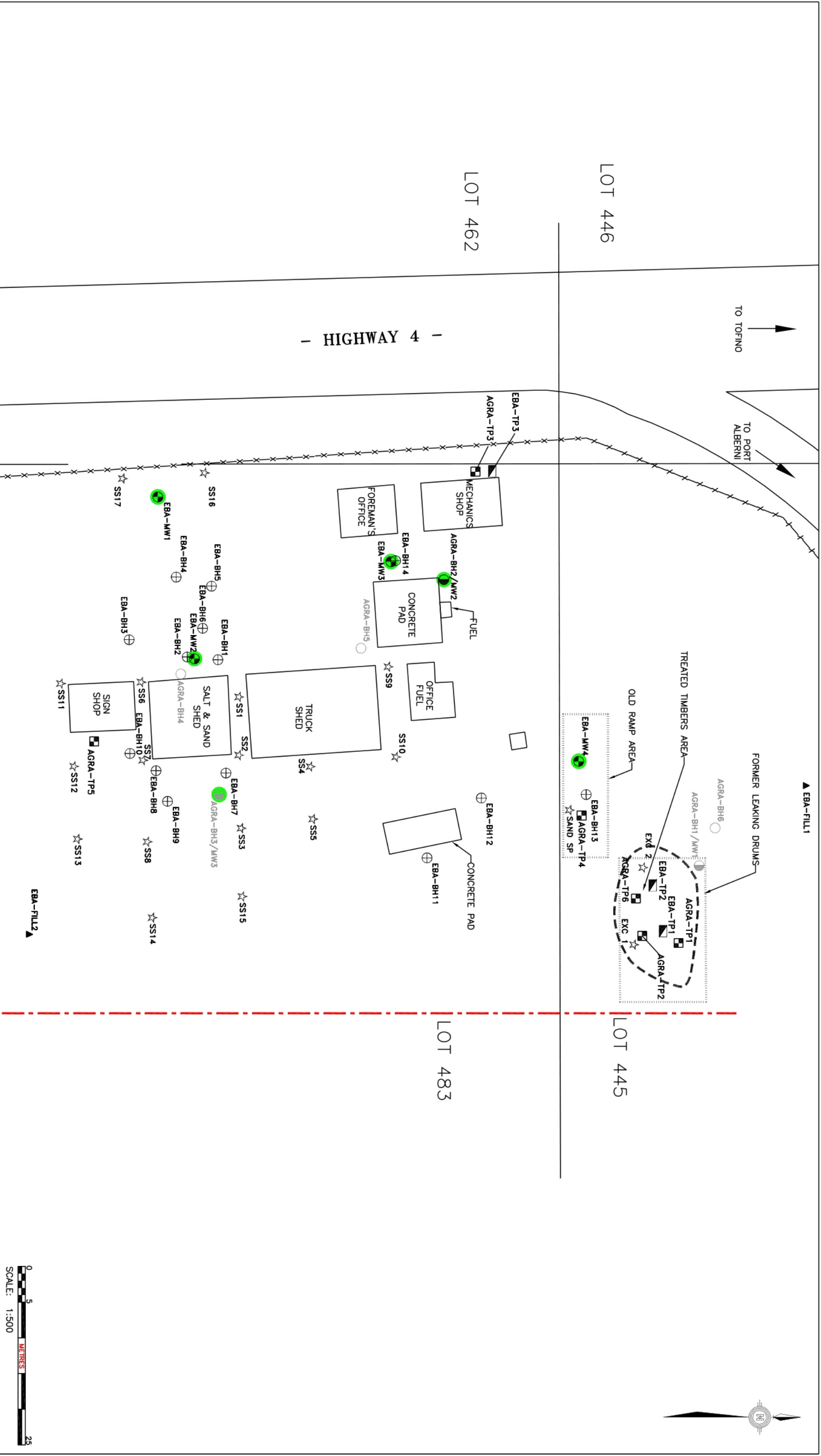


B-B' SECTION
2 HORIZONTAL SCALE
1:200


LEGEND:				SAMPLE LOCATION WHERE PARAMETERS WERE < CSR CL SALT DRAFT STANDARDS	
				SAMPLE LOCATION WHERE PARAMETERS WERE > CSR CL SALT DRAFT STANDARDS	
				CHLORIDE/SODIUM VALUES [376/262]	
				GROUNDWATER ELEVATION MEASURED ON (m)	
				EXTENT OF SALT IMPACTED SOIL PLUME	

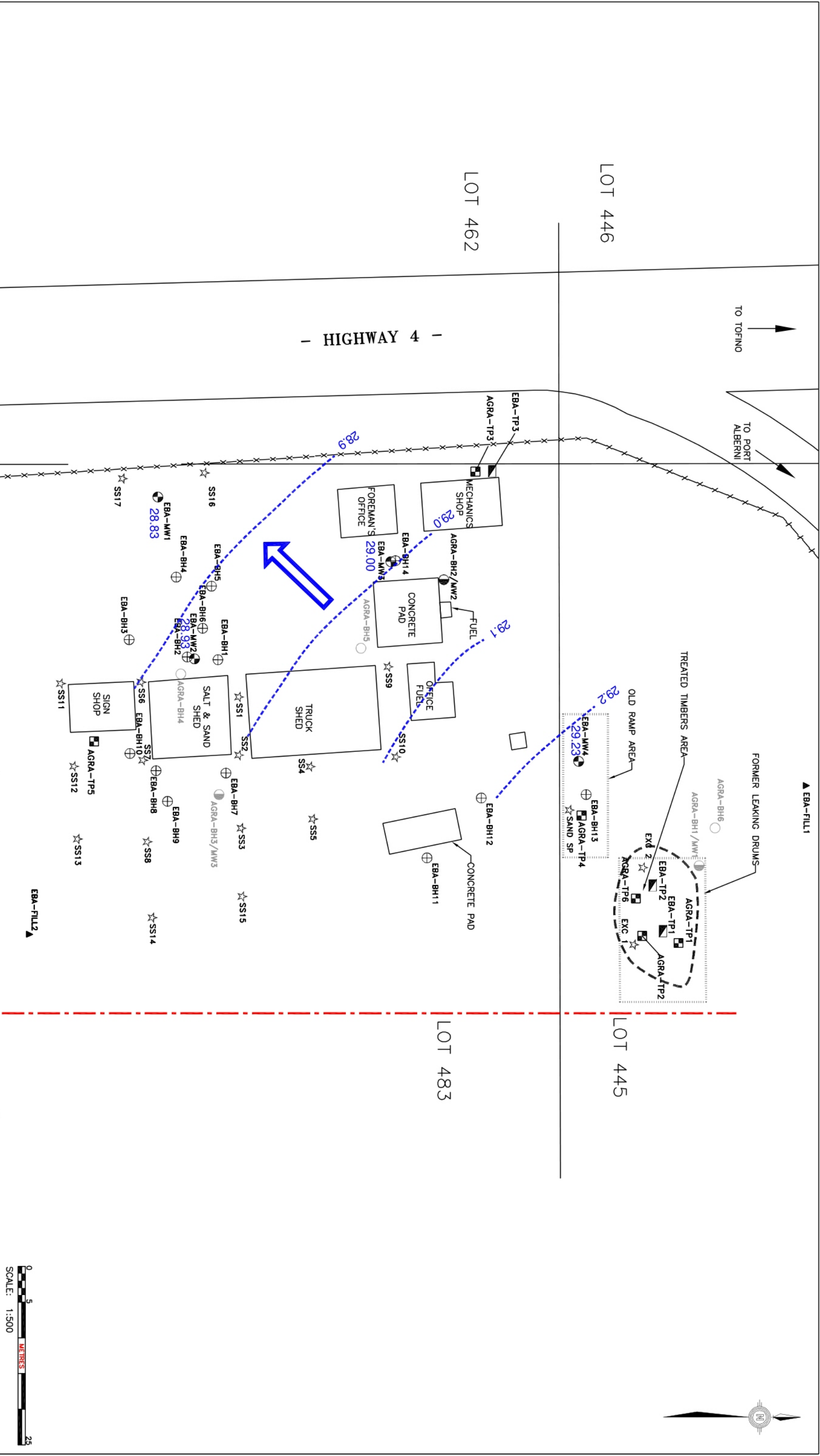






LEGEND:		EBA-TP1		TEST PIT LOCATION-EBA AUG. 2003		▲ FILL1 FILL SAMPLE LOCATION-EBA AUG. 2003	
-X- FENCE LINE		AGRA-BH2/MW2		● MONITORING WELL LOCATION-AGRA FEB. 1999		[] EXTENT OF SALT IMPACTED SOIL PLUME	
- - - PROPERTY BOUNDARY		AGRA-BH5		○ BOREHOLE LOCATION-AGRA FEB. 1999		● SAMPLE POINT WHICH DID NOT EXCEED CSR CL STANDARDS	
- - - EXCAVATION BOUNDARY		AGRA-TP3		▲ TEST PIT LOCATION-AGRA FEB. 1999			
● EBA-MW2		MONITORING WELL LOCATION-EBA AUG. 2003					
⊕ EBA-BH4		BOREHOLE LOCATION-EBA AUG. 2003					
★ SS16		SURFACE SAMPLE LOCATION-EBA AUG. 2003					
		A A A A					
		CROSS SECTION					

EBA Engineering Consultants Ltd.							PROJECT										
CLIENT					BRITISH COLUMBIA BUILDINGS CORPORATION		DETAILED SITE INVESTIGATION										
							UCLUELET HIGHWAYS YARD										
TITLE					DETAILED ANALYTICAL RESULTS - GROUNDWATER												
DATE		SEPT. 22, 2003		DWN.		SG		CHKD.		KT		FILE NO.		0802-2840068		FIGURE 7	



LEGEND:		EBA-TP1		TEST PIT LOCATION-EBA AUG. 2003		▲ FILL1 FILL SAMPLE LOCATION-EBA AUG. 2003	
-X- FENCE LINE		AGRA-BH2/MW2		● MONITORING WELL LOCATION-AGRA FEB. 1999		29.23 GROUNDWATER ELEVATION (m)	
- - - PROPERTY BOUNDARY		AGRA-BH5		○ BOREHOLE LOCATION-AGRA FEB. 1999		29.2 ----- INFERRED GROUNDWATER CONTOUR	
- - - EXCAVATION BOUNDARY		AGRA-TP3		▲ TEST PIT LOCATION-AGRA FEB. 1999		➡ GROUNDWATER FLOW DIRECTION	
● EBA-MW2		BOREHOLE LOCATION-EBA AUG. 2003		CROSS SECTION			
● EBA-BH4		BOREHOLE LOCATION-EBA AUG. 2003					
⊕ SS16		SURFACE SAMPLE LOCATION-EBA AUG. 2003					

Table 1: Summary of Field Conductivity Results

Sample ID	Depth (m)	Conductivity (uS/cm)
SS 1	0 - 0.1	76
SS 2	0 - 0.1	16
SS 3	0 - 0.1	64
SS 4	0 - 0.1	84
SS 5	0 - 0.1	48
SS 6	0 - 0.1	38
SS 7	0 - 0.1	18
SS 8	0 - 0.1	89
SS 9	0 - 0.1	10
SS 10	0 - 0.1	36
SS 11	0 - 0.1	51
SS 12	0 - 0.1	6
SS 13	0 - 0.1	8
SS 14	0 - 0.1	56
SS 15	0 - 0.1	148
SS 16	0 - 0.1	8
SS 17	0 - 0.1	10

Sample ID	Depth (m)	Conductivity (uS/cm)
EBA BH1	0 - 0.5	990
EBA BH1	0.5 - 1.0	1341
EBA BH1	1.0 - 1.5	1750
EBA BH1	2.5 - 3.0	1975
EBA BH1	3.0 - 3.5	3930
EBA BH1	4.0 - 4.5	2640
EBA BH1	4.5 - 5.0	3070
EBA BH1	5.0 - 6.0	2520
EBA BH1	6.1 - 6.6	1955
EBA BH1	6.6 - 7.6	2530
EBA BH2	0 - 0.5	> 3999
EBA BH2	0.5 - 1.0	> 3999
EBA BH2	1.0 - 1.5	> 3999
EBA BH2	2.5 - 3.0	> 3999
EBA BH2	4.0 - 4.5	> 3999
EBA BH2	5.6 - 6.1	2650
EBA BH3	0 - 0.5	125
EBA BH3	1.0 - 1.5	355
EBA BH3	1.5 - 2.0	140
EBA BH3	2.5 - 3.0	156
EBA BH3	3.5 - 4.5	260
EBA BH3	4.5 - 5.0	324
EBA BH3	5.5 - 6.1	190

Sample ID	Depth (m)	Conductivity (uS/cm)
EBA BH4	0 - 0.5	179
EBA BH4	0.5 - 1.0	151
EBA BH4	1.0 - 1.5	115
EBA BH4	1.5 - 2.0	154
EBA BH4	2.5 - 3.0	104
EBA BH4	4.0 - 4.5	118
EBA BH5	0 - 0.5	1750
EBA BH5	1.0 - 1.5	1975
EBA BH5	2.0 - 2.5	3930
EBA BH5	2.5 - 3.0	2640
EBA BH5	4.0 - 4.5	3070
EBA BH6	0 - 0.5	190
EBA BH6	0.5 - 1.0	363
EBA BH6	1.0 - 1.5	442
EBA BH6	1.5 - 2.0	286
EBA BH6	2.5 - 3.0	260
EBA BH6	3.0 - 3.5	257
EBA BH6	4.0 - 4.5	230
EBA BH7	0 - 0.5	122
EBA BH7	0.5 - 1.0	496
EBA BH7	1.0 - 1.5	631
EBA BH7	1.5 - 2.0	528
EBA BH7	2.5 - 3.0	230
EBA BH7	3.0 - 3.5	190
EBA BH7	4.0 - 4.5	118
EBA BH7	5.6 - 6.1	190

Sample ID	Depth (m)	Conductivity (uS/cm)
EBA BH8	0 - 0.5	25
EBA BH8	0.5 - 1.0	1110
EBA BH8	1.0 - 1.5	1773
EBA BH8	1.5 - 2.0	3295
EBA BH8	2.5 - 3.0	2957
EBA BH8	3.0 - 3.5	2080
EBA BH8	4.0 - 4.5	2387
EBA BH8	4.5 - 5.0	1424
EBA BH8	5.6 - 6.1	1993
EBA BH8	7.0 - 7.6	1416
EBA BH9	0 - 0.5	12
EBA BH9	0.5 - 1.0	16
EBA BH9	1.0 - 1.5	148
EBA BH9	1.5 - 2.0	292
EBA BH9	2.5 - 3.0	232
EBA BH9	3.0 - 3.5	261
EBA BH9	4.0 - 4.5	228
EBA BH10	0 - 0.5	18
EBA BH10	0.5 - 1.0	11
EBA BH10	1.0 - 1.5	16
EBA BH10	1.5 - 2.0	17
EBA BH10	2.5 - 3.0	27
EBA BH10	3.0 - 3.5	27
EBA BH10	4.0 - 4.5	108

Table 2: Summary of Soil Analytical Results - Salt Ions and Field Conductivity

Sample ID	Depth (m)	Conductivity (uS/cm)	Chloride (ppm)	Sodium (ppm)
EBA SS1	0 - 0.1	76	1.4	<10
Duplicate 2	0 - 0.1	76	1.1	<10
EBA SS2	0 - 0.1	16	1.6	<10
EBA SS4	0 - 0.1	84	1.0	<10
EBA SS6	0 - 0.1	38	3.2	<10
EBA SS7	0 - 0.1	18	0.8	<10
EBA SS8	0 - 0.1	89	1.0	<10
EBA SS14	0 - 0.1	56	5.0	<10
EBA SS15	0 - 0.1	148	48.9	33
EBA SS17	0 - 0.1	10	1.9	<10
EBA BH1	3.0 - 3.5	3930	610	345
EBA BH1	6.1 - 6.6	1955	395	240
EBA BH2	0.5 - 1.0	> 3999	2160	1380
EBA BH2	4.0 - 4.5	> 3999	8190	5120
EBA BH3	4.5 - 5.0	324	67.6	49
EBA BH4	0.5 - 1.0	151	20.9	24
EBA BH5	1.0 - 1.5	664	210	155
EBA BH6	1.0 - 1.5	442	150	97
EBA BH7	1.0 - 1.5	631	376	262
EBA BH8	1.5 - 2.0	3295	1400	893
Duplicate 4	1.5 - 2.0	3295	550	1040
EBA BH8	4.0 - 4.5	2387	2310	1470
EBA BH9	3.0 - 3.5	261	34.5	36
EBA BH10	4.0 - 4.5	108	25.7	24
CSR ¹ Draft Standards ²			50	1200

Assumes a Kd value = 0

Bold indicates parameter exceeds corresponding CSR Industrial Land Use Standards

Notes:

1. Waste Management Act, Contaminated Sites Regulation (CSR), BC Reg. 37/96, 1996 12 16, O.C. 1480/96, effective 1997 04 01 (includes amendments BC Reg. 244/99, 1999 07 19 and BC Reg. 17/2002, 2002 02 04).
2. CSR draft matrix soil standard for salt - site specific factor for, groundwater used for drinking water, groundwater flow to surface freshwater used by aquatic life, intake of contaminated soil or toxicity to soil invertebrates and plants, whichever is most stringent.

Table 3: Hydrocarbon Vapour Screening Results - Soil Samples

Sample ID	Depth (m)	Hydrocarbon Vapour Concentration (ppm)
TP1	0.4	25
TP1*	1.8	320
TP2	0.35	28
TP2*	1.75	88
TP3*	0.4	0
TP3*	0.6	340
TP3	1.3	60
TP3	1.5	80
SP1	-	20
SP2*	-	77
Sand SP*	0.1	420
EBA BH11	0.40	36
EBA BH11*	1.40	385
EBA BH11*	2.70	50
EBA BH12	0.70	20
EBA BH12*	1.60	240
EBA BH12	2.60	150
EBA BH12*	3.90	110
EBA BH12	5.60	64
EBA BH13	0.80	68
EBA BH13	1.45	100
EBA BH13	2.00	200
EBA BH13*	3.60	380
EBA BH14	0.40	65
EBA BH14	1.40	20
EBA BH14*	2.40	43
EBA BH14	3.90	20

* - Selected for Laboratory Analyses of Hydrocarbon Parameters

Table 4: Summary of Soil Analytical Results - Hydrocarbon Analysis

Sample ID	TP1	TP2	TP3	Duplicate 1	TP3	SP2	Sand SP	EXC 1	EXC 2	EBA BH11	EBA BH11	EBA BH12	EBA BH12	DUPLICATE 3	EBA BH13	EBA BH14	Standards ¹
Depth (m)	1.8	1.75	0.4	0.4	0.6	-	0.1	0.3	0.3	1.4	2.7	1.6	3.9	3.9	3.6	2.4	
Date Sampled	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	4-Sep-03	20-Aug-03	20-Aug-03	20-Aug-03	20-Aug-03	20-Aug-03	20-Aug-03	20-Aug-03	20-Aug-03	20-Aug-03	
Extractable Petroleum Hydrocarbons (mg/kg)																	
EPH ₁₀₋₁₉	-	-	< 200	< 200	< 200	< 200	2290	-	-	< 200	< 200	< 200	399	444	< 200	< 200	2000 ³
LEPH	-	-	-	-	< 200	-	-	-	-	-	-	-	-	-	-	-	2000
EPH ₁₉₋₃₂	-	-	1500	1760	441	942	3370	-	-	447	277	303	511	593	201	< 200	5000 ⁴
HEPH	-	-	-	-	441	-	-	-	-	-	-	-	-	-	-	-	5000
Glycols (mg/kg)																	
Diethylene Glycol	< 10	< 10	< 10	< 10	< 10	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	-
Ethylene Glycol	< 10	< 10	< 10	< 10	< 10	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	1500 ²
1,2-Propylene Glycol	< 10	< 10	< 10	< 10	< 10	-	-	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	-
Non Halogenated Volatiles (mg/kg)																	
Benzene	-	-	-	-	-	-	-	-	-	< 0.4	< 0.4	< 0.4	0.06	0.05	< 0.4	< 0.4	0.04 ²
Ethylbenzene	-	-	-	-	-	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	7 ²
Methyl t-butyl ether (MTBE)	-	-	-	-	-	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
Styrene	-	-	-	-	-	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	50
Toluene	-	-	-	-	-	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	2.5 ²
Total Xylenes	-	-	-	-	-	-	-	-	-	< 0.1	< 0.1	< 0.1	0.2	0.1	< 0.1	< 0.1	20 ²
Volatile Hydrocarbons (VH ₆₋₁₀)	-	-	-	-	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-
VPH	-	-	-	-	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	200
Polycyclic Aromatic Hydrocarbons (mg/kg)																	
Benzo(a)anthracene	< 0.05	<0.05	-	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	-	-	-	10
Benzo(a)pyrene	< 0.05	<0.05	-	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	-	-	-	10 ²
Benzo(b)flouranthene	< 0.05	<0.05	-	-	<0.05	-	-	0.1	<0.05	-	-	-	-	-	-	-	10
Benzo(k)flouranthene	< 0.05	<0.05	-	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	-	-	-	10
Dibenz(a,h)anthracene	< 0.05	<0.05	-	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	-	-	-	10
Indeno(1,2,3-c,d)pyrene	< 0.05	<0.05	-	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	-	-	-	10
Naphthalene	< 0.05	<0.05	-	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	-	-	-	50
Phenanthrene	< 0.05	<0.05	-	-	<0.05	-	-	0.07	<0.05	-	-	-	-	-	-	-	50
Pyrene	< 0.05	<0.05	-	-	<0.05	-	-	0.14	<0.05	-	-	-	-	-	-	-	100

Bold indicates parameter exceeds corresponding CSR CL Standard

NOTES:

1. BC Contaminated Sites Regulation (CSR) (BC Reg. 375/96) generic soil standards for Commercial Land Use, unless otherwise indicated.
2. CSR matrix soil standard - site specific factor for groundwater used for drinking water, groundwater flow to surface used by freshwater aquatic life, intake of contaminated soil or toxicity to soil invertebrates and plants, whichever is most stringent.
3. Compared to LEPH value, Schedule 4 of CSR.
4. Compared to HEPH value, Schedule 4 of CSR.

Table 5: Summary of Soil Analytical Results - Metals Analysis

Location	TP1	TP2	TP3	Duplicate 1	TP3	SP2	Fill 1	Fill 2	Standards ¹
Depth (m)	1.8	1.75	0.4	0.4	0.6	-	0.3	0.3	
Date	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	18-Aug-03	
Total Metals									
pH	5.17	5.06	5.74	5.77	6.03	4.83	5.85	5.98	-
Antimony	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	40
Arsenic	7	8	9	10	10	9	10	9	15 ²
Barium	51	31	44	42	44	42	43	43	2000
Beryllium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	8
Cadmium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.5 ²
Chromium	37	32	30	31	34	30	33	29	60 ²
Cobalt	12	9	16	16	15	15	17	15	300
Copper	46	41	61	62	60	64	64	49	90 ²
Lead	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	100 ²
Mercury	0.13	0.10	0.10	0.11	0.16	0.11	0.10	0.09	40 ²
Molybdenum	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	40
Nickel	23	19	30	29	27	26	30	25	500
Selenium	< 2	< 3	< 2	< 2	< 2	< 2	< 2	< 3	10
Silver	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	40
Tin	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	300
Vanadium	121	86	91	93	97	93	90	88	-
Zinc	54	45	89	89	69	148	69	63	150 ²

Notes:

All sample concentrations in mg/kg unless otherwise indicated.

1. BC Contaminated Sites Regulation (CSR) (BC Reg. 375/96) generic soil standards for Commercial Land Use, unless otherwise indicated.

2. CSR matrix soil standard - site specific factor for groundwater used for drinking water, groundwater flow to surface used by freshwater aquatic life, intake of contaminated soil or toxicity to soil invertebrates and plants, whichever is most stringent.

"-" indicates that no CSR Standards currently apply.

Bold- indicates standard exceedence.

Table 6: Summary of Water Analytical Results

Location	EBA MW1	EBA MW2	EBA MW3	EBA MW4	Standards ¹
Date Sampled	4-Sep-03	4-Sep-03	4-Sep-03	4-Sep-03	
Extractable Petroleum Hydrocarbons (mg/L)					
VPHw	-	-	<0.1	<0.1	1.5 ³
EHw ₁₀₋₁₉	-	-	<0.3	<0.3	5 ²
LEPHw	-	-	-	<0.3	0.5 ³
EHw ₁₉₋₃₂	-	-	<1	<1	-
HEPH	-	-	-	<1	-
Monocyclic Aromatic Hydrocarbons (mg/L)					
Benzene	-	-	<0.0005	<0.0005	0.005 ²
Ethylbenzene	-	-	<0.0005	<0.0005	0.0024 ²
Styrene	-	-	<0.001	<0.001	0.72 ³
Toluene	-	-	<0.0005	<0.0005	0.024 ²
Total Xylenes	-	-	<0.001	<0.001	0.3 ²
Methyl t-butyl ether	-	-	<0.001	<0.001	0.02 ²
Polycyclic Aromatic Hydrocarbons (mg/L)					
Acenaphthene	-	-	-	<0.00005	0.06 ³
Acridine	-	-	-	<0.00005	0.0005 ³
Anthracene	-	-	-	<0.00005	0.001 ³
Benzo(a)anthracene	-	-	-	<0.00005	0.001 ³
Benzo(a)pyrene	-	-	-	<0.00001	0.00001 ²
Chrysene	-	-	-	<0.00005	0.001 ³
Fluoranthene	-	-	-	<0.00005	0.002 ³
Fluorene	-	-	-	<0.00005	0.12 ³
Naphthalene	-	-	-	<0.00005	0.01 ³
Phenanthrene	-	-	-	<0.00005	0.003 ³
Pyrene	-	-	-	<0.00005	0.0002 ³
Salt (mg/L)					
Salinity	<1000	< 1000	-	<1000	15,000 ³
Chloride	7.9	54.3	-	6.4	250 ²
Sodium	11.1	33.0	-	4.0	200 ²

Notes:

1. BC Contaminated Sites Regulation (CSR) (BC Reg. 375/96) Generic Numerical Water Standards.

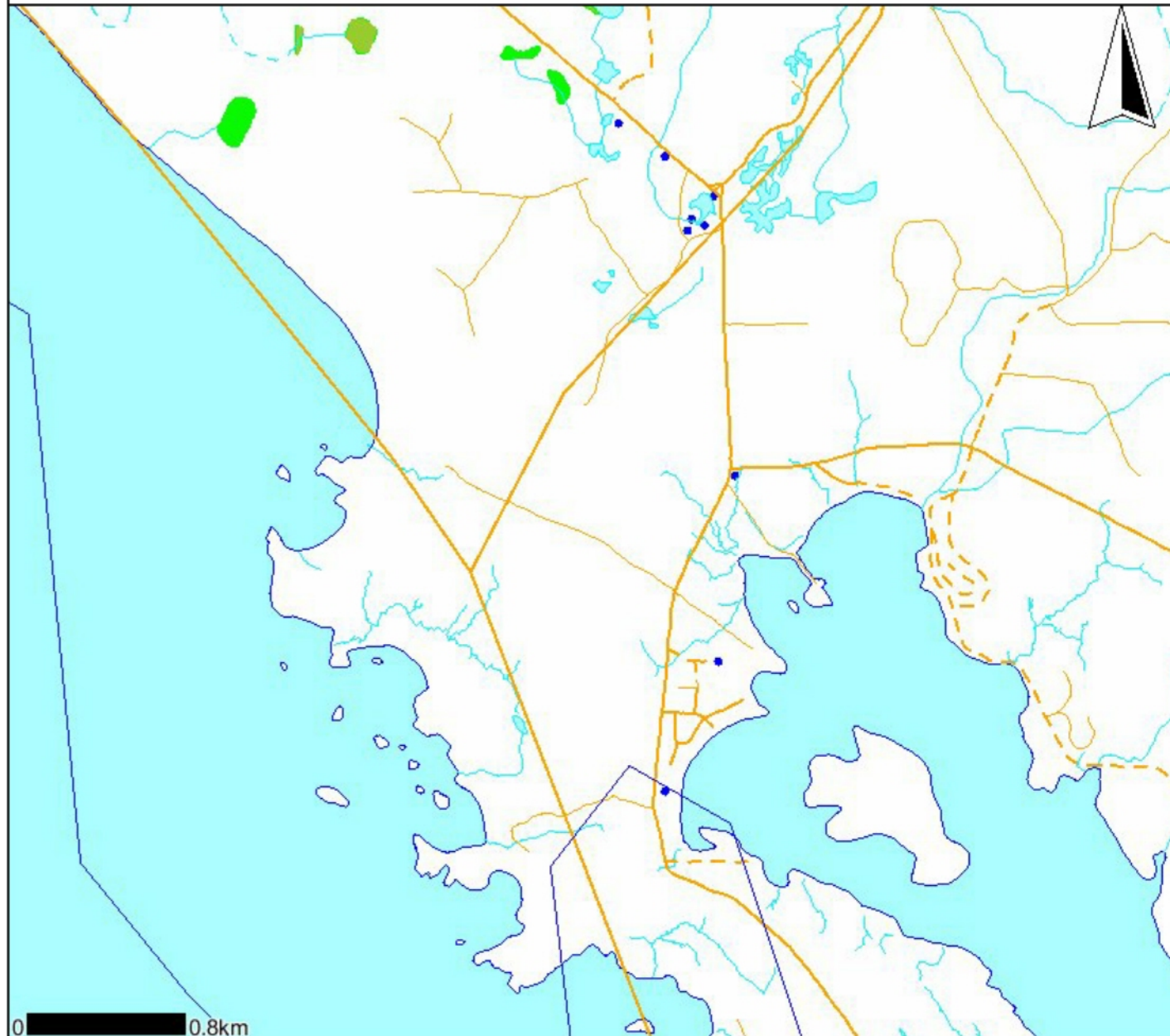
2. CSR Generic Numerical Water Standards - Drinking Water

3. CSR Generic Numerical Water Standards - Aquatic Life

Bold indicates parameter exceeds corresponding CSR Standard

Map created Wed Sep 10 08:41:47 PDT 2003

Legend



- 1:6M Lines
 - River/Stream - Definite
 - Lake - Definite
 - Island - Definite
 - Coastline - Definite
 - Road - Trunk
 - Road - Main
 - Rail Line
 - Boundary (International)
 - Boundary (Interprovincial)
- 1:6M Polygons
 - River/Stream - Definite
 - Lake - Definite
- Transportation - Points (TRIM)
 - Helipad
- Transportation - Lines (TRIM)
 - Airfield
 - Airport
 - Airstrip
 - Airport.Abandoned
 - Ferry Route
 - Road (Gravel Undivided) - 1 Lane
 - Road (Gravel Undivided) - 2 Lanes
 - Road (Gravel Undivided) - U/C - 1 Lane
 - Road (Gravel Undivided) - U/C - 2 Lanes
 - Road (Paved Divided) - Not Elevated - 1 Lane Each Way
 - Road (Paved Divided) - Not Elevated - 2 Lanes Each Way
 - Road (Paved Divided) - U/C - Not Elevated - 2 Lanes Each Way
 - Road (Paved Undivided) - Not Elevated - 1 Lane
 - Road (Paved Undivided) - Not Elevated - 2 Lanes
 - Road (Paved Undivided) - Not Elevated - 4 Lanes
 - Road (Paved Undivided) - U/C - Not Elevated - 4 Lanes
 - Road (Unimproved)
 - Cut (Roadway)
 - Embankment/Fill (Roadway)
 - Trail
 - Bridge - Foot
 - Bridge - Trestle
 - Tunnel
 - Bridge
 - Rail Line (Double Track)
 - Rail Line (Multiple Track)
 - Rail Line (Single Track)
 - Rail Line - Abandoned Track
 - Spur
- Transportation - Airfield (EBM)
 - Air Facility
 - Airport
 - Airstrip
 - Abandoned Airfield
 - Helipad

Scale: 1:30,448

DO NOT USE FOR NAVIGATION



Well Tag Number 000000044226 Owner: PACIFIC RIM TECHNICA Address: PACIFIC RIM NATIONAL PARK Area: TW#1 WELL LOCATION: CLAYOQUOT Land District District Lot Plan Lot Township Section Range Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 092C093333 Well 1 Well Use Unknown Well Use Construction Method Unknown Constr Diameter 8.0 inches Well Depth 54.0 feet Elevation 0 Bedrock Depth UNK feet Screen from 48 to 54 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	Construction Date 19800101 Driller Unknown License Number PRODUCTION DATA AT TIME OF DRILLING: Well Yield 370 USGM Artesian Flow Static Level 10 feet Water Utility Lithology Info Flag Y Pump Test Info Flag Y File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Y Field Chemistry Info Flag Site Info (SEAM) Other Info Flag																																								
GENERAL REMARKS: 370 US GPM. <table border="0"> <tr> <td>From</td> <td>0</td> <td>To</td> <td>43 Ft.</td> <td>Coarse sand and gravel</td> </tr> <tr> <td>From</td> <td>43</td> <td>To</td> <td>44 Ft.</td> <td>Coarse sand</td> </tr> <tr> <td>From</td> <td>44</td> <td>To</td> <td>55 Ft.</td> <td>Coarse sand and gravel</td> </tr> <tr> <td>From</td> <td>55</td> <td>To</td> <td>56 Ft.</td> <td>Silt</td> </tr> <tr> <td>From</td> <td>56</td> <td>To</td> <td>59 Ft.</td> <td>Silty gravel, some clay</td> </tr> <tr> <td>From</td> <td>59</td> <td>To</td> <td>64 Ft.</td> <td>Silty sand and clay</td> </tr> <tr> <td>From</td> <td>0</td> <td>To</td> <td>0 Ft.</td> <td></td> </tr> <tr> <td>From</td> <td>0</td> <td>To</td> <td>0 Ft.</td> <td>54'-64' backfilled.</td> </tr> </table> 8 rows selected.		From	0	To	43 Ft.	Coarse sand and gravel	From	43	To	44 Ft.	Coarse sand	From	44	To	55 Ft.	Coarse sand and gravel	From	55	To	56 Ft.	Silt	From	56	To	59 Ft.	Silty gravel, some clay	From	59	To	64 Ft.	Silty sand and clay	From	0	To	0 Ft.		From	0	To	0 Ft.	54'-64' backfilled.
From	0	To	43 Ft.	Coarse sand and gravel																																					
From	43	To	44 Ft.	Coarse sand																																					
From	44	To	55 Ft.	Coarse sand and gravel																																					
From	55	To	56 Ft.	Silt																																					
From	56	To	59 Ft.	Silty gravel, some clay																																					
From	59	To	64 Ft.	Silty sand and clay																																					
From	0	To	0 Ft.																																						
From	0	To	0 Ft.	54'-64' backfilled.																																					

Information Disclaimer:

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Date entered to WELL



Well Tag Number 000000044227 Owner: PACIFIC RIM TECHNICA Address: PACIFIC RIM NATIONAL PARK Area: TW#2 WELL LOCATION: CLAYOQUOT Land District District Lot Plan Lot Township Section Range Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 092C093333 Well 2 Well Use Unknown Well Use Construction Method Unknown Constr Diameter 8.0 inches Well Depth 59.5 feet Elevation 0 Bedrock Depth UNK feet Screen from 58 to 59 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	Construction Date 19800101 Driller Unknown License Number PRODUCTION DATA AT TIME OF DRILLING: Well Yield 240 USGM Artesian Flow Static Level 18 feet Water Utility Lithology Info Flag Y Pump Test Info Flag Y File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Y Field Chemistry Info Flag Site Info (SEAM) Other Info Flag
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GENERAL REMARKS:

240 US GPM

From	0	To	59 Ft.	Coarse sand and gravel
From	59	To	60 Ft.	Silt
From	60	To	64 Ft.	Sand and fine gravel
From	64	To	67 Ft.	Sandy silt
From	0	To	0 Ft.	
From	0	To	0 Ft.	59'-67' backfilled

6 rows selected.

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Date entered to WELL



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Well Tag Number 000000044200	Construction Date 19800101
Owner: PACIFIC RIM TECHNICA	Driller Unknown
Address: PACIFIC RIM NATIONAL PARK	License Number
Area: TW#4 MERCANTILE CR	
WELL LOCATION:	
CLAYOQUOT Land District	
District Lot Plan Lot	
Township Section Range	
Indian Reserve Meridian Block	
Quarter	
Island	
BCGS Number (NAD 27) 092C093323 Well 1	
Well Use Unknown Well Use	PRODUCTION DATA AT TIME OF DRILLING:
Construction Method Unknown Constr	Well Yield 10 USGM
Diameter 8.0 inches	Artesian Flow
Well Depth 100.0 feet	Static Level 24 feet
Elevation 0	
Bedrock Depth UNK feet	Water Utility
Screen from 95 to 100 feet	Lithology Info Flag Y
Slot Size 1 Slot Size 2	Pump Test Info Flag
Slot Size 3 Slot Size 4	File Info Flag
	Sieve Info Flag
	Screen Info Flag
	Water Chemistry Info Flag Y
	Field Chemistry Info Flag
	Site Info (SEAM)
	Other Info Flag
GENERAL REMARKS:	
<p>From 0 To 7 Ft. Organics, logs, rocks</p> <p>From 7 To 12 Ft. Peat</p> <p>From 12 To 43 Ft. Clay and silt, wood fragments</p> <p>From 43 To 73 Ft. Silt and very fine sand, some water</p> <p>From 73 To 84 Ft. Clay and silt</p> <p>From 84 To 87 Ft. Silt and very fine sand, water</p> <p>From 87 To 95 Ft. Broken rock</p> <p>From 95 To 100 Ft. Subrounded gravel</p> <p>From 100 To 103 Ft. Coarse sand</p> <p>9 rows selected.</p>	

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Date entered to WELL



Well Tag Number 000000062731 Owner: VILLAGE OF UCLUELET Address: PO BOX 999 UCLUELET Area: BC WELL LOCATION: NOOTKA Land District District Lot Plan Lot Township Section Range Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 092C093333 Well 4 Well Use Observation Well Construction Method Other Diameter 8.0 inches Well Depth 59.5 feet Elevation 0 Bedrock Depth feet Screen from 0 to 0 feet Slot Size 1 0 Slot Size 2 0 Slot Size 3 0 Slot Size 4 0	Construction Date Driller Fred's Drilling License Number PRODUCTION DATA AT TIME OF DRILLING: Well Yield 0 Artesian Flow 0 Static Level 30 feet Water Utility Lithology Info Flag Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag
GENERAL REMARKS: From 0 To 59 Ft. COARSE SAND & GRAVEL From 59 To 60 Ft. SILT From 60 To 64 Ft. SAND & FINE GRAVEL From 64 To 67 Ft. SANDY SILT	

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Date entered to WELL 19961107



Well Tag Number 000000053646	Construction Date 19840613
Owner: s.22	Driller FYFE'S WELL DRILLING License Number
Address: 2325 UCLULET HWY	
Area:	
WELL LOCATION: CLAYOQUOT Land District District Lot 469 Plan 33592 Lot A Township Section Range Indian Reserve Meridian Block Quarter Island	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 1 GPM Artesian Flow Static Level 50 feet
BCGS Number (NAD 27) 092C093313 Well 1	Water Utility Lithology Info Flag Y Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag
Well Use Domestic Construction Method Drilled Diameter 6.0 inches Well Depth 500.0 feet Elevation 0 Bedrock Depth 5 feet Screen from 0 to 0 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	
GENERAL REMARKS: 1/2 GPM.	
<p>From 0 To 5 Ft. Clay - boulders</p> <p>From 5 To 10 Ft. Slab rock</p> <p>From 10 To 20 Ft. Blue clay, gravel</p> <p>From 20 To 500 Ft. Black granite</p>	

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Date entered to WELL



Well Tag Number 000000055644	Construction Date 19860101
Owner: s.22	Driller FYFE'S WELL DRILLING
Address: 2425 UCLUELET HIGHWAY	License Number
Area:	
WELL LOCATION:	
CLAYOQUOT Land District	
District Lot 468	Plan 1692 Lot 18
Township	Section Range
Indian Reserve	Meridian Block
Quarter	
Island	
BCGS Number (NAD 27) 092C093331	Well 1
Well Use Domestic	PRODUCTION DATA AT TIME OF DRILLING:
Construction Method Drilled	Well Yield 70 GPM
Diameter 6.0 inches	Artesian Flow
Well Depth 65.0 feet	Static Level 25 feet
Elevation 0	Water Utility
Bedrock Depth UNK feet	Lithology Info Flag Y
Screen from 0 to 0 feet	Pump Test Info Flag
Slot Size 1 Slot Size 2	File Info Flag
Slot Size 3 Slot Size 4	Sieve Info Flag
	Screen Info Flag
	Water Chemistry Info Flag
	Field Chemistry Info Flag
	Site Info (SEAM)
	Other Info Flag
GENERAL REMARKS:	
70 GPM	
<p>From 0 To 10 Ft. Clay and soil</p> <p>From 10 To 20 Ft. Brown sand</p> <p>From 20 To 40 Ft. Clay sand</p> <p>From 40 To 50 Ft. Brown sand</p> <p>From 50 To 65 Ft. * Wet sand and gravel</p> <p>From 0 To 0 Ft.</p> <p>From 0 To 0 Ft. Depth = 65'</p> <p>From 0 To 0 Ft. GPM 70</p> <p>From 0 To 0 Ft. Static 25'</p> <p>From 0 To 0 Ft. Screen 10</p>	
10 rows selected.	

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Date entered to WELL



Well Tag Number 000000081672		Construction Date 19950401	
Owner: UCLUELET		Driller Fred's Drilling License Number	
Address: ALBERNI & UCLUELET-TOFINO HWYS			
Area: UCLUELET			
WELL LOCATION:		PRODUCTION DATA AT TIME OF DRILLING:	
CLAYOQUOT Land District		Well Yield 400 USGM	
District Lot 462	Plan Lot	Artesian Flow 0	
Township	Section Range	Static Level 2.1 feet	
Indian Reserve	Meridian Block		
Quarter			
Island			
BCGS Number (NAD 27) 092C093333	Well 5	Water Utility	
Well Use Municipal		Lithology Info Flag	
Construction Method Drilled		Pump Test Info Flag Y	
Diameter 12 inches		File Info Flag	
Well Depth 60 feet		Sieve Info Flag	
Elevation 0		Screen Info Flag Y	
Bedrock Depth feet		Water Chemistry Info Flag	
Screen from 35.3 to 60 feet		Field Chemistry Info Flag	
Slot Size 1 200 Slot Size 2 150		Site Info (SEAM)	
Slot Size 3 60 Slot Size 4 0		Other Info Flag	
GENERAL REMARKS:			
LOST SHOE CREEK PRODUCTION WELL 1-95			
<p>From 0 To 1 Ft. sand and gravel, fill</p> <p>From 1 To 10 Ft. brown packed silty sand and gravel with some large rocks and wood ch</p> <p>From 10 To 16 Ft. brown silty sand, fill (?)</p> <p>From 16 To 33 Ft. medium to coarse sand and fine to coarse gravel, water-bearing</p> <p>From 33 To 54 Ft. finer gravel with more sand</p> <p>From 54 To 67 Ft. coarse to medium-fine sand with layers of packed brown silt</p> <p>From 67 To 71 Ft. grey sand</p> <p>From 71 To 72 Ft. grey sand and silt with lenses of blue-grey silty clay</p> <p>From 72 To 82 Ft. blue-grey silty clay</p>			
9 rows selected.			

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Date entered to WELL 20020115



Well Tag Number 000000081673	Construction Date 19950501
Owner: UCLUELET	Driller Fred's Drilling
Address: ALBERNI & TOFINO-UCLUELET HWYS	License Number
Area: UCLUELET	
WELL LOCATION:	
CLAYOQUOT Land District	
District Lot 462	Plan Lot
Township	Section Range
Indian Reserve	Meridian Block
Quarter	
Island	
BCGS Number (NAD 27) 092C093333	Well 6
Well Use Municipal	
Construction Method Drilled	
Diameter 12 inches	
Well Depth 54.7 feet	
Elevation 0	
Bedrock Depth feet	
Screen from 32.9 to 51.7 feet	
Slot Size 1 40 Slot Size 2 150	
Slot Size 3 100 Slot Size 4 0	
	PRODUCTION DATA AT TIME OF DRILLING:
	Well Yield 450 USGM
	Artesian Flow 0
	Static Level 4.5 feet
	Water Utility
	Lithology Info Flag
	Pump Test Info Flag Y
	File Info Flag
	Sieve Info Flag
	Screen Info Flag Y
	Water Chemistry Info Flag
	Field Chemistry Info Flag
	Site Info (SEAM)
	Other Info Flag
GENERAL REMARKS:	
LOST SHOE CREEK PRODUCTION WELL 2-95	
<p>From 0 To 1 Ft. fine sand, fill</p> <p>From 1 To 3 Ft. packed sand and gravel with silt, fill</p> <p>From 3 To 9 Ft. silty sand and gravel with wood chunks, fill</p> <p>From 9 To 15 Ft. sand and gravel with some silty chunks, plywood and metal (barbed wi:</p> <p>From 15 To 27 Ft. coarse sand and coarse gravel with cobbles, water-bearing</p> <p>From 27 To 34 Ft. fine gravel with coarse sand</p> <p>From 34 To 35 Ft. brown clay</p> <p>From 35 To 45 Ft. fine gravel with coarse sand, layer of brown clay at 45'</p> <p>From 45 To 55 Ft. fine sand and gravel</p> <p>From 55 To 65 Ft. blue silty clay with interbeds of water-bearing sand</p> <p>From 65 To 82 Ft. blue silty clay</p>	
11 rows selected.	

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Date entered to WELL 20020115

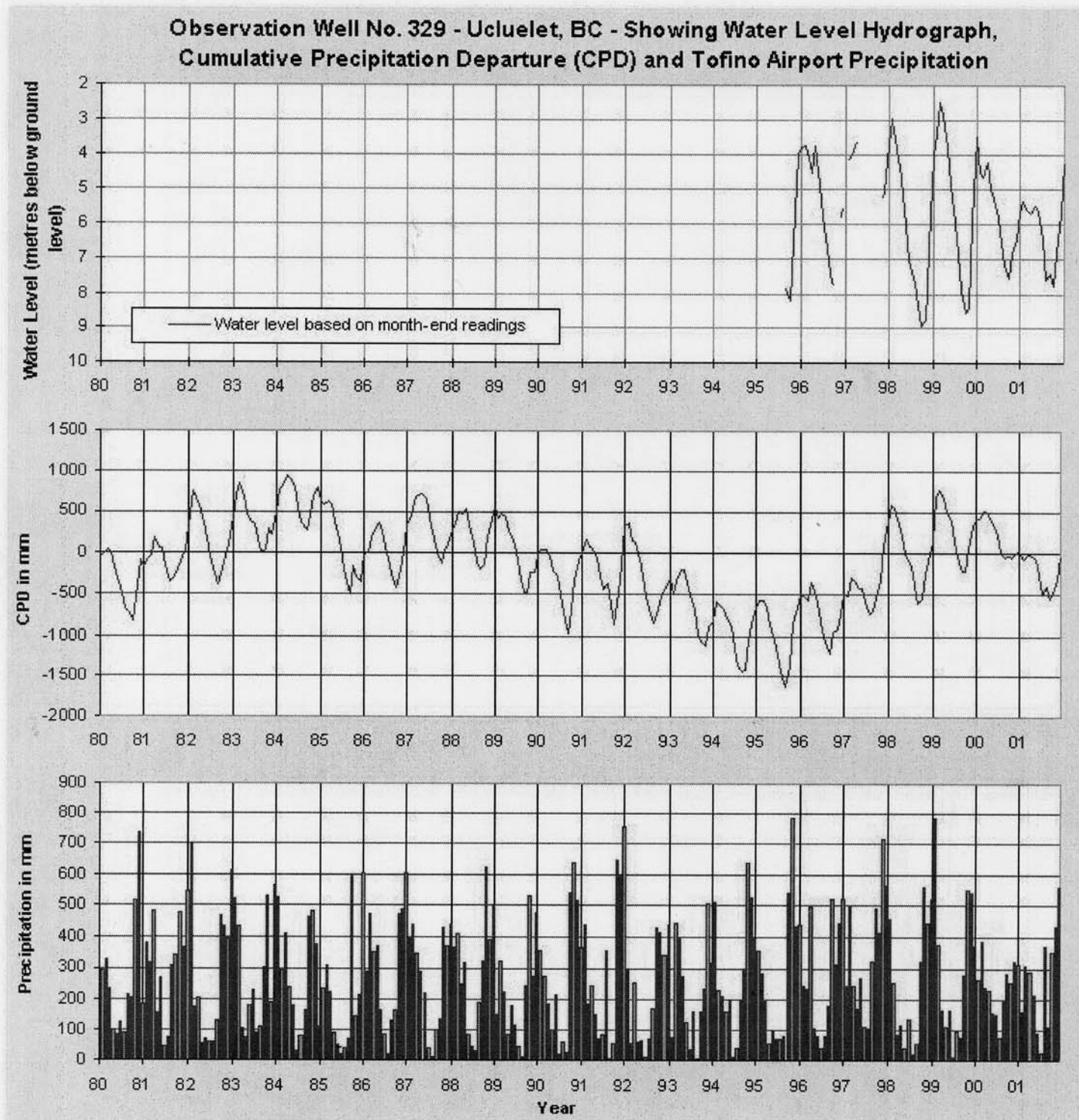


Well Tag Number 000000081674		Construction Date 19950501
Owner: UCLUELET		Driller Fred's Drilling License Number
Address: ALBERNI & TOFINO-UCLUELET HWYS		
Area: UCLUELET		
WELL LOCATION:		
CLAYOQUOT Land District		
District Lot 462	Plan	Lot
Township	Section	Range
Indian Reserve	Meridian	Block
Quarter		
Island		
BCGS Number (NAD 27) 092C093333	Well	7
Well Use Municipal		PRODUCTION DATA AT TIME OF D
Construction Method Drilled		Well Yield 700 USGM
Diameter 12 inches		Artesian Flow 0
Well Depth 67.7 feet		Static Level 7.8 feet
Elevation 0		
Bedrock Depth feet		Water Utility
Screen from 45.7 to 67.7 feet		Lithology Info Flag
Slot Size 1 250 Slot Size 2 200		Pump Test Info Flag Y
Slot Size 3 150 Slot Size 4 100		File Info Flag
		Sieve Info Flag
		Screen Info Flag Y
		Water Chemistry Info Flag
		Field Chemistry Info Flag
		Site Info (SEAM)
		Other Info Flag
GENERAL REMARKS:		
LOST SHOE CREEK PRODUCTION WELL 3-95		
<p>From 0 To 2 Ft. sand and fine gravel, packed, fill (?)</p> <p>From 2 To 10 Ft. dark brown silty clay with gravel, some wood chunks from 7 to 10', d:</p> <p>From 10 To 14 Ft. sand and gravel with some brown silt, compact but making some water</p> <p>From 14 To 37 Ft. sand & gravel & coarse sand & coarse gravel with some layers of medi</p> <p>From 37 To 56 Ft. finer gravel & coarse sand with some medium sand & very little finer</p> <p>From 56 To 60 Ft. brown coarse sand and fine gravel with thin layers of brown, firm si</p> <p>From 60 To 69 Ft. coarse sand and fine gravel with some finer sand</p> <p>From 69 To 72 Ft. grey silty sand with layers of grey silty clay</p> <p>From 72 To 74 Ft. grey-blue silty clay with lenses of grey silty sand</p> <p>From 74 To 84 Ft. grey-blue silty clay</p>		
10 rows selected.		

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Date entered to WELL 20020115



NOTE* Detailed water level information for this well is available in Excel Format.
For more information, please email [Carl Lee \(Carl.Lee@gems9.gov.bc.ca\)](mailto:Carl.Lee@gems9.gov.bc.ca)

Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH1	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, medium gravel, loose, brown, damp			S-BH1-1 @ 0–0.5 m: 990 uS		0.0
	SILT – sandy, some organics, trace gravel, soft, dark brown, moist to saturated			S-BH1-2 @ 0.5–1 m: 1341 uS		
1.0	SAND and GRAVEL – fine to coarse, medium to coarse gravel, trace organics, loose, brown, moist			S-BH1-3 @ 1–1.5 m: 1750 uS		
2.0						5.0
3.0				S-BH1-4 @ 2.5–3 m: 1975 uS		
	– some silt to silty, saturated @ 3.5 m			S-BH1-5 @ 3–3.5 m: 3930 uS		10.0
4.0				S-BH1-6 @ 4–4.5 m: 2640 uS		
				S-BH1-7 @ 4.5–5 m: 3070 uS		15.0
5.0				S-BH1-8 @ 5.5–6.1 m: 2520 uS		
6.0				S-BH1-9 @ 6.1–6.6 m: 1955 uS		20.0
7.0				S-BH1-10 @ 6.6–7.6 m: 2530 uS		
	END OF HOLE @ 7.62 m					25.0
8.0						
9.0						30.0
10.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 7.62 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH2	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) - fine to medium grained, medium gravel, loose, brown, damp	[Symbol]		S-BH2-1 @ 0-0.5 m: >3999 uS		0.0
	SILT - sandy, some organics, trace gravel, soft, dark brown, moist to saturated	[Symbol]		S-BH2-2 @ 0.5-1 m: >3999 uS		
1.0	SAND and GRAVEL - fine to coarse, medium to coarse gravel, trace organics, loose, brown, moist	[Symbol]		S-BH2-3 @ 1-1.5 m: >3999 uS		5.0
2.0		[Symbol]				
3.0		[Symbol]		S-BH2-4 @ 2.5-3 m: >3999 uS		10.0
4.0		[Symbol]		S-BH2-5 @ 4-4.5 m: >3999 uS		15.0
5.0	- moist to saturated @ 4.88 m	[Symbol]				
6.0		[Symbol]		S-BH2-6 @ 5.6-6.1 m: 2650 uS		20.0
7.0		[Symbol]				
8.0	END OF HOLE @ 7.62 m	[Symbol]				25.0
9.0		[Symbol]				30.0
10.0		[Symbol]				

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 7.62 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH3	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) - fine to medium grained, small to medium gravel, trace silt, loose, brown, moist			S-BH3-1 @ 0-0.5 m: 125 uS		0.0
1.0				S-BH3-2 @ 1-1.5 m: 355 uS		
2.0				S-BH3-3 @ 1.5-2 m: 140 uS		5.0
	SAND and GRAVEL - fine to coarse grained, small to coarse gravel, loose, brown, damp to moist			S-BH3-4 @ 2.5-3 m: 156 uS		10.0
3.0				S-BH3-5 @ 3.5-4.5 m: 260 uS		15.0
4.0				S-BH3-6 @ 4.5-5 m: 324 uS		20.0
5.0				S-BH3-7 @ 5.5-6.1 m: 190 uS		
6.0	END OF HOLE @ 6.10 m					
7.0						
8.0						
9.0						
10.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 6.1 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH4	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

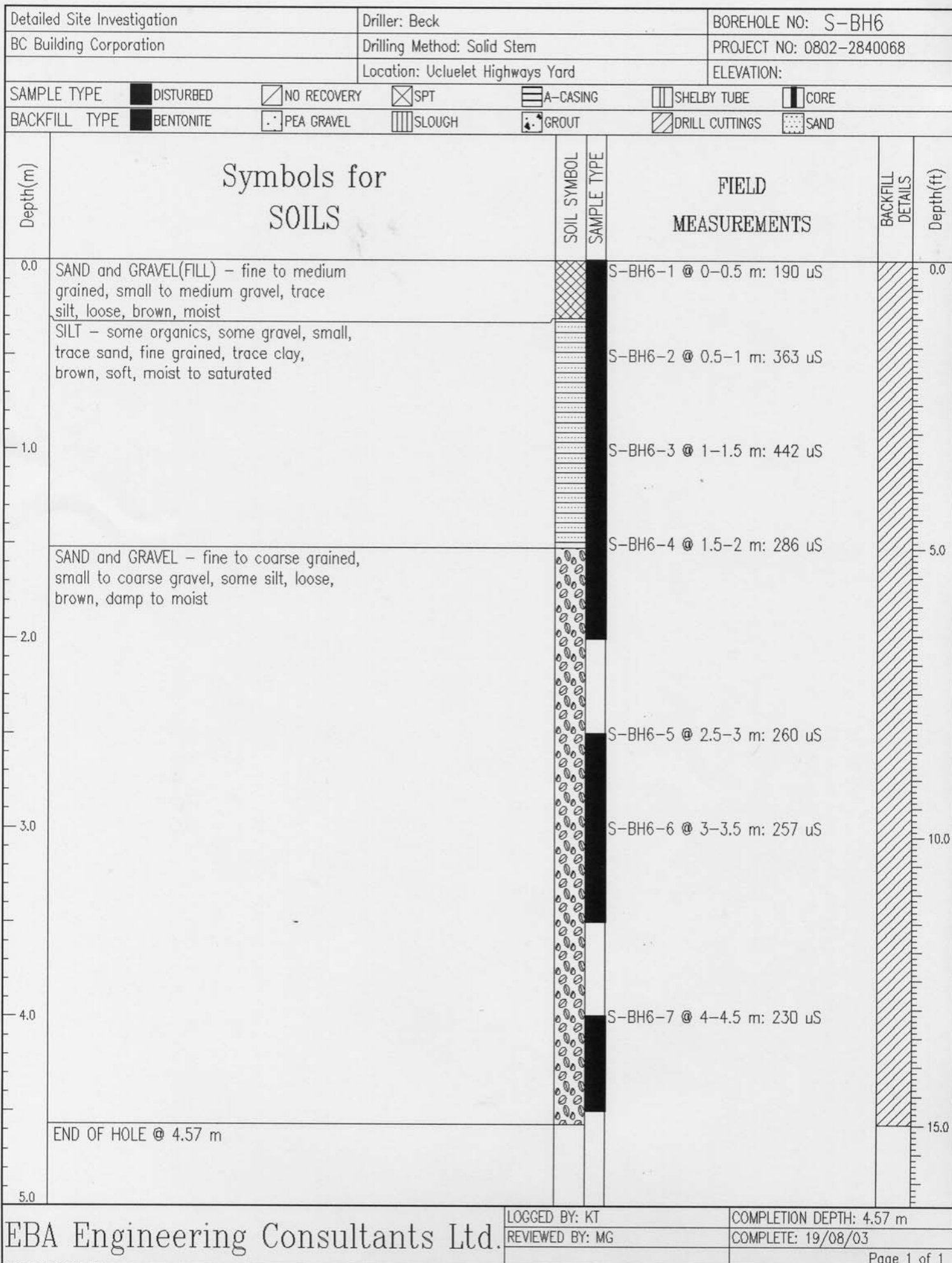
Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) - fine to medium grained, small to medium gravel, trace silt, loose, brown, moist			S-BH4-1 @ 0-0.5 m: 179 uS		0.0
1.0				S-BH4-2 @ 0.5-1 m: 151 uS		0.0
1.0	SILT and SAND - fine grained, trace to some organics, soft, brown, moist			S-BH4-3 @ 1-1.5 m: 115 uS		
2.0	SAND and GRAVEL - fine to coarse grained, small to coarse gravel, trace to some silt loose, brown, damp to moist			S-BH4-4 @ 1.5-2 m: 154 uS		5.0
3.0				S-BH4-5 @ 2.5-3 m: 104 uS		10.0
4.0				S-BH4-6 @ 4-4.5 m: 118 uS		15.0
5.0						20.0
6.0	END OF HOLE @ 6.10 m					20.0
7.0						25.0
8.0						30.0
9.0						
10.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 6.1 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH5	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> SPT <input type="checkbox"/> A-CASING <input type="checkbox"/> SHELBY TUBE <input type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND					

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, small to medium gravel, trace silt, loose, brown, moist		<input checked="" type="checkbox"/>	S-BH5-1 @ 0–0.5 m: 221 uS		0.0
	SILT and ORGANICS – some sand, fine grained, trace gravel, small, soft, saturated		<input checked="" type="checkbox"/>			
1.0	SAND and GRAVEL – fine to medium grained, medium gravel, silty, oxidized, moist to saturated		<input checked="" type="checkbox"/>	S-BH5-2 @ 1–1.5 m: 664 uS		5.0
2.0	SAND and GRAVEL – fine to coarse grained, small to coarse gravel, trace silt, damp to moist		<input checked="" type="checkbox"/>	S-BH5-3 @ 2–2.5 m: 250 uS		10.0
			<input checked="" type="checkbox"/>	S-BH5-4 @ 2.5–3 m: 205 uS		
4.0			<input checked="" type="checkbox"/>	S-BH5-5 @ 4–4.5 m: 293 uS		15.0
	END OF HOLE @ 4.57 m		<input checked="" type="checkbox"/>			
5.0			<input checked="" type="checkbox"/>			

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 4.57 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH7	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> A-CASING <input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input checked="" type="checkbox"/> PEA GRAVEL <input checked="" type="checkbox"/> SLOUGH <input checked="" type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input checked="" type="checkbox"/> SAND					

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, small to medium gravel, trace silt, loose, brown, moist			S-BH7-1 @ 0–0.5 m: 122 uS		0.0
				S-BH7-2 @ 0.5–1 m: 496 uS		
1.0	SAND and GRAVEL – fine to medium grained, small to coarse gravel, silty, trace organics, trace clay, moist to saturated			S-BH7-3 @ 1–1.5 m: 631 uS		
				S-BH7-4 @ 1.5–2 m: 528 uS		
2.0						
				S-BH7-5 @ 2.5–3 m: 230 uS		
3.0	– saturated @ 2.74 m			S-BH7-6 @ 3–3.5 m: 190 uS		
	SAND and GRAVEL – fine to coarse grained, small to coarse gravel, loose, brown, damp to moist			S-BH7-7 @ 4–4.5 m: 118 uS		
4.0			S-BH7-8 @ 5.6–6.1 m: 190 uS		15.0	
5.0						
6.0	END OF HOLE @ 6.10 m					20.0
7.0						
8.0						
9.0						
10.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 6.1 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH8	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> A-CASING <input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input checked="" type="checkbox"/> PEA GRAVEL <input checked="" type="checkbox"/> SLOUGH <input checked="" type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input checked="" type="checkbox"/> SAND					

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, small to medium gravel, trace silt, loose, brown, moist			S-BH8-1 @ 0–0.5 m: 25 uS		0.0
S-BH8-2 @ 0.5–1 m: 1110 uS						
S-BH8-3 @ 1–1.5 m: 1773 uS						
S-BH8-4 @ 1.5–2 m: 3295 uS				5.0		
1.0	SILT, SAND and GRAVEL – fine grained, small to medium gravel, some organics, soft, dark brown, moist to saturated			S-BH8-5 @ 2.5–3 m: 2957 uS		
S-BH8-6 @ 3–3.5 m: 2080 uS						
S-BH8-7 @ 4–4.5 m: 2387 uS						
S-BH8-8 @ 4.5–5 m: 1424 uS				15.0		
2.0	ORGANICS(wood debris) – some silt, some sand, fine grained, trace gravel, small, saturated			S-BH8-9 @ 5.5–6.1 m: 1993 uS		20.0
S-BH8-10 @ 7–7.6 m: 1416 uS						
3.0	SAND and GRAVEL – fine to coarse grained, small to coarse gravel, loose, brown, damp to moist					
4.0	END OF HOLE @ 7.62 m					
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 7.62 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: S-BH9	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
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BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
					<input type="checkbox"/> CORE
					<input type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, small to medium gravel, trace silt, loose, brown, moist			S-BH9-1 @ 0–0.5 m: 12 uS		0.0
	SAND and GRAVEL – fine to medium grained, small to medium gravel, trace to some silt, trace to some organics, loose, brown, moist			S-BH9-2 @ 0.5–1 m: 16 uS		
1.0				S-BH9-3 @ 1–1.5 m: 148 uS		
				S-BH9-4 @ 1.5–2 m: 292 uS		5.0
2.0				S-BH9-5 @ 2.5–3 m: 232 uS		
3.0	– trace organics @ 3.05 m			S-BH9-6 @ 3–3.5 m: 261 uS		10.0
4.0				S-BH9-7 @ 4–4.5 m: 228 uS		
	END OF HOLE @ 4.57 m					15.0
5.0						

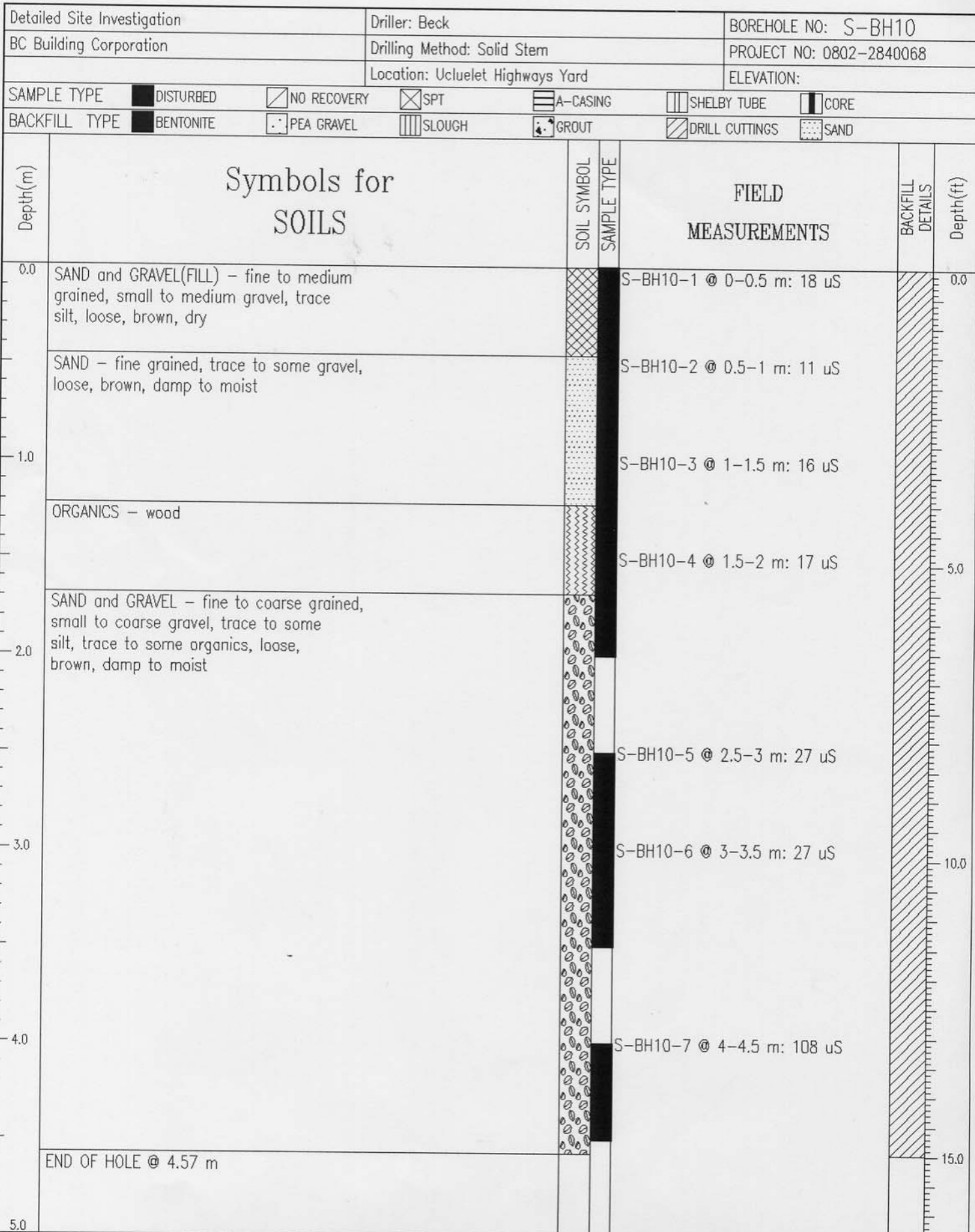
EBA Engineering Consultants Ltd.

LOGGED BY: KT

REVIEWED BY: MG

COMPLETION DEPTH: 4.57 m

COMPLETE: 19/08/03



EBA Engineering Consultants Ltd.

LOGGED BY: KT	COMPLETION DEPTH: 4.57 m
REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: BH11	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
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BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input checked="" type="checkbox"/> PEA GRAVEL <input checked="" type="checkbox"/> SLOUGH <input checked="" type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input checked="" type="checkbox"/> SAND					

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, small to medium gravel, trace silt, loose, brown, moist			BH11-1 @ 0.396 m: 36 ppm		0.0
1.0						
	SAND and GRAVEL – fine to medium grained, small to medium gravel, silty, some organics (wood waste), trace clay, soft, moist to saturated			BH11-2 @ 1.37 m: 385 ppm		5.0
2.0						
	SAND and GRAVEL – fine to medium grained, small gravel, loose, moist to saturated – hydrocarbon odour @ 2.59 m			BH11-3 @ 2.74 m: 50 ppm		10.0
3.0						
	ORGANICS – red cedar log, trace sand and gravel			BH11-4 @ 3.51 m		15.0
4.0						
	END OF HOLE @ 4.57 m					
5.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 4.57 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: BH12	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

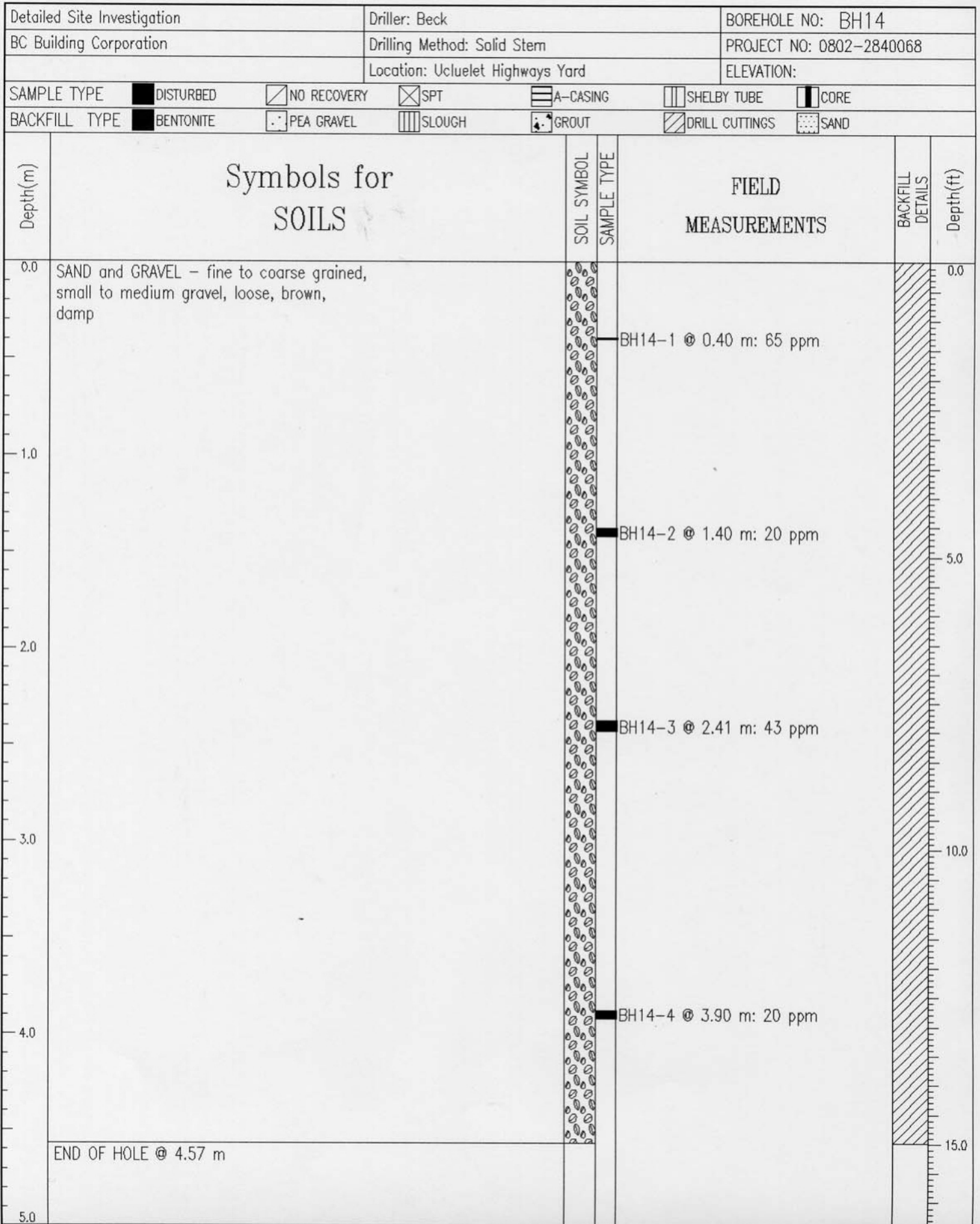
Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) - fine to medium grained, small to medium gravel, trace silt, loose, brown, moist			BH12-1 @ 0.70 m: 20 ppm		0.0
1.0						
2.0	SILT, SAND and GRAVEL - fine to coarse grained, small to coarse gravel, soft, dark brown, moist to saturated			BH12-2 @ 1.60 m: 240 ppm		5.0
3.0	ORGANICS, SILT and SAND - fine grained, some gravel, soft, moist			BH12-3 @ 2.59 m: 150 ppm		10.0
4.0	SAND and GRAVEL - fine to coarse grained, small to coarse gravel, trace to some organics, trace to some silt, soft, moist to saturated			BH12-4 @ 3.90 m: 110 ppm		15.0
5.0						
6.0				BH12-5 @ 5.49 m: 64 ppm		20.0
7.0	END OF HOLE @ 6.10 m					25.0
8.0						30.0
9.0						
10.0						

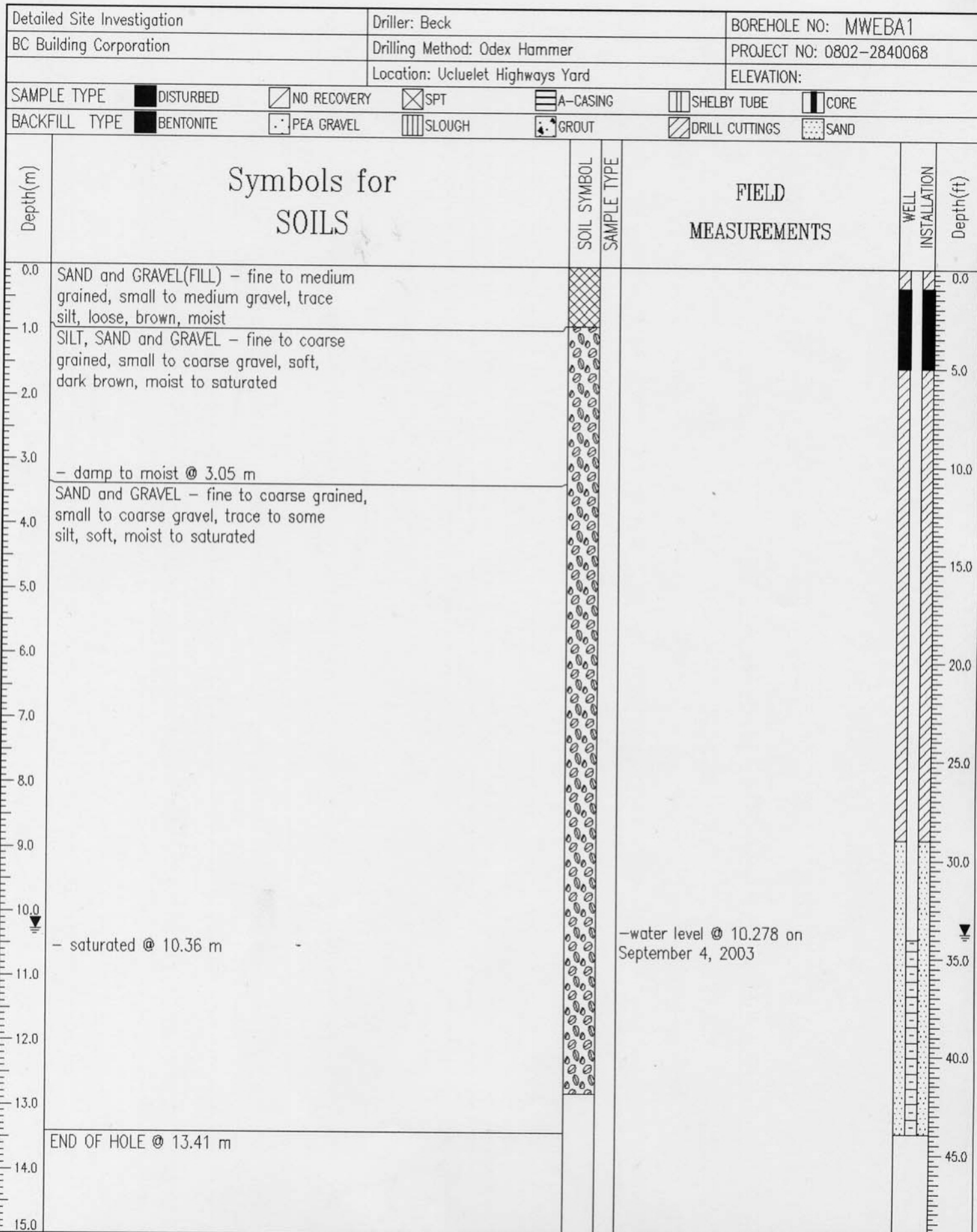
EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 6.1 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: BH13	
BC Building Corporation		Drilling Method: Solid Stem		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
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BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, small to medium gravel, trace silt, loose, brown, moist	[Symbol]				0.0
				BH13-1 @ 0.79 m: 65 ppm		
1.0	SILT, SAND and GRAVEL – fine to coarse grained, small to coarse gravel, soft, dark brown, moist to saturated	[Symbol]				
				BH13-2 @ 1.45 m: 100 ppm		5.0
2.0				BH13-3 @ 2.01 m: 200 ppm		
3.0						10.0
4.0	SAND and GRAVEL – fine to coarse grained, small to coarse gravel, trace to some silt, soft, moist to saturated	[Symbol]				
				BH13-4 @ 3.60 m: 380 ppm		
5.0	END OF HOLE @ 4.57 m					15.0

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 4.57 m
	REVIEWED BY: MG	COMPLETE: 19/08/03
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EBA Engineering Consultants Ltd.

LOGGED BY: KT
REVIEWED BY: MG

COMPLETION DEPTH: 13.41 m
COMPLETE: 03/09/03



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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: MWEB A2	
BC Building Corporation		Drilling Method: Odex Hammer		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	WELL INSTALLATION	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, medium gravel, loose, brown, damp					0.0
1.0	SILT – sandy, some organics, trace gravel, soft, dark brown, moist to saturated					
2.0	SAND and GRAVEL – fine to coarse, medium to coarse gravel, trace organics, loose, brown, moist					5.0
3.0						10.0
4.0						15.0
5.0						20.0
6.0						25.0
7.0						30.0
8.0						35.0
9.0						40.0
10.0	– saturated @ 10.05 m			– water level @ 9.696 on September 4, 2003		45.0
11.0						
12.0						
13.0	END OF HOLE @ 12.5 m					
14.0						
15.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 12.5 m
	REVIEWED BY: MG	COMPLETE: 04/09/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: MWEB3	
BC Building Corporation		Drilling Method: Odex Hammer		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
					<input type="checkbox"/> CORE
					<input type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	WELL INSTALLATION	Depth(ft)
0.0	SAND and GRAVEL – fine to coarse grained, small to medium gravel, loose, brown, damp					0.0
1.0						5.0
2.0						10.0
3.0						15.0
4.0						20.0
5.0						25.0
6.0						30.0
7.0						35.0
8.0						40.0
9.0						45.0
10.0	– saturated @ 9.75 m			–water level @ 9.88 m on September 4, 2003		
11.0						
12.0						
13.0	END OF HOLE @ 12.50 m					
14.0						
15.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 12.5 m
	REVIEWED BY: MG	COMPLETE: 04/09/03
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Detailed Site Investigation		Driller: Beck		BOREHOLE NO: MWEB44	
BC Building Corporation		Drilling Method: Odex Hammer		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE		<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT
		<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> CORE	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	WELL INSTALLATION	Depth(ft)
0.0	SAND and GRAVEL(FILL) - fine to medium grained, small to medium gravel, trace silt, loose, brown, moist					0.0
1.0	SILT, SAND and GRAVEL - fine to coarse grained, small to coarse gravel, soft, dark brown, moist to saturated					5.0
2.0						10.0
3.0						15.0
4.0	SAND and GRAVEL - fine to coarse grained, small to coarse gravel, trace to some silt, soft, moist to saturated					20.0
5.0						25.0
6.0						30.0
7.0	 - saturated @ 7.0 m			- water level @ 6.822 m on September 4, 2003		
8.0						
9.0						
10.0	END OF HOLE @ 9.75 m					

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LOGGED BY: KT

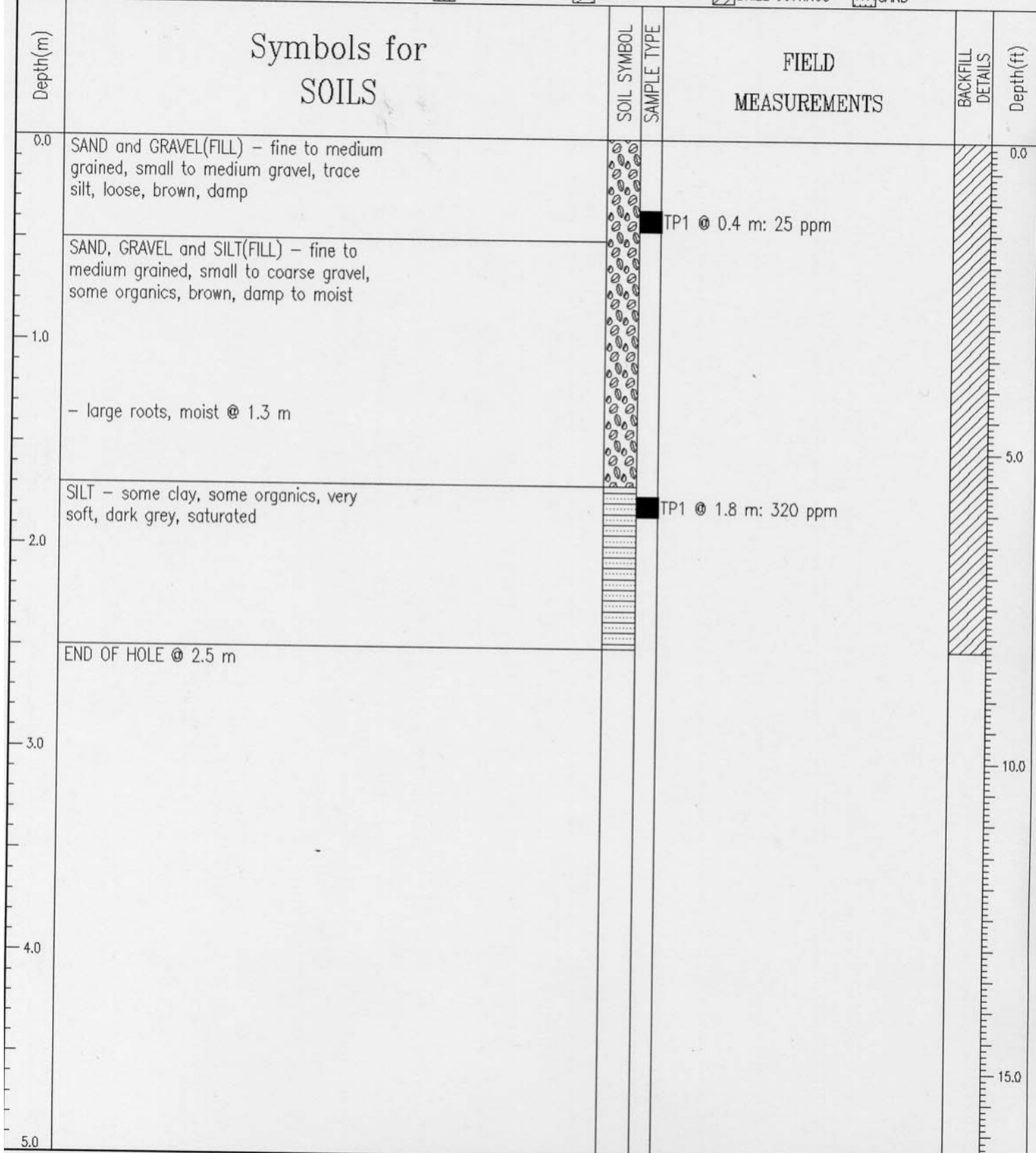
REVIEWED BY: MG

COMPLETION DEPTH: 9.75 m

COMPLETE: 04/09/03

Page 1 of 1

Detailed Site Investigation		Contractor: John Winpenny		BOREHOLE NO: TP1	
BC Building Corporation		Drilling Method: Excavator		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
					<input type="checkbox"/> CORE
					<input type="checkbox"/> SAND



EBA Engineering Consultants Ltd.

LOGGED BY: KT	COMPLETION DEPTH: 2.5 m
REVIEWED BY: MG	COMPLETE: 15/09/03
	Page 1 of 1

Detailed Site Investigation		Contractor: John Winpenny		BOREHOLE NO: TP2	
BC Building Corporation		Drilling Method: Excavator		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	
SAMPLE TYPE <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> A-CASING <input checked="" type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input checked="" type="checkbox"/> PEA GRAVEL <input checked="" type="checkbox"/> SLOUGH <input checked="" type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input checked="" type="checkbox"/> SAND					

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	SAND and GRAVEL(FILL) – fine to medium grained, small to medium gravel, trace silt, loose, brown, damp					0.0
	SAND – fine to medium grained, some gravel, small to coarse, some silt, some organics, brown, damp to moist					
1.0						
	ORGANICS – peat, some sand, fine grained, trace silt, loose, brown, damp			TP2 @ 0.35 m: 28 ppm		
2.0	END OF HOLE @ 2.0 m					TP2 @ 1.75 m: 88 ppm
3.0						
4.0						
5.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 2 m
	REVIEWED BY: MG	COMPLETE: 15/09/03

Detailed Site Investigation		Contractor: John Winpenny		BOREHOLE NO: TP3	
BC Building Corporation		Drilling Method: Excavator		PROJECT NO: 0802-2840068	
		Location: Ucluelet Highways Yard		ELEVATION:	

SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> CORE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	Symbols for SOILS	SOIL SYMBOL	SAMPLE TYPE	FIELD MEASUREMENTS	BACKFILL DETAILS	Depth(ft)
0.0	ORGANICS (rootlets) - sandy, fine grained, trace gravel, small, brown, damp					0.0
	SAND and GRAVEL - fine to medium grained, small to medium gravel, loose, brown, damp			TP3 @ 0.4 m: 0 ppm		
	SAND - medium to coarse grained, trace to some gravel, small, loose, grey, moist to wet, strong hydrocarbon odour			TP3 @ 0.6 m: 340 ppm		
1.0	SAND and GRAVEL - fine to coarse grained, small to coarse gravel, some cobbles, small, loose, oxidized, damp			TP3 @ 1.3 m: 60 ppm		
	END OF HOLE @ 1.5 m			TP3 @ 1.5 m: 80 ppm		5.0
2.0						
3.0						10.0
4.0						15.0
5.0						

EBA Engineering Consultants Ltd.	LOGGED BY: KT	COMPLETION DEPTH: 1.5 m
	REVIEWED BY: MG	COMPLETE: 15/09/03
Page 1 of 1		

CHEMICAL ANALYSIS REPORT

Date: August 28, 2003

ALS File No. T2947

Report On: 0802-2840068 Soil Analysis
BCBC


Report To: **EBA Engineering Consultants Ltd.**
1 - 4376 Boban Drive
Nanaimo, BC
V9T 5V1

Attention: **Mr. Martin Jarman**

Received: August 20, 2003

ALS ENVIRONMENTAL

per:



Can Dang, B.Sc. - Project Chemist
Natasha Markovic-Mirovic, B.Sc. - Project Chemist

**RESULTS OF ANALYSIS - Sediment/Soil**

Sample ID	TP1 @1.8m	TP2 @1.75m	TP3 @0.4m
Sample Date	03 08 18	03 08 18	03 08 18
ALS ID	2	4	5

Physical Tests

Moisture	%	35.5	16.4	3.6
pH		5.17	5.06	5.74

Total Metals

Antimony	T-Sb	<10	<10	<10
Arsenic	T-As	7	8	9
Barium	T-Ba	51	31	44
Beryllium	T-Be	<0.5	<0.5	<0.5
Cadmium	T-Cd	<0.5	<0.5	<0.5
Chromium	T-Cr	37	32	30
Cobalt	T-Co	12	9	16
Copper	T-Cu	46	41	61
Lead	T-Pb	<50	<50	<50
Mercury	T-Hg	0.13	0.10	0.10
Molybdenum	T-Mo	<4	<4	<4
Nickel	T-Ni	23	19	30
Selenium	T-Se	<2	<3	<2
Silver	T-Ag	<2	<2	<2
Tin	T-Sn	<5	<5	<5
Vanadium	T-V	121	86	91
Zinc	T-Zn	54	45	89

Glycols

Diethylene Glycol	<10	<10	-
Ethylene Glycol	<10	<10	-
1,2-Propylene Glycol	<10	<10	-

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

**RESULTS OF ANALYSIS - Sediment/Soil**

Sample ID	TP1 @1.8m	TP2 @1.75m	TP3 @0.4m
Sample Date	03 08 18	03 08 18	03 08 18
ALS ID	2	4	5

Polycyclic Aromatic Hydrocarbons

Acenaphthene	<0.04	<0.04	-
Acenaphthylene	<0.05	<0.05	-
Anthracene	<0.05	<0.05	-
Benz(a)anthracene	<0.05	<0.05	-
Benzo(a)pyrene	<0.05	<0.05	-
Benzo(b)fluoranthene	<0.05	0.11	-
Benzo(g,h,i)perylene	<0.05	<0.05	-
Benzo(k)fluoranthene	<0.05	<0.05	-
Chrysene	<0.05	<0.2	-
Dibenz(a,h)anthracene	<0.05	<0.05	-
Fluoranthene	<0.05	0.30	-
Fluorene	<0.05	<0.05	-
Indeno(1,2,3-c,d)pyrene	<0.05	<0.05	-
Naphthalene	<0.05	<0.05	-
Phenanthrene	<0.05	0.09	-
Pyrene	<0.05	0.27	-

Extractable Hydrocarbons

EPH10-19	-	-	<200
EPH19-32	-	-	1500
LEPH	-	-	-
HEPH	-	-	-

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

**RESULTS OF ANALYSIS - Sediment/Soil**

Sample ID	TP3 @0.6m	SP2	Fill 1
Sample Date <i>ALS ID</i>	03 08 18 6	03 08 18 9	03 08 18 10

Physical Tests

Moisture	%	20.4	6.7	-
pH		6.03	4.83	5.85

Total Metals

Antimony	T-Sb	<10	<10	<10
Arsenic	T-As	10	9	10
Barium	T-Ba	44	42	43
Beryllium	T-Be	<0.5	<0.5	<0.5
Cadmium	T-Cd	<0.5	<0.5	<0.5
Chromium	T-Cr	34	30	33
Cobalt	T-Co	15	15	17
Copper	T-Cu	60	64	64
Lead	T-Pb	<50	<50	<50
Mercury	T-Hg	0.16	0.11	0.10
Molybdenum	T-Mo	<4	<4	<4
Nickel	T-Ni	27	26	30
Selenium	T-Se	<2	<2	<2
Silver	T-Ag	<2	<2	<2
Tin	T-Sn	<5	<5	<5
Vanadium	T-V	97	93	90
Zinc	T-Zn	69	148	69

Glycols

Diethylene Glycol	<10	-	-
Ethylene Glycol	<10	-	-
1,2-Propylene Glycol	<10	-	-

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

**RESULTS OF ANALYSIS - Sediment/Soil**

Sample ID	TP3 @0.6m	SP2
Sample Date ALS ID	03 08 18 6	03 08 18 9

Polycyclic Aromatic Hydrocarbons

Acenaphthene	<0.04	-
Acenaphthylene	<0.05	-
Anthracene	<0.05	-
Benz(a)anthracene	<0.05	-
Benzo(a)pyrene	<0.05	-
Benzo(b)fluoranthene	<0.05	-
Benzo(g,h,i)perylene	<0.05	-
Benzo(k)fluoranthene	<0.05	-
Chrysene	<0.05	-
Dibenz(a,h)anthracene	<0.05	-
Fluoranthene	<0.05	-
Fluorene	<0.05	-
Indeno(1,2,3-c,d)pyrene	<0.05	-
Naphthalene	<0.05	-
Phenanthrene	<0.05	-
Pyrene	<0.05	-

Extractable Hydrocarbons

EPH10-19	<200	<200
EPH19-32	441	942
LEPH	<200	-
HEPH	441	-

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID	Fill 2	Duplic. 1	SS1	SS2	SS4
Sample Date ALS ID	03 08 18 11	03 08 18 12	03 08 18 13	03 08 18 14	03 08 18 15

Physical Tests

Moisture	%	-	3.0	7.6	8.3	6.1
pH		5.98	5.77	-	-	-

Dissolved Anions

Chloride	Cl	-	-	1.4	1.6	1.0
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Extractable Metals

Sodium	Na	-	-	<10	<10	<10
--------	----	---	---	-----	-----	-----

Total Metals

Antimony	T-Sb	<10	<10	-	-	-
Arsenic	T-As	9	10	-	-	-
Barium	T-Ba	43	42	-	-	-
Beryllium	T-Be	<0.5	<0.5	-	-	-
Cadmium	T-Cd	<0.5	<0.5	-	-	-
Chromium	T-Cr	29	31	-	-	-
Cobalt	T-Co	15	16	-	-	-
Copper	T-Cu	49	62	-	-	-
Lead	T-Pb	<50	<50	-	-	-
Mercury	T-Hg	0.09	0.11	-	-	-
Molybdenum	T-Mo	<4	<4	-	-	-
Nickel	T-Ni	25	29	-	-	-
Selenium	T-Se	<3	<2	-	-	-
Silver	T-Ag	<2	<2	-	-	-
Tin	T-Sn	<5	<5	-	-	-
Vanadium	T-V	88	93	-	-	-
Zinc	T-Zn	63	89	-	-	-

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

File No. T2947

RESULTS OF ANALYSIS - Sediment/Soil



Sample ID	Duplic. 1
Sample Date <i>ALS ID</i>	03 08 18 12

Extractable Hydrocarbons

EPH10-19	<200
EPH19-32	1760
LEPH	-
HEPH	-

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

**RESULTS OF ANALYSIS - Sediment/Soil**

Sample ID	SS6	SS7	SS8	SS14	SS15
Sample Date	03 08 18	03 08 18	03 08 18	03 08 18	03 08 18
ALS ID	16	17	18	19	20

Physical Tests

Moisture	%	2.4	5.2	4.6	3.7	3.9
pH		-	-	-	-	-

Dissolved Anions

Chloride	Cl	3.2	0.8	1.0	5.0	48.9
----------	----	-----	-----	-----	-----	------

Extractable Metals

Sodium	Na	<10	<10	<10	<10	33
--------	----	-----	-----	-----	-----	----

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

File No. T2947

RESULTS OF ANALYSIS - Sediment/Soil



Sample ID	SS17	Duplic. 2
Sample Date <i>ALS ID</i>	03 08 18 21	03 08 18 22

Physical Tests

Moisture	%	4.7	7.6
pH		-	-

Dissolved Anions

Chloride	Cl	1.9	1.1
----------	----	-----	-----

Extractable Metals

Sodium	Na	<10	<10
--------	----	-----	-----

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

**Appendix 1 - QUALITY CONTROL - Replicates**

Sediment/Soil		SP2	SP2	Fill 2	Fill 2
		03 08 18	QC # 350664	03 08 18	QC # 350665
Physical Tests					
Moisture	%	6.7	6.5	-	-
pH		4.83	4.84	5.98	5.99
Total Metals					
Antimony	T-Sb	<10	<10	<10	<10
Arsenic	T-As	9	11	9	10
Barium	T-Ba	42	44	43	44
Beryllium	T-Be	<0.5	<0.5	<0.5	<0.5
Cadmium	T-Cd	<0.5	<0.5	<0.5	<0.5
Chromium	T-Cr	30	31	29	28
Cobalt	T-Co	15	15	15	15
Copper	T-Cu	64	64	49	51
Lead	T-Pb	<50	<50	<50	<50
Mercury	T-Hg	0.11	0.10	0.09	0.12
Molybdenum	T-Mo	<4	<4	<4	<4
Nickel	T-Ni	26	27	25	25
Selenium	T-Se	<2	<2	<3	<3
Silver	T-Ag	<2	<2	<2	<2
Tin	T-Sn	<5	<5	<5	<5
Vanadium	T-V	93	96	88	90
Zinc	T-Zn	148	145	63	64
Extractable Hydrocarbons					
EPH10-19		<200	<200	-	-
EPH19-32		942	926	-	-

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

Appendix 2 - METHODOLOGY



Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Moisture in Sediment/Soil

This analysis is carried out gravimetrically by drying the sample at 103 C for a minimum of six hours.

Recommended Holding Time:

Sample: 14 days

Reference: Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

pH in Soil

This analysis is carried out in accordance with procedures described in "Soil Sampling and Methods of Analysis" (CSSS). The procedure involves mixing the air-dried sample with deionized/distilled water. The pH of the solution is then measured using a standard pH probe. A one to two ratio of sediment to water is used for mineral soils and a one to ten ratio is used for highly organic soils.

Metals in Sediment/Soil

This analysis is carried out using procedures from CSR Analytical Method 8 "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, Lands and Parks, 26 June 2001, and procedures adapted from "Test Methods for Evaluating Solid Waste", SW-846 Method 3050B or Method 3051, United States Environmental Protection Agency (EPA). The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested at 90 degrees Celsius for 2 hours by either hotplate or block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic absorption/fluorescence spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

Recommended Holding Time:

Sample: 6 months (Hg = 28 days)

Extract: 6 months (Hg = 28 days, Sb & Sn = 7 days)

Reference: BCMELP

For more detail see ALS Environmental "Collection & Sampling Guide"

**Glycols in Sediment/Soil**

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8015B, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of a subsample of the sediment/soil with deionized water, followed by treatment of the extract with a strong base (NaOH) and benzoyl chloride to form the corresponding benzoate esters. The benzoate esters are then extracted with hexane and the extract is analyzed by capillary column gas chromatography with flame ionization detection (FID).

Recommended Holding Time:

Sample: 14 days

Extract: 40 days

Reference: EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Polycyclic Aromatic Hydrocarbons in Sediment/Soil

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3545, 3630 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses an automated system (Accelerated Solvent Extractor - ASE) to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene and undergoes a silica gel clean-up to remove sample components that could potentially interfere with the analysis. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS).

Recommended Holding Time:

Sample: 14 days

Extract: 40 days

Reference: EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Extractable Hydrocarbons in Sediment/Soil

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Solids by GC/FID, Version 2.1 July 1999". The procedure uses an automated system (Accelerated Solvent Extractor - ASE) to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone at high temperature and pressure. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

Recommended Holding Time:

Sample: 14 days

Extract: 40 days

Reference: BCMELP



Appendix 2 - METHODOLOGY - Continued

For more detail see ALS Environmental "Collection & Sampling Guide"

Light and Heavy Extractable Petroleum Hydrocarbons in Solids

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

Recommended Holding Time: Not Applicable

Paste Salinity in Sediment/Soil

This analysis is adapted from the methods outlined in "Soil Sampling and Methods of Analysis" (Canadian Society of Soil Science). In summary, 200 -500 dry grams of sample is extracted for a minimum of 4 hours with an amount of deionized water required to create a saturated paste. The resulting extract is then filtered or decanted and analysed for the requested parameters by methods adapted from "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). The Sodium Adsorption Ratio (SAR) is calculated from the Na, Ca and Mg results. Further details are available upon request.

Recommended Holding Time:
Sample/Extract: not applicable

This Chemical Analysis Report shall only be reproduced in full, except with the written approval of ALS Environmental.

End of Report



CHEMICAL ANALYSIS REPORT

Date: September 11, 2003

ALS File No. T2979

Report On: 0802-2840068 Soil Analysis
BCBC

Report To: **EBA Engineering Consultants Ltd.**
1 - 4376 Boban Drive
Nanaimo, BC
V9T 5V1

Attention: **Mr. Martin Jarman**

Received: August 21, 2003

ALS ENVIRONMENTAL

per:

Can Dang, B.Sc. - Project Chemist
Natasha Markovic-Mirovic, B.Sc. - Project Chemist

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID	S-BH1 3.0-3.5m	S-BH1 6.1-6.6m	S-BH2 4.0-4.5m	S-BH2 0.5-1.0m	S-BH3 4.5-5.0m
Sample Date	03 08 19	03 08 19	03 08 19	03 08 19	03 08 19
ALS ID	1	2	3	4	5

Physical Tests

Moisture	%	12.2	12.7	15.7	9.4	7.3
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Dissolved Anions

Chloride	Cl	610	395	8190	2160	67.6
----------	----	-----	-----	------	------	------

Extractable Metals

Sodium	Na	345	240	5120	1380	49
--------	----	-----	-----	------	------	----

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID	S-BH4 0.5-1.0m	S-BH5 1.0-1.5m	S-BH6 1.0-1.5m	S-BH7 1.0-1.5m	S-BH8 1.5-2.0m
Sample Date <i>ALS ID</i>	03 08 19 6	03 08 19 7	03 08 19 8	03 08 19 9	03 08 20 10

Physical Tests

Moisture	%	20.7	16.3	25.3	24.8	19.5
----------	---	------	------	------	------	------

Dissolved Anions

Chloride	Cl	20.9	210	150	376	1400
----------	----	------	-----	-----	-----	------

Extractable Metals

Sodium	Na	24	155	97	262	893
--------	----	----	-----	----	-----	-----

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID	S-BH9 3.0-3.5m	Dup. 4	SBH8 4.0-4.5m	SBH10 4.0-4.5m	EBA BH11 @1.4m
Sample Date	03 08 20	03 08 20	03 08 20	03 08 20	03 08 20
ALS ID	11	12	13	14	15

Physical Tests

Moisture	%	20.5	18.9	37.8	30.5	28.0
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Dissolved Anions

Chloride	Cl	34.5	1740	2310	25.7	-
----------	----	------	------	------	------	---

Extractable Metals

Sodium	Na	36	1040	1470	24	-
--------	----	----	------	------	----	---

Non-Halogenated Volatiles

Benzene	-	-	-	-	<0.04
Ethylbenzene	-	-	-	-	<0.05
Methyl t-butyl ether (MTBE)	-	-	-	-	<0.05
Styrene	-	-	-	-	<0.05
Toluene	-	-	-	-	<0.05
meta- & para-Xylene	-	-	-	-	<0.05
ortho-Xylene	-	-	-	-	<0.05
Total Xylenes	-	-	-	-	<0.1
Volatile Hydrocarbons (VH6-10)	-	-	-	-	<100
VPH	-	-	-	-	<100

Glycols

Diethylene Glycol	-	-	-	-	<10
Ethylene Glycol	-	-	-	-	<10
1,2-Propylene Glycol	-	-	-	-	<10

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

File No. T2979

RESULTS OF ANALYSIS - Sediment/Soil



Sample ID EBA BH11
@1.4m

Sample Date 03 08 20
ALS ID 15

Extractable Hydrocarbons

EPH10-19	<200
EPH19-32	447

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

**RESULTS OF ANALYSIS - Sediment/Soil**

Sample ID	EBA BH11 @2.7m	EBA BH12 @1.6m	EBA BH12 @3.9m	EBA BH13 @3.6m	EBA BH14 @2.4m
Sample Date <i>ALS ID</i>	03 08 20 16	03 08 20 17	03 08 20 18	03 08 20 19	03 08 20 20

Physical Tests

Moisture %	15.7	16.8	32.8	11.9	6.1
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Non-Halogenated Volatiles

Benzene	<0.04	<0.04	0.06	<0.04	<0.04
Ethylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl t-butyl ether (MTBE)	<0.05	<0.05	<0.05	<0.05	<0.05
Styrene	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	<0.05	<0.05	<0.05	<0.05	<0.05
meta- & para-Xylene	<0.05	<0.05	0.12	<0.05	<0.05
ortho-Xylene	<0.05	<0.05	0.06	<0.05	<0.05
Total Xylenes	<0.1	<0.1	0.2	<0.1	<0.1
Volatile Hydrocarbons (VH6-10)	<100	<100	<100	<100	<100
VPH	<100	<100	<100	<100	<100

Glycols

Diethylene Glycol	<10	<10	<10	<10	<10
Ethylene Glycol	<10	<10	<10	<10	<10
1,2-Propylene Glycol	<10	<10	<10	<10	<10

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

File No. T2979

RESULTS OF ANALYSIS - Sediment/Soil



Sample ID	EBA BH11 @2.7m	EBA BH12 @1.6m	EBA BH12 @3.9m	EBA BH13 @3.6m	EBA BH14 @2.4m
Sample Date <i>ALS ID</i>	03 08 20 16	03 08 20 17	03 08 20 18	03 08 20 19	03 08 20 20
<hr/>					
<u>Extractable Hydrocarbons</u>					
EPH10-19	<200	<200	399	<200	<200
EPH19-32	277	303	511	201	<200

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
VPH = Volatile Petroleum Hydrocarbons.
EPH = Extractable Petroleum Hydrocarbons.

**RESULTS OF ANALYSIS - Sediment/Soil**

Sample ID	EXC 1	EXC 2	Dup. 3
Sample Date	03 08 20	03 08 20	03 08 20
ALS ID	21	22	23
<hr/>			
Physical Tests			
Moisture %	4.9	4.1	30.2
Non-Halogenated Volatiles			
Benzene	-	-	0.05
Ethylbenzene	-	-	<0.05
Methyl t-butyl ether (MTBE)	-	-	<0.05
Styrene	-	-	<0.05
Toluene	-	-	<0.05
meta- & para-Xylene	-	-	0.10
ortho-Xylene	-	-	<0.05
Total Xylenes	-	-	<0.1
Volatile Hydrocarbons (VH6-10)	-	-	<100
VPH	-	-	<100
Glycols			
Diethylene Glycol	<10	<10	<10
Ethylene Glycol	<10	<10	<10
1,2-Propylene Glycol	<10	<10	<10

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

RESULTS OF ANALYSIS - Sediment/Soil

Sample ID	EXC 1	EXC 2	Dup. 3
Sample Date	03 08 20	03 08 20	03 08 20
ALS ID	21	22	23
<u>Polycyclic Aromatic Hydrocarbons</u>			
Acenaphthene	<0.04	<0.04	-
Acenaphthylene	<0.05	<0.05	-
Anthracene	<0.05	<0.05	-
Benz(a)anthracene	<0.05	<0.05	-
Benzo(a)pyrene	<0.05	<0.05	-
Benzo(b)fluoranthene	0.10	<0.05	-
Benzo(g,h,i)perylene	<0.05	<0.05	-
Benzo(k)fluoranthene	<0.05	<0.05	-
Chrysene	<0.08	<0.05	-
Dibenz(a,h)anthracene	<0.05	<0.05	-
Fluoranthene	0.21	0.06	-
Fluorene	<0.05	<0.05	-
Indeno(1,2,3-c,d)pyrene	<0.05	<0.05	-
Naphthalene	<0.05	<0.05	-
Phenanthrene	0.07	<0.05	-
Pyrene	0.14	<0.05	-
<u>Extractable Hydrocarbons</u>			
EPH10-19	-	-	444
EPH19-32	-	-	593

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

Appendix 1 - QUALITY CONTROL - Replicates

Sediment/Soil	S-BH1 6.1-6.6m	S-BH1 6.1-6.6m	S-BH3 4.5-5.0m	S-BH3 4.5-5.0m
	03 08 19	QC # 350707	03 08 19	QC # 350706

Physical Tests

Moisture	%	12.7	12.2	7.3	7.5
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Dissolved Anions

Chloride	Cl	395	459	67.6	59.0
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Extractable Metals

Sodium	Na	240	278	49	43
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Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

Appendix 1 - QUALITY CONTROL - Replicates

Sediment/Soil	EBA BH12 @3.9m	EBA BH12 @3.9m
	03 08 20	QC # 350708

Physical Tests

Moisture	%	32.8	32.0
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Non-Halogenated Volatiles

Benzene	0.06	0.05
Ethylbenzene	<0.05	<0.05
Methyl t-butyl ether (MTBE)	<0.05	<0.05
Styrene	<0.05	<0.05
Toluene	<0.05	<0.05

meta- & para-Xylene	0.12	0.12
ortho-Xylene	0.06	0.09
Total Xylenes	0.2	0.2
Volatile Hydrocarbons (VH6-10)	<100	<100
VPH	<100	<100

Glycols

Diethylene Glycol	<10	<10
Ethylene Glycol	<10	<10
1,2-Propylene Glycol	<10	<10

Extractable Hydrocarbons

EPH10-19	399	362
EPH19-32	511	419

Results are expressed as milligrams per dry kilogram except where noted.

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

Appendix 2 - METHODOLOGY



Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Moisture in Sediment/Soil

This analysis is carried out gravimetrically by drying the sample at 103 C for a minimum of six hours.

Recommended Holding Time:

Sample: 14 days

Reference: Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Paste Salinity in Sediment/Soil

This analysis is adapted from the methods outlined in "Soil Sampling and Methods of Analysis" (Canadian Society of Soil Science). In summary, 200 -500 dry grams of sample is extracted for a minimum of 4 hours with an amount of deionized water required to create a saturated paste. The resulting extract is then filtered or decanted and analysed for the requested parameters by methods adapted from "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). The Sodium Adsorption Ratio (SAR) is calculated from the Na, Ca and Mg results. Further details are available upon request.

Recommended Holding Time:

Sample/Extract: not applicable

Volatile Organic Compounds and Volatile Hydrocarbons in Sediment/Soil

This analysis involves the extraction of a subsample of the sediment/soil with methanol. Aliquots of the methanol extract are then analyzed for Volatile Hydrocarbons (VH) by capillary column gas chromatography with flame-ionization detection (GC/FID) and for specific Volatile Organic Compounds (VOC) by capillary column gas chromatography with mass spectrometric detection (GC/MS). The methanol extraction and VH analysis are carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1 July 1999). The VOC analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).

Recommended Holding Time:

Sample: 7 days Extract: 40 days

Reference: BCMELP

For more detail see ALS Environmental "Collection & Sampling Guide"

**Calculation of Total Xylenes**

Total Xylenes is the sum of the ortho, meta, and para Xylene isomer concentrations. It is calculated by adding the concentrations of all Xylene isomers that are greater than their detection limits. Results that are below detection limit are treated as zero. The detection limit for this parameter is equal to the sum of the detection limits of the individual xylene parameters.

Volatile Petroleum Hydrocarbons (VPH) in Solids

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

Recommended Holding Time: Not Applicable

Glycols in Sediment/Soil

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8015B, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of a subsample of the sediment/soil with deionized water, followed by treatment of the extract with a strong base (NaOH) and benzoyl chloride to form the corresponding benzoate esters. The benzoate esters are then extracted with hexane and the extract is analyzed by capillary column gas chromatography with flame ionization detection (FID).

Recommended Holding Time:

Sample: 14 days

Extract: 40 days

Reference: EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Extractable Hydrocarbons in Sediment/Soil

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Solids by GC/FID, Version 2.1 July 1999". The procedure uses an automated system (Accelerated Solvent Extractor - ASE) to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone at high temperature and pressure. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable



Appendix 2 - METHODOLOGY - Continued

Petroleum Hydrocarbons (LEPH/HEPH).

Recommended Holding Time:

Sample: 14 days

Extract: 40 days

Reference: BCMELP

For more detail see ALS Environmental "Collection & Sampling Guide"

Polycyclic Aromatic Hydrocarbons in Sediment/Soil

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3545, 3630 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses an automated system (Accelerated Solvent Extractor - ASE) to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene and undergoes a silica gel clean-up to remove sample components that could potentially interfere with the analysis. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS).

Recommended Holding Time:

Sample: 14 days

Extract: 40 days

Reference: EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

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End of Report



CHEMICAL ANALYSIS REPORT

Date: September 16, 2003

ALS File No. T3643

Report On: 0802-2840068 Water/Soil Analysis
BCBC

Report To: **EBA Engineering Consultants Ltd.**
1 - 4376 Boban Drive
Nanaimo, BC
V9T 5V1

Attention: **Mr. Martin Jarman**

Received: September 5, 2003

ALS ENVIRONMENTAL

per:

Can Dang, B.Sc. - Project Chemist
Natasha Markovic-Mirovic, B.Sc. - Project Chemist

RESULTS OF ANALYSIS - Water¹

Sample ID	EBA MW1	EBA MW2	EBA MW3	EBA MW4
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Sample Date ALS ID	03 09 04 1	03 09 04 2	03 09 04 3	03 09 04 4
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Physical Tests

Salinity o/oo	<1	<1	-	<1
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Dissolved Anions

Chloride Cl	7.9	54.3	-	6.4
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Dissolved Metals

Sodium D-Na	11.1	33.0	-	4.00
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Non-Halogenated Volatiles

Benzene	-	-	<0.0005	<0.0005
Ethylbenzene	-	-	<0.0005	<0.0005
Methyl t-butyl ether (MTBE)	-	-	<0.001	<0.001
Styrene	-	-	<0.001	<0.001
Toluene	-	-	<0.0005	<0.0005

meta- & para-Xylene	-	-	<0.0005	<0.0005
ortho-Xylene	-	-	<0.0005	<0.0005
Total Xylenes	-	-	<0.001	<0.001
Volatile Hydrocarbons (VH6-10)	-	-	<0.1	<0.1
VPH	-	-	<0.1	<0.1

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

EPH10-19 is equivalent to EHW10-19.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

¹Results are expressed as milligrams per litre except where noted.

RESULTS OF ANALYSIS - Water¹

Sample ID	EBA MW3	EBA MW4
-----------	---------	---------

Sample Date	03 09 04	03 09 04
ALS ID	3	4

Polycyclic Aromatic Hydrocarbons

Acenaphthene	-	<0.00005
Acenaphthylene	-	<0.00005
Acridine	-	<0.00005
Anthracene	-	<0.00005
Benz(a)anthracene	-	<0.00005
Benzo(a)pyrene	-	<0.00001
Benzo(b)fluoranthene	-	<0.00005
Benzo(g,h,i)perylene	-	<0.00005
Benzo(k)fluoranthene	-	<0.00005
Chrysene	-	<0.00005
Dibenz(a,h)anthracene	-	<0.00005
Fluoranthene	-	<0.00005
Fluorene	-	<0.00005
Indeno(1,2,3-c,d)pyrene	-	<0.00005
Naphthalene	-	0.00006
Phenanthrene	-	<0.00005
Pyrene	-	<0.00005
Quinoline	-	<0.00005

Extractable Hydrocarbons

EPH10-19	<0.3	<0.3
EPH19-32	<1	<1
LEPH	-	<0.3
HEPH	-	<1

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

EPH10-19 is equivalent to EHW10-19.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

¹Results are expressed as milligrams per litre except where noted.

File No. T3643

RESULTS OF ANALYSIS - Sediment/Soil¹



Sample ID SAND SP

Sample Date 03 09 04
ALS ID 5

Physical Tests

Moisture % 30.9

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

EPH10-19 is equivalent to EHW10-19.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

¹Results are expressed as milligrams per dry kilogram except where noted.

File No. T3643

RESULTS OF ANALYSIS - Sediment/Soil¹



Sample ID SAND SP

Sample Date 03 09 04
ALS ID 5

Extractable Hydrocarbons

EPH10-19	2290
EPH19-32	3370

< = Less than the detection limit indicated.
VPH = Volatile Petroleum Hydrocarbons.
EPH = Extractable Petroleum Hydrocarbons.
EPH10-19 is equivalent to EHW10-19.
LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.
¹Results are expressed as milligrams per dry kilogram except where noted.

Appendix 1 - QUALITY CONTROL - ReplicatesWater¹

EBA MW3

EBA MW3

03 09 04

QC #
353245**Non-Halogenated Volatiles**

Benzene	<0.0005	<0.0005
Ethylbenzene	<0.0005	<0.0005
Methyl t-butyl ether (MTBE)	<0.001	<0.001
Styrene	<0.001	<0.001
Toluene	<0.0005	<0.0005
meta- & para-Xylene	<0.0005	<0.0005
ortho-Xylene	<0.0005	<0.0005
Total Xylenes	<0.001	<0.001
Volatile Hydrocarbons (VH6-10)	<0.1	<0.1
VPH	<0.1	<0.1

< = Less than the detection limit indicated.

VPH = Volatile Petroleum Hydrocarbons.

EPH = Extractable Petroleum Hydrocarbons.

EPH10-19 is equivalent to EHW10-19.

LEPH & HEPH = Light and Heavy Extractable Petroleum Hydrocarbons.

Results are expressed as milligrams per litre except where noted.

Appendix 2 - METHODOLOGY



Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Chloride in Water

This analysis is carried out using procedures adapted from APHA Method 4500 "Chloride". Chloride is determined using the ferricyanide colourimetric method.

Recommended Holding Time:

Sample: 28 days

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample: 6 months

Reference: EPA

For more detail see: ALS "Collection & Sampling Guide"

Volatile Organic Compounds and Volatile Hydrocarbons in Water

This procedure involves the purge and trap extraction of the sample prior to analysis for Volatile Hydrocarbons (VH) by capillary column gas chromatography with flame-ionization detection (GC/FID) and for specific Volatile Organic Compounds (VOC) by capillary column gas chromatography with mass spectrometric detection (GC/MS). The VH analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Volatile Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The VOC analysis is carried out using procedures adapted from "Test Methods for



Appendix 2 - METHODOLOGY - Continued

Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).

Note:

For chlorinated waters certain conditions may cause the formation of trihalomethanes after sample collection. Appropriate chemical treatment of chlorinated waters will prevent trihalomethane formation in the samples.

Recommended Holding Time:

Sample: 7 days (VH); 14 days (VOC)

Reference: BCWLAP (VH); EPA (VOC)

For more detail see ALS Environmental "Collection & Sampling Guide"

Calculation of Total Xylenes

Total Xylenes is the sum of the ortho, meta, and para Xylene isomer concentrations. It is calculated by adding the concentrations of all Xylene isomers that are greater than their detection limits. Results that are below detection limit are treated as zero. The detection limit for this parameter is equal to the sum of the detection limits of the individual xylene parameters.

Volatile Petroleum Hydrocarbons (VPH) in Water

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, and Xylenes) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

Recommended Holding Time: Not Applicable

Extractable Hydrocarbons in Water

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

Recommended Holding Time:



Appendix 2 - METHODOLOGY - Continued

Sample: 7 days Extract: 40 days
Reference: BCMELP
For more detail see ALS Environmental "Collection & Sampling Guide"

Polycyclic Aromatic Hydrocarbons in Water

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3630 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS).

Recommended Holding Time:
Sample: 7 days Extract: 40 days
Reference: EPA
For more detail see ALS Environmental "Collection & Sampling Guide"

Light and Heavy Extractable Petroleum Hydrocarbons in Water

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polynuclear Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene, and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

Recommended Holding Time: Not Applicable

Moisture in Sediment/Soil

This analysis is carried out gravimetrically by drying the sample at 103 C for a minimum of six hours.

Recommended Holding Time:
Sample: 14 days
Reference: Puget
For more detail see ALS Environmental "Collection & Sampling Guide"



Extractable Hydrocarbons in Sediment/Soil

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Solids by GC/FID, Version 2.1 July 1999". The procedure uses an automated system (Accelerated Solvent Extractor - ASE) to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone at high temperature and pressure. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

Recommended Holding Time:

Sample: 14 days

Extract: 40 days

Reference: BCMELP

For more detail see ALS Environmental "Collection & Sampling Guide"

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End of Report

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1.0 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

2.1 Information Provided to EBA by Others

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

- (1) With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
- (2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

4.0 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

6.0 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

7.0 EMERGENCY PROCEDURES

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

10.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

**BC BUILDINGS CORPORATION
HYDROCARBON IMPACTED SOIL
REMEDIATION PROGRAM
HIGHWAYS MAINTENANCE YARD
UCLUELET, BC**

FILE: 0802-2840068.001

January, 2004

HYDROCARBON IMPACTED SOIL REMEDIATION PROGRAM
BCBC HIGHWAYS MAINTENANCE YARD
UCLUELET, BC

Prepared by:

EBA ENGINEERING CONSULTANTS LTD.
Nanaimo, BC

Submitted to:

BC BUILDINGS CORPORATION

Mr. Barry Book
Project Superintendent - Environment
Nanaimo, BC

Project No. 0802-2840068.001

January, 2004

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EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. (EBA) was retained by the British Columbia Buildings Corporation (BCBC) to conduct remediation of hydrocarbon impacted soils on the highways maintenance yard located at the Highway 4 junction, approximately 8 km north of Ucluelet, BC (herein referred to as the "Property"). At the time of the remediation program, the highways maintenance yard was active and operated by EMCON Services Inc.

The primary objective of the remediation program was to remove hydrocarbon contaminated soil identified in the Detailed Site Investigation prepared by EBA in 2003. Additional assessment work was completed during this remediation program to confirm the analytical results completed on soils collected from borehole EBA BH 12 @ 3.9 m below surface grade during the DSI.

Based on the results of the additional assessment works and remediation program, EBA makes the following conclusions:

- A total of approximately 3 m³ of hydrocarbon impacted soils was removed from the former leaky drums and treated timbers area. The final limits of this excavation were approximately 15 m by 10 m in size and extended vertically to a depth ranging to a maximum of 0.3 m below surface grade. Two test pits were also completed in this area to depths of 2.5 m and 2.0 m to assess potential hydrocarbon contamination of soil at depth. Confirmatory soil samples collected from the base of the excavation and the two test pits indicated that hydrocarbon concentrations (polycyclic aromatic hydrocarbons and glycol) in soil met the MWLAP standards for a commercial property. The soil generated from the remediation was stockpiled on 6-mil polyethylene sheeting until it was disposed of off site by Quantum Environmental Group (Quantum) on November 6, 2003.
- A total of approximately 1 m³ of hydrocarbon impacted soils was removed from the oil/water separator outflow pipe area, which is located at the base of an old loading ramp in the western portion of the Property. The excavated soil was placed in a polyethylene-lined bag provided by Quantum. The final limits of this excavation were approximately 2 m by 1 m in size and extended vertically to a depth ranging of approximately 0.5 m below surface grade. One confirmatory soil sample was collected from the base of the remedial excavation and was found to contain concentrations of hydrocarbons that were less than the Contaminated Sites Regulation (CSR) commercial land use (CL) standards.

- Analytical results from the soil sample collected from Test Pit 03-4 (TP03-4) at a depth of 3.9 m, contained benzene at a concentration less than the CSR CL standard. This sample was collected by EBA to confirm the marginally elevated benzene concentration found in a soil sample collected from EBA BH12 @ 3.9 m in this area during the DSI.
- The excavated hydrocarbon contaminated soil generated during both the DSI and this remediation program was disposed of at Quantum's Highland Remediation Facility in Victoria, BC in January, 2004.
- EBA concludes that the in situ soils remaining within the target remediation areas on the Property comply with the CSR standards for commercial land use. The remediation program outlined in this report was successful in removing from the Property all suspect fill and native soils containing concentrations of hydrocarbons exceeding the CSR CL standards in the vicinity of the oil/water separator outflow pipe.
- No further action, in regards to CSR regulated hydrocarbon parameters in soil on the property is warranted at this time.

1.0 INTRODUCTION

1.1 General

EBA Engineering Consultants Ltd. (EBA) was retained by the British Columbia Buildings Corporation (BCBC) to conduct remediation of hydrocarbon impacted soils at the highways maintenance yard located at the Highway 4 junction, approximately 8 km north of Ucluelet, BC (herein referred to as the “Property”). At the time of the remediation program, the highways maintenance yard was active and operated by EMCON Services Inc. (EMCON).

The primary objective of the site remediation was to remove hydrocarbon contaminated soil identified in the Stage 1 and 2 Preliminary Site Investigation (PSI) report previously prepared by AGRA Earth and Environmental (AGRA) in 1999 and the Detailed Site Investigation (DSI) conducted by EBA in 2003.

The entire remediation program was completed using the Independent Remediation (IR) process of the BC *Contaminated Sites Regulation*¹ (CSR). This report was prepared to satisfy any future review requirements of the BC Ministry of Water, Land and Air Protection (MWLAP).

Mr. Barry Book of BCBC provided EBA with written authorization to proceed with the site remediation program under a revision to purchase order BR019750, on October 28, 2003.

1.2 Background

EBA was initially retained by BCBC to carry out a review of all previous environmental investigations on the Property such that BCBC could make a future application for either an Approval in Principle (AIP) for a remediation plan or following remediation, apply for a CoC for the Property.

EBA issued a report entitled, “*Review of Previous Investigations – Highways Maintenance Yard, Ucluelet, BC*”, in July 2003 that identified key information missing

from the report previously prepared for BCBC by AGRA. The missing information that would be required for any future review by MWLAP provided the basis for the scope of work of a recommended DSL.

Following the DSI completed by EBA in October 2003, additional hydrocarbon impacted soil was identified at concentrations greater than the CSR CL standards in the vicinity of the oil/water separator outflow pipe and the oil/water separator.

1.3 Scope of Work

EBA conducted the following activities during the hydrocarbon contaminated soil remediation program:

- Excavation of the remaining hydrocarbon impacted soil in the vicinity of the oil/water separator outflow pipe;
- Excavation of one test pit (TP03-4) in the vicinity of borehole EBA BH12 and collection of a confirmatory sample from a depth of 3.9 m to re-assess elevated hydrocarbon concentrations found in soils during the previous DSI;
- Organized the disposal of all excavated soil at Quantum Environmental Group (Quantum's) Highland Remediation Facility in Victoria; and
- Provided this report describing all of the remediation activities.

2.0 SITE DESCRIPTION

The Property is located on the southeast corner of the Highway 4 junction approximately 8 km north of Ucluelet, British Columbia. The legal description and approximate position of the Property is understood to be as follows:

- Block A, District Lot 445 and 446, Clayoquot District, and Block B, District Lot 462 and 483, Clayoquot District;
- PID 000-550-299 and 000-550-302; and
- Global Positioning: Latitude N 48 degrees, 59 minutes, 28.9 seconds
Longitude: W 125 degrees, 35 minutes, 12.7 seconds.

¹ Waste Management Act, *Contaminated Sites Regulation* (CSR), BC Reg. 375/96, deposited 1996 12 16, O.C. 1480/96, effective 1997 04 01 (includes amendments BC Reg. 244/99, deposited 1999 07 19 and

A site location plan is presented as Figure 1 and a plan showing the general layout of the Property is presented as Figure 2.

The Property is located in a mixed residential and commercial area and is approximately 1.2 hectares in size. The Property is bounded by a wetland to the east, a residential house to the south, a tourist information center across Highway 4 to the north, and the District of Ucluelet municipal well field and pump station across Highway 4 to the west.

The Property has been built up with fill material to level grade across the site, however, the local and regional topography slopes gently towards the west in the direction of a the District of Ucluelet municipal well field and a wetland located across Highway 4 from the Property.

3.0 POTENTIAL CONTAMINANTS OF CONCERN

The areas of potential environmental concern (APECs) are listed in the following table along with Potential Contaminants of Concern (PCOCs) and associated regulated parameters.

Table A
Areas and Contaminants of Potential Concern Identified during the DSI

Areas of Potential Environmental Concern (APECs)	Potential Contaminants of Concern (PCOCs)	Regulated Analytical Parameters
Oil/Water Separator	Gasoline	Benzene, Ethylbenzene, Toluene and Xylenes (BETX), Volatile Petroleum Hydrocarbons (VPH).
Oil/Water Separator Discharge Outflow Pipe	Diesel, Waste Oil, Grease	Extractable Petroleum Hydrocarbons (EPH).
Former Leaky Drum and Treated Timbers Area	Waste Oil, Grease, Creosote, Metals	EPH, PAH, metals, glycol, MTBE

4.0 ASSESSMENT STANDARDS AND REGULATORY REQUIREMENTS

For the specific PCOCs for the site, the analytical results for soil samples have been compared to standards contained in the following document:

BC Reg. 17/2002, deposited 2002 02 04).

- Waste Management Act, *Contaminated Sites Regulation* (CSR), BC Reg. 375/96, deposited 1996 12 16, O.C. 1480/96, effective 1997 04 01 (includes amendments BC Reg. 244/99, deposited 1999 07 19 and BC Reg. 17/2002, deposited 2002 02 04).

The CSR groundwater quality standards are based on groundwater used for drinking water purposes or aquatic life standards, whichever is most stringent. The District of Ucluelet municipal water system is supplied by groundwater from production wells located within 500 m from the Property, and therefore, the local groundwater is used for drinking purposes. Groundwater samples were not collected during the supplemental remediation as all groundwater samples analyzed during the DSI met the applicable CSR drinking water and aquatic life standards.

4.1 Contaminated Sites Regulation

Schedules 4 and 5 of the CSR provide generic and matrix numerical standards, respectively, for the assessment and remediation of soils. Generic standards depend solely on land use and matrix standards are risk-based standards that depend on a number of site-specific factors, for example, the use, if any, of groundwater at the site.

Based on the current use of the property for commercial purposes, the CSR Commercial Land Use (CL) standards were selected as the soil remediation targets for this Property. Three site-specific factors of the matrix soil standards also apply to the site. These are:

Human Health Protection

- Intake of contaminated soil; and
- Groundwater used for drinking water.

Environmental Protection

- Toxicity to soil invertebrates and plants; and
- Groundwater flow to surface water used by freshwater aquatic life.

The most stringent of the site-specific factors of the matrix soil standards were applied to the Property.

5.0 REMEDIATION OF HYDROCARBON CONTAMINATED SOILS

5.1 Test Pitting

On November 6, 2003, one test pit (TP03-4) was excavated in the vicinity of EBA BH 12 to confirm a benzene concentration equal to the CSR CL standard found in soils from this area during the DSI. A small tracked excavator supplied by Quantum was used to excavate the test pit. The test pit was excavated to a maximum depth of 4.0 m and a soil sample (TP03-4-1-031106) was collected from the depth of the previous benzene exceedence (approximately 3.9 m bsg).

5.2 Remediation of Hydrocarbon Contaminated Soil

5.2.1 Leaky Oil Drum Excavation

EBA completed an excavation of the former leaky oil drum and treated timbers area during the DSI to remediate soil containing hydrocarbon concentrations greater than the CSR CL standards that were identified in the Stage 1 and 2 PSI completed by AGRA. EBA scraped the soil in the identified areas to a depth of approximately 0.3 m bgs and approximately 3 m³ of soil was stockpiled. In addition, two test pits (EBA-TP1 and EBA-TP2) were completed to depths of 2.5 m and 2.0 m respectively to assess potential hydrocarbon contamination of soil at depth. The stockpiled soil was placed on 6-mil polyethylene sheeting until it was disposed of off site by Quantum on November 6, 2003.

5.2.2 Oil/Water Separator Outflow Pipe Excavation

During the DSI, one soil sample (Sand SP) collected from the base of the oil/water separator outflow pipe contained a concentration of EPH₁₀₋₁₉ exceeding the CSR CL standard for LEPH (light extractable petroleum hydrocarbons). Therefore, the remedial work plan included excavation and confirmatory soil sampling in the vicinity of the oil/water separator outflow pipe.

On December 8, 2003 personnel from EBA's Nanaimo office supervised the excavation of hydrocarbon impacted surface soil from the oil/water separator outflow pipe. A rubber-tired backhoe supplied by EMCON was used to complete the remediation. The total volume of excavated soil generated was approximately 1 m³. The excavated soil was placed in a polyethylene lined soil bag prior to

disposal at Quantum's Highland Remediation Facility located in Victoria, BC. One confirmatory soil sample (EXC031208FL1) from the base of the excavation was collected. The soil sample was submitted to ALS for hydrocarbon analyses.

5.3 Soil Sampling Methodology

Soil samples were collected from the test pit and from the excavations using the bucket of the backhoe. Soil samples were placed into duplicate teflon[®]-lined glass jars, stored in a chilled cooler and submitted to ALS in Vancouver, BC. The soil sample collected from TP03-4 was tested for BETX and VPH concentrations. Confirmatory soil samples collected from the oil/water separator pipe outlet area excavation were tested for concentrations of BETX, VPH and EPH. Due to the minimal depth of the excavation (approximately 0.5 m), only one floor sample was collected from the Oil/Water Separator outflow pipe excavation. The location of the test pit, excavation limits and confirmatory soil sample locations for all remediation work is presented on Figure 2.

6.0 RESULTS OF REMEDIATION

6.1 Test Pit Results

The soil sample collected from TP03-4 at a depth of 3.9 m (TP03-4-1-031106) was found to contain benzene less than the CSR CL standard of 0.04 milligrams per kilogram (mg/kg or ppm). This result was below the laboratory detection limit. Concentrations of ethylbenzene, toluene, xylenes and VPH were also less than the CSR CL standards. The analytical results for the confirmatory soil sample collected from TP03-4 are presented in Table 1 attached. The analytical report from ALS is presented in Appendix A.

6.2 Leaky Oil Drum Excavation Results

Confirmatory soil samples collected from the base of the excavation (EXC 1 and EXC 2) and the two test pits indicated that PAH and glycol concentrations in soil met the MWLAP standards for a commercial property.

6.3 Oil/Water Separator Outflow Pipe Excavation Results

Sample EXC031208 FL1, collected from the base of the oil/water separator, outflow pipe excavation, contained EPH₁₀₋₁₉ and EPH₁₉₋₃₂ at concentrations less than the CSR CL

standards. The analytical results for the confirmatory soil sample collected from the base of the excavation are presented in Table 1 attached. The analytical report from ALS is presented in Appendix A.

6.4 Contaminated Soil Remediation

Approximately 3 m³ of hydrocarbon contaminated soil generated during remediation work completed in the vicinity of the former leaky drums and treated timbers area during the DSI program was disposed of at Quantum's Highland Remediation Facility in Victoria on November 6, 2003. One m³ of hydrocarbon impacted soil generated from the oil/water separator outflow pipe excavation was removed from the Property and disposed of at Quantum's Highland Remediation Facility in Victoria, BC on January 22, 2004.

7.0 CONCLUSION

Based on the results of the additional assessment works and remediation program, EBA makes the following conclusions:

- A total of approximately 3 m³ of hydrocarbon impacted soils was removed from the former leaky drums and treated timbers area. The final limits of this excavation were approximately 15 m by 10 m in size and extended vertically to a depth ranging to a maximum of 0.3 m below surface grade. Two test pits were also completed in this area to depths of 2.5 m and 2.0 m to assess potential hydrocarbon contamination of soil at depth. Confirmatory soil samples collected from the base of the excavation and the two test pits indicated that hydrocarbon concentrations (polycyclic aromatic hydrocarbons and glycol) in soil met the MWLAP standards for a commercial property. The soil generated from the remediation was stockpiled on 6-mil polyethylene sheeting until it was disposed of off site by Quantum Environmental Group (Quantum) on November 6, 2003.
- A total of approximately 1 m³ of hydrocarbon impacted soils was removed from the oil/water separator outflow pipe area, which is located at the base of an old loading ramp in the western portion of the Property. The excavated soil was placed in a polyethylene-lined bag provided by Quantum. The final limits of this excavation were approximately 2 m by 1 m in size and extended vertically to a depth ranging of approximately 0.5 m below surface grade. One confirmatory soil sample was

collected from the base of the remedial excavation and was found to contain concentrations of hydrocarbons that were less than the Contaminated Sites Regulation (CSR) commercial land use (CL) standards.

- Analytical results from the soil sample collected from Test Pit 03-4 (TP03-4) at a depth of 3.9 m, contained benzene at a concentration less than the CSR CL standard. This sample was collected by EBA to confirm the marginally elevated benzene concentration found in a soil sample collected from EBA BH12 @ 3.9 m in this area during the DSI.
- The excavated hydrocarbon contaminated soil generated during both the DSI and this remediation program was disposed of at Quantum's Highland Remediation Facility in Victoria, BC in January, 2004.
- EBA concludes that the in situ soils remaining within the target remediation areas on the Property comply with the CSR standards for commercial land use. The remediation program outlined in this report was successful in removing from the Property all suspect fill and native soils containing concentrations of hydrocarbons exceeding the CSR CL standards in the vicinity of the oil/water separator outflow pipe.
- No further action, in regards to CSR regulated hydrocarbon parameters in soil on the property is warranted at this time.

8.0 PROFESSIONAL STATEMENT

As required under Part 16, Section 63 of the Waste Management Act, *Contaminated Sites Regulation* (CSR), BC Reg. 375/96, deposited 1996 12 16, O.C. 1480/96, effective 1997 04 01 (includes amendments BC Reg. 244/99, deposited 1999 07 19 and BC Reg. 17/2002, deposited 2002 02 04), EBA acknowledges that the person(s) signing this report has (have) demonstrable experience and is(are) familiar in completing the work, as described, for the type of contamination at this site. The documentation provided has been prepared in accordance with the applicable regulations in the Act.

9.0 CLOSURE

This report was prepared by personnel with professional experience in site investigations of this nature and who specifically participated in the investigation at the highways yard located at the Highway 4 junction near Ucluelet, BC. The report was prepared in accordance with all requirements in the Waste Management Act and the regulations.

Conclusions presented in this report are based on site observations made by EBA, soil sampling, and analytical testing of selected samples. This report has been prepared for the use of British Columbia Buildings Corporation, which includes distribution as required by British Columbia Buildings Corporation for the purposes for which this assessment was commissioned. The BC Ministry of Water, Land and Air Protection may rely upon this report for the purposes of review and comment. It has been prepared in accordance with generally accepted engineering practices. No other warranty is made, either express or implied. This report is subject to the "Environmental Report – General Conditions" which are contained in Appendix B.

Respectfully submitted;

EBA Engineering Consultants Ltd.

Prepared by:

Reviewed by:

Mike Gallo, B.Sc.
Environmental Scientist

Martin Jarman, P.Geo.
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Senior Environmental Technician



EBA Engineering Consultants Ltd.



PROJECT

SUPPLEMENTAL REMEDIATION
UCLUELET HIGHWAYS YARD

CLIENT

BRITISH COLUMBIA BUILDINGS CORPORATION

TITLE

SITE LOCATION

DATE 2004 01 06

DWN.

SG/LP

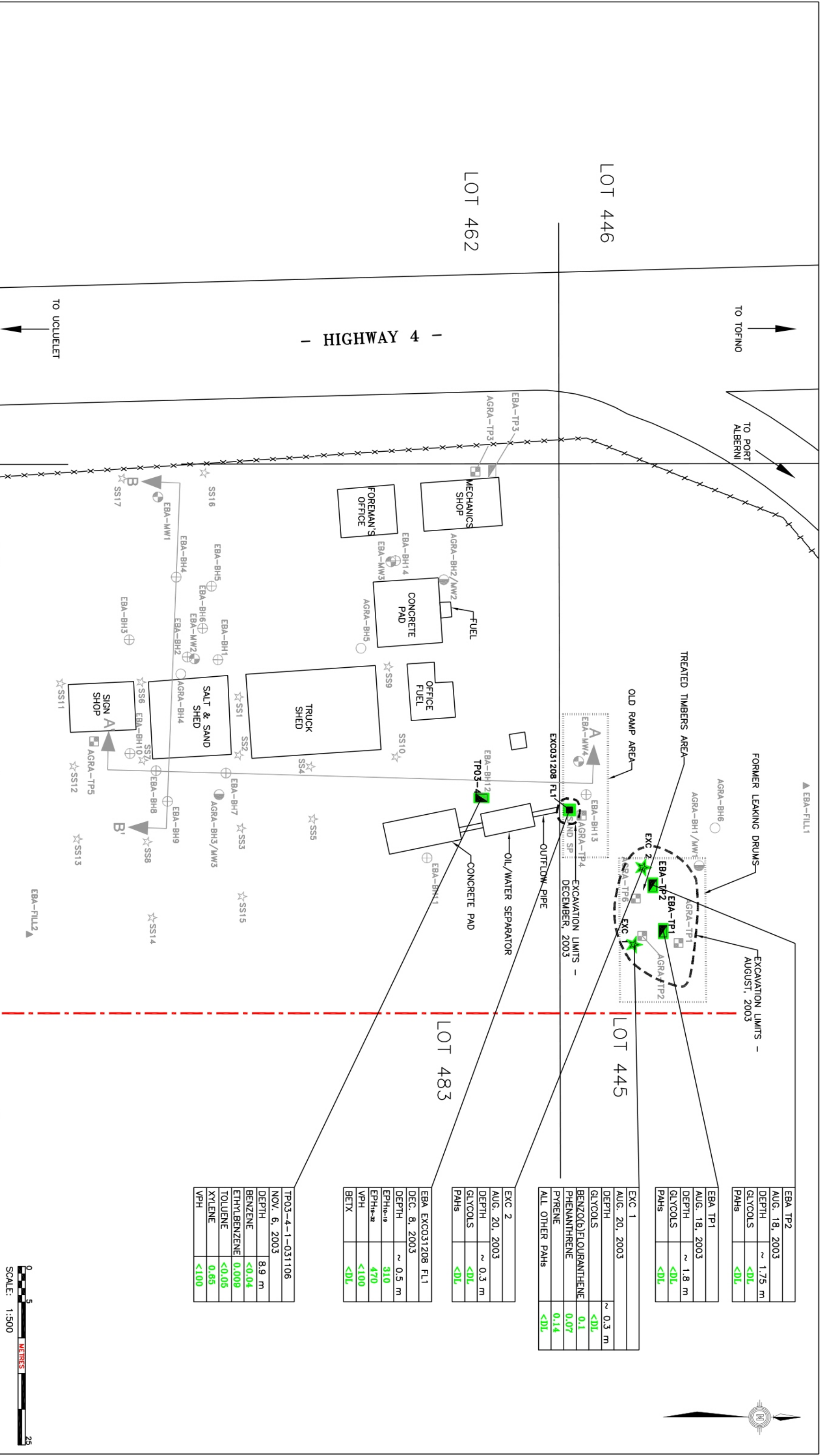
CHKD.


MG

FILE NO.

0802-2840068.001

FIGURE 1



EBA Engineering Consultants Ltd. 				PROJECT	
CLIENT				SUPPLEMENTAL REMEDIATION	
BRITISH COLUMBIA BUILDINGS CORPORATION				UCLUELET HIGHWAYS YARD	
TITLE				SITE PLAN, REMEDIAL EXCAVATION AND SOIL SAMPLE LOCATIONS	
DATE	2004 01 15	DWN	SG	CHKD.	MG
FILE NO.	0802-2840068.001	FIGURE 2			

**Table 1: Summary of Soil Analytical Results
Confirmatory Soil Samples - Hydrocarbon Analysis**

Sample Location	TP03-4	Outflow Pile Excavation	Leaky Drum/Treated Timbers Excavation				CSR CL Standards ¹
Sample ID	TP03-4-1-031106	EXC031208 FL1	EXC 1	EXC 2	EBA TP1	EBA TP2	
Depth (m)	3.9	0.5	0.3	0.3	1.8	1.75	
Date Sampled	6-Nov-03	8-Dec-03	20-Aug-03	20-Aug-03	18-Aug-03	18-Aug-03	
Extractable Petroleum Hydrocarbons (mg/kg)							
EPH ₁₀₋₁₉	-	310	-	-	-	-	2000 ²
EPH ₁₉₋₃₂	-	470	-	-	-	-	5000 ³
Non Halogenated Volatiles (mg/kg)							
Benzene	<0.04	< 0.04	-	-	-	-	0.04 ⁴
Ethylbenzene	0.059	< 0.05	-	-	-	-	7 ⁴
Toluene	<0.05	< 0.05	-	-	-	-	2.5 ⁴
Xylenes	0.65	< 0.10	-	-	-	-	20 ⁴
VPH	<100	< 100	-	-	-	-	200
Glycols (mg/kg)							
Diethylene Glycol	-	-	< 10	< 10	< 10	< 10	-
Ethylene Glycol	-	-	< 10	< 10	< 10	< 10	1,500 ⁴
1,2-Propylene Glycol	-	-	< 10	< 10	< 10	< 10	-
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Benzo(a)anthracene	-	-	< 0.05	< 0.05	< 0.05	< 0.05	10
Benzo(a)pyrene	-	-	< 0.05	< 0.05	< 0.05	< 0.05	10 ⁴
Benzo(b)flouranthene	-	-	0.10	< 0.05	< 0.05	0.11	10
Benzo(k)flouranthene	-	-	< 0.05	< 0.05	< 0.05	< 0.05	10
Dibenz(a,h)anthracene	-	-	< 0.05	< 0.05	< 0.05	< 0.05	10
Indeno(1,2,3-c,d)pyrene	-	-	< 0.05	< 0.05	< 0.05	< 0.05	10
Naphthalene	-	-	< 0.05	< 0.05	< 0.05	< 0.05	50
Phenanthrene	-	-	0.07	< 0.05	< 0.05	0.09	50
Pyrene	-	-	0.14	< 0.05	< 0.05	0.27	100

ALS Files: T2947, T2979, T6395, T7601

NOTES:

"-" indicates not analyzed or no Standards apply

"<" indicates less than laboratory detection limit.

Bold indicates parameter exceeds corresponding CSR CL Standard

¹ BC Contaminated Sites Regulation (CSR) (BC Reg. 375/96) generic soil standards for Commercial Land Use (CL), unless otherwise indicated.

² Compared to LEPH value, Schedule 4 of CSR.

³ Compared to HEPH value, Schedule 4 of CSR.

⁴ CSR matrix soil standard - site specific factor for groundwater used for drinking water, groundwater flow to surface used by freshwater aquatic life, intake of contaminated soil or toxicity to soil invertebrates and plants, whichever is most stringent.



CHEMICAL ANALYSIS REPORT

Date: November 19, 2003

ALS File No. T6395

Report On: Ucluelet Hwys. Yard
Soil Analysis

Report To: **EBA Engineering Consultants Ltd.**
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Attention: **Mr. Cal Faminow**

Received: November 10, 2003

ALS ENVIRONMENTAL

per:

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File No. T6395

RESULTS OF ANALYSIS - Sediment/Soil



Sample ID TP03-4-1
-031106

Sample Date 03 11 06
ALS ID 1

Physical Tests

Moisture % 39.6

Non-Halogenated Volatiles

Benzene <0.040
Ethylbenzene 0.059
Methyl t-butyl ether (MTBE) <0.050
Styrene <0.050
Toluene <0.050

meta- & para-Xylene 0.527
ortho-Xylene 0.120
Total Xylenes 0.65
Volatile Hydrocarbons (VH6-10) <100
VPH <100

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
VPH = Volatile Petroleum Hydrocarbons.

Appendix 1 - METHODOLOGY



Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Moisture in Sediment/Soil

This analysis is carried out gravimetrically by drying the sample at 103 C for a minimum of six hours.

Recommended Holding Time:

Sample: 14 days

Reference: Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Calculation of Total Xylenes

Total Xylenes is the sum of the ortho, meta, and para Xylene isomer concentrations. It is calculated by adding the concentrations of all Xylene isomers that are greater than their detection limits. Results that are below detection limit are treated as zero. The detection limit for this parameter is equal to the sum of the detection limits of the individual xylene parameters.

Volatile Petroleum Hydrocarbons (VPH) in Solids

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

Recommended Holding Time: Not Applicable

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End of Report